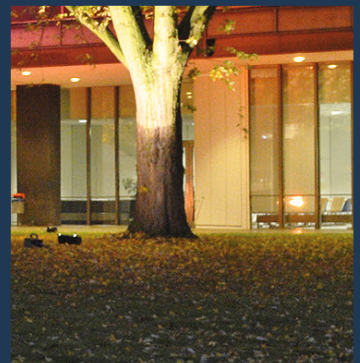
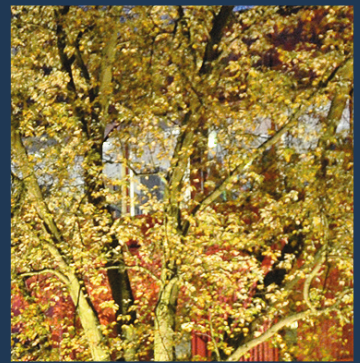
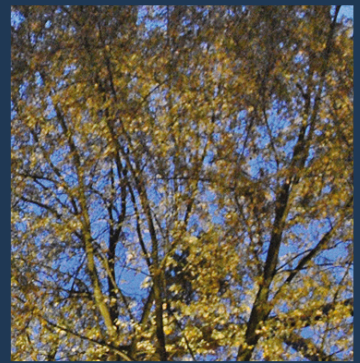




HELMUT SCHMIDT  
UNIVERSITÄT  
Universität der Bundeswehr Hamburg

# RESEARCH REPORT 2020



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# Forewords

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*Dear Readers,*

in spring 2020 the SARS-Covid 19 pandemic hampered research operations at the Helmut Schmidt University / University of the Federal Armed Forces (HSU/UniBw H). Researchers had to forgo some benefits of a federal research campus. Paradoxically, however, our research as a whole ultimately emerged stronger from the pandemic because the federal government implemented dtec.bw, a research and economic stimulus program that provided HSU/UniBw H with additional funding in the areas of digitization and the associated key and future technologies.

Dtec.bw fosters intensive research collaborations with science, economy, administration and society and makes a specific contribution to all three fields of action of the Federal Government's High-Tech Strategy 2025 and to strengthening Germany's digital sovereignty. It also paves the way for increasing the national availability of digital and technological innovations for public and private sectors.

In last year's report, I made a rather abbreviated claim: Scientific knowledge arises through the work and interaction of scientists in departments. HSU/UniBw H has four strong faculties – Economic and Social Sciences, Electrical Engineering, Humanities and Social Sciences, as well as Mechanical Engineering – with 106 professorships and about 333 scientists. Their efforts, aspirations and successes are documented in this research report. Nevertheless, my thesis was only part of the truth, because the system of production of scientific knowledge does not exist without its environmental relation, whose demands on our knowledge production changed a bit with the dtec.bw and at the latest since emerging confrontations on the NATO Eastern Flank: With additional federal funds invested in our research comes expectation, that our scientific output increasingly contributes to the German Federal Ministry of Defence, second to the prosperation of our economic system and third to Germany's comprehensive security approach ("Sicherheitsvorsorge") at large.

In response to the challenges of an increasingly complex world, science and knowledge

production have evolved to be of an interdisciplinary nature, and so our research transgresses departmental boundaries in many cases. This is a particular feature of HSU/UniBw H, which we emphasize in our work and proudly document in the present report. In this research report, you will find a synopsis of new research projects driven by national and international collaborations, selected publications from the year 2020, appointments to scientific committees, memberships in editorial boards of scientific journals and international conference contributions and much more.

A lot has happened in the area of research at HSU/UniBw H, and I am happy to report a successful science year 2020!



**Prof. Dr. rer. pol. Klaus Beckmann**  
President  
of the Helmut Schmidt University  
/University of the Federal Armed Forces  
Hamburg



*Dear Readers,*

with this third research report, researchers at HSU/UniBw H look back on a highly challenging year 2020. Scientific work, the search for knowledge gain, which ideally takes place in teams, the acquisition of financial resources for risky research, the convincing presentation of research results as well as technology transfer is per se an enormously challenging task. This year, these challenges had to be met under the conditions of the pandemic.

In a few words, consider the impact of the pandemic on research as follows: On March 13, 2020, the university had to be closed, so that from one day to the next no attendance could take place at all. All laboratories were closed. The library was no longer accessible. Teaching continued online. Only gradually did research and teaching operations re-establish themselves under the conditions of the pandemic, albeit in a modified form and under much more difficult boundary conditions.

The report now available bears witness to the fact that the scientists at Helmut Schmidt University / University of the Federal Armed Forces Hamburg nevertheless succeeded in advancing research in 2020, making it successful and further increasing the university's visibility.

Thus, this research report traces the development of the faculties and reports on a selection of the numerous research projects carried out at the university's more than 100 professorships. It highlights personal successes of the scientists, e.g., in the form of awards, prizes and scholarships, even if the scholarships in the form of stays abroad could not be started, but had to take place online. We were also unable to receive our foreign guests, who enlivened and enriched our campus with their visits, scientific work, and lectures. Publication activities, on the other hand, could continue, at least as long as the research results were available.

Thus, we hope that we will be able to present you with an interesting research report, despite all the limitations that the pandemic brought to the 2020 research year. And once again, please explore the aspects of our research that interest you in greater depth on the professorships' websites and, even better, contact us directly! We are looking forward to getting into conversation with you!



**Prof. Dr.-Ing. Rolf Lammering**  
Vice President / Research  
of the Helmut Schmidt University  
/University of the Federal Armed Forces  
Hamburg

# Faculty of Economic and Social Sciences

## Overview

*In 2020, members of the Faculty of Economics and Social Sciences at HSU/UniBw H have again carried out research on a wide range of issues, including economics, business administration, law, public management, math and statistics, as well as many interdisciplinary projects, reaching also out to psychology, technology and engineering. By successfully contributing to research and education, and by offering studies which are in high demand, the faculty has even been able to expand its activities. The expansion becomes inter alia visible in a number of newly established professorships which complement those already established and which allow for straddling subfields and widening the scope of research questions as well as methods.*

*Research involved individual research projects, but also active membership in outstanding research clusters, many of which in collaboration with researchers at other Universities (both national and international) as well as research institutes. The fact that third-party funding includes such diverse sources as the German Science Foundation, the Federal Employment Agency, the Ministry of Defense, the German Foundation for Peace Research, the European Regional Development Fund, and the City of Hamburg is witness to how well the faculty and its members are embedded into the scientific community. A short outline of selected research projects, advances, publications, and activities at various professorships gives an impression of the achievements in 2020. Notably, rather than delivering a complete picture, the mentioning is to exemplify the diverse research projects under way at the faculty.*

## News from Research

Prof. D. Kreß was newly appointed to the **Professorship for Business Administration, especially Procurement and Production** in 2020 and has launched a DFG funded research project “Sustainable Personnel Planning in Highly Customized Assembly Lines with Work Sharing”, that will be conducted with research partners at the Universities of Passau and Siegen and the KEDGE Business School Bordeaux for the duration of two years.

**The Professorship for Business Administration, in particular Management Science and Operations Research** (Prof. F. Jaehn) has attracted research grants of the German Research Foundation (DFG) for the project „State Dependent Maintenance Scheduling“, which amount to over 300,000 Euro.

Prof. S. Traub, the chair of the **Professorship for Economics, especially Behavioral Economics**, is the spokesperson of the newly founded research group ERika which consists of several scientists from HSU/UniBw H and the German Federal Institute for Risk-Assessment (BfR). ERika contributes to the scientific foundation of risk communication and therefore improve the efficiency of risk communication. The research group investigates, based on a theoretical and

empirical/experimental method mix, the subject “The cost of a crisis - Analyzing the Significance of Non-Events for Health-Related Consumer Protection” both from an economics and psychology perspective. In the context of non-events, measures of risk communications aim at preventing crises and protecting the health of certain target groups. In the scope of the project, the research team will investigate whether and how cost-benefit analysis can be utilized in risk communication with different stakeholders and in order to improve reputation management.

Dr. Christoph Harig, member of the **Professorship for International Security and Conflict Studies** (Prof. A. Geis), was awarded a research grant (20,000 Euro) by the German Foundation for Peace Research (DSF) for a pilot study on the “Consequences of Stabilization Missions of the United Nations for Internal Military Actions in India”.

**The Professorship for Political Science, especially Political Theory** (Prof. G. Schaal) conducts a sub-project within the new collaborative research project “Secure Digital Coast”, funded by the German Federal Ministry for Economic Affairs and Energy in 2020-2021. The professorship was

awarded with a grant proportion of 105,000 Euro for the HSU/UniBw H.

The **Professorship for Public Law, especially Public Economic and Environmental Law** (Prof. M. Schuler-Harms) currently aims to translate the changing needs of (unmanned) airspace use and the new technological possibilities in aircraft into a legal framework that meets societal demands. Since 2020, the professorship has been undertaking interdisciplinary research in the third-party funded projects UDVeO (Organizing Urbane Drone Traffic Efficiently), i-LUM (Innovative Airborne Urban Mobility), and RIVA (Legally compliant IT concepts and solutions for networks of autonomous land, water and air vehicles), partnering with the **Professorships for Automation Technology** (Prof. A. Fay), **Personnel and Work** (Prof. W. Matiaske), and **Experimental and Biological Psychology** (Prof. T. Jacobsen) among others. Within the collaborative project i-LUM („Innovative Airborne Urban Mobility“) the professorship has attracted about 141.130 Euro proportionate funding. The joint project is being funded by the Hamburg Ministry for Science, Research, Equality and Districts (BWFG) with nearly two million Euro as one of a total of four future clusters, so-called “HamburgX projects“. The professorship is co-applicant in the project RIVA (“Legally compliant IT concepts and solutions for networks of autonomous UAS, land and water vehicles“) that has been supported within the dtec.bw funding scheme.

At the **Professorship for Quantitative Methods in Economics** (Prof. C. Weiß) started a new project in 2020, “Coherent Forecasting and Risk Analysis for Count Processes“ (October 2020 – September 2022), funded by the German Research Foundation (DFG).

### Selected Publications

**Adele, D.; Wyszynski, M.; Traub, S.**  
*Need, Framing, and Time Constraints in Risky Decision Making*, *Theory and Decision* 89, 1-37 (2020).

**Baciu, C.-A.; Friede, A. M.**  
Towards an alternative vision of power: a scenario-based analysis on the EU’s CFSP/ CSDP in 2030, *New Perspectives*, 28(3), 398–412 (2020).  
DOI:/10.1177/2336825X20935245.

**Beblo, M.; Schuler-Harms, M.; Werding, M.**  
*Familiengerechtigkeit in der sozialen Pflegeversicherung*, *Sozialer Fortschritt* 69, 625-639 (2020).

**Esau, K.; Fleuß, D.; Nienhaus, S.-M.**  
*Different Deliberative Arenas, Different Deliberative Quality? Evaluating Online Deliberations’ Quality on German Immigration Policy with a Systemic Framework*. *Policy and Internet* 13(1) (2020).  
DOI:/10.1002/poi3.232.

**Fleuß, D.; Helbig, K.**  
*Measuring Nation States’ Deliberative Quality: Systematic Challenges, Methodological Pitfalls, and Strategies for Upscaling the Measurement of Deliberation*. *Political Studies*, online (2020).  
DOI: /10.1177/0032321719890817.

**Gagnon, J.-P.; Fleuß, D.**  
*The Case for Extending Measures of Democracy in the World — “Beneath”, “Above”, and “Outside” the National Level*. *Political Geography*, online (2020).  
DOI:/10.1016/j.polgeo.2020.102276.

**Geis, A.**  
*Partizipative Formate in der deutschen Aussen- und Sicherheitspolitik: die Politisierung des staatlichen Arkanbereichs?*, In: Andreas Schäfer/David Meiering (eds.): (Ent-)Politisierung? Die demokratische Gesellschaft des 21. Jahrhunderts, Baden-Baden: Nomos (Special Volume of Leviathan 35), 207-228 (2020).

**Grotz, F.; Lewandowsky, M.**  
*Promoting or Controlling Political Decisions? Citizen Preferences for Direct-Democratic Institutions in Germany*. *German Politics* 29 (2), 180-200 (2020).

**Harig, C.**  
*Soldiers in police roles*, In: *Policing and Society*, 30 (9), 1097-1114 (2020).

**Harig, C.**  
*Learning to fight in UN peacekeeping*, *Defence Studies*, 20 (1), 39-60 (2020).

**Herzer, D.**  
*How does mortality affect innovative activity in the long run? World Development*, 125 (1), 1-15 (2020).

**Kilian, F.**

*Die Rechtsquellen der unbemannten Luftfahrt – Teil 1: Völker- und Unionsrecht*, Zeitschrift für Luft- und Weltraumrecht 69, 240-287 (2020).

**Kilian, F.**

*Die Rechtsquellen der unbemannten Luftfahrt – Teil 2: Deutsches Recht*, Zeitschrift für Luft- und Weltraumrecht 69, 415-434 (2020).

**Kilian, F.; Gebhardt, P.**

*Die Ausgestaltung des U-Space nimmt Formen an*. Europäische Zeitschrift für Wirtschaftsrecht, 735-740 (2020).

**Kirchner, S.; Matiaske, W.**

*Plattformökonomie und Arbeitsbeziehungen: Digitalisierung zwischen imaginierter Zukunft und greifbarer Gegenwart*. Industrielle Beziehungen, Zeitschrift für Arbeit, Organisation und Management, 27(2), 105-119 (2020). DOI:/10.3224/indbez.v27i2.01.

**Klausch, M.**

*Die Entwicklung des Gesetzentwurfs zur Landkreisneugliederung in Brandenburg: Responsivität im Detail – Differenzen bei Grundsatzfragen*, Zeitschrift für Parlamentsfragen 51 (2), 367–384 (2020).

**Kocak, D.**

*On the Spatial-temporal Diffusion of Community Based Policing from Japan to Peninsula Southeast Asia: The Case of Timor-Leste*, Nadine Ansorg, Eleanor Gordon (Eds.), Co-Operation, Contestation and Complexity in Peacebuilding, Post-Conflict Security Sector Reform, Oxon: Routledge, 24-39 (2020).

