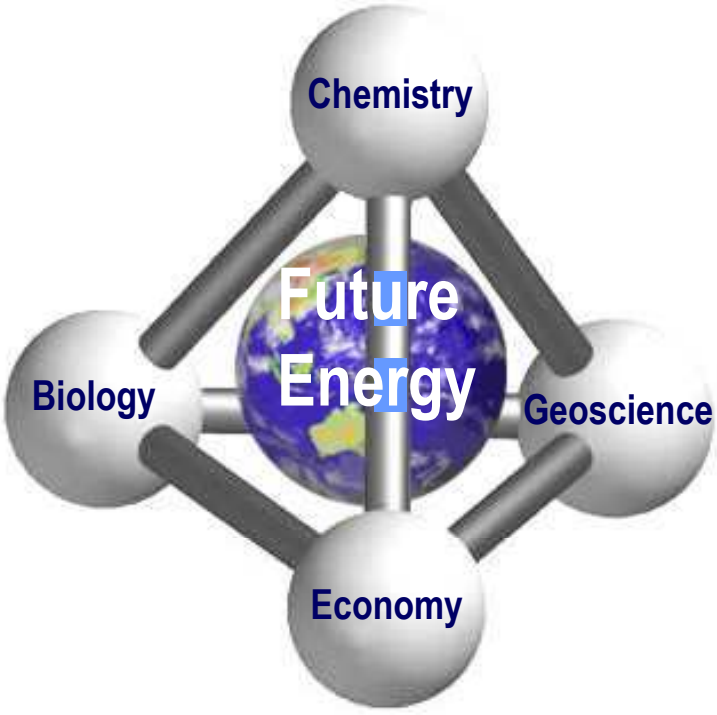
Graduate School
Future Energy Resources



Application Draft
September 2006

TUHH Technische Universität Hamburg-Harburg

HWWI Hamburgisches WeltWirtschafts Institut

UHH

Helmut Schmidt Universität Universität der Bundeswehr Hamburg

BFH

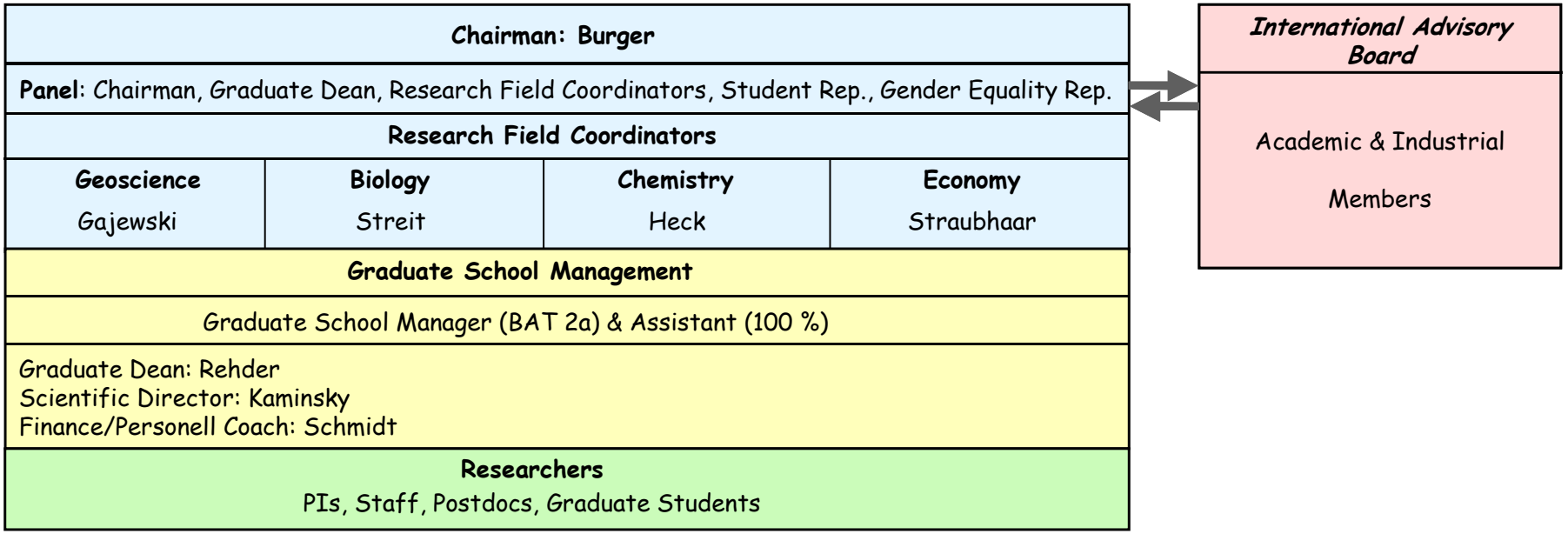
REpower Systems

Hamburg Research Platform

Hochschule für Angewandte Wissenschaften Hamburg
Hamburg University of Applied Sciences

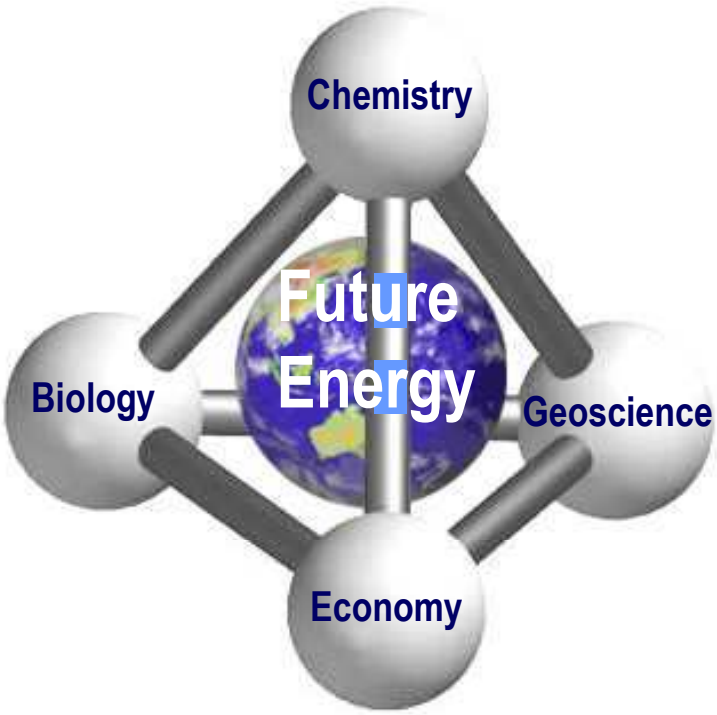
University of Hamburg & Technical University of Hamburg-Harburg & Repower AG & Hamburg Institute of International Economics (HWWI) & Federal Research Centre for Forestry and Forest Products & Hamburg University of Applied Sciences (HAW)

GS+FEYR: Organisational Structure



Graduate School Future Energy Resources, GS+FEYR

University of Hamburg



Application Draft

7.9.2006

List of Abbreviations:

GS+FEYR	**Graduate School Future Energy Resources**
GS	**Graduate School**
GSM	**Graduate School Management**
PI	**Principal Investigator**
UniHH	**University of Hamburg**
TUHH	**Technical University Hamburg-Harburg**
HSU	**Helmut Schmidt University**
HAW	**Hamburg University of Applied Sciences**
GK	**Graduiertenkolleg**
MIN Faculty	**Faculty of Mathematics, Informatics and Natural Sciences**

Table of Contents:

1. Basic Data

Graduate School: Future Energy Resources FEYR

Host university: University of Hamburg (UniHH)

