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1 Introduction

With the outstanding financial investment of the Jacobs Foundation in the International University Bremen (IUB)¹ on October 31, 2006, the future perspective of the University and in particular the School of Engineering and Science is on steady and foreseeable grounds. This, and the advent of the new president Professor Dr. Dr. h.c. mult. Joachim Treusch, who formally took office by July 1, 2006, eventually resulted in a reformulation of the key mission and the main research objectives of the university. The main scientific activities of the School can be considered to be perfectly consistent with the new objectives.

1.1 The Mission

The International University Bremen has been designed and developed as an international research university using the anglo-saxon template, and incorporating the European Bologna Process into its teaching model. The main mission is to academically educate bright young people, irrespective of their nationality, religion, sex, race and financial conditions, in order to prepare them for future leading roles in our globalized world. Thus, the University is designed to provide significant contributions towards a peaceful, and sustainable development of mankind. As a campus university where students from more than 80 nations live and learn together in colleges, intercultural understanding and collaboration in daily life is trained as a byproduct of the university education.

Research and teaching are closely interwoven and pursued on the same high level taking into account the requirements of practical life in enterprises and industry. Interdisciplinarity constitutes the key concept. Research at the International University Bremen aims at delivering key contributions towards the main challenges of mankind, namely

- energy and materials
- water and food
- health
- "Bildung" and communication
- peace and conflict management.

The School of Engineering and Science contributes with its activities mainly towards the former three of these, although its strong electrical engineering faculty addresses technological issues that are closely related to the latter two.

The scientific objectives of the International University Bremen concentrate in five broad areas, namely

- bio-geo-marine resources - from molecules towards technologies
- modeling of complex systems - computer simulation, visualization, networks and management
- changing societies, cultures, and institutions - aspects of globalization
- Asia and Europe - historical, psychological and cultural perspectives
- productive adult development
- "Bildung" and work.

The five research fields of the School of Engineering and Science that have been emerging during the founding years contribute towards the first two of these: Projects within "Information and Communication Technologies" are directly related to the second research area. Topics addressed by IUB's "Life Sciences" and "Geosciences and Astrophysics" contribute to the first as well as to the second area. "Nanoscience and Material Research" and "Mathematics and Theoretical Physics" establish the scientific backbones of the above. These provide important scientific tools and the key methods for successfully tackling questions at the interfaces between the conventional disciplines.

¹Jacobs University as of Spring 2007

The latter, namely science across disciplinary borders is indeed the outstanding - if not the main - trademark of research and development, and teaching at the School of Engineering and Science.

1.2 Factual Development During the Founding Period

1.2.1 Students

During the course of the past founding years, the School of Engineering and Science has been showing remarkable growth, in quantity as well as in quality. The number of undergraduate students, starting in 2001 with 67 has now reached its preliminary saturation at 381 students (Fig. 1). Basically this is dictated by the number of college places and the fact that according to planning 2/3 of the total number of students can be admitted to programs of the School. There are now 12 undergraduate programs of which 10 are formally accredited.

In 2004, for the first time a significant number (48) of graduate students were admitted to the graduate programs of the School. Since then, the number of graduate students has been growing to an impressive total of 223 out of which 142 are PHD-students (Fig. 1). By now, the School has successfully established seven graduate programs on the master's level.

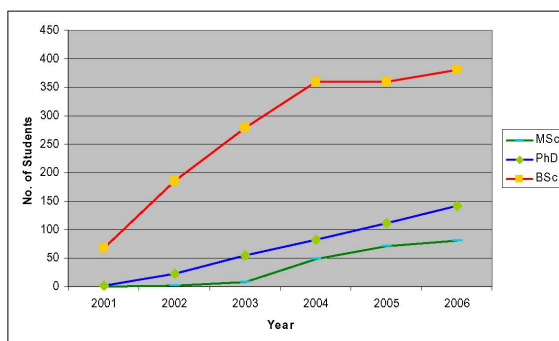


Figure 1: Temporal Development of Number of Students in the School of Engineering and Science

1.2.2 Publications

During the founding period, the scientific output of the School, measured in terms of the number of publications, has been growing from initially 144 to 389 in 2006, after an intermediate decrease in 2004 which can be understood by having in mind that 2004 has been the year during which the main research laboratories have been planned and constructed (Fig. 2). The last of the laboratories (the Lab II laboratory) has been finished in 2005.

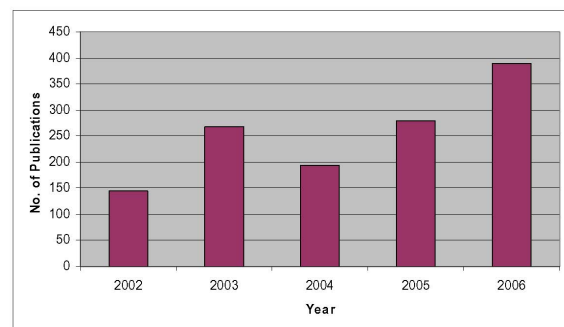


Figure 2: Number of Peer-reviewed Articles, Conference Proceedings, Articles in Encycl./Handbooks, Monographs/Books, Editorship, and Contribution in Ed. Volumes

1.2.3 Grants

The development of third party funding is summarized in Fig. 3 and Fig 4. Revenues from Research grants have reached a total of more than 4.000.000 EURO in 2006 which implies an average revenue per professor of 82.000 EURO.

1.3 Personnel

Presently, the School comprises in total 64 professors out of which four are adjunct professors, located at the Alfred-Wegner-Institut in Bremerhaven. Two distinguished professors and six university lecturers complete the faculty. In addition, 70 research associates, five research assistants, 26 technicians, 1 director and 7 assistants belong to the staff. In 2006, several new faculty members have been hired.

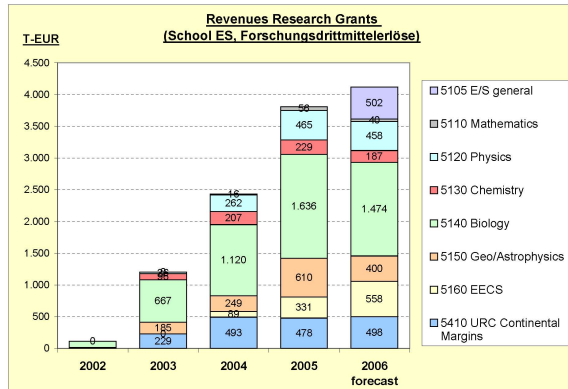


Figure 3: Revenue from Research Grants

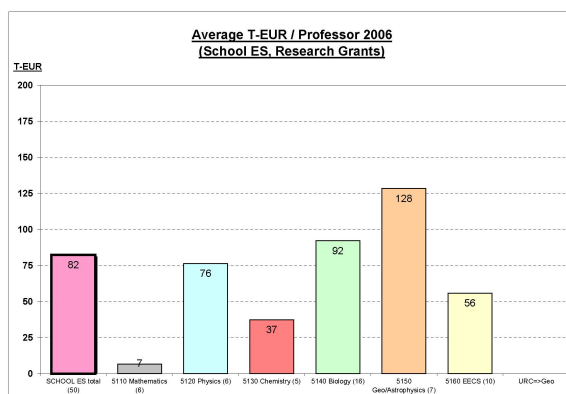


Figure 4: Research Grants Average T-EUR/Professor

- Dr. Marc-Thorsten Hütt, Associate Professor of Computational Systems Biology
- Dr. Ulrich Kleinkathöfer, Associate Professor of Theoretical Physics
- Dr. Nikolai Kuhnert, Associate Professor of Chemistry
- Dr. Lars Linsen, Associate Professor of Computational Science and Computer Science
- Dr. Bendick Mahleko, University Lecturer of Computer Science
- Dr. Danilo Roccatano, University Lecturer of Chemistry
- Jon Wallace, PhD, Assistant Professor of Electrical Engineering
- Dr. Karen Wiltshire, Professor of Marine Geosciences.

