

**BIOGRAPHICAL SKETCH**

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NAME: Kenneth S. Campbell

eRA COMMONS USER NAME (credential, e.g., agency login): ken.campbell

POSITION TITLE: Professor and Director of Translational Research for Cardiovascular Medicine

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
University of Oxford, Oxford, UK	BA (Hons)	09/90 – 06/93	Physics
University of Birmingham, Birmingham, UK	PhD	09/93 – 04/98	Muscle physiology
University of Wisconsin-Madison, WI, USA	Postdoc	04/98 – 01/03	Muscle physiology

No variances from ordinary career progression

**A. Personal Statement**

My goal as the inaugural Director of Translational Research for Cardiovascular Medicine at the University of Kentucky is to accelerate research that has the potential to improve care for patients with cardiovascular disease. This includes (a) helping clinicians to develop research projects, (b) enrolling patients in trials, and (c) creating registries and biobanks. I try to lower the energy barriers that can prevent busy clinicians from performing meaningful research.

My own lab's research integrates biophysical, biochemical, and computational techniques to develop better therapies for heart failure. Much of our work, including that described in Austin Minton's proposal, uses samples of human myocardium that we have been collecting from organ donors and patients with advanced heart failure since 2008. Our cardiac biobank has procured a total of 20,000 samples and distributed ~5,000 samples to 40 groups around the world in the last 5 years.

Since joining the University of Kentucky in 2004, I have mentored ~60 trainees (high school to postdoc) and five junior faculty. I am a member of the Center for Clinical and Translational Science's clinician-scientist mentoring committee (TREE) and was recognized as the College of Medicine's Mentor of the Year as an Associate Professor. Roughly 20 undergraduates have performed research in our lab and applied to medical school. All have been accepted. Four of our six postdoc alumni are in faculty positions; three have tenure and two are R01-funded. Our lab currently comprises 3 PhD students (Austin is one), 1 MD/PhD student, 3 postdocs, 2 research coordinators, and 10 undergraduates. 16 of these 19 individuals are women. All trainees are making excellent progress.

I served as PI of T32 GM118292 after the original PI left our institution. I also completed the 12 hour "Entering Mentoring" curriculum developed by the National Research Mentoring Network (NRMN) in 2020. Following that, I led a session titled "Assessing Knowledge" for the College of Medicine's mentor training program for 3 years.

As the Director of Translational Research for Cardiovascular Medicine, I am responsible for training ~80 faculty, clinical fellows, and other trainees in the responsible conduct of research. This includes, but is not limited to, ensuring the safety of all individuals in the research environment. My lab also tries to set positive examples in rigorous and unbiased experimental design as well as the analysis, interpretation, and reporting of data. We document all data in LabArchives (an electronic lab management system) and version-control all computer code using GitHub. Last year, we published open-source software (GelBox) to improve rigor and reproducibility when analyzing gels and immunoblots.

Our team is fortunate to be supported by multiple NIH grants including:

1. R01 HL163977 (Corresponding MPI to 2026)
2. R01 HL146676 (MPI to 2028)
3. R01 HD 090642 (Co-I to 2026)
4. R01 HL 163585 (Co-I to 2026)
- A. R01 HL173989 (MPI to 2028)

Manuscripts (from a total of ~130, h-index=42) that are representative of my work include:

1. **CAMPBELL, K. S.**, Yengo, C. M., Lee, L. C., Kotter, J., Sorrell, V. L., Guglin, M. & Wenk, J. F. (2019). Closing the therapeutic loop. *Arch Biochem Biophys.* 663, 129-131. PMC6377839.
2. Blair, C. A., Brundage, E. A., Thompson, K. L., Stromberg, A., Guglin, M., Biesiadecki, B. J. & **CAMPBELL, K. S.** (2020). Heart Failure in Humans Reduces Contractile Force in Myocardium From Both Ventricles. *JACC Basic Transl Sci.* 5, 786-798. PMC7452203.
3. **CAMPBELL, K. S.**, Chrisman, B. S. & Campbell, S. G. (2020). Multiscale Modeling of Cardiovascular Function Predicts That the End-Systolic Pressure Volume Relationship Can Be Targeted via Multiple Therapeutic Strategies. *Front Physiol.* 11, 1043. PMC7466769.
4. Sharifi, H., Mann, C. K., Wenk, J. F. & **CAMPBELL, K. S.** (2022). A multiscale model of the cardiovascular system that regulates arterial pressure via closed loop baroreflex control of chronotropism, cell-level contractility, and vascular tone. *Biomech Model Mechanobiol.* 21, 1903-1917. PMC10066042.

