Curriculum vitae Dietmar Hömberg

1 Personal

Date of birth:	12.8.1961
Nationality:	german
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2 Academic Background

1988	Diploma, University of Münster
1993	Ph.D., University of Essen
2002	Habilitation, Technische Universität Berlin

3 Employment

1988–1994	Research assistent, University of Essen
1994–2003	Research associate, WIAS Berlin
since 2003	Full professor, Technische Universität Berlin and head of research group “Nonlinear Optimization and Inverse Problems” of WIAS
since 2014	adjunct professor, Norwegian University of Science and Technology, Trondheim

4 Fields of interest

- modeling, simulation and control of complex production processes
- phase transition models
- nonlinear optimization
- optimal control of PDEs
- optimal shape design

5 Functions in scientific organizations, scientific service

- Vice president of the Council of the European Consortium for Mathematics in Industry (ECMI)
- Head of new ECMI Special Interest Group on 'Digital Factories'
- Member of 7th Technical Committee (TC7) of the International Federation for Information Processing (IFIP) on System Modeling and Optimization
- Scientist in Charge of Application Area 'Energy and Materials' of Research Center MATHEON– Mathematics for key technologies
- Member of COST Management Committee Cost Action TD1409 (Mi-NET)

6 Thesis Supervision

- *Ph.D. Theses*
  - L. Panizzi, On a mathematical model for case hardening of steel, Double doctorate Scuola Normale Superiore di Pisa/Technische Universität Berlin, March 5, 2010.
  - D. Kern, Analysis and numerics for a thermomechanical phase transition model in steel, Technische Universität Berlin, May 26, 2011.
  - N. Kleemann, Shape derivatives for diffraction by non-smooth periodic interfaces, Technische Universität Berlin, August 19, 2011.
  - O. Rott, Simulation and stability of milling processes, Technische Universität Berlin, October 25, 2011.
  - T. Arnold, Scattering of plane waves by rough surfaces in the sense of Born approximation, Technische Universität Berlin, March 10, 2014.
  - T. Petzold, Modelling, analysis and simulation of multifrequency induction hardening, Technische Universität Berlin, May 19, 2014.
  - B. Bugert, On integral equation methods for electromagnetic scattering by biperiodic structures, Technische Universität Berlin, June 2, 2014.
  - K. Sturm, On shape optimization with non-linear partial differential equations, Technische Universität Berlin, October 9, 2014.
  - N. Togobytska, Multiphase steels: Modelling parameter identification and optimal control, Technische Universität Berlin, November 19, 2014.
- *Diploma Theses*
  - M. Seibold, Optimale Steuerung von Phasenübergängen in Stahl, Technische Universität Berlin, July 2004.
  - D. Naumov, Modelling and Simulation of Laser-induced Thermotherapy, Technische Universität Berlin, April 2007.

- G. Freiwald, Modellierung und Stabilitätsanalyse von Fräsprozessen, Technische Universität Berlin, December 2007.
- K. Sturm, On a visco-elastic milling model: Existence, uniqueness and numerical analysis, Technische Universität Berlin, May 2011.

7 Projects

- *Finished Projects*

  BMBF Math & Industry

  Project *"Modelling, analysis, and simulation of induction welding"*, 1 x BAT IIa, (1.7.1997–30.6.2000)

  Stiftung Industrieforschung, Köln

  Project *"Numerical simulation of temperature fields for the beam hardening of components with complicated geometry"* (together with Prof. Spiess, Bergakademie Freiberg), 453 TDM (1.12.1999–28.2.2002)

  Volkswagen AG, Wolfsburg

  Project *"Modelling and parameter identification of cost models in factory planning"*, 10 TEURO (Spring 2004)

  pro-beam Anlagen GmbH

  Project *"Modelling and simulation of electron beam multi-spot welding"*, 20 TEURO (1.1.–31.12.2007)

  DFG Research Center MATHEON "Mathematics for Key Technologies" (Berlin)

