Austin Baird

Biomedcial Engineering Group Leader and Distinguished Member of the Technical Staff

1416 Dollar Ave, Durham NC, 27701

📞 (801) 792-2582 | ✉ ajbaird86@gmail.com | ⌕ ajbaird | in bairdaustin

Objective

I am a leader in biological modeling and computational mathematics. I'm looking to make a broad impact in the industry and have a strong track record of leadership and project development.

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 Won

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*

Projects

BioGears Physiology Engine
C++, ARM, GITHUB, JAVA, PYTHON, XML

Raleigh, NC
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
ANDROID, UNREAL ENGINE 4, C++

Raleigh, NC
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
C++, JAVASCRIPT, PYTHON

Raleigh, NC
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
"BURNCARE: VIRTUAL TABLET TRAINING TO ENHANCE BURN INJURY CARE AND TREATMENT"

Orlando, Fl
August 2019

Society for Simulation in Health
BIOGEARS MODEL TO SIMULATE PATIENT RESPONSES TO SEPSIS

Raleigh, NC
March 2019

American College of Surgeons Simulation Summit
BIOGEARS: A FRAMEWORK FOR MULTISCALE PHYSIOLOGY MODELING

Chicago, IL
March 2019

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

Arlington, Va
February 2019

Virtual Physiological Human Conference
AN IN-SILICO WHOLE-BODY FRAMEWORK TO SIMULATE KINETICS AND DYNAMICS OF PHARMACEUTICALS AND ASSOCIATED REVERSAL AGENTS

Zaragoza, Spain
September 2018

International Meeting on Simulation in Healthcare
AN IN-SILICO WHOLE-BODY FRAMEWORK TO SIMULATE KINETICS AND DYNAMICS OF PHARMACEUTICALS AND ASSOCIATED REVERSAL AGENTS

Los Angeles, CA
January 2018

Chemical and Biological Defense Science and Technology Conference
BIOGEARS: SIMULATING WHOLE-BODY RESPONSE TO CHEMICAL EXPOSURE

Long Beach, CA
November 2017

Chemical and Biological Defense Science and Technology Conference
BIOGEARS: SIMULATING WHOLE-BODY RESPONSE TO CHEMICAL EXPOSURE

Long Beach, CA
November 2017

Experimental Biology
IMPLICATIONS OF INCREASE RENAL VENOUS PRESSURE FOR RENAL HEMODYNAMIC AND REABSORPTIVE FUNCTION STUDIED BY A MATHEMATICAL MODEL OF THE KIDNEY

Boston, MA
March 2015

Duke Interdisciplinary Discussion Course
MOVING FLUID IN TUBES

Durham, NC
October, 2014

Society of Mathematical Biology
ELECTRO-DYNAMIC SUCTION PUMPING AT SMALL SCALES

Osaka, Japan
August 2014

Teaching Experiance

Duke University, Math 353
INTRODUCTION TO ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS FOR ENGINEERS

Durham, NC
Spring 2015

Duke University, Math 353
INTRODUCTION TO ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS FOR ENGINEERS

Durham, NC
Fall 2014

University of North Carolina, Chapel Hill, Math 290

Applied Mathematical Methods (Computational Lab)

<div align="right">

Chapel Hill, NC

Spring 2013

</div>

University of North Carolina, Chapel Hill, Math 190

Chaos and Population Dynamics

<div align="right">

Chapel Hill, NC

Fall 2012

</div>

Skills

Languages	Python, Java, JavaScript, C, Ruby, Hack, Scheme
Frameworks	Django, Jenkins, Chef, React, Angular, Flask, AWS, Docker, GraphQL