Mary M. (Molly) Maleckar

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Education

2008 **Ph.D., Biomedical Engineering**; The Johns Hopkins University (Baltimore, MD)

2002 **B.Sc., Biomedical Engineering**; Tulane University (New Orleans, LA)

Professional Experience

2019 – **Research Professor**, Computational Physiology, Simula Research Laboratory, Incorporated, Walnut Creek, CA.

2017 – 2019 **Director**, Models and Theory, The Allen Institute for Cell Science, Seattle, WA.

2015 – 2016 **Senior Scientist**, Computational Cardiac Modeling, Simula Research Laboratory, Oslo, Norway

2012 – 2015 **Director**, Simula School of Research and Innovation, Oslo, Norway

2011 – 2012 **Research Department Head**, Computational Cardiac Modeling, Simula Research Laboratory, Oslo, Norway

2010 **Research Group Leader**, Computational Cardiac Modeling and Center for Biomedical Computing, Simula Research Laboratory, Oslo, Norway

2009 **Postdoctoral Research Fellow**, Center for Biomedical Computing, Scientific Computing, Simula School of Research and Innovation, Oslo, Norway

Grants and Fellowships

2020 – present PROCardio Centre for Precision Health Care in Cardiology, Management Group Member, Technical Coordinator and Work Package Lead

Norwegian Centre for Research-Based Innovation

2016 – 2019 SysAFib: Systems medicine for diagnosis and stratification of atrial fibrillation, **Coordinator**

ERA CoSysMed, European Commission and BIOTEK2021 Research Council of Norway

2015 – 2019 EU Training Network on Novel Targets and Methods in Atrial Fibrillation (AFib-TrainNet), Marie Skłodowska-Curie Actions, European
Commission, **Training Coordinator**

2015 – 2018 "Risk factors for sudden cardiac death during acute myocardial infarction (MI-RISK)", Novo Nordisk Foundation Interdisciplinary Synergy Grant

2014 – 2015 PREPARE2: Increased science awareness among youth, Simula School of Research and Innovation, PROFORSK, Research Council of Norway, **Coordinator**

2014 Expert Advisor Policy Fellowship, The Research Council of Norway Brussels Office

2012 – 2013 Can Simulation shed light on a complex disease process?, Simula Research Laboratory/University of California San Diego, IS-BILAT,
Research Council of Norway

2011 – 2019 The Center for Cardiological Innovation, Simula Research Laboratory, SFI Program, Research Council of Norway, **Deputy Director for Simulation and Modeling**, 2011-2012

Commissions of Trust

2021 – present Chair, Chan Zuckerberg Initiative, Scientic Advisory Board.

2020 – present Member, Chan Zuckerberg Initiative, Open Science Initiative, Scientific Advisory Board.

2019 – present Member, University of Washington Center for Translational Muscle Research, External Advisory Board.

2019 – present Member, Chan Zuckerberg Iniative, Single Cell Science, Scientific Advisory Board.

2018 – 2021 Member, Chan Zuckerberg Initiative, Scientic Advisory Board.

2012 – 2016 Board Member, Simula Research Laboratory, Center for Cardiological Innovation (SFI) Board of Directors

Pre-print or Under Peer Review

A deep generative model of 3D single-cell organization. Rory M. Donovan-Maiye, Jackson M. Brown, Caleb K. Chan, Liya Ding, Calysta Yan, Nathalie Gaudreault, Julie A. Theriot, **Mary M. Maleckar**, Theo A. Knijnenburg, Gregory R. Johnson. Posted June 10th, 2021. bioRxiv; doi: https://doi.org/10.1101/2021.06.09.447725.

