Dr.-Ing. Christoph Meier

Institute for Computational Mechanics (LNM)
Technical University of Munich (TUM)
85748 Garching b. München, Germany

phone	+49-171-2095128
e-mail (private)	christoph.meier984@gmail.com
e-mail (office)	christoph.anton.meier@tum.de
date of birth	25.02.1984
nationality	German
personal	married and two children

Professional Career

01/2024 –	**ERC Starting Grant *ExcelAM*: Group Leader and TUM Juniors Fellow** Technical University of Munich (TUM), Principal investigator and group leader of the ERC Starting Grant project: "Accelerated additive manufacturing: Digital discovery of a new process generation (ExcelAM)"
02/2018 –	**Lecturer, Deputy Head of Institute and Leader of AM Group** Institute for Computational Mechanics (Head: Prof. W.A. Wall), TUM, Scientific co-supervision of nine full-time Ph.D. students at TUM and one full-time Ph.D. student at MIT
08/2016 – 01/2018	**Postdoctoral Fellow** Mechanosynthesis Group (Head: Prof. A.J. Hart), Massachusetts Institute of Technology (MIT), Research project: "Advanced physics-based modeling of metal additive manufacturing processes across length scales"
07/2010 – 07/2016	**Research and Teaching Associate** Institute for Computational Mechanics, TUM

Education

07/2016	**Ph.D. Mechanical Engineering (Dr.-Ing.), TUM** Doctoral thesis: "Geometrically exact finite element formulations for slender beams and their contact interaction", Passed with high distinction (summa cum laude), GPA 1.0, Examination committee: Prof. Ewald Werner (chairman), Prof. Wolfgang A. Wall, Prof. Ignacio Romero (examiners)
07/2010	**Diploma Mechanical Engineering (Dipl.-Ing. Univ.), TUM** Diploma thesis: "Development of a finite element for non-linear beams based on the Frenet-Serret formulas", Institute for Computational Mechanics, TUM, Passed with high distinction (summa cum laude), GPA 1.0, Ranked no. 1 out of 3580 examinees in the period from summer term 2007 (begin of recordings) until winter term 2014/15
10/2007	**Intermediate Examination Mechanical Engineering, TUM** Passed with high distinction (summa cum laude), GPA 1.2, Ranked no. 1 out of 679 examinees within the academic year 2006/07
10/2005 – 07/2010	**Diploma Studies Mechanical Engineering, TUM** Specialization in "Materials Engineering" and "Fundamentals in Engineering Sciences"

07/2005	**High-School Diploma (Fachgeb. Hochschulreife), BOS Landshut** Passed with high distinction (summa cum laude), GPA 1.0
09/2003 – 07/2005	**Upper Vocational School (BOS) Landshut** Continuation education after apprenticeship
07/2003	**Certificate of Apprenticeship (Gesellenbrief)** Passed with high distinction (summa cum laude), GPA 1.0
09/2000 – 07/2003	**Apprenticeship as Tool Mechanic at BMW AG, Dingolfing** Abbreviated apprenticeship due to excellent performance Focus on tooling and manufacturing technologies

Parental Leaves

03/2019 – 05/2020	**Three-Month Parental Leave and Six-Month Part-Time Work**
07/2021 – 08/2021	**Two-Month Parental Leave**

Honors and Awards

10/2017	**ERC Starting Grant Project *ExcelAM*** Principle investigator of the ERC Starting Grant project: “Accelerated additive manufacturing: Digital discovery of a new process generation (ExcelAM)”
07/2017	**Rudolf Schmidt-Burkhardt Memorial Prize of TUM** With an endowment of 10.000 Euro, this is the highest PhD award in the Department of Mechanical Engineering of TUM
04/2017	**Finalist of the ECCOMAS Award for the Best PhD Thesis of 2016 on Computational Methods in Applied Sciences and Engineering** The prize has been granted by the European Community on Computational Methods in Applied Sciences (ECCOMAS)
03/2017	**Dr.-Klaus-Körper Prize for the Best PhD Thesis of 2016 in the Fields of Applied Mathematics and Mechanics** The prize has been granted by the international Association of Applied Mathematics and Mechanics (GAMM)
01/2017	**GAMM Juniors Fellowship of the International Association of Applied Mathematics and Mechanics (GAMM)** Every year, only 10 candidates are selected based on an excellent Ph.D. thesis in the fields of Applied Mathematics or Mechanics
03/2016	**Postdoctoral Fellowship (18 months) of the German Academic Exchange Service (DAAD)**
07/2015	**Ranked as Best Diploma Graduate in Mechanical Engineering at TUM since recordings began in 2007** No. 1 out of 3580 examinees from summer term 07 - winter term 14/15
12/2012	**Teaching Award of the Bavarian State Government** Only one assistant lecturer out of all Bavarian universities receives this annual award
05/2012	**Golden Needle and Award for Excellence in Teaching of TUM**
07/2012	**Teaching Award within the Annual Teaching Evaluation of the Department of Mechanical Engineering, TUM**
07/2011	**Teaching Award within the Annual Teaching Evaluation of the Department of Mechanical Engineering, TUM**
07/2011	**Award for the Best Final Degree in Mechanical Engineering in the Academic Year 2010/2011, TUM**

11/2010	**CADFEM and ANSYS Diploma Thesis Award** Awarded for an excellent diploma thesis in engineering
10/2007 – 07/2010	**Full Scholarship of the German National Academic Foundation** Less than 1% of all students were granted this scholarship
03/2007 – 06/2010	**Fastlane Fellowship of BMW** Less than 5% of former BMW trainees / interns were granted this fellowship