In Mathematics, the visiting professors Prof. Grigori Litvinov and Prof. Vladimir Tikhomirov, and Dr. Marc Comerford (research instructor) left. They are replaced by

- Dr. Stefan Baier (Visiting Lecturer for Mathematics)
- Kaivan Mallahi-Karai, PhD (Visiting Lecturer for Mathematics)
- Dr. Alexei Belov (Visiting Professor for Mathematics).

The following members of the faculty have been promoted during 2006.

- Dr. Klaudia Brix from Associate to Full Professor
- Dr. Albert Jeltsch from Associate to Full Professor
- Dr. Laurenz Thomsen from Associate to Full Professor
- Marcus Brüggem, PhD, from Assistant to Associate Professor
- Claus C. Hilgetag, PhD, from Assistant to Associate Professor
- Dr. Ulrich Schwaneberg from Assistant to Associate Professor.

Dr. Stefano Carpin, Assistant Professor of Computer Science, has accepted an offer of an Assistant Professorship at University of California, Merced, USA, starting on January 1, 2007.

1.4 International Center for Transdisciplinary Science

The "International Center for Transdisciplinary Studies" has been founded and started to operate. The center invites internationally highly ranked scientists as fellows for periods of several weeks, mostly during the summer break. The visiting scientists are generally expected to participate in ongoing scientific activities. In 2006, 46 scientists have been participating, among them 39 from foreign countries, see Section 4.5.

1.5 Workshops and Summer Schools

During the year, several international research workshops have been organized on the campus by members of the faculty.

- From October 19-22, the International Workshop on Astrobiology took place at IUB, organized by Professor M. Bau. Focus of the workshop were Banded Iron Formations (BIFs), that developed between two and four billion years ago in the precambrian era. The workshop aimed at providing an overview on current ideas on the formation and preservation of Precambrian BIF, on the use of BIF as proxies for Precambrian seawater, on differences between Early Precambrian BIF and younger ironstones and hydrogenetic Fe(-Mn) precipitates, and on experimental set-ups to simulate BIF-related processes in Early Precambrian environments.
- A workshop for young scientists is offered biannually by the DFG Schwerpunktprogramm SPP1170 (priority program) "Directed Evolution to Optimize and Understand Molecular Biocatalysts". This year's workshop took place from July 30 - August 1 on the IUB campus, organized by Professor U. Schwaneberg. 70 scientists from the 17 DFG institutions participated in the program.
- From July 28 - August 5, a Summer School for students and postdocs took place. Focus of the more than 50 lectures and workshops has been on recent research perspectives in biosensing and its application. 70 participants from 14 Nations met on IUB campus. The fourth IUB Summer School has been organized by Professor M. Winterhalter.
- In June 2006, the 10th International RoboCup has been organized in Bremen. More than 400 teams and 2500 participants from 36 countries participated and competed in three main categories: the robot soccer competition, the robot rescue competition (coordinated by Professor A. Birk), and the RoboCupJunior for educational purposes. IUB teams participated in the "Rescue Robot League" and the "Virtual Robot Competition". The team led by Professor A. Birk reached the finals of the Robot League and won the Innovation Award, a student team led by Professor S. Carpin came in second place in the Virtual Robot Competition.
- From January 16-20, IUB hosted the international "HERMES Graduate Training and Job Fair". More than 30 Master's and PhD students working at HERMES partner institutions all over Europe participated. The HERMES (Hotspot Ecosystem Research on the Margins of European Seas) Program, funded by the European Commission, was begun to gain better understanding of life in depths of between 200 and 2000 meters and deeper.

1.6 Research Highlights

Researchers of the School of Engineering and Science have been contributing towards the international scientific progress with several important discoveries that have been published in the most prestigious international journals.

- Professor A. Jeltsch and his co-workers from IUB, the Institute of Biochemistry of the University of Giessen, and the Medical Research Council of Cambridge University (UK) for the first time successfully used genetically engineered proteins to deactivate Herpes viruses in human cell lines. The study is published in the November 2006 issue of Nucleic Acids Research
- Professor S. Tautz and his group for the first time managed to detect a much larger delocalization of electrons in an organic monolayer semiconductor deposited on a metallic substrate than ever detected in an insulated organic semiconductor. The results, which were published in Nature 444, p. 350 - 353, on November 16, 2006, allow insights into basic mechanisms of electron transport within organic materials and their interfaces with metallic surfaces.
- On the 68th cruise of the German research vessel METEOR an international team of scientists under the lead of Professor A. Koschinsky registered 407 ° C at a hydrothermal vent as the

highest temperature on record measured at the ocean bottom (May 22, 2006). The scientists registered the record temperature in 3000m water depth at a so-called "black smoker", a hydrothermal deep-sea vent with a characteristic particle plume in the discharge water. Maximum deep-sea water temperatures up to 402 °C so far have only been observed in the Pacific.

- Professor S. Rosswog and D. Price, Postdoc at the University of Exeter, for the first time were able to demonstrate in supercomputer simulation of a neutron star merger that a collision of these super dense cosmic objects create magnetic fields a quadrillion (10^{15}) times stronger than the magnetic field of the earth. The simulation results are published in the online express issue of Science ("Producing ultra-strong magnetic fields in magnetized neutron star mergers").
- Professor C. Hilgetag and his colleague H. Barbas, Professor of Health Sciences at Boston University, found new answers to one of the oldest questions in neuroscience: How do the characteristic folds of the primate brain cortex form? The results of an extensive analysis of neuroanatomic data are published as the cover story in the PLoS Computational Biology ("Role of Mechanical Factors in the Morphology of the Primate Cerebral Cortex", Volume 2, Issue 3, MARCH 2006, www.ploscompbiol.org). Prof. C. Hilgetag for the first time was able to provide empirical evidence for the hypothesis that the characteristic folds of the primate brain are mainly formed by mechanical forces of fiber tension.

1.7 Noteworthy

- On November 15, the association Unifreunde e. V. awarded the Ernst A. C. Lange Prize for the joint research project "New display technology for mobile applications" of IUB and University of Bremen. The award, which is endowed with 5000 euros prize money, acknowledges innovative co-operational research between scientists of the two Bremen universities in the fields of Mathematics, Natural and Technical Sciences. The two laureates 2006 are the two Bremen scientists Professor D. Knipp and Professor W. Benecke, Professor of Physics, Electronics and Information Technology at University of Bremen.
- Researchers from all over Germany were taking part in the Science Festival "Highlights of Physics" from November 6-10 in Bremen. Under the motto of "WaveWorlds" scientists gave an introduction into wave phenomena in water, light and sound through series of talks, live experiments and science shows. IUB was involved in the organization and preparation of this event. Faculty and staff contributed in particular to the big opening show, the exhibition, and the physics competition for pupils.
- In October the research network International Research Consortium on Continental Margins (IRCCM) under IUB's lead started a new research project on biomonitoring of cold water coral reefs in the vicinity of oil exploration sites. The aim of the 1.2 million euro project financed by the Norwegian company Statoil is to develop new monitoring and ecosystem modelling approaches for risk assessment in the offshore industry. Research site is the Tisler cold water coral reef in the Skagerrak, which was placed under environmental protection by the Norwegian government in 2003. It will host IUB's second deep-sea online observatory.
- On April 23, IUB's RoboCup team managed another international tournament victory at the US Open Robot Rescue League in Atlanta, prevailing against the other competing institutions only two weeks after their success at the Dutch Open in Eindhoven. The ten contesting teams in Atlanta included such renowned institutions as the Georgia Institute of Technology and Carnegie Mellon University, which demonstrated with their impressive investments into their teams the importance of research on search and rescue robots in the US.
- Informatics Year has been organised in conjunction with the Science in Dialogue initiative and the Gesellschaft für Informatik (GI) as well as with numerous partners in the fields of sci-

ence, industry and culture. The idea behind this Science Year was to familiarise a broader public with the contents, processes and practical applications of science and to do so in an informative, exciting and entertaining way. IUB was involved in exhibitions, the Symposium on Artificial Intelligence and various other activities.

Bremen, January 2007

A handwritten signature in black ink, appearing to read 'B. Kramer', with a stylized, cursive script.