**Schuler-Harms, M.**

*Verfassungsrecht*. Wolfgang Hoffmann-Riem/Hans-Joachim Koch (Hrsg.), Landesrecht Hamburg – Hamburgisches Staats- und Verwaltungsrecht. Studienbuch. 4. Auflage, § 1, 19-41 2020.

**Schuler-Harms, M.**

*Kommentierung von § 15 SGB II*, Gagel (Hrsg.), SGB II / SGB III, 79. Ergänzungslieferung (2020).

**Traub, S.; Kittel, B.**

*Need-based Distributive Justice: An Interdisciplinary Perspective*, Springer Nature, Cham (eds.) (2020).

**Weinmann, P.; Grotz, F.**

*Reconciling Parliamentary Size with Personalized Proportional Representation? Frontiers of Electoral Reform for the German Bundestag*. German Politics, 558-578, online (2020). DOI:10.1080/09644008.2020.1790531.

**Weinmann, P.**

Wahlen in den USA, Handbuch Politik USA. Hrsg. Christian Lammert, Markus B. Siewert und Boris Vormann. Wiesbaden, 2. Aufl., 405–422 (2020).

**Weiß, C.H.; Zhu, F.; Hoshiyar, A.**

*Softplus INGARCH Models*, Statistica Sinica, (2020).

**Wiuff Moe, L.; Geis, A.**

*From liberal interventionism to stabilisation: A new consensus on norm-downsizing in interventions in Africa*, Global Constitutionalism, 9 (2), 387-412 (2020).

*Professors, Deputy Professors and Junior Professors*

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Prof. Dr. Klaus Beckmann,  
*President since April 1, 2018*

Prof. Dr. Michael Berlemann,  
*Political Economy and Empirical Economics*

Prof. Dr. Christina Besio,  
*Sociology, especially Sociology of Organizations*

Prof. Dr. Sigrid Boysen,  
*Public Law, European and Public International Law*

Prof. Dr. Sandra Destradi,  
*International Relations and Regional Governance*

Prof. Dr. Ralf Dewenter,  
*Economics, in particular Industrial Economics*

Prof. Dr. Barbara Dluhosch,  
*International Economics and Economic Policy Research*

Prof. Dr. Stephan Duschek,  
*Business Administration, in particular Organizational Theory*





Prof. Dr. Christian Ernst,  
*Public Law and Commercial Law (including  
Public Procurement Law)*

Prof. Dr. Claudia Fantapié Altobelli,  
*Business Administration, in particular  
Marketing*

Prof. Dr. Andreas Fink,  
*Business Administration, in particular  
Business Informatics*

Prof. Dr. Gabriel Frahm,  
*Applied Stochastics and Risk Management*

Prof. Dr. Andreas Fuchs,  
*Environmental, Climate and Development  
Economics*

Prof. Dr. Martin Josef Geiger,  
*Business Administration, in particular  
Logistics Management*

Prof. Dr. Anna Geis,  
*International Security and Conflict Studies*

Prof. Dr. Jan Gertheiss,  
*Statistics and Data Science*

Prof. Dr. Markus Göbel,  
*Corporate Governance and Corporate  
Theories*

Prof. Dr. Florian Grotz,  
*Comparative Government*

Prof. Dr. Hans Hanau,  
*Civil Law, Commercial, Economic and  
Labour Law*

Prof. Dr. Dierk Herzer,  
*Economics, especially Economics and Growth*

Prof. Dr. Ulrich Hufeld,  
*Public Law and Tax Law*

Prof. Dr. Florian Jaehn,  
*Business Administration, in particular  
Management Science and Operations  
Research*

Prof. Dr. Annette Jünemann,  
*Political Science with a Focus on  
International Politics*

Prof. Dr. Bert Kaminski,  
*Business Administration, in particular  
Business Taxation*

Prof. Dr. Tanja Klenk,  
*Public Administration and Public Policy*

Prof. Dr. Sven Knoth,  
*Computational Statistics*

Prof. Dr. Hans Koller,  
*Business Administration, in Particular  
Technology and Innovation Management*

Prof. Dr. Roland Lhotta,  
*Political Science, especially the Political  
System of the Federal Republic of Germany*

Prof. Dr. Wenzel Matiaske,  
*Personnel and Work*

Prof. Dr. Matija Denise Mayer-Friedrich,  
*General Business Administration and  
International Finance*

Prof. Dr. Dirk Meyer,  
*Economics, especially Regulatory Economics*

Prof. Dr. Stefan Müller,  
*Business Administration, in particular  
Accounting and Auditing*

Deputy Prof. Dr. Fabian Paetzel,  
*Public Economics*

Prof. Dr. Christian Pierdzioch,  
*Economics, in particular Monetary Economics*

Prof. Dr. Günter Reiner,  
*Business and Tax Law*

Prof. Dr. Gary S. Schaal,  
*Political Science, in particular Political Theory*

Prof. Dr. Christina Schaefer,  
*Administrative Science, in particular  
Management of Public Organizations*

Prof. Dr. Tobias Scheytt,  
*Management Accounting and Control*

Prof. Dr. Margarete Schuler-Harms,  
*Public Law especially Public Business Law and  
Environmental Law*

Prof. Dr. Michael Staack,  
*Theoretical and Empirical Research in  
International Relations*

Prof. Dr. Stefan Traub,  
*Economics, especially Behavioral Economics*

Prof. Dr. Florian Wagner-von Papp,  
*Private and Business Law (including Contract  
Design)*

Prof. Dr. Christian H. Weiß,  
*Quantitative Methods in Economics*

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## Young scientists mentioned in this report

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Dr. Maéva Clément,  
*International Security and Conflict Studies*

Dr. Dannica Fleuß,  
Political Science, in particular Political Theory

Dr. Nicolas Fromm,  
*Political Science with a Focus on International Politics*

Dr. Christoph Harig,  
*International Relations and Regional Governance*

Dr. Marcel Lewandowsky,  
*Comparative Government*

## New Memberships in Editorial Boards of Scientific Journals

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Prof. D. Herzer became a senior associate editor of **Applied Economics and Applied Economics Letters**.

Prof. F. Jaehn became a member of the editorial boards of **European Journal of Operational Research** and **Journal of Business Economics**.

Prof. D. Kreß became an associate editor of **OMEGA – The International Journal of Management Science** (Area: Production Management, Scheduling and Logistics).

Prof. W. Matiaske became an editor of the **Management Revue - Socio-Economic Studies** (MREV) and managing editor of the **Industrielle Beziehungen - The German Journal of Industrial Relations** (IndBez).

Prof. S. Müller became a member of the advisory board of the **Zeitschrift für Corporate Governance**.

Prof. G. S. Schaal became a member of the editorial board of **Digital Classics Online**, of the **Österreichische Zeitschrift für Politikwissenschaft**, and of the **Zeitschrift für Politische Theorie**.

Prof. C. H. Weiß became an associate editor of **Statistical Methods & Applications**, associate editor of **Entropy**, and member of the editorial board of **Quality Engineering**.

Dr. D. Fleuß became a member of the editorial board of the **Journal of Democratic Theory**.

## Election into Renowned Scientific Organizations

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Prof. S. Müller now heads the corporate governance reporting working group of the **Schmalenbachgesellschaft e.V.**

Prof. M. Schuler-Harms was elected as a member of the Scientific Advisory Board of the **Max Planck Institute (MPI) of Social Law and Social Policy**.

Prof. C. H. Weiß was elected to the Executive Board of **Society of Reliability, Quality and Safety** and **Treasurer of European Network of Business and Industrial Statistics**.

Dr. D. Fleuß became a convenor of the **Specialist Group for Participatory and Deliberative Democracy of the Political Studies Association, UK**.

## Conferences and Workshops

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Prof. W. Matiaske co-organized the International PhD Research Workshop „**Methods for PhD XIV**“ of HSU/UniBw H that is conducted together with the Universities of Flensburg, Hamburg, Lüneburg, the Syddansk Universitet, the DIW/Soep, and the IAB Nürnberg in September 2020.

The Professorship for Political Science, especially International Security and Conflict Studies (Prof. G. S. Schaal), conducted an international workshop on the topic “**African Agency in the Transforming Field of Security Governance**“ in November 2020, exploring the rising significance of African regional organizations in the field of peace and security. The digital workshop constituted the final element within the DFG-funded research project “Management of Interface Conflicts in African Security Governance”.

The Professorship for Public Law, especially Public Economic and Environmental Law, headed by Prof. M. Schuler-Harms, co-organized the digital kick-off workshop of the DFG-funded conference on the “**Social Security of Self-Employed Persons – International and Interdisciplinary Perspectives**“ in September 2020. The conference was organized together with Dr. O. Lessmann of the University Hamburg, who is

coordinator of the research consortium “Labour Standards for Improved Well-Being”.

Dr. D. Fleuß co-organized and moderated the Webinar Series “**Democracy Rebooted: Classical Concepts for Contemporary Times**”, comprising of three online workshops with about 60 participants, for the Political Studies Association (UK), and the “**PDD Summer Webinar Series**” with six online workshops/panels with about 40 participants for the Political Studies Association (UK), Co-Organization, Moderation, circa 40 per webinar.

Dr. S. Neumann at the Professorship for Management and Business Administration, in particular Management Science and Operations Research organized an **international conference on airplane boarding** that took place in November 2020 with participants from nine different countries.

## Outlook

As 2020 marked another successful year in acquiring external funds, a major goal for 2021 (and thereafter) will be to sustain the dynamics, to publish results in highly visible outlets, and to build on the knowledge thus generated by further advancing the respective research activities. Many research results are already accepted for publication in 2021. Plans include the deepening of international cooperation, the presentation and networking in various academic fora, and, last but not least, intensifying public outreach in an attempt to make research results accessible to politics and bureaucracy as well as the general public. With this aim, a number of new chairs have been established and new research projects have been initiated by means of seed money grants. Moreover, research proposals and, many other projects covering issues at the theoretical and empirical frontier of academic research as well as those relating to public policy are in the making.



# Faculty of Electrical Engineering

## Overview

The Faculty of Electrical Engineering is divided into 13 professorships covering the full spectrum of electrical engineering both in teaching and in research. It is responsible for the bachelor study program "Electrical Engineering" and the master programs "Electrical Engineering", "Renewable Energy and Smart Grids", "Information Technology" and "Computer Science and Engineering". The faculty supports the junior scientific staff and its research activities by providing the opportunities for doctorate and post-doctorate qualifications. In research, the Faculty of Electrical Engineering provides a broad selection of independent research and development projects which guarantee an education on par with modern standards and expectations. All the results are published in scientific publications and books as well as presented at international scientific forums and conventions.

## News from Research

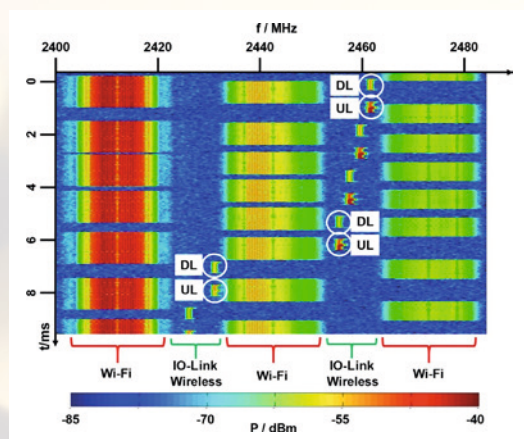
In a new project entitled "IO-Link Wireless Standardization for IEC-Approval" the **Professorship for Electrical Measurement Engineering** (Prof. G. Scholl) is leading a research consortium funded by the Federal Ministry of Economic Affairs and Energy. In the context of the Industry 4.0 initiative, Cyber-Physical Production Systems can be characterized as advanced networked mechatronic production systems gaining their benefit by interaction with the ambient Industrial Internet of Things. In this context, appropriate communication technologies and standards play a vital role to realize the manifold potential improvements in the production process. One of these standards is IO-Link. With the publication of the „IO-Link Wireless System Extensions Specification“ in March 2018 the IO-Link community approved an extension of the standard for wireless networking of intelligent sensors and actuators.

master and two devices. RF communication is carried out between the occupied Wi-Fi bands. The downlink (DL) signal is followed by the uplink (UL) signals. In the spectrogram they can be distinguished by their different signal powers.

In this project, an IEC-compliant test specification will be prepared and the current IOLW standard will be converted into an IEC-compliant form in order to establish the new IO-Link Wireless Standard internationally, to qualify the systems, to establish conformity to the standard and to guarantee the interoperability of systems from different manufacturers worldwide.

The **Professorship for Electrical Measurement Engineering** (Prof. G. Scholl) has started a new project on "Measuring Atmospheric Boundary Layers Above Sea Level" funded by the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support. Under certain atmospheric conditions, optical/electromagnetic waveguides develop in the lower atmosphere above sea surface, the shape and height of which depend on the position of the sun, air masses and wind conditions. In this project, a study is to be carried out to evaluate possible measurement methods for recording the vertical profile of air temperature, dew point, air pressure and wind vector in the lower atmosphere above sea. Selected measurement methods are also to be tested in a real-world scenario.

The **Professorship for Electrical Power Systems** (Prof. D. Schulz) started a new joint project on "Fuel Cell Systems Development for Aviation Engineering – MCU-System" funded by the



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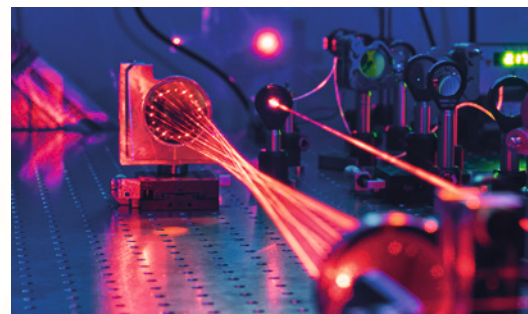
Figure 1, Spectrogram of the RF traffic in the 2.45 GHz band. The IO-Link Wireless network comprises one

Federal Ministry for Economic Affairs and Climate Action. Use of hydrogen as an energy carrier opens up new concepts for emission free mobility, which were out of reach due to emission and weight restrictions. Furthermore, advancements in fuel cell technology, and linked to that, drive train technology, can play a significant part in the decarbonisation of the mobility sector. Possible applications include small drones up to long range airliners. The project Fuel Cell Systems Development for Aviation Engineering (BETA) focuses on a concept of direct interconnection between fuel cell and drive shaft, a so-called H<sub>2</sub>-to-Torque-Concept. This allows a reduction of the electrical grid to the minimum required configuration, saving material and thereby weight and cost. The department for Electrical Power Systems at HSU/UniBw H develops a unique control system for this specific application in the context of the project. Among other aspects, the system offers a power dependent voltage control, redundancy, reliability and the corresponding safety mechanisms to enable a safe operation of such a system.