Professional Service

11/2021 –	**GAMM Fachausschuss "Moderne Lehre und Didaktik in der Mathematik und Mechanik"**
06/2018 –	**Organization of International Scientific Conferences and Advanced Teaching Courses as well as Minisymposia at Scientific Conferences**
01/2018 –	**Mentor for Ph.D. Students in the TUM Graduate School**
01/2017 – 01/2020	**GAMM Juniors Committee**
08/2016 –	**Reviewer for more than 20 Leading International Journals and Various Funding Agencies in Engineering Science**

Memberships

01/2017 –	**International Association of Applied Mathematics and Mechanics (GAMM)**
11/2016 –	**European Community on Computational Methods in Applied Sciences (ECCOMAS)**
11/2016 –	**German Association for Computational Mechanics (GACM)**
11/2016 –	**International Association for Computational Mechanics (IACM)**

Publications

Overview and Citation Metrics

- 34 articles in peer-reviewed scientific journals (plus 7 currently submitted)
- > 30 invited and contributed presentations at international conferences / workshops
- > 1600 citations in total / h-Index of 18 (Google Scholar)
- > 1000 citations in total / h-Index of 16 (Scopus)

Peer-Reviewed International Journal Articles

[1] Proell, S.D., Brotz, J., Kronbichler, M., Wall, W.A., Meier, C. (2024): A highly efficient computational approach for part-scale microstructure predictions in Ti-6Al-4V additive manufacturing, **submitted for publication**, arXiv preprint arXiv:2402.17580

[2] Schreter-Fleischhacker, M., Munch, P., Much, N., Kronbichler, M., Wall, W.A., Meier, C. (2024): A consistent diffuse-interface model for two-phase flow problems with rapid evaporation, **submitted for publication**, arXiv preprint arXiv:2401.07805

[3] Much, N., Schreter-Fleischhacker, M., Munch, P., Kronbichler, M., Wall, W.A., Meier, C. (2024): Improved accuracy of continuum surface flux models for metal additive manufacturing melt pool simulations, **submitted for publication**, arXiv preprint arXiv:2401.12114

[4] Satheesh, A., Schmidt, C.P., Wall, W.A., Meier, C. (2024): A novel mesh regularization approach based on finite element distortion potentials: Application to material expansion processes with extreme volume change, **submitted for publication**, arXiv preprint arXiv:2307.07582

[5] Weissbach, R., Praegla, P.M., Wall, W.A., Hart, A.J., Meier, C. (2024): Novel simulation-inspired roller spreading strategies for fine and highly cohesive metal powders, **submitted for publication**, arXiv preprint arXiv:2306.06013

[6] Praegla, P.M., Mair, T., Wimmer, A., Fuchs, S.L., Zäh, M.F., Wall, W.A., Meier, C. (2024): Towards additively manufactured structures with powder inclusions for controllable dissipation: The critical influence of packing density, **submitted for publication**, arXiv preprint arXiv:2302.08371

[7] Steinbrecher, I., Hagmeyer, N., Meier, C., Popp, A. (2024): A consistent mixed-dimensional coupling approach for 1D Cosserat beams and 2D solid surfaces, **submitted for publication**, arXiv preprint arXiv:2210.16010

[8] Grill, M.J., Wall, W.A., Meier, C. (2024): Asymptotically consistent and computationally efficient modeling of short-ranged molecular interactions between curved slender fibers undergoing large 3D deformations, **accepted for publication**, arXiv preprint arXiv:2208.03149

[9] Penny, R.W., Oropeza, D., Praegla, P.M., Weissbach, R., Meier, C., Wall, W.A., Hart, A.J. (2024): Quantitative analysis of thin metal powder layers via transmission X-ray imaging and discrete element simulation: Blade-based spreading approaches, Powder Technology, 432:119106

[10] Penny, R.W., Oropeza, D., Praegla, P.M., Weissbach, R., Meier, C., Wall, W.A., Hart, A.J. (2024): Quantitative analysis of thin metal powder layers via transmission X-ray imaging and discrete element simulation: Roller-based spreading approaches, Powder Technology, 432:119105

[11] Satheesh, A., Schmidt, C.P., Wall, W.A., Meier, C. (2024): Structure-preserving invariant interpolation schemes for invertible second-order tensors, International Journal for Numerical Methods in Engineering, 125:e7373

[12] Proell, S.D., Munch, P., Kronbichler, M., Wall, W.A., Meier, C. (2023): A highly efficient computational framework for fast scan-resolved simulations of metal additive manufacturing processes on the scale of real parts, Additive Manufacturing, 103921

[13] Meier, C., Grill, M.J., Wall, W.A. (2023): Generalized section-section interaction potentials in the geometrically exact beam theory: modeling of intermolecular forces, asymptotic limit as strain-energy function, and formulation of rotational constraints, International Journal of Solids and Structures, 276:112255

[14] Grill, M.J., Wall, W.A., Meier, C. (2023): Analytical disk-cylinder interaction potential laws for the computational modeling of adhesive, deformable (nano)fibers, International Journal of Solids and Structures, 112175

[15] Schneider, C., Schmidt, C.P., Neumann, A., Clausnitzer, M., Sadowski, M., Harm, S., Meier, C., Danner, T., Albe, K., Latz, A., Wall, W.A., Lotsch, B.V. (2023): Effect of particle size and pressure on the transport properties of the fast ion conductor t-Li7SiPS8, Advanced Energy Materials, 13: 2203873

[16] Faraji, M. , Seitz, A., Meier, C., Wall, W.A. (2023): A mortar finite element formulation for large deformation lubricated contact problems with smooth transition between mixed, elasto-hydrodynamic, and full hydrodynamic lubrication, Tribology Letters, 71:11