Prof. Dr. Dr. h.c. Bernhard Kramer
Vice President and Dean
School of Engineering and Science

2 Information and Communication Technologies

The increasing impact of information and communication technology dominates our everyday life, our society, and the environment. Examples comprise the World-Wide-Web, the ubiquitous use of computers, cellular multimedia and wireless communications, robots in factories as well as in offices and homes, and sophisticated computer models used to predict the evolution of complex systems such as the global climate.

The enormous level of integration in micro-electronics has enabled unprecedented progress in many sectors – and even more importantly, it has created many new profitable technologies and services based on them. The 21st century will witness technologies that enable machines to do things that have been so far restricted to humans: machines will be able to sense, act, speak, listen, decide and sometimes understand. Our T-shirts may have their own Internet addresses and wirelessly tell the laundry machine about proper treatment. We will see cars that negotiate with each other in order to maximize traffic flow while reducing pollution using sophisticated energy management systems. Manufacturing technologies will improve using a combination of detectors and software to control processes. Robots are also more and more used in domains where some autonomy and intelligence is necessary. They work under conditions where it is unpleasant or even risky for humans like in abandoned mines or at disaster sites and where they have to deal with situations unforeseen by their designers and programmers. The hallmark of such smart systems is their integration of technologies from analogue devices and sensors, communication systems and networks, internet services, artificial intelligence, machine learning, robotics, and many more.

The School of Engineering and Science actively contributes to this rapidly growing, boldly interdisciplinary endeavor, focusing on the areas described in the following.

2.1 Communication Networks and Systems

The basic desire of modern society to be able to access and distribute “any” information at “any-time” and “anywhere” is the driving force for the rapid development of communication networks and systems. The implications of these goals are manifold and require truly interdisciplinary research efforts. A typical, but clearly not complete, list of involved high level research fields includes

- Wireless Network Engineering and System Design
- Network Interoperability
- System capacity management and optimization
- Information transmission
- Network protocols
- Information security.

All these research areas are strongly inter-related and the strength of a research cluster in “communication networks and systems” resides in the close cooperation of the respected research groups involved. The particular ‘flat hierarchy’ at IUB (no departments and chairs) fosters such cooperations.

2.1.1 Cellular and Wireless Communications

Research Team Harald Haas (Professor), Rami Abu-Alhiga (PhD Student), Zubin Bharucha (PhD Student), Hany Elgala (PhD Student), Ellina Foutekova (PhD Student), Birendra Ghimire (PhD Student), Dennis Kolyuzhnov (PhD Student), Raed Youself Mesleh (PhD Student), Abdurazak Mudesir (PhD Student), Hrishikesh Venkataraman (PhD Student), Sinan Sinanovic (Research Associate), Peter Omiyi (Postdoc), Mostafa Afgani (Research Engineer), Sudharasan Ganesan (Graduate Student)

Research in Cellular and Wireless Communications is geared towards new technologies. Particular focus is on the development and the interaction of key air-interface building blocks

- multicarrier transmission (in particular OFDM (Orthogonal Frequency Division Multiplexing))
- duplexing techniques (in particular time division duplexing (TDD))
- multiple-input multiple-output (MIMO) techniques
- wireless ad hoc systems
- medium access control (MAC) algorithms
- multiple access and scheduling techniques
- dynamic channel assignment (DCA) algorithms
- mobile positioning
- visible light communication.

Highlights

Spatial Modulation. Spatial modulation (SM) is a new and patented multiple antenna transmission approach for wireless systems that increases the spectral efficiency (number of bits transmitted per Hz bandwidth) by utilizing the transmit antenna number as an implicit source of information. A block of information bits is mapped to an information symbol and a transmit antenna number. As a consequence, at any given time instant only a single antenna of the antenna array is transmitting signal power. The actual block of information bits determines which antenna is active at a particular time instant. As a result, inter-channel interference (ICI) at the receiver input and the need to synchronize the transmit antennas are completely avoided. Simple receiver algorithms such as maximum receive ratio combining (MRRRC) can be used to retrieve the information bits. The performance and the receiver complexity of SM and V-BLAST (Vertical-Bell Labs Layered Space-Time) algorithm in flat fading channels are compared. V-BLAST applies zero forcing detection based optimum ordering, nulling and successive interference cancellation. The basic principle of SM is depicted in Fig. 5, and results of the comparison with state-of-the-art V-BLAST are shown in Fig. 6. From the results it can be found that the performance gains are significant. In both schemes the same number of bits per unit bandwidth are transmitted (for fair com-

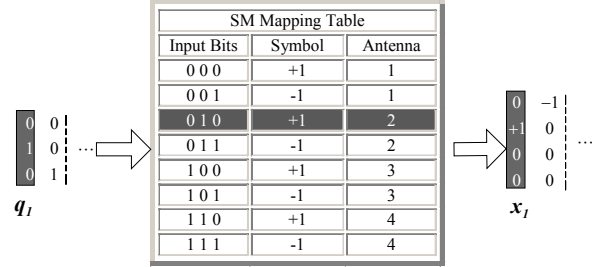


Figure 5: 3bits/symbol spatial modulation mapping table using binary phase shift keying (BPSK) and four transmit antennas

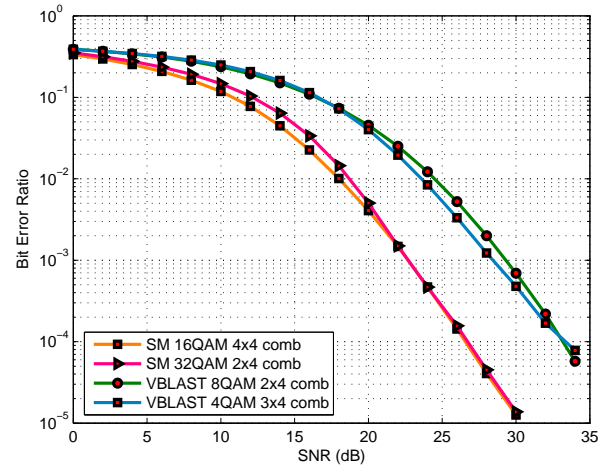


Figure 6: Bit error performance as a function of signal-to-noise ratio (SNR) for state-of-the-art V-BLAST and novel SM.

parison), but with SM the bit error performance is reduced considerably. For example, at an SNR of 20dB a 10-fold reduction in the BER is observed. **Dynamic Resource Allocation.** In this work a fully decentralized interference avoidance algorithm to manage interference in an *ad hoc* wireless network, applicable to wireless sensor networks, is developed and analyzed. Fig. 7 depicts a randomly chosen distribution of transmitting (Tx) and receiving (Rx) nodes. The new algorithm, called *busy tone interference tolerance signaling*, is of low complexity and is very easy to implement. It is based on different functions to set the busy tone signal power dependent on the level of tolerable interference, and their performance is

compared with a special case of a fixed power system which provides maximum capacity assuming equal transmit powers. Results show that an appropriately chosen function for setting the busy-tone can lead to gains in capacity using very little power. This power efficiency advantage is quite significant, implying that battery life of units can be extended while providing a similar capacity than a fixed power system.

