Dr. Sanjay R Kharche.
Curriculum vitae, appointments, referees, and publications.
Monday June 16th 2025.

WORK ADDRESSES:
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Company URL: https://www.mvtinsilico.ca
DATE OF BIRTH: 30th January 1974.
CITIZENSHIPS (dual): Canadian and British.

EDUCATION.

1. 30/09/1997 – 30/09/2000. Ph.D. in Applied Mathematics. Institution: Department of Applied Mathematics, University of Hull, Hull, UK. Thesis title: "Stefan Problems with Two Dimensional Linearised Perturbations in Their Boundary Geometry or Boundary Conditions."
2. 30/09/2015-30/06/2016. Post-graduate certificate (equivalent to Master's) in secondary science and mathematics education. University of Manchester, Manchester, UK.
3. June 1991 to June 1996. Bachelor's and Master's in Physics. Institution: Department of Physics, University of Pune, India. First class with distinction.

RECENT APPOINTMENTS.

July 2023 to present. CEO & president. MVT *in* Silico Corporation. (100% ownership).

April 2023 to present. Independent Scientist. Western University.

July 2023 to June 2024. Project manager, Frisbee Lab, Medical Biophysics Department, Western University.

1st April 2023 to present: Allied personnel in Welsh Lab, Robarts Institute, Western University.

August 2016 to March 2023: Research Scientist (Lawson Health Research Institute, Canada); Assistant Professor (non-tenured) in Medical Biophysics, Western University, Canada.
My primary duties were to lead the PM^3 laboratory to investigate vascular and electrophysiological processes in health and disease; generate external funding applications; provide UG and PG research training to upcoming HQPs; and undertake teaching. I further developed and maintain the blood flow simulation software, SimVascular. I managed a team of 10 personnel including two graduate students, one project manager, and several undergraduate trainees.

January 2019 to January 2021: Assistant professor/course instructor (non-tenured teaching) in Applied Mathematics, Western University.
In this role, I taught first year applied mathematics to students from a medical sciences and biology background. The BMSc course title is "Ordinary differential equations and probability theory." (Western University course code: AM1201B).

September 2012 to September 2014. Senior post-doctoral fellow. Universities of Liverpool and Exeter.
My primary role was the develop, maintain, and support use of cardiac simulator BeatBox. PI: Prof. Vadim N. Biktashev.

TEACHING EXPERIENCE.

January 2019 to 2021: Instructor for the course AM1201B in Western University's mathematics department.

Summer 2020: I designed and delivered a training course to my two postgraduate students. The teaching

involved vascular pathophysiology, biophysics, ordinary and partial differential equations, and numerical methods. The teaching was delivered online and synchronously. The contents of the lectures are organized into a course manual and available openly at the link: shorturl.at/jmH47 .

August 2016 to March 2022: I have assisted Prof. Daniel Goldman (Associate Professor of Medical Biophysics and Applied Mathematics, Western University) in delivering his 3rd year course.

September 2015 to July 2016: I gained experience in teaching 12 to 19 year olds (high school computer science, physics, biology, and mathematics) during my postgraduate certificate in education (PGCE) training when I worked in both special needs and private secondary schools.

September 1997-September 2000: I worked as a graduate teaching assistant in the Department of Applied Mathematics, University of Hull, UK, where I taught calculus and algebra.

TECHNICAL EXPERTISE.

I was the lead developer of PM^3 (Precision Medicine using Mathematical Modelling) platforms that I use to mechanistically investigate **a)** multi-scale blood flow phenomena; **b)** cellular and molecular electrophysiology; and **c)** to undertake image processing. My platforms, computer models, and data repositories are open source that are designed for application in pre-clinical research and clinical trials. In recent years, I have up taken computational platforms to assist my research into blood flow dynamics, CT, μCT, and intravital microscopy imaging. I use and implement finite element and finite difference solvers for differential equations, methods such as maximum likelihood estimation and Markov chains to analyse single ion channel molecular data. I routinely perform sensitivity analysis using methods involving mutual information, Sobol indices, and partial rank correlation. I use machine learning methods such as probabilistic neural networks to perform uncertainty quantification in my models. I am a proficient user of national HPC services with advanced programming skills in C, Python, and related scripting.

