Name:	Marie E. Rognes
Born:	October 7 1982
Nationality:	Norwegian
Gender:	Female
Present position:	Chief Research Scientist, Simula Research Laboratory, Oslo, Norway

Education

2009	PhD in Applied Mathematics/Numerical Analysis (Date of conferred degree: 17.09.2009), Centre for Mathematics for Applications (Centre of Excellence), University of Oslo (UiO), Norway. Thesis title: *Mixed finite element methods for viscoelasticity and gels*
2005	MSc in Applied Mathematics, Department of Mathematics, UiO

Current and previous professional positions

2016–	Chief Research Scientist, Simula Research Laboratory, Oslo, Norway
2022–2023	Visiting Scholar, University of California San Diego, La Jolla, CA, USA
2020–2022	Professor II, Department of Mathematics, University of Bergen, Norway (20%)
2014–2017	Consultant, Melior Innovations, Houston, TX, USA (part-time)
2012–2016	Head of Biomedical Computing Department, Simula Research Laboratory
2015–2016	Associate Professor II, Department of Mathematics, UiO (20%)
2012–2016	Senior Research Scientist, Simula Research Laboratory, Norway
2012–2013	Lecturer, Department of Informatics, UiO (part-time)
2009–2012	Postdoctoral fellow, Center for Biomedical Computing, Simula Research Laboratory
Jan–Jun 2007	Visiting Scholar, University of Minnesota Twin Cities, Minneapolis, MN, USA
2005–2008	Research fellow, Centre for Mathematics for Applications, UiO

Awards, prizes, and academy memberships

⋄ Member of the Norwegian Academy of Technological Sciences (2022–).

⋄ 2022 Fulbright Scholarship Award, U.S.-Norway Fulbright Foundation for Educational Exchange.

⋄ 2018 Royal Norwegian Society of Sciences and Letters Prize for Young Researchers within the Natural Sciences. This prize is awarded once annually to researchers in Norway below the age of 40 who have accomplished exceptional results within their field, with documented originality and talent.

⋄ 2015 Wilkinson Prize for Numerical Software. The Wilkinson prize for Numerical Software is the most prestigious prize in the numerical software research community, awarded once every four years to the authors of an outstanding piece of numerical software. I won the 2015 prize for the dolfin-adjoint project (dolfin-adjoint.org), together with my co-authors P. E. Farrell, S. W. Funke and D. A. Ham.

⋄ Founding Member of the Young Academy of Norway (2015–2019). The Young Academy of Norway was initiated by the Norwegian Academy of Science and Letters and targets talented, young researchers interested in working interdisciplinarily with broader issues. Only 20 members were selected from all scientific disciplines out of 160 applicants in this first cycle of four-year terms.

⋄ 2015 Simula Research Award. This award is presented annually to honour excellent contributions to research undertaken at Simula that lead to new insight within the field.

Research, innovation and mobility grants

2024–2026	Essential Open Source Software for Science Grant, Chan-Zuckerberg Initiative/Wellcome Trust: *Next-Generation Simulation and Learning in Imaging-Based Biomedicine* (4 MNOK) (Project leader)
2024–2029	The Foundation K. G. Jebsen Centre for Medical Research: *K. G. Jebsen Center for Brain Fluid Research* (61 MNOK) (Deputy Director)
2022–2026	UiO Life Science Convergence Environment: *AUTORHYTHM: an interdisciplinary research environment to elucidate the role of autophagy in healthy aging* (16 MNOK) (co-PI)
2021–2025	FRIPRO Research Grant, Research Council of Norway (Researcher project for scientific renewal): *Exciting times: Extreme modelling of excitable tissue* (12 MNOK) (Project leader)
2017–2023	ERC Starting Grant (PE1 Mathematics), European Research Council: *Mathematical and computational foundations for modelling cerebral fluid flow* (1.5 MEUR) (Project leader)

2016–2023	EPSRC CDT Oxford-Simula InFoMM Collaboration ($\sim$1 MNOK) (co-PI)
2016–2019	FRIPRO Research Grant, Research Council of Norway (Young Research Talent): *The Numerical Waterscape of the Brain* (8.7 MNOK) (Project leader)
2015–2018	Nordforsk Research Grant (the Nordic Council of Ministers): *Automated uncertainty quantification for numerical solution of partial differential equations* (6.7 MNOK) (Project leader)
2015–2016	Horizon 2020 MSCA RISE Research and Mobility Grant: *Unique Biomaterial-Drug Solution for Multifunctional Central Venous Catheters* (1.8 MNOK total) (Work package leader)
2014–2018	Horizon 2020 MSCA ITN Grant: *TheLink* (34 MNOK total) (Associated partner)
2012–2018	RCN Centre of Excellence Center for Biomedical Computing: Robust Solvers and High-level adjoints: software and applications ($\sim$0.5 MEUR/year, Work package leader/PI)
2007	Leiv Eiriksson Programme Mobility Grant, Research Council of Norway (60 KNOK) (Project leader)

