

## CURRICULUM VITAE

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**Date of Birth** 29 March 1957

**Citizenship** German

### Academic Degrees

PhD Heidelberg, Germany 1982 (Grade: Summa cum laude)

Diplommathematiker (degree comparable to MSc by thesis) Heidelberg, Germany 1981 (Grade: Mit Auszeichnung, with Honours)

### Academic Positions

Aug.2002-	Full Professor (Chair), Freie Universität Berlin, Germany
Dec.1995-Jul.2002	Chair of Pure Mathematics, Monash University, Melbourne, Australia
Feb.1993-Dec.1995	Senior Lecturer, Department of Mathematics, University of Melbourne, Australia; tenured position
Jan.1989-Jan.1993	Lecturer, Department of Mathematics, University of Melbourne, Australia
Jan.1988-Jan.1989	Postdoctoral fellowship, Centre for Mathematical Analysis (CMA), Australian National University (ANU)
Jan.1985-Dec.1987	Wissenschaftlicher Mitarbeiter at SFBs (Collaborative Research Centres) #72 (Approximation and Optimization in Applied Mathematics) and #256 (Nonlinear partial differential equations) at University of Bonn, Germany
Dec.1983-Dec.1984	Wissenschaftlicher Mitarbeiter at University of Heidelberg, Germany
Aug.-Nov.1983	Postdoctoral fellow at CMA, ANU
Aug.1982-Aug.1983	Visiting Fellow at CMA, ANU, on a research grant from the Deutsche Forschungsgemeinschaft (comparable to ARC in Australia)

Jan.-Aug.1982

Visiting Fellow at RSPHysS, Institute of Advanced Studies,  
ANU

### **Visiting Positions**

I have visited the mathematics departments at Stanford University, UC San Diego, Cambridge University, Columbia University (NYC), Courant Institute (NYU), Trento University (Italy), University of Tübingen (Germany), University of Freiburg (Germany) and the Universities of Athens and of Crete (Heraklion) in Greece for extended periods (two weeks and above).

### **Administrative Positions**

As Chair of Pure Mathematics at Monash University in Australia I was by default in charge of major administrative affairs regarding Pure Mathematics. I also was Director of Postgraduate studies of the whole department for a number of years.

Deputy Director (stellvertretender Sprecher) of the DFG collaborative research centre (Sonderforschungsbereich) SFB 647 from 2004 until the end of 2015

Deputy Director of the International Max Planck Research School Geometric Analysis, Gravitation and String Theory, Institute for Gravitational Physics (Albert Einstein Institute), Potsdam, for a number of years

### **Research interests**

Geometric Analysis, Nonlinear partial differential equations, Geometric Evolution Equations especially Mean Curvature Flow and Ricciflow, Variational problems, Geometric Measure Theory, Mathematical Relativity

### **PhD supervision**

Denis Pihan, "Length preserving curvature evolution of curves in the plane" PhD, completed 1999, University of Melbourne

Miles Simon, "Singularity formation of warped product metrics under Ricci flow " PhD, joint supervision with J.H.Rubinstein, completed 1999, University of Melbourne

Nick Stavrou, "Selfsimilar solutions of mean curvature flow for entire graphs", PhD, completed 1999, University of Melbourne

Phil Unterberger, "Mean curvature evolution of graphs in hyperbolic space", PhD, completed 1999, University of Melbourne

James McCoy, "Area preserving mean curvature flow", PhD, completed 2002, Monash University

John Buckland, "Mean curvature evolution of graphs in external domains with free boundary conditions", PhD, completed 2003, Monash University

Mark Aarons, "Mean curvature flow of spacelike hypersurfaces in Lorentzian manifolds, PhD completed 2004, FU Berlin and Albert Einstein Institut (joint supervision with Prof. Dr.G. Huisken)

Josh Bode, 'Mean curvature flow of graphs over cylinders, PhD, completed 2007, FU Berlin FU Berlin and Albert Einstein Institut (joint supervision with Prof. Dr.G. Huisken)