  Projekt C21 "Reduced Order Modelling and Optimal Control of Robot Guided Laser Material Treatments" (together with T. Stykel, TU Berlin), 1x TVöD 13 (1.10.2006–30.9.08)

  Endress+Hauser Flowtec AG, Reinach, Schweiz

  Project *"Simulation of distortion in flow meters during arc welding"*, 5 TEURO, (1.6-30.9.2008)

  DFG Research Center MATHEON "Mathematics for Key Technologies" (Berlin)

  Project Z1.4 "Innovations in Mathematics Education for the Engineering Sciences" (together with M. Karow and K. Roegner, TU Berlin), 1x TVöD 13 (1.6.2006–31.5.2010).

  DFG Research Center MATHEON "Mathematics for Key Technologies" (Berlin)

  Project D25 "Computation of shape derivatives for conical diffraction by polygonal gratings" (together with A. Rathsfeld, WIAS), 0.5 x TVöD 13 (1.7.2010–31.12.2010)

  DFG–SPP 1180 "Prediction and manipulation of interaction between structure and process"

  Project "Development of a prognosis tool for the prediction of stable milling processes" (together with E. Uhlmann, TU Berlin), 2x TVöD 13 (1.5.2005–30.4.2011)

Zentrales Innovationsprogramm Mittelstand (ZIM)

Project "New methods of measurements for the development of materials" (together with BÄHR Thermoanalyse, Hüllhorst; W. Bleck, RWTH Aachen), 540 TEURO (1.10.2009–31.10.2011)

DFG Research Center MATHEON "Mathematics for Key Technologies" (Berlin)

Project C11 "Modelling and optimization of phase transitions in steel" (together with M. Hintermüller, HU Berlin), 1x TVöD 13 (1.4.2003–31.5.2014)

DFG Research Center MATHEON "Mathematics for Key Technologies" (Berlin)

Projekt C30 "Automatic reconfiguration of robotic welding cells" (together with R. Henrion, WIAS und M. Skutella, TU Berlin), 2x TVöD 13 (1.6.2010–31.5.2014)

DFG–SPP 1204 "Algorithms for fast, material specific process-chain design and -analysis in metal forming"

Project "Simulation and control of phase transitions and mechanical properties during hot-rolling of multiphase steel" (together with W. Bleck, RWTH Aachen), 2x TVöD 13 (23.10.2006–1.7.2014)

BMBF Math & Industry

Project "Modeling, simulation and optimization of multifrequency induction hardening" (together with R. Hoppe, Augsburg; A. Schmidt, F. Hoffmann, Bremen; EFD, Freiburg; ZF, Friedrichshafen; Coordinator D. Hömberg), 786 TEURO (1.7.2010–31.8.2013)

Nippon Steel & Sumitomo Metal Corporation, Tokyo

Project "Optimization of steel microstructures on a mesoscopic scale", 60 TEURO (23.9.2010–13.11.2013)

- *Current Projects*

Research Center MATHEON "Mathematics for Key Technologies" (Berlin)

Project C-SE13 "Topology optimization of wind turbines under uncertainties", 1x TVöD 13

8 Organization of Minisymposia and Workshops

- Minisymposium "Shape, Structure and Topology Optimization for Models governed by Non-linear PDEs", ICIAM'03, Sydney, 7.–11.7.2003
- Minisymposium "Mathematical models for laser material processing", ECMI 2004, Eindhoven, 21.–25.6.2004
- Workshop "New Trends in Simulation and Control of PDEs", WIAS Berlin, 26.–28.9.2005
- Minisymposium "Industrial Optimal control Problems", SIAM Conference on Mathematics for Industry, Detroit, 24.–26.10.2005