Career breaks

May–Dec 2018	Maternity leave
Jun–Dec 2013	Maternity leave

Lectures, short courses and other teaching activities

2022	Finite elements and brain multiphysics, Invited Guest Lecture (80 min), MAE 207: Finite element analysis in coupled problems, UCSD, La Jolla, US
2021	Lecture series on Brain modelling: from magnetic resonance imaging to finite element simulation, Porous Media Math Short Course Series, University of Bergen (online)
2015, 2016	Lecturer, 3-day course on FEniCS and Dolfin-adjoint, EPSRC CDT NGCM Summer Academy, University of Southampton, UK (top-rated course of the Academy)
2015, 2022	Lecturer and Project mentor, UCSD/UiO/Simula Summer School in Computational Physiology
2015–2016	Lecturer, Solid mechanics (MEK2500, 10 ECTS), Department of Mathematics, UiO
2012–2013	Lecturer, Numerical methods (INF-MAT2351, 10 ECTS), Department of Informatics, UiO
2008–2013	Lecturer and demonstrator, FEniCS short courses, including at the American Institute of Mathematics, California, USA; Imperial College London, UK; King Abdullah University of Science and Technology, Saudi Arabia; and University of Southampton.
2001–2003	Assistant teacher in different courses in mathematics and computer science (introduction to programming, programming with high-level languages, numerical linear algebra) at the Faculty for Mathematics and Natural Sciences, University of Oslo.

Organization of scientific meetings (selection)

2024	2024 FEniCS Conference, June 12-14, Simula Research Laboratory, Oslo, Norway (Local organization committee)
2024	13th European Conference on Mathematical and Theoretical Biology, July 2024, Toledo, Spain (Scientific Committee)
2023	SIAM CSE'23, Minisymposium organizer, Amsterdam, the Netherlands
2022	ECCOMAS Congress 2022, 8th European Congress on Computational Methods in Applied Sciences and Engineering, Oslo, Norway (Scientific Committee/Young Investigators Initiative Chair)
2022	Minisymposium at ECCOMAS 2022 (Advances in automatic code-generation software for for simulations in science and engineering), Oslo, Norway
2020	2nd Oslo Brainphatics Symposium, Simula, Norway
2019	Minisymposium at ENUMATH 2019 (Discretizations of mixed-dimensional PDEs), Egmond aan Zee, the Netherlands
2019	2019 SIAM Conference on Computational Science and Engineering, Spokane, US (Scientific committee)
2019	5th Cerebrospinal Fluid Dynamics Symposium, Simula Research Laboratory, Norway
2018	PDESOFT 2018, Bergen, Norway (Scientific committee)
2018	Minisymposium at ECCM-ECFD 2018 (Mathematical and computational modelling of fluid flow and transport in the brain and spinal cord), Glasgow, UK

2016	FEniCS'16, Simula Research Laboratory, Norway
2015	Minisymposium at 2015 SIAM Conference on Computational Science and Engineering (Efficient Solvers for PDE-Constrained Optimization mini-symposium) Salt Lake City, UT, USA
2013	26th Nordic Seminar on Computational Mechanics, Simula Research Laboratory, Norway

Scientific software projects (selection)

2007–	Core FEniCS developer and Founding member of the FEniCS Steering Council (2016–)
2011–	Founding member and core developer of the Dolfin-adjoint project

Editorial board memberships

2023–	Editorial board member, European Mathematical Society Magazine
2022–	Associate editor, AIMS: Applied Mathematics for Modern Challenges (AIMS)
2022–	Associate editor, ESAIM: Mathematical Modelling and Numerical Analysis (ESAIM: M2AN)
2020–	Associate editor, SIAM Journal of Scientific Computing (SISC)
2020–	Editorial board member, Springer Nature Partial Differential Equations and Applications
2020–	Editorial board member, BMC Fluids and Barriers of the Central Nervous System
2020–2023	Topic editor, Journal of Open Source Software (JOSS)

Other invited research programmes/fellowships

Interfaces and unfitted discretization methods, Mittag-Leffler Institute, Stockholm, Sweden (2025*); *Numerical PDEs: Analysis, Algorithms, and Data Challenges*, Institute for Computational and Experimental Research in Mathematics, Brown U, US (Mar 2024, cancelled); *Multiscale Numerics for the Atmosphere and Ocean*, Isaac Newton Institute for Math. Sci., Cambridge, UK (Dec 2012).

Other invited or elected memberships and positions

2024–2028	Research Council of Norway Portfolio Board for Ground-breaking Research
2023–2026	European Mathematical Society Committee for Applications and Interdisciplinary Relations
2023–2027	Interpore Council

Society memberships

2022–	European Mathematical Society (EMS)
2022–2023	Society for Neuroscience (SfN)
2014, 2022–2023	Society for Industrial and Applied Mathematics (SIAM)

Reviewer for international journals

I have acted as a reviewer for the following scientific journals

SIAM Journal on Applied Mathematics, SIAM Journal on Scientific Computing, Mathematics of Computation, Mathematical Models and Methods in Applied Sciences, BIT Numerical Mathematics, ACM Transactions on Mathematical Software, Journal of Numerical Mathematics, Annals of Biomedical Engineering, International Journal on Numerical Methods in Biomedical Engineering, Nature Scientific Reports, PLOS Computational Biology, Fluids and Barriers of the Central Nervous System, Journal of Fluid Mechanics, Journal of Computational Physics, and Geoscientific Model Development.