## **B. Positions, Scientific Appointments, and Honors**

### **Positions and Scientific Appointments**

2025 - present	Associate Vice-Chair for Translational Research, Department of Internal Medicine, University of Kentucky
2023 - present	University of Kentucky, College of Medicine, Research Vision Committee
2023 - present	Editorial board, Circulation: Heart Failure
2023 - present	University of Kentucky, College of Medicine, Trainees in Research Advisory Committee
2022 - present	Director of Translational Research for Cardiovascular Medicine, University of Kentucky
2022	University of Kentucky Research Leadership Academy
2022 – present	Scientific Review Board, Sydney Heart Bank, Australia
2021	University of Kentucky College of Medicine Leadership Training
2020 - present	Grant review, multiple NIH panels
2020	Biophysical Society, Motility Sub-group, Co-leader
2020 - present	Course Director, Medical School Cardiology (100 hours at 3 campuses)
2020 - 2023	Director, COVID-19 Research Registry and Specimen Bank, University of Kentucky
2019 – 2021	Guest Editor, Archives of Biochemistry and Biophysics: special issue on muscle modeling
2019 - present	Editorial Board, Scientific Reports
2018 - 2019	Guest Editor, Biophysical Journal: special issue on cardiac modeling
2018 - present	Grant review, Wellcome Trust, United Kingdom
2018 - present	Professor (Tenured), Department of Physiology and Division of Cardiovascular Medicine, University of Kentucky, Lexington, KY
2017 - present	Principal Investigator, Gill Cardiovascular Biorepository, University of Kentucky
2017 - 2023	Editorial Board, Life Sciences
2016 - 2022	Director of Graduate Studies, Department of Physiology, University of Kentucky
2015	Grant review, American Heart Association Established Investigator Award
2015 - 2018	Co-founder and Chief Technology Officer, MyoAnalytics, LLC
2015 - 2018	Associate Professor (Joint Appointment), Division of Cardiovascular Medicine, University of Kentucky, Lexington, KY
2014	Symposium Speaker, Biophysical Society Annual Meeting

2014	Auckland Bioengineering Institute, New Zealand – 4 week visit supported by research grant from the Royal Society of New Zealand, Auckland, New Zealand
2014 - 2020	Grant review, NIH MTI, K99-R00 panel for NHLBI
2013	Grant review, NHLBI PPG
2013 - 2014	Grant review Chair, American Heart Association, Cardiac Biology and Regulation 1
2013 - present	Core Director, Biospecimens, Kentucky Center for Clinical and Translational Sciences
2012 - 2014	Grant review, NIH ZHL1 CSR-P (01)1 – Mentored Career Transition Scientist
2011	Co-Chair, Muscle Mechanics and Ultrastructure, Biophysical Society Annual Meeting
2011 - 2012	Grant review Co-Chair, American Heart Association, Cardiac Biology and Regulation 1
2011	Director, Modeling workshop for trainees in muscle biology, University of Kentucky, Lexington, KY
2010	Symposium Chair, 6 <sup>th</sup> World Congress on Biomechanics, Singapore
2010 - present	Editorial Board, Frontiers in Cardiac Muscle Physiology
2009 - 2019	Executive Committee Member, Center for Muscle Biology, University of Kentucky
2009 - 2018	Associate Professor (Tenured), Department of Physiology, University of Kentucky
2008, 2010	Biophysical Society Annual Meeting Career Workshop Coordinator
2007	Symposium Chair, Experimental Biology, American Physiological Society Annual Meeting
2007 - 2009	Grant review, American Heart Association, Cardiac biology and regulation
2007, 2012, 2014	Grant review, National Science Foundation
2006 - 2012	Biophysical Society Early Careers Committee
2004 - 2009	Assistant Professor (Tenure-track), Department of Physiology, University of Kentucky
2004 - present	Member of the American Physiological Society
2003 - 2004	Assistant Scientist, Department of Physiology, University of Madison-Wisconsin
2001 - present	Member of the American Heart Association
1998 - present	Member of the Biophysical Society
1993 - 2010	Member of the Physiological Society (United Kingdom)

