Austin J. Baird PhD

Biomedcial Engineering Group Leader · Distinguished Member of the Technical Staff
1416 Dollar Ave, Durham NC, 27701
(801) 792-2582 | ajbaird86@gmail.com | ajbaird | bairdaustin

Objective

I have a passion of computational biological modeling and a track record of accomplishments related to this wonderful field. I'm always inspired by new approches and methods that consistently expand whats possible and whats known. I'm looking to make a broad impact in this reserach area and have a strong track record of leadership, scholarship, and project leadership.

Education

University of North Carolina at Chapel Hill — *Chapel Hill, NC*
PhD in Applied Mathematics — *August 2014*

University of California, Santa Cruz — *Santa Cruz, CA*
BA in Mathematics — *June 2008*

Experience

Applied Research Associates, Inc. — *Raleigh, NC*
Biomedical Modeling Group Leader (Senior Engineer, Distinguished Member of the Technical Staff) — *December 2018 - PRESENT*

- Lead a multidisciplinary team across 4 different projects in charge of agile development processes, technical roadmaping and delivery scheduling, direct communication with government customers
- Led and won six million dollars in research and development funds through Defense Health Agency grants
- Lead technical physiology modeler and principal investigator of the BioGears project
- Organized teaming across three research hospitals and multiple small businesses
- Communicate research progress through multiple conferences and peer reviewed publications, including the BioGears 2020 conference
- Oversaw implementation of all models associated with BioGears releases 7.0-7.3

Applied Research Associates, Inc. — *Raleigh, NC*
Staff Engineer 2 — *January 2017 - December 2018*

- Expanded the BioGears physiology model by adding gastro-intestinal digestion/absorption, diuretic drug, pain stimulus and epinephrine release and many others
- Nominated and won federal innovation award in collaboration with Telemedicine & Advanced Technology Research Center (TATRC) government lab
- Updated the BioGears build library to be hosted on github, modernized development timeline
- Won two government contracts totaling 4 million dollars in additional research and development funding
- Oversaw implementation of all models associated with BioGears releases 6.1-6.3

Applied Research Associates, Inc. — *Raleigh, NC*
Staff Engineer — *February 2016 - January. 2017*

- Implemented a new renal system model in the BioGears engine with local autoregulation
- Contributed to updated blood/gas model and matrix circuit solver implementation
- Led validation and unit testing of C++ code base
- Oversaw Jenkins cloud build testing environment including daily reporting and system validation

Webassign — *Raleigh, NC*
Content Developer — *August 2015 - February 2016*

- Created detailed solutions for the differential equation teaching application including step-by-step instructions for support the backend software
- Coordinated content outlines with leadership teams to detail requirements

Duke University

Durham, NC

Visiting Assistant Professor

August 2014 - August 2015

- Analyzed how pressure changes induced by heart failure affect the hemodynamic and reabsorptive function of the kidney.
- Taught two semesters of introduction to partial and ordinary differential equations, developed all course materials
- Developed computational mathematical model of the kidney and coordinated work with University of Ontario research hospital clinicians. Presented results at experimental biology, Boston MA
- Investigated blood clotting in the renal veins using the immersed boundary method

University of North Carolina, Chapel Hill

Chapel Hill, NC

Graduate Research Fellow

September 2010 - August 2014

- Developed a fully coupled fluid-structure interaction code in C++ and Python to test the performance of valveless pumping.
- Created a new computational valveless pumping mechanism using muscle cells providing the forcing in the system.
- Presented and work at 12 conferences, domestic and abroad and published results
- Led wet lab organism maintenance and worked with lab-mates to collect particle image velocity data from

