



Fig. 4. Specimens showing the effects of bending on the Gaussian curvature. a Anticlastic curvature, b cylindrical surface, c synclastic curvature

Professor Jan Knippers

The rightmost image is from: Riccardo La Magna and Jan Knippers, “Tailoring the bending behaviour of material patterns for the induction of double curvature”, K. De Rycke, et al, editors, Humanizing Digital Reality, Springer Nature Singapore, 2018

See:

<http://ideaconference.hu/en/presenters/jan-knippers-prof-dr-ing>
<https://share-architects.com/professor-jan-knippers-talks-about-adaptive-building-skins/>
<https://www.uni-stuttgart.de/en/press/experts/Prof.-Dr.-Jan-Knippers/>
https://www.researchgate.net/profile/Jan_Knippers

Institute for Building Structures and Structural Design (ITKE), Faculty for Architecture and Urban Design, University of Stuttgart and Knippers Helbig Advanced Engineering

Summary:

Jan Knippers completed his academic studies of structural engineering at the Technische Universität Berlin in 1992 with the award of a PhD. After that he worked for a few years in an internationally recognized engineering firm. Since 2000 he has been head of the Institute for Building Structures and Structural Design (ITKE) at the Faculty for Architecture and Urban Design at the University of Stuttgart. In 2001 he co-founded together with Thorsten Helbig in Stuttgart a consulting firm, Knippers Helbig Advanced Engineering. Since then they opened offices in Berlin and New York City. Jan Knippers focuses on efficient structural design for international and architecturally demanding construction projects involving solid, timber, steel and glass constructions. He specializes in the design of complex shaped and highly efficient roof and façade structures, as well as in research and development on the use of fibre based materials and biomimetic structures in architecture. A particular focus here is on fiber composite materials and textiles as well as the development of simulation and production techniques for these materials that are adapted to the specific requirements of the construction industry. The institute is involved in numerous application-oriented research projects in collaboration with small and medium-sized industrial partners and has particular expertise in the planning and production of demonstrators and prototypes. For this purpose, it has access to the test facilities and workshops of the Faculty of Architecture and Urban Planning. From 2014 to 2019 Jan Knippers was the lead coordinator of the DFG collaborative research centre TRR141, Biological Design and Integrative Structures, a collaboration between the Universities of Stuttgart, Tübingen and Freiburg. Since 2019 he has been Vice Rector for Research at the University of Stuttgart and Deputy Director of the Cluster of Excellence, Integrative Computational Design and Construction for Architecture.

Selected Publications:

Books:

Philippe Block, Jan Knippers, Niloy J. Mitra and Wenping Wang (Editors), *Advances in Architectural Geometry*. Springer, 2014, 385 pages

Jan Knippers, Klaus G. Nickel and Thomas Speck (Editors), *Biomimetic Research for Architecture and Building Construction, Biological Design and Integrative Structures*, Springer, 2016, 408 pages

Journal Articles, etc.:

Bulenda Th., Knippers J., 'Stability of Grid Shells', *Computer and Structures*, 79, 2001, pp 1161-1174.

Knippers Jan., and Gabler. Markus. 2007. *New Design Concepts for Advanced Composite Bridges- The Friedberg Bridge in Germany*.

Jan Knippers and Thorsten Helbig. Recent developments in the design of glazed grid shells. *International Journal of Space Structures*, 24(2):111–126, 06 2009.

Hwang KJ, Knippers J, Park S-W (2009) Influence of various types of node connectors on the buckling loads of grid shells. In: *Symposium of the International Association for Shell and Spatial Structures (50th. 2009. Valencia)*. Evolution and Trends in Design, Analysis and Construction of Shell and Spatial Structures:

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Hwang K J, Knippers J. Stability of single layered grid shells with various connectors, *Proceeding of the ICSA 2010 Guimaraes*. Portugal: ICSA, 2010: 581–588.

Lienhard J, Schleicher S, Poppinga S, Masselter T, Milwich M, Speck T and Knippers J 2011 Flectofin: a hingeless flapping mechanism inspired by nature *Bioinsp. Biomim.* 6 045001

Li J.-M., Knippers J., Form-finding of grid shells with continuous elastic rods, *Proceedings of the International Symposium of the IABSE-IASS Symposium*, London, UK, 2011

Jan Knippers and Thomas Speck. Design and construction principles in nature and architecture. *Bioinspiration & Biomimetics*, 7(1):015002, 2012.

