

**BIOGRAPHICAL SKETCH**

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.  
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME Robin Shandas	POSITION TITLE Professor		
eRA COMMONS USER NAME			
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR(s)	FIELD OF STUDY
University of California, Santa Barbara	B.S.E.E.	1987	Electrical Engineering
University of California, San Diego	M.Sc	1991	Biomedical Engineering
University of California, San Diego	Ph.D.	1993	Biomedical Engineering
California Institute of Technology	Post-Doc	1993-1994	Fluid Dynamics

Please refer to the application instructions in order to complete sections A, B, and C of the Biographical Sketch.

**A. Positions and Honors**

- 7/94 – 6/00 : Assistant Professor, Dept. of Pediatrics, Section of Cardiology, University of Colorado Health Sciences Center, affiliated with The Children’s Hospital, Denver, CO.  
 1/96 – 1/01: Adjunct Assistant Professor, Dept. of Mechanical Engineering, University of Colorado, Boulder.  
 6/00 – 6/06: Associate Professor, Dept. of Pediatrics, Section of Cardiology, University of Colorado Health Sciences Center, affiliated with The Children’s Hospital, Denver, CO.  
 1/01 – 6/06: Joint Associate Professor, Dept. of Mechanical Engineering, University of Colorado, Boulder and Dept. of Pediatrics, Section of Cardiology, University of Colorado Health Sciences Center  
 7/06 - +: Professor, Dept. of Mechanical Engineering, University of Colorado, Boulder  
 7/06 - +: Professor, Dept. of Pediatrics, Section of Cardiology, University of Colorado Health Sciences Center, Denver.  
 6/06 - +: Director of Research, Children’s Hospital Heart Institute, Children’s Hospital, Denver, CO  
*Jointly tenured at University of Colorado, Boulder, Dept. of Mechanical Engineering, and University of Colorado Health Sciences Center, Dept. of Pediatric Cardiology.*

**Select Honors**

- 2006: NIH K-24 Mid-CAREER Award in Translational Research  
 2006: Dean’s Faculty Fellowship, University of Colorado, College of Engineering and Applied Sciences  
 2005: Shell Outstanding Graduate Educator Award, Dept. of Mechanical Engineering  
 2004: Nightingale Award for best paper published in 2003 in journal *Medical & Biological Engineering and Computing*  
 2001: Children’s Hospital Research Service Award  
 1996: Children’s Hospital Professional Development Award  
 1991: Summer Research Fellowship, University of Trondheim, Norway  
 1983-87: Full Scholarship (Regents Award), University of California Santa Barbara

**Study sections (select)**

- NIH: Heart, Lung, and Blood Institute, Surgery & Bioengineering Study Section (2002, 2005)
- NSF-SBIR Bioengineering Review Panel (2002, 2003, 2004, 2006)

- NSF-CAREER Bioengineering Review Panel (2002)
- NIH: HLBI, Fellowship Training Study Section (2003,2004,2005, 2006)
- NIH: Fellowship Training Study Section: Imaging (2004)
- NIH: P41 Imaging Review Section (2004)
- NIH: CICS Imaging Study Section (2004,2005)
- NIH: SBIR Ultrasound Study Section (2005)
- AHA: Research Grants Study Section (2006)

**B. Select Publications (from > 85 journal papers, > 100 mini-papers / conference proceedings, > 110 abstracts) – Dr. Shandas' Trainees highlighted in CAPS**