In a new project entitled “HyReflexS - Hydrogen-based Emergency Power Supply with Integrated Backup Power via Flexible Sector Coupling and Metal Hydride Storage”, the **Professorship for Electrical Power Systems** (Prof. D. Schulz) is working on innovative concepts for the coupling of the energy supply sectors in order to meet the challenges of the future energy production. The project, which is performed in collaboration with the **Professorship of Materials Science** (Prof. T. Klassen) at HSU/UniBw H, is funded by the Federal Ministry for Economic Affairs and Climate Action with a total support of 5.1 million Euro. Apart from renewable production, the energy storage, the balancing of fluctuations in the electricity production and the transportation of energy play an increasingly important role as well. All of these challenges can be met by the usage of renewable hydrogen, which has several advantages in comparison to the energy sources currently in use. This subproject, which is being developed by the Professorship of Electrical Power Systems and the Professorship of Material Science simultaneously, investigates a sophisticated use case of hydrogen and especially of the coupling of different energy sectors. The application of a unitized reversible fuel and electrolyzer cell system, which is coupled to the electricity grid, is combined with the emergency power supply of a depot

for electric busses. Supplemented by metal hydride hydrogen storage applications, this system allows the combination of a renewable emergency power supply with a continuous and economically feasible method of reducing peak loads and increasing energy efficiency during regular operation.

In a new subproject “FIONA - Function-Integrated Optimized Novel Additive Structures” the **Professorship for Electrical Power Systems** (Prof. D. Schulz) is working on the development and practical testing of adapted electrical test procedures for additively manufactured aircraft parts with integrated electrical functions. The application of the developed test methods allows to acquire knowledge about the suitability of materials and processes for this new technology. Furthermore, the test methods serve the purpose of testing the system demonstrators which will be developed in the course of the collaborative project. Thereby the project contributes to the improvement of new manufacturing processes, which reduce the consumption of resources. The department of Electrical Power Systems at HSU/ UniBw H contributes to the design of functional components and participates in the definition of use cases, the specification of functions to integrate in components and the definition of requirements for additively manufactured aircraft parts. Furthermore, HSU/UniBw H will conduct coupon tests, which accompany the material and process development in order to feed back the results and insights for a possible optimization.



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Figure 2, Free space quasi waveguide or, in simple words, multipass cell.

The **Professorship for Laser Technology and Spectroscopy** (Prof. O. Pronin) has the goal not only to push the frontier of the ultrafast laser physics research but also bring the novel technologies to the market. In 2020 the group has received an approval for

“EXIST-Forschungstransfer” start-up grant to commercialize a disruptive multi-pass spectral broadening technology. Additionally, the highest peak power ultrafast laser-oscillator in the world has been developed in this lab. This laser is going to enable next-generation table-top XUV frequency comb source. The progress during 2020 was extraordinarily good and resulted in six CLEO Europe 2021 conference contributions accepted. Three contributions were accepted as oral talks and three as posters. More patent applications and publications are to appear in 2021.

The **Professorship for Signal Processing and Communications** (Prof. U. Zölzer) has successfully finished a four year research project entitled “3D Spatial Audio for Improving Hearing Protection Devices of Soldiers” as a common international research project between HSU/UniBw H and the French-German Research Institute of Saint-Louis (ISL) in France. Due to the high noise levels on the battlefield, hearing protection devices are essential for soldiers and successful missions. However, wearing hearing protection devices reduces the situational awareness of the soldiers. Here, 3D spatial audio can be used to equip the hearing protection devices with a transparent-sounding system and enhance the audio communication by including spatial information into the transmitted audio signals. A further established collaboration with the Centre de Recherche des Écoles de Saint-Cyr Coëtquidan in France allows a yearly exchange of students from Saint-Cyr for their final engineering thesis performed at HSU/UniBw H and delivered to the study program at Saint-Cyr.

The **Professorship of Theoretical Electrical Engineering and Numerical Simulations** (Prof. M. Stiemer) was able to deepen the cooperation with the Technology Innovation Institute (TII), Abu Dhabi, already mentioned in last year’s report by adding an external PhD student, Dr. M. al-Mansoori, to the joint team. Dr. M. al-Mansoori received a Young Scientist Award last year by the German URSI for her paper titled „Classification of Importance Factors based on their Influence on Extreme Values in HPEM Studies”, which was published later in PIERS. In addition to the research on vircator simulations performed by Dr. M. al-Mansoori, the work on Frequency Selective Surfaces was continued. Another developing cooperation started in 2020 with the Romanian Land Forces Academy „Nicolae Balcescu” in Sibiu. In a first step, the joint team examines possibilities to simulate the heat transfer into biological cells in which

magnetic nano-particles have been injected. The results will be very valuable to estimate the chances for a hyperthermal therapy for terminal cancer patients. This new initiative is embedded in the group’s research on modelling the interaction between electromagnetic fields and biological systems.



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Figure 3, Magnetic nanoparticle inside a cell, image courteously by Prof. Simona Miclaus, Romanian Land Forces Academy „Nicolae Balcescu“.

## Selected Publications

**Böhmelt, S.; Kielian, N.; Hagel, M.; Stiemer, M.; Henkel, M. L.; Clemens, M.**

*Electro-quasistatic field-simulation of biological cells using balanced domain-decomposition*, *Comptel - The international journal for computation and mathematics in electrical and electronic engineering* 39, 739 (2020).

DOI: /10.1108/COMPEL-10-2019-0414.

**Cosse, C.; Schumann, M.; Grumm, F.; Becker, D.; Schulz, D.**

*Numerical investigation of PEMFC short-circuit behaviour using an agglomerate model approach*, *Energies* 13, 4108 (2020).

DOI:/10.3390/en13143661.

**Gröbmeyer, S.; Fritsch, K.; Schneider, B.; Poetzlberger, M.; Pervak, V.; Brons, J.; Pronin, O.**

*Self-compression at 1  $\mu\text{m}$  wavelength in all-bulk multi-pass geometry*, *Appl. Phys. B* 126, 159 (2020).

DOI:/10.1007/s00340-020-07506-4.

**Grumm, F.; Schumann, M.; Cosse, C.; Plenz, M.; Lücken, A.; Schulz, D.**

*Short circuit characteristics of PEM fuel cells*

for grid integration applications, *Electronics* 9, 602 (2020).  
DOI: /10.3390/electronics9040602.

**Grund, J.; Rathjen, K.; Rädels, C. F.; Stierner, M.; Dickmann, S.**

*Planar multilayer model of human tissue exposed to a plane electromagnetic wave*, *IEEE Journal of Electromagnetics, RF and Microwaves in Medicine and Biology* (2020).  
DOI: /10.1109/JERM.2020.3043417.

**Holters, M.**

*Antiderivative antialiasing for stateful systems*, *Appl. Sci.* 10, 20 (2020).  
DOI: /10.3390/app10010020.

**Kowalski, M.; Gertz, S.; Mrkulic, O.; Kreischer, C.**

*Validation and application of magnetic sub-model techniques in turbogenerator end zones for local eddy current calculation in Roebel-bars*, *IEEE Transactions on Magnetics* 56, 7510804 (2020).  
DOI:/10.1109/TMAG.2019.2954618.

**Plenz, M.; Meyer, M. F.; Grumm, F.; Becker, D.; Jia, H.; Schulz, D.; McCulloch, M.**

*Impact of lossy compression techniques on the impedance determination*, *Energies* 13, 3661 (2020).  
DOI:/10.3390/en13143661.

**Plenz, M.; Don, C.; Grumm, F.; Meyer, M. F.; Schumann, M.; McCulloch, M.; Jia, H.; Schulz, D.**

*Framework integrating lossy compression and perturbation for the case of smart meter privacy* *Electronics* 9, 465 (2020).  
DOI:/10.3390/electronics9030465.

**Pupeza, I.; Huber, M.; Trubetskov, M.; Schweinberger, W.; Hussain, S. A.; Hofer, C.; Fritsch, K.; Poetzlberger, M.; Vamos, L.; Fill, E.; Amotchkina, T.; Kepesidis, K. V.; Apolonski, A.; Karpowicz, N.; Pervak, V.; Pronin, O.; Fleischmann, F.; Azzeer, A.; Žigman, M.; Krausz, F.**

*Field-resolved infrared spectroscopy of biological systems*, *Nature* 577, 52 (2020).  
DOI:/10.1038/s41586-019-1850-7.

**Rüter, C. E.; Brüske, D.; Suntsov, S.; Kip, D.**  
*Investigation of ytterbium incorporation in lithium niobate for active waveguide devices*, *Appl. Sci.* 10, 2189 (2020).  
DOI:/10.3390/app10062189.

**Urbansky, L.; Zölzer, U.**

*A high-quality digital radio-frequency capacitor microphone with improved dynamic range*, *J. Acoust. Soc. Am.* 147, 1953 (2020). DOI: /10.1121/10.0000946.

**Usenko, S.; Schwickert, D.; Przystawik, A.; Baev, K.; Baev, I.; Braune, M.; Bocklage, L.; Czwalińska, M.K.; Deinert, S.; Duesterer, S.; Hans, A.; Hartmann, G.; Haunhorst, C.; Kuhlmann, M.; Palutke, S.; Roehlsberger, R.; Roensch-Schulenburg, J.; Schmidt, P.; Skruszewicz, S.; Toleikis, S.; Vieffhaus, J.; Martins, M.; Knie, A.; Kip, D.; Laarmann, T.**  
*Auger electron wave packet interferometry on extreme timescales with coherent soft x-rays*, *J. Phys. B* 53, 244008 (2020).  
DOI:/10.1088/1361-6455/abc661.

**Vorwerk, D.; Schulz, D.**

*Conception of domestic final energy delivery including EV charging in terms of integrated multimodal grid expansion*, *WSEAS Transactions on Systems* 19, 2224 (2020).  
DOI:/10.37394/23202.2020.19.2.

### Professors, Deputy Professors and Junior Professors

Prof. Dr.-Ing. Stefan Dickmann,  
*Fundamentals of Electrical Engineering*

Prof. Dr.-Ing. Holger Göbel,  
*Electronics*

Prof. Dr.-Ing. Klaus Hoffmann,  
*Power Electronics*

Prof. Dr.-Ing. Joachim Horn,  
*Control Engineering*

Prof. Dr. rer. nat. habil. Detlef Kip,  
*Experimental Physics and Materials Science*

Prof. Dr. phil. nat. habil. Bernd Klauer,  
*Computer Engineering*

Prof. Dr.-Ing. Christian Kreischer,  
*Electrical Machines and Drive Systems*

Prof. Dr. Oleg Pronin,  
*Laser Technology*

Prof. Dr.-Ing. Christian Schäffer,  
*High-Frequency Engineering*

Prof. Dr.-Ing. habil. Detlef Schulz,  
*Electrical Power Systems*

Prof. Dr.-Ing. Gerd Scholl,  
*Electrical Measurement Engineering*

Prof. Dr. rer. nat. habil. Marcus Stiemer,  
*Theory of Electrical Engineering and  
Computational Electromagnetics*

Prof. Dr.-Ing. habil. Udo Zölzer,  
*Signal Processing and Communication*

#### Young scientists mentioned in this report

Dr.-Ing. Lars Ole Fichte,  
*Theory of Electrical Engineering and  
Computational Electromagnetics*

PD Dr.-Ing. habil. Thomas Fickenscher,  
*High-Frequency Technology*

Dr. Mae al-Mansoori,  
*Theoretical Electrical Engineering and  
Numerical Simulations*

#### New Memberships in Editorial Boards of Scientific Journals

Prof. D. Kip became an Editorial Board Member of the Open Access Online Journal **Optics and Lasers of the Journal Applied Sciences** (IF:2.412).

Prof. D. Schulz became an Editorial Board Member of the Open Access Online Journal **Power Electronic Section of the Journal Applied Sciences** (IF:2.412).

Dr. L. O. Fichte became head of the **commission K (biological effects) of the national committee of the URSI** (Union Radio-Scientifique International). Consequently, he joined the scientific boards of the **German and international URSI** conferences.

#### Fellowships and Awards

Dr. M. al-Mansoori received a **Young Scientist Award by the German URSI** for her paper titled „Classification of Importance Factors based on their Influence on Extreme Values in HPEM Studies“, which was published later in PIERS.

#### National and International Collaborations started in 2020

At the Professorship of Theory of Electrical

Engineering (Prof. M. Stiemer) together with the Institute Pascal, **Université Clermont Auvergne** (Dr. S. Lalléchère, Prof. M. Bonnet, Prof. F. Palladian), **Institut d'Électronique et de Télécommunications de Rennes** (Prof. P. Besnier) and TU Dresden (Dr. R. Jacobs) a research program has been defined to explore transient Effects in electromagnetic reverberation chambers. The results of this research will lead to enhanced testing methods for electromagnetic compatibility (EMC), electromagnetic resilience, and electrical impacts on biological systems. Further, stochastic methods in EMC are jointly developed.

Together with the Chair of Electromagnetic Theory at **University of Wuppertal** (Prof. M. Clemens) the Professorship of Theory of Electrical Engineering (Prof. M. Stiemer) started a collaboration: Development of parallelized numerical methods for high performance computation of large electro-quasi-static systems as occurring in real life (biological systems, electromagnetic circuits).

With the research groups at **University of Regensburg** (Prof. R. Huber), XFEL, **Hamburg** (Dr. M. Lederer) and DESY (Prof. F. Kärtner) the Professorship of Theory of Electrical Engineering (Prof. M. Stiemer) have a collaboration on multi-pass spectral broadening and compression.

