

# Meike Akveld

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Born: November 24, 1972 — Leiden, The Netherlands  
Nationality: Dutch / Swiss

## Current position

*Titularprofessorin*, Department of Mathematics, ETH Zürich

## Areas of specialisation

Maths Education, Outreach, Maths Competitions, Gender & Diversity questions, Knot Theory (Popularisation), [STACK](#), [Kangaroo](#)

## Appointments held

2024- now	Titularprofessorin at D-MATH, ETHZ
2016-2024	Senior Scientist at D-MATH (first 70% then 90% now 100%), ETHZ
2011-2016	Teaching Assignment in the Teacher Education Group DMATH (40%), ETHZ
2007-2016	Teaching Assignment at DMATH (30%), ETHZ Analysis courses for D-ITET, D-INFK and D-BAUG
2006-2011	Teaching Assignment at DINFK, ETHZ Project BESIKOL under Prof.J. Hromkovic
2006-2007	Teaching Assignment at the ZHAW, Winterthur Mathematics course for students in aviatics
2001-2005	Mathematics Teacher at LG Rämibühl, Zürich
2000-2011	Mathematics Teacher at MNG Rämibühl, Zürich elected as "Lehrperson mbA" in 2004
1997-2004	Research Assistant at DMATH, ETHZ
1995-1997	Research Assistant at the University Leiden, Netherlands

## Education

- 2006 - 2011 WEITERBILDUNG FÜR DEN INFORMATIKUNTERRICHT (30 KP).  
2006 AUSWEIS ZUR IMMERSIONSLEHRPERSON  
2003 LEHRDIPLOM FÜR MATHEMATIK  
1997-2000 ETH ZÜRICH: PHD IN MATHEMATICS  
PhD Thesis "Hofer geometry for Lagrangian loops, a Legendrian knot and a travelling wave".  
Supervised by Prof. Dietmar Salamon.  
1994-1995 CAMBRIDGE UNIVERSITY: PART III WITH DISTINCTION  
Part.III Essay "Morse Theory and Floer Homology"  
Supervised by Prof. Charles Thomas.  
1991-1994 UNIVERSITY OF WARWICK: BACHELOR'S OF MATHEMATICS, GRADE: FIRST  
Bsc.Thesis "The towers of Hanoi".  
Supervised by Prof. Ian Stewart.  
1985-1991 MARNIX GYMNASIUM, ROTTERDAM

## Honours & Awards

- 2024 Finalist KITE Award *Förderung von selbständigem Lernen durch digitales Mathematik-Assessment*,  
together with G.Ionita and A.Steiger  
2023 The project *Kangaroo goes Science* is nominated for the ETH Diversity Award  
2023 STACK (together with G. Ionita, A. Steiger) nominated by the "Lehrkommission" for the KITE  
Award 2024  
2021 [Credit Suisse Award](#) for Best Teaching  
2020 [Finalist KITE Award](#) (Brückenkurs) together with A. Caspar, N. Hungerbühler H. Rasched)  
2014 Goldene Eule des VSETH  
2009 Goldene Eule des VSETH  
1995 Top 5, Part III in Mathematics at Cambridge.  
1994 Top 3, BSc. in Mathematics at Warwick.  
1991 Top student of the year, Marnix Gymnasium.

## Teaching at the ETH

- 2022 - now Mathematical Tools II, ETH & Ashesi, MSc in Mechatronics, Ghana.  
2019-now Analysis I & II for DBAUG.  
2019, 2024 Complex Analysis for DITET.  
2016-2018 Linear Algebra I & II for DMATH & DPHYS.  
2016 Sabbatical at UC Berkeley, Co-Teaching Math 54 with Prof.K. Wehrheim.  
2011 - 2019 Introduction to Knot Theory for DMATH (four times).  
2008 - 2016 Analysis I & II for DBAUG.  
2007 - 2008 Analysis I & II for DINFK & DITET.