RECENT INVITED TALKS.

1. Title: “Multi-scale modeling of cardiac arrythmia”. Date: August, 2017. Venue: Department of Applied Mathematics, Western University, Canada.
2. Title: “Sensitivity analysis and blood flow modelling”. Date: June 2018. Venue: Department of Computer Science, University of Oxford, UK.
3. Title: “Interpreting CT perfusion data for the effects of dialysis: Fractal dimension as a novel measure of heterogeneity”. Date: May 2019. Venue: Kidney Clinical Research Unit, Victoria Hospital, Lawson Health Research Institute, London, Ontario.
4. Title: “Blood flow and arrhythmia modelling: A multi-physics approach”. Date: July 2020. Venue: Department of Mathematics, University of Waterloo, Canada. (virtual).
5. Title: “Fractional flow reserve, a large data application”. Date: May 2022. Venue: Montreal Conference Centre, Canarie Research Software Conference, Montreal.
6. Title: “Seeking collaborations among engineers, mathematicians, and computer scientists: A deployment of digital twins.”. Date: July 2022. Venue: Department of Computer Science and Software, McMaster University, Canada.
7. Title: “Application of CFD models in systems biology”. Date: August 2022. Venue: Systems Medicine Laboratory, University of Florida, USA. (virtual).

CONFERENCE ORGANISATION.

- Co-organiser of BeatBox software workshop, Manchester UK, 24-25 June 2013.
- I organized the annual Western University PM^3-SimVascular workshops since September 2020 to September 2022.

CURRENT COLLABORATORS.

- **Multiple (presently six) PM^3 users’ laboratories.** Topic: Data driven hemodynamic risk assessment in mammalian arteries and medical devices. Funding: Canarie Inc., NSERC, OGS.
- Computational Microvasculature Laboratory. PI: Prof. Daniel Goldman. Topic: Development of

modelling and imaging software, development of methods and models of multi-scale vasculature modelling. Funding: Canarie Inc., NSERC, OGS.

- The Welsh Laboratory. PI: Prof. Donald G. Welsh. Topic: Quantifying alterations in ion channel function due to hypertension and extending functional expectation to vasculature.
- Dobrzynski Laboratory. PI: Prof. Halina Dobrzynski. Topic: Investigating the role of imaged human cardiac sino-atrial node anatomy to function for hypothesis testing.

GRANTS AWARDED.

1. Funder: Canarie Inc. Value: $300,000. Title: "Simulation of blood flow for risk assessment in human". PI: CW McIntyre. Co-Is: D. Goldman and **SR Kharche.** I developed this grant application and secured the funding. I am the lead developer and co-investigator in this project. I will build upon the outcomes of this project.
2. Funder: Heart and Stroke Foundation bridging grant. Value: $40,000. Title: "Validation of an ECG based arrythmia risk assessment method using inverse solutions." PI: CW McIntyre. Co-Is: **SR Kharche**, Ting Lee, Alan Skaynes, et al.
3. MITACS GlobaLink Canada. Value: $45,000 per annum. I have been awarded international interns each year since 2018 to date. To date, I have supervised eight international interns that present the potential to become students in Canadian universities.

FELLOWSHIPS AND AWARDS.

Fellowship: 15/07/2011- 10/09/ 2011. HPC Europa 2011 Visiting Fellowship, CINECA, Bologna, Italy. Project: Development of 1D and 2D parallel bi-domain solvers. **(PI).**

Awards:
1) Winner of "Physics Association" prizes during undergraduate and postgraduate studies.
2) Union Grants Commission (India) funded scholar during undergraduate and postgraduate studies.
3) Winner of Graduate Teaching Assistantship during Ph.D. in University of Hull, UK.

JOURNAL PEER REVIEW EXPERIENCE.