Together with the Bundeswehr Institute of Radiobiology, **Munich, Germany** (Dr. A. Lamkowski, Prof. M. Port, Prof. M. Abend) the Professorship of Theory of Electrical Engineering (Prof. M. Stiemer) started the project: Systematic exploration of biological effects of electromagnetic fields on various biological models. The close cooperation is embedded into the European network RF-Bio organized by the European Defence Agency (EDA).

The Professorship of Theory of Electrical Engineering (Prof. M. Stiemer) started with **Universidade de Coimbra**, Faculdade de Ciências e Tecnologia (Prof. T. R. de Oliveira de Almeida) the project: A systematic investigation of aging effects on electromagnetic compatibility properties of electronic devices. The research is supported by the Wehrwissenschaftliches Institut für Schutztechnologien – ABC-Schutz in Munster.

The Professorship of Theory of Electrical Engineering (Prof. M. Stiemer) started with the Chair of Reliability of Technical Systems and Electrical Measurement, **University of Siegen**



(Prof. F. Gronwald) the project: A systematic study of different numerical techniques to assess stochastic distributions of volatile electromagnetic quantities in technical devices. So far, several joint conference papers have been prepared.

The Professorship of Theory of Electrical Engineering (Prof. M. Stiemer) together with the Department of Military Electronic and Information Systems at the **Technical Military Academy of Bucharest** (Dr. G. Rosu) joint testing environments for signal integrity in electronical devices and for the assessment of biological effects of radio-frequency electromagnetic fields are jointly developed. The cooperation is also embedded into the European network RF-Bio organized by the European Defence Agency (EDA).

TII (Dr. C. Kasmı, Prof. F. Vega, Dr. N. Mora) is an **interdisciplinary research instituted based in Abu Dhabi, UAE**. A cooperation with this thriving research team is currently being installed on the fields on Intentional Electromagnetic Interference, EMC test facilities and Computational Electromagnetics with the Professorship of Theory of Electrical Engineering (Prof. M. Stiemer). Dr. Kasmı is also affiliated to the group of Prof. M. Stiemer at HSU/UniBw H as an external associate researcher working on his habilitation thesis.

The **National Metrology Institute of Germany** (PD Dr. T. Kleine Ostmann), and the Chair of Theory of Electrical Engineering (Prof. M. Stiemer) are conducting research within the framework of a jointly supervised doctoral thesis on the development of methods for the evaluation and minimization of uncertainty budgets for certain measurement procedures in antenna theory.

The Professorship of Theory of Electrical Engineering (Prof. M. Stiemer) and the **Bundeswehr Research Institute for Protective Technology - NBS Protection, Germany** (Dr. M. Lange, Dr. C. Schaarschmidt) started several projects concerning test environments for electromagnetic compatibility (EMC) and resilience as well as aging effects in EMC are jointly carried out.

## Conferences and Workshops

The **NEIS 2020 - Conference on Sustainable Energy Supply and Energy Storage Systems** took place at September 14th - 15th 2020 in Hamburg at HSU/UniBw H and was organized by the Professorship Electrical Power Systems (Prof. D. Schulz), technically co-sponsored by IEEE Power and Energy Society Germany Chapter, Conference papers are published in VDE Conference Proceedings and in IEEE Xplore data base, 82 registered participants, 41 full papers, Website: [www.neis-conference.com](http://www.neis-conference.com).

## Outlook

The Faculty of Electrical Engineering continues to be in an expansion phase. The appointment process for the new professorship in "Data Engineering" was successfully carried out and an appointment list was approved by the Senate. This position is expected to be filled in early 2021. The planned research activities are related to the analysis of large amounts of data with a high potential of cooperation with various research institutions within the other faculties of HSU/UniBw H, such as all logistics-related institutes or e.g. the Professorship for "Electrical Measurement Technology" or "Automation Technology". Here, there are many opportunities for cooperation with the research and development activities in the port and trading city of Hamburg, such as with neighboring universities and external research institutions.

The members of the faculty will continue to acquire external funding from public agencies (BMBF, BMWi, DFG etc.) or from direct collaboration with the industry. Therefore, research results of the different groups within the faculty will be transferred into the public and private sector.

# Faculty of Humanities and Social Sciences

## Overview

*The Faculty of Humanities and Social Sciences at HSU/UniBw H covers a broad range of research, from historical issues to the psyche of the human being to the educational dimensions of human life in society, but also covers theological and human resource management aspects. Both application-oriented research and basic research play an important role. Research is understood not only in terms of empirical analyses, but also as a theoretical endeavor. Not only professors and post-doc researchers participate in the research, but also Ph.D. and master students.*

*Research at the faculty is increasingly supported by third-party funding. Donors include the DFG, the Volkswagen Foundation and the Federal Ministry of Education and Research. In 2020, a sociologist and a historian contributed funds from the DFG's renowned Heisenberg Programme to their professorships.*

## News from Research

The **Professorship for Adult Education** (Prof. C. Zeuner) received 388.787,38 Euro funding for the project 'Literacy in Dialogue – Participatory, Reflexive and Action-developing Research' (Alpha Laboratory): Participatory Research concerning Literacy as Social Practice in Adult Literacy Courses' from the Federal Ministry of Education and Research.

Prof. B. Meißner, chair of the **Professorship for Ancient History**, has become a member of the newly founded „Forschungsverbund Gewalt-Zeiten. Temporalitäten von Gewaltunternehmungen“, located at the University Hamburg.

The **Professorship of Clinical Psychology** (Prof. Y. Nestoriuc) received a grant over 754.400 Euro from the German Research Foundation for a project entitled: „Disentangling pharmacologic and expectations effects in antidepressant discontinuation: a balanced open-hidden trial“ (in cooperation with Prof. T. Kircher, University Medical Center Giessen/Marburg). The project is part of the collaborative research center (CRC/Transregio 289) entitled "Treatment Expectation".

The **Professorship of Clinical Psychology** (Prof. Y. Nestoriuc) received a grant over 200.563 Euro from the Hamburg Ministry for Science, Research, Equality and Districts (BWFGB) for a project entitled: "Mechanisms of change in dynamic social interactions within the psychotherapeutic encounter" (in cooperation with Dr. F. Steinicke, Computer Science, University of Hamburg). The project is part of a research group initiative

entitled: "Mechanisms of change in dynamic social interactions" in cooperation with the departments of Psychology and Computer Science at University of Hamburg.

The **Professorship of Clinical Psychology** (Prof. Y. Nestoriuc) received a grant over 69.900 Euro from the HSU/UniBw H for a project entitled: "Course of expectations and well-being in patients following a biopsy of the uterus – a multimethods prospective cohort study" (together with Dr. A.-K. Meyrose).

Supervised by the chair of the **Professorship for Educational Science**, especially Intercultural and Comparative Educational Research (Prof. M. Gomolla), L. M. Rosen received a three-year Ph.D. grant over 57.000 Euro from the Hans Böckler Foundation for her doctoral project on "Diversity Politics and Culture in Higher Education Institutions – An international comparison" (working title).

The **Professorship of Educational Science, especially Foundations of Education** (Prof. A.-M. Nohl) received a grant from the Volkswagen Foundation for a project titled "Between educating and teaching the adult population. Andragogical perspectives on the Corona Pandemic" (in cooperation with Dr. D. Klinge and Prof. B. Schäffer).

The **Professorships for Sociology, especially Transformation of Governance in Education and Society** (Prof. S. Hartong) received a grant over 327.150 Euro from the DFG for a project

titled “Bildungsmedien 4.0? Eine Analyse zu den Veränderungen von Produktion und Vermittlungswissen im Feld der Bildungsmedien”.

The newly appointed chair of the **Professorship for the History of Eastern Europe and Eastern Central Europe** (Prof. J. Happel) brought a DFG-funded Heisenberg Professorship endowed with 550.000 Euro.

Prof. S. Hartong received a DFG-funded Heisenberg Professorship endowed with 650.000 Euro, and was appointed as **Professor for Sociology, especially Transformation of Governance in Education and Society**.

The **Professorship of Sociology with Special Emphasis on Microsociology** (Prof. K. Liebsch) received a grant for a sub-project on the technologization of care within the cooperative research project “Care – Transformations – International Care Work Research” from the Hamburg Ministry for Science, Research, Equality and Districts (BWFGB).

The **Professorship of Vocational and Occupational Education** (Prof. T. Schlömer) received funding for the project “Transfer of modules for the business model and competence

development for sustainable economics (GEKONAWItransfer): digitalization, nationwide and regional distribution, transfer research” by the Federal Institute for Vocational Education and Training (BIBB) for 24 months.

The **Professorships for Work, Organizational and Economic Psychology** (Prof. Felfe), **Experimental and Biological Psychology** (Prof. T. Jacobsen), **Clinical Psychology** (Prof. Y. Nestoriuc), and **Behavioral Economics** (Prof. S. Traub) received a grant over 726.200 Euro from Bundesinstitut für Risikobewertung (BfR) entitled: “Effektive risk communication (ERika): Costs of a crisis – Relevance of non-events for risk communication”.

The **Professorships for Work, Organizational and Economic Psychology** (Prof. J. Felfe) received a grant over 55.200 Euro from BMVg entitled: "Entwicklung und Erprobung eines Stärkentests".

The **Professorships for Work, Organizational and Economic Psychology** (Prof. J. Felfe) received a grant over 160.000 Euro from AOK entitled: "Care 4 care: Health oriented Leadership".

## Selected Publications

**Abendroth, J.; Heiss, A.; Jacobsen, T.; Röttger, S.; Kowalski, J.**

*Job mobility and job performance: Beliefs about social and occupational (dis-) advantages as mediators.* International Journal of Occupational Safety and Ergonomics (2020).

**Amling, S.; Geimer, A.; Rundel, S.; Thomsen, S.** (Hrsg.)

Jahrbuch Dokumentarische Methode. Heft 2+3, 432 Berlin: Centrum für qualitative Evaluations- und Sozialforschung e.V. (ces). (2020).  
DOI:/10.21241/ssoar.70843.

**Antons, J.-H.**

*The Nation in a Nutshell? Ukrainian Displaced Persons Camps in Post-war Germany,* Harvard Ukrainian Studies 37, 1-2, 177-211 (2020).

**Brandt, P. M.; Herzberg, P. Y.**

*Is a cover letter still needed? Using LIWC to predict application success,* International Journal of Selection and Assessment, 28, 417-429 (2020).  
DOI:/10.1111/ijsa.12299.

**Brandt, V.; Patalay, P.; Kerner auch Koerner, J.**

*Predicting ADHD symptoms and diagnosis at age 14 from objective activity levels at age 7 in a large UK cohort.* European Child & Adolescent Psychiatry (2020).  
DOI:/10.1007/s00787-020-01566-9.

**Büchter, K.**

*Gleichwertigkeit allgemeiner und beruflicher Bildung als Demokratisierungsprojekt. Historische Kontinuität und Grenzen einer Forderung,* In: Kaiser, F./Götzl, M. (Hg.): Historische Berufsbildungsforschung. Perspektiven auf Wissenschaftsgenese und -dynamik. Paderborn, 137-153 (2020).

**Felfe, J.**

*Mitarbeiterbindung,* 2. Aufl. Göttingen: Hogrefe (2020).

**Gerke, L.; Meyrose, A.-K.; Ladwig, I.; Rief, W.; Nestoriuc, Y.**

*Frequencies and Predictors of Negative Effects in Routine Inpatient and Outpatient Psychotherapy: Two Observational Studies.* Frontiers in Psychology, 11, 2144 (2020).

**Gomolla, M.**

*Schulreform, Neue Steuerung und Inklusion,* In: Baros, Wassilios/Jobst, Solvejg/Gugg, Ricarda/Theurer, T. (Hrsg.): Bildungsherausforderungen in der globalen Migrationsgesellschaft. Berlin: Peter Lang, 87-109 (2020).

**Groppe, C.; Oelmann, U.**

*Stefan George – Ernst Morwitz. Briefwechsel 1905–1933.* Berlin : De Gruyter (2020).

**Happel, J.**

*Fears, Rumours, Violence: The Tsarist Regime and the Revolt of the Nomads in Central Asia, 1916,* In: Aminat Chokobaeva, Cloé Drieu, Alexander Morrison (Hg.): The Central Asian Revolt of 1916. A Collapsing Empire in the Age of War and Revolution, Manchester, 126-144 (2020).

**Haq, R.; Klarsfeld, A.; Kornau, A.; Ngunjiri, F.W.**

*Diversity in India: Addressing caste, disability and gender. Equality, Diversity and Inclusion,* 39(6), 585–596 (2020).  
DOI: 10.1108/EDI-04-2020-0095.

**Hartong, S.**

*The Power of Relation-Making: Insights into the Production and Operation of Digital School Performance Platforms in US State Education Agencies,* Critical Studies in Education, 62 (1): 34-49 (2020).

**Hauff, S.; Felfe, J.; Klug, K.**

*High-performance Work Practices, Employee Well-being, and Supportive Leadership: Spillover mechanisms and boundary conditions between HRM and leadership behavior.* International Journal of Human Resource Management, 2109-2137 (2020).  
DOI: 10.1080/09585192.2020.1841819.

**Höhne, T.**

*Smart-Learning?! – Digitalisierung und ökonomisierte Lernkultur in der Schule,* In: Bildung und Erziehung 73, 183 – 196 (2020).

**Höhne, T.; Karcher, M.; Voss, C.**

*Wolkige Verheissungen – Die Schul-Cloud als Mittel der Technologisierung von Schule und Lernen,* Zeitschrift für Pädagogik 66 (3), 324–340 (2020).

**İnal, K.**

*From the Village Institutes to Critical Pedagogy. Rethinking the 'Democratic School'*

through Tonguç and Freire, Rethinking Critical Pedagogy, 1(2), 48-68 (2020).

**Karcher, M.**

*Die kybernetische Bändigung des Zufalls. Dataveillance und Learning Analytics als Herausforderung erziehungswissenschaftlicher Reflexion: Versuch einer Technikfolgenabschätzung*, Fickermann, Detlef, Maniti, Verkonika und Martin Karcher (eds.): Neue Steuerung – Renaissance der Kybernetik? Münster: Waxmann (2020).