Amos Koeller, 'Partial regularity of measure theoretic solutions of mean curvature flow, PhD completed 2007, FU Berlin and Albert Einstein Institut

Kashif Rasul, "Asymptotic expansions for entire solutions of mean curvature flow", PhD completed 2010, FU Berlin and Albert Einstein Institut (joint supervision with Prof. Dr.G. Huisken)

Paul Appleby, 'Mean curvature flow towards minimal foliations', PhD completed 2010, FU Berlin

Valentina Vulcanov, "Mean curvature flow of graphs with free boundary conditions", PhD completed 2011, FU Berlin

Tobias Marxen, "Ricci flow of warped product metrics with torus fibres and Gaussian estimates", PhD completed 2013, FU Berlin

Ananda Lahiri, "Brakke's regularity theorem for mean curvature flow", PhD completed 2014, FU Berlin

Ahmad Afuni, "Local monotonicity formulas for Yang-Mills connections", PhD completed 2015, FU Berlin

Hanne Hardering, "Finite element methods on Riemannian manifolds with applications to geometric flows", PhD completed 2015, FU Berlin, joint supervision with Prof. Dr. Ralf Kornhuber, FU Berlin

Friederike Dittberner, "Planar curve flows with constraints", PhD completed 2018 FU Berlin

## **Teaching experience**

In Australia, I have taught undergraduate courses from first to third year level since 1989. These included large first year service subjects (introduction to calculus and linear algebra) with class sizes of up to 400 students. Smaller subjects included first and second year subjects on Real Analysis and on Linear Algebra. Third year subjects I have taught covered topics such as Metric Spaces (metric topology), Functional Analysis, Geometry and Analysis (nonlinear analysis within a geometric context) and Partial Differential Equations. In addition, I regularly (one per year) taught Honours (fourth year level subjects). Topics here have included Partial Differential Equations, Differential Geometry and Geometric Measure Theory.

At the Freie Universität Berlin I have taught the three semester beginner's cycle Analysis I - III four times. Furthermore, I have taught the advanced subjects PDE I - III and Differential Geometry I - III several times as well as the subjects Geometric Measure Theory, Complex Analysis and Functional Analysis II. Level III of the above-mentioned subjects comprise for instance introductions to Ricciflow, Mean Curvature Flow, advanced Calculus of Variations or Minimal surfaces Theory. I also run several regular undergraduate, postgraduate and research level seminars.

## Contributions to academic profession

Director of the 43rd Annual Conference of the Australian Mathematical Society held in Melbourne in July 1999. This was a joint meeting with the American Mathematical Society.

Coorganisation of several international workshops including at Oberwolfach (Nonlinear Evolution Equations) at BIRS (Geometric Evolution Equations) and an Oberwolfach Arbeitsgemeinschaft on the solution of the Poincaré conjecture in 2008

## Publications

- [1] K.Ecker, Estimates for evolutionary surfaces of prescribed mean curvature, *Math.Zeitschrift* 180, 179 - 192 (1982)
- [2] K.Ecker, An interior gradient bound for solutions of equations of capillary type, *Arch.Rational Mech.Analysis* 92, 137 - 151 (1986)
- [3] K.Ecker, Area maximizing hypersurfaces in Minkowski space having an isolated singularity, *manuscripta mathematica* 56, 375 - 397 (1986)
- [4] K. Ecker, Area minimizing integral currents with movable boundary parts of prescribed mass, *Ann. Inst. H. Poincarè, Analyse non linéaire*, Vol. 6, no. 4, 261 - 293 (1989)
- [5] K.Ecker and G.Huisken, Immersed hypersurfaces with constant Weingarten curvature, *Math. Annalen* 283, no.2, 329 - 332 (1989)
- [6] K.Ecker and G.Huisken, Interior curvature estimates for hypersurfaces of prescribed mean curvature, *Ann. Inst. H. Poincarè , Analyse non linéaire*, Vol. 6, no. 4, 251 - 260 (1989)
- [7] K.Ecker and G.Huisken, Mean curvature evolution of entire graphs, *Annals of Mathematics* 130, 453 - 471 (1989)
- [8] K.Ecker and G.Huisken, A Bernstein result for minimal graphs of controlled growth, *J. Diff. Geom.* 31, 397 - 400 (1990)
- [9] K.Ecker and G.Huisken, Parabolic methods for the construction of spacelike slices of prescribed mean curvature in cosmological spacetimes, *Comm. Math. Phys.*135, 595-613 (1991)
- [10] K.Ecker and G.Huisken, Interior estimates for hypersurfaces moving by mean curvature, *Inventiones Mathematicae* 105, 547-569 (1991)
- [11] K.Ecker, Local techniques for mean curvature flow, *Proceedings of the Centre for Mathematics and its Applications* , ANU ,Vol.26, 1991
- [12] K. Ecker, On mean curvature flow of spacelike hypersurfaces in asymptotically flat spacetimes, *J.Austral.Math.Soc.(Series A)* **55**, 41-59 (1993)