- Review editor of Frontiers in Physiology since May 2018. I have reviewed over 50 manuscripts over the past 6 years.
- Guest lead editor of special issue in Frontiers in Physiology Computational in 2020. Special issue titled: "Vascular Disease Multi-Scale Multi-Physics Modelling and Experimental Data." My co-editors are Profs. Daniel Goldman (Western University) and Halina Dobrzynski (University of Manchester, UK).
- Reviewer of following journals: Nature Translational Psychiatry, Plos Computational Biology, Plos ONE, Journal of Physiology, MDPI journals, Computers in Medicine, Chaos, Biophysical Journal, American Journal of Physiology, IEEE journals.
- Editor for Frontiers in Physiology, BMC Cardiovascular Disorders.
- Grants reviewing experience: I have reviewed a grant application for the UK Engineering and Physical Research Council. Recently, I have acquired training regarding the review process of Canadian CIHR and NSERC grants. I recently provided reviewer service to Digital Research Alliance of Canada's competition entitled Data Champions, where I reviewed 6 applications.

LEADERSHIP.

2016 to 2023. I have acquired external research funding to support my computational medicine laboratory, nominally termed PM^3 laboratory. I have trained two graduate students as HQPs and mentored numerous undergraduates.

July 2023 to present. I have founded & am the lead scientist in the life sciences innovation company, MVT in Silico Corp. I am presently supervising two employees.

SERVICE.

- I have led a special issue in Frontiers in Physiology (Computational medicine and biology) titled: "Vascular Disease Multi-Scale Multi-Physics Modelling and Experimental Data".
- In 2020, I have served on the admissions committee for Schulich School of Medicine, UWO.
- I have served on funding review committee for Digital Alliance of Canada in 2021-2022.

MANAGEMENT EXPERIENCE.

I am experienced in planning, documenting, and reporting of progress related to my recent project (#1 in GRANTS AWARDED above). I routinely attended departmental and committee meetings to align with institutional direction.

RECENT STUDENT SUPERVISION ACTIVITY.

I have previously supervised over 16 final year undergraduate thesis reports between 2016 to 2020. I am currently supervising two master's post-graduates and 8 undergraduates (4^{th} year research projects). I have supervised one project manager employee.

Graduate supervision and academic advisor and supervisor.

- 2020-2022. Candidate: Jermiah J Joseph. Program: Master's in Medical Biophysics. Thesis title: Computational assessment of cardiac fractional flow reserve using CT imaging data and computational fluid dynamics. Current status: In progress to medical school entry.
- 2020-2022. Candidate: Timothy J Hunter. Program: Master's in Medical Biophysics. Thesis title: Computational assessment of cerebral aneurysm risk rupture in light of cerebral vasculature variants. Current status: In progress to a non-academic career in industrial technology and management.

Recent undergraduate thesis (2020-2022 academic year) supervision.

4^{th} year UG projects in 2020-2022 academic years.

2021-2022.

- Candidate: Ms Gabrielle Alimorad. Bachelor's in Medical Biophysics. Thesis title: Eliciting microvascular changes due to ischemic stress. Current status: Progressed to graduate studies in the Stephanie Frisbee lab in UWO.
- Candidate: Ms Randa Mudathir. Bachelor's in Medical Biophysics. Thesis title: Potential inefficacy of antiarrhythmic drugs in light of Timothy Syndrome (ion channel dysfunction). Current status: Progressed to graduate studies in UWO Bioengineering.
- Candidate: Ms Nicole Fi. Bachelor's in Medical Biophysics. Thesis title: Augmentation of aortic dissection risk due to aging.
- Candidate: Ms An Ngyuen. Bachelor's in Computer Science. Thesis title: Programming the aorta-brain geometry and its boundary conditions. Current status: In progress to non-academic career.
- Candidate: Ms. Anqi Wang. Bachelor's in Computer Science. Thesis title: Fine tuning brain pial boundary conditions for realistic hemodynamic simulations. Current status: In progress to non-academic career.
- Candidate: Mr. Melvin Tiang. Bachelor's in Computer Science. Thesis title: Code module to automatically analyze and visualize microvasculature geometry from videos. Current status: In progress to non-academic career.
- Candidate: Mr. Abdus Samad. Bachelor's in Biology and Physiology. Thesis title: Assessing intracellular Ca2+ under hypertension using an existing smooth muscle cell mathematical model. Current status: In progress to becoming a teacher in special needs schools.
- Candidate: Mr. Amir Parvaresh. Bachelor's in Biology and Physiology. Thesis title: Changes in murine heart rate under I_{CaL} mutations using an existing sino-atrial node cell mathematical model. Current status: In progress to non-academic career.