Publications

- McDaniel, M., & Baird, A. (2019, July). *A Full-Body Model of Burn Pathophysiology and Treatment Using the BioGears Engine.* In 2019 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC) (pp. 261-264). IEEE.
- McDaniel, M., Keller, J., White, S., & Baird, A. (2019). *A Whole-Body Mathematical Model of Sepsis Progression and Treatment Designed in the BioGears Physiology Engine.* Frontiers in physiology, 10, 1321.
- McDaniel, M., Carter, J., Keller, J. M., White, S. A., & Baird, A. (2019). *Open source pharmacokinetic/pharmacodynamic framework: tutorial on the BioGears Engine.* CPT: pharmacometrics & systems pharmacology, 8(1), 12-25.
- Battista, N. A., Baird, A. J., & Miller, L. A. (2015). *A mathematical model and MATLAB code for muscle–fluid–structure simulations.* Integrative and comparative biology, 55(5), 901-911.
- Baird, A., Waldrop, L., & Miller, L. (2015). *Neuromechanical pumping: boundary flexibility and traveling depolarization waves drive flow within valveless, tubular hearts.* Japan Journal of Industrial and Applied Mathematics, 32(3), 829-846.
- Baird, A. (2014). *Modeling Valveless Pumping Mechanisms.*
- Baird, A., King, T., & Miller, L. A. (2014). *Numerical study of scaling effects in peristalsis and dynamic suction pumping.* Contemp. Math, 628, 129-148.
- Baird, A., & Miller, L. (2013, November). *Electro-dynamic suction pumping at small scales.* In APS Division of Fluid Dynamics Meeting Abstracts.

Funding Secured

Defense Health Agency

Fredrick, MD

Sustain: Pronlonged Field Care Training Framework

Q3 2018

- *Role:* Lead Physiology Modeler and Proposal Manager
- *Amount:* 2.2 million

Defense Health Agency

Orlando, FL

Virtual Patient Application to Train Thermal Injury

Q2 2017

- *Role:* Principal Investigator
- *Amount:* 2.1 million

Army Research Labs

Raleigh, NC

Fast Computational Simulations of Traumatic Brain Injury

Q1 2017

- *Role:* Principal Investigator
- *Amount:* 353 thousand

Defense Health Agency

Fredrick, MD

BioGears Follow-on Reasearch Award

Q4 2016

- *Role:* Principal Investigator
- *Amount:* 1.9 million

Projects

BioGears Physiology Engine

Raleigh, NC

C++, ARM, Github, Java, Python, XML

Feb 2016 - PRESENT

- A whole body physiology engine programmed in C++
- Lumped parameter physics based circulatory model with compartment overlays for complete systems biology modeling support
- Models include: cardio-pulmonary circulation, drug pharmicokinetic-pharmacodynamics, traumatic brain injury, pnuemothorax, urine concentration, blood coagulation, pain stimulus, infection, digestion absorption, and others
- Multi-platform build support and agile process development

BurnCARE Medical Training Application

Raleigh, NC

Android, Unreal Engine 4, C++

Jan 2018 - PRESENT

- Burn care application developed in Unreal Engine 4 for the Android tablet platform
- Modular concept designed to teach individual, unique burn treatment requirements
- Collaborative effort with the U.S. Army Institute of Surgical Research
- Led the grant writing effort and secured 1.8 million dollar grant to fund effort in competitive selection process

Sustain: Prolong Field Care Training Framework

Raleigh, NC

C++, Javascript, Python

Jan 2018 - PRESENT

- Modular framework to connect different software critical for prolonged care training
- Scenario builder, Unreal Engine 4 training game, networking code, DDS virtual patient management code, and learning record database portal
- Led the grant writing effort and secured 2.2 million dollar grant to fund effort in competitive selection process

Selected Presentations (of 23)

Military Health System Research Symposium

Orlando, Fl

"BurnCare: Virtual Tablet Training to Enhance Burn Injury Care and Treatment"

August 2019

Society for Simulation in Health

Raleigh, NC

BioGears Model to Simulate Patient Responses to Sepsis

March 2019

American College of Surgeons Simulation Summit

Chicago, IL

BioGears: A Framework for Multiscale Physiology Modeling

March 2019

Department of Defense Working Group on Computational Modeling of Human Lethality, Injury, and Impairment from Blast-Related Threats

