

Curriculum vitæ

October 8, 2019

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| Personalia | <i>Name:</i> <u>Klas Erik Finn Modin</u> <i>Date of Birth:</i> July 30, 1979 <i>Place of Birth:</i> Skaftö, Sweden | |
| Affiliation | Chalmers University of Technology Department of Mathematical Sciences Chalmers Tvärgata 3 SE-412 96 Göteborg Office phone: +46(0)31-772 35 22 Cell phone: +46(0)708-456 479 <i>E-mail:</i> klas.modin@chalmers.se <i>Web:</i> klasmodin.wordpress.com <i>ORCID:</i> 0000-0001-6900-1122 | |
| Education | <i>PhD, Mathematics</i> Lund University, Sweden Title: Adaptive Geometric Numerical Integration of Mechanical Systems Supervisors: Claus Führer and Gustaf Söderlind <i>Master of Science, Mathematics</i> Lund University, Sweden | May 2010 Feb 2004 |
| Academic positions | Associate Professor, <i>Chalmers University of Technology</i> Assistant Professor, <i>Chalmers University of Technology</i> (75% research, 25% teaching) Post-doc, <i>University of Toronto, Canada</i> Funded by the Swedish Research Council. Post-doc, <i>Massey University, New Zealand</i> Funded by the Marsden Fund and the Royal Physiographical Society in Lund. | since Nov 2017 Nov 2013–Oct 2017 Jul 2012–Jun 2014 Jul 2009–Jan 2012 |
| Other positions | Numerical Analyst, <i>SKF Sverige AB</i> , Göteborg Employment on a project basis. | 2004–2005 |
| Invitations to research institutes | Princeton Center of Theoretical Sciences (PCTS), Princeton, USA Hausdorff Research Institute (HIM), Bonn, Germany Isaac Newton Insitute (INI), UK Banff International Research Station (BIRS), Canada Isaac Newton Insitute (INI), UK Mathematisches Forschungsinstitut Oberwolfach (MFO), Germany Erwin Schrödinger Institute (ESI), Vienna, Austria Simon Center for Geometry and Physics (SCGP), New York, USA Fields Institute (FI), Toronto, Canada | Feb 2020 Nov 2019 Nov 2019 Dec 2018 Nov 2017 Mar 2016 Jan 2015 May 2014 Jul–Aug 2012 |

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| Invitations as guest researcher | Massey University, New Zealand (host: Robert McLachlan) | Jan–Apr 2018 |
| | Massey University, New Zealand (host: Robert McLachlan) | Jan–Mar 2016 |
| | Imperial College, UK (host: Darryl Holm) | Oct 2013 |
| | University of Vienna, Austria (host: Peter Michor) | May 2013 |
| | Imperial College, UK (host: Darryl Holm) | Apr 2012 |
| | NTNU, Norway (host: Brynjulf Owren) | Feb–Mar 2012 |

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| Tutoring experience | <i>Supervision of Post-docs</i> | Geir Bogfjellmo (2015–2017) |
| | <i>Supervision of PhD students</i> | Milo Viviani (2015–today) |
| | <i>Co-supervision of PhD students</i> | Filp Wikman (2018–today) Carl Lundholm (2015–today) Magnus Önnheim (2015–Nov 2016) |
| | <i>Supervision of master students</i> | Carl-Joar Karlsson (2018) Tim Cardilin (2014) Olof Gredegård (2008) Joakim Wählstrand Hansson (2007) |
| | <i>Pedagogical training</i> | |
| | 2014–2017. Chalmers EER courses (17 ECTS). | |
| | <i>Undergraduate teaching</i> | |
| | 2018. Development of Canvas-based course “Scientific Visualization”. | |
| | 2014–today. Basic calculus courses at Chalmers. (Teacher and examiner.) | |
| | 2010–2012. Various mathematics courses at Massey. (Teacher and examiner.) | |
| <i>Post-graduate teaching</i> | | |
| 2013. Course on geometric integration at Chalmers. (Organizer and teacher.) | | |
| 2018. Mini-course on “Geometric Hydrodynamics” at the University of Coimbra, Portugal, December 6–8, 2018. | | |
| <i>Written lecture notes</i> | | |
| 2013. “Geometric Mechanics and Geometric Integration”. | | |