### Honors

2006, 2010, 2014	Holsinger Award for Excellence in Teaching (University of Kentucky, Physiology)
2014	University of Kentucky CTSA Mentor Recognition Award
2012	Fellow of the American Heart Association
1993 - 1998	Wellcome Trust Prize Studentship (United Kingdom)

## **C. Contributions to Science**

### **Contribution 1: Quantitative understanding of sarcomere-level function**

Dr. Campbell has published ~30 manuscripts that quantify the mechanical properties of skeletal and cardiac muscles. Important insights from these publications include: (a) bound cross-bridges contribute to diastolic myocardial stiffness, (b) heterogeneity of half-sarcomere responses contributes to residual force enhancement, and (c) myocardial relaxation is independent of afterload but accelerated by end-systolic lengthening.

- CAMPBELL, K. S.**, Patel, J. R. & Moss, R. L. (2003). Cycling cross-bridges increase myocardial stiffness at submaximal levels of Ca<sup>2+</sup> activation. *Biophys. J.* 84, 3807-3815. PMC1302962.
- CAMPBELL, K. S.** (2006). Tension recovery in permeabilized rat soleus muscle fibers after rapid shortening and restretch. *Biophys. J.* 90, 1288-1294. PMC1367280.
- Campbell, S. G. & **CAMPBELL, K. S.** (2011). Mechanisms Of Residual Force Enhancement In Skeletal Muscle: Insights From Experiments And Mathematical Models. *Biophysical Reviews.* 3, 199-207. PMC3237401
- Chung, C. S., Hoopes, C. W. & **CAMPBELL, K. S.** (2017). Myocardial relaxation is accelerated by fast stretch, not reduced afterload. *J Mol Cell Cardiol.* 103, 65-73. PMC5347980.

## **Contribution 2: Mathematical modeling of striated muscle**

Dr. Campbell has published ~30 manuscripts that integrate mathematical modeling of skeletal and cardiac muscles with experimental data. The earliest manuscripts focused on the short-range mechanical properties of skeletal muscle and continue to influence the field of sensorimotor control. Three manuscripts from 2009 to 2011 showed that interactions between half-sarcomeres could explain residual force enhancement and apparent activation-dependent stiffening of muscle fibers. The latest work focuses on OFF/ON transitions in thick filament structure and their contribution to length-dependent activation in myocardium.

- a) **CAMPBELL, K. S.** & Lakie, M. (1998). A cross-bridge mechanism can explain the thixotropic short-range elastic component of relaxed frog skeletal muscle. *J. Physiol.* 510, 941-962. PMC2231083.
- b) **CAMPBELL, K. S.** (2009). Interactions between connected half-sarcomeres produce emergent mechanical behavior in a mathematical model of muscle. *PLoS Comput Biol.* 5, e1000560. PMC PMC2770126.
- c) Campbell, S. G., Hatfield, P. C. & **CAMPBELL, K. S.** (2011). A mathematical model of muscle containing heterogeneous half-sarcomeres exhibits residual force enhancement. *PLoS Computational Biology.* 7, e1002156. PMC3182863.
- d) **CAMPBELL, K. S.**, Janssen, P.M. & Campbell, S. G. (2018). Force-dependent recruitment from the myosin OFF state contributes to length-dependent activation. *Biophys. J.* 115, 543-553. PMC6084639.

## **Contribution 3: Open source software for scientific research**

Dr. Campbell has a 16 year track record of creating scientific software and making it freely available to the research community. Major projects include: (a) SLControl, a package for acquiring and analyzing data relating to muscle mechanics, (b) GelBandFitter, a tool for analyzing closely-running bands on gels and immunoblots, (c) MyoSim, software for simulating the mechanical properties of half-sarcomeres, and (d) MyoVision, which automates image analysis for muscle cross-sections.