J. Lienhard, H Alpermann, C Gengnagel and J Knippers, Active Bending, A Review on Structures where Bending is used as a Self-Formation Process, *International Journal of Space Structures*, Volume 28, Number 3 - 4 / September-December 2013.

Knippers Helbig. The Theme Pavilion One Ocean. http://www.knippershelbig.com/press/Pressemeldung_Yeosu_E.pdf, 2013.

Kenryo Takahashi, Axel Koerner, Valentin Koslowski and Jan Knippers, "Scale effect in bending-active plates and a novel concept for elastic kinetic roof systems", *Proceedings of the IASS Annual Symposium 2016, Spatial Structures in the 21st Century*, Tokyo, Japan 26-30 September 2016

Jan Knippers (2017) *The Limits of Simulation: Towards a New Culture of Architectural Engineering*, *Technology|Architecture + Design*, 1:2, 155-162

Gene T.C. Kao, Axel Koerner, Daniel Sonntag, Long Nguyen, Achim Menges and Jan Knippers, "Assembly-aware design of masonry shell structures: A computational approach", *Proceedings of the IASS Annual Symposium 2017, Interfaces: Architecture, Engineering, Science*, Hamburg, Germany, 25-28 September 2017

Riccardo La Magna and Jan Knippers, "On the behaviour of bending-active plate structures", *Proceedings of the IASS Annual Symposium 2017, Interfaces: Architecture, Engineering, Science*, Hamburg, Germany, 25-28 September 2017

Jan Bruetting, Axel Koerner, Daniel Sonntag and Jan Knippers, "Bending-active segmented shells", *Proceedings of the IASS Annual Symposium 2017, Interfaces: Architecture, Engineering, Science*, Hamburg, Germany, 25-28 September 2017

Valentin Koslowski, James Solly and Jan Knippers, "Structural design methods of component based lattice composites for the Elytra Pavilion", *Proceedings of the IASS Annual Symposium 2017, Interfaces: Architecture, Engineering, Science*, Hamburg, Germany, 25-28 September 2017

Valentin Koslowski, James Solly and Jan Knippers, "Experimental investigation of failure modes of lattice grid composites for building structures based on case studies", *SAMPE Europe Conference*, Stuttgart, Germany, 2017

Axel Koerner, Vahid Eshraghi, Ali Zolfaghari, Leyla Asrar Haghighi, Maryam Kalantari and Jan Knippers, "Arch(k)kinetic curved-line folding for elastic, adaptive building envelopes", *Proceedings of the IASS Annual Symposium 2018, Creativity in Structural Design*, MIT, Boston, USA, July 16-20 2018

Seiichi Suzuki, Axel Koerner and Jan Knippers, "IGUANA: Advances on the development of a robust computational framework for active-geometric and -topologic modeling of lightweight structures", *Proceedings*

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Simon Bechert, Abel Groenewolt, Oliver David Krieg, Achim Menges and Jan Knippers, “Structural performance of construction systems for segmented timber shell structures”, Proceedings of the IASS Annual Symposium 2018, Creativity in Structural Design, MIT, Boston, USA, July 16-20 2018
ICD/ITKE research pavilion 2016/2017: Integrative design of a composite lattice cantilever”, Proceedings of the IASS Annual Symposium 2018, Creativity in Structural Design, MIT, Boston, USA, July 16-20 2018
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Simon Bechert, Lotte Aldinger, Jan Knippers, Dylan Wood and Achim Menges, “Structural design approach and novel applications for folded shell structures made of single-curved CLT – Tower Urbach, Remstal Gartenschau 2019, IASS Annual Symposium, Structural Membranes Form and Force, Barcelona, Spain, 7-10 October 2019
Jorge Christie, Jonathan J. Solly, Simon Bechert and Jan Knippers, “Bending-driven dynamic corrugation for a funnel shell design”, IASS Annual Symposium, Structural Membranes Form and Force, Barcelona, Spain, 7-10 October 2019
Bas Rongen, Valentin Koslowski, Marta Gil Perez and Jan Knippers, “Structural optimization and rationalization of the BUGA fibre composite dome”, IASS Annual Symposium, Structural Membranes Form and Force, Barcelona, Spain, 7-10 October 2019