Scientific advisory board

◇ Member of the Scientific advisory board for the Research Council of Finland Flagship Programme's Flagship of Advanced Mathematics for Sensing, Imaging and Modelling (FAME) (https://fameflagship.fi/).

Evaluation committee

◇ Member of **PhD thesis evaluation committees** at LSM Ecole Polytechnique, Paris, France (2023); the MOX, Politechnico di Milano (2018, 2020); Department of Mathematics and Computer Science, University of Southern Denmark, Odense (2018); Department of Computer Science, Imperial College London (2014); Department of Informatics, University of Grenoble, France (2013); and the Department of Informatics, University of Bergen, Norway (2012);

◇ Member of **faculty evaluation committees** at the Department of Mathematics, University of Uppsala (2020), the Department of Mathematics/Informatics, Oslo and Akershus University College (2014), and the Department of Informatics, UiO (2001);

◇ **Panel member** and **external reviewer** for a number of national, European and international research councils (2015–2024); further details omitted.

Supervision of postdoctoral fellows and graduate students

Postdoctoral fellows

VIII) Dr. Marte Julie Sætra studies *modelling and simulation of electrodiffusion and interstitial fluid flow* as a Postdoctoral Fellow with me at Simula (2021–);

VII) Dr. Rami Masri studied *mixed-dimensional modelling of excitable tissue* as a Postdoctoral Fellow with me at Simula (2022–2024);

VI) Dr. Pietro Benedusi studied *extreme scale modelling and simulation of excitable tissue* as a Postdoctoral Fellow with me at Simula (2022–2024);

V) Dr. Ingeborg Gjerde studied *predictive modelling of perivascular flows* as a Postdoctoral Fellow in the Waterscales (ERC) project at Simula (2020–2022), was subsequently employed as a Research Engineer at Simula, and is now in R&D at the Norwegian Geotechnical Institute;

IV) Dr. Cécile Daversin-Catty studied *mixed dimensional mathematical and computational modelling* as a Postdoctoral Fellow in the Waterscales (ERC) project (2017–2021), and was subsequently employed as a Research Scientist at Simula;

III) Dr. Travis B. Thompson studied *mixed finite element methods for multiple-network poroelasticity* as a Postdoctoral Fellow in the Waterscape (RCN) project (2017–2019). Thompson was next a Postdoctoral Research Associate at the Department of Mathematics, University of Oxford, before accepting a faculty position at Texas Tech University, Texas, US.

II) Dr. Rocio Rodriguez-Cantano studied *uncertainty quantification in cardiac electromechanics* as a Postdoctoral Fellow in the AUQ-PDE (NordForsk) project (2016–2018);

I) Dr. Simon Funke studied *predictive modeling in physiological flow* as a postdoctoral fellow with me at Simula (2013–2015). Funke was subsequently awarded a FRIPRO Young Research Talent Grant, became a Senior Research Scientist and Research Director at Simula, and is now CEO of a deep technology start-up company.

PhD students

xvi) Ms. Ingvild Devold is currently pursuing her PhD in Computational physiology on the topic of *Mechanochemical interplay underlying human performance* under my supervision (with P. Rangamani, UCSD as co-supervisor) at Simula.

xv) Mr. Balint Laczko is currently pursuing his PhD in Music technology on the topic of *sonification of autophagy* under my co-supervision (with A. Jensenius as main supervisor) at RITMO, University of Oslo.

xiv) Ms. Nanna Berre is currently pursuing her PhD on the topic of *cut finite element methods for modelling excitable tissue* under my co-supervision (with A. Massing as main supervisor) at the Norwegian University of Science and Technology.

xiii) Ms. Eirill Strand Hauge is currently pursuing her PhD on the topic of *cellular modelling of electrochemical interactions in neural tissue* under my supervision at Simula.

xii) Mr. Martin Hornkjøl is currently pursuing his PhD under my co-supervision (with K. A. Mardal as main supervisor) at the University of Oslo.

xi) Mr. Marius Causemann is currently pursuing his PhD on the topic of *Mathematical and numerical foundations for modelling deforming excitable tissue* under my supervision at Simula.

x) Dr. Georgia Brennan successfully completed her DPhil on the topic of *Mathematical modelling of clearance and proteopathy in neurodegenerative diseases with application to Alzheimer's disease* under my co-supervision (with A. Goriely as main supervisor) at the University of Oxford in March 2024.

ix) Dr. Eleonora Piersanti completed her PhD on *Parameter-robust formulation and preconditioning of poroelasticity equations for brain modelling* under my supervision at Simula in 2023. Piersanti is now a software and data science consultant at Expert Analytics, Oslo, Norway.

viii) Dr. Nicolas Boullé completed his DPhil under my co-supervision (with P. E. Farrell as main supervisor) at the University of Oxford in 2022. He was later a Simons Postdoctoral Research Fellow in Mathematics at

the University of Cambridge, and is now an Assistant Professor in Applied Mathematics at Imperial College London.

