

Curriculum Vitae – Thomas Speck

Name: Thomas Speck		Male or Female: Male
Birth date: 20 th November 1957		Nationality: German
Present affiliation:	Plant Biomechanics Group Freiburg Botanic Garden Faculty of Biology University of Freiburg Schänzlestr. 1 D-79104 Freiburg, Germany	
Title:	Dr. rer. nat., Dipl.-Biol.	
Profession:	Full Professor for Botany: Functional Morphology & Bionics Director of the Botanic Garden	
E-mail:	thomas.speck@biologie.uni-freiburg.de	
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Final school 1963-1968 Primary School (Karlsruhe-Beiertheim)
career: 1968-1969 High School (Goethe-Gymnasium, Karlsruhe)
 1968-1976 High School (Markgrafen-Gymnasium, Karlsruhe-Durlach)
 1976 High School Graduation (Abitur)

Military Service: 10'01'1976 – 12'31'1977

Diploma: 1986 Diploma thesis at the Botanic Garden – Department of Systematics and Palaeobotany at the University of Freiburg on 'Biomechanics and functional morphology of early land plants'

Doctor's degree: 1990 Ph.D.-Thesis at the at the Botanic Garden – Department of Systematics and Palaeobotany at the University of Freiburg on 'Biomechanics of extant and fossil plants with different growth habits'

Habilitation: 1996 Habilitation and Venia Legend in 'Botany / Biophysics'

Career of occupation: 2006 until present Full Professor for 'Botany: Functional Morphology and Bionics' and Director of the Botanic Garden of the University of Freiburg
 2006 Offer of a Full Professorship 'Systematic Botany and Plant Geography' at the Freie University Berlin combined with the Directorship in General of the Botanic Garden and Botanic Museum Berlin-Dahlem
 2002-2006 Associate Professor for 'Botany: Functional Morphology and Biomechanics' and Director of the Botanic Garden of the University of Freiburg

2001 Offer of a Professorship 'Paleobotany' at the Humboldt University Berlin combined with a Deputys Directorship at the Museum of Natural History in Berlin

2000-2002 Reader for Botany and Biophysics, University of Freiburg (Hochschuldozent)

1999-2000 Visiting Professor, Faculty of Formal & Natural Sciences, University Vienna (Winter Term 99/00)

1993-1999 Assistant Professor for Botany and Paleobotany, University of Freiburg (Hochschulassistent)

1990-1993 Research Scientist (Plant Biomechanics), University of Freiburg

1986-1990 Research Associate - Biomechanics of Plants & Paleobotany (DFG-Project)

1978-1986 Study of Biology, University of Freiburg (Diploma 1986)

01'01'1978-'09'30'1978 Management-Assistant, Ambassador Inc. (Germany and USA)

Supervised PhD-, Diploma-, Master-, Magister- and Bachelor-Theses and Scientific Theses for College Teachers

PhD-Theses: University of Freiburg: 36 completed (2 Thèse en Cotutelle avec Université de Strasbourg & 1 Thèse en Cotutelle Université de Reims) // 11 ongoing

Co-Supervision at other Universities: 6 completed / 1 ongoing

Diploma-Theses (until 2015): 29 completed

Theses for College Teachers: 43 completed

Magister-Theses: 11 completed

Master-Theses (since 2013): 21 completed

Bachelor-Theses (since 2011): 93 completed

Awards and Grants

(19) **2023 'Materialica Design+Technology Winner Award 2023-Category Process**
Product/Project: Bionic concept for microfiber filters. Laureates: Prof. Dr. Thomas Speck, Dr. Georg Bold, Dr. Tim Kampowski, Dr. Tom Masselter Dr. Marc Thielen, MSc. Kim Ulrich (Plant Biomechanics Group Freiburg / Botanic Garden of the University of Freiburg), Dr.-Ing.Uwe Schauman(E.G.O. Elektro-Gerätebau)

(18) **2021 – 2022 Several Awards for the Cactus-Inspired *livMatS* Fiber Pavillon in the Botanic Garden of the University of Freiburg:**

ICONIC Award 2022: Winner – Innovative Architecture (Kategorie: Architecture – Special)

ICONIC Award 2022: Best of Best – Innovative Material (Kategorie: Innovative Material)

Green Concepts Award 2022

Raumprobe - Materialpreis 2021

Laureates: Prof. Achim Menges (Cluster of Excellence IntCDC & ICD University of Stuttgart and collaborators), Prof. Dr. Jan Knippers (Cluster of Excellence IntCDC

& ITKE University of Stuttgart & collaborators) & Prof. Dr. Thomas Speck (Cluster of Excellence *livMatS* & / Botanic Garden of the University of Freiburg)

(17) **2020 Recognition as Excellent Member of the International Society for Bionic Engineering (ISBE)**

For academic achievements on bionic engineering and contributions to the International Society for Bionic Engineering (ISBE)

(16) **2019 'Materialica Design+Technology Gold Award 2019-Category Surface & Technology'**