Selection of honours and grants

- 2017. *Starting Grant*, from the Swedish Research Council (VR). (3.4 MSEK)
- 2015. *International post-doc recruitment grant*, from Knut and Alice Wallenberg Foundation. (1.6 MSEK)
- 2015. *Stenbäckska Stipendiet*, from The Finnish Society of Sciences and Letters. (Personal stipend of 35 KEUR)
- 2015. *Marie Skłodowska-Curie Individual Fellowship*, EU Horizon 2020. (186 KEUR)
- 2015. *Transition Grant*, from The Swedish Foundation for International Cooperation in Research and Higher Education (STINT). (555 KSEK)
- 2013. *Ingvar Carlsson Award* from the Swedish Foundation of Strategic Research (SSF). (Personal stipend and 3 MSEK research grant)
- 2012. *International Post-doc grant* from the Swedish Research Council (VR). (2.1 MSEK)
- 2010. *Post-doctoral scholarship* from the Royal Physiographic Society in Lund. (185 KSEK)
- 2009. *Travel scholarship* from the Royal Swedish Academy of Science (KVA). (25 KSEK)
- 2007. *Young researcher scholarship* from the Royal Physiographic Society in Lund. (25 KSEK)

Entrepreneurial achievements

2008. Development of a new numerical solver for the simulation software BEAST (BEARING Simulation Tool), used by engineers at the rolling bearing company SKF as a “virtual test rig”.

2005–today. Initiator and contributor to many open-source software projects, see github.com/kmodin.

Peer-Reviewed Publications

For updates, see klasmodin.wordpress.com/publications

- [M32] K. Modin and M. Viviani. *A Casimir preserving scheme for long-time simulation of spherical ideal hydrodynamics*, accepted in *J. Fluid Mech.*, 2019
- [M31] J. Benn, S. Marsland, R. McLachlan, K. Modin, O. Verdier. *Currents and finite elements as tools for shape space*, *Int. J. Comput. Vis. (IJCV)*, 2019 DOI:10.1007/s10851-019-00896-x
- [M30] K. Modin and M. Viviani. *Lie-Poisson methods for isospectral flows*, *Found. Comput. Math. (FoCM)*, 2019 DOI:10.1007/s10208-019-09428-w
- [M29] B. Khesin, G. Misiolek, K. Modin. *Geometry of the Madelung transform*, *Arch. Ration. Mech. Anal.*, 234(2), 549-573, 2019.
- [M28] J. Hellsvik, D. Thonig, K. Modin, D. Iusan, A. Bergman, O. Eriksson, L. Bergqvist, A. Delin. *General method for atomistic spin-lattice dynamics with first-principles accuracy*, *Phys. Rev. B*, 99:104302, 2019.
- [M27] K. Modin, A. Nachman, L. Rondi. *A Multiscale Theory for Image Registration and Nonlinear Inverse Problems*, *Adv. Math.*, 346, 1009–1066, 2018.
- [M26] G. Bogfjellmo, K. Modin, O. Verdier. *A Numerical Algorithm for C^2 -splines on Symmetric Spaces*, *SIAM J. Numer. Analysis*, 2018. 56(4), 2623–2647.
- [M25] B. Khesin, G. Misiolek, K. Modin. *Geometric Hydrodynamics via Madelung Transform*, *PNAS*, 115(24):6165-6170, 2018.
- [M24] M. Bauer, S. Joshi, K. Modin. *Diffeomorphic random sampling using optimal information transport*, In: Nielsen F., Barbaresco F. (eds) *Geometric Science of Information. GSI 2017. Lecture Notes in Computer Science*, vol 10589. Springer, Cham.
- [M23] M. Bauer, S. Joshi, K. Modin. *On Geodesic Completeness of Riemannian Metrics on Smooth Probability Densities*, *Calc. Var. Partial Differential Equations*, 56:113, 2017.
- [M22] K. Modin. *Geometry of Matrix Decompositions Seen Through Optimal Transport and Information Geometry*, *J. Geom. Mech.*, 9(3):335-390, 2017.
- [M21] R. McLachlan, K. Modin, H. Munthe-Kaas, O. Verdier. *Butcher series: A story of rooted trees and numerical methods for evolution equations*, *Asia Pacific Mathematics Newsletter*, 7(1):1-11, 2017.
- [M20] R. McLachlan, K. Modin, O. Verdier. *Symmetry reduction for central force problems*, *Eur. J. Phys.*, 37(5):0055003, 2016.
- [M19] R. McLachlan, K. Modin, O. Verdier. *Geometry of discrete-time spin systems*, *J. Nonlin. Sci.*, 26(5):1507-1523, 2016.