DeepFake electrocardiograms: the key for open science for artificial intelligence in medicine. Vajira Thambawita, Jonas L. Isaksen, Steven A. Hicks, Jonas Ghouse, Gustav Ahlberg, Allan Linneberg, Niels Grarup, Christina Ellervik, Morten Salling Olesen, Torben Hansen, Claus Graff, Niels-Henrik Holstein-Rathlou, Inga Strümke, Hugo L. Hammer, **Molly Maleckar**, Pål Halvorsen, Michael A. Riegler, Jørgen K. Kanters. Posted May 10th, 2021. medRxiv; [https://doi.org/10.1101/2021.04.27.21256189]

Building a 3D Integrated Cell. Gregory R. Johnson, Rory M. Donovan-Maiye, **Mary M. Maleckar**. Posted December 21, 2017. bioRxiv 238378; doi: https://doi.org/10.1101/238378

Three dimensional cross-modal image inference: label-free methods for subcellular structure prediction. Chek Ounkomol, Daniel A. Fernandes, Sharmishtaa Seshamani, **Mary M. Maleckar**, Forrest Collman, Gregory R. Johnson. Posted November 9, 2017. bioRxiv 216606; doi: https://doi.org/10.1101/216606

Generative Modeling with Conditional Autoencoders: Building an Integrated Cell. Gregory R. Johnson, Rory M. Donovan-Maiye, **Mary M. Maleckar**. Submitted on 28 Apr 2017. http://arxiv.org/abs/1705.00092v1

Peer-reviewed Journal Publications

2021

Explaining deep neural networks for knowledge discovery in electrocardiogram analysis. Hicks SA, Isaksen JL, Thambawita V, Ghouse J, Ahlberg G, Linneberg A, Grarup N, Strümke I, Ellervik C, Olesen MS, Hansen T, Graff C, Holstein-Rathlou NH, Halvorsen P, **Maleckar MM**, Riegler MA, Kanters JK. Explaining deep neural networks for knowledge discovery in electrocardiogram analysis. Sci Rep. 2021 May 26;11(1):10949. doi: 10.1038/s41598-021-90285-5. PMID: 34040033

2020

Mary M. Maleckar, Pablo Martín-Vasallo, Wayne R. Giles, and Ali Mobasheri. Physiological Effects of the Electrogenic Current Generated by the Na+/K+ Pump in Mammalian Articular Chondrocytes. Bioelectricity. Sep 2020.258-268.http://doi.org/

Tveito A, Jæger KH, **Maleckar MM**, Giles WR, Wall S. Computational translation of drug effects from animal experiments to human ventricular myocytes. Sci Rep. 2020 Jun 29;10(1):10537. doi: 10.1038/s41598-020-66910-0. PMID: 32601303; PMCID: PMC7324560.

Jæger KH, Charwat V, Charrez B, Finsberg H, **Maleckar MM**, Wall S, Healy KE, Tveito A. Improved Computational Identification of Drug Response Using Optical Measurements of Human Stem Cell Derived Cardiomyocytes in Microphysiological Systems. Front Pharmacol. 2020 Feb 12;10:1648. doi: 10.3389/fphar.2019.01648. PMID: 32116671; PMCID: PMC7029356.

2019

Vasan R, **Maleckar MM**, Williams CD, Rangamani P. DLITE Uses Cell-Cell Interface Movement to Better Infer Cell-Cell Tensions. Biophys J. 2019 Nov 5;117(9):1714-1727. doi: 10.1016/j.bpj.2019.09.034. Epub 2019 Oct 7.

2018

S Behdadfar, L Navarro, J Sundnes, **MM Maleckar**, HH Odland, S Avril. Abnormal Tissue Zone Detection and Average Active Stress Estimation in Patients with LV Dysfunction. Medical and Biological Image Analysis, 69.

Tveito A, **Maleckar MM**, Lines GT. Computing optimal properties of drugs using mathematical models of single channel dynamics. Computational and Mathematical Biophysics 6 (1), 41-64.

Ounkomol C, Seshamani S, **Maleckar MM**, Collman F, Johnson GR. Label-free prediction of three-dimensional fluorescence images from transmitted-light microscopy. Nat Methods. 2018 Sep 17. doi: 10.1038/s41592-018-0111-2. [Epub ahead of print]

Maleckar MM, Clark RB, Votta B, Giles WR. The Resting Potential and K(+) Currents in Primary Human Articular Chondrocytes. Front Physiol. 2018 Sep 4;9:974. doi: 10.3389/fphys.2018.00974. eCollection 2018.