2020-2021.

- Candidate: Ms Kairavi Desai. Bachelor's in Biology and Physiology. Thesis title: Assessment of mouse as an experimental model for the study of human arrhythmia: ion channel recording, and anatomical imaging. Current status: Progressed to medical school in McMaster University in 2021.
- Candidate: Ms Xingyi Wang. Program: Bachelor's in Medical Biophysics. Thesis title: Development of an atlas of human aortic anatomies: image segmentation and finite element meshing. Current status: Progressed to medical school in UBC University in 2021.
- Candidate: Mr Spencer Bain. Program: Bachelor's in Computer Science. Thesis title: 1D finite element model cerebral model construction for CFD simulations. Current status: Progressed to employment in 2021.
- Candidate: Mr Matin Sanaat. Program: Bachelor's in Medical Biophysics. Thesis title: Segmentation of CT images to generate 3D coronary vasculature: Inputs to FFR assessment using CFD. Current status: Progressed to engineering school in McMaster University in 2021.

3rd year projects in 2020-2021 academic year.

- Candidate: Ms Mengyu Qi. Program: Bachelor's in Medical Biophysics. Thesis title: Development of an atlas of human kidneys and livers: image segmentation and meshing.
- Candidate: Ms Gabrielle Alimorad. Program: Bachelor's in Medical Biophysics. Thesis title: Testing microvasculature segmentation algorithms.
- Candidate: Ms Randa Mudathir. Program: Bachelor's in Medical Biophysics. Thesis title: Assignment of fibre architecture to mouse 3D heart anatomies.
- Candidate: Ms Nicole Anne Fi. Program: Bachelor's in Medical Biophysics. Thesis title: Use of digital image correlation (semi-automatic) and manual methods to track ascending aorta strain in 2D echograms.

Experiential learning projects.

- Candidate: Mr Bamdad Tayyari. Program: Bachelor's in Interdisciplinary Medical Sciences. (Experiential learning student). Project: Modelling electrical waves in the whole mouse heart.
- Candidate: Ms Riva Patel. Program: Bachelor's in Biology and Physiology. (Experiential learning student). Project: Morphometry of hepatic and renal vasculature.
- Candidate: Ms Clara F. Sun. Program: Bachelor's in Biology. Project: To assist PM3 activities through her undergraduate course (2020 to 2024). Clara has already contributed to manuscript #3.

Company employees.

- Yihang Cheng. Data Analytics R&D officer. (2025).
- Harpreet Kaur. Business officer. (2025).

LANGUAGE SKILLS.

Through my educational, professional, and personal life, I use English as my primary language of communication which as such is my first language. My proficiency is reflected in the numerous scientific articles I have written, and the multiple talks that I have presented. In addition, I possess a diploma in French language.

List of referees.

Referee 1.

Donald G Welsh (mentor and scientific advisor).
Professor, Department of Physiology and Pharmacology,
Western University.
Phone: 519.931.5777 x 25330
Email: dwelsh24@uwo.ca

List of publications.

Dr. Sanjay R Kharche.

I have over 114 publications, including 47 peer reviewed journal articles. On date of this document, I have 1300 citations (Scopus). I have presented at numerous tier 1 conferences. Recent and relevant publications are listed below.

Under review, in preparation, or in progress.

1. **Sanjay R. Kharche**, Andrew Atkinson, Galina Mironova, DG Welsh. Computationally assessing the role of sinoatrial node exit pathways in a biophysically detailed electrically active human 3D model (under review in iScience).