Product/Project: Sensor mounting for washing machines. Laureates: Prof. Dr. Thomas Speck, Dr. Georg Bold, Dr. Tim Kampowski, M.Sc. Max Langer, Dr. Tom Masselter Dr. Marc Thielen (Plant Biomechanics Group Freiburg / Botanic Garden of the University of Freiburg), Dipl.-Ing. Christian Seidler, Dr.-Ing. Uwe Schauman (E.G.O. Elektro-Gerätebau)

(15) **2017 AVK-Innovationprice 2017 – 3rd Place in the Category „Research/ Science“**

Product/Project: Biomimetic, joint-free, facade-shading system „Flectofold“ inspired by the trap of the waterwheel plant and wing-folding of the shield bug *Graphosma lineatum*

Laureates: Prof. Dr. Thomas Speck, Dr. Simon Poppinga & M.Sc. Anna Westermeier (Plant Biomechanics Group Freiburg / Universität of Freiburg), M.Sc. Larissa Born (ITFT University of Stuttgart), Prof. Dr. Götz Gresser (ITFT University of Stuttgart / ITV Denkendorf), Prof. Dr. Markus Milwich (University Reutlingen / ITV Denkendorf), Prof. Dr. Manfred Bischoff & M.Sc. Renate Sachse & (IBB University of Stuttgart), Prof. Dr. Jan Knippers, M.Sc. Axel Körner, M.Sc. Anja Mader, M.Sc. Saman Saffarian & Dipl.-Ing. Gundula Schieber (ITKE University of Stuttgart) und Prof. Dr. Oliver Betz & M.Sc. Paavo Bergmann (University of Tübingen)

(14) **2016 Materialica Design+Technology Gold Award 2016 - Category Surface & Technology'**

Product/Project: Biomimetic 3-arm branch made of fiber-reinforced material

Laureates: Prof. Dr. Thomas Speck & Dr. Tom Masselter (Plant Biomechanics Group University of Freiburg), Prof. Dr. Markus Milwich, Dr. Simon Küppers & Dipl.-Ing. Lena Müller (ITV Denkendorf) and Prof. Dr. Christoph, Prof. Maik Gude & Dipl.-Ing. Andreas Gruhl (ILK & Botany TU Dresden).

(13) **2015 European Cluster Excellence Initiative - Bronze Label Certificate**

Competence Network Biomimetics – Plants and Animals as Concept Generators for Biomimetic Materials and Technologies Baden-Württemberg (Kompetenznetz Biomimetik) represented by T. Speck as Speaker of Competence Network and O. Speck as Manager of the Competence Network (period: 2015-2017).

(12) **2013 Gips-Schüle-Forschungspreis**

Product/Project: Biomimetic facade-shading system inspired by the Bird of Paradise flower (Flectofin®)

Laureates: Prof. Dr. Thomas Speck (University of Freiburg), Prof. Dr.-Ing. Jan Knippers (University of Stuttgart), Dr. Markus Milwich (ITV Denkendorf)

Together with: Dr. Tom Masselter, Dipl.-Biol. Simon Poppinga (Plant Biomechanics Group University of Freiburg), Simon Schleicher M. Arch., Dipl.-Ing. Julian Lienhard (ITKE University of Stuttgart), Dipl.-Ing. Lena Müller (ITV Denkendorf).

- (11) **2012 European Cluster Excellence Initiative - Bronze Label Certificate**
Competence Network Biomimetics – Plants and Animals as Concept Generators for Biomimetic Materials and Technologies Baden-Württemberg (Kompetenznetz Biomimetik) represented by T. Speck as Speaker of Competence Network and O. Speck as Manager of the Competence Network (period: 2012-2014)
- (10) **2011 Best of Certificate 'Materialica Design+Technology Award 2011 - Category CO₂-Efficiency'**
Product/Project: Biomimetic impact damping palette
Laureates: Prof. Dr. Thomas Speck & Dr. Deane Harder (Plant Biomechanics Group University of Freiburg), Dr. Markus Milwich & Dipl.-Ing. Dagmar Yilmaz (Institut für Textil- und Verfahrenstechnik (ITV) Denkendorf), Dipl.-Ing.M. Hartel (Rittal GmbH & Co. KG), Dipl.-Ing. Henrike Monnerat (Hochschule für Gestaltung Offenbach), Firma Winter and Firma I.S.T. Ficotex.
- (9) **2011 Techtextil – Innovationprize 2011 - Architecture**
Product/Project: Biomimetic facade-shading system inspired by the Bird of Paradise flower
Laureates: Prof. Dr. Thomas Speck, Dr. Tom Masselter, Dipl.-Biol. Simon Poppinga (Plant Biomechanics Group University of Freiburg), Prof. Dr.-Ing. Jan Knippers, Simon Schleicher M. Arch., Dipl.-Ing. Julian Lienhard (ITKE University of Stuttgart), Prof. Dr. Heinrich Planck, Dr. Markus Milwich, Dr. Thomas Stegmaier, Larissa Born B.Eng., Dipl.-Ing. Anja Walter, Julian Sartori B. Sc. (ITV Denkendorf)
- (8) **2011 Award for the 'Biomimetic Cabinet' [„Bionik-Vitrine“] as 'Contribution to the World Decade of the United Nations 2005-2014: Education by Sustainable Development' [„Beitrag zur Weltdekade der Vereinten Nationen 2005-2014: Bildung für nachhaltige Entwicklung“]**
Laureates: Dr. Olga Speck, Florian Antony, Florian Mai, Dipl.-Biol. Stefan Heyl, Ulrike Hertel, Prof. Dr. Thomas Speck (University of Freiburg)
- (7) **2009 Zander - Medal of the Society of Botanic Gardens Germany** (Zander-Medaille des Verbands Botanischer Gärten e.V.)
For the activities for Botanic Gardens and for the Society of Botanic Gardens Germany
- (6) **2007 TechTextile Innovationprize – New Materials**
Project/Product: Development of the 'Technical Plant Stem' a Biomimetic, Structurally Optimized Fibrous Compound Material
Laureates: Prof. Dr. Thomas Speck and Dr. Olga Speck (Plant Biomechanics Group University of Freiburg), Dr. Markus Milwich, Dr. Thomas Stegmaier & Prof. Dr. Heinrich Planck (ITV Denkendorf)
- (5) **2007 Prize Winner of the 'Ideenwettbewerb Bionik – Innovationen aus der Natur' (Federal Ministry of Education and Research, Germany)**
Product/Project: From Biological Templates to Biomimetic Products: Wound Healing in Plants as Concept Generators for Self-Repairing Technical Materials