Kallhovd S, **Maleckar MM**, Rognes ME. Inverse estimation of cardiac activation times via gradient-based optimization. Int J Numer Method Biomed Eng. 2018 Feb;34(2). doi: 10.1002/cnm.2919. Epub 2017 Aug 23.

2017

Vagos MR, Arevalo H, de Oliveira BL, Sundnes J, **Maleckar MM**. A computational framework for testing arrhythmia marker sensitivities to model parameters in functionally calibrated populations of atrial cells. Chaos. 2017 Sep;27(9):093941.

Behdadfar S, Navarro L, Sundnes J, **Maleckar MM**, Avril S. Importance of material parameters and strain energy function on the wall stresses in the left ventricle. Comput Methods Biomech Biomed Engin. 2017 Aug;20(11):1223-1232. doi: 10.1080/10255842.2017.1347160. Epub 2017 Jul 4.

Maleckar MM, Edwards AG, Louch WE, Lines GT. Studying dyadic structure-function relationships: a review of current modeling approaches and new insights into Ca(2+) (mis)handling. Clin Med Insights Cardiol. 2017 Apr 12;11:1179546817698602.

Belardinelli L, **Maleckar MM**, Giles WR. Ventricular Microanatomy, Arrhythmias, and the Electrochemical Driving Force for Na(+): Is There a Need for Flipped Learning? Circ Arrhythm Electrophysiol. 2017 Feb;10(2):e004955. doi: 10.1161/CIRCEP.117.004955. Erratum in: Circ Arrhythm Electrophysiol. 2017 Mar;10 (3):.

2016

Skibsbye L, Jespersen T, Christ T, **Maleckar MM**, van den Brink J, Tavi P, Koivumäki JT. Refractoriness in human atria: Time and voltage dependence of sodium channel availability. J Mol Cell Cardiol. 2016 Dec;101:26-34.

Grandi E, **Maleckar MM**. Anti-arrhythmic strategies for atrial fibrillation: The role of computational modeling in discovery, development, and optimization. Pharmacol Ther. 2016 Sep 6. pii: S0163-7258(16)30168-1.

Lines GT, Oliveira BL, Skavhaug O, **MM Maleckar**. Simple T wave metrics may better predict early ischemia as compared to ST segment. IEEE Transactions on Biomedical Engineering, 2017 Jun;64(6):1305-1309. doi: 10.1109/TBME.2016.2600198. Epub 2016 Aug 25.

2015 S. Kallhovd, S.U. Gerald, J. Saberniak, K. Haugaa, **MM Maleckar**.Localization and not Extent of Fibrofatty Infiltration is the Primary Factor Determining Conduction Disturbance in a Computational Model of Arrhythmogenic Cardiomyopathy. Proceedings IEEE e-Health and Bioengineering 2015. EHB 2015, November 19-21, 2015, Iasi, Romania.

2014 **Maleckar MM**, Lines GT, Koivumäki J, Cordeiro JM, Calloe K.NS5806 partially restores action potential duration but fails to ameliorate calcium transient dysfunction in a computational model of canine heart failure, 2014 Nov;16 Suppl 4:iv46-iv55.

Koivumäki JT, Clark RB, Belke D, Kondo C, Fedak PW, **Maleckar MM**, Giles WR.Na(+) current expression in human atrial myofibroblasts: identity and functional roles. Front Physiol. 2014 Aug 7;5:275. doi: 10.3389/fphys.2014.00275. eCollection 2014.

Frisk M, Koivumaki J, Norseng PA, **Maleckar MM**, Sejersted OM, Louch WE. Variable t-tubule organization and Ca2+ homeostasis across the atria. Am J Physiol Heart Circ Physiol. 2014 Jun 20.

Koivumäki JT, Seemann G, **Maleckar MM**, Tavi P. In silico screening of the key cellular remodeling targets in chronic atrial fibrillation. PLoS Comput Biol. 2014 May 22;10(5):e1003620. doi: 10.1371/journal.pcbi.1003620. eCollection 2014 May.