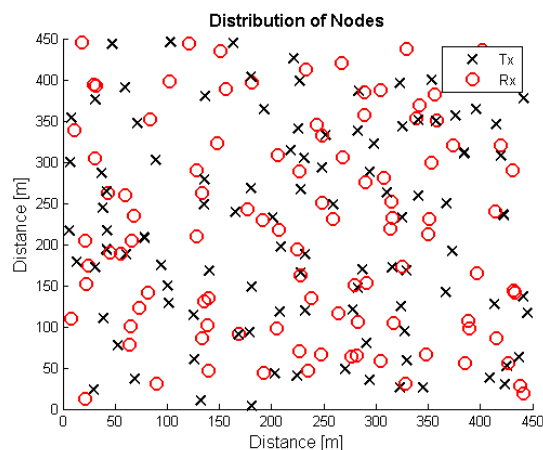


Figure 7: Random distribution of nodes in an *ad hoc* wireless network

Organization

1. Member of Technical Program Committee of and session chair at *IEEE International Conference on Personal, Indoor & Mobile Radio Communications* – PIMRC 2006
2. Member of Technical Program Committee of *International IEEE Conference on Vehicular Technology* – VTC 2006

Collaborations

1. *The University of Edinburgh, UK*
Prof. S. McLaughlin
Joint project with industrial partner on *Hybrid Cellular and Multihop Wireless Networks*

Grants

1. Funded by industry partner, *Cellular TDD-OFDM (Time division duplex - orthogonal frequency division multiplexing)*, June 2004 - July 2005
2. Funding by industry partner and University of Edinburgh, *Hybrid Cellular and Multihop Wireless Networks*, July 2005 - July 2006
3. Funded by industry partner, *Link Adaptation and Scheduling in Cellular Systems*, March 2005 - February 2008
4. Funded by Bremen T.I.M.E program funded by BIS Bremerhaven, *Mobile Positioning (MPos)* in collaboration with MobilTec GmbH and supported by T-Mobile, June 2006 - September 2009
5. Funded by DFG Schwerpunktprogram Take-OFDM, *DCA Algorithms and MAC Protocols for COFDM Based Cellular and Ad hoc Systems Using Carrier Sensing Time Division Multiple Access (CSTDMA)*, October 2004 - September 2006

Patents

1. Four new patent applications submitted
2. Three previously submitted patents got granted in 2006

Awards, Prizes

1. Nominated for the Chinese 111 Program – Guest Academic Talents Programme for the Development of University Disciplines in China
2. Invited Talk at the University of Mondragon (Spain)

Publications

- M. Afgani and H. Haas. Visible light communication using OFDM. In *Proceedings of the 2nd International Conference on Testbeds and Research Infrastructures for the Development of Networks and Communities (Trident 2006)*, Barcelona, Spain, March 01-06 2006.

- [] S. Beauregard and H. Haas. "Pedestrian Dead Reckoning (PDR) and GPS for Indoor Positioning". In *Proceedings of 3rd Workshop on Positioning, Navigation and Communication (WPNC'06)*, Hannover, Germany, March 16 2006.
- [] S. Chaudhury, H. Venkataraman, and H. Haas. "Uplink Capacity Comparison of Non-Perfect Frequency Synchronised Cellular OFDM Systems". In *Proceedings of International Wireless Communications and Mobile Computing Conference (IWCMC 2006)*, Vancouver (Canada), July 3-6 2006.
- [] E. Foutekova, P. Agyapong, B. Ghimire, H. Venkataraman, and H. Haas. "Scheduling in Cellular TDD-CDMA Networks". In *Proceedings of the International Vehicular Technology Conference (VTC) 2006-Fall*, Montreal, Canada, September 25-28 2006. IEEE.
- [] E. Foutekova, C. Evers, and H. Haas. "Semi-Analytical Derivation of Interference in TDD-CDMA Systems Employing Random Time Slot Hopping (RTSH)". In *Proceedings of the International Vehicular Technology Conference (VTC) 2006-Fall*, Montreal, Canada, September 25-28 2006. IEEE.
- [] S. Ganesan and H. Haas. "On the Performance of Spatial Modulation OFDM". In *Asilomar Conference on Signals, Systems, and Computers*, Monterey, CA, USA, October 30 – November 1 2006. IEEE.
- [] H. Haas, V. D. Nguyen, P. Omiyi, N. H. Nedeve, and G. Auer. "Interference Aware Medium Access in Cellular OFDMA/TDD Network". In *Proceedings of International Conference on Communications (ICC 2006)*, Istanbul, Turkey, June 11-15 2006. IEEE.
- [] H. Harald and S. McLaughlin, editors. *"Next Generation Mobile Access Technologies: Implementing TDD"*. Cambridge University Press, Spring 2007.
- [] P. Jain, H. Haas, and S. McLaughlin. "Capacity Enhancement using Ad Hoc Pico-Cells and TDD Underlay". In *Proceedings of the 17th International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC 2006)*, page 5, Helsinki, Finland, September 11-14 2006. IEEE.
- [] R. Mesleh, H. Haas, C. C. Ahn, and S. Yun. "Spatial Modulation – OFDM". In *Proceedings of the International OFDM Workshop*, Hamburg, Germany, August 30-31 2006.
- [] R. Mesleh, H. Haas, C. Wook Ahn, and S. Yun. "Spatial Modulation – A New Low Complexity Spectral Efficiency Enhancing Technique". In *"ChinaCOM 2006"*, Beijing, China, October 25 – 27 2006. IEEE.
- [] P. Omiyi, H. Haas, and G. Auer. "Analysis of Inter-cellular Timeslot Allocation in Self-Organising TDD Cellular Mobile Systems". In *Proceedings of the 17th International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC 2006)*, page 5 pages on CD ROM, Helsinki, Finland, September 11-14 2006. IEEE.
- [] H. Venkataraman and H. Haas. "Throughput Capacity for 2-Hop Hybrid Cellular Networks". In *Proceedings of 6th Scandinavian Workshop on Wireless Ad-hoc Networks (ADHOC '06)*, Stockholm (Sweden), May 3-4 2006.

2.1.2 Digital Transmission Methods and Coding

Research Team Werner Henkel (Professor), Fangning Hu (PhD Student), Neele von Deetzen (PhD Student), Khaled Shawky Hassan (PhD Student), Apirath Limmanee (PhD Student)

We currently concentrate on iterative decoding and unequal error protection in coding and physical transport. In iterative decoding, we study the convergence behavior and properties of analog Turbo-like codes and the possible design of Turbo and LDPC codes for unequal error pro-

tection (UEP). In the design of UEP codes, we especially cooperate with ENSEA, France, and Luleå University, Sweden. UEP is also the goal in our multicarrier research, where we design bit-allocation algorithms that allow for easy realization of different protection classes in an arbitrary way. UEP will be a must for current and especially future triple-play data services to different devices at varying channel qualities.

The analog codes have a strong relation to signal processing. Regarding practical applications of such codes, we especially look into the correction of impulse-noise and clipping effects. There, the most important task is to determine statistical properties that allow for easy erasure marking, which would support further decoding steps, analog and digital.

We further started a project on data transmission using ultrasound signals. We currently design lab experiments to deliver data for later modeling of the channel and disturbances.

Highlights The design of UEP Turbo codes by a pruning approach led us to a structure that we named hybrid concatenation, a combination of outer parallel and inner serial concatenation. The study of the decoding convergence with so-called EXIT charts yielded the result that the area between the curves describing the outer iterations depend on the number of inner iterations. This allows for minimizing the decoding complexity by a scheduling with varying number of iterations in the different decoding steps (Fig. 8). The pruning concept was also the starting point for our design of UEP LDPC codes with an irregular check-node profile (pat. pending).

In analog coding, we further improved the presentation of our proof that Turbo-like decoding leads to a least-squares solution. We can now exactly forecast the convergence limits for the stepsize and can also modify it for every iteration to allow for very fast convergence. For impulse-noise detection, we currently investigate new statistical properties, e.g., the slope distribution, and correlation approaches. This study will also close a gap in impulse-noise modeling regarding the autocor-

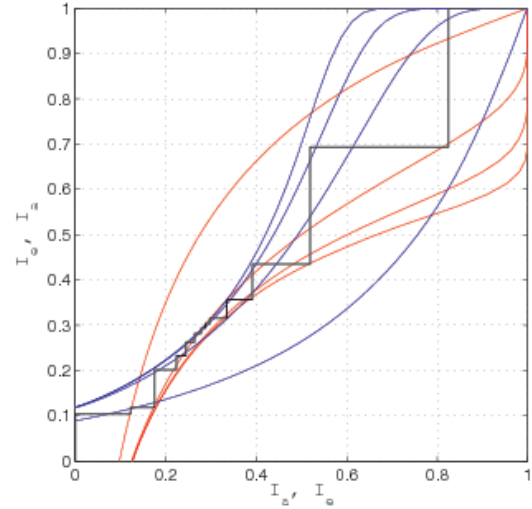


Figure 8: Convergence scheduling for hybrid concatenation

relation function of impulse noise.