vii) Dr. Ada J. Ellingsrud completed her PhD on *Computational modelling of electrodiffusion and osmosis in cerebral tissue* under my supervision at Simula in 2021. Ellingsrud is now a Research Scientist at Simula, Coordinator for the Simula@BI Research Centre, and Head of Simula's Scientific Computing and Numerical Analysis Department.

vi) Dr. Lars M. Valnes completed his PhD on *Patient-specific Modeling of the Human Brain using Magnetic Resonance Imaging* under my co-supervision (with K.-A. Mardal as main supervisor) at the University of Oslo in 2020. Valnes is now a Research Engineer at Oslo University Hospital – Rikshospitalet, Norway.

v) Dr. Vegard Vinje completed his PhD on *Mathematical Modeling of Cerebrospinal Fluid Pulsatility and Pathways* under my supervision at Simula in 2019. Vinje was next a Research Scientist and Research Director for Scientific Computing at Simula, and is now with Expert Analytics AS.

iv) Dr. Matteo Croci completed his DPhil (PhD) in Mathematics on *Multilevel Monte Carlo Methods for Uncertainty Quantification in Brain Simulations* under my co-supervision (with P. E. Farrell and M. Giles as main supervisors) at the University of Oxford in 2019. Croci was then a Postdoctoral Research Fellow at the Oden Institute, University of Texas at Austin, US, and is now an Ikerbasque Research Fellow at the Basque Center for Applied Mathematics (BCAM).

iii) Dr. Gabriel Balaban completed his PhD on *Adjoint Data Assimilation Methods for Cardiac Mechanics* under my supervision at Simula in 2017. He subsequently won a Postdoctoral Research Associate position at King's College London, UK and a Postdoctoral Fellowship in Bioinformatics at the University of Oslo; he is now Associate Professor at Kristiania University College.

ii) Dr. Giulia Pizzichelli completed part of her PhD studies with me (and with E. Sinibaldi as main supervisor) at Simula in 2015 and graduated from the School of Advanced Studies, Pisa/Istituto Italiano di Tecnologia, Italy in 2016.

i) Dr. Andre Massing completed his PhD on *Analysis and Implementation of Finite Element Methods on Overlapping and Fictitious Domains* under my co-supervision (with A. Logg as main supervisor) at Simula in 2012. He was subsequently offered an Assistant Professorship at Umeå University, Sweden, and is now an Associate Professor at the Norwegian University of Technology and Science, Trondheim, Norway.

MSc students

I have supervised or actively co-supervised the following MSc students in their thesis research at the Departments of Informatics and/or Mathematics at the UiO, at the Norwegian University of Technology and Science, Trondheim, Norway, at the University of Trento, Italy, and at Karlsruhe Institute of Technology, Germany:

Åsmund Aamodt Resell (2022), Nanna Berre (2022), Marius Causemann (2020), Emilie Ødegaard (2018), Valentyna Pysarieva (2018), Carlo Cisale (2017), Janis Grobovs (2017), Vegard Vinje (2016), Ada J. Ellingsrud (2015), Ingeborg Sauge Torpe (2014), Nina Ødegaard (2014), Eline Sundt (2012), Fredrik Valdmanis (2012),

Preprints

61. E. A. Francis, J. G. Laughlin, J. S. Dokken, H. N. T. Finsberg, C. T. Lee, M. E. Rognes and P. Rangamani, Spatial modeling algorithms for reactions and transport (SMART) in biological cells, bioRxiv, 2024

60. L. W. Dreyer, A. Eklund, M. E. Rognes, J. Malm, S. Qvarlander, K.-H. Støverud, K.-A. Mardal and V. Vinje, Modeling CSF circulation and the glymphatic system during infusion using subject specific intracranial pressures and brain geometries, bioRxiv, 2024

59. P. Benedusi, A. J. Ellingsrud, H. Herlyng, M. E. Rognes, Scalable approximation and solvers for ionic electrodiffusion in cellular geometries, arXiv, 2024

58. I. A. Baratta, J. P. Dean, J. S. Dokken, M. Habera, J. S. Hale, C. N. Richardson, M. E. Rognes, M. W. Scroggs, N. Sime and G. N. Wells, DOLFINx: the next generation FEniCS problem solving environment, Zenodo, 2023

57. I. Gjerde, M. Kuchta, M. E. Rognes and B. Wohlmuth, Directional flow in perivascular networks: mixed finite elements for reduced-dimensional models on graphs, arXiv, 2023

56. R. Masri, M. Zeinhofer, M. Kuchta and M. E. Rognes, The modelling error in multi-dimensional time-dependent solute transport models, arXiv, 2023.

Articles in peer-reviewed international journals

55. N. Berre, M. E. Rognes and A. Massing, Cut finite element discretizations of cell-by-cell EMI electrophysiology models, Accepted for publication in SIAM Journal on Scientific Computing, 2024

54. P. Benedusi, P. Ferrari, M. E. Rognes and S. Serra-Capizzano, Modeling excitable cells with the EMI equations: spectral analysis and iterative solution strategy, Journal of Scientific Computing, 2024

53. I. Gjerde, M. E. Rognes and A. Sánchez, The directional flow generated by peristalsis in perivascular networks – theoretical and numerical reduced-order description, Journal of Applied Physics, 2023

52. E. Piersanti, M. E. Rognes, V. Vinje, Are brain displacements and pressures within the parenchyma induced by surface pressure differences? A computational modelling study, PLOS ONE, 2023.