[17] Fuchs, S.L., Praegla, P.M., Cyron, C.J., Wall, W.A., Meier, C. (2022): A versatile SPH modeling framework for coupled microfluid-powder dynamics in additive manufacturing: binder jetting, material jetting, directed energy deposition and powder bed fusion, Engineering with Computers, 1-25

[18] Proell, S.D., Wall, W.A., Meier, C. (2021): A simple yet consistent constitutive law and mortar-based layer coupling schemes for thermo-mechanical macroscale simulations of metal additive manufacturing processes, Advanced Modeling and Simulation in Engineering Sciences, 8:1-37

[19] Steinbrecher, I., Popp, A., Meier, C. (2021): Consistent coupling of positions and rotations for embedding 1D Cosserat beams into 3D solid volumes, Computational Mechanics, 1-32

[20] Meier, C., Fuchs, S.L., Much, N., Nitzler, J., Penny, R.W., Praegla, P.M., Proell, S.D., Sun, Y., Weissbach, R., Schreter, M., Hodge, N.E., Hart, A.J., Wall, W.A. (2021): Physics-based modeling and predictive simulation of powder bed fusion additive manufacturing across length scales, GAMM-Mitteilungen, published online, doi:https://doi.org/10.1002/gamm

[21] Penny, R.W., Praegla, P.M., Ochsenius, M., Oropeza, D., Weissbach, R., Meier, C., Wall, W.A., Hart, A.J. (2021): Spatial mapping of powder layer density for metal additive manufacturing via transmission X-ray imaging, Additive Manufacturing, 46:102197

[22] Nitzler*, J., Meier*, C., Müller, K.W., Wall, W.A., Hodge, N.E. (2021): A novel physics-based and data-supported microstructure model for part-scale simulation of laser powder bed fusion of Ti-6Al-4V, Advanced Modeling and Simulation in Engineering Sciences, 8:1-39
*shared first-authorship

[23] Fuchs, S.L., Meier, C., Wall, W.A., Cyron, C.J. (2021): An SPH framework for fluid-solid and contact interaction problems including thermo-mechanical coupling and reversible phase transitions, Advanced Modeling and Simulation in Engineering Sciences, 8:15

[24] Fuchs, S.L., Meier, C., Wall, W.A., Cyron, C.J. (2021): A novel smoothed particle hydrodynamics and finite element coupling scheme for fluid-structure interaction: the sliding boundary particle approach, Computer Methods in Applied Mechanics and Engineering, 383:113922

[25] Grill, M.J., Eichinger, J.F., Koban, J., Meier, C., Lieleg, O., Wall, W.A. (2021): A novel modeling and simulation approach for the hindered mobility of charged particles in biological hydrogels, Proceedings of the Royal Society A, 477: 20210039

[26] Meier, C., Fuchs, S.L., Hart, A.J., Wall, W.A. (2021): A novel smoothed particle hydrodynamics formulation for thermo-capillary phase change problems with focus on metal additive manufacturing melt pool modeling, Computer Methods in Applied Mechanics and Engineering, 381:113812

[27] Steinbrecher, I., Mayr, M., Grill, M.J., Kremheller, J., Meier, C., Popp, A. (2020): A mortar-type finite element approach for embedding 1D beams into 3D solid volumes, Computational Mechanics, 66:1377-1398

[28] Grill, M.J., Meier, C., Wall, W.A. (2019): Investigation of the peeling and pull-off behavior of adhesive elastic fibers via a novel computational beam interaction model, The Journal of Adhesion, 1-30

[29] Grill, M.J., Wall, W.A., Meier, C. (2020): A computational model for molecular interactions between curved slender fibers undergoing large 3D deformations with a focus on electrostatic,

van der Waals, and repulsive steric forces, International Journal for Numerical Methods in Engineering, 121:2285-2330

[30] Proell, S.D., Wall, W.A., Meier, C. (2020): On phase change and latent heat models in metal additive manufacturing process simulation, Advanced Modeling and Simulation in Engineering Sciences, 7:1-32

[31] Pattinson, S.W., Huber, M.E., Kim, S., Lee, J., Grunsfeld, S., Roberts, R. Dreifus, G. Meier, C.Liu, L., Hogan, N., Hart, A.J. (2019): Additive manufacturing of biomechanically tailored meshes for compliant wearable and implantable devices, Advanced Functional Materials, 29:1901815

[32] Meier, C., Weissbach, R., Weinberg, J., Wall, W.A., Hart, A.J. (2019): Modeling and characterization of cohesion in fine metal powders with a focus on additive manufacturing process simulations, Powder Technology, 343:855-866

[33] Meier, C., Weissbach, R., Weinberg, J., Wall, W.A., Hart, A.J. (2019): Critical influences of particle size and adhesion on the powder layer uniformity in metal additive manufacturing, Journal of Materials Processing Technology, 266:484-501

[34] Meier, C., Popp, A., Wall, W.A. (2019): Geometrically exact finite element formulations for slender beams: Kirchhoff-Love theory versus Simo-Reissner theory, Archives of Computational Methods in Engineering, 26:163-243

[35] Meier, C., Grill, M., Wall, W.A., Popp, A. (2018): Geometrically exact finite elements and smooth contact schemes for the modeling of fiber-based materials and structures, International Journal of Solids and Structures, 154:124-146

[36] Meier, C., Penny, R., Zou, Y., Gibbs, J.S., Hart, A.J. (2017): Thermophysical phenomena in metal additive manufacturing by selective laser melting: Fundamentals, modeling, simulation and experimentation, Annual Review of Heat Transfer, 20:241-316