By designing a new bit-allocation algorithm (pat. pending), following the principles of an existing one by Chow, Cioffi, and Bingham, we can obtain UEP properties in a very elegant way. It allows for an arbitrary number of error-protection classes with arbitrary margins between them and an arbitrary number of bits per class. Fig. 9 shows a resulting bit and power allocation according to the channel SNRs, assuming three error protection classes with a 3 dB separation.

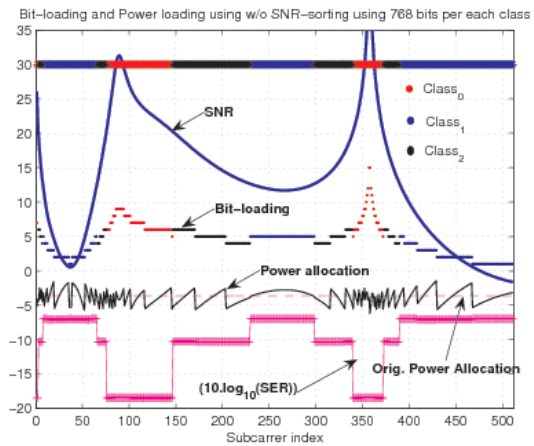


Figure 9: UEP bit and power allocation for three protection classes

Organization

1. Program Committee member of ICC 2006

Grants

1. Funded by EU-IST STREP (FP 6), *M-Pipe*, October 2004 - March 2007

Patents

1. L. Sassatelli, W. Henkel, and D. Declercq. Check-Irregular LDPC Codes, Jan. 27 2006. European Patent Application 06 100 979.1.
2. W. Henkel and K. Hassan. Unequal Error Protection Bit Loading for Multi-Carrier Transmission, Aug 30 2006. European Patent Application 06 119 771.1.

International ITG-Conference on Source and Channel Coding, Munich, April 4-7 2006.

- [6] N. von Deetzen. Decoder Scheduling of Hybrid (parallel/serial) Turbo Codes. In *ITG-Fachgruppe, 7. Sitzung*, Munich, May 22 2006.

- [7] N. von Deetzen and W. Henkel. Decoder Scheduling of Hybrid Turbo Codes. In *2006 IEEE International Symposium on Information Theory (ISIT 2006)*, Seattle, Washington, USA, July 9-14 2006.

Publications

- [1] K. Hassan and W. Henkel. Unequal Error Protection Bit Loading in MIMO OFDM. In *ITG-Fachgruppe, 8. Sitzung*, Bremen, Oct. 6 2006.
- [2] W. Henkel and K. Hassan. OFDM (DMT) Bit and Power Loading for Unequal Error Protection. In *OFDM Workshop*, Hamburg, Aug 30-31 2006.
- [3] W. Henkel and N. von Deetzen. Path Pruning for Unequal Error Protection Turbo Codes. In *2006 International Zürich Seminar on Communications*, Zürich, Switzerland, Feb. 22-24 2006.
- [4] F. Hu and W. Henkel. A Geometric Description of the Iterative Least-Squares Decoding of Analog Block Codes. In *4th International Symposium on Turbo Codes & Related Topics in connection with the 6th International ITG-Conference on Source and Channel Coding*, Munich, April 4-7 2006.
- [5] L. Sassatelli, W. Henkel, and D. Declercq. Check-Irregular LDPC Codes for Unequal Error Protection under Iterative Decoding. In *4th International Symposium on Turbo Codes & Related Topics in connection with the 6th*

3 Education

The School of Engineering and Science offers 12 Bachelor of Science programs

- Mathematics
- Physics
- Chemistry
- Biology
- Biochemical Engineering
- Biochemistry and Cell Biology
- Bioinformatics and Computational Biology
- Geosciences and Astrophysics
- Computer Science
- Electrical and Computer engineering
- Electrical Engineering and Computer Science

and seven Master's programs

- Mathematical Sciences
- Astroparticle Physics
- Biological Recognition
- Nanomolecular Science
- Geo-Ocean Dynamics
- Communications, Systems and Electronics (Electrical Engineering)
- Smart Systems (Computer Science.)

3.1 Master's Degrees

Biological Recognition

1. *Esther Ghanem*: “Heterologous expression of murine tapasin in the yeast expression systems *S.cerevisiae* and *P.pastoris*”
Examiners: Prof. Dr. Albert Jeltsch, Prof. Dr. Sebastian Springer
2. *Srinivasaraghavan Kannan*: “Enhanced Conformational sampling of peptides and proteins by Biasing potential Replica Exchange Molecular Dynamics Simulations (BP - REMD)”
Examiners: Prof. Dr. Martin Zacharias, Prof. Dr. Mathias Winterhalter
3. *Rustem Khusainov*: “On the facilitation of dye-affinity sorption methods for Downstream Processing of bioproducts”
Examiners: Prof. Dr. Marcelo Fernandez-Lahore, Prof. Dr. Mathias Winterhalter
4. *Liliya Kulishova*: “Investigation of the Residues Involved in Target Sequence Recognition by the M.EcoRV Adenine-N6-methyltransferase”
Examiners: Prof. Dr. Albert Jeltsch, Prof. Dr. Ulrich Schwaneberg
5. *Benny Mwale*: “Encapsulation and Characterization of Horseradish Peroxidase in Liposomes”
Examiners: Prof. Dr. Mathias Winterhalter, Prof. Dr. Jürgen Fritz
6. *Rakina Yaneva*: “Cloning, expression, and purification of murine tapasin in *E. coli*”
Examiners: Prof. Dr. Martin Zacharias, Prof. Dr. Sebastian Springer

Communications, Systems and Electronics

1. *Mostafa Afgani*: “On User Scheduling in the Downlink of a Cellular OFDMA System”
Examiners: Prof. Dr. Harald Haas, Dr. Gunther Auer
2. *Sudharsan Ganesan*: “On the Performance of Spatial Modulation OFDM”
Examiners: Prof. Dr. Harald Haas, Dr. Mathias Bode
3. *Abdurazak Mudesir*: “Analytical derivation of the pdf of the signal to interference ratio(SIR) in a cross layer environment under Nakagam-m distribution fading envelop. ”
Examiners: Prof. Dr. Harald Haas, Dr. Mathias Bode
4. *Nandhavel Sethubalasubramanian*: “Design of low power SIMD shufflers using Datapath Generator ”
Examiners: Prof. Dr. Werner Bergholz, Dr. Franky Catthoor

Geo-Ocean Dynamics

1. *Serkan Kulkaksiz*: “The Bahviour of Anthropogenic Gd in Comparison with Natural Rare Earth Elements and Yttrium in the Weser Estuary”
Examiners: Prof. Dr. Michael Bau, Prof. Dr. Andrea Koschinsky-Fritsche
2. *Prasesh Sharma*: “Potential correlation of heavy metal contamination in surface soils with infestation of viscum album in poplar trees in Goslar using a micro-ecosystem study”
Examiners: Prof. Dr. Andrea Koschinsky-Fritsche, Prof. Dr. Dr. Ewald Schnug
3. *Aryani Sumoondur*: “Amino acids and primary amines in seawater and hydrothermal fluids from the Mid-Atlantic Ridge: Implications for metal-amino acid interactions”
Examiners: Prof. Dr. Andrea Koschinsky-Fritsche, Dr. Christian Ostertag-Henning

Nanomolecular Science

1. *Supriya Babu*: “Novel methods of preparation of Liposome-Based Nanocapsules”
Examiners: Prof. Dr. Mathias Winterhalter, Prof. Dr. Jürgen Fritz
2. *Tivadar Mach*: “Translocation through nanopores via an internal binding site”
Examiners: Prof. Dr. Mathias Winterhalter, Prof. Dr. Jürgen Fritz
3. *Ahson Shaikh*: “One-Pot Asymmetric Sequential Amination-Alkylation Methodology: Synthesis of Chiral Amines”
Examiners: Prof. Dr. Thomas Nugent, Prof. Dr. Werner Nau

