

# 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  
**Training Coordinator,** AFib-TrainNet EU MCSA ITN  
**Coordinator,** SysAFib ERA CoSysMed European Project
- 2012 – 2016**      **Board Member,** Simula Research Laboratory, Center for Cardiological Innovation (SFI) Board of Directors
- 2012 – 2015**      **Director,** Simula School of Research and Innovation, Oslo, Norway
- 2011 – 2012**      **Deputy Director for Simulation and Modeling,** Center for Cardiological Innovation (CCI), a Norwegian Center for Research Innovation (SFI)
- 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

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

## Pre-print or Under Peer Review

DLITE uses cell-cell interface movement to better infer cell-cell tensions. Ritvik Vasan, **Mary M Maleckar**, C. David Williams, Padmini Rangamani. bioRxiv, 541144. 2019.

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, Sharmishta Seshamani, **Mary M. Maleckar**, Forrest Collman, Gregory R. Johnson. Posted November 9, 2017. bioRxiv 216606; doi: <https://doi.org/10.1101/216606>

## Peer-reviewed Journal Publications

- 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** Skibsbjerg 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, Koivumäki 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 Navβ1b 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/fphys.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. Ca<sup>2+</sup> 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, 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. Ca<sup>2+</sup>-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 consultation experience in science communication, including presentation, popular, and technical writing.

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