## Talks

### KNOT THEORY AND TOPOLOGY (SINCE 2012)

- 2024 "Introduction to knot theory" – three Workshops for 200 - 300 children at the First Asia Maths Camp, Hainan Island (CN).
- 2023 "Knotted or not – that's the question" 2.Karsruher Didaktikworkshop (DE).
- 2019 "Introduction to knot theory", Maths & Maths Education at Nesin math Village (TK).
- 2018 "Introduction to knot theory" at Fontys Lerarenopleiding, Sittard (NL).
- 2018 "Knoten in der Mathematik - Ein Spiel mit Schnüren, Bildern und Formeln", Didaktisches Kolloquium, University of Graz, invited by Karin Baur (AT).
- 2017, 2018 "Knotted or not knotted – that's the question!" Masterclass at the Univeristy of Nijmegen (NL).
- 2017 "Knotted or not – that's the question!" Kleindagarna på Institut Mittag-Leffler (SE).
- 2016, 2017 "Knoten und Lineare Algebra" at VMP weekend for first year students.
- 2015 "The Shape of Space – Eine Alternative zur Schulung des Raumvorstellungsvermögens" at STIU.
- since 2014 Talks about Knot theory for ETH unterwegs.
- 2012 "Mathematical knots", Girl's Angle, MIT – invited by Prof. Katrin Wherheim (US).
- 2012 "Lagrangian correspondences - a toric case study" Talk at symplectic seminar, ETH, with Ana Cannas da Silva.
- 2012 "Aktuelle Herausforderungen und Anwendungen der Knotentheorie" at a philosophical Symposium in Vienna around the theme "The Gordian Knot" (AT).
- 2012 - now Annual talk for future students at Maturandentag, ETH.

### HIGHER EDUCATION (SELECTED TALKS)

- 2024 icme'15, Sydney (AU), Discussion Group, "Developing an international research agenda for e-assessment", with Paula Iannone, George Kinnear, Igor Kontorovich
- 2024 icme'15, Sydney (AU), "Partial credit in computer aided assessment in calculus courses for large engineering classes" with Andreas Steiger and George Ionita
- 2024 STACK conference 2024, Amberg - Weiden (DE), "Partial credit in computer aided assessment in calculus courses for large engineering classes" with Andreas Steiger and George Ionita
- 2023 Refresh Teaching: "Teaching the crowd - making the large class feel small"
- 2023 STACK conference 2023, Tallin, "Designing the Integral Trainer at ETH: Didactical aspects" with Andreas Steiger and George Ionita
- 2023 STACK conference 2023, Tallin, "Building the Integral Trainer at ETH: Technical aspects" with Andreas Steiger and George Ionita
- 2022 "Improving mathematics diagnostic tests using item analysis" University of Gothenborg
- 2022 Refresh Teaching: "Online assessment with STACK - making individual feedback possible"
- 2022 STACK conference 2022 "STACK at ETH Zürich" with Andreas Steiger
- since 2022 ETH New Faculty Orientation "Effective learning & inspiring your students"
- 2022 Refresh Teaching: "Does size matter? Teaching and learning in large classes."
- 2021 Refresh Teaching: "Productive failure: an example from linear algebra".
- 2020 Refresh Teaching: "Preparing students for the summer exams after a COVID 19 semester"
- 2019 Panel discussion at UZH "Hat die Schweiz ein Mathematikproblem?".
- 2019 Didaktisches Kolloquium Berlin "Linear algebra and productive failure".
- 2018 Lunch meeting DMATH "HS 18: Experiment *Complex numbers flipped*" with Menny Akka, Alexander Caspar, Laura Keller, Andreas Steiger.

2018 Informal discussion about "Brückenkurs" at University of Graz, invited by Karin Baur.

#### SECONDARY EDUCATION (SELECTED TALKS)

- 2018 "Differentialgleichungen im Grundlagenfach" TMU, Stans mit Michael Bucher.  
2018 "The Shape of Space: Introduction to 2- and 3-manifolds" – Fachschaftstag KZO.  
2018 "Differentialgleichungen im Grundlagenfach" at Fachschaftstag Luzern with Michael Bucher and Arno Gropengiesser.  
2018 "Kanon Mathematik – Stand der Dinge" at Fachschaftstag Luzern.  
2012 Expert talk at Immersion Course for secondary school teachers.  
2010 "Integrieren – do it yourself", DMK Weiterbildungskurs with further authors.  
2008? "The shape of space", Kantonaler Fachschaftstag in Thun.  
2007 "Knoten in der Mathematik - Ein Spiel mit Schnüren, Bildern und Formeln", DMK Weiterbildungskurs.  
2006 "Knoten in der Mathematik - Ein Spiel mit Schnüren, Bildern und Formeln", Fachschaftstag KS Rychenberg.