Smart Systems

1. *Horia Balan*: “An Experimental Evaluation of Voice-over-IP Quality over the Datagram Congestion Control Protocol”
Examiners: Prof. Dr. Jürgen Schönwälder, Prof. Dr. Michael Kohlhase , Dr. Lars Eggert
2. *Hamed Bastani*: “Absolute 3D Indoor Radio Positioning Using Dynamic Roles Assignment”
Examiners: Prof. Dr. Stefano Carpin, Prof. Dr. Harald Haas
3. *Gorkem Erinc*: “Nonholonomic Motion Planning Using Genetic Algorithms for Car-Like Robots”
Examiners: Prof. Dr. Stefano Carpin, Prof. Dr. Andreas Birk
4. *Andreas Kolling*: “Multirobot Cooperation for Surveillance of Multiple Moving Targets - An Improved Behavioral Approach and Its Formalization”
Examiners: Prof. Dr. Stefano Carpin, Prof. Dr. Herbert Jaeger

5. *Seongchu Lee*: “Localization and map building in volumetric modeling for autonomous mobile robots ”
Examiners: Prof. Dr. Andreas Birk, Prof. Dr. Stefano Carpin
6. *Mantas Lukosevicius*: “ Improving Echo State Networks by Training Intermediate Units”
Examiners: Prof. Dr. Herbert Jaeger , Dr. Mathias Bode

3.2 PhD Degrees

Mathematical Sciences

1. *Alexandra Kaffl*: “Hubbard Trees and Kneading Sequences for Unicritical and Cubic Polynomials”
Dissertation Committee: Prof. D. Schleicher (supervisor), Prof. M. Stoll, Prof. R. O. Wells, Prof. J. Milnor, Prof. M. Rees, Prof. H. Bruin
2. *Johannes Rückert*: “Newton’s Method as a Dynamical System”
Dissertation Committee: Prof. D. Schleicher (supervisor), Prof. M. Oliver, Prof. R. O. Wells, Prof. M. Lyubich, Prof. H. Bruin

Chemical Sciences

1. *Firasat Hussain*: “Hybrid Organic-Inorganic Polyoxometalates Functionalized by Diorganotin Groups”
Dissertation Committee: Prof. U. Kortz (supervisor), Dr. M. Dickmann, Prof. E. Cadot, Prof. M. Pope
2. *Annette Wensing*: “Siderophore Production of *Pseudomonas syringae* and its Implications on the Biological Control of Bacterial Blight of Soybean”
Dissertation Committee: Prof. M. Ullrich (supervisor), Prof. U. Schwaneberg, Prof. G. Muskheishvili, Prof. B. Völksch
3. *Alexander Kraynov*: “Preparation and Characterization of Pt and Pd Nanoclusters Modified with Chiral Ligands: Examination of Catalytic Activity in Hydrogenation of Ethyl Pyruvate”
Dissertation Committee: Prof. R. Richards (supervisor), Prof. T. Nugent, Prof. S. Tautz
4. *Harekrushna Sahoo*: ”Investigation of Structural, Conformational, and Dynamic Properties of Polypeptide by Fluorescence-Based Techniques” Dissertation Committee: Prof. W. Nau (supervisor), Prof. M. Zacharias, Prof. T. Nugent, Prof. X. Zang
5. *Tuck Seng Wong*: ”Expanding the Toolbox of Directed Evolution for Understanding Protein Structure-Function Relationships” Dissertation Committee: Prof. U. Schwaneberg (supervisor), Dr. D. Roccatano, Prof. M. Zacharias, Prof. K-E. Jaeger

Life Sciences

1. *Kristina Mayer*: “Cathepsins during Intestinal Trauma”
Dissertation Committee: Prof. K. Brix (supervisor), Prof. A. Lerchl, Prof. A. Baici
2. *Silvia Jordans*: “Localization, Trafficking and functional Role of Cysteine Cathepsins in Thyroid Epithelial Cells”
Dissertation Committee: Prof. K. Brix (supervisor), Dr. D. Buttle, Prof. A. Lerchl
3. *Brit Wolters*: “Cathepsins L and V in human Keratinocytes”
Dissertation Committee: Prof. K. Brix (supervisor), Prof. M. Ullrich, Prof. A. Lerchl, Dr. D. Buttle

4. *Heiko Büth*: “Contribution of Lysosomal Cystein Protease Cathepsin B to Extracellular Matrix remodeling during Keratinocyte Migration and Wound Healing”
Dissertation Committee: Prof. K. Brix (supervisor), Prof. Boukamp, Prof. A. Lerchl, Prof. M. Ullrich
5. *Karen Hinsch*: “Analysis of Proliferation, Fate and Stem Cell Characteristics of Newly Generated Cells in the Adult Fish Brain”
Dissertation Committee: Prof. G. K. H Zupanc (supervisor), Prof. C. Hilgetag, Prof. S. Thanos
6. *Marcus Lindemann*: “Membrane-Protein Matrix for Technical Application”
Dissertation Committee: Prof. M. Winterhalter (supervisor), Prof. J. Fritz, Prof. V. Wagner, Prof. E. Schleif
7. *Hong Qu*: “Significance of Cathepsins B, D and L for Homeostasis of the Small Intestine”
Dissertation Committee: Prof. K. Brix (supervisor), Prof. S. Springer, Prof. M. Ullrich, Prof. G. van Echten-Deckert
8. *Christian Keithahn*: “Radical Scavenging Behavior of Biogenic Amines”
Dissertation Committee: Prof. A. Lerchl (supervisor), Prof. K. Brix, Prof. M. Zacharias, Prof. L. Rensing
9. *Chris André Würdemann*: “Method Development for Expression Profiling in Prokaryotes and their Application in Marine Environments”
Dissertation Committee: Prof. F. O. Glöckner (supervisor), Prof. G. Muskhelishvili, Prof. M. Ullrich, Prof. R. Amman
10. *Ziwei Zhu*: “Making Glucose Oxidase fit for Biofuel Cell Applications by Directed Protein Evolution” Dissertation Committee: Prof. U. Schwaneberg (supervisor), Prof. M. Zacharias, Prof. M. Fernandez-Lahore, Prof. V. Hass
11. *Joana Pereira da Silva Gomes*: “Liposomes for Biosensing” Dissertation Committee: Prof. M. Winterhalter (supervisor), Prof. J. Fritz, Prof. D. Gabel
12. *Stoyan Kurtev*: “Lateralization of Spatial Attention in Human Brain: A ‘Virtual Lesion’ Approach” Dissertation Committee: Prof. C. Hilgetag (supervisor), Prof. B. Olk, Prof. Valero-Cabre

4 The School of Engineering and Science

4.1 Administration

Prof. Dr. Kramer, Bernhard	Vice President and Dean
Dr. Allner, Anke	Director, Dean's Office
Schreiber, Angela	Assistant to the Dean
Buck, Iris	Graduate Admission
Dr. Frischholz, Svenja	Graduate Student Affairs
Knoop, Katja	Team Assistant to the Faculty
Manss, Sigrid	Team Assistant to the Faculty
Pankratz, Elke	Team Assistant to the Faculty

4.2 Advisory Board

Prof. Dr. Andrew S. Douglas (Chair)	Johns Hopkins University, Baltimore, MD
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Prof. Dr. James L. Kinsey	William Marsh Rice University, Houston, TX
Prof. Dr. Berrien Moore III,	University of New Hampshire
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Prof. Dr. Karl Wieghardt	Max-Planck-Institut für Strahlenchemie, Mülheim/Ruhr

4.3 Faculty

Antoulas, Athanasios C., Ph.D.	Visiting Professor of Electrical Engineering
Dr. Baier, Stephan	Visiting Lecturer in Mathematics
Dr. Bau, Michael	Associate Professor of Geosciences
Dr. Baumann, Peter	Associate Professor of Computer Science
Dr. Belov, Alexei	Visiting Professor of Mathematics
Dr. Bergholz, Werner	Professor of Electrical Engineering
Dr. Bijma, Jelle	Adjunct Professor of Marine Geosciences
	Alfred Wegener Institute for Polar and Marine Research
Dr. Birk, Andreas	Associate Professor of Computer Science
Dr. Bode, Mathias	Lecturer of Electrical Engineering
Dr. Boetius, Antje	Associate Professor of Microbiology
Dr. Brix, Klaudia	Professor of Cell Biology
Brüggen, Marcus, Ph.D.	Associate Professor of Astrophysics
Dr. Carpin, Stefano	Assistant Professor of Computer Science
Fernández-Lahore, Marcelo, Ph.D.	Associate Professor of Downstream-Processing
Dr. Fritz, Jürgen	Assistant Professor of Biophysics
Dr. Glöckner, Frank Oliver	Associate Professor of Bioinformatics
	(joint appointment with the MPI for Marine Microbiology)
Haas, Harald, Ph.D.	Associate Professor of Electrical Engineering
Dr. Haerendel, Gerhard	Distinguished Professor of Space Physics