Coordinator (Chairman): Prof. Peter Burger, UniHH

Principal Investigator	Institution
Prof. Antranikian, Garabed	TUHH, Institute of Technical Microbiology
Prof. Betzel, Christian	UniHH, Institute of Biochemistry and Molecular Biology
Prof. Broekaert, José A.C.	UniHH, Institute of Inorganic and Applied Chemistry
Prof. Burger, Peter	UniHH, Institute of Inorganic and Applied Chemistry
PD Bräuninger, Michael	Hamburgisches Weltwirtschaftsinstitut, HWWI
Prof. Fröba, Michael (appointed)	UniHH, Institute of Inorganic and Applied Chemistry
Prof. Gajewski, Dirk	UniHH, Institute of Geophysics
Prof. Hahn, Ulrich	UniHH, Institute of Biochemistry and Molecular Biology
Prof. Heck, Jürgen	UniHH, Institute of Inorganic and Applied Chemistry
Prof. Kaltschmitt, Martin	Institute of Environmental Technology and Energy Economics
Prof. Kaminsky, Walter	UniHH, Institute of Technical and Macromolecular Chemistry
Prof. Liese, Andreas	TUHH, Institute of Technical Biocatalysis
Dr. Meier, Dietrich	UniHH/Federal Research Centre for Forestry and Forest Products
Prof. Michaelis, Walter	UniHH, Institute of Biogeochemistry and Marine Chemistry
Prof. Müller, Rudolf	TUHH, Institute of Technical Biocatalysis
Prof. Niemeyer, Bernd	HSU, Process Engineering Department
Prof. Prosenc, Marc-Heinrich	UniHH, Institute of Inorganic and Applied Chemistry
Prof. Rehder, Dieter	UniHH, Institute of Inorganic and Applied Chemistry
Prof. Scherer, Paul	HAW, Research Center of Lifetec Process Engineering
Prof. Straubhaar, Thomas	UniHH, Hamburgisches Weltwirtschaftsinstitut, HWWI
Prof. Streit, Wolfgang	UniHH, Biocenter Flottbek
Prof. Thiem, Joachim	UniHH, Institute of Organic Chemistry
Prof. Tol, Richard S.	Economic and Social Research Institute Dublin, Ireland
Prof. Vahrenholt, Fritz	UniHH, Chemistry Department / Repower AG
Prof. Weller, Horst	UniHH, Institute of Physical Chemistry

Participating Institutions:

Institutes and central facilities of the host university	Location
Institute of Inorganic and Applied Chemistry	Hamburg
Institute of Biochemistry and Molecular Biology	Hamburg
Institute of Organic Chemistry	Hamburg
Institute of Physical Chemistry	Hamburg
Biocenter Flottbek	Hamburg
Institute of Biogeochemistry and Marine Chemistry	Hamburg
Institute of Geophysics	Hamburg
Institute of Technical and Macromolecular Chemistry	Hamburg
Institutes and central facilities of other participating universities	Location
Institute of Environmental Technology and Energy Economics (TUHH)	Hamburg
Institute of Technical Microbiology (TUHH)	Hamburg
Institute of Technical Biocatalysis (TUHH)	Hamburg
Research Center of Lifetec Process Engineering (HAW)	Hamburg
Process Engineering Department (HSU)	Hamburg
Non-university institutions (if applicable)	Location
Hamburgisches Weltwirtschaftsinstitut, HWWI	Hamburg
Repower AG	Hamburg
Industrielle Biotechnologie Nord, IBN	Hamburg
Federal Research Centre for Forestry and Forest Products	Hamburg
Cooperation partners** (if applicable)	Location
Economic and Social Research Institute	Dublin, Ireland

Total Number of Students in Graduate School: ca. 110

This number will be achieved after 4 years of operation assuming 70 PhD students with stipends provided by the GS+FEYR and 40 otherwise funded graduate students.