Arlington, Va

BioGears Human Physiology Engine

February 2019

Virtual Physiological Human Conference

Zaragoza, Spain

An In-Silico Whole-Body Framework to Simulate Kinetics and Dynamics of Pharmaceuticals and Associated Reversal Agents

September 2018

International Meeting on Simulation in Healthcare

Los Angeles, CA

An In-Silico Whole-Body Framework to Simulate Kinetics and Dynamics of Pharmaceuticals and Associated Reversal Agents

January 2018

Chemical and Biological Defense Science and Technology Conference

Long Beach, CA

BioGears: Simulating Whole-Body Response to Chemical Exposure

November 2017

Experimental Biology — *Boston, MA*

Implications of Increase Renal Venous Pressure for Renal Hemodynamic and Reabsorptive Function Studied by a Mathematical Model of the Kidney — *March 2015*

Duke Interdisciplinary Discussion Course — *Durham, NC*

Moving Fluid in Tubes — *October, 2014*

Society of Mathematical Biology — *Osaka, Japan*

Electro-Dynamic Suction Pumping at Small Scales — *August 2014*

Professional Memberships

Society for Simulation in Healthcare

Leadership group on simulation and modeling — *2016 - PRESENT*

IEEE: Engineering in Medicine and Biology

2018 - PRESENT

NIH Intergency Modeling and Analysis Group

2019 - PRESENT

Publications

Journal Articles

Incentive-based resource assignment and regulation for collaborative cloud services in community networks

A. M. Khan, Ü. C. Büyüksahin, F. Freitag

Journal of Computer and System Sciences 81.8 (Dec. 2015) pp. 1479–1495. 2015

Cloud services in the Guifi.net community network

M. Selimi, A. M. Khan, E. Dimogerontakis, F. Freitag, R. P. Centelles

Computer Networks 93.P2 (Dec. 2015) pp. 373–388. 2015

Conference Proceedings

Prototyping Incentive-Based Resource Assignment for Clouds in Community Networks

A. M. Khan, U. C. Buyuksahin, F. Freitag

28th IEEE International Conference on Advanced Information Networking and Applications (AINA 2014), 2014, Victoria, Canada

Teaching Experiance

Duke University, Math 353 — *Durham, NC*

Introduction to Ordinary and Partial Differential Equations for Engineers — *Spring 2015*

Duke University, Math 353 — *Durham, NC*

Introduction to Ordinary and Partial Differential Equations for Engineers — *Fall 2014*

University of North Carolina, Chapel Hill, Math 290 — *Chapel Hill, NC*

Applied Mathematical Methods (Computational Lab) — *Spring 2013*

University of North Carolina, Chapel Hill, Math 190 *Chapel Hill, NC*

Chaos and Population Dynamics *Fall 2012*

Skills

Technical	Python, C++, Buildbot, Paraview, VTK, CMAKE, XML, AWS, Docker, Matlab, R
Modeling	Systems Biology, Fluid-Structure Interaction, Pharmacology (PKPD), Injury Physiology, Dynamical Systems, Protein Interaction, Lumped Parameter
Management	Agile Development, Scrum, Personnel Management, Hiring, Public Speaking, Financial Coverage, Grant Writing, Teaming, Sub-Contractor Management

Recommendations

Laura Miller

Professor of Biology and Mathematics UNC, Chapel Hill, University of Arizona

- Address: Department of Biology CB 3280 Coker Hall University of North Carolina Chapel Hill, NC 27599
- Phone: 919-943-2434
- Email: fairyflies9@gmail.com
- Website: https://sites.google.com/site/swimflypump/

Professor M. Gregory Forest

Grant Dahlstrom Distinguished Professor of Mathematics at University of North Carolina, Chapel Hill

- Address: CB 3250, UNC Chapel Hill, Chapel Hill, NC 27599-3250
- Email: forest@unc.edu
- Website: https://aps.unc.edu/faculty-member/forest-greg/