- [M18] C. Rottman, M. Bauer, K. Modin, S. Joshi. *Weighted Diffeomorphic Density Matching with Applications to Thoracic Image Registration*, Proc. 5th MICCAI Workshop on Mathematical Foundations of Computational Anatomy (MFCA), Munich, Germany, October 9, 2015.
- [M17] R. McLachlan, K. Modin, O. Verdier. *A minimal-variable symplectic integrator on spheres*, Math. Comp., 86(307):2325-2344, 2017.
- [M16] M. Bauer, S. Joshi, K. Modin. *Diffeomorphic density matching by optimal information transport*, SIAM J. Imaging Sci., 8(3):1718-1751, 2015.
- [M15] R. McLachlan, K. Modin, H. Munthe-Kaas, O. Verdier. *B-series methods are exactly the affine equivariant methods*, Numer. Math., 133(3):599-622, 2016.
- [M14] R. McLachlan, K. Modin, O. Verdier. *Symplectic integrators for spin systems*, Phys. Rev. E, 89 (2014), 061301.
- [M13] R. McLachlan, K. Modin, O. Verdier. *Collective symplectic integrators*, Nonlinearity 27 (2014), 1525–1542.
- [M12] S. Marsland, R. McLachlan, K. Modin, M. Perlmutter. *On conformal variational problems and free boundary continua*, J. Phys. A. 47 (2014), 145204.
- [M11] R. McLachlan, K. Modin, O. Verdier. *Collective Lie-Poisson integrators on \mathbb{R}^3* , IMA J. Numer. Anal. 35 (2015), 546–560.
- [M10] K. Modin. *Generalized Hunter–Saxton equations, optimal information transport, and factorization of diffeomorphisms*, J. Geom. Anal. 25 (2015), 1306–1334.
- [M9] R. McLachlan, K. Modin, O. Verdier, M. Wilkins. *Symplectic integrators for index 1 constraints*, SIAM J. Sci. Comput. 35 (2013), A2150–A2162.
- [M8] K. Modin and O. Verdier. *Integrability of Nonholonomically Coupled Oscillators*, Discrete Contin. Dyn. Syst. A. 34 (2013), 1121–1130.
- [M7] R. McLachlan, K. Modin, O. Verdier, M. Wilkins. *Geometric Generalisations of SHAKE and RATTLE*, Found. Comput. Math. 14 (2014), 339–370.
- [M6] S. Marsland, R. McLachlan, K. Modin, M. Perlmutter. *Image Registration by Geodesic Warps of Conformal Mappings*, Int. J. Comput. Vis. 105 (2013), 144–154.
- [M5] K. Modin and G. Söderlind. *Geometric integration of Hamiltonian systems perturbed by Rayleigh damping*, BIT Num. Math. 51 (2011), 977–1007.
- [M4] K. Modin, M. Perlmutter, S. Marsland, and R. I. McLachlan. *On Euler-Arnold equations and totally geodesic subgroups*, J. Geom. Phys. 61 (2011), 1446–1461.
- [M3] K. Modin. *Time transformation and reversibility of Nambu-Poisson systems*, J. Gen. Lie Theory Appl. 3 (2009), 39–52.
- [M2] K. Modin. *On explicit adaptive symplectic integration of separable Hamiltonian systems*, J. Multibody Dyn. 222 (2008), 289–300.
- [M1] K. Modin and C. Führer. *Time-step adaptivity in variational integrators with application to contact problems*, ZAMM Z. Angew. Math. Mech. 86 (2006), 785–794.