Curriculum vitae

W.H.A. (Wil) Schilders

Personal data/education

Born:	August 26, 1956, Arnhem (NL)
Mobile phone:	+31651892525
Email:	w.h.a.schilders@tue.nl
BSc/MSc:	Mathematics, RU Nijmegen (1974-1978, cum laude)
Ph.D.:	1980, Trinity College Dublin

Awards

Mathematics award RU Nijmegen (1978)
4th Mittelsten-Scheid guest professor University of Wuppertal (2020/2021)
Hans Fischer senior fellowship TU Munich (2022-2024)
ECMI Honorary Member (2021)
Nomination NWO Stairway to Impact prize 2021

Professional experience

KU Nijmegen:	Scientific assistant (1977/78)
Maynooth University:	Lecturer (analysis for 1st and 2nd year, numerical analysis for 4th year) (1979/1980)
Philips:	Researcher, Mathematical Software Group (1980-1990)
Philips Research:	Senior researcher, Applied Mathematics Group (1991-1996)
	Principal researcher, IC Design (1996-2006)
NXP Semiconductors:	Principal senior, Systems and Circuits (2006-2010)
NXP Semiconductors:	Leader of mathematics cluster (2006-2010)
TU Eindhoven:	Professor, "Scientific computing for industry" (1999-)
Dutch Maths Platform:	Executive director (2010-)
TU Eindhoven:	Director of Project Development Office (2013-2018)

Additional duties:
- *ECMI* President (2010-2011) & Chair of Research & Innovation Committee (2012-2019)
- *EU-MATHS-IN*: Founder, board member and treasurer (2013-2015) & President (2016-2020)
- *International Advisory Boards:* Matheon/MATH+ Berlin (2015-), CeMEAI Brasil (2017-), IMI (Fukuoka) (2015-)
- *SCEE:* Member of Standing Committee (treasurer; 2018-)
- *ICIAM:* Officer at large (2019-), President Elect (2021-2023), President (2023-2027)
- Reviewer for EU projects and funding organisations in Europe

Supervision

- Main supervisor of 23 PhD students since 2003
- Member of 68 PhD committees (national and European)
- Main supervisor of 20 external MSc students (at Philips Research)
- Main supervisor of 23 MSc students at TU Eindhoven (since 1998)
- Part-time supervisor of 11 external PhD students visiting TU Eindhoven
- Main supervisor of 9 postdoctoral students (1999-)

Funding/project management

- 20 European projects, mainly as initiator and coordinator, total funding 10 MEuro, mainly with European industry (Mentor, Siemens, Bosch, austriamicrosystems, MAGWEL, ST, Philips, NXP Semiconductors, Signify). Main projects:
  - COST Action network EU-MORNET, initiator and chair, 2014-2018, with more than 300 researchers in Europe on model order reduction and reduced basis methods. End product is a three volume handbook on model order reduction
  - Several industrial doctorate projects: ASIVA14 with Mentor Graphics (France) and HYDRA with KELDA (Norway)
  - Recent projects with NXP Semiconductors (COMPAS) and Philips Lighting/Signify (Delphi4LED, AI-TWILIGHT) thanks to expertise in model order reduction and machine learning
- 6 national NWO projects, mainly on research for model order reduction

Organisation of conferences and workshops (selection)

- Chairman SCEE-2002 and SCEE-2020 conference (Eindhoven)
- Organiser of workshops on "Model order reduction and coupled problems" (Eindhoven, Milan, Naples, Wuppertal) (2001-2006)
- Organizer of workshop on Indefinite Systems (2001, 2012)
- Organizer of workshop "Model order reduction, coupled problems and optimization" (Lorentz Center, Leiden, 2005)
- Co-organizer of "Numerical methods for finance" (Dublin, 2006, 2008)
- Organiser and Chair of International Conference on Preconditioning for Linear Systems (June 2015)
- Organiser and Chair of LMS Durham symposium on Model Order Reduction (10 days, August 2017)
- Co-chair for SIAM CSE 2017 (Atlanta, February 2017) and SIAM CSE 2023 (Amsterdam, Feb 26-Mar 3, 2023)

Research
When in industry (1980-2010)

- Semiconductor device simulation: research into numerical methods for this extremely challenging problem, cooperation with Bell Labs, IBM, Stanford. Produced world-class software used by Philips worldwide.
- Electronic circuit simulation
- Simulation of electromagnetic compatibility using BEM
- Interconnect simulation and simulation of electrostatic discharge

- Scattered topics: Electron optics, Magnetostatics, Liquid crystal polymers, X-ray powder diffraction, Computerized tomography, Magnetic resonance imaging, Optical mammographics, Organic semiconductors (OLED), Cardiopulmonary resuscitation

When at TU Eindhoven (1999-)

