Curriculum Vitae

Dr.-Ing. Renate Sachse

Address	Institute for Computational Mechanics Technical University of Munich Boltzmannstr. 15 85748 Garching b. München
E-Mail	renate.sachse@tum.de
Day of Birth	December 9th, 1989 in Stuttgart
Nationality	German
Children	One child, born June 2022

Professional Experience

from 07/2023	**Associate** of the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS), Harvard University
from 01/2021	**Research associate (Postdoc)** at the Institute for Computational Mechanics, Technical University of Munich directed by Prof. Dr.-Ing. Wolfgang A. Wall *(approximately 10 months parental leave)*
04/2023 – 06/2023	**Postdoctoral Fellow** in the Bertoldi Lab at Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS), Harvard University directed by Prof. Katia Bertoldi
(04/2020 – 06/2020)	**Acceptance as Visiting Student Research Collaborator** at Princeton University, New Jersey, USA *(cancelled mid of march due to COVID-19)*
01/2015 – 12/2020	**Research associate** at the Institute for Structural Mechanics, University of Stuttgart directed by Prof. Dr.-Ing. habil. Manfred Bischoff
04/2014 – 07/2014	**Research assistant** at the Institute for Structural Mechanics, University of Stuttgart
11/2012 – 12/2013	**Working student** in structural engineering at the Werner Sobek AG, Stuttgart, Germany
09/2011 – 12/2011	**Intern** in the field of Structural Engineering at Foster + Partners, London, UK
02/2011 – 08/2011	**Research assistant** at the Institute for Structural Mechanics, University of Stuttgart
05/2009 – 12/2010	**Working student** in structural engineering at the Werner Sobek AG, Stuttgart, Germany
09/2008 – 10/2008	**Intern** on a construction site at Ed. Züblin AG, Kelsterbach, Germany

Education

10/2020	**Ph. D. in Civil Engineering (Dr.-Ing.)** at the Institute for Structural Mechanics, University of Stuttgart *Title of the thesis*: „Variational Motion Design for Adaptive Structures" *Grade*: 1,0 with distinction (summa cum laude) *Committee*: Prof. Dr.-Ing. habil. Manfred Bischoff, Prof. Dr.-Ing. Kai-Uwe Bletzinger
10/2011 – 10/2014	**M. Sc. in Civil Engineering**, University of Stuttgart, *Grade: 1,2 (with distinction)* Thesis: „Isogeometric Contact Analysis of Thin-Walled Structures"

01/2012 – 05/2012	**Study Abroad in the ERASMUS-Program**, École Spéciale des Travaux Public, du Batiment et de l'Industrie (ESTP) in Cachan, France
10/2008 – 09/2011	**B. Sc. in Civil Engineering**, University of Stuttgart, *Grade: 1,4* Thesis: „An Elementary School Pavilion for Magagula in South Africa – Structural Analysis"
07/2008	**Abitur**, Hegel-Gymnasium Stuttgart, *Grade: 1,5*

GRANTS AND AWARDS

08/2023	Admission into the **Freiburg Rising Stars Academy** – platform for connecting highly qualified international early career researchers to Freiburg scientists
07/2022	**Publication Award 2020** of the Faculty 2 (Civil and Environmental Engineering) of the University of Stuttgart for the publication „Snapping Mechanics of the Venus flytrap" in *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*
06/2022	**Bertha-Benz-Award 2022** from the Daimler and Benz Foundation for female engineering scientists who have achieved added value for society with their dissertation and honors pioneering spirit, courage and visionary character
03/2022	Recipient of the **Klaus Tschira Boost Fund Fellowship** for excellent researchers with a flexible funding of 80.000 € for an independent, higher risk, interdisciplinary project in an early career stage
11/2021	3rd **place of the Dr.-Wilhelmy-VDI Award** for young female scientists in engineering sciences for an outstanding dissertation with a high significance for science and Germany as a location for technology
07/2021	**Award of the Friends of the University of Stuttgart** for special scientific achievements for the dissertation
01/2020 – 12/2022	**GAMM Juniors Fellowship** of the Association of Applied Mathematics and Mechanics (GAMM) for excellent junior scientists – limited to three years
09/2017	3rd **place at the AVK-Prize for Innovations 2017** for the submission of „Flectofold – ein bionisches, gelenkloses Verschattungssystem" (translated: Flectofold – a biomimetic, hingeless shading system)
10/2014	**Emil-Mörsch-Study Award** for exceptional academic achievements
10/2013 – 09/2014	**Scholarship of the German Federal Ministry of Education and Research** (Deutschlandstipendium) for talented and high-performing students
10/2009 – 09/2011	**Exemption from tuition fees** for outstanding academic achievements (for the top 5% of students in the academic year)
10/2008 – 09/2009	**Exemption from tuition fees** due to well above-average aptitude (for the top 5% of students in the academic year)