2a. Zusammenfassung

Die ausschließlich englischsprachige* Graduiertenschule "Future Energy Resources", GS+FEYR, soll auf einem der wichtigsten Themengebiete des 21. Jahrhundert eingerichtet werden. Führende natur- und wirtschaftswissenschaftliche Arbeitsgruppen der Hamburger Wissenschaftsplattform** aus der industriellen und universitären Forschung sind Garanten für den Erfolg der Graduiertenschule. Die eng vernetzte Grundlagenforschung beinhaltet folgenden Gebiete; a) erneuerbare Energien aus Biomasse, b) klassische und nicht-klassische fossile Rohstoffe, c) Solarenergie, d) Volkswirtschaft, e) Gasspeicherung und C_1-Chemie. Die anspruchsvolle Thematik verlangt ein innovatives, kompetitives Ausbildungskonzept, leistungsorientierte Verteilung der Forschungsmittel/Stipendien und ein professionelles Management, dem die geeigneten Mitarbeiter und Maßnahmen zur Qualitätskontrolle zur Verfügung stehen. Während es nur geringfügiger Änderungen der Prüfungsordnungen bedarf, wird dies zu einer erheblichen Änderung der Graduiertenausbildung führen. Dies bedarf eines hohen Einsatzes aller Beteiligten, die als Gegenleistung durch die kreative und wissenschaftliche Umgebung der Graduiertenschule belohnt werden. Doktoranden/innen mit hervorragendem Bachelor- oder Master- bzw. Diplomabschluss werden weltweit rekrutiert und einmal pro Jahr aufgenommen. Jährlich werden 20 Kandidaten vom Panel der Graduiertenschule unter Berücksichtigung der Gleichstellungskriterien ausgewählt und mit einem Stipendium ausgestattet. Die Promotionsdauer beträgt vier bzw. drei Jahre für Absolventen mit BSc bzw. MSc/Diplomabschluss.

Die Ausbildung umfasst mehrere Abschnitte, die sich in den Anteilen an Lehrveranstaltungen und eigenständiger Forschung unterscheiden. Das Herzstück der Lehrveranstaltungen ist die neu entwickelte Vorlesung FEYR, in der Konzepte der Energieressourcen im wirtschaftlichen Kontext vorgestellt werden. Neben weiteren gemeinsamen Pflichtkursen werden von den Studierenden fachspezifische Kurse der beteiligten Einrichtungen nach Rücksprache mit dem Advisory Commitee belegt. Letzteres setzt sich aus dem Betreuer der Doktorarbeit und zwei weiteren maßgeblich beteiligten Wissenschaftlern, PIs, zusammen, die auch als Mentoren während der gesamten Promotionsdauer fungieren. Zusätzlich übernimmt das Advisory Committee die Bewertungen und zugehörigen mündlichen Prüfungen der von den Studierenden verfassten zwei Forschungsanträge. Letztere fördern neben der Kreativität die Kenntnisse in Forschungsgebieten der Graduiertenschule und werden auch zur Leistungsbeurteilung für die Vergabe des "Stipend Bonus" herangezogen. Die Einbindung in die Organisation der GS+FEYR, z.B. die Gestaltung des Vortragsprogramms ist eine weitere Maßnahme zur Förderung der wissenschaftlichen Selbständigkeit der Studierenden. Hierbei wird der "Junior/Seniorwissenschaftler-Geist" der Graduiertenschule zusätzlich beitragen.

Die Qualität des Ausbildungsprogramms wird vom Graduate Dean unter Zuhilfenahme des Selbstevaluationssystems überprüft, der zugehörige wissenschaftliche Anteil vom Scientific Director überwacht. Hinzu kommt der Finance/Personnel Coach, der die Kontrolle der Personalbetreuung und des Geschäftsplans übernimmt. Dieses dreiköpfige "Qualitätssicherungsteam" setzt sich aus kürzlich emeritierten Professoren zusammen, die über größere Zeitressourcen verfügen. Auch bei der Besetzung des International Advisory Board wird der Ansatz verfolgt, reputierte, seit kurzem im Ruhestand befindliche Wissenschaftler einzubinden. Neben richtungsweisenden Beiträgen zur Entwicklung der GS+FEYR wird dieses Gremium die Koordination der Begutachtung der Forschungsanträge der PIs für Mittel der projektbezogenen Stipendienvergabe übernehmen.