2. Mironova, **Kharche,** Welsh, et al.. The modulation of I_{CaL} under pressure. (under review in PNAS, 2025).

Manuscript #1 demonstrates the application of my platform, Virtual Cardiac Physiology Lab, in the study of cardiac electrical phenomena. I collaborate with the Atkinson group in the School of Medicine, University of Manchester, UK for cardiac EP basic science research.

Editorial.

3. **Kharche Sanjay R.,** Dobrzynski Halina, Goldman Daniel. Editorial: Vascular Disease Multi-Scale Multi-Physics Modeling and Experimental Data. Frontiers in Physiology. 13. 2022.

I was the lead editor on this special issue that led to editorial (manuscript #4).

Primary journal publications.

4. Joseph JJ, Sun C, Lee T-Y, Goldman D, **Kharche SR**, McIntyre CW. Structure (Epicardial Stenosis) and Function (Microvascular Dysfunction) That Influence Coronary Fractional Flow Reserve Estimation. Applied Sciences. 2022; 12(9):4281.

5. Joseph, J.J.; Hunter, T.J.; Sun, C.; Goldman, D.; **Kharche, S.R.**; McIntyre, C.W. Using a Human Circulation Mathematical Model to Simulate the Effects of Hemodialysis and Therapeutic Hypothermia. Appl. Sci. 2022, 12, 307.

6. Hunter, T.J.; Joseph, J.J.; Anazodo, U.; **Kharche, S.R.**; McIntyre, C.W.; Goldman, D. Atrial Fibrillation and Anterior Cerebral Artery Absence Reduce Cerebral Perfusion: A De Novo Hemodynamic Model. Appl. Sci. 2022, 12, 1750.

I am the co-senior author of articles #4,5,6 above. I supervised graduate students JJ and TH, who are funded by the Canarie Inc. grant that I co-investigate. I am supervising CS under an experiential learning program through her undergraduate studies.

7. **Sanjay R. Kharche**, Randa Mudathir, C.W. McIntyre. Electro-anatomical computational cardiology in humans and experimental animal models. Translational Research in Anatomy. Volume 26. 2022. 100162, ISSN 2214-854X.

Above article #7 was the outcome of my experiential supervision of RM. In addition to first author, I am the senior author on the article.

8. **Kharche SR,** Lemoine S, Tamasi T, Hur L, So A and McIntyre CW (2021) Therapeutic Hypothermia Reduces Peritoneal Dialysis Induced Myocardial Blood Flow Heterogeneity and Arrhythmia. Front. Med. 8: 700824.

Manuscript #8 above is part of my collaboration with the McIntyre group focusing on renal failure patients linking blood flow to arrythmia.

9. **Kharche, S.R.**, Mironova, G.Y., Goldman, D., McIntyre, C.W., Welsh, D.G. (2021). Sensitivity Analysis of a Smooth Muscle Cell Electrophysiological Model. In: Ennis, D.B., Perotti, L.E., Wang, V.Y. (eds) Functional Imaging and Modeling of the Heart. FIMH 2021. Lecture Notes in Computer Science, vol 12738.

Manuscript #9 above reflects the application of electrophysiology to data from the Welsh lab. I used my sensitivity analysis codes for the work.

10. Joseph, J.J., Lee, TY., Goldman, D., McIntyre, C.W., **Kharche, S.R.** (2021). The Role of Extra-Coronary Vascular Conditions that Affect Coronary Fractional Flow Reserve Estimation. In: Ennis, D.B., Perotti, L.E., Wang, V.Y. (eds) Functional Imaging and Modeling of the Heart. FIMH 2021. Lecture Notes in Computer Science, vol 12738. Springer, Cham.

11. Hunter, T.J., Joseph, J.J., Anazodo, U., **Kharche, S.R.**, McIntyre, C.W., Goldman, D. (2021). Computational Modelling of the Role of Atrial Fibrillation on Cerebral Blood Perfusion. In: Ennis, D.B., Perotti, L.E., Wang, V.Y. (eds) Functional Imaging and Modeling of the Heart. FIMH 2021. Lecture Notes in Computer Science, vol 12738. Springer, Cham.