Voluntary Activities

11/2020 – 07/2022	Active member at Ingenieure ohne Grenzen (Engineers without borders), Regional Group Munich - *Participation in the internal management (project organization and general administration) and Public Relations*

Languages

German (fluent), English (fluent), French (advanced), Russian (advanced)

Responsibilities in University and Academics

07/2021 – 04/2023	Initiation and organization of the mailing list „young-academics-in-gamm" with information from and for junior scientists (summer schools, workshops, job offers, etc.) with over 200 subscriptions
01/2021 – 04/2023	Elected member in the Committee for Equality of the Association of Applied Mathematics and Mechanics (GAMM)
11/2019 – 12/2020	Foundation and board member of the GAMM Student Chapter at the University of Stuttgart, with over 70 doctoral students in mechanics and applied mathematics
10/2019 – 12/2020	Elected representative of the doctoral candidates in the faculty council
01/2015 – 12/2019	Organization and support of the student exchange between the University of Stuttgart and the University of Calgary

Teaching

Numerische Methoden für Ingenieure (Numerical methods for engineers) – Technical University of Munich

Nichtlineare Kontinuumsmechanik (Nonlinear continuum mechanics) – Technical University of Munich

Nichtlineare Finite-Element-Methoden (Nonlinear finite element methods) – Technical University of Munich

Baustatik und Baudynamik I (Structural statics and dynamics I) – University of Stuttgart

Baustatik und Baudynamik II (Structural statics and dynamics II) – University of Stuttgart

Nichtlineare finite Elemente (Nonlinear finite elements) – University of Stuttgart

Supervision of 9 bachelor theses, 14 master theses and 2 term papers

Reviewer in Scientific Journals

Frontiers in Robotics and AI, Frontiers

Mechanisms and Machine Theory, Elsevier

Membership in Academic Institutions

Member in the German Association for Computational Mechanics (GACM)

Member in the Association of Applied Mathematics and Mechanics (GAMM)

Member in the International Association for Computational Mechanics (IACM)

ACTIVITIES ON ACADEMIC CONFERENCES AND SCIENTIFIC EVENTS

PRESENTATIONS

R. SACHSE. Motion Design für optimale Bewegungen flexibler Strukturen. *Guest lecture within the research colloquium Computational Science and Engineering at the Universität der Bundeswehr Munich, April 7th, 2022*

R. SACHSE, F. GEIGER, M. BISCHOFF. Constrained motion design for adaptive structures based on a variational formulation. *GAMM 2020/21, 91st Annual Meeting of the International Association of Applied Mathematics and Mechanics, Kassel, Germany, March, 15th − 19th, 2021*

R. SACHSE, M. BISCHOFF. A variational formulation for motion design of adaptive structures. *GAMM 2019, 90th Annual Meeting of the International Association of Applied Mathematics and Mechanics, Vienna, Austria, February, 20th − 24th, 2019*

R. SACHSE, A. KÖRNER, A. WESTERMEIER, L. BORN, S. POPPINGA, G. GRESSER, T. SPECK, J. KNIPPERS, M. BISCHOFF. Biological Design and Integrative Structures - Simulation in der Biomimetik. *Forschungskolloquium FE im Schnee, Hirschegg, Austria, March 25th − 28th, 2018*

R. SACHSE, M. BISCHOFF. A variational formulation for motion design of adaptive structures. *6th European Conference on Computational Mechanics (ECCM - ECFD 2018), Glasgow, UK, June 11th − 15th, 2018*

R. SACHSE, B. OESTERLE, E. RAMM, M. BISCHOFF. Hierarchic isogeometric large rotation shell elements including linearized transverse shear parametrization. *7th GACM Colloquium on Computational Mechanics, Stuttgart, Germany, October 11th − 13th, 2017*