51. J. G. Laughlin, J. S. Dokken, H. N. Finsberg, E. A. Francis, C. T. Lee, M. E. Rognes and P. Rangamani, SMART: Spatial Modeling Algorithms for Reaction and Transport, Journal of Open Source Software, 2023

50. V. Vinje, B. Zapf, G. Ringstad, P.-K. Eide, M. E. Rognes, K.-A. Mardal, Human brain solute transport quantified by glymphatic MRI-informed biophysics during sleep and sleep deprivation, Fluids and Barriers of the Central Nervous System, 2023.

49. M. J. Sætra, A. J. Ellingsrud and M. E. Rognes, Neural activity induces strongly coupled electro-chemo-mechanical interactions and fluid flow in astrocyte networks and extracellular space – a computational study, PLOS Comp. Bio., 2023.

48. E. Eliseussen, M. E. Rognes, T. B. Thompson, A-posteriori error estimation and adaptivity for multiple-network poroelasticity, ESAIM: M2AN, 2023.

47. G. S. Brennan, T. B. Thompson, H. Oliveri, M. E. Rognes, A. Goriely, The role of clearance in neurodegenerative disease, SIAM Journal on Applied Mathematics, 2023.

46. N. Boullé, P. E. Farrell, M. E. Rognes, Optimal control of Hopf bifurcation points, SIAM Journal on Scientific Computing, 2023.

45. M. E. Rognes, Waterscales: Mathematical and computational foundations for cerebral fluid flow. European Mathematical Society Magazine, 2022

44. Q. Hong, J. O. Kraus, M. I. Kuchta, M. A. Lymbery, K.-A. Mardal, M. E. Rognes, Robust approximation of generalized Biot-Brinkman problems. Journal of Scientific Computing, Springer, 2022.

43. M. Causemann, V. Vinje and M. E. Rognes, Human intracranial pulsatility during the cardiac cycle: a computational modelling framework, Fluids and Barriers of the Central Nervous System, 2022

42. M. Hornkjøl, L. M. Valnes, G. Ringstad, M. E. Rognes, P. K. Eide, K.-A. Mardal and V. Vinje, CSF circulation and dispersion yield rapid clearance from intracranial compartments, Frontiers in Bioengineering and Biotechnology, 2022.

41. C. Daversin-Catty, I. G. Gjerde, and M. E. Rognes, Geometrically reduced modelling of pulsatile flow in perivascular networks, Frontiers in Physics, 2022.

40. A. J. Ellingsrud, D. B. Dukefoss, R. Enger, G. Halnes, K. Pettersen and M. E. Rognes, Validating a computational framework for ionic electrodiffusion with cortical spreading depression as a case study, eNeuro, 2022.

39. X. Lai, H. A. Taskén, T. Mo, S. W. Funke, A. Frigessi, M. E. Rognes and A. Köhn-Luque. A scalable solver for a stochastic, hybrid cellular automaton model of personalized breast cancer therapy. International Journal on Numerical Methods for Biomedical Engineering e3542, 2021

38. A. J. Ellingsrud, N. Boullé, P. E. Farrell and M. E. Rognes. Accurate numerical simulation of electrodiffusion and water movement in brain tissue. IMA Mathematical Medicine & Biology, 2021

37. C. Daversin-Catty, C. N. Richardson, A. J. Ellingsrud and M. E. Rognes. Abstractions and automated algorithms for mixed-dimensional finite element methods. ACM Transactions on Mathematical Software, 2021

36. V. Vinje, E. N. Bakker and M. E. Rognes. Brain solute transport is more rapid in periarterial than perivenous spaces. Nature Scientific Reports, 2021

35. E. Piersanti, J. J. Lee, K.-A. Mardal, M. E. Rognes and T. Thompson. Parameter robust preconditioning by congruence for multiple-network poroelasticity. SIAM Journal on Scientific Computing, 2021

34. K.-A. Mardal, M. E. Rognes and T. B. Thompson. Accurate discretization of poroelasticity without Darcy stability – Stokes-Biot revisited. BIT Numerical Mathematics, 2021.

33. C. Daversin-Catty, V. Vinje, K.-A. Mardal and M. E. Rognes. The mechanisms behind perivascular fluid

flow. PLOS ONE, 2020.

32. V. Vinje, A. Eklund, K.-A. Mardal, M. E. Rognes and K.-H. Støverud. Intracranial pressure elevation alters CSF clearance pathways. Fluids and Barriers of the CNS, 2020.

31. M. Croci, V. Vinje and M. E. Rognes. Fast uncertainty quantification of tracer distribution in the brain interstitial fluid with multilevel and quasi Monte Carlo. International Journal for Numerical Methods in Biomedical Engineering, 2020.