- Workshop "Kopplung von Prozess und Struktur in Modellen der spanenden Fertigung", WIAS Berlin, 7.–8.9.2006
- Minisymposium "Mathematics for Steel Manufacturing", ICIAM'07, Zurich, 16.–20.7.2007
- Minisymposium "Inverse Problems in Electromagnetic Scattering", ICIAM'07, Zurich, 16.–20.7.2007
- Workshop "Parameteridentifikation bei Werkzeugmaschinen", WIAS Berlin, 21.–22.2.2008
- Workshop "Phase Transitions and Optimal Control", WIAS Berlin, 23.–25.10.2008
- Workshop "Mathematical Education of First-Year Engineering Students", 6.–7.4.2009
- 25^{th} IFIP TC7 Conference on System Modeling and Optimization, TU Berlin, 12.–16.9.2011
- Minisymposium "Optimization Applications in Industry I – V", 21st International Symposium on Mathematical Programming (ISMP 2012), 19.–24.8.2012
- Workshop "Electromagnetics – Modelling, Simulation, Control and Industrial Applications", WIAS Berlin, 13.–17.5.2013
- Minisymposium "Simulation and Control of Hot-Rolling", The 18th European Conference on Mathematics for Industry 2014 (ECMI 2014), Taormina, 9.–13.6.2014
- Workshop "Math for the Digital Factory", WIAS Berlin, 7.–9.5.2014

9 Teaching (Technische Universität Berlin)

- Lineare Algebra für Ingenieure (lecture), 2 SWS, Summer Semester 2003.
- Optimalsteuerung bei partiellen Differentialgleichungen (lecture), 4 SWS, Summer Semester 2004, 2006, 2008, 2010.
- Nichtlineare Optimierung (lecture), 4 SWS, Winter Semester 2003/2004, Winter Semester 2005/2006, Winter Semester 2008/2009, Summer Semester 2012, 2014.
- Nichtlineare Optimierung (seminar), 2 SWS, Winter Semester 2006/2007, 2008/2009, 2010/2011, 2014/2015, Summer Semester 2010.
- Nichtlineare Optimierung (Optimale Bahnplanung von Industrierobotern) (seminar), 2 SWS, Summer Semester 2005.
- Spieltheorie (seminar), 2 SWS, Winter Semester 2005/2006.
- Analysis I für Ingenieure (lecture), 4 SWS, Winter Semester 2004/2005, 2013/2014, Summer Semester 2007, 2009, 2013.
- Analysis II für Ingenieure (lecture), 4 SWS, Winter Semester 2009/2010.

- Differentialgleichungen für Ingenieure (lecture), 2 SWS, Summer Semester 2011.
- Integraltransformationen und partielle Differentialgleichungen für Ingenieure (lecture), 2 SWS, Winter Semester 2011/2012.

10 Courses and summer schools

- Phasenübergänge in Stahl, Summer School "Simulation und Anwendungen von Mikrostrukturen", August 14–18, 2006, Föhr.
- A crash course in Nonlinear Optimization, November 13–23, 2006, Escuela Politécnica Nacional, Quito, Ecuador.
- A short course on PDE-constrained optimal control, March 20–30, 2007, Università degli Studi di Milano, Dipartimento di Matematica, Italy.
- Optimal control of partial differential equations, University of Oxford, autumn/winter 2007.
- PDE-constrained optimal control, Mathematics Taught Course Centre/University of Bath, autumn/winter 2012.
- Optimal control and shape design problems in thermomechanics, BMS-WIAS Summer School "Applied Analysis for Materials", August 25–September 5, 2014, Berlin Mathematical School, Technische Universität Berlin, September 1, 2014.
- Variational calculus and optimal control, Norwegian University of Science and Technology, Department of Mathematical Sciences, Trondheim, Norway, October 13–31, 2014.

