

Brynjulf Owren

Department of Mathematical Sciences,
NTNU,
N-7491 Trondheim,
Norway.

Current position: Professor at Department of Mathematical Sciences, The Norwegian University of Science and Technology, since January 1994.

Main area of research: Numerical analysis of ordinary and partial differential equations, initial value problems, integration methods for differential equations on manifolds (geometric integration).

Education

- Doktoringeniør (PhD) in Numerical Analysis at NTH (started September 1985, completed 25.01.1990). *Continuous Explicit Runge-Kutta Methods with Applications to Ordinary and Delay Differential Equations*, advisor: Professor S.P. Nørsett.
- Sivilingeniør (Master of Science) in Physics and Mathematics at the Norwegian Institute of Technology (NTH), 1980-1984. Main subject: Numerical mathematics. MSc thesis: *Acoustic response in oil wells* (in Norwegian).

Positions

1992-1993 Førsteamanuensis (Assistant professor) at Department of Mathematics and Statistics, University of Trondheim

1990-1992 Postdoctoral fellow at Department of Computer Science, University of Toronto.

1990 Lecturer at the Norwegian Institute of Technology.

1987-1989 Ph.D. fellowship from NTH.

1986 Research assistant (vitenskapelig assistent) at Department of Mathematical Sciences, NTH.

1988-90 Research scientist (forsker), part time, at SINTEF Industrial Mathematics, Trondheim, Norway.

1985-1988 Research Geophysicist at SERES A/S, Trondheim, Norway.

Student supervision 30 MSc students, and the following PhD students.

Arne Marthinsen 14.05.1999, *Numerical Integration of Ordinary Differential Equations on Manifolds via Lie Group Actions*

Roman Kozlov 05.01.2001, *Symmetry Applications to Difference and Differential-Difference Equations*

Hallgeir Melbø 17.12.2001, *A Posteriori Error Estimation for Finite Element Methods and Iterative Linear Solvers*

Bård Skaflestad 20.12.2005, *Exponential Integrators and Applications to the Incompressible Navier-Stokes Equations.*

Bjarte Hægland 02.06.2006, *Computational methods for handling incompressible fluid flows involving internal density interfaces and boundary layers.*

Håvard Berland 15.09.2006, *Lie group and exponential integrators: theory, implementation and applications.*

Andreas Asheim 24.06.2010 (co-supervised with Prof. Nørsett), *Numerical methods for highly oscillatory problems*

Memberships, leadership etc

- Leader of study programme in Physics and Mathematics, NTNU, 2008–
- President of the Norwegian Mathematical Society 2007–2011 (board member since 2004)
- Council member of ECMI 2007–2011 (European Consortium for Mathematics in Industry).
- Head of programme in Industrial Mathematics, Department of Mathematical Sciences, NTNU 2004-2007.
- Leader of Research Program in Computational Science and Visualization at NTNU, 2005/2006.
- Member of NTVA (The Norwegian Academy of Technological Sciences) since 2005.
- Member of DKNVS (The Royal Norwegian Society of Sciences and Letters) since 2008.
- Leader of special year in Geometric Integration, Center for Advanced Study, Oslo, 2002-2003 (coorganised with Prof Munthe-Kaas, University of Bergen)
- Board member of Sintef Applied Mathematics, 2000-2003

Selected publications

1. Dahlby M., and Owren B., *A General Framework for Deriving Integral Preserving Numerical Methods for PDEs*, SIAM J. Sci. Comput. **33** (2011), 2318-2340.
2. Dahlby M., Owren B., and Yaguchi T., *Preserving multiple first integrals by discrete gradients*, J. Phys. A. **44** (2011).
3. Christiansen S., Munthe-Kaas H., and Owren B., *Topics in Structure Preserving Discretization*, Acta Numerica **20** (2011), 1–119.
4. Celledoni E., McLachlan R.I, Owren B. and Quispel G.R.W., *Energy-preserving integrators and the structure of B-series*. Found. Comput. Math. **10** (2010), 673–693
5. Celledoni E., McLachlan R.I, Owren B. and Quispel G.R.W., *On conjugate B-series and their geometric structure*. Journal on Numerical Analysis Industrial and Applied Mathematics **5** (2010), 85–90.
6. Celledoni E., McLachlan R.I, Owren B. and Quispel G.R.W., *Structure of B-series for some classes of geometric integrators*, AIP Conference Proceedings **1168** (2009), 739–742.
7. Celledoni E., McLachlan R.I, McLaren D.I, Owren B., Quispel G.R.W. and Wright W. *Energy-preserving Runge-Kutta methods*, ESAIM: M2AN **43** (2009), 645–649.
8. Dahlby M.L. and Owren B., *Plane wave stability of some conservative schemes for the cubic Schrödinger equation*, ESAIM: M2AN **43** (2009), 677–687.
9. Celledoni E., Cohen D. and Owren B., *Symmetric exponential integrators with an application to the cubic Schrödinger equation*. Found. Comput. Math. **8** (2008), 303–317.
10. Cohen D., Owren B. and Raynaud X., *Multi-symplectic integration of the Camassa-Holm equation*. J. Comput. Phys. **227** (2008), 5492–5512.
11. Berland H., Owren B., Skaflestad B., *Solving the nonlinear Schrödinger equation using exponential integrators*. Modeling, Identification and Control, **27** (2006), 201–217,
12. Owren B., *Order conditions for commutator-free Lie group methods*, J. Phys. A **39** (2006), 5585-5599.
13. Berland H., Owren B. and Skaflestad B. *B-series and order conditions for exponential integrators*. SIAM J. Numer. Anal. **43** (2005), 1715–1727.
14. Berland H. and Owren, B., *Algebraic structures on ordered rooted trees and their significance to Lie group integrators*. Group theory and numerical analysis, 49–63, CRM Proc. Lecture Notes, **39** (2005), Amer. Math. Soc.
15. Kozlov R., Kværnø A., Owren B., *The local behaviour of splitting methods applied to stiff problems*, Journal of Computational Physics, **195**/2 (2004) 576–593.
16. Celledoni E., Owren B., *On the implementation of Lie group methods on the Stiefel manifold*, Numer. Alg. **32** (2003) 163–183.
17. Celledoni E., Marthinsen A. and Owren B., *Commutator-free Lie group methods*, Future Generation Computer Systems **19** (2003) 341–352.
18. Celledoni E. and Owren B.: *Lie group methods for rigid body dynamics and time integration on manifolds*, Comput. Meth. Appl. Mech. Engrg. **192** (2003), 421–438.