#### OUTREACH

- 2024 First Kangaroo in Asia camp, Hainan Island (CN), Key note speech  
2024 AKSF Workshop "Preparing good proposals", in Zoom, 100 participants (organiser)  
2024 ICMI'15 Invited talk about "Kangaroo" as WFNMC vice president in the session for ICMI Affiliates  
2023 INTED2023 – 17th annual International Technology, Education and Development Conference, Valencia: "What are the problems like in the world's largest international mathematical competition?" together with L. Caceres and O. Colon.  
2022 WFNMC Conference "Folding polygons and knots" together with R. Geretschläger.  
2022 18th International Bebras Task Workshop Kangaroo: "The selection process of the questions for the competition."  
2022 Virtual visit to school class in Vienna: "What does daily life of a mathematician look like?"  
2021 "Mathematical Kangaroo: The worlds largest international math competition" at the ASDAN Teacher Conference, China (for more that 900 teachers).  
2022 17th International Bebras Task Workshop Kangaroo: "The worlds largest international math competition "  
2020 "Mathematical Kangaroo: The world's largest international math competition" presentation for the AMU (African Mathematical Union).  
2020 "Mathematical Kangaroo: The world's largest international math competition" workshop with Luis Cáceres, José Heber Nieto, Rafael Sánchez, JMM (Joint Mathematics Meeting AMS & MAA), Denver.  
2020 Kick-off meeting African Students Association of Zurich (ASAZ) "Mathematical Kangaroo".  
2020 Rotary club Chur "The challenges of Kangaroo".  
2015 - now Workshop at "Nationaler Zukunftstag" (representing DMATH within the ETH).

## GENDER & RESPECT ISSUES

- 2022 Zürich Graduate School, panellist at Mathematics Forum: Networking within the math community.
- 2022 Panel discussion on diversity in STEM by the Swiss Study Foundation.
- 2021 Coffee lectures at DMATH: "Respect".
- 2020 Input referat 500womenscientists "Afterwork discussion about the work & family balance"
- 2018 Coffee lecture at DMATH.
- 2017 Public lecture at DMATH "Life lessons".
- 2016 Refresh Teaching: "Motivating students for mathematics".

## Meetings and events

- 2020 - now Responsible for the scientific program of the Annual Meeting & Board Meetings of AKSF (108 countries, between 100 and 200 participants).
- 2019, 2022 Co-organiser of GoMath event at DMATH (Special guests: Vicky Neale (2019, Oxford); Jeffrey Weeks (2022, USA)).
- 2019 Co-organiser of IRT workshop at ETH with Edinburgh.
- 2019 Moderator of the event "Meeting Alessio Figali".
- 2018 - now Annual "Kangaroo goes Science event" (one day event for the top 100 girls in year 7, Kangaroo), together with Darcy Molnar.
- 2017 Main organiser of the Annual Meeting of AKSF in Luzern.
- 2011 - now Co-organiser Tag für Mathematik und Unterricht.
- 2011 - now Co-organising of Annual Series of lectures at the ETH for mathematics teachers "The Kolloquium".
- 2011 Weiterbildungsveranstaltung: Horizonte der Mathematik erweitern, PSI with H.R. Schneebeli.
- 2010 - 2014 Initiator and first organiser of the DATCH event (maths camp for pupils from Germany, Austria and Switzerland)

## Current service to the profession

- President of the Association Kangourou sans Frontières ([AKSF](#))
- President of "[Verein Känguru Schweiz](#)"
- Vice-President of the World Federation of National Mathematics Competitions ([WFNMC](#))
- Member of the [STACK International Advisory Board](#)
- Quästorin der [Stiftung zur Förderung der mathematischen Wissenschaften in der Schweiz](#)
- Co-President of the [GoMath](#) committee of the Department of Mathematics, ETH Zürich.
- Member of "Aufnahmeprüfungskommission der ETHZ".
- Member of the [RESPECT](#) group at DMATH, ETHZ.
- Member of the [MELETE](#) group at DMATH, ETHZ.
- Member of the scientific committee planning "[den dritten stoffdidaktischen Workshop an der KIT, Karlsruhe](#)".
- Reviewer *International Journal of Mathematical Education in Science and Technology*.
- Invited contributor to the Research Agenda for Generative AI in Undergraduate Mathematics Education.

Member of the [ETH Women professor forum](#)

## Previous service to the profession

- 2020 - 2023 Elected Member of "[Schulkommission der Kantonsschule Hohe Promenade](#)"  
2021 Organisation of a Summer Academy for the "Schweizer Studien Stiftung" with K. Baur & R. Geretschläger.  
2019 - 2021 Reviewer *MDPI*.  
2019 - 2021 Member of the committee "Curriculum reform at DMATH", ETH.  
2008-2021 Matura-Expertin at MNG Rämibühl/ LG Rämibühl/ RG Rämibühl / KS Bühlrain / KS Hohe Promenade / KS Baden .  
2014 - 2016 Expert in the Committee "Basale Kompetenzen".  
2011 - 2013 Reviewer for *Die Elemente*.  
2011 - 2016 Member of the "Kanon Gruppe" (revising the high school curriculum).  
2007 - 2009 Member of the curriculum reform committee at MNG Rämibühl.  
2004 - 2012 Member of the Deutschschweizerische Mathematik Kommission (DMK).  
2004 - 2007 Expert for "Schweizer Jugend forscht".

