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Research and Teaching activities

Topics of actual research activities

- Self-excited vibrations with frictional contacts; applications to brake vibrations.
- Nonlinear Dynamics
- Machine Dynamics
- Stochastics: Solutions of Fokker-Planck Equations
- Energy Harvesting
- Vibrations of artwork

Funded research projects since 2011

Deutsche Forschungsgemeinschaft (DFG, http://www.dfg.de/en/index.jsp)

- Structure process interaction in micro-milling
- Rapid procedure for the calculation of friction forces
- Solution of Fokker-Planck equations for nonlinear mechanical systems
- Active influence of wheel-rail contact
- Squealing of railway block brakes
- Investigation of nonlinear energy harvesting systems by solutions of Fokker-Planck equations

- Hybrid model for the simulation of brake squeal
- Suppression of brake vibrations by deliberately introduced damping
- Initiator of the DFG priority program SPP 1897 “Calm Smooth and Smart - Novel Approaches for Influencing Vibrations by Means of Deliberately Introduced Dissipation" (coordinator Prof. Eberhard).

German Federation of Industrial Research Associations
(AiF **,** https://www.aif.de/en/about-aif.html)

- Computer-aided design of silent brakes
- Dynamic Compression Test Rig for brake pad materials

Industrial Funding

- BPW Bergische Achsen: Vibrations in brakes I, II, III
- MAN Diesel & Turbo: Dynamics of base frames

For the research work on vibrations of oil paintings, performed mainly by my former doctoral student Dr. Kerstin Kracht, my chair has been honored being a place in “Germany - Land of Ideas” in 2011, an initiative under the patronage of the German Federal President.

Actual Teaching activities at TU Berlin:

- Statics, Strength of Materials,
- Kinematics and Dynamics
- Energy Methods
- Continuum Mechanics
- Mechanical Vibrations and Machine Dynamics
- Mechatronics and System Dynamics
- Nonlinear Oscillations

Teaching projects

Two funded projects for E-Learning in lectures on fundamentals of Mechanics (2007-2010) and starting 2017.

Reviewer of applications for research projects:

- Deutsche Forschungsgemeinschaft (DFG, http://www.dfg.de/en/index.jsp)
- Austrian Science Fund (FWF, https://www.fwf.ac.at/en/)
- Austrian Research Promotion Agency (FFG, https://www.ffg.at/en)

Reviewer for German Academic Exchange Service

(DAAD, https://www.daad.de/en/)
Member of the selection committee for scholarships in North America since 2008.

Reviewer for Journals:

- Journal of Sound and Vibration ("Outstanding Reviewer", March 2015)
- International Journal of Non-Linear Mechanics
- Nonlinear Dynamics
- Journal of Vibration and Control
- International Journal of Solid and Structures
- Computer Methods in Applied Mechanics and Engineering
- Archive of Applied Mechanics
- International Journal of Acoustics and Vibration
- Journal of the Acoustical Society of America
- Journal of Computational and Applied Mathematics
- Applied Mathematical Modelling
- Technische Mechanik
- Zeitschrift für Naturforschung
- IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control
- International Journal of Vehicle Structures & Systems
- International Journal of Bifurcation and Chaos
- European Journal of Mechanics – A/Solids
- Journal of Applied Mathematics and Mechanics ZAMM

Member of the Editorial Board of the Journal of Theoretical and Applied Mechanics
(published by the Polish Society of Theoretical and Applied Mechanics)

Section editor of ,,Mechatronics, Robotics and Related Problems"

Cooperation with Warsaw University of Technology

Coordinator from TU Berlin side of the activities in the strategic partnership between Warsaw University of Technology and TU Berlin.

VDI standard (http://www.vdi.eu/engineering/vdi-standards/)

Initiator and chair of standard committee VDI 3843 “Modelling of vibrating systems”.

Memberships

- GAMM (https://www.gamm-ev.de/index.php/en/)
- VDI (http://www.vdi.eu/)

Publications

[1] von Wagner, U.: Stabilität eines Eisenbahnradsatzes bei stochastischer Parametererregung. ZAMM 77(1), 359 – 360, 1997.