30. A. J. Ellingsrud, A. Solbraa, G. T. Einevoll, G. Halnes and M. E. Rognes. Finite element simulation of ionic electrodiffusion in cellular geometries. Frontiers in Neuroinformatics, 2020

29. M. Croci, V. Vinje and M. E. Rognes. Uncertainty quantification of parenchymal tracer distribution using random diffusion and convective velocity fields. Fluids and Barriers of the CNS, 2019

28. X. Lai, O. Geier, T. Fleischer, Ø. Garred, E. F. Borgen, S. Funke, S. Kumar, M. E. Rognes, T. Seierstad, A.-L. Børresen-Dale, V. N. Kristensen, O. Engebraaten, A. Kohn-Luque and A. Frigessi. Towards personalized computer simulation of breast cancer treatment: a multi-scale pharmacokinetic and pharmacodynamic model informed by multi-type patient data. Cancer Research, 2019

27. V. Vinje, G. Ringstad, E. K. Lindstrom, L. M. Valnes, M. E. Rognes, P. K. Eide and K.-A. Mardal. Respiratory influence on cerebrospinal fluid flow – a computational study based on long-term intracranial pressure measurements. Nature Scientific Reports, 2019

26. P. E. Farrell, J. E. Hake, S. W. Funke and M. E. Rognes. Automated adjoints of coupled PDE-ODE systems. SIAM Journal on Scientific Computing, 2019.

25. J. J. Lee, E. Piersanti, K.-A. Mardal and M. E. Rognes. A mixed finite element method for nearly incompressible multiple-network poroelasticity. SIAM Journal on Scientific Computing, 2019.

24. R. Rodriguez-Cantano, J. Sundnes and M. E. Rognes. Uncertainty in cardiac myofiber orientation and stiffnesses dominate the variability of left ventricle deformation response. International Journal for Numerical Methods in Biomedical Engineering, 2019.

23. M. Croci, M. B. Giles, M. E. Rognes and P. E. Farrell. Efficient white noise sampling and coupling for multilevel Monte Carlo with non-nested meshes. SIAM Journal on Uncertainty Quantification, 2018

22. V. Vinje, J. Bruckner, M. E. Rognes, K.-A. Mardal and V. Haughton. Fluid dynamics in syringomyelia cavities: Effects of heart rate, CSF velocity, CSF velocity waveform and craniovertebral decompression. The Neuroradiology Journal, 2018

21. G. Balaban, H. Finsberg, S. Funke, T. F. Håland, E. Hopp, J. Sundnes, S. Wall and M. E. Rognes. Data assimillation allows for in-silico identification of cardiac elastic heterogeneity in an infarcted human. Biomechanics and Modeling in Mechanobiology, 2018

20. G. Pizzichelli, B. Kehlet, Ø. Evju, B. Martin, M. E. Rognes, K.-A. Mardal and E. Sinibaldi. Numerical study of intrathecal drug delivery to a permeable spinal cord: effect of catheter position and angle. Computer Methods in Biomechanics and Biomedical Engineering, 2017

19. A. Tveito, K. H. Jæger, M. Kuchta, K.-A. Mardal and M. E. Rognes. A cell-based framework for numerical modelling of electrical conduction in cardiac tissue. Frontiers in Physics, Computational Physics, 2017

18. S. Kallhovd, M. M. Maleckar and M. E. Rognes. Inverse estimation of cardiac activation times via gradient-based optimisation. International Journal for Numerical Methods in Biomed. Engineering, 2017

17. M. E. Rognes, P. E. Farrell, S. W. Funke, J. E. Hake and M. M. C. Maleckar. cbcbeat: an adjoint-enabled framework for computational cardiac electro-physiology. Journal of Open Source Software, 2017

16. G. Balaban, H. Finsberg, H. H. Odland, M. E. Rognes, S. Ross, J. Sundnes and S. Wall. High resolution data assimilation of cardiac mechanics applied to a dyssynchronous ventricle. International Journal for Numerical Methods in Biomedical Engineering, 2017

15. G. Balaban, M. S. Alnæs, J. Sundnes and M. E. Rognes. Adjoint multi-start based estimation of cardiac hyperelastic material parameters using shear data. Biomechanics and Modeling in Mechanobiology, 2016

14. M. Alnæs, J. Blechta, J. Hake, A. Johansson, B. Kehlet, A. Logg, C. Richardson, J. Ring, M. E. Rognes and G. N. Wells. The FEniCS Project Version 1.5. Archive of Numerical Software, 2015

13. A. Massing, M. G. Larson, A. Logg and M. E. Rognes. A Nitsche-based cut finite element method for a fluid-structure interaction problem. Communications in Applied Mathematics and Comput. Science, 2015

12. A. Massing, M. G. Larson, A. Logg and M. E. Rognes. A stabilized Nitsche overlapping mesh method for the Stokes problem. Numerische Mathematik, 2014

11. A. Massing, M. G. Larson, A. Logg and M. E. Rognes. A stabilized Nitsche fictitious domain method for

the Stokes problem. Journal of Scientific Computing, 2014

10. M. S. Alnæs, A. Logg, K. B. Ølgaard, M. E. Rognes and G. N. Wells. Unified Form Language: A domain-specific language for weak formulations of partial differential equations. ACM Transactions on Mathematical Software, 2014

9. M. E. Rognes, D. A. Ham, C. J. Cotter and A. T. T. McRae. Automating the solution of PDEs on the sphere and other manifolds in FEniCS 1.2. Geoscientific Model Development, 2013

8. P. E. Farrell, D. A. Ham, S. W. Funke and M. E. Rognes. Automated derivation of the adjoint of high-level transient finite element programs. SIAM Journal on Scientific Computing, 2013.