11 Invited conference talks

- Optimal shape design of inductor coils, Fifth SIAM Conference on Control and its Applications, July 11–14, 2001, San Diego, California, USA, July 14, 2001.
- Modeling and optimal control of the surface hardening of steel, 4 talks, International School on Industrial Mathematics, Siena, Italy, July 23–28, 2001.
- A mathematical model for capacitor resistance welding, 5th International Congress on Industrial and Applied Mathematics (ICIAM 2003), July 7–11, 2003, Sydney, Australia, July 10, 2003.
- Optimal design of inductor coils, 5th International Congress on Industrial and Applied Mathematics (ICIAM 2003), July 7–11, 2003, Sydney, Australia, July 10, 2003.
- Surface hardening of steel — Part I: Optimal design of inductor coils, 9th IEEE International Conference on Methods and Models in Automation and Robotics, August 25–28, 2003, Miedzyzdroje, Poland, August 26, 2003.

- Modelling, simulation and control issues in laser-induced thermotherapy, 13-th European Conference on Mathematics for Industry (ECMI 2004), June 21–25, 2004, Eindhoven University of Technology, Eindhoven, The Netherlands, June 22, 2004.

- On a thermomechanical model of phase transitions in steel, INdAM Workshop "Dissipative Models in Phase Transitions", September 5–11, 2004, Cortona, Italy, September 10, 2004.

- Optimal control of solid-solid phase transitions including mechanical effects, Workshop "Optimal Control of Coupled Systems of PDE", April 17–23, 2005, Mathematisches Forschungsinstitut Oberwolfach, April 22, 2005.

- A thermomechanical phase transition model for the surface hardening of steel, International Conference "Free Boundary Problems: Theory and Applications", June 7–12, 2005, Coimbra, Portugal, June 11, 2005.

- On a thermomechanical model of surface heat treatments, EQUADIFF 11 International conference on differential equations, July 25–29, 2005, Comenius University, Bratislava, Slovakia, July 28, 2005.

- Control of laser material treatments, SIAM Conference on Mathematics for Industry, October 24–26, 2005, Detroit Marriott Renaissance Center, USA, October 25, 2005.

- Von der Stahlhärtung bis zur Krebstherapie — Simulations- und Optimierungsaufgaben in Lehre und Forschung, FEMLAB Konferenz 2005, November 3–4, 2005, Frankfurt am Main, November 3, 2005.

- Optimal control of thermomechanical phase transitions, Workshop "Inverse and Control Problems for PDE's", March 13–17, 2006, Rome, Italy, March 13, 2006.

- Optimal control of laser material treatments, 21st European Conference on Operational Research (EURO XXI), July 3–5, 2006, Reykjavik, Iceland, July 3, 2006.

- Optimal control of a thermomechanical phase transition model, 12th IEEE International Conference on Methods and Models in Automation and Robotics, August 28–31, 2006, Miedzyzdroje, Poland, August 29, 2006.

- Laser surface hardening — modelling, simulation and optimal control, 4th Korean-German Seminar on Applied Mathematics and Physics, September 24–October 1, 2006, Erlangen, September 26, 2006.

- Optimal control of a thermomechanical model of phase transitions in steel (joint with D. Kern), 6th International Congress on Industrial and Applied Mathematics (ICIAM 2007), July 16–20, 2007, ETH Zurich, Switzerland, July 19, 2007.

- The heat treatment of steel — A mathematical control problem, 2nd International Conference on Distortion Engineering 2008, September 17–19, 2008, Bremen, September 19, 2008.

- On a mathematical model for high-speed milling including the dynamics of machine and work-piece, Conference "Direct, Inverse and Control Problems for PDE's" (DICOP 08), September 22–26, 2008, Cortona, Italy, September 26, 2008.

- Prozesskette Stahl, Workshop of MATHEON with Siemens AG (Industry Sector) in cooperation with Center of Knowledge Interchange (CKI) of Technische Universität (TU) Berlin and Siemens AG, TU Berlin, September 29, 2008.

- Coupling of process, machine, and work-piece in production processes — A challenge for industrial mathematics, Workshop "Industrial Mathematics and its Practice", February 23–24, 2009, University of Tokyo, Japan, February 23, 2009.

- Direct and inverse problems related to phase transitions and distortion in modern multi-phase steels, Workshop "Mathematical Models and Analytical Problems for Special Materials", July 9–11, 2009, Università degli Studi di Brescia, Italy, July 9, 2009.