**Kelle, U.**

*Qualitative Sozialforschung*, In: Joas, Hans; Mau, Steffen (Hg.): Lehrbuch der Soziologie. 4. vollständig überarbeitete und erweiterte Auflage. Frankfurt am Main: Campus Verlag, 97 – 132 (2020).

**Klug, K.; Selenko, E.; Gerlitz, J.-Y.**

*Working, but not for a living: A longitudinal study on the psychological consequences of economic vulnerability among German employees*, European Journal of Work and Organizational Psychology, 1–18 (2020).

**Kollender, E.**

*Eltern – Schule – Migrationsgesellschaft. Neuformation von rassistischen Ein- und Ausschlüssen in Zeiten neoliberaler Staatlichkeit*, Bielefeld: transcript-Verlag (2020).

**Kornau, A.; Frerichs, I. M.; Sieben, B.**

*An empirical analysis of research paradigms within international human resource management: The need for more diversity*, German Journal of Human Resource Management, 24(2), 148–177 (2020). DOI: 10.1177/2397002220908035.

**Krick, A.; Felfe, J.**

Who benefits from mindfulness? The moderating role of personality and social norms for the effectiveness on psychological and physiological outcomes among police officers, Journal of Occupational Health Psychology, 25(2), 99-112 (2020).

**Krzywdzinski, M.; Je Jo, H.**

*Skill Formation, Automation and Governance. Comparing German and Korean Automotive Manufacturers in Central-Eastern Europe*, In: Critical Perspectives on International Business, advance access (2020). DOI:/10.1108/cpoib-02-2020-0007.

**Laborde, S.; Kauschke, D.; Hosang, T. J.; Javelle, F.; Mosley, E.**

*Performance Habits: A Framework Proposal*, Frontiers in Psychology, 11:1815 (2020).

**Langfeldt, B.; Kelle, U.; Metje, B.**

*Mixed Methods und die Qualität standardisierter Daten*, Grundlagen-Methoden-Anwendungen in den Sozialwissenschaften. Springer VS, Wiesbaden, 173-195 (2020).

**Liesch, K.; Scheiterbauer, T.; Ruppert, U.**

*Zukunftsbilanz: Transnationale Feminismen 25 Jahre nach Peking*. Edition of the Special Issue of feministische studien 38, 1 (2020).

**Mark, R. A.**

*Händler, Forscher, Invasoren. Russland und Zentralasien 1000-1900*. Paderborn: Schöningh Verlag (2020).

**Marschallek, B. E.; Jacobsen, T.**

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## Professors, Deputy Professors and Junior Professors

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Prof. Dr. Esther Berner,  
*Educational Science, especially History of Ideas and Discourse in Education and Upbringing*

Prof. Dr. Karin Büchter,  
*Vocational and Company Pedagogy*

Prof. Dr. Monika Daseking,  
*Educational Psychology*

Prof. Dr. Hans-Peter Erb,  
*Social Psychology*

Prof. Dr. Jörg Felfe,  
*Work, Organizational and Economic Psychology*

Prof. Dr. Mechtild Gomolla,  
*Educational Science, especially Intercultural and Comparative Educational Research*

Prof. Dr. Carola Groppe,  
*Educational Science, especially Historical Education Research*

Prof. Dr. Jörn Happel  
*Eastern European History*

Prof. Dr. Sigrid Hartong,  
*Sociology, especially Transformation of Governance in Education and Society*

Prof. Dr. Sven Hauff,  
*Labour, Human Resources and Organization*

Prof. Dr. Philipp Y. Herzberg,  
*Personality Psychology and Psychological Assessment*

Prof. Dr. Thomas Höhne,  
*Educational Science, especially Social, Political and Legal Foundations of Education and Upbringing*

Prof. Dr. Thomas Hoppe,  
*Catholic Theology with Special Consideration of the Social Sciences and Social Ethics*

Prof. Dr. Thomas Jacobsen,  
*Experimental and Biological Psychology*

Deputy Prof. Dr. Athanasios Karafillidis  
(Professorship representative),  
*General sociology*

Prof. Dr. Udo Kelle,  
*Methods of Empirical Social Research and Statistics*

Prof. Dr. Martin Krzywdzinski,  
*International Labor Relations*

Prof. Dr. Katharina Liebsch,  
*Sociology with Special Emphasis on Microsociology*

Prof. Dr. Burkhard Meißner,  
*Ancient History*

Prof. Dr. Yvonne Nestoriuc,  
*Clinical Psychology*

Deputy Prof. Dr. Christopher Neumaier,  
*Modern Social, Economic and Technical History*

Prof. Dr. Arnd-Michael Nohl,  
*Educational Science, especially Foundations of Education*

Prof. Dr. Jutta Nowosadtko,  
*Early Modern History with Special Consideration of Social and Economic History*

Prof. Dr. Marcus Payk,  
*Modern History with Special Consideration of Western Europe*

Deputy Prof. Dr. Frank Renkewitz,  
*Psychological Methodology*

Prof. Dr. Olaf Sanders,  
*Educational Science, especially Educational Theory and Philosophical Foundations*

Prof. Dr. Tobias Schlömer,  
*Vocational and Occupational Education*

Prof. Dr. Sabine Schmidt-Lauff,  
*Continuing Education and Lifelong Learning*

Prof. Dr. Stephan Selzer,  
*Medieval History*

Prof. Dr. Barbara Sieben,  
*Human Resource Management*

Prof. Dr. Ewald Stübinger,  
*Protestant Theology with Special Consideration of Social Ethics and the History of Theology*

Prof. Dr. Christine Zeuner,  
*Adult Education*

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## Young scientists mentioned in this report

Dr. Steffen Amling,  
*Educational Science, especially Foundations  
of Education*

Dr. Axel Heinrichs,  
*Catholic Theology with Special Consideration  
of the Social Sciences and Social Ethics*

Prof. Dr. Kemal Inal,  
*Guest Researcher at HSU/UniBw H  
Educational Science, especially Foundations  
of Education*

Dr. Martin Karcher,  
*Educational Science, especially Social,  
Political and Legal Foundations of Education  
and Upbringing*

Dr. Felix Knappertsbusch,  
*Methods of Empirical Social Research and  
Statistics*

Dr. Ellen Kollender,  
*Educational Science, especially Intercultural  
and Comparative Educational Research*







Dr. Angela Kornau,  
*Human Resource Management*

Dr. Ann-Katrin Meyrose,  
*Clinical Psychology*

Dr. Florian Reith,  
*Methods of Empirical Social Research and  
Statistics*

Lisa Marie Rosen  
*Educational Science, especially Intercultural  
and Comparative Educational Research*

Dr. Jörg Schwarz,  
*Continuing Education and Lifelong Learning*

Dr. Sarah Thomsen,  
*Educational Science, especially Foundations  
of Education*

Dr. Lisa Wiedemann,  
*Sociology with special emphasis on  
Microsociology*



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## New Memberships in Editorial Boards of Scientific Journals

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Prof. K. Büchter became member of the editorial boards of **“Bildung und Erziehung”** and of **“Berufs- und Wirtschaftspädagogik online”**.

Prof. M. Daseking became a member of the editorial board of **“Diagnostica”**.

Prof. J. Felfe became a member of the editorial boards of **“German Journal of Work- & Organizational Psychology”**, **“European Journal of Work- & Organizational Psychology”** and **“Journal of Personnel Psychology”**.

Prof. M. Gomolla became a member of the editorial board of **“Erziehungswissenschaftliche Revue”**.

Prof. S. Hauff became a member of the editorial board of **“Human Resource Management Journal”** and **“International Journal of Human Resource Management”**.

Prof. P. Y. Herzberg was elected as associate editor of the **“Journal of Individual Differences”**.

Prof. T. Jacobsen became a member of the editorial boards of **“Empirical Studies of the Arts,”** **“Frontiers in Neuroscience,”** and of **“Frontiers in Psychology”**.

Prof. M. Krzywdzinski became a member of the editorial board of **“Work in the Global Economy”** and of the international editorial board of **“The International Journal of Automotive Technology and Management”**.

Prof. K. Liebsch became a member of the editorial board of **“feministische studien. Interdisziplinäre Zeitschrift für Frauen- und Geschlechterforschung”**.

Prof. B. Meißner became a member of the Editorial Board of the journal **“Мнемон / Mnemon”** (St. Petersburg).

Prof. S. Schmidt-Lauff became a member of the Editorial Advisory Board **“Journal of Comparative Studies and International Education”**.

Prof. B. Sieben now co-edits the **“Zeitschrift für Diversityforschung und –management”** and became a member of the editorial board of **“Emotion and Society”**.

Dr. J. Schwarz became a member of the Editorial Board of the **“Jahrbuch Organisationspädagogik”**.

## Election into Renowned Scientific Organizations

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Prof. M. Krzywdzinski became a member of the Program Committee of the **DFG Priority Program 2267** "Digitalization of the World of Work", which started in 2020.

## Fellowships and Awards

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Dr. K. Inal received a two year's grant by the **Philip-Schwartz-Initiative (Alexander von Humboldt Foundation)** for a research fellowship hosted by Prof. A.-M. Nohl.

Dr. E. Kollender received the **Science Award of the HSU/UniBw H** for her excellent doctoral thesis.

Dr. L. Wiedemann was nominated for the **German Study Award 2020**, Geistes- und Kulturwissenschaften.

## National and International Collaborations started in 2020

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Prof. S. Hartong started a collaboration with scholars from University of **Kiel**, University of **Tübingen**, **DIPF Frankfurt**, **Alanus Hochschule Alfter**, as well as teachers from **Hamburg** on a knowledge transfer initiative in the field of educational digitisation (Unblack the Box, [www.unblackthebox.org](http://www.unblackthebox.org)).

The Professorship of Human Resource Management (Dr. A. Kornau, V. Bernauer, Prof. B. Sieben) cooperated with the Professorship of Human Resources and Gender, University of **Hamburg** (Prof. D. Rastetter, Dr. A. Mucha, Dr. S. Schmucker) in preparing a special issue on **“Digitalization of work: Barriers and benefits for equality, diversity and inclusion”** in the **“Zeitschrift für Diversitätsforschung und –management”**.

Prof. M. Krzywdzinski (Professorship of International Labor Relations) became a Research Associate at the **Oxford** Internet Institute and cooperates with Prof. M. Graham in the Fairwork project focusing on the future of platform work and the development of fair work standards for this field.

Prof. Arnd-Michael Nohl and Dr. S. Amling (Professorship of Education Science, especially Systematic Education Science) founded an "International Network Documentary Method" in which 44 professors from **seven countries** work together.

Dr. A. Kornau (Professorship of Human Resource Management), together with Prof. A. Klarsfeld, Prof. L. Knappert, Prof. E. Ng and Prof. F. W. Ngunjiri, finalized the edited volume "International Handbook on New Frontiers of Diversity and Equality at Work" that will be published 2021 at Edward Elgar.

Dr. A. Kornau (Professorship of Human Resource Management) co-edited a special issue on "Equality, Diversity and Inclusion in India" for the EDI Journal (39/6) together with Prof. R. Haq, Prof. A. Klarsfeld (**Toulouse, France**) and Prof. F. W. Ngunjiri (**Pennsylvania, USA**).

### Conferences and Workshops

Prof. M. Gomolla organized the Interdisciplinary Research Colloquium '**Discourse Analysis**' (28.01.2020).

Prof. S. Hartong co-organized the workshop "**Predictive Governance (PreGov)**" (<https://www.hsu-hh.de/opal/workshop-pregov-predictive-governance-towards-transdisciplinary-perspectives/>) 7.-8.2.2020.

Prof. S. Hauff co-organized a symposium on "**Necessary Condition Analysis. Method and Applications**" at the EURAM 2020 online conference supported by Trinity College, Ireland (together with Prof. J. Dul et al.).

Prof. T. Höhne organized the initial workshop with the Georg-Eckert-Leibniz-Institut (Braunschweig) on the DFG-project "**Educational Media 4.0? An Analysis of the Changes in Production and Mediation Knowledge in the Field of Educational Media**" (Bildungsmedien 4.0? Eine Analyse zu den Veränderungen von Produktion und Vermittlungswissen im Feld der Bildungsmedien).

Prof. T. Jacobsen invited Prof. Harald Heinrichs (Leuphana University Lüneburg) for a guest lecture on "**Sensory Sustainability Science: theoretical and empirical considerations**".

Within the DFG funded Interdisciplinary Network on the Methodology and Applications of Integrative Research Methods the Professorship

for Methods of Empirical Social Research and Statistics (Prof. U. Kelle) organized a conference on "**Quality Criteria and Best Practice Standards for Mixed Methods and Multimethod Research**" on February 5-7, including Keynotes by international guest speakers Prof. K. Collins (University of Arkansas) and M. Hammersley (The Open University UK).

The Working Group „Mixed Methods“ within the *German Sociological Association (DGS)*, initiated by Prof. U. Kelle, Dr. F. Reith, Dr. F. Knappertsbusch and others in 2019, co-organized a conference session on the topic of "**Mixed Methods' between method integration and method pluralism**" ('Mixed Methods' zwischen Methodenintegration und Methodenpluralismus") together with the section "Qualitative Research Methods" at the DGS-Conference at Berlin in September 2020.

Prof. S. Schmidt-Lauff co-organized the **INTALL@home online workshop** (16.09.2020) with 34 mainly international guests.

Dr. M. Karcher co-organized the conference "**Living Theory**" (Lebendige Theorie).

Dr. E. Kollender und J. Krzeminska organized the International Digital Conference "**Exploring Intersectionality – Building Solidarity across EU-Turkey Borders: Inclusive Education in Times of Forced Migration and COVID-19**" at the Istanbul Policy Center at Sabanci University (11.-12.11.2020).

Dr. S. Thomsen co-organized the annual meeting of the **Center for Qualitative Evaluation and Social Research** (ces e.V.), Oct. 30th, 2020.

Dr. L. Wiedemann co-organized a **STSHub** (a nation-wide conference on Science and Technology Studies).

### Outlook

The professorships of the faculty will continue to advance their research, not only supported by third-party funding. In doing so, they will open up new subject areas (for example in the field of digitisation) and continue to publish cutting-edge research for the national and international scientific community.