[37] Meier, C., Wall, W.A., Popp, A.: Unified approach for beam-to-beam contact (2017), Computer Methods in Applied Mechanics and Engineering, 315:972-1010

[38] Meier, C., Popp, A., Wall, W.A.: A finite element approach for the line-to-line contact interaction of thin beams with arbitrary orientation (2016), Computer Methods in Applied Mechanics and Engineering, 308:377-413

[39] Müller, K.W., Meier, C., Wall, W.A. (2015): The resolution of sub-element length scales in Brownian dynamics of biopolymer networks with geometrically exact beam finite elements, Journal of Computational Physics, 303C:185-202

[40] Meier, C., Popp, A., Wall, W.A. (2015): A locking-free finite element formulation and reduced models for geometrically exact Kirchhoff rods. Computer Methods in Applied Mechanics and Engineering, 290:314-341

[41] Meier, C., Popp, A., Wall, W.A. (2014): An objective 3D large deformation finite element formulation for geometrically exact curved Kirchhoff rods. Computer Methods in Applied Mechanics and Engineering, 278:445-478

Peer-Reviewed Proceedings and Other Articles

[42] Wall, W.A., Cyron, C.J., Klöppel, T., Meier, C., Müller, K.W. (2011): Coupled problems on the cellular and sub-cellular scale, 4th International Conference on Computational Methods for Coupled Problems in Science and Engineering, Kos Island, Greece

[43] Müller, K.W., Meier, C., Wall, W.A. (2015): Brownian dynamics simulation of cellular protein networks, IACM expressions, 37:2-5

Ph.D. Thesis

[44] Meier, C. (2016): Geometrically exact finite element formulations for slender beams and their contact interaction, TUM

10 Selected Presentations at International Scientific Conferences

[1] Generalized section-section interaction potentials in the geometrically exact beam theory (**plenary lecture**), International Conference on Highly Flexible Slender Structures, Rijeka, Republic of Croatia, September 2023

[2] Solids (and fluids) in (inter-)action (**plenary lecture**), given by W.A. Wall, 10th International Congress on Computational Mechanics, Virtual Congress, 2021

[3] A mesoscale powder spreading and melt pool model for metal powder bed fusion additive manufacturing process simulation, 14th World Congress in Computational Mechanics (WCCM), Virtual Congress, 2021

[4] Critical influences of particle size and adhesion on the powder layer uniformity in metal additive manufacturing (**keynote lecture**), 2nd International Conference on Simulation for Additive Manufacturing (Sim-AM), Pavia, Italy, 2019

[5] Metal additive manufacturing by selective laser melting: modeling and simulation approaches across length scales, 13th World Congress on Computational Mechanics (WCCM), New York, USA, 2018

[6] Geometrically exact finite element formulations for highly slender beams and their interaction: Kirchhoff-Love theory vs. Simo-Reissner theory, 6th European Conference on Computational Mechanics (ECCM), Glasgow, UK, 2018

[7] Nonlinear contact modeling for geometrically exact beam finite element formulations (**plenary lecture**), given by A. Popp, 4th ECCOMAS Young Investigators Conference (YIC), Milan, Italy, 2017

[8] Geometrically exact finite element formulations for slender beams: Kirchhoff-Love theory vs. Simo-Reissner theory, 14th US National Congress on Computational Mechanics (USNCCM), Montreal, Canada, 2017

[9] Modeling of highly slender fibers based on geometrically exact Kirchhoff beam elements and a unified contact approach, Euromech Colloquium 569 – Multiscale modeling of fibrous and textile materials, Châtenay-Malabry, France, 2016

[10] A finite element approach for contact interaction of thin beams with arbitrary orientation, 4th International Conference on Computational Contact Mechanics (ICCCM), Hannover, Germany, 2015

5 Selected Other Scientific Presentations on Invitation

[1] Modeling and simulation of powder bed fusion additive manufacturing across length scales, Vulcan Forms, Online Presentation, 2021

[2] Cosserat continuum models for molecular and macroscale interactions of slender fibers, Leopold-Franzens-Universität Innsbruck, Österreich, 2019

[3] Modeling of the powder recoating process in metal additive manufacturing, Desktop Metal (DM), Burlington, USA, 2018

[4] Geometrically exact finite element formulations for slender beams: Kirchhoff-Love theory vs. Simo-Reissner theory, Fraunhofer Institute for Industrial Mathematics (ITWM), Kaiserslautern, 2017

[5] Invitation to the priority meeting "*Modeling of Powder Dynamics in Metal Additive Manufacturing*"*, Austin, USA, 2017

*Only 100 researchers from industry, U.S. national laboratories, and academia have been selected to identify priority research directions with respect to powder spreading in metal additive manufacturing processes.