Yuan L, Koivumäki JT, Liang B, Lorentzen LG, Tang C, Andersen MN, Svendsen JH, Tfelt-Hansen J, **Maleckar M**, Schmitt N, Olesen MS, Jespersen T. Investigations of the Navß1b sodium channel subunit in human ventricle; functional characterization of the H162P Brugada syndrome mutant. Am J Physiol Heart Circ Physiol. 2014 Apr 15;306(8):H1204-12. doi: 10.1152/ajpheart.00405.2013. Epub 2014 Feb 21.

2013 Li P, Lines GT, **Maleckar MM**, Tveito A. Mathematical Models of Cardiac Pacemaking Function. Frontiers in Physics, 1(20): 2013 http://www.frontiersin.org/Journal/10.3389/fphy.2013.00020/abstract

Wilhelms M, Hetmann H, **Maleckar MM**, Koivumäki J, Dossel O, Seeman G. Benchmarking electrophysiological models of human atrial myocytes, Frontiers in Physiology 3(487), 2013.

2012 Koivumäki J, Christ T, Seemann G, and **Maleckar MM**. Divergent action potential morphology in human atrial cells vs. tissue: underlying ionic mechanisms, In: Computing in Cardiology, ed. by Alan Murray, vol. 39, pp. 121-124, Alan Murray (ISBN: 978-1-4673-2076-4), 2012. Refereed proceedings.

Rose RA, Belke DD, **Maleckar MM**, Giles WR. Ca2+ Entry Through TRP-C Channels Regulates Fibroblast Biology in Chronic Atrial Fibrillation. Circulation 126(17): 2039-41, 2012.

Tveito A, Lines GT, Edwards AG, **Maleckar MM**, Michailova A, Hake J, McCulloch A. Slow Calcium-Depolarization-Calcium waves may initiate fast local depolarization waves in ventricular tissue. Prog Biophys Mol Biol 110(2-3): 295-304, 2012.

Tveito A, Lines G, Rognes ME, and **Maleckar MM**. An analysis of the shock strength needed to achieve defibrillation in a simplified mathematical model of cardiac tissue. International Journal of Numerical Analysis and Modeling 9(3): 644-57, 2012.

Tveito A, Lines G, and **Maleckar MM**. Note on a possible pro-arrhythmic property of anti-arrhythmic drugs aimed at improving gap-junction coupling. Biophys J 102(2): 231-37, 2012.

2011 Niederer SA, Kerfoot E, Benson A, Bernabeu MO, Bernus O, Bradley C, Cherry EM, Clayton R, Fenton FH, Garny A, Heidenreich E, Land S, **Maleckar M**, Pathmanathan P, Plank G, Rodríguez JF, Roy I, Sachse FB, Seemann G, Skavhaug O and Smith NP. N-Version Benchmark Evaluation of Cardiac Tissue Electrophysiology Simulators. Philosophical Transactions of the Royal Society VPH Issue. Philos Transact A Math Phys Eng Sci. 369(1954): 4331-51, 2011.

McDowell K, Arevalo H, **Maleckar MM**, and Trayanova NA. Susceptibility to reentry in the infarcted heart depends on active fibroblast density. Biophysical Journal 101(6): 1307-15, 2011.

Tveito A, Lines G, Skavhaug O, and **Maleckar MM**. Unstable eigenmodes are possible drivers for cardiac arrhythmias. Journal of the Royal Society Interface. 8(61): 1212-6, 2011.

Tveito A, Lines G, Artebrant R, Skavhaug O, and **Maleckar MM**. Existence of excitation waves for a collection of cardiomyocytes electrically coupled to fibroblasts. Mathematical Biosciences 230(2): 79-86, 2011.

2009 – **Maleckar MM**, Greenstein JL, Giles WR, and Trayanova NA. Electrotonic coupling between human atrial myocytes and fibroblasts alters excitability and repolarization. Biophysical Journal 97(8): 2179-2190, 2009.

Maleckar MM, Greenstein JL, Giles WR, and Trayanova NA. Repolarization in the human atrial myocyte – rate-dependent changes in the action potential waveform. Am J Physiol Heart Circ Physiol 297(4): 1398-1410, 2009.

Maleckar MM, Greenstein JL, Trayanova NA, and Giles WR. Mathematical simulations of ligand-gated and specific cell-type effects in the human atrium. Prog Biophys Mol Biol 98: 161-70, 2008.