R. SACHSE, A. KÖRNER, A. WESTERMEIER, L. BORN, S. POPPINGA, G. GRESSER, T. SPECK, M. BISCHOFF, J. KNIPPERS. Design process of a biomimetic facade element inspired by the carnivorous plant Aldrovanda vesiculosa. *7th European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS), Crete, Greece, June 5th − 10th, 2016*

ORGANIZED MINISYMPOSIA, CONFERENCES AND SCIENTIFIC EVENTS

Organization of a mini-symposium at the „9th European Congress on Computational Methods in Applied Sciences and Engineering" in Lisbon, Portugal, June 3rd-7th, 2024 on „Computational Methods for Soft Robotics"

Organization of a mini-symposium at the "9th GACM Colloquium on Computational Mechanics" in Essen, Germany, September 21st 23rd, 2022 on „Computational Biomechanics and Biomedical Engineering of Active Biological Systems – from Methods to Clinical Application"

Organization of a mini-symposium at the „8th European Congress on Computational Methods in Applied Sciences and Engineering" in Oslo, Norway, June 5th-9th, 2022 on „Adaptive and Compliant Engineering Structures"

Organization of a mini-symposium at the „15th World Congress on Computational Mechanics and 8th Asian Pacific Congress on Computational Mechanics" in Yokohama, Japan, July 31st − August 5^{th,} 2022 on „Musculoskeletal Biomechanics"

Co-organization of the "Pre-GAMM – Onboarding for young researchers"-Workshop – a technical workshop with a short introduction into the topics of the plenary lectures of the GAMM Annual Meeting on a beginner level. *Online workshop with 6 speakers and over 90 participants.*

Co-organization of a mini-symposium at the 14th World Congress on Computational Mechanics and 8th European Congress on Computational Methods in Applied Sciences and Engineering, Paris, France, January 11th − 15th, 2021 on "Adaptive Engineering Structures"

Co-organization of the 14th Baustatik-Baupraxis Conference, Stuttgart, Germany, March 23rd-24th, 2020 (approximately around 300 participants) *(cancelled on short notice due to Covid-19)*

Co-organization of the 7th GACM Colloquium on Computational Mechanics, Stuttgart, Germany, Oktober 11th-13th, 2017 (around 250 participants)

Organization of a mini-symposium at the 7th GACM Colloquium on Computational Mechanics, Stuttgart, Germany, Oktober 11th-13th, 2017 on "Computation Mechanics in Biomimetics"

PUBLICATIONS

G. M. DURAK, R. THIERER, **R. SACHSE**, M. BISCHOFF, T. SPECK, S. POPPINGA. Smooth or with a snap! Trap opening mechanisms of the Venus flytrap (*Dionaea muscipula*). *Advanced Science. 2022. DOI: https://doi.org/10.1002/advs.202201362*

C. J. EGER, M. HORSTMANN, S. POPPINGA, **R. SACHSE**, R. THIERER, N. NESTLE, B. BRUCHMANN, T. SPECK, M. BISCHOFF, J. RÜHE. The Structural and Mechanical Basis for Passive-Hydraulic Pine Cone Actuation. *Advanced Science. 2022. DOI: https://doi.org/10.1002/advs.202200458*

F. KRÜGER, R. THIERER, Y. TAHOUNI, **R. SACHSE**, D. WOOD, A. MENGES, M. BISCHOFF, J. RÜHE. Development of a material design space for 4D-printed bio-inspired hygroscopically actuated bilayer structures with unequal effective layer widths. *Biomimetics. 2021. DOI: https:doi.org/10.3390/biomimetics6040058*

R. SACHSE, F. GEIGER, M. VON SCHEVEN, M. BISCHOFF. Motion design with efficient actuator placement for adaptive structures that perform large deformations. *Frontiers in Built Environment 7 (88). 2021. DOI: https://doi.org/10.3389/fbuil.2021.545962*

R. SACHSE, F. GEIGER, M. BISCHOFF. Constrained motion design with distinct actuators and motion stabilization. *International Journal for Numerical Methods in Engineering 122 (11). 2021. DOI: https://doi.org/10.1002/nme.6638*

Y. TAHOUNI, T. CHENG, D. WOOD, **R. SACHSE**, R. THIERER, M. BISCHOFF, A. MENGES. Self-shaping Curved Folding: A 4D-printing method for fabrication of self-folding curved crease structures. *Symposium on Computational Fabrication, 1-11. DOI: https://doi.org/10.1145/3424630.3425416*