12. Yufeng Wang, Zhaohan Xiong, Aaqel Nalar, Brian J. Hansen, **Sanjay R. Kharche**, Gunnar Seemann, Axel Loewe, Vadim V. Fedorov and Jichao Zhao. A robust computational framework for estimating 3D Bi-Atrial chamber wall thickness. Computers in Biology and Medicine, 2019. vol. 114, article: 103444.

13. Luiz Altamarino Diaz, Andrea Kassay, Baran Serajelahi, C. W. McIntyre, Guido Filler, and **Sanjay R. Kharche**. Arterial hypertension and unusual ascending aortic dilatation in a neonate with acute kidney injury: mechanistic computer modelling. Frontiers in Physiol. (Computational Medicine). 2019. 10: 1391. (senior author).

Above article (#13), where I led the study, demonstrates clinical data interpretation and evidence generation using models. AK has now progressed to medical school (2018-2019) in the University of Saskatchewan.

14. Sunil Jit R. J. Logantha, **Sanjay R. Kharche**, Yu Zhang, Andrew J. Atkinson, Guoliang Hao, Mark R. Boyett. and Halina Dobrzynski. Sinus node-like pacemaker mechanisms regulate ectopic pacemaker activity in the adult rat atrioventricular ring. Scientific Reports 9. Article number: 11781 (2019).

15. Ursula Doris, **Sanjay R. Kharche**, Maria Petkova, Balint Borbas, Sunil Jit R.J. Logantha, Olga Fedorenko, Michal Maczewski, Urszula Mackiewicz, Yu Zhang, Anwar Chahal, Alicia D'Souza, Andrew J Atkinson, Halina Dobrzynski, Joseph Yanni. A sexy approach to pacemaking: differences in function and molecular make up of the sinoatrial node. Histology and Histopathology. 2019: 31(11): 1255-1268.

16. Tom Sheard, **Sanjay R. Kharche**, Christian Pinali and Holly A. Shiels. 3-d ultrastructural study of sarcoplasmic reticulum forming calcium release units in avian cardiomyocytes. Journal of Experimental Biology. 2019. 222: jeb197640.

17. **Sanjay R. Kharche**, Aaron So, F Salerno, Ting-Yim Lee, Chris Ellis, Daniel Goldman, C W McIntyre. Computational Assessment of Blood Flow Heterogeneity in Peritoneal Dialysis Patients' Cardiac Ventricles. Front Physiol. 2018; 9: 511.

Article #17 established my human coronary blood flow model. It is part of my collaboration with the McIntyre group, where I used cardiac CT perfusion data to propose a novel heterogeneity index. I used optimization, binary trees, and Monte Carlo simulations in this study that I led and was also the first author on.

18. **Sanjay R. Kharche**, Vigmond E, Efimov IR, Dobrzynski H (2017) Computational assessment of the functional role of sinoatrial node exit pathways in the human heart. PLoS ONE 12(9): e0183727.

19. Mario Antonioletti, Vadim N. Biktashev, Adrian Jackson, **Sanjay R. Kharche**, Tomas Stary, Irina Biktasheva. BeatBox — HPC Simulation Environment for Biophysically and Anatomically Realistic Cardiac Electrophysiology. PLoS ONE 12(5): e0172292.

20. Zhao J, **Sanjay R. Kharche**, Hansen BJ, Csepe TA, Wang Y, Stiles MK, Fedorov VV. Optimization of catheter ablation of atrial fibrillation: insights gained from clinically-derived computer models. Int J Mol Sci. 2015;16(5): 10834-54.

21. Logantha SJ, Stokke MK, Atkinson AJ, **Sanjay R. Kharche**, Parveen S, Saeed Y, Sjaastad I, Sejersted OM, Dobrzynski H. Ca(2+)-Clock-Dependent Pacemaking in the Sinus Node Is Impaired in Mice with a Cardiac Specific Reduction in SERCA2 Abundance. Front Physiol. 2016. 7: 197 (IF 5).