1. **Shandas R**, Gharib M, Sahn DJ: The Nature of Flow Acceleration into a Finite Sized Orifice: Steady and Pulsatile Flow Studies on the Flow Convergence Region using Simultaneous Ultrasound Doppler Flow Mapping and Laser Doppler Velocimetry, *J Am Coll Cardiology*, 1995;25:1199-212.
2. GE S, Jones M, Shiota T, Yamada I, Valdes-Cruz LM, **Shandas R**, Sahn DJ: Determination of flow rate and orifice area in mitral stenosis by Doppler color flow imaging: Quantitative application of centerline velocity/distance function of proximal flow field. *J Am Coll Cardiol* 1995;379A.
3. **Shandas R**, WEINBERG C, Nicol E, Ivy DD, DEGROFF C, Hertzberg J, Valdes-Cruz LM: Development Of A Non-Invasive Ultrasound Color M-Mode Means Of Estimating Pulmonary Vascular Resistance In Pediatric Pulmonary Hypertension: Numerical Analysis, *In vitro* Validation and Preliminary Clinical Studies, *Circulation*. 2001;104(8):908-13.
4. **Shandas R**, WEINBERG C, Ivy D, GE S, Hertzberg J, DEGROFF CG, Valdes-Cruz LM: Use of Doppler and color M-mode flow propagation to predict local compliance and pulmonary vascular resistance for pediatric pulmonary hypertension: In vitro and clinical studies, *Circulation (Suppl-II)* 2000;102(18):II-772.
5. **Shandas R**, KWON J, Valdes-Cruz LM: Laser Flow Visualization of the *Vena Contracta* Areas for Heart Valve Prostheses: *In Vitro* Studies on Bileaflet Mechanical Valves, *Circulation*, 2000;101:1953-1959
6. GE S, **Shandas R**, DEGROFF CG, Knudson O, Shaffer EM, Valdes-Cruz LM: Assessment of pediatric aortic stenosis using 3D color Doppler echocardiography, *J Am. Soc. Echocardiography* 2001;14(5):477.
7. GE S, **Shandas R**, Mazzaro L, DEGROFF CG, Knudson O, Valdes-Cruz L. A Novel method to Non-Invasively Assess Effective Flow Areas for pediatric Aortic Stenosis using Contrast Echocardiography Coupled with Second harmonic Imaging: Comparison with the Doppler Continuity Equation and Laser Flow Visualization. *J Am Coll Cardiol* 39: 1189-49, 2002.
8. KHUNATORN Y, DEGROFF C, Mahalingam S, **Shandas R**: Influence of connection geometry and SVC-IVC flow rate ratio on flow structures within the total cavopulmonary connection: A numerical study, *J. Biomechanical Engineering* 2002;124(4):364-377.
9. WEINBERG C, Hertzberg J, **Shandas R**: Utility of Intravascular Ultrasound to Measure Local Compliance of the Pediatric Pulmonary Artery: In Vitro Studies, *J. Am. Soc. Echo*, 2002;15:1507-1514.
10. KHUNATORN Y, **Shandas R**, DEGROFF C, Mahalingam S: Comparison of *in vitro* velocity measurements in a scaled total cavopulmonary connection with computational predictions, *Annals of Biomedical Engineering*, 2003;31:810-822.
11. LANNING C, **Shandas R**: Development and validation of implantable sensors for monitoring function of prosthetic heart valves: in vitro studies, *Med Biol Eng Comput*. 2003;41(4):416-24. – **BEST PAPER AWARD FOR 2003.**
12. COOKE J, Hertzberg J, Boardman M, **Shandas R**: Characterizing Vortex Ring Behavior During Left Ventricular Diastolic Filling with Doppler Color M-Mode Echocardiography: An *In-Vitro* Study, *Annals of Biomedical Engineering*, 2004 Feb;32(2):245-56.

13. KIM HB, Hertzberg JR, **Shandas R**: Development and validation of an ultrasound-based flow velocimetry system, *Experiments in Fluids*, 2004;36:455-462.
14. WEINBERG C, Hertzberg J, Valdes-Cruz LM, **Shandas R**: Extraction of pulmonary vascular compliance, PVR and RV work from single-pressure and Doppler flow measurements in children with pulmonary hypertension -- a new method for evaluating reactivity: In vitro and clinical studies, *Circulation*, 2004;110:2609-2617.
15. KIM HB, Hertzberg JR, LANNING C, **Shandas R** Non-invasive measurement of steady and pulsating velocity profiles and shear rates in arteries using echo PIV: in vitro validation studies, *Annals of Biomedical Engineering*, 2004;32(8):1067-1076.
16. MUKDADI O, KIM HB, Hertzberg JR, **Shandas R**: On the enhancement of ultrasound backscatter from microbubbles for optimal particle image velocimetry, *Ultrasonics*, 2004;42(10):1111-1121.
17. ZHENG H, MUKDADI O, Hertzberg J, **Shandas R**: Advantages in using multifrequency excitation of contrast microbubbles for enhancing echo particle image velocimetry techniques: Initial numerical studies using rectangular and triangular waves, *Ultrasound Med Biol*. 2005 Jan;31(1):99-108.
18. Degroff C, Birnbaum B, **Shandas R**, Orlando W, Hertzberg J: Computational simulations of the total cavo-pulmonary connection: insights in optimizing numerical solutions. *Med Eng Phys*. 2005 Mar;27(2):135-46.
19. MAZZARO LA, Almasi S, Seals DR, **Shandas R**, Gates PE: Aortic input impedance increases with age in healthy men and women, *Hypertension*, 2005;45:1-6.
20. ZHANG Y, Dunn M, Drexler ES, Wright JE, Slifka AJ, McCowan CN, Ivy DD, **Shandas R**: Orthotropic hyperelasticity of the pulmonary arteries in rats with and without pulmonary hypertension: a microstructural modeling approach, *Ann. Biomed. Eng.*, 2005;35:1042-1052.
21. HUNTER K, LANNING C, Chen K-C, Ivy DD, **Shandas R**: Simulations of Congenital Septal Defect Closure and Reactivity Testing in Patient-Specific Models of the Pediatric Pulmonary Vasculature: A 3-D Numerical Study with Fluid-Structure Interaction, in press, *J. Biomechanical Engineering*, 2006.
22. ZHENG H, BARKER A, **Shandas R**: Predicting backscatter characteristics from micron- and sub-micron scale ultrasound contrast agents using a size integration technique, in press, *IEEE Transactions Ultrasonics and Ferrofrequency Control*, 2006.
23. DYER K, LANNING C, DAS BB, Ivy DD, **Shandas R**: Development and validation of a non-invasive color M-mode tissue Doppler imaging technique for measuring pulmonary artery compliance: in vitro and clinical studies, in press, *J Am. Soc. Echocardiography*, 2006.
24. DYER K, Pauliks LP, DAS BB, **Shandas R**, Ivy D, Shaffer EM, Valdes-Cruz LM. Use of Myocardial Performance Index in Pediatric Patients with Idiopathic Pulmonary Arterial Hypertension, *J Am. Soc. Echocardiography*, 2006;19(1):21-27.
25. ZHENG H, MUKDADI O, **Shandas R**: Computational and experimental backscatter characterization of sub-micron contrast agents for ultrasound based molecular imaging techniques, *Physics Med Biol* 2006;51(2):557-573.
26. Gall K, YAKACKI C, Liu Y, **Shandas R**, Anseth KA: Thermomechanics of the Shape Memory Effect in Polymers for Biomedical Applications, *J. Biomedical Materials Research*, 2005;73A:339-348.
27. ZHENG H, LIU L, WILLIAMS L, Hertzberg JR, **Shandas R**: High resolution real time multi-component echo particle image velocimetry technique for opaque flow imaging, accepted pending minor revision, *App. Phys. Letters*, 2006.