- a) **CAMPBELL, K. S.** & Moss, R. L. (2003). SLControl: PC-based data acquisition and analysis for muscle mechanics. *AJP: Heart.* 285, H2857-2864. PMC not available. PMID 12907419.
- b) Mitov, M. I., Greaser, M. L. & **CAMPBELL, K. S.** (2009). GelBandFitter--a computer program for analysis of closely spaced electrophoretic and immunoblotted bands. *Electrophoresis.* 30, 848-851. PMC2742644.
- c) **CAMPBELL, K. S.** (2014). Dynamic coupling of regulated binding sites and cycling myosin heads in striated muscle. *J Gen. Physiol.* 143, 387-399. PMC 3933939.
- d) Wen, Y., Murach, K. A., Vechetti, I. J., Jr., Fry, C. S., Vickery, C., Peterson, C. A., McCarthy, J. J. & **CAMPBELL, K. S.** (2018). MyoVision: software for automated high-content analysis of skeletal muscle immunohistochemistry. *J Appl Physiol (1985).* 124, 40-51. PMC6048460.

## **Contribution 4: Transmural variation in myocardium**

Dr. Campbell's laboratory has demonstrated that rodent and human hearts exhibit transmural variation in contractile function and that disease changes the normal patterns. These results are important because they may explain changes in cardiac torsion and regional shortening that predict clinical outcomes.

- a) Campbell, S. G., Haynes, P., Kelsey Snapp, W., Nava, K. E. & **CAMPBELL, K. S.** (2013). Altered ventricular torsion and transmural patterns of myocyte relaxation precede heart failure in aging F344 rats. *AJP Heart.* 305, H676-686. PMC3761331.
- b) Chung, C. S. & **CAMPBELL, K. S.** (2013). Temperature and transmural region influence functional measurements in unloaded left ventricular cardiomyocytes. *Physiological Reports.* 1, e00158. PMC3871472.
- c) Haynes, P., Nava, K. E., Lawson, B. A., Chung, C. S., Mitov, M. I., Campbell, S. G., Stromberg, A. J., Sadayappan, S., Bonnell, M. R., Hoopes, C. W. & **CAMPBELL, K. S.** (2014). Transmural heterogeneity of cellular level power output is reduced in human heart failure. *J Mol Cell Cardiol.* 72, 1-8. PMC4037376.
- d) Zhang, X., Haynes, P., **CAMPBELL, K. S.**, & Wenk, J. (2015). Numerical evaluation of myofiber orientation and transmural contractile strength on left ventricular function. *J. Biomech. Eng.* 137:044502. PMID not available. PMID25367232.

### **Contribution 5: Biobanking**

Dr. Campbell's experience with biobanking started in 2008 when he initiated a collaboration with a cardiothoracic surgeon to collect samples of human myocardium. The project has now evolved into the Gill Cardiovascular Biorepository which Dr. Campbell leads as PI. The bank has acquired >20,000 myocardial samples from >650 organ donors and patients. The resource supports collaborations with ~40 groups in ~10 countries. Because of his experience, Dr. Campbell was chosen to lead an institution-wide biobanking program for the University of Kentucky CTSA-supported Center for Clinical and Translational Sciences. This program has enrolled ~60,000 patients to date and gives the institution permission to bank any sample that is procured as part of normal clinical care and that would otherwise be discarded. Starting in February 2020, Dr. Campbell worked with stakeholders from across the University of Kentucky to develop a COVID-related biobank to facilitate campus research during the pandemic. Dr. Campbell devotes 5% of his academic effort to these activities.

- a) Blair, C. A., Haynes, P., Campbell, S. G., Chung, C., Mitov, M. I., Dennis, D., Bonnell, M. R., Hoopes, C. W., Guglin, M. & **CAMPBELL, K. S.** (2016). A protocol for collecting human cardiac tissue for research. *The VAD Journal*. 2, Article 12. PMC5199025.
- b) Croker, J. A., Patel, R., **CAMPBELL, K. S.**, Barton-Baxter, M., Wallet, S., Firestein, G., Kimberly, R. P., & Elemento, O. (2021). Building biorepositories in the midst of a pandemic. *Journal of Clinical and Translational Science*. 10.1017/cts.2021.6. PMCID7785692.

### **Complete list of published work in NCBI My Bibliography**

(~130 publications, h-index=42, i10-index is 85).

<https://www.ncbi.nlm.nih.gov/myncbi/kenneth.campbell.1/bibliography/public/>