A common thread in my research over the years (1978-now) has been to develop so-called **mimetic methods**, in the areas of discretisation, solution of linear and nonlinear systems, model order reduction. From a numerical point of view, the foregoing application areas have many challenges and have led to research into a variety of numerical methods:

- *Linear and non-linear systems:*
  - subset solving algorithms for non-linear problems
  - correction transformation for strongly non-linear problems
  - iterative solution methods and preconditioning techniques
  - vector extrapolation techniques
  - indefinite linear systems ("Schilders' factorisation")
- *Discretisation:*
  - mixed finite element methods with Franco Brezzi and Peter Markowich
  - methods for singularly perturbed problems
  - finite difference time domain, finite integration technique and lattice gauge method
  - multirate time integration methods
- *Miscellaneous:*
  - efficient quadrature of 4-dimensional integrals
  - frequency domain analysis in high dimensions
  - efficient solution methods for simulating liquid crystal polymers
  - methods for solving cardiopulmonary resuscitation problems

Current research:

- Model Order Reduction for linear, non-linear, coupled and parameterized systems
  - Main focus of my research over the last 20 years. Developed MOR methods for coupled systems, for sensitivity analysis, structure-preserving methods, for differential-algebraic systems, for resistor and resistor-capacitor networks.
- Combining scientific computing methods with machine learning/neural networks
  - Focus on incorporating physical properties into dynamic neural networks,
  - Reducing neural networks using relations with state-space methods

Invited presentations
(not including "invited" presentations in conference mini-symposia)

66 invited presentations at international conferences and workshops since 1999.

Publications

- 10 books, mainly as editor. Most notable:
  1. W.H.A. Schilders and E.J.W. ter Maten (eds.), Numerical methods in electromagnetics, Handbook of Numerical Analysis (2005)
  2. W.H.A. Schilders, H.A. van der Vorst and J. Rommes (eds.), Model Order Reduction: Theory, Research Aspects and Applications, Springer Verlag (2009)

3. Peter Benner, Stefano Grivet-Talocia, Alfio Quarteroni, Gianluigi Rozza, Wilhelmus H. A. Schilders and Luis Miguel Silveira (eds), Handbook of Model Order Reduction", Volume 1,2,3, Walter De Gruyter GmbH, Berlin (2020-2021) (Open Access)
4. W.H.A. Schilders and M. Guenther (eds), "Novel mathematics inspired by industrial challenges", Springer Verlag, Heidelberg (2021)

- 62 journal publications. Selection:
    5. S.J. Polak, C. den Heijer, W.H.A. Schilders, and P.A. Markowich, "*Semiconductor device modelling from the numerical point of view*" (**review paper**, International Journal for Numerical Methods in Engineering, vol. 24, pp. 763-838 (1987)
    6. W.H.A. Schilders, J.J.H. Miller and S. Wang, "*Application of finite element methods to the simulation of semiconductor devices*" (**review paper**), Reports on Progress in Physics, vol. 62, pp. 277-353 (1999)
    7. H.S. Dollar, N.I.M. Gould, W.H.A. Schilders, A.J. Wathen, "*On iterative methods and implicit-factorization preconditioners for regularized saddle-point systems*", SIAM J. Matr. Anal. Appl., vol. 27, pp. 170-189 (2006)
    8. W.H.A. Schilders, *"Solution of indefinite linear systems using an LQ decomposition for the linear constraints",* Linear Algebra and its Applications, vol.431 (30-4), pp. 381-395 (2009)
    9. J. Rommes and W.H.A. Schilders, "*Efficient methods for large resistor networks*", IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, vol. 29, pp. 28-39 (2010)
    10. S. Lungten, W.H.A. Schilders and J.A. Scott, "*Preordering saddle-point systems for sparse LDLT factorization without pivoting*", Numerical Linear Algebra with Applications, 25(5), [e2173]. DOI: 10.1002/nla.2173 (2018)
    11. P. Benner, X. Cao and W.H.A. Schilders, "*A bilinear H2 model order reduction approach to linear parameter-varying systems*", Advances in Computational Mathematics. DOI: 10.1007/s10444-019-09695-9 (2019)
- 91 articles in Conference Proceedings
- 10 book chapters. Selection:
    12. W.H.A. Schilders, A.J.H. Wachters, "*Simulation of EMC behaviour*", in: Handbook of Numerical Analysis, vol. XIII, special volume on Numerical methods for electromagnetics, Elsevier Publ. Co., pp. 661-753 (2005)
    13. X. Cao, J. Maubach, W. Schilders and S. Weiland, "*Interpolation-based Model Order Reduction for Quadratic-Bilinear Systems and H2 Optimal Approximation*", in: Festschrift Thanos Antoulas (2021)