# Faculty of Mechanical Engineering

## Overview

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*The professorships of the Faculty of Mechanical Engineering cover the numerous and diverse aspects of mechanical engineering, take up current developments, carry them into research and teaching, and work on their further development. The department of civil engineering, whose first professorships were filled in 2019, has grown further with the appointment of further professorships. Even in the early phase of cooperation between the mechanical and civil engineering departments, common interests in research could be worked out, e.g., in the field of structural monitoring, in the application of modern mathematical methods or of artificial intelligence techniques, to name a few examples. In addition, since students from both departments get to know each other in a number of courses, they become aware of the diversity in engineering from the beginning of their studies, so that preparation for an interdisciplinary professional activity is already prepared during their studies.*

*The research work at the professorships is supported by public and industrial third-party funds. The research projects are often carried out in cooperation with university partners and industrial companies from the Hamburg metropolitan region. In addition to subject-specific research work, the further qualification of young scientists is a central concern in the professorships. They are supported in their careers and encouraged to work independently. Wherever possible, students are also involved in research projects and thus introduced to a scientific way of working. For their research work, the professorships of the Faculty of Mechanical Engineering have well-equipped laboratories and a good IT infrastructure at their disposal.*

## News from Research

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**The Professorship for Automation Technology** (Prof. A. Fay), together with Prof. S. Kowalewski, Chair of Computer Science 11 at RWTH Aachen University, received a grant from the German Research Foundation for the project AGRAFE: Analysis of GRAFCET specifications for the detection of design errors. Complex software-controlled systems are prone to software bugs. To prevent this in future products and systems, a formal description of control sequences is developed in this project by using the GRAFCET specification language. GRAFCET allows to unambiguously specify the control functions of a system. In this project, the possibilities for formal verification of these specifications will be investigated in order to support the design phase in the engineering process.

**The Professorship for Automation Technology** (Prof. A. Fay) started new projects in 2020: Scientific investigation of a locomotive drive train together with industry and experimental investigations of soils and the prediction of trafficability using empirical and physical MBS-FEM methods for the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support.

At the **Professorship for Automotive Engineering** (Prof. M. Meywerk) the two research domains were expanded: experimental and corresponding CAE techniques. A huge effort is spent in the experimental investigation of deformable soils and the prediction of trafficability using MBS and coupled MBS-FEM models. In this area, a lot of laboratory and in-situ experiments are done to characterize soils in order to establish material models for soils using Bekker-Wong-Reece and Drucker-Prager-Cap approaches. Furthermore, the detailed life-cycle-analysis investigations of energy and greenhouse gas aspects of vehicles is continued.

**The Professorship in Computational Materials Design** (Prof. D. Kramer) has a standing interest in electrocatalysis. Building on prior work, an important detail of the charging behavior of supported nanoparticles in electrochemical environments could be clarified in a short contribution in Nature Communications, which allows to further improve e.g. fuel cell catalysts by exploiting indirect interactions between catalyst and support. The Professorship is also strongly engaged in the development of Li-Ion batteries. In a collaboration with the Faraday Institution in

the United Kingdom, it could be shown that a peculiar topological surface state at the so-called zigzag edge of graphite anodes strongly couples with Li, which limits the charging rate and could provide nucleation sites for dangerous Li metal dendrites. Novel synthesis routes that aim to weaken the topological surface state through doping or prevent the formation of zigzag edges altogether are, therefore, promising to reduce propensity for Li dendrite formation and increase battery safety.

The **Professorship for Computer Science in Mechanical Engineering** (Prof. O. Niggemann) received funding from the Federal Ministry of Education and Research for the project Time4CPS - A Software Framework for the analysis of time dependent behavior in production and logistic processes. The use of artificial intelligence has recently been a major driver of innovation within production and logistic processes. Due to this, many methods exist that can be used to analyze process data. However, in practice many of these projects fail, since an elemental information in production and logistic processes – time – is not being considered. This is despite the fact, that time dependent behavior can show many effects and interdependencies and is usually available without the use of additional sensors. So why is the freely available and invisible sensor time so neglected in the domain of optimization? The main reason is that durations of time can only be measured between two distinct events – which are usually not defined in production and logistic systems. Measurable events do exist (for example in control signals or state changes of discrete sensors), but usually the events relevant to optimization are hidden in continuous, interdependent and high-dimensional sensor values over time. They are therefore unknown and not explicitly usable for optimization algorithms. The project Time4CPS therefore aims towards the development of a methodology and a software platform to automatically discretize relevant events from production and logistic processes. These can then be used for system monitoring and optimization.

The **Professorship for Computer Science in Mechanical Engineering** (Prof. O. Niggemann) received ZIM funding (Zentrales Innovationsprogramm Mittelstand, Central Innovation Programme for small and medium-sized enterprises) from Federal Ministry for Economic Affairs and Climate Action. The

funded project is dealing with the development of an intelligent thread monitoring. In sewing technology, increasing process automation can significantly improve productivity and process reliability. However, automation of sewing machines is sometimes very challenging, since a flexible, thin thread is often difficult to handle and control. The aim of this project is to develop an intelligent thread monitoring system for lockstitch sewing machines, with the help of which the entire thread guide can be monitored and sewing errors can be reliably detected. For this purpose, a new type of sensor system is to be developed and an intelligent artificial intelligence system is being developed that will enable the prediction of thread consumption as well as the calculation of the position of the loop in the material and the presence of a dummy sewing.

The **Professorship for Computer Science in Mechanical Engineering** (Prof. O. Niggemann) started the dtcc.bw-project SmartShip – Digital Twins for Intelligent Ships and for Ship Fleets. Sea rescue organizations play an important role in civil security. They secure sea routes, clarify emergencies at sea and provide information on the condition of critical infrastructures at sea. Application scenarios and the scope of shipping traffic are becoming increasingly complex. Methods of artificial intelligence (AI) and machine learning (ML) offer solutions for this. Such methods could help users with increasingly difficult ship configurations, optimize search maneuvers between ships or use imaging methods to automatically detect people and objects in the water, even in rough seas. However, there is currently a lack of powerful sensors, e.g., cameras, and, above all, sensor networking. Furthermore, data from different ships are currently not being compared with one another. In this project, various ships are therefore to be retrofitted with new sensors including a camera system and built-in IT / AI systems as a test platform. Using this collected data, digital twins are to be created for the ships. A digital twin is defined here as a model of a real system that is enriched in the life cycle and is used to analyze and forecast system behavior. In this case, digital twins also allow the very heterogeneous sensor information (navigation, weather, cameras, motor, ...) to be combined into a uniform, coordinated forecast model. A digital twin for a ship allows e.g. to detect anomalies such as problems early by comparing expected

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behavior with current sensor information. So, prototypes for IT-based ships of a new generation are created here. Another focus is the creation of such digital twins for fleets of ships. This is intended to optimize both the behavior of the fleet, e.g., for search maneuvers or operational planning, and to examine the transferability of knowledge gained from one ship to another. Various AI services such as anomaly detection and fleet optimization are implemented to verify the methods. Using real-time data and intelligent forecasts, bunker costs can be reduced at the fleet level, operating materials can be procured as required and storage can be reduced.

The **Professorship for Computer Science in Mechanical Engineering** (Prof. O. Niggemann) started the project (K)ISS – Artificial Intelligence for the diagnosis of the International Space Station ISS. The International Space Station ISS is a complex technological system. In the event of an error, e.g. a disturbance in the life support system, a quick and targeted identification of the cause of the error is necessary. At the moment, however, it is an increasing challenge for the experts in the ground station to understand the data from 20,000 sensors and the complex interactions in the station. In this project, data-based methods of machine learning and knowledge-based methods of symbolic artificial intelligence are therefore combined in order to develop an assistance system to support the operator. The aim of this project is to develop algorithms and to implement the appropriate practical software solution that provides the following functionalities: i. Automatic AI-driven detection of anomalies in different subsystems by analyzing streaming data, ii. Sending of notifications to the expert team in Bremen and to the control center about the occurrence of the anomalies, iii. Automatic and AI-driven diagnosis (root cause analysis) for detected anomalies, iv. Provision of recommendations for action and repair instructions to remedy the anomalies for the responsible engineers, v. In the case of critical, time-critical errors, initiation of measures for automatic repair.

Research at the **Professorship for Engineering Materials and Building Preservation** (Prof. S. Keßler) focusses on condition assessment and maintenance of reinforced and prestressed concrete structures under consideration of the sustainability assessment, non-destructive testing (NDT) and the reliability assessment of NDT, Structural Health Monitoring (SHM) of infrastructure. This includes in particular research on the design and modelling of the

durability of constructions materials, corrosion of steel in concrete and concrete self-healing.

The Professorship for Engineering Materials and Building Preservation (Prof. S. Keßler) received a grant from the WIPANO program of the Federal Ministry for Economic Affairs and Energy for the project normPOD – Standardization for probabilistic evaluation of the reliability of non-destructive testing systems.

The **Professorship of Fluid Mechanics** (Prof. M. Breuer) received a grant from the German Research Foundation (DFG) for the project Turbulent Wind Gusts and their Dynamic Effects on Flexible Structures: Modeling and High-Resolution Simulations. The aim of the project is to develop a methodology for efficient simulation and analysis of the effects of strong turbulent wind gusts on flexible structures. For the design and dimensioning of such lightweight structures, the highly dynamic interaction between rather infrequent but very strong gusts and the structure is the crucial factor for its stability and stableness.

At the **Professorship of Manufacturing Engineering** (Prof. J.-P. Wulfsberg) the Laboratory of Production Engineering (LaFT,) received funding for the project "Startup Port" - EXIST potentials - start-up culture with a focus on regional networking from the Federal Ministry for Economic Affairs and Energy and for the project FabCity Hamburg from the Hamburg Authority for Economy and Innovation.

The **Professorship of Mathematics in Civil Engineering** (Prof. K. Welker) is principal investigator of the DFG project „Semi-smooth Newton methods on shape spaces” within the DFG priority program SPP1962/2. The main aim of this project is to set up an approach for investigating analytically and solving computationally shape optimization problems constrained by variational inequalities in order to solve application problems like shape optimization for experimental design in Bingham flow and modeling of the formation of the stratum corneum. First research results from this project are now published in the renowned international SIAM Journal on Optimization.

The **Professorship of Mathematics in Civil Engineering** (Prof. K. Welker) is a partner in the joint project "Simulation-based Design Optimization of Dynamic Systems under Uncertainties", which is carried out together with the University of Hamburg (UHH) and the

Technical University of Hamburg (TUHH). The main aim of the project is to develop new innovative simulation methods for the robust optimization of complex components. By combining methods from applied mathematics and theoretical mechanical engineering, mathematical models, which involve dynamic operating conditions and uncertain manufacturing processes, will be developed. In particular, a robust design is important for maintenance-intensive and maintenance-free products from the Hamburg aviation and medical technology environment.

The **Professorship for Power Train Engineering** (Prof. W. Thiemann) has completed a project that deals with the properties of different fuels for diesel engines for use in on-road vehicles. The quality of diesel fuels varies greatly worldwide and can be characterized in a first step by the cetane number to describe the ignitability. In addition, however, the chemical composition of the fuel must be taken into account. With the help of an injection system test bench and a special research diesel engine, fuels were investigated that differ within wide limits in their combustion behavior. Even with extremely low ignition propensity, a stable combustion process could be demonstrated with the engine at operating temperature, although the mechanical stresses on the engine increase dramatically and exceed the limits of standard engines. In contrast to this are synthetically produced fuels with a high ignition propensity. In the future, these renewable fuels can make an important contribution to the low-carbon energy supply of the transport sector. The good combustion properties lead to a smooth combustion process with low engine loads, low noise emission and offer the additional possibility of further reducing pollutants in the raw exhaust gas of the engine through targeted adjustments of the injection parameters.

The **Professorship for Process Engineering** (Prof. B. Niemeyer) obtained the first acceptance of the approval process for the project DEFERM which focuses on the development of decontamination processes against biological hazards. The cooperation of eleven partners from French and German research institutions as well as first responder organizations has a duration of three years and a volume of 3,2 Mio. Euro in total.

At the **Professorship of Thermodynamics** (Prof. K. Meyer), thermophysical properties of humid air were investigated using sophisticated theoretical approaches, which resulted in new reference formulations for the water-air

second virial and binary diffusion coefficients for temperatures up to 2000 K. In addition, in collaboration with the National Institute of Standards and Technology (NIST) in the US, diffusivity ratios of different water isotopologues in air were determined for the first time theoretically, significantly improving the data situation. These ratios are of high importance in different areas of geophysics, for example, in paleoclimatology for the interpretation of Antarctic ice cores.

### Selected Publications

**Angst, U.; Moro, F.; Geiker, M.; Keßler, S.; Beushausen, H.; Andrade, C.; Lahdensivu, J.; Köliö, A.; Imamoto, K.; von Greve-Dierfeld, S.; Serdar, M.**

*Corrosion of steel in carbonated concrete: mechanisms, practical experience, and research priorities - a critical review by RILEM TC 281-CCC*, RILEM Technical Letters, 5, 85-100 (2020).

