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CURRICULUM VITAE

Last updated: 06/11/2022

RESEARCH INTERESTS

I am fascinated by how external factors such as obesity can modulate cardiac arrhythmias at molecular, cellular, tissue and whole organ level. The long-term goal for my independent research career is to combine electrophysiology, adipose biology, and bioinformatics to characterize the role of metabolic syndrome and obesity in particular in promoting cardiac arrhythmias as well as develop and validate novel diagnostic tools and strategies for effective therapy of these diseases.

EDUCATION

University of Utah, Salt Lake City, UT Ph.D. in Biomedical Engineering, August 2015	2007-2015
University of Notre Dame, South Bend, IN M.S. in Computer Science and Engineering, January 2006	2002-2006
Andrews University, Berrien Springs, MI B.S. in Computer Science, December 2000	1998-2000

RESEARCH EXPERIENCE

Postdoctoral Research Fellow, George Washington University, Washington, DC Dr. Igor R. Efimov Project title: Arrhythmia mechanism in donor human hearts	2015-present
Predocotrinal Research Fellow, University of Utah, Salt Lake City, UT Dr. Rob S. MacLeod Thesis title: Bioelectric source characterization of acute myocardial ischemia	2007-2015

Graduate Student, University of Notre Dame, South Bend, IN 2002-2006
Dr. Jesus A. Izaguirre
Thesis title: Using design patterns in scientific applications

INDUSTRY EXPERIENCE

Intellectual Property Manager, Whirlpool Corporation, Benton Harbor, MI 2004-2007
Business Analyst, Whirlpool Corporation, Benton Harbor, MI 2002-2004
Project Engineer, Whirlpool Corporation, Benton Harbor, MI 2000-2002

HONORS & AWARDS

NIH K99/R00 Pathway to Independence Award (NHLBI) 2020-present
Jos Willems Young Investigator Recipient (ISCE) 2014
Young Investigator Finalist (ICE) 2013
Graduate student scholarship (University of Utah) 2007-2015
Undergraduate student scholarship (Andrews University) 1998-2000

PUBLICATIONS

In preparation

1. **Aras KK**, Rytkin E, Efimov IR. The Role of Virtual Electrode Polarization in Cardiac Stimulation and Electrotherapy.
2. Gândara MI, Efimov IR, **Aras K**. Effect of Spatial Resolution on Arrhythmia Rotor Detection and Localization.
3. **Aras KK**, Gupta SG, Richards KA, Gams A, Baranova A, Rahnavard A, Crandall KA, Efimov IR. Integrative analysis of cardiac and epicardial adipose tissue multi-omics to detect the molecular mechanisms for cardiac obesity induced arrhythmias in humans.

Published

1. Ernault AC, Verkerk AO, Bayer JD, **Aras K**, Agudo PM, Mohan RA, Veldkamp M, Kawasaki M, van Amersfoort SCM, Driessen AHG, Efimov IR, de Groot J, Coronel R. The Secretome of Epicardial Adipose Tissue Facilitates Reentrant Arrhythmias by Myocardial Remodeling. *Heart Rhythm*, 2022.
2. Yang Z, Zhang L, **Aras K**, Efimov IR, Adam GC. Hardware Mappable Cellular Neural Networks for Distributed Wavefront Detection in Next-generation Cardiac Implants. *Advanced Intelligent Systems*, 2022.
3. Choi YS, Jeong H, Yin RT, Pfenniger A, Tzavelis A, Lee JY, Avila R, Lee YJ, Chen SW, Kim S, Yoo J, Knight HS, Ahn H, Wickerson G, Dempsey E, Russo BA, Napolitano MA, Holleran TJ, Miniovich AN, Lee G, Vazquez A, Geist B, Kim B, Han S, Brennan JA, **Aras K**, Kwak SS, Kim J, Yang X, Burrell A, Chun KS, Wu C, Rwei AY, Banks A, Johnson D, Zhang ZJ, Haney CR, Jin SH, Sahakian AV, Huang Y, Trachiotis GD, Knight BP, Arora RK, Efimov IR, Rogers JA. Transient closed-loop network of wireless, body-integrated devices for autonomous electrotherapy. *Science*, 2022.
4. **Aras KK**[#], Gams A, Faye NR, Brennan JB, Goldrick K, Li J, Zhong Y, Chiang C, Smith EH, Poston MD, Potter J, Hanna P, Mori S, Ajijola O, Shivkumar K, Hoover DB, Viventi J, Rogers JA,