Research

Research Interests

Fields of Application

- Physics-based and data-integrated modeling and simulation of additive manufacturing (AM):
  - different process technologies:
    laser powder bed fusion (LPBF)
    binder jetting (BJ)
    directed energy deposition (DED)
    material jetting (MJ)
  - different length scales:
    macroscale (part-scale thermo-solid-mechanics)
    mesoscale (multi-phase flow with phase change, cohesive powders)
    microscale (microstructure evolution)
  - objectives:
    new insights and fundamental understanding through physics-based simulations
    multi-objective process and part optimization
    digital discovery of new process strategies and regimes
- Design-optimized structures and materials through additive manufacturing:
  - fiber-based materials and structures with complex fiber arrangements / interactions
  - metamaterials for controllable dissipation (e.g., with powder/polymer inclusions)
  - slender and thin-walled lightweight structures

Fundamental Research in Method Development

- Computational mechanics with focus on finite element methods (FEM), discrete element methods (DEM), and smoothed particle hydrodynamics (SPH)
- Computational solid and structural mechanics
- Mechanics of cohesive powders
- Multi-phase flow with solid-liquid and liquid-vapor phase transitions
- Mechanics of slender structures and their embedding in 3D continua
- Contact and interface mechanics (including, e.g., adhesion, lubrication, surface tension)
- Coupled thermomechanical modeling
- Material modeling and identification
- Multi-scale and multi-physics modeling
- Model order reduction / dimensional reduction
- Data-integration and machine learning
- Bayesian schemes for uncertainty quantification, inverse analysis and optimization
- Software development
- High performance computing (HPC)

Raised Funding

- *Accelerated additive manufacturing: Digital discovery of a new process generation (ExcelAM)*
  ERC Starting Grant: European Research Council (ERC)
  Funding: **€ 1,500,000** / 5 years, 2024 – 2029
  Personal Role: PI
  Collaborators: Prof. A. John Hart (MIT, USA), Prof. Jürgen Eckert (Montanuniversität Leoben, Austria), Dr. Neil Hodge (Lawrence Livermore National Laboratory, USA)

- *In-situ metrology, inverse analysis and first-principle modelling for the physics- and data-based prediction of highly non-linear material behavior and failure in manufacturing processes*
  DFG Research Grant: German Research Foundation (DFG), Germany
  Funding: **€ 350,000** / 2 years, 2024 – 2026
  Personal Role: PI
  Further PIs: Prof. Wolfram Volk, Dr. Christoph Hartmann, Prof. Wolfgang A. Wall (all TUM)

- *Scale-up of metal AM by data-based synthesis of simulation and experiment*
  MIT-Germany Lockheed Martin Seed Fund: MIT, USA
  Funding: **€ 18,000** / 18 months, 2022 – 2024
  Personal Role: PI
  Further PI: Prof. A. John Hart (MIT, USA)

- *Highly efficient numerical model for forward and inverse problems in the physics-based simulation of metal additive manufacturing processes on part scale*
  DFG Research Grant: German Research Foundation (DFG), Germany
  Funding: **€ 245,000** / 3 years, 2020 - 2023
  Personal Role: PI
  Further PI: Prof. Wolfgang A. Wall (TUM)

- *Development, numerical simulation and experimental characterization of selective laser melting (SLM) microstructures with deliberately introduced dissipation*
  DFG Research Grant: German Research Foundation (DFG), Germany
  Funding: **€ 470,000** / 3 years, 2020 - 2023
  Personal Role: Co-PI
  Further PIs: Prof. Michael Zäh (TUM), Prof. Wolfgang A. Wall (TUM)

- *Advanced finite element modeling of selective laser melting processes*
  Postdoctoral Research Fellowship: German Academic Exchange Service (DAAD), Germany
  Funding: **€ 60,000** / 18 months, 2016 - 2018
  Personal Role: PI
  Collaborator and Host: Prof. A. John Hart (MIT, USA)

Selected Funding with Significant Contribution

- *Combined phase field/DG-FEM modeling of multi-phase flow problems – a modern approach for high-fidelity metal additive manufacturing process simulations*
  Erwin Schrödinger Fellowship: Austrian Science Fund (FWF), Austria
  Funding: **€ 55,000** / 18 months, 2021 – 2022
  Personal Role: Proposal conceptualization and writing (co-author), host of the PI
  PI: Magdalena Schreter, University of Innsbruck, Austria

- *A multiscale experimental–computational study of the mechanobiology of tissue shaping*
  EuroTech PhD Program: EuroTech Universities alliance
  Funding: **€ 172,000** / 4 years, 2023 – 2027
  Personal Role: Proposal conceptualization and writing (co-author), host of the PhD candidate
  PI: Prof. Nicholas Kurniawan, Technical University of Eindhoven, the Netherlands

Organization of Scientific Conferences and Courses

- Member of the Scientific Committee: 2nd International Conference on Highly Flexible Slender Structures (HFSS), Kaiserslautern, Germany, 2025
- Meier*+, C., Hart*+, A.J., Colosimo+, B.M., Eckert+, J., Gusarov+, A., Hodge+, N.: Metal additive manufacturing: fundamentals, modeling, materials, and implementation, CISM advanced course at the International Centre for Mechanical Science (CISM), Udine, Italy, 2021
  *main organizers, +lecturers

