

# Curriculum vitae with track record



## PERSONAL INFORMATION

Family name, First name: Mardal, Kent-Andre

Date of birth: 26.11.1974

Sex: Male

Nationality: Norwegian

Researcher unique identifier: <https://orcid.org/0000-0002-4946-1110>

URL for personal web site: <http://folk.uio.no/kent-and>

## EDUCATION

2003 PhD, Thesis title: Software and Numerical Methods for the Incompressible Navier-Stokes Equations. Supervisors: Hans Petter Langtangen and Aslak Tveito  
Department of Informatics, University of Oslo.

1999 Cand. Scient, Department of Mathematics, University of Oslo, Norway

## CURRENT AND PREVIOUS POSITIONS

2015-present Professor, Division of Mechanics, Department of Mathematics, University of Oslo, Norway

2014-present Adjunct Scientist, Scientific Computing Department, Simula Research Laboratory, Norway

2014-2015 Associate Professor, Division of Mechanics, Department of Mathematics, University of Oslo, Norway

2007-2014 Senior Scientific Researcher, Simula Research Laboratory, Norway

2003-2014 Associate Professor (20%), Department of Informatics, University of Oslo, Norway

2003-2007 Postdoctoral Fellow, Simula Research Laboratory, Norway

## FELLOWSHIPS, AWARDS, GRANTS

2018-2021: Novel cascade technology for optimal utilization of animal and marine by products, workpackage leader of 2MNOK, BIONÆR

2017-2018: Brain, aging and neurodegenerative disease - exchange with Neuroscientists in Toulouse, 80 KNOK., Co-PI

2017-2021: Industrial Ph.D. OPSECTS - Optimal Patient Specific Electro Convulsive Therapy Simulator with Expert Analytics, PI

2017-2019: Nordforsk grant for developing new scandinavian course in "Computational Mathematical Modeling", co-PI with Logg (Chalmers) and Mathiesen (Copenhagen), 900 KNOK.

2015-2016: Improved intracranial pressure estimations using cloud-based simulations of the cerebral blood flow. Fortissimo, EU-7th Framework Program, 200 000 euros, co-PI.

2011-2015: Patient-specific mathematical modeling with applications to clinical medicine: Stroke and syringomyelia, PI, 0.8 million euros. NFR funded because it was on the shortlist for ERC funding.

2011-2012: Magnitude of Turbulence in CSF Flow. The Chiari & Syringomyelia Foundation funded a grant of \$30,000. PI.

2003-2006: Mixed methods for the stress-displacement formulation of elasticity – A software framework for advanced finite element methods. Norwegian Research Council.

## **SUPERVISION**

Main supervisor of 8 PhD students; 5 successfully completed (Gunnar Staff [2006], Kristian Valen-Sendstad [2011], Karen Støverud [2014], Øyvind Evju [2016], Magne Nordaas [2017]; 3 ongoing (Karl Erik Holter, Lars Magnus Valnes, Jacob Schreier). Co-supervisor of 16 PhD students; 8 successfully completed (Martin Alnæs [2009], Sigrid Dahl [2012], Ole Elvetun [2015], Giulia Pizzichelli [2016], Kartik Jain [2016], Miroslav Kuchta [2017], Owais Khan [2017], Trygve Bærland [2019]), and 8 ongoing (Eleonora Piersanti, Tormod Landet, Vegard Vinje, Jørgen Dokken, Ada Ellingsrud, Christian Pedersen, Rossana Molina). Supervisor of 44 MSc students (41 successfully completed and 3 ongoing) and 4 postdocs; 3 successfully completed (Martin Alnæs, Simon Funke, Erika Lindstrøm) and one ongoing (Miroslav Kuchta).

## **TEACHING ACTIVITIES** (University of Oslo)

MEK3570 - Computational Solid Mechanics H17, H18

MEK4250 - Computational Mechanics V17, V18, V19

MEK3220 - Continuum Mechanics H14, H15 and H16.

INF-MAT5650 - Finite Elements for Partial Differential Equations V13 and V14.

INF-MAT3360 - Partial Differential Equations V12 and V13.

INF5670 - Numerical Methods for Navier-Stokes equations H04, H06, H07, and H09.

INF5600 - Iterative Methods and Multigrid V02, V03, V04, V05, V07, and V10.

INF5660 - INF5660 - Advanced problem solving with high level languages V04, V05, V06, V07

## **ORGANISATION OF SCIENTIFIC MEETINGS**

CSF Symposium 2019 (ca 50 participants), Bio-Mechanics workshop on cell membrane dynamics, micro-circulation and plasticity in tissue (Oslo, 2018 ca 50 participants), Biomechanics of living systems from cells to organisms, (Oslo, 2017, ca 50 participants), Nordic Seminar of Computational Mechanics 26 (Oslo, 2013, ca 150 participants), 2013 and numerous workshops in 2007-2017 within the Center of Excellence Biomedical Computing.