- Bernus O, Efimov IR. Electrophysiology and Arrhythmogenesis of the human right ventricle outflow tract. *Circ Arrhythm Electrophysiol*, 2022 (*Editor's pick*) #co-corresponding author
5. Yang Q, Wei T, Yin RT, Wu M, Xu Y, Koo J, Choi YS, Xie Z, Chen SW, Kandela I, Yao S, Deng Y, Avila R, Liu T, Bai W, Yang Y, Han M, Zhang Q, Haney CR, Lee KB, **Aras K**, Wang T, Seo M, Luan H, Lee SM, Brikha A, Ghoreishi-Haack N, Tran L, Stepian I, Aird F, Waters EA, Yu X, Banks T, Trachiotis G, Torkelson JM, Huang Y, Kozorovitskiy Y, Efimov IR, Rogers JA. Photocurable bioresorbable adhesives as functional interfaces between flexible bioelectronic devices and soft biological tissues. *Nat Materials*, 2021
 6. Kyryachenko S, Georges A, Yu M, Berrandou T, Guo L, Bruneval P, Rubio T, Gronwald J, Baraki H, Kutschka I, **Aras K**, Efimov IR, Norris RA, Voigt N, Bouatia-Naji N. Chromatin Accessibility of Human Mitral Valves and Functional Assessment of MVP Risk Loci. *Circ Res*, 2021
 7. Han M*, Chen L*, **Aras K***, Liang C, Chen X, Zhao H, Li K, Faye NR, Sun B, Kim JH, Bai W, Yang Q, Ma Y, Lu W, Song E, Baek JM, Lee Y, Liu C, Model JB, Yang G, Ghaffari R, Huang Y, Efimov IR, Rogers JA. Catheter-integrated soft multilayer electronic arrays for multiplexed sensing and actuation during cardiac surgery. *Nat Biomed Eng*, 2020 *These authors contributed equally to the work.
 8. Smirnov D, Pikunov A, Syunyaev R, Deviatiiarov R, Gusev O, **Aras K**, Gams A, Koppel A, Efimov IR. Genetic algorithm-based personalized models of human cardiac action potential. *PLoS One*, 2020
 9. Tate JD, Pilcher TA, **Aras KK**, Burton BM, MacLeod RS. Validating defibrillation simulation in a human-shaped phantom. *Heart Rhythm*, 2020
 10. Handa BS, Li X, **Aras KK**, Qureshi NA, Mann I, Chowdhury RA, Whinnett ZI, Linton NWF, Lim PB, Kanagaratnam P, Efimov IR, Peters NS, Ng FS. Granger Causality-Based Analysis for Classification of Fibrillation Mechanisms and Localization of Rotational Drivers. *Circ Arrhythm Electrophysiol*, 2020
 11. **Aras KK**, Efimov IR. Irreversible electroporation: Proceed with caution. *Heart Rhythm*, 2018
 12. **Aras KK**, Faye NR, Cathey B, Efimov IR. Critical Volume of Human Myocardium Necessary to Maintain Ventricular Fibrillation. *Circ Arrhythm Electrophysiol*, 2018
 13. Burton BM, **Aras KK**, Good WW, Tate JD, Zenger B, MacLeod RS. A Framework for Image-Based Modeling of Acute Myocardial Ischemia Using Intramurally Recorded Extracellular Potentials. *Ann Biomed Eng*, 2018
 14. Burton BM, **Aras KK**, Good WW, Tate JD, Zenger B, MacLeod RS. Image-based modeling of acute myocardial ischemia using experimentally derived ischemic zone source representations. *J Electrocardiol*, 2018
 15. Gloschat C, **Aras K**, Gupta S, Faye NR, Zhang H, Syunyaev RA, Pryamonosov RA, Rogers J, Kay MW, Efimov IR. RHYTHM: An Open Source Imaging Toolkit for Cardiac Panoramic Optical Mapping. *Sci Rep*, 2018
 16. Rodenhauer A, Good WW, Zenger B, Tate J, **Aras K**, Burton B, MacLeod RS. PFEIFER: Preprocessing Framework for Electrograms Intermittently Fiducialized from Experimental Recordings. *J Open Source Softw*, 2018
 17. **Aras KK**, Kay MW, Efimov IR. Ventricular Fibrillation: Rotors or Foci? Both!. *Circ Arrhythm Electrophysiol*, 2017