Laureates: Dr. Olga Speck (University of Freiburg, Project Manager), Prof. Dr. Thomas Speck (Plant Biomechanics Group Freiburg), Prof. Dr. Rolf Mülhaupt (FMF, University of Freiburg), and Dr. Rolf Luchsinger (EMPA Dübendorf, Switzerland)

(4) **2007 Prize Winner of the ‘Ideenwettbewerb Bionik – Innovationen aus der Natur’ (Federal Ministry of Education and Research, Germany)**

Product/Project: From Gradient Materials in Plants to Optimized Fibrous Compound Materials

Laureates: Prof. Dr. Ingo Burgert (MPI Potsdam/Golm, project manager), Prof. Dr. Thomas Speck (Plant Biomechanics Group University of Freiburg) and Markus Milwich (ITV Denkendorf)

(3) **2007 ‘ExpoNaTe 2007 - Award’ of the ,Baden-Württemberg Stiftung for ‘Didactic Experiments on Biophysics of Water Conduction in Plants’**

Laureates: Prof. Dr. Thomas Speck, Dr. Olga Speck, Dr. Deane Harder, Dr. Friederike Gallenmüller, Dipl.-Biol. Tina Steinbrecher (Plant Biomechanics Group University of Freiburg)

(2) **1990 Hans Spemann Award** (Prize for best PhD-Thesis of the Faculty of Biology, University of Freiburg)

(1) **1980-1984 Scholarship of the ‘German National Merit Foundation’ (Studienstiftung des Deutschen Volkes)**

Scientific Boards and Honorary Offices

(14) Member of the Scientific Advisory Board EU-Project Nature4Nature [since 2023]

(13) Member of the Scientific Advisory Board EU-Project iSeed [since 2022]

(12) Member of the Scientific Advisory Board Fraunhofer Cluster of Excellence Programmable Materials CPM [since 2021]

(11) Member of Integrative Board des Excellence-Clusters *livMatS* (Living, Adaptive and Energy-autonomous Materials Systems, EXC 2193) [since 2019]

(10) Member of the spokesperson team and Principle Investigator of the Excellence Cluster *livMatS* Living, Adaptive and Energy-autonomous Materials Systems (EXC 2193) [since 2018]

(9) Member of the Conseil Scientifique of the Centre d’études & d’expertises et Réseau d’acteurs industriels & académiques national – Ceebios, France (seit 2017)

(8) Jury Member of the „Steven Vogel Young Investigator Award” awarded by the IOP Journal Bioinspiration & Biomimetics [since 2017]

(7) Member of the International Advisory Board of the conference series “Living Machines” (seit 2016)

(6) Member of the Co-ordinating Committee of the Research Network “Functional Nanostructures” (Kompetenznetz Funktionelle Nanostrukturen - Baden-Württemberg) [since 2015]

(5) Member of the Scientific Advisory Board of the B CUBE - Center for Molecular Bioengineering Technical University of Dresden [since 2013]

(4) Member of the Board of Directors of the ‘Freiburg Centre for Interactive Materials and Bio-Inspired Technologies – FIT’ (Freiburger Zentrum für interaktive Werkstoffe und bioinspirierte Technologien) [since 2012] // Associate Managing

Director of the 'Freiburg Centre for Interactive Materials and Bio-Inspired Technologies [2012-2024]