Organization of Minisymposia at International Scientific Conferences

- Hattel, J., Lundbäck, A., Kollmannsberger, S., Chiumenti, M., Meier, C., To, A.: Modeling and simulation for additive manufacturing, Organization of minisymposium at the 9th European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS), *Lisboa, Portugal, 2024*
- Chiumenti, M., Bartel, T., Osaka, Y.K., Kollmannsberger, S. Lundback, A., Meier, C., Spear, A., To, A., Wagner, G., Zhao, Y.F.: Modeling and simulation for additive manufacturing, Organization of minisymposium at the 16th World Congress on Computational Mechanics (WCCM), Vancouver, Canada, 2024
- Escalona, J., Gerstmayr, J., Meier, C. and Vetyukov, Y.: Contact and friction in mechanics of flexible slender structures, Organization of minisymposium at the International Conference on Highly Flexible Slender Structures (HFSS), Rijeka, Republic of Croatia, 2023
- Meier, C., Wudy, K., Bartel, T., Menzel, A., Chiumenti, M., Hodge, N.: Simulation and experimental validation of metal additive manufacturing processes on part-scale, Organization of invited session at the 4th International Conference on Simulation for Additive Manufacturing (Sim-Am), Munich, Germany, scheduled for 2023
- Meier, C., Kollmannsberger, S., Bartel, T., Auricchio, F.: Modeling and simulation of metal additive manufacturing processes, Organization of minisymposium at the 9th GACM Colloquium on Computational Mechanics (GACM), Essen, Germany, 2022
- Meier, C., Chiumenti, M. Hodge, N., Cervera, M., Wall, W.A.: Modeling and simulation approaches of metal additive manufacturing on part scale, Organization of minisymposium at the 15th World Congress on Computational Mechanics (WCCM), Yokohama, Japan, 2022
- Romero, I., Meier, C., Linn, J., Oesterle, B.: New numerical methods for slender bodies and their interactions, Organization of minisymposium at the 15th World Congress on Computational Mechanics (WCCM), Yokohama, Japan, 2022
- Meier, C., Hodge, N., Chiumenti, M., Wall, W.A.: Modeling and simulation approaches in metal additive manufacturing, Organization of minisymposium at the 14th World Congress on Computational Mechanics (WCCM), Paris, France, 2021
- Meier, C., Romero, I., Linn, J., Durville, D., Gerstmayr, Zupan, D., Betsch, P.: Advances in the modeling and discretization of slender continua and their interaction, Organization of minisymposium at the 14th World Congress on Computational Mechanics (WCCM), Paris, France, 2020 [shifted to digital version in 2021 due to COVID-19 pandemic]
- Eisenträger, J., Kaiser, T., Meier, C.: Organization of the YAMM (Young Academics Meet Mentors) Lunch at the 90th Annual Meeting of the International Association of Applied Mathematics and Mechanics (GAMM), Vienna, Austria, 2019
- Meier, C., Durville, D., Brüls, O., Gerstmayr, J., Linn, J.: Modeling and discretization approaches for slender continua and their interaction, Organization of minisymposium at the 6th European Conference on Computational Mechanics (ECCM), Glasgow, UK, 2018

Reviewing Activities for International Journals

- Acta Mechanica
- Additive Manufacturing
- Applied Mathematical Modelling
- Applied Physics A
- Archive of Applied Mechanics
- Computers and Structures
- Computational Mechanics
- Computer Methods in Applied Mechanics and Engineering
- GAMM-Mitteilungen
- Granular Matter
- Integrating Materials and Manufacturing Innovation
- International Journal for Numerical Methods in Engineering
- International Journal of Mechanical Sciences
- International Journal of Non-Linear Mechanics
- International Journal of Solids and Structures
- Journal of Theoretical, Computational and Applied Mechanics
- Mechanics Based Design of Structures and Machines
- Mechanical Sciences
- Metals
- Multibody System Dynamics
- Powder Technology
- Progress in Additive Manufacturing
- Zeitschrift für Angewandte Mathematik und Mechanik

Reviewing Activities for Research Agencies

- European Union: Marie Skłodowska-Curie COFUND doctoral programs
- European Research Council (ERC): ERC Consolidator Grant
- German Research Foundation (DFG)
- Czech Science Foundation (CSF)
- Swiss National Science Foundation (SNSF)
- National Science Centre Poland (NCN)

National and International Collaborations (Joint Publications or Research Funding)

- Prof. Karsten Albe – Technical University of Darmstadt, Germany
- Prof. Christian J. Cyron – Hamburg University of Technology / Helmholtz Centre Hereon in Geesthacht, Germany
- Prof. A. John Hart – Massachusetts Institute of Technology, USA
- Dr. Christoph Hartmann – TUM, Germany
- Dr. Neil E. Hodge – Lawrence Livermore National Laboratory, USA
- Prof. Stefan Kollmannsberger – Bauhaus Universität Weimar, Germany
- Prof. Martin Kronbichler – University of Augsburg, Germany
- Prof. Arnulf Latz – University of Ulm, Germany
- Prof. Bettina von Lotsch – Ludwig-Maximilians University in Munich / Max Planck Institute for Solid State Research in Stuttgart, Germany
- Prof. Oliver Lieleg – TUM, Germany
- Dr. Matthias Mayr – University of the Bundeswehr Munich, Germany
- Dr. Daniel Oropeza – Massachusetts Institute of Technology, USA
- Prof. Sebastian W. Pattinson – University of Cambridge, UK
- Prof. Alexander Popp – University of the Bundeswehr Munich / German Aerospace Center (DLR) in St. Augustin, Germany
- Dr. Magdalena Schreter – University of Innsbruck, Austria
- Dr. Ivo Steinbrecher – University of the Bundeswehr Munich, Germany
- Prof. Wolfram Volk – TUM, Germany
- Prof. Wolfgang A. Wall – TUM, Germany
- Dr. Thomas Wimmer – TUM, Germany
- Prof. Katrin Wudy – TUM, Germany
- Prof. Michael Zäh – TUM, Germany

Extended Scientific Network (Joint Organization of Scientific Events)