Dies wird durch die strenge "no-automatism funding policy" der Graduiertenschule erforderlich, die zum einen das Niveau der Forschung sichern soll und zum anderen im Unterschied zu Graduiertenkollegs die Einbindung neuer PIs mit Interesse auf dem Gebiet der GS+FEYR ermöglicht. Von den PIs wird großer Einsatz gefordert, der aber durch das hohe Engagement und die Beteiligung der Studierenden bei der Organisation der Graduiertenschule wettgemacht wird. Es soll nicht unerwähnt bleiben, dass die wissenschaftlichen Ziele der Graduiertenschule langfristig angelegt sind. Eine mindestens ebenbürtige, kurzfristig erreichbare Errungenschaft ist die Ausbildung hervorragender Wissenschaftler auf dem Gebiet der GS+FEYR, die über natur- und wirtschaftswissenschaftliche Kenntnisse zur Bewertung zukünftiger Technologien verfügen. Dies wird es unseren Absolventen ermöglichen, selbst neue Projekte auf diesem Gebiet zu initiieren.

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* Englisch ist die Pflichtsprache für alle Bereiche der Graduiertenschule, d.h. Kurse, Berichte, Formulare etc..

** Teilnehmende Einrichtungen: Universität Hamburg, TU Hamburg-Harburg, Repower AG, Helmut Schmidt Universität, Hochschule für Angewandte Wissenschaften, Bundesforschungsanstalt für Forst- und Holzwirtschaft Hamburg, Hamburgisches Wirtschaftsinstitut HWWI.

2b. Summary

The Graduate School "Future Energy Resources", GS+FEYR, will establish a PhD programme* addressing one of the top priority problems of the 21st century. Leading experts from different research fields of natural science, economy and industry of the Hamburg research platform** will contribute to the success of this highly scientifically oriented graduate school. The interdisciplinary fundamental research is comprised of i) renewable energy from biological and organic mass, ii) classical and unprecedented fossil resources, iii) solar energy conversion, iv) economy and v) chemical transformations (C_1 chemistry) and storage.

These challenging subjects mandate an innovative, competitive scientific training concept, performance-based allocation of funding and an active management equipped with the appropriate tools to establish, assure and improve the quality of the GS+FEYR. While this will require just a few adjustments to the current regulations, it will "provoke" a rather radical change of the current PhD programmes of the participating institutions. This will demand for a high level of dedication of all graduate school members, which will be rewarded by a highly creative scientifically stimulating atmosphere. Talented students with excellent BSc *and* MSc/Diploma degrees will be recruited worldwide. Twenty new research stipends will be awarded annually by the Panel of the GS+FEYR to the best candidates under the premises of gender equality. The PhD programme will span 3 years for students entering with MSc/Diploma certificates and 4 years for students with BSc degrees, and will offer an enrollment once per year. The doctoral training consists of several stages with varying ratios of coursework and individual research on the PhD project.

The heart of the coursework is the newly conceived class FEYR, which will address all aspects of future energy resources placed into an economic context. In addition to further common obligatory classes, research specific courses will be selected by the student upon reconciliation with the Advisory Committee. The latter is constituted by the student's PhD supervisor and two further PIs of the GS+FEYR, who are also mentors for the student throughout the enrolment in the graduate school. Furthermore, the Advisory Committee will pursue the examination of the requested two research proposals, which will foster the student's creativity and knowledge in the research area of the GS+FEYR. Additionally, students will be awarded a stipend bonus depending on their performance in these examinations. Further measures, such as student organized research seminars or workshops will foster the scientific independence of the PhD students. This will be further enhanced through the acclaimed senior/junior scientist (PI/student) spirit of the GS+FEYR.

The educational programme is monitored by the Graduate Dean, who is assisted by the self-evaluation system of the GS+FEYR. The scientific progress of the graduate school is surveyed by the Scientific Director, while the performance of the management and the business plan is reviewed by the Finance/Personnel Coach. This quality assurance team consists of highly active, recently retired scientist, who have a relaxed time budget due to their reduced day to day business. This type of approach will be also pursued for the constitution of the International Advisory Board, which will guide the GS+FEYR with advice for strategic directions.

