

# **Kedar Kirtikumar Aras, Ph.D.**

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## **CURRICULUM VITAE**

Last updated: 11/17/2021

### **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
Predocctoral 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 Dr. Jesus A. Izaguirre	2002-2006

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**, 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.
2. 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 system.
3. 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.

### ***Published***

1. 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.
2. 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
3. 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.*

4. 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
5. Tate JD, Pilcher TA, **Aras KK**, Burton BM, MacLeod RS. Validating defibrillation simulation in a human-shaped phantom. *Heart Rhythm.* 2020
6. 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
7. **Aras KK**, Efimov IR. Irreversible electroporation: Proceed with caution. *Heart Rhythm.* 2018
8. **Aras KK**, Faye NR, Cathey B, Efimov IR. Critical Volume of Human Myocardium Necessary to Maintain Ventricular Fibrillation. *Circ Arrhythm Electrophysiol.* 2018
9. 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
10. 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
11. 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
12. 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
13. **Aras KK**, Kay MW, Efimov IR. Ventricular Fibrillation: Rotors or Foci? Both!. *Circ Arrhythm Electrophysiol.* 2017 Dec
14. Gloschat CR, Koppel AC, **Aras KK**, Brennan JA, Holzem KM, Efimov IR. Arrhythmogenic and metabolic remodeling of failing human heart. *J Physiol.* 2016
15. **Aras K**, Burton B, Swenson D, MacLeod R. Spatial organization of acute myocardial ischemia. *J Electrocardiol.* 2016
16. **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
17. **Aras K**, Burton B, Swenson D, MacLeod R. Sensitivity of epicardial electrical markers to acute ischemia detection. *J Electrocardiol.* 2014
18. 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).* 2010

19. **Aras KK**, Shome S, Swenson DJ, Stinstra J, MacLeod RS. Electrographic Response of the Heart to Myocardial Ischemia. *Comput Cardiol*. 2009
20. 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, 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.
2. **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.
3. **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.
4. **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 Committee Member**

2020-present

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

### **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*