[2] von Wagner, U.: Zur Berechnung der Verteilungsdichte des stochastisch parametererregten van der Pol-Oszillators. ZAMM 78(2), 791 – 792, 1998.

[3] von Wagner, U.: On the Calculation of the Probability Density of Stochastically Excited Nonlinear Oscillators by Orthogonal Functions. ZAMM 79(2), 323 – 324,1999.

[4] von Wagner, U.; Wedig, W. V.: Extended Laguerre-Polynomials for Nonlinear Stochastic Systems. Computational Stochastic Mechanics, ed. P. D. Spanos, A. A. Balkema, Rotterdam, Brookfield, 293-298, 1999.

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[7] von Wagner, U.; Wedig, W. V.: Oscillatory Stochastic Systems with Nonlinear Dissipations. ZAMM 80(2), 309 – 310, 2000.

[8] von Wagner, U.; Wedig, W. V.: Nonlinear Stochastic Car Vibrations. ZAMM 81(2), 235 – 236, 2001.

[9] von Wagner, U.; Hagedorn, P.; Nguyen, M. N.: Nonlinear Behavior of Piezo-Beam-Systems Subjected to Weak Electric Field. Proceedings of ASME DETC 2001, Pittsburgh, VIB 21488.

[10] Wedig, W. V.; von Wagner, U.: Stochastic Car Vibrations with Strong Nonlinearities. Proceedings of ASME DETC 2001, Pittsburgh, VIB 21605.

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[12] von Wagner, U.; Hagedorn, P.: Nonlinearities of Piezoceramics Subjected to Weak Electric Fields: Experiments and Modeling. Proceedings of 3rd Workshop on Structural Health Monitoring, Stanford University, 1183 – 1191, 2001.

[13] von Wagner, U.; Wauer, J.: On the Optimization of the Vibration in Dental Tools by Compensation Masses. Proceedings of 9th German-Japanese Seminar on Nonlinear Problems in Dynamical Systems –Theory and Applications- . 297 – 304, Shaker Verlag 2002.

[14] von Wagner, U.: On Double Crater-Like Probability Density Functions of a Duffing Oscillator Subjected to Harmonic and Stochastic Excitation. Nonlinear Dynamics 28, 343 – 355, 2002.

[15] von Wagner, U.; Hagedorn, P.: Piezo-Beam Systems Subjected to Weak Electric Field: Experiments and Modeling of Nonlinearities. Journal of Sound and Vibration 256 (5), 861 – 872, 2002.

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[17] von Wagner, U.: Nonlinear Longitudinal Vibrations of Piezoceramics Excited by Weak Electric Fields. International Journal of Nonlinear Mechanics 38, 565 – 574, 2003.

[18] von Wagner, U.; Hagedorn, P.: Nonlinear Effects of Piezoceramics Excited by Weak Electric Fields. Nonlinear Dynamics 31, 133 – 149, 2003.

[19] von Wagner, U.; Jearsiripongkul, T.; Vomstein, T.; Chakraborty, G.; Hagedorn, P.: Brake Squeal: Modeling and Experiments. VDI-Bericht 1749, 173 – 186, 2003.

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[34] Kracht, K.; von Wagner, U. ; Danziger, B.; Segert, T.: Modal analysis of the Dobson space telescope. Proceedings of 57th International Astronautical Congress IAC Valencia, 2006.

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Non-Scientific publications

Numerous text and photo publications on actual topics and history of railways in journals, calendars and books.

Author/coauthor of three books on railways (in German):

- von Wagner, U.: Die Jagsttalbahn. Eisenbahnkurier-Verlag Freiburg, 2002.
- von Wagner, U.: Die Odenwaldbahn, Eisenbahnkurier-Verlag Freiburg, 2005.
- Knoblauch, U.; von Wagner, U.: Eisenbahnen in der Prignitz, Eisenbahnkurier-Verlag Freiburg, 2008.