- Distortion compensation — An optimal control approach, 24th IFIP TC 7 Conference on System Modelling and Optimization, July 27–31, 2009, Buenos Aires, Argentina, July 27, 2009.

- Interactions between machine, work-piece, and process dynamics in milling machines, SIAM Conference on Mathematics for Industry: Challenges and Frontiers (MI09), October 9–10, 2009, San Francisco, USA, October 9, 2009.

- On a thermomechanical milling model, Workshop "Rate-independent Systems: Modeling, Analysis, and Computations", August 30–September 3, 2010, Banff International Research Station for Mathematical Innovation and Discovery (BIRS), Canada, August 31, 2010.

- Multiphase steels, heat treatment and distortion — Mathematical challenges in steel production and manufacturing, Summer School "High Performance Computing" (organizer: TU Ilmenau), September 29–October 2, 2010, Upstalsboom Hotel Friedrichshain, Berlin, September 30, 2010.

- Manufacturing and processing of steel — A challenge for industrial mathematics, Forum "Math for Industry" 2010, October 21–23, 2010, Fukuoka, Japan, October 21, 2010.

- A brief introduction to PDE-constrained control, Warsaw Seminar on Industrial Mathematics (WSIM'10), March 18–19, 2010, Warsaw University of Technology, Poland, March 18, 2010.

- Coupling of process, machine, and work-piece in production processes — A challenge for industrial mathematics, Warsaw Seminar on Industrial Mathematics (WSIM'10), March 18–19, 2010, Warsaw University of Technology, Poland, March 19, 2010.

- Identification of phase transition kinetics from dilatometer measurements, 19th International Conference on Computer Methods in Mechanics, May 9–12, 2011, Warsaw University of Technology, Poland, May 11, 2011.

- Optimal boundary coefficient control for parabolic equations, Interfaces and Discontinuities in Solids, Liquids and Crystals (INDI2011), June 20–23, 2011, Gargnano (Brescia), Italy, June 20, 2011.

- Modelling, simulation and control of multiphase steel production, International Congress on Modelling and Simulation (MODSIM 2011), December 12–16, 2011, Perth, Australia, December 15, 2011.

- Optimal control of multiphase induction hardening, 83rd Annual Meeting of the International Association of Applied Mathematics and Mechanics (GAMM 2012), Session on Optimization of differential equations, March 26–30, 2012, Technische Universität Darmstadt, Fachbereich Mathematik, March 29, 2012.

- Optimal control of multiphase steel production, 21st International Symposium on Mathematical Programming (ISMP), August 19–24, 2012, Technische Universität Berlin, August 23, 2012.

- Optimal control of multifrequency induction hardening, INDAM Workshop PDEs for Multiphase Advanced Materials (ADMAT2012), September 17–21, 2012, Cortona, Italy, September 18, 2012.

- On a phase field approach to topology optimization, Mini-Workshop "Geometries, Shapes and Topologies in PDE-based Applications", November 25–December 1, 2012, Mathematisches Forschungsinstitut Oberwolfach, November 27, 2012.

- Modelling, analysis and simulation of multifrequency induction hardening, Forum Math-for-Industry 2013 "The Impact of Applications on Mathematics", November 4–8, 2013, Kyushu University, Fukuoka, Japan, November 7, 2013.

- An optimal shape design approach towards distortion compensation, Equadiff13, MS21 – Recent Trends in PDE-constrained Control and Shape Design, August 26–30, 2013, Prague, Czech Republic, August 29, 2013.

- Modern mathematical tools for process optimization, Course on Trends in Rolling Technology, November 26–27, 2013, POHTO – The Institute of Management and Technological Training, Oulu, Finland, November 26, 2013.

- Nucleation, growth, and grain size evolution in dual phase steels, Workshop "Recent Developments and Challenges in Interface and Free Boundary Problems", March 25–28, 2014, University of Warwick, UK, March 26, 2014.