- (3) Scientific Member of the 'Freiburg Materials Research Center – FMF' (Freiburger Materialforschungszentrums) [since 2007]
- (2) Speaker of the Competence Network Biomimetics – Plants and Animals as Concept Generators for Biomimetic Materials and Technologies (Ministry of Science, Research, and the Arts of the Federal State of Baden-Württemberg) [since 2006; Board Member since 2002]
- (1) Fellow of the Linnean Society London [since 2000]

Past activities:

Vice-president of the 'Society for Technical Biology and Bionics – GTBB' (Gesellschaft für Technische Biologie und Bionik) [1999-2024]

Jury member of the 'International Bionic-Award' of the Schauenburgstiftung awarded bi-annually by the 'Germany Economy Foundation' (Stiftung der Deutschen Wirtschaft e.V.) and 'The Association of German Engineers' (Verein Deutscher Ingenieure e.V. - VDI) [2008-2023]

Member of the Scientific Advisory Board of the "State Agency for Lightweight Constructions Baden-Württemberg" (Landesagentur für Leichtbau Baden-Württemberg – Leichtbau BW GmbH) [2014-2022]

Member of the Steering Committee of the Sustainability Center LZN (Leistungszentrum Nachhaltigkeit) Fraunhofer [2015-2022]

Vice-President of 'B/OKON international – The Biomimetics Association' [2009-2021]

Member in the Advisory Board 'Bionics' of 'The Association of German Engineers' (Verein Deutscher Ingenieure e.V. - VDI) Development of VDI-Guidelines on Bionics / Head of the Task Group: Bionic Construction Materials & Structures [2007-2020]

Co-coordinator (University of Freiburg) of the Collaborative Research Center 141 (SFB-Transregio 141) „Biological Design and Integrative Structures - Analysis, Simulation and Implementation in Architecture", Universities of Stuttgart, Freiburg and Tübingen [2014-2020]

Member of the Scientific Advisory Board of the INM Leibniz-Institut for New Materials gGmbH Saarbrücken (Leibniz-Institut für Neue Materialien gGmbH) [2011-2019]

Board member of the "Biomechanics Group" of the Society for Experimental Biology U.K. [2002-2018]

Jury Member of the „Casio-Vektoria Award 2016/2017" awarded for the topic Bionics by Casio Europe [2016/2017]

Member of the Board of the 'Bionic Competence Network B/OKON' (Ministry of Education and Research of the Federal Republic of Germany) [2004-2016]

Member in the Program-Committee of the Priority Program 1420 'Biomimetic Materials Research: Functionality by Hierarchical Structuring of Materials' (German Research Foundation – DFG) [2008-2016]

External Scientific Advisor of the Arts-based Research Project: "Growing As Building" at the Universität für Angewandte Kunst (Vienna), funded by the Fonds zur Förderung der wissenschaftlichen Forschung (FWF) [2013-2015]

Member of the Advisory Board for the 'BIONA' (Bionic Inspirations for Sustainable Products and Technologies) in the HighTech-Strategy of the Ministry of Education and Research of the Federal Republic of Germany [2007-2014]

Chairman of the 'Bionic Competence Network *B/OKON*' (Ministry of Education and Research of the Federal Republic of Germany) [2010-2013]

Coordinator of the Priority Grant-Programme 'Bionics' of the Deutsche Bundesstiftung Umwelt (DBU) (together with C. Neinhuis, TU Dresden) [2004-2013]

Member of the „Spiegelgremium“ ISOBIONIK des DIN, Deutsches Institut für Normung e. V., Normenausschuss Materialprüfung (NMP) (2011-2012)

Member of the Founding Commission of 'Freiburg Center for Interactive Materials and Bio-Inspired Technologies – FIT' (Freiburger Zentrum für interaktive Werkstoffe und bioinspirierte Technologien) [2010 - 2012]

Liaison Professor of the 'German National Merit Foundation' (Studienstiftung des Deutschen Volkes) [2005-2012]

Member of the Scientific Advisory Board of the Joint-Research Project 'BioSkin', Austrian Institute of Technology (AIT), Austria [2008-2011]

Jury member for the international biomimetic prize 'BionikStar', Bozen, Italien [2011]

Scientific Member of the 'Centre for Applied Biological Sciences Freiburg' (Zentrum für angewandte Biowissenschaften Freiburg) [1999-2011]

President of the Society of Botanic Gardens of Germany (Präsident des Verbands Botanischer Gärten e.V. [2003-2009]

Patents:

- (17) IT102023000019704 – Patent application – A biohybrid miniature robot mimicking wild oat. Inventors: Barabara Mazzolai (IIT), Isabella Fiorello /IIT/livMatS), Eduardo Sinibaldi (IIT) Thomas Speck (livMatS/PBG Univ Freiburg). Patentapplication: 25.09.2023
- (16) EP 3 553 220 – Sensorvorrichtung und Verfahren zur Untersuchung einer Flüssigkeit und Waschmaschine // Sensor device and Method for inspecting a liquid and washing machine // Dispositif capteur et procédé d'analyse d'un liquide et lave-linge, Erfinder: Georg Bold, Tim Kampowsiki, Max Langer, Tom Masselter, Michael Riffel, Uwe Schaumann, Thomas Speck, Marc Thielen, Patent Application: 03.12.2018, Application number 18209898.8 / Disclosure of Patent: 16.10.2019 / Grant of patent: 14.09.2022, EP 3 553 220 B1 (for AL, AT, BE, BG, CH, CY, CZ, DE, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LI, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR)
- (15) Invention disclosure VA-CO 2021-22-2021 – Bionischer Sauggreifer. Inventors: Harald Kuolt, Thomas Speck, Simon Poppinga, Tim Kampowski. Invention disclosure: xx.xx.2021
- (14) EP21164568.4 – Patent Application – Anordnung in Art eines Sprechventils zum Aufsetzen und Anbringen an eine Tracheostomiekanüle, Erfinder: Claudius Stahl, Klaus-Michael Lücking, Falk Tauber (geb. Esser), Thomas Speck, Phillip Auth, Patentapplikation: 23.03.2021
- (13) DE102021207442 (unpublished) – Filtervorrichtung für ein wasserführendes Haushaltsgerät. Inventors: Thomas Speck, Georg Bold, Marc Thielen, Max Langer,

Tom Masselter, Tim Kampowsiki, Kim Ulrich, Antonio Di Maggio, Uwe Schaumann.
Invention disclosure: xx.xx.2021. (Anmelder E.G.O. Elektrogerätebau GmbH -
Erfindungsmeldung ERM 2020-12-28)

- (12) EP 3 872 350 A1 – Balde for an Impeller, Erfinder: Thomas Speck, Georg Bold, Marc Thielen, Linnea Hesse, Christian Seidler, Uwe Schaumann, Patent Application: 25.02.2020, Application number 20159221.9 / Disclosure of Patent: 01.09.2021 (für AL, AT, BA, BE, BG, CH, CY, CZ, DE, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, KH, LI, LT, LU, LV, MA, MC, ME, MD, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TN, TR) (Anmelder E.G.O. Elektrogerätebau GmbH)
- (11) DE 10 2019 203 809 – Wasserführendes Haushaltsgerät und Verfahren zu seinem Betrieb, Erfinder: Georg Bold, Tim Kampowski, Max Langer, Uwe Schaumann, Thomas Speck, Marc Thielen, Patenanmeldung: 20.03.2019, DE 10 2019 203 809.3 / Patenterteilung: 02.07.2020, DE 10 2019 203 809-B3
- (10) Invention disclosure ERM 2018-034 – Filteranordnung für die Analyse im Waschprozess. ID: Inventors: Georg Bold, Tim Kampowski, Max Langer, Uwe Schaumann, Thomas Speck, Marc Thielen. Invention disclosure: 19.10.2018
- (9) DE10201805502A1 – Sensorkammer für Waschmaschine, Erfinder: Gerog Bold, Tim Kampowski, Max Langer, Tom Masselter, Michael Riffle, Uwe Schaumann, Thomas Speck, Marc Thielen, Patentanmeldung: 10.04.2018 / Amtliches Kennzeichen 102018205502.5 (Anmelder E.G.O. Elektrogerätebau GmbH - P 57143DE/ PAT 11700)
- (8) Invention disclosure 2015/1838 VW AG – Plasmanitrieren von Aluminium (Al) und anderen Werkstoffen mit bionisch inspirierter Mikrostrukturierung der Oberfläche, Erfinder: Jürgen Olfe, Florian Schmich, Jochen Brand, Peter Kästner, Thomas Speck, Erfindungsmeldung 10.11.2015.
- (7) Invention disclosure 2015/0224 VW AG – Druckbegrenzungsventil mit integrierter Pulsationsdämpfung, Inventors: Erik Engelen-Krause, Jessica Wolf, David Bach, Thomas Speck, Tom Masselter, Invention disclosure 02.02.2015 / 27.04.2015.
[published in: Prior Art Publication, 18. Juni 2015]
- (6) EP 2 320 015 – Hingeless, infinitely deformable folding mechanism, Inventors: Jan Knippers, Julian Lienhard, Simon Schleicher, Simon Poppinga, Tom Masselter, Thomas Speck, Grant of Patent: 10.11.2009, EP20060743126 / Disclosure of Patent: 11.05.2011, EP 2 320 015 A2 / Grant of Patent: 13.08.2020 (für D, A, CH)
[see also: 378003P-EP – Gelenkloser, stufenlos verformbarer Klappmechanismus]
- (5) DE102009043103 – Kraftumlenkung in Faserverbundbauteilen, Inventors: D. Dullenkopf, T. Groß, W. Kornprobst, T. Speck, O. Speck, T. Masselter, M. Milwich & C. Neinhuis, Patent Application: 26.09.2009, DE102009043103 / Disclosure of Patent: 31.03.2011, DE102009043103
[see also: Chinese Patent ZL 201080042993.9 – Fibre Composite Structure – Patent Publication No: CN 102596546B, Grant of Patent: 24.09.2014, and EP Patent 2,480,399 – Fibre Composite Structure, Grant of Patent: 01.08.2012 and WO2011035860, Disclosure of Patent: 01.04.2001]