19. Casas F. and Owren B., *Cost efficient Lie group integrators in the RKMK class*, BIT Numerical Mathematics, **43**/4 (2003) 723–742.
20. Celledoni E. and Owren B.: *A class of intrinsic schemes for orthogonal integration*, SIAM J. Numer. Anal. **40** (2002), 2069–2084.
21. Owren B., Marthinsen A., *Integration Methods Based on Canonical Coordinates of the Second Kind*, Numer. Math. **87** (2001) 763–790
22. Marthinsen A., Owren B., *Quadrature methods based on the Cayley transform*. Special issue: Themes in geometric integration. Appl. Numer. Math. **39** (2001), no. 3-4, 403–413.
23. Marthinsen A., Owren B.: *A note on the construction of Crouch-Grossman methods*, BIT, **41** (2001) 207–214.
24. Jackiewicz Z., Marthinsen A., Owren B.: *Construction of Runge-Kutta methods of Crouch-Grossman type of high order*, Advances in Computational Mathematics **13** (2000) 405–415.
25. Munthe-Kaas H., Owren B.: *Computations in a free Lie algebra.*, R. Soc. Lond. Philos. Trans. Ser. A Math. Phys. Eng. Sci. **357** (1999), 957–981.
26. Owren B., Marthinsen A.: *Runge-Kutta Methods Adapted to Manifolds and Based on Rigid Frames*, BIT **39** (1999) 116–142.
27. Owren B., Welfert B.: *The Newton Iteration on Lie Groups*, BIT **40** (2000), 121–145.
28. Jackiewicz Z., Owren B., Welfert B.: *Pseudospectra of Waveform Relaxation Operators*, Computers Math. Appl. , **36** (1998) 67–85.
29. Kværnø A., Nørsett S.P., Owren B.: *Runge-Kutta Research in Trondheim*, Applied Numerical Mathematics, **22** (1996) 263–279.
30. Marthinsen A., Munthe-Kaas H., Owren B.: *Simulation of Ordinary Differential Equations on Manifolds*, Modeling, Identification and Control, **18** (1997) 75–88.
31. Ekeland K., Owren B., Øines E.: *Stiffness Detection and Estimation of Dominant Spectra with Explicit Runge-Kutta Methods*, ACM, Transactions of Mathematical Software, **24** (1998) 368–382.
32. Higham D.J., Owren B.: *Non-Normality Effects in a Discretized Non-linear Reaction-Convection-Diffusion Equation*, J. Comput. Phys., **124** (1996), 309–323.
33. Owren B.: *Stability of Runge-Kutta methods used in modular integration*, J. Comput. Appl. Math., **62** (1995) 89–101.
34. Owren B., Simonsen H.H.: *Alternative Integration Methods for Problems in Structural Dynamics*, Comput. Meth. in Appl. Mech. and Eng. **122** (1995), pp 1–10
35. Muir P., Owren B.: *Order Barriers and Characterizations of Continuous Mono-Implicit Runge-Kutta Schemes*, Math. Comp., **61** (1993) pp 675–679.
36. Landrø M., Zaalberg-Metselaar G., Owren B., Vaage S.: *Modelling of water gun signatures*, Geophysics, **58** (1993), 101–109.
37. Owren B., Zennaro M.: *Derivation of Efficient Continuous Explicit Runge-Kutta Methods*, SIAM J. Sci. Stat. Comput., **6** (1992), 1488–1501.

38. Owren B., Zennaro M.: *Order Barriers for Continuous Explicit Runge-Kutta Methods*, Math. Comp., **56** (1991), 645–661.
39. Owren B., Seip K.: *A uniqueness result related to the stability of explicit Runge-Kutta methods*, BIT **31**, (1991) 373–374.
40. Owren B., Seip K.: *Some Stability Results for Explicit Runge-Kutta Methods*, BIT **30** (1990), 700–706.
41. Owren B., Zennaro M.: *Continuous Explicit Runge-Kutta Methods*, in Computational Ordinary Differential Equations, edited by Cash and Gladwell, Clarendon Press (1992), 97–105.