# Austin Baird

Biomedcial Engineering Group Leader and Distinguished Member of the Technical Staff
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## 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

1. 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.
2. 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.
3. 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.
4. 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.
5. 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.
6. Baird, A. (2014). *Modeling Valveless Pumping Mechanisms.*
7. Baird, A., King, T., & Miller, L. A. (2014). *Numerical study of scaling effects in peristalsis and dynamic suction pumping.* Contemp. Math, 628, 129-148.
8. Baird, A., & Miller, L. (2013, November). *Electro-dynamic suction pumping at small scales.* In APS Division of Fluid Dynamics Meeting Abstracts.

## 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

1. 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.
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## Skills

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