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**Professors, Deputy Professors and Junior Professors**

Prof. Dr. Markus Bause,  
*Numerical Mathematics*

Prof. Dr.-Ing. Michael Breuer,  
*Fluid Mechanics*



Prof. Dr.-Ing. Rainer Bruns,  
*Technical Logistics*

Prof. Dr. Thomas Carraro,  
*Applied Mathematics*

Prof. Dr.-Ing. Alexander Fay,  
*Automation Technology*

Prof. Dr.-Ing. Sascha Henke,  
*Geotechnical Engineering*

Prof. Dr.-Ing. Sylvia Keßler,  
*Engineering Materials and Building  
Preservation*

Prof. Dr.-Ing. Thomas Klassen,  
*Materials Science*

Prof. Dr.-Ing. Denis Kramer,  
*Computational Material Design*

Prof. Dr.-Ing. Rolf Lammering,  
*Mechanics and Vice President for Research*

Prof. Dr.-Ing. Frank Mantwill,  
*Machine Elements and Computer Aided  
Product Development*

Prof. Dr.-Ing. Karsten Meier,  
*Thermodynamics*

Prof. Dr.-Ing. Martin Meywerk,  
*Automotive Engineering*

Prof. Dr. Philipp Neumann,  
*High Performance Computing*

Prof. Dr.-Ing. Bernd Niemeyer,  
*Process Engineering, in particular Material  
Separation*

Prof. Dr.-Ing. Oliver Niggemann,  
*Computer Science in Mechanical Engineering*

Prof. Dr.-Ing. Delf Sachau,  
*Mechatronics*

Prof. Dr.-Ing. Markus Schatz,  
*Laboratory of Turbomachinery*

Prof. Dr.-Ing. Wolfgang Thiemann,  
*Power Train Engineering*

Prof. Dr.-Ing. Wolfgang Weber,  
*Statics and Dynamics*

Jun.-Prof. Dr. Kathrin Welker,  
*Mathematics in Civil Engineering*

Prof. Dr.-Ing. Jens-Peter Wulfsberg,  
*Manufacturing Engineering*

#### **Young scientists mentioned in this report**

Sissy-Ve Basmer-Birkenfeld  
*Manufacturing Engineering*

Dr. rer. nat. Sonja Buxbaum-Conradi  
*Manufacturing Engineering*

Dr.-Ing. Bhuiyan S. M. Ebna Hai,  
*Numerical Mathematics*

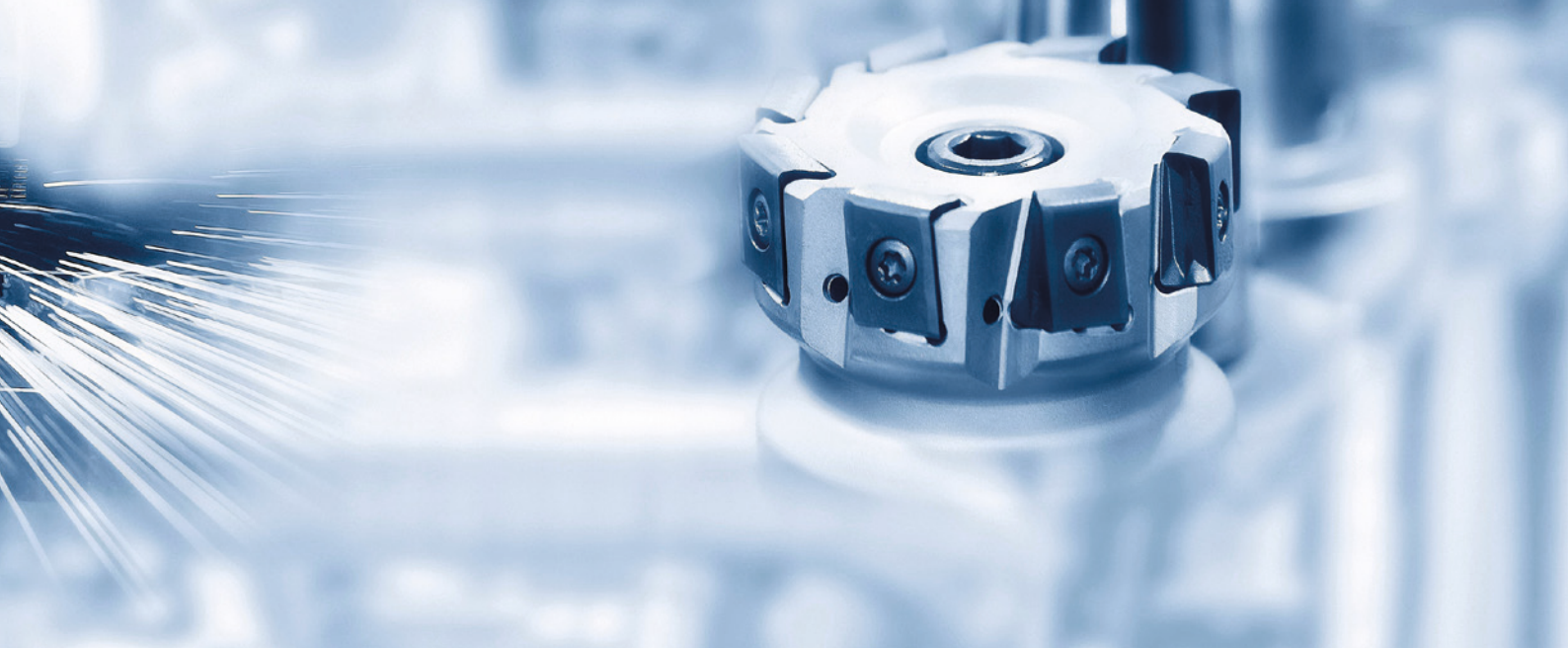
Dr. rer. nat. Frank Gärtner,  
*Materials Science*

Dr. rer. nat. Frank Gimbel,  
*Numerical Mathematics*

Dr.-Ing. Tobias Hellberg,  
*Automotive Engineering*

Dr.-Ing. Bernhard Heinemann,  
*Mechatronics*

Dr.-Ing. Robert Hellmann,  
*Thermodynamics*



Dr.- Ing. Uwe Köcher,  
*Numerical Mathematics*

Dr. Stephan Lassen,  
*Process Engineering, in particular Material Separation*

Dr.-Ing. Alexander List,  
*Materials Science*

Dr.-Ing. Guillaume De Nayer,  
*Fluid Mechanics*

Dr.-Ing. Natalie Rauter,  
*Mechanics*

Dr.-Ing. Tobias Redlich,  
*Manufacturing Engineering*

Dr. Carmen Tenholt,  
*Materials Science*

Dr.-Ing. Stephan Ulrich,  
*Technical Logistics*

Prof. Dr.-Ing. Robert Weidner  
*Manufacturing Engineering*  
*(since 2018 Professorship for Mechanics, University of Innsbruck, Austria)*

Dr.-Ing. Eugen Zimmermann,  
*Statics and Dynamics*

### National and International Collaborations started in 2020

Jun. Prof. K. Welker (Professorship of Mathematics in Civil Engineering) started a cooperation with scientists from **Heidelberg University** (Prof. Dr. R. Herzog), **WWU Münster** (Prof. Dr. B. Wirth), **University of Göttingen** (Prof. Dr. M. Wardetzky), **TU Berlin** (Prof. Dr. G. Steidl), **University of Bayreuth** (Prof. Dr.

A. Schiela), **University of Lübeck** (Prof. Dr. J. Lellmann) and **NTNU Trondheim Norway** (Prof. Dr. R. Bergmann) with view on a proposal for a DFG Research Group (DFG Forschergruppe) with the topic "Optimization on Manifolds: Images and Shapes".

Jun. Prof. K. Welker is part of the women in shape (WiSh) international research network. In 2020, she cooperated with scientists from **USA** (Dr. I. Demir, Jun. Prof Dr. X. Wang and Prof Dr. Y. Lou) to prepare the book "Advances in Data Science", which will be published in 2021. The volume highlights recent advanced in data science, including image processing and enhancement on large data, shape analysis and geometry processing in 2D/3D, exploration and understanding of neural networks, and extensions to atypical data types such as social and biological signals.

Jun. Prof. K. Welker started a cooperation with the Leibniz Institute of Virology, **Germany**, in developing new methods for recognition of cellular structures in immunohistochemistry. In this project, specialized cell populations or an infection of a cell shall be identified and quantified in immunohistochemistry from kidney biopsies by detecting staining patterns of proteins that surrogate a cell population or an infection of a cell.

### Memberships in Editorial Boards of Scientific Journals

Prof. M. Breuer became a member of the editorial boards of "**International Journal of Heat and Fluid Flow**" and "**Flow, Turbulence and Combustion, An International Journal**".

Prof. A. Ebigbo became an associate editor of **Advances in Geo-Energy Research**.



Prof. M. Gündel became a guest editor of **“Stahl in Bestform”**, Volume 89, Issue 1, (2020).

Prof. R. Lammering became a member of the editorial boards of **“Smart Materials and Structures”** and **“Smart Structures and Systems”**.

Jun. Prof. K. Welker became a member of the editorial board of the online-journal **GAMMAS** and reviewer of the **SIAM Journal on Optimization**, the **SIAM Journal on Numerical**

**Analysis**, and the **MathSciNet** at the American Mathematical Society.

Dr. T. Redlich became member of the editorial board **HardwareX** (Elsevier).

### **Election into Renowned Scientific Organizations**

Prof. M. Gündel became a member of the European Committee for Standardization (CEN) CEN/TC 250/SC 08 **“Eurocode 8; Earthquake resistance design of structures”**, CEN standards committee CEN/TC 250/SC 08/WG 02 **“Steel and Composite Structures”**, DIN standards committee NA 005-51-11 GA **“Gemeinschaftsausschuss NABau/NALS, Schwingungsfragen im Bauwesen, Einwirkungen auf Menschen in Gebäuden (DIN 4150-2)”**, DIN standards committee NA 005-51-06 AA **“Erdbeben, Sonderfragen (SpA zu CEN/TC 250/SC 8)”**, and DIN standards committee NA 005-57-05 AA **“Auslegung von Brücken gegen Erdbeben (SpA zu EN 1998-2)”**.

Prof. S. Keßler became a member of the **International Federation for Structural Concrete**, TG 3.3: **„Existing Concrete Structures: Life Management, Testing and Structural Health Monitoring”**, the **International Union of Laboratories and Experts in Construction**

**Materials, Systems and Structures**, the TC CCC **„Carbonation of concrete with supplementary cementitious materials”** and TC CCH **“Stress corrosion cracking and hydrogen embrittlement of concrete-reinforcing steels”** and chair of TC ECS **“Assessment of electrochemical methods to study corrosion of steel in concrete”**.

Prof. K. Meier and Dr. R. Hellmann of the Professorship of Thermodynamics became members of the **International Association for the Properties of Water and Steam (IAPWS)** and **International Association for Transport Properties (IATP)**.

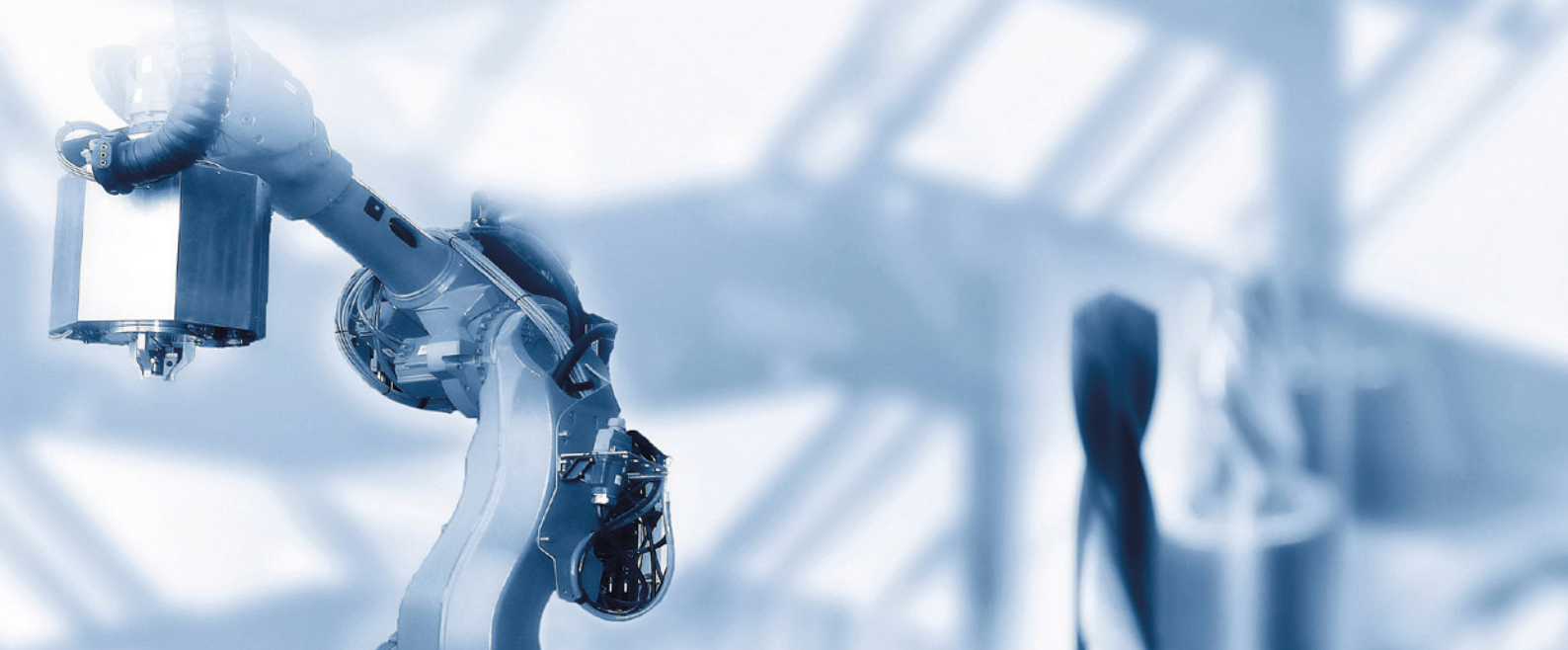
Jun. Prof. K. Welker was invited to **Mathematisches Forschungsinstitut Oberwolfach (MFO)**, Miniworkshop **„Computational Optimization on Manifolds”**, 15.11.2020–21.11.2020.

Prof. J-P Wulfsberg was elected as a member of the **Academy of Science and Engineering, Acatech** and Vice President of the **Scientific Society for Production Engineering**.

Dr. S. Buxbaum-Conradi was elected member of the **Arab-German Young Academy of Sciences and Humanities (AGYA)** at the **Berlin Brandenburg Academy of Sciences**.

### **Fellowships and Awards**

Dr. N. Rauter was awarded a **research grant by the German Academic Exchange Service (DAAD)** for a stay at the University of Pennsylvania, USA. This research grant enables her to collaborate with Prof. C. Reina in the field of short fiber reinforced plastics.