## Supervision of Theses

### MSc. THESIS

- 2019 Michel Makhlouf *Existence of trisections* - co-supervised with Peter Feller

### BSc. THESES

- 2024 Luisa Tschannen *something with stats and integral trainer* - co-supervised with Fadoua Baldaoui.  
2022 Sina Keller *Introduction to knot theory – with a focus on the Jones polynomial*  
2020 Joel Schmitz *Braids and the homological construction of the Burau representation*

### SEMESTER PAPERS AND READING COURSE

- 2023 Yannis Bähni *Introduction to knot theory* (reading course)  
2021 Vera Sanchez Ramon *Introduction to knot theory* (reading course)  
2018 Michel Makhlouf *A construction of uncountably many wild knots* (semester paper) - co-supervised with Peter Feller  
2018 Aline Kaszuba *Turning knots into braids* (semester paper) - co-supervised with Peter Feller  
2017 Michel Makhlouf *Trisections & Group trisections* (reading course) - co-supervised with Peter Feller

### THESES FOR THE TEACHING DIPLOMA AND MATURA PAPERS

Around 15 Theses for the Teaching Education and around 10 Matura papers for high school students.

## Publications

### JOURNAL ARTICLES

- *Learning Mechanisms of Problem-Solving before Instruction in University Mathematics* (in preparation) (with V. Baumgartner, D. Trninic, N. Hungerbühler, M. Kapur).
- *Problem-solving before Instruction for Learning Linear Algebra in University Mathematics* (with V. Baumgartner, S. Daguati, D. Trninic, A. Caspar, N. Hungerbühler, M. Kapur), submitted to **Instructional Science** (2023).
- *Folding Polygons and Knots* (with R. Geretschläger), **Engaging Young Students in Mathematics through Competitions Volume III**, World Scientific (2024).
- *Integration using partial fractions & STACK* (with G. Ionita and A. Steiger), **STACK Case Study** (2023).
- *Improving mathematics diagnostic tests using item analysis* (with G. Kinnear), **International Journal of Mathematical Education in Science and Technology** (2023).
- *30 years of Mathematical Kangaroo* (with G. Dolinar), **EMS Digest Nr.45** (2022).
- *AKSF & Math Kangaroo: The World's Largest International Mathematics Competition* (with L. Cáceres), **Notices of the AMS**, Vol.69 (No.11) (2022).
- *Perspectives on mathematics competitions and their relationship with mathematics education* (with L. Cáceres, D. Crawford, F. Henao), **ZDM – Mathematics Education** (2022).
- *Reflections on diverse and inclusive teaching* (with M. Luetli), **ETH Learning and Teaching Journal**, Vol.3 (No.1) (2022), 36 - 44.
- *Large-Scale Flipped Classroom with a Single Lecturer* (with M. Akka, A. Caspar, L. Keller, A. Steiger), **Special Issue: ICED 2020 proceedings**, Vol.2 (No.2) (2020).
- *Math Kangaroo* (with L. Cáceres, R. Geretschläger), **Mathematics Competitions**, Vol.33 (No.2) (2020).
- *In-Class Formative Assessment in an Introductory Calculus Class* (with M. Akka, A. Caspar, G. Kortemeyer, M. Valkering-Sijssling), **iceed**, Vol.13 (No.1), (2020).
- *The Math Kangaroo Competition* (with L. Cáceres, J.H. Nieto, R. Sánchez), **Espacio Matemático**, Vol.1 (No.2), (2020).
- *Kangaroo goes Science* (with L. Wiegmann), **Bulletin der VSMP** 138 (2018).
- *Solitärwellen besser bekannt als perfekte Tsunamis* (with W. Hager), **Bulletin der VSMP** 137 (2018).
- *Knots in the classroom* (with A. Jobbings), **The Scottish Mathematical Council** 45 (2015).
- *Was ist die Wurzel aus 36?* (With A. Caspar), **Bulletin der VSMP** 125 (2014).