- Prof. Ferdinando Aurricchio – University of Pavia, Italy
- Dr. Thorsten Bartel – Technical University of Dortmund, Germany
- Prof. Peter Betsch – University of Siegen, Germany
- Prof. Olivier Brüls – University of Liège, Belgium
- Prof. Miguel Cervera – Technical University of Catalonia, Spain
- Prof. Michele Chiumenti – Technical University of Catalonia, Spain
- Prof. Bianca Colosimo – Polytechnic University of Milan, Italy
- Dr. Damien Durville – Centrale Supélec, France
- Prof. Jürgen Eckert – Montan Universität Leoben, Austria
- Prof. José L. Escalona - University of Seville, Spain
- Prof. Johannes Gerstmayr – University of Innsbruck, Austria
- Prof. Andrey Gusarov – Moscow State Technological University, Russia
- Dr. Joachim Linn – Fraunhofer Institute for Industrial Mathematics Kaiserslautern, Germany
- Prof. Andreas Menzel – Technical University of Dortmund, Germany
- Dr. Bastian Oesterle – University of Stuttgart, Germany
- Prof. Ignacio Romero – Universidad Politécnica de Madrid, Spain
- Dr. Yury Vetyukov – Technical University of Vienna, Austria
- Prof. Dejan Zupan – University of Ljubljana

General Research Philosophy

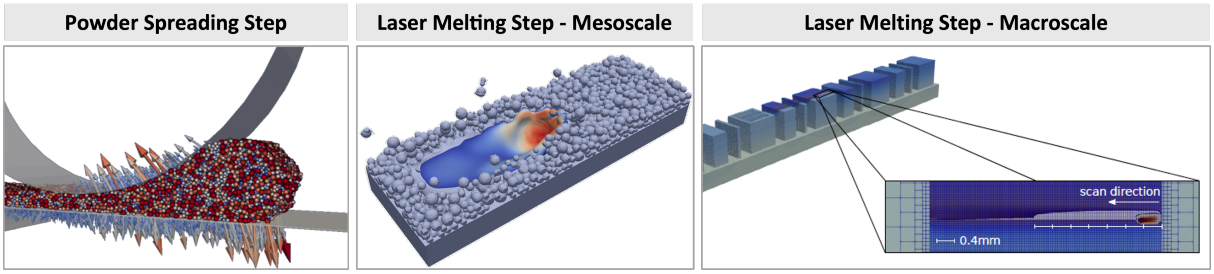
Application-Motivated Fundamental Research

- Guideline: Pushing state-of-the art in Computational Modeling AND in Additive Manufacturing (AM)
  - novel physics-based and data-supported modeling approaches and numerical methods
  - novel insights, fundamental understanding, and process strategies / technologies in AM
- Unique research infrastructure
  - research code BACI at TUM
  - custom-built AM devices at MIT

  } novel methods and highest flexibility far beyond the capabilities of commercial tools / systems
- Unique personal background and expertise
  - strong methodological expertise in computational mechanics (Ph.D, diploma studies)
  - well-founded application-oriented expertise in AM (postdoc time at MIT, apprenticeship)

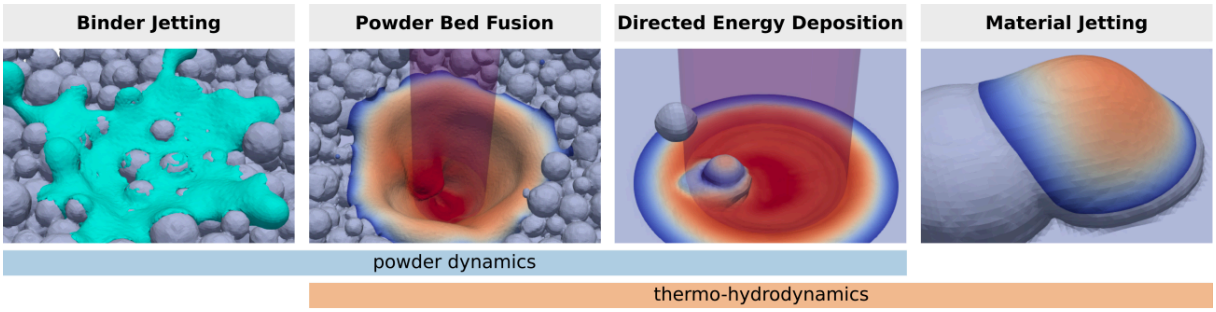
Integrated and Cross-Disciplinary Research

- Multiphysics and multiscale modeling along entire process chain (i.e., multiple processing steps)
- Integration of related research disciplines and enabling technologies
  - AM applications and process technology
  - materials science and engineering fundamentals
  - data sciences and applied mathematics
  - code development and high-performance computing



Process- and Material-Overarching Research

- Exploiting synergies in the modeling of multiple AM process classes such as
  - laser powder bed fusion (LPBF)
  - binder jetting (BJ)
  - directed energy deposition (DED)
  - material jetting (MJ)
- Exploiting synergies in the modeling of multiple AM material classes such as
  - metals
  - ceramics
  - polymers
  - concrete



Teaching

Teaching Experience as Lecturer

- *Physics-Based Modeling and Simulation of Metal Additive Manufacturing*, lecture, M.Sc.
  Department of Mechanical Engineering, TUM,
  winter terms 2023/24[+^], 2022/23[+^], 2021/22[+^]
- *Nonlinear Continuum Mechanics*, lecture, M.Sc.
  Department of Mechanical Engineering, TUM
  winter terms 2023/24, 2022/23, 2021/22, 2020/21, 2019/20, 2018/19
- *Computational Solid and Fluid Dynamics*, lecture, B.Sc.
  Munich School of Engineering (MSE), TUM
  winter terms 2020/21[+], 2019/20[+], 2018/19[+]
- *Research Topics in Computational Mechanics – Additive Manufacturing*, lecture, M.Sc.
  Department of Mechanical Engineering, TUM
  winter terms 2020/21[^], 2019/20
- *Finite Elements*, lecture, M.Sc.
  Department of Mechanical Engineering, TUM
  winter term 2023/24
- *Nonlinear Finite Element Methods*, lecture, M.Sc.
  Department of Mechanical Engineering, TUM
  summer terms 2024, 2023, 2022, 2021, 2020
  summer terms 2019, 2018 - selected chapters (with W.A. Wall)
- *Engineering Mechanics 1 – Statics*, lecture, B.Sc.
  Department of Mechanical Engineering, TUM
  winter term 2018/19* – selected chapters (with W.A. Wall)
- *Engineering Mechanics 2 – Elastostatics*, lecture, B.Sc.
  Department of Mechanical Engineering, TUM
  summer term 2019* – selected chapters (with W.A. Wall)
- *Engineering Mechanics 3 – Dynamics*, exercises and tutorials, B.Sc.
  Department of Mechanical Engineering, TUM
  winter term 2011/12*
- *Engineering Mechanics 2 – Elastostatics*, exercises and tutorials, B.Sc.
  Department of Mechanical Engineering, TUM
  summer term 2011*
- *Engineering Mechanics 1 – Statics*, exercises and tutorials, B.Sc.
  Department of Mechanical Engineering, TUM
  winter term 2010/11*