The paper “Chloride migration measurement for chloride and sulfide contaminated concrete.” in Mater Struct 53, 90 (2020) from Decker, M., Grosch, R., Keßler, S. et al. was awarded the **Outstanding Paper Award 2020 by Materials and Structures**.

#### Conferences and Workshops

Prof. A. Ebigo became a member of the scientific program committee of the **International Society for Porous Media**, 12th Annual Meeting, 31 Aug – 4 Sep 2020, online.

Jun. Prof. K. Welker organized the mini-symposium „**Applied Shape and Design Optimization**“ at the **Annual Meeting of the German Mathematical Society** (Sept. 14-17, 2020) at Chemnitz University of Technology, Germany; together with the Co-organizers: Jun. Prof. Dr. M. Siebenborn and Ass.-Prof. Dr. K. Sturm.

At **Young Forum: Engineering Sciences** (Junges Forum: Technikwissenschaften) S.-V. Basmer-Birkenfeld, Dr. T. Redlich, and Prof. R. Weidner organized the Online Workshop on 1st Digital Workshop Engineering Science, Crisis Technologies and Cooperation Technology (June 18, 2020) and the Online Annual Meeting 2020 at the Institute of Materials Engineering, University of Kassel (September 09, 2020).

#### Outlook

As mentioned in the 2019 research report, the faculty is in an expansion phase. Within the faculty, the field of civil engineering will be further expanded by establishing additional professorships.



# Centre for Technology Based Education and Training

(ZtB; Zentrum für technologiegestützte Bildung)

## Overview

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*The Center for Technology-Based Education (ZtB) is a central scientific institution of HSU/UniBw H for the concerns of research in technology-based education. As an integral part of the university, it reports to the President. It performs its tasks autonomously and enjoys scientific independence within the scope of its research activities.*

*As an interdisciplinary and central scientific institution of the HSU/UniBw H, the ZtB researches topics of technology-supported teaching and learning in education, further education and training, and participates in projects of university development and profile building on behalf of the university management.*

*The head of the ZtB, Prof. Dr. Manuel Schulz, is involved in teaching in the bachelor and master programs in education and educational sciences.*

*In addition, the ZtB's portfolio of tasks includes the conception, organization, implementation and follow-up of the Bundeswehr Education Congress, which takes place annually at HSU/UniBw H in close coordination with the so-called „working triangle“, consisting of the Bundeswehr Education Center, the Armed Forces Training Department in the Armed Forces Base Command and the HSU/UniBw H. The ZtB is also responsible for the organization and implementation of the Bundeswehr Education Congress. Due to the Corona pandemic, this 2020 event could not be carried out for the first time.*

## News from Research

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### Study „Multinational Capability Situation“

In November 2020, the research work in the third-party funded project „Study Multinational Capability Situation“, which was carried out in cooperation with the task owner, Unit I 3 „Multinational Defense Planning / Capability Cooperation“ (Multinationale Verteidigungsplanung / Fähigkeitskooperation) of the Bundeswehr Planning Office and by an interdisciplinary research consortium of HSU/UniBw H, was completed.

The HSU/UniBw H research consortium included the President of the HSU/UniBw H, Prof. K. Beckmann (Professor of Economics), Prof. M. Bause (Professor of Numerical Mathematics), and Prof. M. Schulz (Head of the ZtB) as head of the interdisciplinary research consortium.

In the study, the consortium has developed basic principles and application demonstrators

of an IT-based tool that enables the assessment of potentials and risks of possible defense policy cooperation's for capability development from a German perspective scientifically under socio-economic, mathematical, and security and military policy perspectives as well as capability-related by means of qualitative and quantitative IT-based analysis in the IT system of the Bundeswehr.

Together with Dipl.-Soz. B. Griebenow, Prof. M. Schulz has developed a consensual process model for the creation and optimization of a common situation picture of target formation. In an open-ended experiment, the procedure of an agile stakeholder management was tested. This approach to stakeholder management focuses on the product to be realized and the acceptance of the users with the aim of bringing together the various interests of all the stakeholders concerned. In this way, it was possible to jointly achieve a compatible understanding

of the process and, by continuously involving all stakeholders „at eye level“ throughout the process, to develop a process model for creating and optimizing a common picture of the situation for goal formation.

### **Competencies for the digital world of work (KoDiA) - upgrading for digitization**

The project „Competencies for the Digital World of Work (KoDiA) - Empowerment for Digitization“ is funded by the Zentrum für Digitalisierungs- und Technologieforschung der Bundeswehr (dtec.bw) with almost 24 million Euro over a period of four years (from Jan. 1, 2021 - Dec. 31, 2024). Within the framework of the interdisciplinary research design, cooperation with other universities, institutions of education, training and further education and companies is planned.

The main focus of the project is research into digital education using the possibilities of virtual space as a dimension for science, research and technology transfer, with the aim of promoting the acquisition of skills for coping with and helping to shape the digital world of work and life.

Confident handling of digital technologies, which generate changes in daily processes in the areas of our everyday lives and in company contexts, requires special competencies on the part of employees and trainees.

Based on a fundamental pedagogical approach, according to which competencies for participation in a digital working and living environment are actively developed by the subject, we work on issues relating to training for digitization in various sub-projects with cooperation partners from science and educational practice using interactive and agile stakeholder management. The focus here is on promoting the acquisition of action competence for coping with and responsibly helping to shape the digitized society. The associated educational claim thus extends beyond a merely qualification-related understanding.

With the programmatic claim of an extended public science approach (cf. Aulenbacher et al.<sup>1</sup>; cf. Schulz / Neusius<sup>2</sup>), we develop integrated platform environments to open up virtual space as a new dimension for science, research and technology transfer and cooperation between science, business and society.

At the same time, the development and continuous maintenance of a cross-sectional, scientific and interdisciplinary research network enables the integration of potentially all dtec.bw scientists and their research projects. This creates the opportunity for a project-accompanying scientific exchange about questions, methods and gained knowledge for the development of synergies. The research network enables a lively flow of information between the scientists involved in the project and beyond.

### **Publication**

**Beckmann, K.; Reimer, L.; Knauf, K.; Bause, M.; Stieber, A.; Anselmann, M.; Schulz, M.; Neusius, A.; Nachtsheim, G.; Griebenow, B.; Friede, A.**

*Study Multinational Capability Lay (MN FäLg), Final report on the study Hamburg (2020).*  
(Classification: VS-nfD).

1 Aulenbacher, B.; Burawoy, M.; Dörre, K.; Sittel, J.  
*Public sociology. Science in dialogue with society*, Frankfurt/M (2017).

2 Schulz, M.; Neusius, A.  
*Do we need a public pedagogy? – An introduction to the series*, In: Schulz, M., Neusius, A. (Eds.):  
Schriftenreihe Öffentliche Pädagogik - Beiträge zur Bildung für Individuum und Gesellschaft, Vol. 1:  
Hendrik Hoffmann: Sicherheit durch Kompetenzorientierung – Ein ressortgemeinsames Bildungskonzept  
für Einsatzkräfte, Bielefeld, 21 – 30 (2017).

## Facts and Figures 2020

### Majors

Departments	Majors
Economic and Social Sciences (ES)	Business Administration (BSc, MSc) Comparative Democracy Research (MA) Economics (BSc, MSc) International Relations (MA) Law of Public Administration (LL B) Logistics (BSc) Political Science (BA)
Electrical Engineering (EE)	Computational Engineering (MSc) Electrical Engineering (BSc) Energy Management (MSc) Information Technology (MSc) Industrial Engineering (BSc, MSc) Renewable Energy and Smart Grids (MSc)
Humanities and Social Sciences (HS)	Educational Sciences (BA, MA) History (BA, MA) Psychology (BSc, MSc)
Mechanical Engineering (ME)	Automotive Engineering (MSc) Civil Engineering (BSc) Defence Systems (MSc) Energy and Environmental Technology (MSc) Engineering Science (BSc) Mechanical Engineering (BSc) Mechatronics (MSc) Product Engineering and Logistics (MSc)

### Study and Teaching

Departments	Students	
	Total	Proportion of Women
ES	1,084	14.7 %
EE	259	8.5 %
HS	918	31.4 %
ME	284	11.6 %
<b>Total</b>	<b>2,545</b>	<b>19.8 %</b>
International	15	

#### Success Rate (Bachelor's Degree)

First-year students (class of 2016)	575
Graduated students (class of 2016)	380
Success rate (as of December 2020)	66 %

#### Success Rate (Master's Degree)

First-year students (class of 2015)	377
Graduated students (class of 2015)	318
Success rate (as of December 2020)	84 %

#### PhD Degrees and Habilitations (Academic Year 2019/2020)

PhD degrees	39
Postdoctoral lecturer qualification	0

### Staff

University Staff	Members <sup>1</sup>	Positions <sup>2</sup>
Academic staff	462	413
Non-academic staff	509	436
of which:		
Academic department	114	109
Military department <sup>3</sup>	142	87
Central facilities (CF)	48	44
Central administration	152	140
Library	29	32
President's staff	24	24
Trainees	23	23
<b>Total</b>	<b>994</b>	<b>872</b>

<sup>1</sup> Headcounts as of October 1, 2020

<sup>2</sup> Converted to full-time positions (FTEs); for research assistants 18 hours per week were taken as basis for a full-time equivalent.

<sup>3</sup> Military leaders and student services and support

### Academic Staff

Departments	Professors		Academic Staff		Assist.
	Members	Positions	Members	Positions	Members.
ES	43	47	125	78	11
EE	13	14	37	46	5
HS	29	32	114	76	1
ME	21	32	60	87	3
CF			0	1	
<b>Total</b>	<b>106</b>	<b>125</b>	<b>336</b>	<b>288</b>	<b>20</b>

#### Appointments (Academic Year 2018/2019)

An offer of professorship from HSU accepted	10
An offer of professorship from other universities accepted	2

### Funding

Spending (Fiscal Year 2020)	Euro
Personnel costs	54,298,876
Material expenses	5,036,890
Real estate costs <sup>1</sup>	48,985,248
Capital expenditure	9,251,080
IT costs	1,195,663
<b>Total</b>	<b>118,767,757</b>

<sup>1</sup> including rental and leasing charges (32,683,680 Euro)

### Third-Party Funds

Externally Funded Staff <sup>1</sup>	
Academic staff	149
Other staff	27
<b>Total</b>	<b>176</b>

<sup>1</sup> Third-party funded personnel, as far as included in the university's budget (headcount)



Spending by Sponsors (Fiscal Year 2020)	Euro
DFG German Research Foundation	1,501,961
Federal Ministry of Defence	3,348,297
Federal Ministry of Education and Research	1,076,797
Other federal ministries	2,692,708
Federal authorities	89,174
European Union	365,828
State ministries and authorities	490,877
Contract research	1,941,579
Other public organizations	858,687
Foundations	170,192
<b>Total</b>	<b>12,536,100</b>

Spending by Departments (Fiscal Year 2020)	Euro
EE	3,460,104
HS	651,617
ME	5,250,753
ES	1,604,522
ZtB	154,657
ZWW	262,015
Other	170,192
<b>Total</b>	<b>12,536,100</b>

### International Relations

The Helmut Schmidt University collaborates with universities and institutions of higher education throughout the world. A study abroad term is offering students an opportunity to study their field at another university, to gain diverse new impressions, to broaden their individual horizons and to improve their personal development. There are more than 50 partner universities to choose from.

The university offers exchange programs with universities in Australia, Austria, Brasil, Canada, Czech Republic, Finland, France, Greek, Hungary, Island, Israel, Lithuania, Norway, Poland, Portugal, Romania, Russia, Scotland, Slovakia, South Africa, Sweden, Switzerland, Turkey, and United States of America.

Student Exchanges (Academic Year 2018/2019)	
Outgoing students	65
Incoming students	35

### Property Administration

Total area of campus (m <sup>2</sup> )	380,000
Number of buildings	57
Number of lecture/office buildings	13
Number of lecture halls and seminar rooms	40
Number of office rooms	676
Accommodations	1,948

### Studies

The Helmut Schmidt University offers 29 degree programs in shorter time frame. All degree programs are accredited by civilian quality insurance agencies. It is possible to obtain a Bachelor's degree in seven trimesters (2 ¼ years) and a Master's degree in another five trimesters (1 ¾ years). All in all, studies should not take longer than four years.

In addition to their major field of study all students have to study interdisciplinary modules. Here they obtain general career-related skills and interdisciplinary and

inter-methodological competences. Language training is mandatory for all students, as is the completion of work experience placements. In general, teaching takes place in classes with no more than 25 students.

### Research

Research conditions are excellent, with laboratories of high technical standards and well-stocked libraries. The Helmut Schmidt University works in close cooperation with other universities, non-university research facilities and companies in Hamburg and its metropolitan area.

The University is network member of Hamburg Aviation, one of the first leading-edge clusters with a total funding of 80 million euros. It is a partner in the Biocatalysis2021 research cluster, which develops biotechnological methods for manufacturing processes. The Helmut Schmidt University co-operates with the Helmholtz-Zentrum Geesthacht (Centre for Materials and Coastal Research) in the field of materials research, in which both institutions are world leaders in their respective disciplines.

Together with the University of Hamburg, the Hamburg University of Technology, the Hamburg University of Applied Sciences and the Hafencity University Hamburg, the Helmut Schmidt University established the Renewable Energy Research Group. Research clusters at the university comprise Aeronautics Research, Cognitive Science, Maritime Security, Organisation, Personnel, Employment and Leadership, Sustainable Power Systems.

### Continuing Education

Our Academy for Continuing Scientific Education (ZWW) offers various Master-degree programs and other courses on a part-time basis. Develop-ing and providing high-quality certification modules and further education courses with a main emphasis on the public sector is supposed to achieve two goals: First, fulfil the further education mandate of the Hamburg Higher Education Act in the best possible way. Second, with regard to personnel development and lifelong learning make an essential contribution to the further development of the HSU as an internationally oriented science partner of the Federal Government.

Departments	Postgraduate Courses
Humanities and Social Sciences (HS)	Leading Diversity (pg MA)
Economic and Social Sciences (ES)	Military Leadership and international Security (pg MA) Civil-Military Interaction (pg MA) Leadership in Medicine (pg MA, MSc) Leadership in Fiscal Management (pg MA)

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