22. **Sanjay R. Kharche**, Irina V. Biktasheva, Gunnar Seemann, Henggui Zhang, Vadim N. Biktashev. A Computer Simulation Study of Anatomy Induced Drift of Spiral Waves in the Human Atrium. *BioMed Research International (2015). 2015: 731386.*

23. C Moreno, A Oliveras, **Sanjay R. Kharche**, M Guizy, A de la Cruz, N Comes, T Starý, I Baró, G Loussouarn, S Severi, A Felipe, C Valenzuela. Effects of n-3 polyunsaturated fatty acids on the function, expression and location of Kv7.1 channels. *Cardiovasc Res. (2015). 105(2): 223-232.IF: 5.9.*

In article #23, I developed a maximum likelihood estimation code that identified a Markov model for whole cell ion channel data.

24. Hancox JC, **Sanjay R. Kharche**, El Harchi A, Stott J, Law P, Zhang H. In silico investigation of a KCNQ1 mutation associated with familial atrial fibrillation. J Electrocardiol. (2014). 47(2): 158-65.

25. **Sanjay R. Kharche**, Stary T, Colman MA, Biktasheva IV, Workman AJ, Rankin AC, Holden AV, Zhang H. Effects of human atrial ionic remodelling by β-blocker therapy on mechanisms of atrial fibrillation: a computer simulation**.** Europace (2014). 16 (10): 1524-33.

26. MA Colman, OV Aslanidi, **Sanjay R. Kharche**, et al. Pro-arrhythmogenic Effects of Atrial Fibrillation Induced Electrical Remodelling - Insights from 3D Virtual Human Atria. J Physiol. (2013). 591(17): 4249-72.

27. **Sanjay R. Kharche** et al. Pro-arrhythmogenic effects of the S140G KCNQ1 mutation in human atrial fibrillation - insights from modelling. J Physiol. (2012). 590(8): 4501-14.

28. Aslanidi OV,…, Holden AV, **Sanjay R. Kharche**, et al. Virtual tissue engineering of the human atrium: modelling pharmacological actions on atrial arrhythmogenesis. Eur J Pharm Sci. (2012) 46(4): 209-21.

29. M Zi, TE Kimura, W Liu, J Jin, J Higham, **Sanjay R. Kharche**, et al. Mitogen-activated protein kinase kinase 4 deficiency in cardiomyocytes causes connexin 43 reduction and couples hypertrophic signals to ventricular arrhythmogenesis. J Biol Chem. (2011) 286 (20): 17821-30.

30. **Sanjay R. Kharche**, Yu J, Lei M,Zhang H. A mathematical model of action potentials of mouse sinoatrial node cells with molecular bases. Am J Physiol (2011) 301(3): H945-63.

31. Tong WC, Choi CY, **Sanjay R. Kharche,** et al. A computational model of the ionic currents, Ca2+ dynamics and action potentials underlying contraction of isolated uterine smooth muscle. PLoS One. 2011. 6(4): e18685

In articles #30 and 31, I developed the biophysical models for cell excitability. In #31, I used Monte Carlo methods to identify model parameters. I #32, I provided an extensive data analysis upon which the uterine cell model was based.

32. **Sanjay R. Kharche,** N Lüdtke, S Panzeri and H Zhang. A Global Sensitivity Index for Biophysically Detailed Cardiac Cell Models: A Computational Approach. LNCS (2009); 5528: 366-375.

33. **Sanjay R. Kharche,** Garratt CJ, Boyett MR, Inada S, Holden AV, Hancox JC, Zhang H. Atrial proarrhythmia due to increased inward rectifier current (I_{K1}) arising from KCNJ2 mutation – A simulation study. PBMB. **98: (2-3)**: pp. 186-197; (2008).

34. H. Wright, R.H. Crompton, **Sanjay R. Kharche**, P. Wenisch. Steering and visualization: Enabling

technologies for computational science. Future Generation Computer Systems (2010); **26(3):** 506-513.