*Attended by up to 1000 undergraduate students
[+]English lecture
[^]joint lecture for students from TUM, MIT and Polimi

Invitation as Guest Lecturer

- A highly efficient computational approach for fast scan-resolved simulations of metal additive manufacturing processes on the scale of real parts, seminar, École Polytechnique Paris, 2024
- *Scan Path-Resolved Simulation of Laser Powder Bed Fusion Additive Manufacturing on the Scale of Realistic Parts,* seminar, MIT, 2023
- *Summer school in Computational Mechanics of Materials and Structures*, lecture, M.Sc.
  COMMAS program, University of Stuttgart, 2019
- *Additive Manufacturing: From 3D Printing to the factory floor*, short course, M.Sc.
  MIT, 2018 and 2017

Evaluation Results

- *Physics-Based Modeling and Simulation of Metal Additive Manufacturing*
  winter term 2022/23 grade: 1.5(*)
  winter term 2021/22 grade: 1.2(*)
- *Nonlinear Continuum Mechanics*
  winter term 2022/23 grade: 1.6
  winter term 2021/22 grade: 1.0
  winter term 2020/21 grade: 1.5
  winter term 2019/20 grade: 1.4
  winter term 2018/19 grade: 1.3
- *Research Topics in Computational Mechanics – Additive Manufacturing*
  winter term 2020/21 grade: 1.4
  winter term 2019/20 grade: 1.3
- *Nonlinear Finite Element Methods*
  summer term 2022 grade: 1.5
  summer term 2021 grade: 1.4
  summer term 2020 grade: 1.4
- *Engineering Mechanics 3 – Dynamics*
  winter term 2011/12 - award ”Goldene Lehre” grade: 1.7
- *Engineering Mechanics 2 – Elastostatics*
  summer term 2011 grade: 1.6
- *Engineering Mechanics 1 – Statics*
  winter term 2010/11 - award ”Goldene Lehre” grade: 1.2

(*) grade spectrum: 1; 2; 3; 4; 5; 6.

Teaching Certification

GAMM Fachausschuss "Moderne Lehre und Didaktik in der Mathematik und Mechanik"
In quarterly meetings learning theories and teaching methods are presented, assessed and jointly adapted or extended. Moreover, strategies are developed to disseminate the output in the scientific community. As specific example, a minisymposium on *teaching methods* has been organized at the GAMM Annual Meeting 2023 in Essen.

Supervised Ph.D. Students (independent supervision)

- Computational models for the coupled fluid-powder dynamics in binder jetting and laser powder bed fusion additive manufacturing
  (Julian Brotz, Institute for Computational Mechanics, TUM, starting in 2024)
- Computational models for the rapid evaporation dynamics in binder jetting and laser powder bed fusion additive manufacturing
  (Andreas Ritthaler, Institute for Computational Mechanics, TUM, starting in 2024)
- Model order reduction techniques for fast part-scale simulations of AM processes
  (Torsten Schmid, Institute for Computational Mechanics, TUM, since 2023)

Supervised Ph.D. Students (accountable supervision)

- Experimental and model-based characterization of AM processes on the mesoscale
  (Reimar Weissbach, Mechanosynthesis Group, MIT, since 2020)
  together with A.J. Hart (MIT)
- Microstructure modeling and microstructure-informed material laws for metal AM
  (Nils Much, Institute for Computational Mechanics, TUM, since 2020)
  together with W.A. Wall (TUM)
- Modeling of cohesive powders and coupled fluid-powder dynamics in AM
  (Patrick Praegla, Institute for Computational Mechanics, TUM, since 2020)
  together with W.A. Wall (TUM)
- Material laws and self-contact modeling in the complex swelling process of foams
  (Abhiroop Satheesh, Institute for Computational Mechanics, TUM, since 2018)
  together with W.A. Wall (TUM)
- Fast computational models for the part-scale simulation of AM processes
  (Sebastian Pröll, Institute for Computational Mechanics, TUM, since 2018)
  together with W.A. Wall (TUM)
- Two-phase flow and coupled fluid-powder dynamics based on SPH
  (Sebastian Fuchs, Institute for Computational Mechanics, TUM, 2016 - 2021)
  together with W.A. Wall (TUM)
- Molecular interactions of slender beams in complex biophysical systems
  (Maximilian Grill, Institute for Computational Mechanics, TUM, 2014 - 2020)
  together with W.A. Wall (TUM)

Other Supervision Activities

- (Co-)Supervision of more than 30 bachelor and master Theses, TUM
- Mentoring of 10 Ph.D. Students in TUM Graduate School, TUM