## **PROJECT MANAGEMENT EXPERIENCE**

2007-2017 Group Leader of Biomedical Flows and Structures group at Center of Excellence, Center for Biomedical Computing (CBC), Simula Research Laboratory, Norway

## **COMMISSIONS OF TRUST**

*Reviewer for funding agencies:* Université libre de Bruxelles (ULB) 2019, The French National Research Agency (ANR, 2012 & 2017); Canadian Council for the Arts, Killam Fellowship, 2016, Research Foundation Flanders (FWO) Belgium (2013, 2016)

*Reviewer for scientific journals:* >15, ACM Trans. Math. Softw, Am J Neuroradiol, BIT Numer. Math, J. Biomech, Cardiovasc Eng Technol, Int J Numer Method Biomed Eng, J Fluid Mech, Math. Comp. Numer. Anal. PLOS One, J Sci Comput, SIAM J. Numer. Anal., SIAM Journal of Sci. Comput., SIAM J. Numer. Math., Fluids and Barriers in the CNS.

*Member of thesis committees:* 7; Marcela Szopos (Strasbourg, 2017), Helena Svihlova (Prague, 2017), Kartik Jain (Siegien, 2016), Giulia Pizzichelli (Pisa, 2016), Erika Lindstrøm (Oslo, 2015), Arne Morten Kvarving (Trondheim, 2010), Sylfest Glimsdal (Oslo, 2010)

## **MAJOR COLLABORATIONS (current, not including PhD students and Post Docs)**

Per Kristian Eide and Geir Ringstad, University Hospital of Oslo, Norway

Paulo Zunino, MOX, Milan, Italy

Simon Funke, Marie Rognes and Aslak Tveito, Simula Research Laboratory

Ragnar Winther, Andreas Carlson, and Andre Erhardt University of Oslo  
Anders Dale and Anna Devor, University California, San Diego, US  
Zdenek Strakos, University of Prague, Czech Republic  
Anders Eklund and Karen Støverud, University of Umeå, Sweden

## Track record:

### INVITED LECTURES AT INTERNATIONAL MEETINGS:

*Invited keynote/plenary*, 13; Mathematical models in health sciences, Nantes, 2018; I Mathematical and Numerical Modeling of the Cardiovascular System, iNdAM, Rome 2018; Enumath Voss, 2017; Interpore, Rotterdam 2017; HPCSE Ostrava 2017; Cerebrospinal Fluid Dynamics Society Meeting, Atlanta 2017; American Association of Spine Radiology San Diego 2017; American Society of Neuroradiology, Chicago 2015; International Hydrocephalus Imaging Working Group, Chicago 2015, Cerebrospinal Fluid Dynamics Society Meeting, Amiens 2015; Gordon Conference on Flow & Transport in Permeable Media Portland 2014; Preconditioning Conference, Oxford 2013, Modelling of physiological flows, Sardinia 2013.  
More than 100 presentations at conferences and workshops internationally and nationally.

### SCIENTIFIC SOFTWARE:

I have made significant contributions to FEniCS, in particular the multiple packages cbc.block, dolfin, instant, UFC, SyFi, Exterior. Earlier, I contributed to Diffpack and VMTK.

### *The book about the software framework FEniCS :*

*“Logg A, Mardal KA, Wells G, editors. Automated solution of differential equations by the finite element method: The FEniCS book. Springer 2012.”*

***has now been cited more than 1500 times since 2012.***

### MAJOR CONTRIBUTION TO EARLY CAREERS OF EXCELLENT RESEARCHERS:

Alnæs (with Mardal) developed core components of FEniCS used by thousands of users around the world. After his Post Doc, he has continued as a group leader in the Center of Excellence, Center for Biomedical Computing at Simula. Valen-Sendstad, Jain, Nordaas and Støverud have been Post-Docs hired by world-leading scientists in fields that are relevant, D. Steinman, V. Kurtcuoglu, A. Logg and A. Eklund. Valen-Senstad is now a senior scientist at Simula.