### Chapters in books

1. **Shandas R:** Physics and Instrumentation of Ultrasound and Doppler imaging, in *Echocardiography in Congenital Heart Disease: Embryologic-Anatomic Considerations and Surgical Implications*, by Valdes-Cruz LM, Cayre R, Lippincott-Raven, Philadelphia, 1999.

### C. RESEARCH SUPPORT (Select)

NIH, NHLBI (HL 55243) (PI: Shandas), *Effective flow areas of bileaflet mechanical valves*, 8/96 – 7/99  
The major goals of this project were to develop clinically usable methods to assess functional flow area for prosthetic heart valves.

The Whitaker Foundation (PI: Shandas), *Fluid mechanics of ventricular filling*, 9/98 – 08/01,  
The major goals of this project were to develop ultrasound contrast-based techniques to quantify LV inflow dynamics.

NIH NHLBI, (RO1-HL67393), (PI: Shandas), *Non-Invasive Assessment of Primary Pulmonary Hypertension* 7/01 – 6/07, % effort: 8%  
The major goals of this project are to develop novel non-invasive techniques to estimate pulmonary vascular resistance in primary pulmonary hypertension

NIH-HLBI (R21 HL079868), (PI: Shandas), *Real time blood flow velocimetry using ultrasound*, 9/04 – 9/07, \$425,000, % effort: 5%  
The major goals of this grant are to develop contrast-based flow velocimetry techniques.

NSF – Major Research Instrumentation (MRI) Development Award, (PI: Shandas), *Development of a non-invasive flow velocimetry system for opaque flows*, 9/04 – 8/07, % effort: %  
The major goals of this project are to develop a hardware-based system optimized for non-linear contrast imaging and ultrasound flow velocimetry.

NIH HLBI (T32 HL 72738), (PI: Shandas), Pre- and Post-doctoral Training Grant: *Cardiovascular Biomechanics and Imaging*, 3/03 – 3/08, \$975,000, % effort: 5%  
This grant provides support for pre- and post-doctoral (Ph.D, and MD) training in various aspects of cardiovascular bio/fluid mechanics and imaging (ultrasound, MRI, angiography).

NIH-NIBIB, R21 EB 004481, (PI: Shandas), 7/05 – 7/08, \$391,808, % effort: 5%  
*Development of SMP's for cardiovascular application*  
The goals of this project are to explore novel polymers with shape memory properties to develop cardiovascular prostheses for minimally invasive surgery.

NIH-NHLBI, K24 HL051506 (PI: Shandas), 9/06 – 8/11, \$785,799, % effort: 20%  
*Comprehensive Clinical Assessment of Pediatric PHT*  
The goals of this mid-level CAREER award in translational research are to develop new methods to evaluate pulmonary hypertension in children and to train clinical researchers in this area.

NIH-NHLBI-SCCOR, P50 HL084923 (PI: Stenmark), 12/06 – 11/11 \$14,422,073  
*Lung vascular disease in infants and children: Mechanisms and treatment*  
Project 3 (PI:Shandas) *Advanced diagnostics and imaging in pediatric PHT*, \$2,984,305, % effort: 30