A further even more important task of the International Advisory Board is the coordination of the peer-reviewing process of research grant applications, for which application drafts have to be submitted by the PIs. This is in alignment with the strict "no-automatism funding policy" of the graduate school and will assure the high scientific quality of the graduate school. In addition, it will allow to integrate excellent new PIs, who have not been involved during the set-up phase of the GS+FEYR. This is considered a strong surplus compared to research training groups (GKs). The PIs will certainly have to make strong commitments to the GS+FEYR, but will be rewarded by scientifically more dedicated coworkers. In addition to the long-term scientific goals of the GS+FEYR, the anticipated short-term educational accomplishments of the graduate school are considered to be of equally high value: Graduates of the school will acquire a broad training and knowledge in the field of future energy resources with an appraisal of scientific and economic/social consequences. We are therefore confident that our graduates will be able to solve problems of related upcoming projects and initiate new directions for future energy resources.

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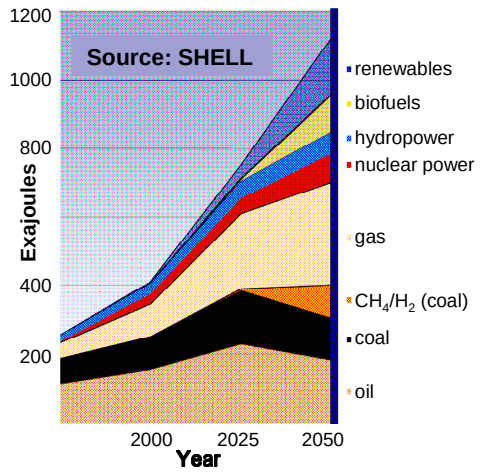
* English is the mandatory language of the graduate school encompassing not only classes but also official forms etc..

** Participating institutions: University of Hamburg, Technical University of Hamburg-Harburg, Helmut Schmidt University, Hamburg University of Applied Sciences, Federal Research Centre for Forestry and Forest Products Hamburg, Hamburg Institute of International Economics (HWWI) and Repower AG.

3. Graduate school profile and scientific abstract



The central problem of the 21st century can be readily depicted from the forecasted continuously increasing world-wide energy demand shown on the right hand side, which is opposing the *restricted global fossil* energy resources. While nuclear fusion has been promised as single exclusive energy source, the future of this technology is still uncertain. Multi-faceted approaches are therefore anticipated to provide the best prospects of success for this top priority problem. It is nevertheless also a major opportunity for Germany to remain at the cutting edge of scientific research, and future technology derived thereof has certainly significant potential to open new areas of economy and employment. These considerations in combination with the excellent scientific environment in Hamburg inspired us to propose the Graduate School "Future Energy Resources", GS+FEYR, within the framework of the German Excellence Initiative. The research programme of the GS+FEYR *focuses on fields* of fundamental and applied natural and economic sciences for which excellent expertise has been gained in Hamburg.

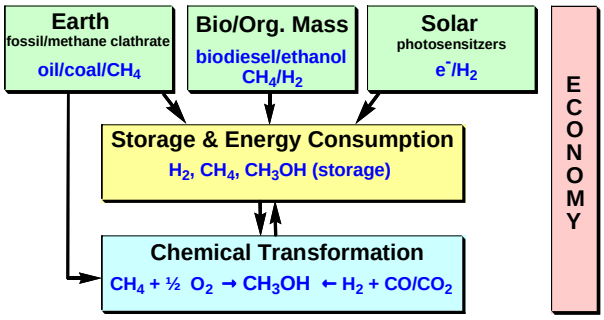
A special remark seems in place before the scientific structure of the GS+FEYR will be presented. The extraordinary challenge of our research objective readily explains that the targets of our graduate school have to be considered long-term goals. Therefore, the anticipated following short-term educational accomplishments are perhaps of even higher value: Graduates of the school will acquire a broad training and knowledge in the field of future energy resources with an appraisal of scientific and economic/social consequences. We are confident that our graduates will be able to solve problems of related upcoming projects and initiate new directions for future energy resources. This new type of highly educated academics with a base knowledge in economics and an in-depth knowledge in future energy resources is considered a true asset for the German society.