- Nucleation, growth, and grain size evolution in dual phase steels, The 18th European Conference on Mathematics for Industry 2014 (ECMI 2014), June 9–13, 2014, Taormina, Italy, June 9, 2014.

- Models of induction hardening – An FK limited approach, RIPE60 – Rate Independent Processes and Evolution Workshop, June 24–26, 2014, Mathematical Institute of the Czech Academy of Sciences, Prague, June 25, 2014.

- Oberflächenbearbeitung mit Mathematik, Opel Innovation Day, Rüsselsheim, November 7, 2014.

12 Colloquia and invited seminar talks

- Ein mathematisches Modell für das Widerstandsimpulsschweißen, Universität Bremen, May 7, 2001.
- Induction hardening — modeling, analysis and optimal design, Auburn University, Alabama, USA, July 6, 2001.
- Ein elektro-thermoviskoelastisches Modell für das Widerstandsimpulsschweißen, Universität Konstanz, Fachbereich Mathematik und Statistik, January 29, 2002.
- The surface hardening of steel — Modeling, analysis and optimal control, Technical University of Eindhoven, The Netherlands, October 23, 2002.
- Über ein elektro-thermoviskoelastisches Modell für das Widerstandsimpulsschweißen, Technische Universität Darmstadt, Fachbereich Mathematik, November 14, 2002.
- Modellierung, Analysis und optimale Steuerung der Oberflächenhärtung von Stahl, Technische Universität München, Zentrum Mathematik, November 19, 2002.
- Die Induktionshärtung von Stahl — Mathematische Modellierung und optimales Design von Induktoren, Johannes Kepler Universität Linz, Institut für Numerische Mathematik, Austria, November 20, 2002.
- On a thermoviscoelastic model related to resistance welding, Université Henri Poincaré, Laboratoire de Mathématiques, Nancy, France, December 11, 2002.
- A thermo-viscoelastic model related to capacitor resistance welding, California State University, Department of Mathematics, Northridge, USA, February 19, 2003.
- Widerstandsschweißen und Oberflächenhärtung von Stahl — Modellierung, Analysis und optimale Steuerung, Colloquium of Sfb 393, Technische Universität Chemnitz, Institut für Mathematik, February 13, 2004.
- Thermoelastische Phasenübergänge in Stahl, Humboldt-Universität zu Berlin, Institut für Mathematik, May 13, 2004.
- Simulation und Optimierung der Lasermaterialbearbeitung, Seminar des Forschungsschwerpunktes Photonik, Technische Universität Berlin, Optisches Institut, June 18, 2004.
- On a thermomechanical model of surface heat treatments, University of Tokyo, Department of Mathematical Sciences, Japan, October 14, 2004.
- Optimal control of laser surface hardening, University of Chiba, Department of Mathematics and Informatics, Japan, October 19, 2004.
- The induction hardening of steel — Modelling, analysis and optimal design of inductor coils, University of Kyoto, Department of Mathematics, Japan, October 21, 2004.