- [13] K.Ecker, On regularity for mean curvature flow of hypersurfaces, *Calc.Var.* **3**, 107-126 (1995)
- [14] K.Ecker, On mean curvature flow of surfaces in Riemannian manifolds, *Proc. Centre for Math. and its Applications*, ANU, Vol 33 (1994)
- [15] K.Ecker, Geometric Evolution Equations (lecture notes), *Proceedings of the Centre for Mathematics and its Applications*, Australian National University, Volume 34, 79-107, 1996
- [16] K.Ecker, Interior estimates and longtime solutions for mean curvature flow of noncompact spacelike hypersurfaces in Minkowski space, *Journal of Differential Geometry*, **46** (1997), 481-498
- [17] K.Ecker, Logarithmic Sobolev inequalities on submanifolds of Euclidean space, *J. reine und angew. Math.* **522** (2000), 105-118
- [18] K.Ecker, Mean curvature evolution of spacelike hypersurfaces, *Proceedings of the Centre for Mathematics and its Applications*, Australian National University, Volume 37, 119-132, 1999
- [19] K.Ecker, Mean curvature evolution of spacelike hypersurfaces near null initial data, *Comm. Analysis and Geometry*, **11.2** (2003), 181-205
- [20] K.Ecker, A local mean value formula for mean curvature flow, *Annals of Math.*, **154** (2001), 503-525
- [21] K.Ecker, Local mean value formulas for some nonlinear diffusion equations, *Calculus of Variations* **23** (2005), 67-81
- [22] K. Ecker, Dan Knopf, Lei Ni, and Peter Topping, Local Monotonicity and Mean Value Formulas for evolving Riemannian Manifolds, *Journal für die Reine und Angewandte Mathematik* **616** (2008), 89-130
- [23] K. Ecker, A Formula Relating Entropy Monotonicity to Harnack Inequalities. *Comm. in Analysis and Geom.* **15**, No 5 (2008), 1025 - 1061
- [24] K. Ecker, Partial Regularity at the First Singular Time for Hypersurfaces Evolving by Mean Curvature, *Math. Annalen*, **356** (1), (2013) 217-240
- [25] K.Ecker, Entropy and differential Harnack type formulas for evolving domains, *Calculus of Variations and PDE*, **50**, (2014) 455-480

### Monographs

K.Ecker, Regularity theory for mean curvature flow, *Progress in Nonlinear Differential Equations and Their Applications*, Birkhäuser (2004)

## Survey Articles

- [1] K. Ecker, Heat diffusion, the structure of space and the Poincaré conjecture, book chapter in 'Mathematics Everywhere', AMS 2010, editors: Aigner and Behrends
- [2] K. Ecker, Wärmeleitung, die Struktur des Raumes und die Poincaré-Vermutung, book chapter in monograph "Alles Mathematik", 2008, editors: Aigner und Behrends
- [3] K. Ecker, Heat equations in geometry and topology, Jahresbericht der DMV (2008), no. 3, 117 - 141