35. H Zhang, T Tao, **Sanjay R. Kharche**, S M Harrison. Modelling changes in transmural propagation and susceptibility to arrhythmia induced by volatile anesthetics in ventricular tissue. J. Theo. Biol. 257(2): 279-291.

36. **Sanjay R. Kharche**, G Seemann, L Margetts, J Leng, A V Holden, H Zhang. Simulation of clinical electrophysiology in 3D human atria: a high-performance computing and high-performance visualization application. Conc. Comput.: Practice and Experience. (2008); **20(11):** 1317-1328.

37. Howarth FC, Chandler NJ, **Sanjay R. Kharche**, et al. Effects of streptozotocin-induced diabetes on connexin43 mRNA and protein expression in ventricular muscle. Mol Cell Biochem. (2008); **319(1-2)**: 105-114.

38. H Zhang, **Sanjay R. Kharche**, A V Holden, J C Hancox. Repolarisation and vulnerability to re-entry in the human heart with short QT syndrome arising from KCNQ1 mutation--A simulation study. PBMB. **96 (1-3)**: 2008. (I.F.: 5).

39. H Zhang, C J Garratt**, Sanjay R. Kharche**, A V Holden. Remodelling of cellular excitation (reaction) and intercellular coupling (diffusion) by chronic atrial fibrillation represented by a reaction-diffusion system, Physica D: Nonlinear Phenomena. **238**: 976-983; 2009.

40. Salle; L, **Sanjay R. Kharche**, Zhang H, Brette F. Mechanisms underlying adaptation of action potential duration by pacing rate in rat myocytes. PBMB 96 **(1-3)**: 305-20. 2008. (joint *first author*) (I.F.: 5.009).

41. Taggart MJ, Blanks A, **Sanjay R. Kharche**, et al. Towards understanding the myometrial physiome: approaches for the construction of a virtual physiological uterus. BMC Pregnancy Childbirth. (2007). 7 (1: S3).

42. **Sanjay R. Kharche**, G Seemann, J Leng, AV Holden, CJ Garratt, H Zhang. Waves in 3D Virtual Human Atria: A Computational Study. F.B. Sachse and G. Seemann (Eds.): LNCS (2007); **4466**: 129–138.

43. AP Benson, RH Clayton, AV Holden, **Sanjay R. Kharche**, WC Tong. Endogenous driving and synchronization in cardiac and uterine tissues: bifurcations and local coupling. Philos. Tans. Roy. Soc. **364 (1842)**: 1313-1327; (2006).

44. **Sanjay R. Kharche**, H Zhang, AV Holden. Hypertrophy in rat virtual left ventricular cells and tissue. A. F. Frangi et al. (Eds): LNCS (2005); **3504**: 153-161.

45. **Sanjay R. Kharche**, JA Howarth. The inward solidification of a liquid cylinder with periodic axial perturbation of the boundary temperature or heat flux. Int. Comms. Heat and Mass. (2000); **27 (7)**: 903-912.

46. **Sanjay R. Kharche**, JA Howarth. The inward solidification of a liquid cylinder with periodic axial perturbation of the boundary geometry, and constant temperature or heat flux. Int. Comms. Heat and Mass. (2000); **27 (7)**: 913-923.

Book chapter.

47. **Sanjay R. Kharche**, Phillip R. Law and Henggui Zhang (2009). Studying Ion Channel Dysfunction and Arrhythmogenesis in the Human Atrium: A Computational Approach, Recent Advances in Biomedical Engineering. Ganesh R Naik (Ed.), ISBN: 978-953-307-004-9, InTech publishers.

Selected conference publications.

48. **Kharche SR,** Desai K, McIntyre CW. Elucidating the relationship between arrhythmia and ischemic heterogeneity: an in silico study. Annual Int Conf IEEE Eng Med Biol Soc. 2020:2434-2437.

49. Joseph JJ, McIntyre CW, **Kharche SR.** Proarrhythmic Effects of Electrolyte Imbalance in Virtual Human Atrial and Ventricular Cardiomyocytes. Annual Int Conf IEEE Eng Med Biol Soc. 2020:2315-2318.

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