3a. Scientific Structure: Before the general scientific framework will be presented, a brief introduction into the topics of the GS+FEYR seems in place. As stated in the 2003 report[*] of the German Advisory Board Council on Global Change (WBGU), there will be a gradual transition to future energy resources of the global energy budget, which relies currently to ca. 80% on *non-renewable* (carbon) fossil resources.[**] Considering an unchanged, i.e. *static* as well as a market price and future energy supply adapted *dynamic* energy mix, current estimates predict a static range of the *reserves* for oil, natural gas and coal of 45, 69 and 452 years and a dynamic range of 95, 230 and 1000 years, respectively. Therefore, the research in the GS+FEYR distinguishes between short (2 decades), intermediate (2050) and long-term goals (2100+). With regard to short-term and intermediate goals, the better exploitation of current oil sources will be a highly desirable achievement (item **I1**). At the intermediate to long term level, the establishment of unprecedented *biogenic* future energy technology is sought (item **I2**). This also applies to more efficient catalytic routes for the conversion of synthesis gas (CO, H_2). The synthesis gas will be likely produced at this stage by gasification of coal, which is considered a long term and (yet) inexpensive source of carbon. This will be complemented by the chemical *aerobic* conversion of the major component of natural gas, methane (CH_4), to methanol. Depending on the accessibility of methane, CH_4, from methane chlathrates the latter transformation may be also operational for a longer period (item **I3**) While the biotechnology is certainly envisaged as long-term resource, an upper limit to the contribution of the future energy budget in the range of 10-15% has to be presumably acknowledged due to agricultural restrictions. In addition to the expansion of other renewable energy sources, e.g. wind power, solar energy conversion is sought. The design of novel more efficient photovoltaic cells is therefore conceived in addition to the direct solar driven water splitting process (item **I4**). The latter is deemed as environmentally benign large-scale source of H_2 and will require new storage devices (item **I5**). The availability of hydrogen will allow to access CO_2 as future energy resource upon H_2 reduction to e.g. methanol. Methanol or dimethyl ether derived thereof, rather than hydrogen may in

[*] Title of the report: "World in Transition - Towards Sustainable Energy Systems".
[**] Oil: 36%; natural gas: 21%; coal 23%.

fact replace gasoline in the future transportation sector. This future perspective has been proposed by the Nobel price winner George Olah, who coined the term "methanol economy". This leads over to the last point, namely economy and energy economization. The prediction of energy markets and estimates of future technology is a highly desirable goal of the graduates and PIs of the GS+FEYR. The education and research of the GS will be hence accompanied by economic experts. Finally, an often underrated but yet important future energy resource, i.e. energy economization will be included and will be discussed in the part economy (item **I6**).

The general scientific structure of the GS+FEYR is shown below



and is best described with regard to its main components, namely energy and feedstock resources shown in green, storage (yellow), chemical transformations (blue) and finally economic considerations (lilac). These compartments are presented below, which is followed by a section on the integration of the GS+FEYR into the university's academic profile and development strategy.

I1. Earth: Classical fossil resources (coal, oil, gas) will form the major contribution in the energy budget for the next two decades. Their demand will experience an increase of ca. 40 % in the next 20 years. The *optimized* exploration and the improved production and monitoring of hydrocarbon reservoirs is therefore of foremost interest for future energy. Leading edge research on the exploration, monitoring and exploitation of fossil fuel reservoirs is therefore necessary. Further research of the GS+FEYR will focus on *unprecedented fossil* resources, i.e. the highly abundant marine methane chlathrates. The investigation and exploration of methane chlathrate has recently gained high scientific attention due to the huge methane resources, which are estimated to exceed the fossil reserves by a factor of 2-10 (!). This part is divided in two sections. Firstly, geophysical aspects will be discussed followed by a second section on the geochemical origin, formation and degradation of chlathrates and the marine conversion of hydrogen and carbon based materials.

I1.1. Geophysics: The seismic method, SM, is the most important technique to produce images of the earth interior and allows to detect and characterize subsurface reservoirs. The SM is also an essential tool to discover, map and quantify methane clathrate deposits. All current estimates of the huge amount of clathrates in the offshore oceanic sediments are based on the observation of the so called Bottom Simulating Reflector (BSR) which was mapped worldwide by seismic techniques.