- (4) DE 02007017151 – Palette II, Inventors: M. Hartel, D. Harder, H. Monnerat, M. Milwich & T. Speck, Patent Application: 11.04.2007 / Grant of Patent: 16.10.2008, DE102007017151 A1 / Disclosure of Patent: 19.08.2010, DE102007017151 B4
[see also: US Patent 7712421 – Pallet II, Grant of Patent: 11.05.2010]
- (3) DE 10 2006 037 482 – Palette I, Inventors: M. Hartel, T. Steinbrecher, T. Speck, & D. Harder, Patent Application: 10.08.2006 / Disclosure of Patent: 21.02.2008, DE 10 2006 037 482 A1 / Grant of Patent: 13.11.2008, DE202006020532 U1
[see also: US Patent 7637219 – Pallet I - Pallet having strip-like support elements made of plastic with embedded fibers, Grant of Patent: 29.12.2009]
- (2) DE 10 2005 027 879 A1 – Stabförmiger Faserverbundwerkstoff, Verfahren und Vorrichtung zu seiner Herstellung, Inventors: M. Milwich, C. Linti, T. Stegmaier, H. Planck, T. Speck, A. Herrmann & O. Speck, Patentanmeldung: 09.06.2005, DE200510027879/ Disclosure of Patent: 14.12.2006, DE102005027879 A1
[see also: EP1902167 – Stabförmiger Faserverbundwerkstoff, Verfahren und Vorrichtung zu seiner Herstellung, Grant of Patent: 11.09.2013 and WO2006131344, CA2611189, and US Patent 8104392 – Rod-shaped fibre composite, and method and device for the production thereof, Grant of Patent: 31.01.2012]
- (1) 01179/05 CH – Selbstheilende Membran, Inventors: R. Luchsinger, T. Speck & O. Speck, Patent Application: 12.07.2005 / Disclosure of Patent: 2006 / Grant of Patent: 2006
[see also: EP 1904291 Disclosure of Patent: 02.04.2008 and WO2007009280, and US20090035551 A1 – Method of producing a self-healing membrane, Grant of Patent: US8822024 B2]

Associate Editor / Member of the Editorial Board of Scientific Journals & Book Series

- (1) Biomimetics - Open Access Journal MDPI - Open Access Publishing [since 2016]
- (2) Bioinspiration and Biomimetics, IOP Science, Bristol [since 2013]
- (3) Journal of Bionic Engineering, Elsevier, Amsterdam [since 2007]
- (4) Trees – Structure and Function, Springer-Verlag [since 2002]
- (5) Paläontographica, Abt. B - Palaeophytologie. E. Schweitzerbart'sche Verlagsbuchhandlung [since 2001]

Past activities as Associate Editor:

IOP SciNotes [2019-2023]

Applied Physics A, Springer-Verlag [2018-2022]

The International Journal of Design & Nature and Ecodynamics, WIT-Press, Southampton-Boston [2006 - 2015]

Book Series: Design and Nature, WIT-Press, Southampton-Boston [2002-2014]

Main Research Areas

- Biomimetics (Especially Bio-Inspired Materials and Surfaces as: Self-Repairing Materials, Damping Materials, Branched and Un-Branched Fibrous Compound Materials, Adhesive Materials and Surfaces, Anti-Adhesive Surfaces, Self-Adaptive Materials, Biomimetics and Architecture)

- Bioinspired Soft Machines and Soft Robots
- Biomechanics and Functional Morphology of Plants
- Evolution of Growth Forms and other Functional Parameters in Plants
- Early Evolution of Land-Plants
- Eco-Biomechanics of Plants in Tropical Rainforests
- Movements of Plants and Plant Organs (e.g. in Flowers and Carnivorous Plants)
- Functional Aspects of Pollination Biology (e.g. in Sage-Species (*Salvia* sp.) or Bird of Paradise Flowers (*Strelitzia* sp.), Structural and Mechanical Aspects of Co-Evolution between Flower and Pollinator
- Didactics of Biomimetics and Biomechanics
- Botanic Gardens (Research, Education, Teaching)

Publications

More than 800 Publications, over 380 in Peer Reviewed Journal and Peer Reviewed Books

VDI-Guideline to Biomimetics:

- VDI-Richtlinie 6220: „Bionik - Konzeption und Strategie; Abgrenzung zwischen bionischen und konventionellen Verfahren/Produkten / Biomimetics - Conception and strategy; Differences between biomimetic and conventional methods/products“: A. Kesel (Leitung), O. Speck & T. Speck, I. Tesari, H. Beismann, J. Bertling, H.G. Beyer, I. Boblan, R. Erb, M. Fischer, M. Herdy, A. Jordan, S. Menzel, M. Mörtl, G. Pohl, H. Seitz, J. Tschernjaew, M. Wirth, 36 pp. – VDI-Gesellschaft Technologies of Life Sciences, Verein Deutscher Ingenieure e.V., Beuth-Verlag, Berlin.
- VDI-Richtlinie 6223: „Bionik: Bionische Materialien, Strukturen und Bauteile / Biomimetics: Biomimetic materials, structures and components“: T. Speck (Leitung), O. Speck, J. Bertling, I. Burgert, F. Horn, R. Kappel, S. Menzel, W. Michel, H. Seitz, T. Stegmaier, 51 pp. – VDI-Gesellschaft Technologies of Life Sciences, Verein Deutscher Ingenieure e.V., Beuth-Verlag, Berlin.