7. M. E. Rognes and A. Logg. Automated goal-oriented error control I: stationary variational problems. SIAM Journal on Scientific Computing, 2013

6. L. Vynnytska, M. E. Rognes and S. R. Clark. Benchmarking FEniCS for mantle convection simulations. Computers & Geosciences, 2013.

5. A. Tveito, G. T. Lines, M. E. Rognes and M. M. Maleckar. 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, 2012.

4. M. E. Rognes and R. Winther. Mixed finite element methods for linear viscoelasticity with weak symmetry. Mathematical Models and Methods in Applied Science, 2010.

3. M. E. Rognes, M. C. Calderer and C. A. Micek. Modelling of and mixed finite element methods for gels in biomedical applications. SIAM Journal of Applied Mathematics, 2009.

2. M. E. Rognes, R. C. Kirby and A. Logg. Efficient assembly of H(div) and H(curl) conforming finite elements. SIAM Journal on Scientific Computing, 2009.

1. D. N. Arnold and M. E. Rognes. Stability of Lagrange elements for the mixed Laplacian. Calcolo, 2009.

Peer-reviewed books and edited volumes

3. J. S. Dokken, K.-A. Mardal, M. E. Rognes, L. M. Valnes and V. Vinje. Mathematical modeling of the human brain II: from glymphatics to deep learning, Submitted as a Simula SpringerBriefs on Computing (2024∗)

2. K.-A. Mardal, M. E. Rognes, T. B. Thompson and L. M. Valnes. Mathematical modeling of the human brain: from magnetic resonance images to finite element simulation, Simula SpringerBriefs on Computing (2022)

1. K.-A. Mardal, M. E. Rognes and A. Tveito. Modeling excitable tissue: the EMI framework, Simula SpringerBriefs on Computing (2021)

Peer-reviewed chapters in books (selection)

7. C. Daversin-Catty, J. P. Dean and M. E. Rognes, Finite element software and performance for network models with multipliers, submitted, Springer, 2023

6. M. Kuchta, K.-A. Mardal and M. E. Rognes. Solving the EMI equations using finite element methods. In Modeling excitable tissue: the EMI framework, edited by A. Tveito, K.-A. Mardal, and M. E. Rognes, Springer, 2021.

5. A. J. Ellingsrud, C. Daversin-Catty and M. E. Rognes. A cell-based model for ionic electrodiffusion in excitable tissue. In Modeling excitable tissue: the EMI framework, edited by A. Tveito, K.-A. Mardal, and M. E. Rognes, Springer, 2021.

4. G. Halnes, K. H. Pettersen, L. Øyehaug, M. E. Rognes and G. T. Einevoll. Astrocytic ion dynamics: implications for potassium buffering and liquid flow. In Computational Glioscience, Springer Series in Computational Neuroscience, 2019.

3. M. E. Rognes. Automated Testing of Saddle Point Stability Conditions. In Automated solution of differential equations by the finite element method, Springer-Verlag, 2012.

2. A. Logg, K. B. Ølgaard, M. E. Rognes and G. N. Wells. FFC: the FEniCS Form Compiler. In Automated solution of differential equations by the finite element method, Springer-Verlag, 2012.

1. L. Vynnytska, S. R. Clark and M. E. Rognes. Dynamic Simulations of Convection in the Earth's Mantle. In Automated solution of differential equations by the finite element method, Springer-Verlag, 2012.

Scientific presentations (selection, upcoming events marked by ∗)

I have given more than 90 scientific presentations (including keynotes, plenary lectures, invited talks) since 2007, with recent events including