18. Gloschat CR, Koppel AC, **Aras KK**, Brennan JA, Holzem KM, Efimov IR. Arrhythmogenic and metabolic remodeling of failing human heart. *J Physiol*, 2016
19. **Aras K[#]**, Burton B, Swenson D, MacLeod R. Spatial organization of acute myocardial ischemia. *J Electrocardiol*, 2016. #Corresponding author
20. **Aras K[#]**, Good W, Tate J, Burton B, Brooks D, Coll-Font J, Doessel O, Schulze W, Potyagaylo D, Wang L, van Dam P, MacLeod R. Experimental Data and Geometric Analysis Repository-EDGAR. *J Electrocardiol*, 2015. #Corresponding author
21. **Aras K[#]**, Burton B, Swenson D, MacLeod R. Sensitivity of epicardial electrical markers to acute ischemia detection. *J Electrocardiol*, 2014. #Corresponding author
22. Tate J, Pilcher T, **Aras K**, Burton B, MacLeod R. Verification of a Defibrillation Simulation Using Internal Electric Fields in a Human Shaped Phantom. *Computing in Cardiology*, 2010
23. **Aras KK**, Shome S, Swenson DJ, Stinstra J, MacLeod RS. Electrographic Response of the Heart to Myocardial Ischemia. *Comput Cardiol*, 2009
24. Cickovski T, **Aras K**, Alber MS, Izaguirre JA, Swat M, Glazier JA, Merks RM, Glimm T, Hentschel HG, Newman SA. From Genes to Organisms Via the Cell A Problem-Solving Environment for Multicellular Development. *Comput Sci Eng*, 2007

PATENTS

Efimov IR, **Aras KK**, Rogers JA, Gremi E, Pospisil D. High resolution multi-function and conformal electronics device for diagnosis and treatment of cardiac arrhythmias. US Patent App. 15/886,673, filed Aug. 8, 2018.

INVITED BOOK CHAPTERS

1. Yin RT, Choi YS, **Aras KK**, Knight HS, Miniovich AN, Efimov IR. Innovation in Cardiovascular Bioelectronics. In Jamshid H. Karimov et al., Editors, *Advances in Cardiovascular Technology, New Devices and Concepts*, pages 587-600. Academic Press, first edition, 2022.
2. Yin RT, Lee B, Panting JS, Chen SW, **Aras KK**, Efimov IR. Organ conformal electronics for cardiac therapeutics. In Udi Nussinovitch, Editor, *Emerging Technologies in Heart Diseases Volume 2: Treatments for Myocardial Ischemia and Arrhythmias*, pages 911-940. Academic Press, first edition, 2020.
3. **Aras KK**, Ripplinger CM, Efimov IR. The virtual electrode hypothesis of defibrillation. In Igor Efimov, Mark Kroll, and Patrick Tchou, editors, *Cardiac Bioelectric Therapy, Mechanisms and Practical Implications*, pages 331-356. Springer Nature, second edition, 2020.
4. **Aras KK**, Efimov IR. Conformal electronics therapy for defibrillation. In Igor Efimov, Mark Kroll, and Patrick Tchou, editors, *Cardiac Bioelectric Therapy, Mechanisms and Practical Implications*, pages 660-686. Springer Nature, second edition, 2020.
5. **Aras KK**, Boukens BJ, Ripplinger CM, Gloschat CR, Efimov IR. Optical mapping of successful and failed defibrillation. In Mohammad Shenasa, editor, *Cardiac Mapping*, pages 448-463. John Wiley and sons, fifth edition, 2019.