Wichtigste Publikationen in den Jahren 2019-2024:

15 Wichtigste Publikationen zum Thema „Biomechanik und Funktionsmorphologie als Grundlage der Bionik“:

- (1) Klimm F., Thielen M., Homburger J., Modert M. & Speck T. (2024): Natural coil springs: biomechanics and morphology of the coiled tendrils of the climbing passion flower *Passiflora discophora*. *Acta Biomaterialia*, 189: 478-490.
DOI.org/10.1016/j.actbio.2024.10.002
- (2) Horstmann M., Speck T. & Poppinga S. (2024): Orchestrated movement sequences and shape memory-like effects in pine cones. *Plants*, 13: 2078.
DOI.org/10.3390/plants13152078
- (3) Klimm F., Speck T. & Thielen M. (2023): Force generation in the coiling tendrils of *Passiflora caerulea*. *Advanced Science*, 26: 2301496.
DOI: 10.1002/adv.202301496

- (4) Wolff-Vorbeck S., Speck O., Langer M., Speck T. & Dondl P.W. (2022): Charting the twist-to-bend ratio of plant axes. *Journal of the Royal Society Interface*, 19: 20220131. DOI.org/10.1098/rsif.2022.0131
- (5) Kampowski T., Schuler B., Speck T. & Poppinga S. (2022): The effects of substrate porosity, mechanical substrate properties, and loading conditions on the attachment performance of the Mediterranean medicinal leech (*Hirudo verbana*). *Journal of the Royal Society Interface*, 19: 20220068. DOI.org/10.1098/rsif.2022.0068
- (6) Eger C., Horstmann M., Poppinga S., Sachse R., Thierer R., Nestle N., Bruchmann B., Speck T., Bischoff M. & R  he J. (2022): The Structural and Mechanical Basis for Passive-Hydraulic Pine Cone Actuation. *Advanced Science*: 9(22): 2200458. DOI: 10.1002/advs.202200458
- (7) Durak G., Thierer R., Sachse R., Bischoff M., Speck T. & Poppinga S. (2022): Smooth or with a snap! Biomechanics of trap re-opening in the Venus flytrap (*Dionaea muscipula*). *Advanced Science*, 9 (22): 2201362. DOI.org/10.1002/advs.202201362
- (8) Jentzsch M., Badst  ber M.-C., Umlass F. & Speck T. (2022): Damage protection in fruits: Comparative analysis of the functional morphology of the fruit peels of five *Citrus* species via quasi-static compression tests. *Frontiers in Materials*, 9: 979151. DOI:10.3389/fmats.2022.979151
- (9) Langer M., Kelbel M.C., Speck T., M  ller, C. & Speck, O. [2021]: Twist-to-bend ratios and safety factors of petioles having various geometries, sizes and shapes. *Frontiers in Plant Science*, 12: 765605. DOI: 10.3389/fpls.2021.765605
- (10) Mylo M.D., Hofmann M., Delp A., Scholz R., Walther F., Speck T. & Speck O. (2021): Advances on the visualization of the internal structures of the European mistletoe: 3D reconstruction using microtomography. *Frontiers in Plant Science*, 12: 715711. DOI: 10.3389/fpls.2021.715711
- (11) Sachse R., Westermeier A., Mylo M., Nadasdi J., Bischoff M., Speck T. & Poppinga S. (2020): Snapping mechanics of the Venus flytrap (*Dionaea muscipula*). *Proceedings National Academy of Sciences*, 117(27): 16035-16042. DOI/10.1073/pnas.2002707117
- (12) Schmier S., Hosoda N. & Speck T. (2020): Hierarchical structure of the endocarp of *Cocos nucifera*: Morphology and its influence on fracture toughness. *Molecules*, 25: 23. DOI:10.3390/molecules25010223
- (13) Hesse L., Kampowski T., Leupold J., Caliaro S., Speck T. & Speck O. (2020): Comparative analyses of the self-sealing mechanisms in leaves of *Delosperma cooperi* and *Delosperma ecklonis* (Aizoaceae). *International Journal of Molecular Sciences*, 21: 5768. DOI: 10.3390/ijms21165768
- (14) Poppinga S., B  se A., Seidel R., Hesse L., Leupold J. & Speck T. (2019): A seed flying like a bullet: Ballistic seed dispersal in Chinese witch hazel (*Hamamelis mollis* OLIV., Hamamelidaceae). *Journal of the Royal Society Interface*, 16: 20190327. DOI.org/10.1098/rsif.2019.0327
- (15) Kumar C., Palacios A., Surapanen V.A., Bold G., Thielen M., Licht E., Higham T.E., Speck T. & Le Hou  rou V. (2019): Replicating the complexity of natural surfaces: technique validation and applications for biomimetics, ecology, and evolution. *Philosophical Transactions of the Royal Society London A*, 377: 20180265. DOI 10.1098/rsta.2018.0265