2025*	Plenary lecture, 30th Biennial Numerical Analysis Conference, University of Strathclyde, Glasgow, Scotland
2025*	Plenary lecture, XI International Conference on Coupled Problems in Science and Engineering, Sardinia, Italy
2025*	Invited MOX Colloquium, MOX, University of Milano, Milano, Italy
2024*	Keynote lecture, Amsterdam Center for Dynamics and Computation workshop on "Numerical brain: inverse and forward problems", Vrije Universiteit Amsterdam, the Netherlands
2024*	Keynote lectures, the Woudschoten Conference of the Dutch-Flemish Scientific Computing Society, the Netherlands
2024*	Plenary lecture, Nasjonalt matematikermøte (Norwegian Mathematics Meeting), Oslo, Norway
2024	Invited Lecture: *Computational mathematics and the brain's waterscape*, ERC Synergy Grant NEMESIS Kick-off workshop, Institute Montpellier Alexandre Grothendieck, Montpellier, France
2024	Invited Lecture: *Brains in motion - computational modelling of the brain's waterscape*, European Society for Mathematical and Theoretical Biology Colloquium, online
2023	Invited minisymposium talk: *In-silico brain flow and transport*, 2023 International Congress on Industrial and Applied Mathematics, Tokyo, Japan,
2023	Invited Numerical Analysis and Scientific Computing Seminar: *Perivascular pathways and the dimension-2 gap*, Courant Institute, New York, US
2023	Invited Applied Mathematics Seminar *Perivascular pathways and the dimension-2 gap*, Brown University, Providence, US
2023	Invited Oden Institute Seminar *Brains in motion - computational modelling of the brain's waterscape*, University of Texas at Austin, TX, US
2023	Invited CMOR Colloquium, *Perivascular pathways and the dimension-2 gap*, Rice University, Houston, TX, US
2023	Invited Fluid Mechanics, Combustion, & Engineering Physics Seminar, *Brains in motion - computational modelling of the brain's waterscape*, UCSD , La Jolla, CA, USA
2022	Invited Institute for Neural Computation Chalk Talk, *Mathematical modeling of human brain transport: from medical images to biophysical simulation*, San Diego Supercomputer Center, La Jolla, CA, USA
2022	Plenary lecture, *Such stuff as dreams are made on: a finite element tale of optimal transport and brain clearance*, 30 years of Acta Numerica, Banach Center at Bedlewo, Poland
2022	Semi-plenary lecture, *Mathematical modelling of the human brain*, 2022 ECCOMAS Congress, Oslo, Norway
2022	Invited Pretty Porous Science Seminar, University of Stuttgart, Stuttgart, Germany
2022	Invited seminar, *Mathematical modelling of human brain transport: from medical images to biophysical simulation*, Laboratoire de Mécanique des Solides, Ecole Polytechnique, Paris, France
2021	Invited lecture, *Modelling intracranial pressure, fluid flow and solute transport in surface perivascular space*, BrainH20 Symposium, Copenhagen, Denmark (online)
2021	Semi-plenary lecture, *Understanding the mechanisms of the brain's waterscape*, 2021 InterPore Conference (online)
2021	Invited talk, *Depressed brain cells - a numerical perspective*, 6th Oxford International Neuron and Brain Mechanics Workshop (online)
2021	Invited seminar, *Numerical foundations of the brain's waterscape*, Laboratoire Jacques-Louis Lions, Sorbonne University, Paris, France (online)
2021	Plenary lecture, *Computational brainphatics*, 2021 SIAM Conference on Computational Science and Engineering (online)
2020	Invited lecture, Springer Partial Differential Equations and Applications webinar (online)
2020	Invited seminar, Oxford Center for Industrial and Applied Mathematics, Oxford, UK
2019	Invited talk, *UQ of parenchymal tracer distribution using random diffusion and convective velocity fields*, 5th biennial CSF Dynamics Symposium, Oslo, Norway
2019	Invited talk, *Nearly incompressible generalized poroelasticity - discretization and preconditioning*, International workshop in connection with Ragnar Winther's 70th birthday, Oslo, Norway
2018	Invited talk, 2nd Workshop on computational aspects of perfusion and flow in live tissue, Bergen
2017	Invited seminar, *The numerical waterscape of the brain*, Universite libre du Bruxelles, Belgium

2017	Invited talk, Biomechanics of living systems, from cells to organisms workshop, Oslo, Norway
2017	Plenary lecture, *Compatible discretizations in our hearts and minds*, European Conference on Numerical Mathematics and Advanced Applications, Voss, Norway
2017	Invited talk, *Accurate numerical modelling of small collections of cardiac cells*, FEniCS'17, Luxembourg
2017	Plenary lecture, *Impact of high abstraction/high performance finite element software in biomedical computing, 24th International Conference on Domain Decomposition Methods*, Svalbard, Norway
2017	Keynote lecture, *The PDEs of our hearts and minds*, Women in PDEs, Karlsruhe, Germany
2016	Plenary lecture, *High-level abstractions, algorithms and applications in forward and inverse finite element solution of PDEs*, Nordic Seminar on Computational Mechanics, Chalmers, Sweden
2016	Invited seminar, *Developing simulation technology to solve biomedical problems: analysis, implementation and applications*, University of Uppsala, Sweden
2016	Invited talk, University of Southampton, UK
2016	Invited talk, *The FEniCS and Dolfin-adjoint projects*, Higher-order DG methods and finite element software for modern architectures workshop, University of Bath, UK

Outreach and popular science (selection since 2016, upcoming events marked by ∗)

2022	Waterscales: Mathematical and computational foundations for cerebral fluid flow, European Mathematical Society Magazine (invited article)
2022	University of Bergen, Museum exhibit, Porous media flow
2018	*Hjernens vannveier*, Public lecture at the Norwegian Academy of Technological Sciences, Bergen, Norway
2018	*The research life*, invited talk for Young Scientist Contest Finalists, Research Council of Norway
2017	TEDx talk, Mathematics that cures us, TEDxOslo, Oslo, Norway
2017	Invited talk, *Making models of your brain's waterscape*, 2017 Cutting Edge Festival, Oslo
2016	Invited talk, *Time scales of mathematics: from basic research to societal application* RCN workshop on the importance of mathematics for value creation, Lysaker, Norway