Dr. Henkel, Werner	Professor of Electrical Engineering
Hilgetag, Claus C., Ph.D.	Associate Professor of Neuroscience
Dr. Hütt, Marc-Thorsten	Associate Professor of Computational Systems Biology
Dr. Jaeger, Herbert	Associate Professor of Computational Science
Dr. Jeltsch, Albert	Professor of Biochemistry
Dr. Kaimanovich, Vadim	Professor of Mathematics
Dr. Khalili, Arzhang	Professor of Computational Science (joint appointment with the MPI for Marine Microbiology)
Dr. Kleinekathöfer, Ulrich	Associate Professor of Physics
Dr. Knipp, Dietmar	Assistant Professor of Electrical Engineering
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Dr. Kohlhase, Michael	Professor of Computer Science
Kortz, Ulrich, Ph.D.	Associate Professor of Chemistry
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Dr. Kuhnert, Nikolai	Associate Professor of Chemistry
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Dr.-Ing Linsen, Lars	Associate Professor of Computer Science and Computational Science
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Dr.-Ing Mahleko, Bendick	University Lecturer of Electrical Engineering
Mallahi-Karai, Keivan, Ph.D.	Visiting Lecturer of Mathematics
Dr. Materny, Arnulf	Professor of Chemical Physics
Dr. Meyer-Ortmanns, Hildegard	Professor of Physics
Meyer-Rochow, V. Benno, Ph.D., D.Sc.	Professor of Biology
Dr. Muskhelishvili, Georgi	Professor of Genetics
Dr. Nau, Werner	Professor of Chemistry
Nugent, Thomas, Ph.D.	Assistant Professor of Chemistry
Oliver, Marcel, Ph.D.	Assistant Professor of Mathematics
Dr. Oswald, Peter	Professor of Mathematics
Dr. Penkov, Ivan	Professor of Mathematics
Pfander, Götz, Ph.D.	Assistant Professor of Mathematics
Richards, Ryan M., Ph.D.	Assistant Professor of Chemistry
Dr. Roccatano, Danilo	University Lecturer of Chemistry
Dr. Rosswog, Stephan	Assistant Professor of Astrophysics
Schleicher, Dierk, Ph.D.	Professor of Mathematics
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Dr. Schwaneberg, Ulrich	Associate Professor of Biochemical Engineering
Springer, Sebastian, D.Phil.	Assistant Professor of Biochemistry and Cell Biology
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Dr. Styrkas, Konstantin	Visiting Assistant Professor of Mathematics
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Dr. Ullrich, Matthias	Professor of Microbiology
Unnithan, Vikram, Ph.D.	Assistant Professor of Geoscience

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 Dr. Wagner, Veit
 Wallace, Jon, Ph.D.
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 Dr. Wiltshire, Karen Helen
 Dr. Winterhalter, Mathias
 Dr. Zacharias, Martin
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 Professor of Geoscience
 Professor of Biophysics
 Associate Professor of Computational Biology
 Professor of Neurobiology

4.4 Staff

Abu-Alhiga, Rami
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 Al-Karablieh, Nehaya
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 Alexander, Brian
 Bakirci, Huseyin
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 Bassil, Bassem
 Becker, Sandra
 Behnke, Torsten
 Benor, Amare
 Berger, Michael
 Bharucha, Zubin
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 Büth, Heiko
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 Chonnaparamutt, Winai
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 Curusku, Jeremy
 Dairpoosh, Farnoosh
 Dammann, Frauke
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 de Jesus Mendes, Pedro André
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 Graduate Student (Microbiology)
 Integrated PhD Student (Computer Science)
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 Graduate Student (Chemistry)
 Research Associate
 Graduate Student (Nanomolecular Science)
 Lab Assistant (Biology)
 Technician, Ocean Lab
 Graduate Student (Electrical Engineering)
 Graduate Student (Biochemistry)
 Integrated PhD Student (Electrical Engineering)
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 Graduate Student (Cell Biology)
 Lab Assistant (Biochemistry)
 Graduate Student (Biochemical Engineering)
 Postdoctoral Fellow (Downstream Processing)
 Graduate Student (Biochemistry)
 Graduate Student (Electrical Engineering)
 Graduate Student (Computer Science)
 Postdoctoral Fellow (Chemistry)
 Lab Assistant (Biochemistry)
 Research Associate (Computational Biology)
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 IMO Assistant (Mathematics)
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 Graduate Student (Geosciences)
 Postdoctoral Fellow (Computational Systems Biology)
 Graduate Student (Biochemistry)

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El-Sheshtawy, Hamdy	Graduate Student (Chemistry)
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Gobet, Angelique	Graduate Student (Marmic)
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Hoppe, Arne	Graduate Student (Physics)
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Dr. Hu, Jun-Cheng	Postdoctoral Fellow (Chemistry)
Hussain, Firasat	Graduate Student (Chemistry)
Ihle, Saskia	Graduate Student (Biochemical Engineering)
Ismail, Amal	Graduate Student (Chemistry)
Ivanovska, Tetyana	Graduate Student (Computer Science)
Jordans, Silvia	Graduate Student (Cell Biology)
Josuttis, Daniela	Lab Technician (Biochemical Engineering)
Jurkowski, Renata	Graduate Student and Research Associate (Biochemistry)
Jurkowski, Thomasz	Graduate Student (Biochemistry)
Kaffl, Alexandra	Graduate Student (Mathematics)
von der Kammer, Bernd	Lab Assistant Physics

Kannan, Srinivasaraghavan	Research Associate (Biology)
Dr. Karpen, Volker	Research Associate (Oceanography)
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Klose, Melanie	Graduate Student (Biology)
Kohlhase, Andrea	Guest (Computer Science)
Kolyuzhov, Dennis	Graduate Student (Electrical Engineering)
Konradi, Jakob	Graduate Student (Physics)
Kottmann, Renzo	Graduate Student (Marine Microbiology)
Kraynov, Alexander	Graduate Student (Chemistry)
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Kurtev, Stoyan	Graduate Student (Neuroscience)
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Lucosevicius, Mantas	Graduate Student (Computer Science)
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Mavathur, Ramesh	Graduate Student (Biochemistry)
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Momeu, Iuliana Carmen	Graduate Student (Biochemical Engineering)
Mudesir, Abdurazak	Graduate Student (Electrical Engineering)
Müller, Christine	Graduate Student (Computer Science)
Müller, Jan Steffen	Graduate Student (Mathematics)
Müller, Normen	Graduate Student (Computer Science)
Müller-Linow, Mark	Graduate Student (Computational Systems Biology)
Namboodiri, Vinu	Graduate Student (Chemical Physics)
Nazor, Jovanna	Graduate Student (Biochemical Engineering)
Neu, Florian	IRCCM/CLAMV Systems Administrator
Nour Abdel-Gawad Ahmed, Mohammed	Graduate Student (Computer Science)
Normann, Immanuel	Graduate Student (Computer Science)
Nsouli, Nadeen	Graduate Student (Chemistry)
Dr. Omiyi, Peter	Postdoctoral Fellow (Electrical Engineering)