- Modellierung, Analysis und optimale Steuerung der Lasermaterialbearbeitung, Kolloquium der Angewandten Mathematik, Universität Münster, December 3, 2004.
- Die Laserhärtung von Stahl — Modellierung, Analysis und optimale Steuerung, Universität Bayreuth, Mathematisches Institut, June 30, 2005.
- Laser material treatments — modeling, simulation, and optimal control, Michigan State University, Department of Mathematics, East Lansing, USA, October 27, 2005.
- Modelling, simulation and control of laser material treatments, Scuola Normale Superiore, Pisa, Italy, November 22, 2005.
- Die Wärmebehandlung von Stahl — ein Optimierungsproblem, Universität Bremen, SFB 570 "Distortion Engineering", March 2, 2006.
- Modellierung, Simulation und Optimierung der Wärmebehandlung von Stahl, Endress+Hauser Flowtec AG, Reinach, Switzerland, May 15, 2006.
- Thermomechanical models of phase transitions — modelling, control and industrial applications, Escuela Politécnica Nacional, Departamento de Matématica, Quito, Ecuador, November 13, 2006.
- On a thermomechanical phase transition model for the heat treatment of steel, Universidad de Cádiz, Departamento de Matemáticas, Puerto Real, Spain, January 15, 2007.
- Mathematical tools for the simulation and control of heat treatments, Delphi, Puerto Real, Spain, January 16, 2007.
- Optimal control of semilinear parabolic equations and an application to laser material treatments (part I), University of Tokyo, Department of Mathematical Sciences, Japan, February 21, 2007.
- Optimal control of semilinear parabolic equations and an application to laser material treatments (part II), University of Tokyo, Department of Mathematical Sciences, Japan, February 22, 2007.
- Mathematics for steel production and manufacturing, Nippon Steel, Kimitsu, Japan, March 1, 2007.
- On a thermomechanical phase transition model for the heat treatment of steel, Fudan University, Department of Mathematics, Shanghai, China, March 5, 2007.
- Mathematics for complex production processes, Comau, Turin, Italy, March 23, 2007.
- Solid-solid phase transitions in steel — modeling, simulation and optimal control, Università di Pavia, Dipartimento di Matematica, Italy, March 27, 2007.
- Thermomechanical phase transition models — analysis, optimal control and industrial applications, University of Oxford, Oxford Centre for Industrial and Applied Mathematics, UK, October 11, 2007.

- Phase transition models for multiphase steels, Industrial and Interdisciplinary Workshop "Problems Related to the Manufacture of Multiphase Steels", University of Oxford, Oxford Centre for Industrial and Applied Mathematics, UK, November 2, 2007.

- Modellierung und Optimierung der Gefügeumwandlung in niedrig legierten Stählen und Anwendungen, Salzgitter Mannesmann Forschung GmbH, February 19, 2008.

- Solid-solid phase transitions — Analysis, optimal control and industrial application, Warsaw University of Technology, Faculty of Mathematics and Information Science, Poland, February 14, 2008.

- Die Wärmebehandlung von Stahl — Thermomechanische Modellierung, Simulation und Optimierung, Technische Universität Dortmund, Fakultät Maschinenbau, January 22, 2009.

- The mathematics of distortion, University of Delaware, Department of Mathematical Sciences, Newark, USA, October 6, 2009.

- Optimal control of heat treatments and stability of milling processes — Two case studies from industrial mathematics, Worcester Polytechnic Institute, Mechanical Engineering Department, USA, October 7, 2009.

- Steel manufacturing — A challenge for applied mathematics, Universität Duisburg-Essen, Fachbereich Mathematik, May 11, 2010.

- The mathematics of distortion, "Seminario Matematico e Fisico di Milano", Università degli Studi di Milano, Dipartimento di Matematica, Italy, March 1, 2010.

- Modelling, simulation and control of phase transformations in steel, Nippon Steel Corporation, Chiba, Japan, September 10, 2010.

- Optimal control problems in thermomechanics, Schwerpunktskolloquium "Analysis und Numerik", Universität Konstanz, Fachbereich Mathematik und Statistik, January 20, 2011.

- Solid-solid phase transitions: From surface hardening of steel to laser thermo-therapy, Southeast University, Department of Mathematics, Nanjing, Republic of China, March 28, 2011.

- Mathematical concepts in steel manufacturing, Fudan University, School of Mathematics, Shanghai, Republic of China, March 29, 2011.

- On the phase field approach to shape and topology optimization, Università degli Studi di Pavia, Dipartimento di Matematica "F. Casorati", Italy, November 15, 2011.

- On the phase field approach to shape and topology optimization, University of Tokyo, Graduate School of Mathematical Sciences, Japan, March 6, 2012.

- Modern multiphase steels: Modelling, simulation and control (part I), Universidad de Cádiz, Departamento de Matemáticas, Spain, April 18, 2012.