15 Most Important Publications Dealing with Biomimetic Materials and Methods:

- (1) Cheng T., Tahouni Y., Sahin E.S., Ulrich K., Lajewski S., Bonten C., Wood D., R  he J., Speck T. & Menges A. (2024) Weather-responsive adaptive shading through biobased and bioinspired hygromorphic 4D-printing. *Nature Communications*, 15: 10366. DOI.org/10.1038/s41467-024-54808-8
- (2) Conrad S., Teichmann J., Knorr N., Bellin D., Speck T. & Tauber F.J. (2024): 3D printed digital pneumatic logic for the control of soft robotic actuators. *Science Robotics*, 9: eadh4060. DOI:10.1126/scirobotics.adh4060
- (3) Knorr N., Auth P., Kruppert S., Stahl C., L  cking M., Tauber F.J. & Speck T. (2024): Speaking valve with integrated biomimetic overpressure release and acoustic warning signal. *Scientific Reports*, 14: 26655. DOI.org/10.1038/s41598-024-77595-0
- (4) M  ller M., Speck T. & Speck O. (2024): Sustainability assessments inspired by biological concepts. *Technology in Society*, 78: 102630. DOI.org/10.1016/j.techsoc.2024.102630
- (5) Fiorello I., Ronzan M., Speck T., Sinibaldi E. & Mazzolai B. (2024): A Biohybrid Self-Dispersing Miniature Machine Using Wild Oat Fruit Awns for Reforestation and Precision Agriculture. *Advanced Materials*, 36(27): 2313906. DOI/pdf/10.1002/adma.202313906
- (6) Speck T., Cheng T., Klimm F., Menges A., Poppinga S., Speck O., Tahouni Y., Tauber F. & Thielen M. (2023): Plants as inspiration for material-based sensing and actuation in soft robots and machines. *MRS Bulletin*, 48: 1–16. [Invited Impact Review] DOI.org/10.1557/s43577-022-00470-8
- (7) Farhan M., Klimm F., Thielen M., Re  eti   A., Bastola A., Behl M., Speck T. & Lendlein A. (2023): Artificial tendrils mimicking plant movements by mismatching modulus and strain in core and shell. *Advanced Materials*, 35: 2211902. DOI:10.1002/adma.202211902
- (8) Masselter T., Schaumann U., Kampowski T., Ulrich K., Bold G. & Speck T. (2023): Improvement of a microfiber filter for domestic washing machines. *Bioinspiration & Biomimetics*, 18(1): 016017. DOI.org/10.1088/1748-3190/acaba2
- (9) Tauber F., Auth P., Teichmann J., Scherag F. & Speck T. (2022): Novel motion sequences in plant-inspired robotics: combining inspirations from snap-trapping in two plant species into an artificial Venus flytrap demonstrator. *Biomimetics*, 7: 99. DOI.org/10.3390/biomimetics7030099
- (10) Cheng T., Tahouni Y., Wood D., Thielen M., Poppinga S., Buchholz L., Steinberg T., Menges A. & Speck T. (2021): Bio-inspired motion mechanisms: Computational design and material programming of self-adjusting 4D-printed wearable systems. *Advanced Science*: 2100411. DOI: 10.1002/adv.202100411
- (11) Meder F., Thielen M., Mondini A., Speck T. & Mazzolai B. (2020): Living plant-based generators for multidirectional wind energy conversion. *Energy Technology*, 2020: 2000236. DOI: 10.1002/ente.202000236
- (12) Correa D., Poppinga S., Mylo M., Westermeier A., Bruchmann B., Menges A. & Speck T. (2020): Biomimetic 4D printed autonomous scale and flap structures capable of multi-phase movement. *Philosophical Transactions of the Royal Society London A* 378 (2167): 20190445. DOI.org/10.1098/rsta.2019.0445

- (13) Esser F., Masselter T. & Speck T. (2019): Silent pumpers: a comparative topical overview of the peristaltic pumping principle in living nature, engineering and biomimetics. *Advanced Intelligent Systems*, 1(2): 1900009.
DOI:10.1002/aisy.201900009
- (14) Speck O. & Speck T. (2019): An overview on bioinspired and biomimetic self-repairing materials. *Biomimetics*, 4: 26. DOI:10.3390/biomimetics4010026
- (15) Knippers J., Schmid U. & Speck T. (eds.) (2019): *Biomimetics for Architecture: Learning from Nature*, 208 pp. Birkhäuser Verlag, Basel. ISBN 978-3-0356-1785-6 // Deutsche Ausgabe: Knippers J., Schmid U. & Speck T. (eds.) (2019): *Bionisch Bauen: Von der Natur Lernen*, 208 pp. Birkhäuser Verlag, Basel. ISBN 978-3-0356-1786-3