TEACHING EXPERIENCE

Guest Lecturer Fall 2021
BME3907: Clinical Cardiovascular Engineering
Biomedical Engineering Department, George Washington University
Course master: Dr. Igor Efimov

Guest Lecturer Fall 2020
BME6045: Cardiovascular Engineering & Technology
Biomedical Engineering Department, George Washington University
Course master: Dr. Igor Efimov

Guest Lecturer Fall 2015-2018
BME3820: Principles and Practice of Biomedical Engineering
Biomedical Engineering Department, George Washington University
Course master: Dr. Matthew Kay

Co-Instructor Summer 2014-2015
Image-based Biomedical Modeling
University of Utah
Course curriculum included 10 days of a combination of lectures, demos, and structure laboratory exercises on topics including: Image processing and segmentation, Scientific visualization, Geometry processing, and Bioelectric activity and fields.

Teaching Assistant Spring 2009
BE6000: Systems Physiology I
Bioengineering Department, University of Utah
Advisor: Dr. Rob MacLeod

STUDENTS MENTORED IN RESEARCH

Undergraduate, Brianna Cathey, George Washington University 2015-2019
Undergraduate, Shubham Gupta, George Washington University 2015-2019
Graduate Student, Maria Ines Gândara, George Washington University 2021-present

RESEARCH SUPPORT

Active

K99 HL148523 Aras (PI) 05/07/2020-04/30/2025
NIH (NHLBI)

Project title: Role of epicardial adiposity as a local mediator of VT/VF dynamics in donor hearts.
Project goal: This project will determine whether epicardial adipose tissue paracrine signaling promotes VT/VF in obese human hearts via local inflammation mediated CaMKII hyperactivity.
Role: PI

R01 HL141470 Efimov (PI) 01/10/2019-12/31/2022
NIH (NHLBI)
Project title: High-Definition conformal electronics for VT/VF
Project goal: This project will develop next generation of bioelectronics platform for high-definition diagnostics and electrotherapy of sudden cardiac death.
Role: Postdoctoral Fellow.

OUTREACH

Volunteer Judge 2017-2018
GWU Research Showcase, George Washington University, Washington D.C.

PROFESSIONAL DEVELOPMENT

GWU Genomics Data Carpentry Workshop Spring 2021
GWU Responsible Conduct of Research Spring 2020

PROFESSIONAL ORGANIZATION MEMBERSHIPS

American Heart Association 2017-present
Heart Rhythm Society 2019-present
George Washington Postdoc Association 2019-present

INVITED ORAL PRESENTATIONS

Heart Rhythm Society (HRS); Boston MA 2021
Leducq RHYTHM Scientific Meeting; Baltimore MD 2019
Leducq RHYTHM Scientific Meeting; Amsterdam, Netherlands 2018
International Society of Computerized Electrocardiology; Atlantic Beach FL 2014
International Congress on Electrocardiology; Glasgow, Scotland 2013
Computing in Cardiology; Park City UT 2009-2010

CONFERENCES

Gordon Research Conference; Ventura CA (poster) 2021
Heart Rhythm Society; Boston MA (second poster) 2021
American Heart Association Scientific Sessions; Philadelphia PA (poster) 2019
Heart Rhythm Society; San Francisco CA (poster) 2019
Gordon Research Conference; Tuscany, Italy (poster) 2019
American Heart Association Scientific Sessions; Anaheim CA (poster) 2017
Biomedical Engineering Society; Phoenix AZ (poster) 2017
Gordon Research Conference; Ventura CA (poster) 2017
Utah Biomedical Engineering Conference; Salt Lake City UT (poster) 2012-2014
International Society of Computerized Electrocardiology, San Jose CA (poster) 2011

SERVICE

Thesis Advisor

2020-2022

Maria Ines Gândara, M.S student of Dr. Carla Quintão (NOVA University of Lisbon)

Thesis title: Effects of spatial resolution on arrhythmia rotor detection and localization

Reviewer

American Journal of Physiology

Heart Rhythm Journal

Nature Scientific Reports

Circulation Arrhythmia and Electrophysiology

International Journal of Biochemistry and Cell Biology

Frontiers in Cardiovascular Medicine

Cardiovascular Engineering and Technology

Journal of Electrocardiology