- *Adding Realism to Cost Functions for Road Network Renewal to Identify Better Management* (with C. Richmond, C. Kielhauser, B. Adey), **Conference Proceedings Industry Studies Association** (2014).
- *Die mathematische Knotentheorie und ihre aktuelle Anwendungen* (with O. Neumaier), Wolfgang Gratzler/Otto Neumaier (Hg.): **Der Gordische Knoten. Lösungsszenarien in Wissenschaft und Kunst**, Wien - Münster: Lit (2014), 55 - 72.
- *Knopen in het wiskunde onderwijs*, **Euclides** Nr.87-7 (2012).
- *Job shop scheduling with unit length tasks* (with R. Bernhard and D. Komm), **RAIRO - Theoretical Informatics and Applications**, Volume 46(3)2 (2012).
- *Knoten im Mathematikunterricht*, **MNU Heft 2** (2009).
- *Eine Perle aus der mehr-dimensionalen Analysis*, **Bulletin der VSMP** 108 (2008).
- *Augenschein in der Junior Euler Society*, **Bulletin der VSMP** 108 (2008).
- *Knoten in der Mathematik*, **Bulletin der VSMP** 103 (2007).
- *Beweis des Kirchhoff'schen Satzes im Allgemeinen*, **Bulletin der VSMP** 101 (2006).
- *Loops of Lagrangian submanifolds and pseudoholomorphic discs* (with D. Salamon), **GAF** 11 (2001), 609-650.
- *Travelling wave solutions of a fourth order semi-linear diffusion equation* (with J. Hulshof), **Appl. Math. Letters**. 11(3) (1998), 115-120.
- *De ruimtewandeling*, **Pythagoras – wiskundetijschrift voor jongeren** 35(1) (1995), 8-10.

#### BOOKS

- *Mathe mit dem Känguru* (with A. Unger and R. Geretschläger), Hanser Verlag, 2024.
- *Mathe mit dem Känguru* (with M. Noack, R. Geretschläger and A. Unger), Hanser Verlag, 2019.
- *Knopen in de wiskunde* (with A. van de Roest), Epsilon Uitgaven, 2015.
- *Analysis II (first and second edition)* (with R. Sperb), VDF, 2015.
- *Analysis I (third and fourth edition)* (with R. Sperb), VDF, 2012.
- *Knots Unravelling: from string to mathematics* (with A. Jobbings), Arbelos, 2011.
- *Integrieren - do it yourself* (with U. Eisler and D. Zogg), Orell Füssli Verlag, 2010.
- *Hofer geometry for Lagrangian loops*, VDM Verlag Dr.Müller, 2008.
- *Themenheft: Knoten in der Mathematik* (in Zusammenarbeit mit Peter Gallin) , Orell Füssli Verlag, 2007.
- *Doe-boekje nr.II: Knopen* (with F. Akveld), Vierkant voor Wiskunde, 1997.



## INTERVIEWS

- *Interview about Maths Competitions – research project* OIS, University of Toronto, November 2023.
- *Braucht es in Mathematikvorlesungen noch Wandtafeln?*, [ETH News](#), October 2023.
- *ETH setzt auf Computer als zusätzliche Mathe-Tutoren* [ETH News](#), September 2023.
- Short presentation of Kangaroo in *The Shark's Quiz*, national television Ghana, July 2022 & 2023.
- Interview in *Girls'Angle Bulletin, Volume 14, Nr.3*, 2021.
- Interview in *Johnian Blog, St. John's College Cambridge, March 08*, 2021.
- Interview in *Kijk Magazine "Een warrig verhaal – over knopen en hun nut voor de wetenschap"*, Nr. 4, 2021.
- Interview in *Wir Eltern (Denksport)* about Kangaroo.

## Current Collaborators

- IRT & MC Questions: George Kinenar, Chris Sangwin (Edinburgh University, UK) and Pamela Docherty (Heriot Watt University, UK)
- STACK: Andreas Steiger (ETHZ), George Ionita (ETHZ & University of Bern)
- MC Questions and distractors: Seraina Wachter (Ostschweizer Fachhochschule) and Jakob Meier (ETHZ)
- Using STACK to develop questions for optimisation: Wigand Rathmaier (FAU Erlangen-Nürnberg, DE)
- Kangaroo: Luis Caceres (University of Puerto Rico, Mayaguez Campus), Jose Nieto (University of Zulia, VE), Rafael Sanchez (University Antonio Narino, CO), David Crawford (UK)
- Kangaroo and Outreach: Robert Geretschläger (BRG Kepler, Graz, AT)
- Knots and 3D-visualisation skills: Sebastian Bauer (KIT Karlsruhe, DE) & Andreas Büchter (Universität Duisburg Essen, DE).