### DISSEMINATION:

In 2011 my research on cerebral aneurysms was featured in 9 Norwegian newspapers, magazines including VG. In 2017, my research on Alzheimer and clearance of waste during sleep is featured on NRK (NRK skole, lærerike programmer og klipp):

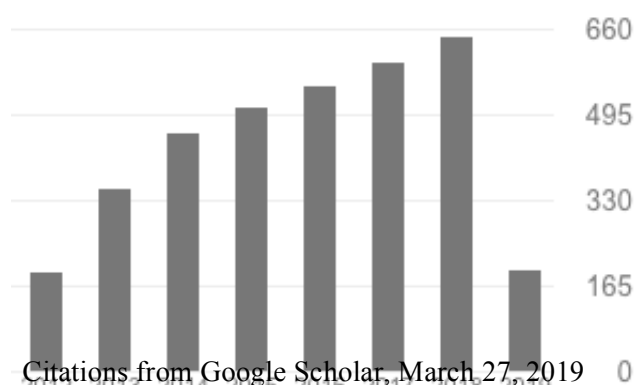
[https://www.nrk.no/embed/PS\\*310437?autoplay=true](https://www.nrk.no/embed/PS*310437?autoplay=true)

In 2018 our research on Alzheimer appeared in VG, Norway’s most selling newspaper.

<https://www.vg.no/forbruker/helse/i/VRwBK4/norske-forskere-soevn-kan-bremse-demens>

### BRIEF SUMMARY OF PUBLICATIONS:

82 articles with 145 co-authors, citations/H-index (March 2019): 1527/21 (Scopus), 4223/25 (Google Scholar), papers with more than 100 citations: 7. Publications in top-tier journals Proceedings of National Science of Academy USA, Journal of Clinical Investigation



Insight as well as top-tier journals in scientific computing, numerical analysis, biomechanics and neuroradiology; SIAM J. Sci Comput, SIAM J. Numer Anal., J. Biomech, Am J Neuroradiol, NeuroImage, One co-authored and two co-edited books, one co-authored book accepted at Springer. 51 book chapters or refereed proceedings.

**TEN SELECTED PAPERS:** (Mardal Impact factor of journal (IF) and citations from Google Scholar indicated in bold):

- [1] Ringstad G, Valnes LM, Dale AM, Pripp AH, Vatnehol SA, Emblem KE, **Mardal KA**, Eide PK. Brain-wide glymphatic enhancement and clearance in humans assessed with MRI. *Journal of Clinical Investigations: Insight*. 2018 Jul 26;3(13) (**IF: 13.3, citations: 11**).
- [2] Holter KE, Kehlet B, Devor A, Sejnowski TJ, Dale AM, Omholt SW, Ottersen OP, Nagelhus EA, **Mardal KA**, Pettersen KH. Interstitial solute transport in 3D reconstructed neuropil occurs by diffusion rather than bulk flow. *Proceedings of the National Academy of Sciences*. 2017 (**IF: 9.5, citations: 42**)
- [3] Lindstrøm EK, Ringstad G, **Mardal KA**, Eide PK. Cerebrospinal fluid volumetric net flow rate and direction in idiopathic normal pressure hydrocephalus. *NeuroImage: Clinical*. 2018;20:731-41. (**IF: 5.4, citations: 4**)
- [4] Ringstad G, Lindstrøm EK, Vatnehol SA, **Mardal KA**, Emblem KE, Eide PK. Non-invasive assessment of pulsatile intracranial pressure with phase-contrast magnetic resonance imaging. *PloS one*. 2017 Nov 30;12(11):e0188896. (**IF: 2.8, citations: 7**)
- [5] Lee JJ, Piersanti E, **Mardal KA**, Rognes ME. A mixed finite element method for nearly incompressible multiple-network poroelasticity. *SIAM Journal on Scientific Computing*. 2019 Mar 12;41(2):A722-47 (**IF: 2, citations: 5**).
- [6] Lee JJ, Mardal KA, Winther R. Parameter-robust discretization and preconditioning of Biot's consolidation model. *SIAM Journal on Scientific Computing*. 2017 Jan 3;39(1):A1-24. (**IF: 2, citations: 27**)
- [7] Valen-Sendstad K, Mardal KA, Mortensen M, Reif BA, Langtangen HP. Direct numerical simulation of transitional flow in a patient-specific intracranial aneurysm. *Journal of biomechanics*. 2011 Nov 10;44(16):2826-32. (**IF: 2.4, citations: 95**)
- [8] Bærland T, Kuchta M, **Mardal KA**. Multigrid Methods for Discrete Fractional Sobolev Spaces. *SIAM Journal on Scientific Computing*. (in press) (**IF: 2, citations 1**)
- [9] Funke SW, Nordaas M, Evju Ø, Alnæs MS, **Mardal KA**. Variational data assimilation for transient blood flow simulations: Cerebral aneurysms as an illustrative example. *International journal for numerical methods in biomedical engineering*. 2019;35(1):e3152 (**IF: 2.4, citations: 1**).
- [10] Mardal KA, Winther R. Preconditioning discretizations of systems of partial differential equations. *Numerical Linear Algebra with Applications*. 2011 Jan;18(1):1-40. (**IF: 1.3, citations: 186**)