Onaca, Ozana	Graduate Student (Biochemical Engineering)
Pagel, Uwe	Electrical Engineering & Computer Science Technician
Pathak, Kaustubh, Ph.D.	Postdoctoral Fellow (Computer Science)
Pereira Da Silva Gomes, Joana Filipa	Postdoctoral Fellow (Biophysics)
Pezeshki, Soroosh	Graduate Student and Research Associate (Physics)
Pfingsthorn, Max	Graduate Student (Computer Science)
Piedra-Garza, Luis	Graduate Student (Chemistry)
Poppescu, Traian	Graduate Student (Astrophysics)
Poppinga, Jann	Graduate Student (Computer Science)
Prabhakar, Rajendran	Graduate Student (Nanomolecular Science)
Praeg, Daniel, Ph.D.	Research Associate (Geosciences)
Prodanovic, Radivoje, Ph.D.	Postdoctoral Fellow (Biochemical Engineering)
Purser, Autun	Integrated PhD Student (Geosciences)
Qu, Hong	Graduate Student (Cell Biology)
Rabe, Florian	Graduate Student (Computer Science)
Radicchi, Filippo	Graduate Student (Physics)
Dr. Ragozin, Sergey	Postdoctoral Fellow (Biochemistry)
Rajendran, Raphael Samuel	Graduate Student (Neurosciences)
Dr. Ramaye, Yannic	Postdoctoral Fellow (Biophysics)
Rashkov, Peter	Graduate Student (Mathematics)
Rathert, Philipp	Graduate Student (Biochemistry)
Rehders, Maren	Lab Assistant (Biochemistry and Cell Biology)
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Dr. Rödiger, Elke	Research Associate (Astrophysics)
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Rosenthal, Paul	Graduate Student (Computer Science)
Rückert, Johannes	Graduate Student (Mathematics)
Rulli, Matteo	Graduate Student (Physics)
Sahoo, Harekrushna	Graduate Student (Chemistry)
Santillano, Daniel	Graduate Student (Marmic)
Scaria, Abraham	Graduate Student (Physics)
Dr.Schäfer, Angela	Research Associate (IRCCM)
Dr. Schirmer, Thomas	Research Associate (Geosciences)
Schlickenrider, Martina	Research Associate (Biochemistry)
Schmidt, Katja	Graduate Student (Geoscience)
Schneeweiß, Clemens	Research Associate (Biochemistry)
Schröder, Markus	Graduate Student and Research Associate (Physics)
Schwarzlose, Thomas	Research Assistant, Teaching Lab Chemistry
Dr. Schwarzpaul, Kristin	Research Associate (Biology)
Schwerdtfeger, Maike	Lab Assistant Biochemistry
Schwertfeger, Sören	Graduate Student (Computer Science)
Shaik, Mona	Visiting Graduate Student (Electrical Engineering)
Sieker, Florian	Graduate Student (Bioinformatics)
Sharma, Praseh	Graduate Student (Geosciences)
Simon, Tatjana	Technical Assistant (Biology)
Dr. Solodukhin, Sergey N.	Senior Research Associate (Physics)

Dr. Sommer, Angela	Research Associate (Biology)
Dr. Soubatch, Serguei	Research Associate (Physics)
Sourly-Gopala, Divakara	Graduate Student (Chemistry)
Srivastava, Abhishek	Graduate Student (BioRec)
Strohlein, Thomas	Animal Keeper
Suchopar, Andreas	Lab Assistant Chemistry
Tayakuniyil, Praveen	Graduate Student (Biochemistry)
Tee, Kang Lan	Graduate Student (Biochemical Engineering)
Temirov, Ruslan	Graduate Student (Nanomolecular Science)
Thomsen, Claudia	Research Associate (Oceanography)
Thon, Michael	Graduate Student (Mathematics)
Tömmers, Stephanie	Graduate Student (Biochemical Engineering)
Tran, Ha Manh	Graduate Student (Computer Science)
Tran, Que-Tien	Graduate Student (Biophysics)
Tran, Van Long	Graduate Student (Computer Science)
Vennapusa, RamiReddy	Graduate Student (Biochemical Engineering)
Venkatraman, Hrishikesh	Graduate Student (Electrical Engineering)
Vilone, Daniele, Ph.D.	Postdoctoral Fellow (Physics)
Viergutz, Thomas	Marine Technology Engineer
von Deetzen, Neele	Graduate Student (Electrical Engineering)
Wagner, Hannes	Graduate Student (Geosciences)
Wakchaure, Vijay	Graduate Student (Chemistry)
Wecker, Patricia	Graduate Student (Microbiology)
Wellbrock, Ursula	Research Assistant (Biology)
Wensing, Annette	Graduate Student (Microbiology)
Wong, Tuck Seng	Graduate Student (Biochemical Engineering)
Wolters, Brit	Graduate Student (Cell Biology)
Würdemann, Chris André	Graduate Student (Genetics)
Yaneva, Rakina	Graduate Student (Cell Biology)
Yang, Mouyu	Graduate Student (Biology)
You, JiangJiang	Graduate Student (Astrophysics)
Dr. Yu, Jin	Postdoctoral Fellow (Neuroscience)
Zhang, YingYing	Graduate Student (Biochemistry)
Zhao, Mingjie, Ph.D.	Postdoctoral Fellow (Electrical Engineering)
Zhu, Ziwei	Graduate Student (Biochemical Engineering)
Dr. Zieger, Bertalan	Postdoctoral Fellow (Physics)
Dr. Zieger, Marina	Postdoctoral Fellow (Biology)
Dr. Zupanc, Marianne	Research Associate (Neurobiology)

4.5 ICTS Guests

Professor Dr. Roland Benz	Universität Würzburg, Germany
Professor Dr. Jan Bergstra	University of Amsterdam, The Netherlands
Dr. Andrey Bessonov	University of Sankt Petersburg, Russia
Dr. S.M. Bezrukov	National Institute of Health, Bethesda, USA
Dr. Georges Bouzerar	Laboratoire Louis Nel, Grenoble, France
Dr. Henk Bruin	University of Surrey, UK
Professor Dr. Mark Burgess	University College Oslo, Norway
Professor Dr. Valérie Cabuil	Université Pierre et Marie Curie, Paris, France
Dr. Fabio Cavaliere	Università di Genova, Italy
Professor Dr. Shengbo Chen	Institute of Geography and Natural Resources, Beijing, PR China
Elizabeth Dan-Cohen	University of California, Berkeley, USA
Professor Dr. Gero Decher	Institut Charles Sadron, Strasbourg, France
Dr. Martin Evans	University of Edinburgh, UK
Dr. Tom Fisher	University of Cambridge, UK
Dr. Claus Fütterer	Institut Marie Curie, Paris, France
Professor Dr. Mariano Grasselli	Universidad Nacional de Quilmes, Argentina
Dr. Giovanni Indiveri	University of Lecce, Italy
Professor Dr. Dieter Jäger	Emory University, Atlanta, USA
Professor Dr. Larry S. Liebovich	Florida Atlantic University, USA
Professor Liviu Movileanu	Syrakuse University, USA
Dr. Sergei Nechaev	CNRS Orsay, France
Professor Dr. Catherine O'Neill	Columbia University, USA
Dr. Marieke Postma	NIKHEF, Amsterdam, The Netherlands
Dr. Enrico Ramirez-Ruiz	Institute of Advanced Studies, Princeton, USA
Professor Dr. Helmut Ringsdorf	Universität Mainz, Germany
Dr. Karin Römisch	University of Cambridge, UK
Lucile Sassatelli	ENSEA-ETIS, Cergy-Pontoise, France
Professor Dr. Jürgen Schnack	Universität Osnabrück, Germany
Professor Dr. Gerhard Schwarz	Biozentrum Basel, Switzerland
Professor Dr. Vera Serganova	University of California, Berkeley, USA
Professor Dr. Nobuo Shimamoto	National Institute of Genetics, Mishima, Japan
Professor Dr. Canan Tari	Izmir Institute of Technology, Turkey
Professor Dr. Alexander Tikhomirov	Yaroslavl State Pedagogical University, Russia
Dr. Andrew Travers	Medical Research Council, Cambridge, UK
Dr. Martin Weigt	ISI Foundation, Torino, Italy
Professor Dr. James Whisstock	Monash University, Victoria, Australia
Dr. Wojtek Zakrzewski	University of Durham, UK
Dr. Michael Zaks	Humboldt-Universität Berlin, Germany
Professor Dr. Gregg Zuckerman	Yale University, USA.