Maleckar MM, Woods MC, Sidorov VY, Holcomb MR, Mashburn DN, Wikswo JP and Trayanova NA. Polarity reversal lowers activation time during diastolic field stimulation of the rabbit ventricles: Insight into mechanisms. Am J Physiol Heart Circ Physiol 295(4):H1626-33, 2008.

Bourn DW, **Maleckar MM**, Rodríguez B, Trayanova NA. Mechanistic enquiry into the effect of increased pacing rate on the upper limit of vulnerability. Phil Trans. Royal Soc A, 346:1333-1348, 2006.

Gurev V, **Maleckar MM**, and Trayanova NA. Cardiac Defibrillation and the Role of Mechano-Electric Feedback in Postshock Arrhythmogenesis. The Annals of the New York Academy of Sciences,1080:320-333, 2006.

Selected Conferences and Talks

Maleckar MM. Label-free imaging and novel generative models. Cardiac Arrhythmia Mechanisms Gordon Research Conference. April 1-4, 2019. Il Ciocco, Italy. Invited talk.

Maleckar MM. Stem cell organization using label-free imaging and a novel generative model. Biophysical Society Annual Meeting Computational Biology Platform. February 18th, 2018. BPS 2018, San Francisco, CA. Invited talk.

Maleckar MM. Capturing variance: integrating a moving target. Building the Cell 2017 Subgroup Meeting, December 2nd, 2017, ASCB, Philadelphia, PA. Invited talk.

Maleckar MM. Putting the pieces together: Towards supplementing sparse clinical data with multi physics simulation Foundation Teofilo Rossi di Montelera Forum 2015, December 6-9, 2015, Lugano, Switzerland. Invited talk.

Maleckar MM. How many ionic models do we need for modelling of the atria? Atrial Signals 2015, Karlsruhe, Germany, 22.-24. October. Invited talk.

Maleckar MM. Patient-specific modeling: how good do we have to be? TRM Forum 2013, December 1-3, 2013, Lugano, Switzerland. Invited talk.

Maleckar MM, Lines GT, Koivumäki JT, Calloe K, Cordeiro JM. Ca2+-transient dysfunction and ion channel therapy: what can we gather from a computational model of canine heart failure? EHRA Scientific Sessions 2013, 37th Annual Meeting of the ESC Working Group on Cardiac Cellular Electrophysiology, 2013. Poster and presentation.

Maleckar MM. Towards Modeling Arrhythmogenic Cardiomyopathy – Can Simulation Shed Light on a Complex Disease Process? Cardiac Physiome Workshop, San Diego, October 30 – November 2, 2012. Invited talk.

Maleckar MM. Modeling the effects of rotigaptide in atrial tissue: a cautionary tale. 9th International Conference of Numerical Analysis and Applied Mathematics, September 19-25, 2011. Invited talk.

Maleckar MM, Greenstein JL, Giles WR, Trayanova NA. Electrotonic coupling between human atrial myocytes and fibroblasts alters excitability and repolarization. Gordon Research Conference on Cardiac Arrhythmia Mechanisms, Il Ciocco, Italy, February 2009.

Maleckar MM, Greenstein JL, Giles WR, Trayanova NA. Coupling of Human Atrial Myocytes and Myofibroblasts Can Lead to Conduction Disturbances. Heart Rhythm 5(5S): S57, 2008. Session talk.

Professional Affiliations

- 2016 – present, Member, American Society for Cell Biology
- 2011 – present, Member, Scandinavian Physiological Society
- 2011 – present, Member, Biophysical Society
- 2011 – present, Member, European Society of Cardiology Working Group on Cellular Cardiac Electrophysiology
- 2012 – present, Member, European Society of Cardiology Working Group on eCardiology
- 2009 – present, Member, Heart Rhythm Society
- 2009 – present, Member, American Association for the Advancement of Science

Other

- English (native); Spanish (C2); Norwegian (B2)
- 10+ years experience in all stages of proposal coordination, including project leadership and management, consortium building, and technical and general writing
- 10+ years consultation experience in science communication, including presentation, popular, and technical writing.

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