R. SACHSE, M. BISCHOFF. A variational formulation for motion design of adaptive compliant structures. *International Journal for Numerical Methods in Engineering. 2020. DOI: https://doi.org/10.1002/nme.6570*

R. SACHSE, A. WESTERMEIER, M. MYLO, J. NADASDI, M. BISCHOFF, T. SPECK, S. POPPINGA. Snapping mechanics of the Venus flytrap. *Proceedings of the National Academy of Sciences of the United States of America (PNAS), 117. 2020. DOI: 10.1073/pnas.2002707117*

A. KÖRNER, L. BORN, A. MADER, **R. SACHSE**, S. SAFFARIAN, A. S. WESTERMEIER, S. POPPINGA, M. BISCHOFF, G. T. GRESSER, M. MILWICH, T. SPECK, J. KNIPPERS. Flectofold - a biomimetic compliant shading device for complex free form facades. *Smart Materials and Structures, 27. 2018. DOI: 10.1088/1361-665X/aa9c2f*

B. OESTERLE, S. BIEBER, **R. SACHSE**, E. RAMM, M. BISCHOFF. Intrinsically locking-free formulations for isogeometric beam, plate and shell analysis. *Proc. Appl. Math. Mech., 18. 2018. DOI: 10.1002/pamm.201800399*

A. S. WESTERMEIER, **R. SACHSE**, S. POPPINGA, P. VÖGELE, L. ADAMEC, T. SPECK, M. BISCHOFF. How the carnivorous waterwheel plant (Aldrovanda vesiculosa) snaps. *Proceedings of the Royal Society B, 285. 2018. DOI: 10.1098/rspb.2018.0012*

B. OESTERLE, **R. SACHSE**, E. RAMM, M. BISCHOFF. Hierarchic isogeometric large rotation shell elements including linearized transverse shear parametrization. *Computer Methods in Applied Mechanics and Engineering, 321. 2017. DOI: 10.1016/j.cma.2017.03.031*

B. OESTERLE, **R. SACHSE**, S. BIEBER, E. RAMM, M. BISCHOFF. Isogeometric analysis with hierarchic shell elements – intrinsically free from locking by alternative parametrizations. *Proceedings of the IASS Annual Symposium 2017. Annette Bögle, Manfred Grohmann (eds.) "Interfaces: architecture.engineering.science". 25-28th September, 2017, Hamburg, Germany. 2017.*

M. Bischoff, R. Sachse, A. Körner, A. Westermeier, L. Born, S. Poppinga, G. T. Gresser, T. Speck, J. Knippers. Modeling and analysis of the trapping mechanism of *Aldrovanda vesiculosa* as biomimetic inspiration for façade elements. *Proceedings of the IASS Annual Symposium 2017. Annette Bögle, Manfred Grohmann (eds.) "Interfaces: architecture.engineering.science". 25-28th September 2017, Hamburg, Germany, 2017. 2017.*

L. Born, A. Körner, G. Schieber, A. Westermeier, S. Poppinga, R. Sachse, P. Bergmann, O. Betz, M. Bischoff, T. Speck, J. Knippers, M. Milwich and G. T. Gresser. Fiber-reinforced plastics with locally adapted stiffness for bio-inspired hingeless, deployable architectural systems. *Proceedings of the 21th Symposium on Composites, Bremen, Germany. 2017.*

A. Westermeier, S. Poppinga, A. Körner, L. Born, R. Sachse, S. Saffarian, J. Knippers, M. Bischoff, G. Gresser, T. Speck. Keine Gelenkbeschwerden – Wie Pflanzen sich bewegen und die Technik inspirieren. In: J. Knippers, U. Schmid & T. Speck (eds.), Baubionik – Biologie beflügelt Architektur, *30 − 39. Stuttgarter Beiträge zur Naturkunde, Serie C, Band 82, Staatliches Museum für Naturkunde Stuttgart. 2017.*

S. Poppinga, A. Körner, R. Sachse, L. Born, A. Westermeier, L. Hesse, J. Knippers, M. Bischoff, G. T. Gresser, T. Speck. Compliant Mechanisms in Plants and Architecture. In: Jan Knippers, Klaus G. Nickel, Thomas Speck (Eds.). Biomimetic Research for Architecture and Building Construction. *Volume 8 of the series Biologically-Inspired Systems. Springer. 2016. DOI: 10.1007/978-3-319-46374-2_9*