- On a phasefield approach towards distortion compensation, Universidad de Cádiz, Departamento de Matemáticas, Spain, April 18, 2012.
- Modern multiphase steels: Modelling, simulation and control (part II), Universidad de Cádiz, Departamento de Matemáticas, Spain, April 19, 2012.
- From dilatometer experiments to distortion compensation — optimal control problems related to solid-solid phase transitions, University of Bath, Department of Mathematical Sciences, UK, October 9, 2012.
- Changing shapes and measuring phase transitions — optimal control problems in thermomechanics, University of Warwick, Mathematics Institute, UK, October 12, 2012.
- On a phase field approach to shape optimization, Université de Paris-Sud, Laboratoire de Mathématiques Analyse Numérique et EDP, France, January 16, 2013.
- Sufficient optimality conditions for a semi-linear parabolic system, University of Tokyo, Graduate School of Mathematical Sciences, Japan, February 27, 2013.
- An optimal shape design approach towards distortion compensation, Fudan University, School of Mathematics, Shanghai, China, March 6, 2013.
- dentification of phase transition kinetics and the generalized Avrami–Kolmogorov model, Nippon Steel & Sumitomo Metal Corporation, Tokyo, Japan, November 11, 2013.
- Multifrequency induction hardening — modelling, analysis, and simulation, Fudan University, School of Mathematical Sciences, Shanghai, China, March 4, 2014.
- Modelling and simulation of multi-frequency induction hardening, Ecole Polytechnique, Laboratoire de Mecanique des Solides, Palaiseau, France, March 13, 2014.
- Nucleation, growth, and grain size evolution in dual phase steels, Wrocław University of Technology, Institute of Mathematics and Computer Science, Poland, July 1, 2014.
- Modelling, simulation and control of surface heat treatments, Norwegian University of Science and Technology, Department of Physics, Trondheim, Norway, October 31, 2014.
- Modelling, analysis and simulation of multifrequency induction hardening, Norwegian University of Science and Technology, Department of Mathematical Sciences, Trondheim, Norway, October 21, 2014.
- Optimal coefficient control for semilinear parabolic equations, Fudan University, School of Mathematical Sciences, Shanghai, China, March 10, 2015.
- A crash course on optimal control, Fudan University, School of Mathematical Sciences, Shanghai, China, March 18, 2015.

13 Talks for a more general public

- Was erforscht eigentlich ein angewandter Mathematiker? WIAS, April 29, 2005.
- Mathematik — Rohstoff für die Industriegesellschaft, 15 Jahre Forschungsverbund Berlin, Urania, Berlin, March 12, 2007.
- Verzieh Dich (bloß nicht) — Über die Modellierung, Simulation und Optimierung der Wärmeausdehnung von Festkörpern, MathInside — Überall ist Mathematik, Urania, Berlin, March 24, 2009.
- Angewandte Mathematik — Beispiele aus der Praxis, Technische Universität Berlin, January 11, 2012.

14 Publications

1. Hömberg, D.: A mathematical model for the phase transitions in eutectoid carbon steel, IMA J. Appl. Math., 54 (1995), 31–57.
2. Hömberg, D.: Irreversible phase transitions in steel, Math. Methods Appl. Sci., 20 (1997), 59–77.
3. Hömberg, D., Sokołowski, J.: Optimal control of laser hardening. Adv. Math. Sci. Appl., 8 (1998), 911–928.
4. Arnăutu, V., Hömberg, D., Sokołowski, J.: Convergence results for a nonlinear parabolic control problem, Numer. Funct. Anal. Optim., 20 (1999), 805–824.
5. Arnăutu, V., Hömberg, D., Sokołowski, J.: On a laser hardening problem. An. Stiint. Univ. Ovidius Constanta Ser. Mat., 6 (1999), 1–7.
6. Hömberg, D., Khludnev, A., Sokolowski, J.: Quasistationary problem for a cracked body with electrothermoconductivity, Interfaces Free Bound., 3 (2001), 129–142.
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