Future discoveries of oil and gas reservoirs will be in geological complex environments since the "easy reservoirs" are already found. To image reservoirs beneath areas of complex salt tectonics or below basalt flows with their high impedance contrast will require not only new techniques for data acquisition and seismic imaging but the joint inversion of multi-disciplinary data sets. The integration of seismic data with potential field data (gravity and electrical data), blended into the geological knowledge provide challenges for future generation of geo-scientists. Furthermore, the future research will aim at cost effective techniques to excite and acquire offshore seismic shear waves as well as to develop appropriate methods for processing and imaging (Gajewski). The quantification of clathrate reservoirs is still in its *infancy* since it is completely different to the characterization and quantification of oil/gas reservoirs. The use of shear waves will be essential to make progress in this direction. Currently, this research is almost entirely academic since economical exploitation technologies for methane hydrates are not yet available and no commercial research is carried out here.

Additional methods include natural seismic sources (acoustic emissions) occurring for example during production of a reservoir or arising from changes in the physical stability condition of methane clathrates. This passive seismic method offers numerous research opportunities, e.g. for mapping the acoustic emissions as CO_2 sequestration monitoring. Here as well, seismic interferometry may

be a new tool to image minimal changes in subsurface properties. It is now broadly accepted that the classical mostly academic seismology may provide contributions for reservoir monitoring.

I1.2. Geochemistry: Organic geochemistry offers essential tools for the exploration and assessment of fossil fuel deposits as well as for the handling of environmental burden caused by fossil fuels.

Methane chlathrates are of particular interest for the research programme of the GS+FEYR with regard to gas storage, methane conversion and supply. While considerable progress was achieved during the last three decades in elucidating the geochemistry and microbiology of methane dynamics on earth, many questions remained unanswered including those concerning marine habitats. In this context, the Michaelis group has pursued interdisciplinary research combining the fields of organic geochemistry, microbiology, geophysics, and stable isotope geochemistry. This work focuses on the anaerobic and aerobic cycling of methane by microorganisms. The latter will be pursued in cooperation with the biochemistry and microbiology groups, which will address the isolation and crystallographic characterization of the enzymes (Streit, Antranikian, Hahn & Betzel). Consecutively, the investigation of elemental methane transformation steps will be performed with the colleagues of the bioinorganic and inorganic chemistry sections (Rehder, Burger, Prosenc). A particularly interesting project not mentioned in the outset, arises from the observation of $CO_2/CO/H_2/C_nH_{2n+2}$ at high temperature and pressure under marine hydrothermal conditions. This particular composition of molecules can be readily identified as components of syngas (Fischer-Tropsch) chemistry. This may eventually lead to new marine inspired catalysts and will be investigated by the groups in the chemistry and geoscience departments.

In addition, the occurrence, generation mechanisms and quantitative importance of hydrogen in the natural environment will be addressed as a research target. Hydrogen is in the focus of interest among the options for future fuels with “hydrogen economy” playing a promising role in solving the problems of air pollution and global warming. However, little has been done to evaluate the potential contribution from natural hydrogen sources, though hydrogen is known to be generated by different natural processes including rock-water reactions (e.g. serpentinization) and the diagenesis of organic matter (e.g. coalification) (Michaelis, Prosenc, Burger).

I2. Biogenic/Organic Mass: Products from agriculture and forestry supplied for the non-food area are defined as "renewable resources". At present, the discussion for their increased employment becomes momentum due to environmental issues (e.g. CO_2-neutral) as well as to additional chances for the cooperation of agriculture and industry (e.g. jobs and production in rural areas). The annually regrowing biomass amounts worldwide to about 200 billion tons and consists roughly of 95% of cellulose, 5% including saccharides, proteins, polyketides and aromatics. Only a fraction of 3% (after all a respectable 6 billion tons) find application in feed, food and fibres. These renewable resources can be employed in the microbial synthesis of biofuels, which encompasses short chain alcohols, e.g. methanol, ethanol. In addition, biogases produced by microbes fall within this terminology. They are mainly comprised of the biologically produced methane (50-70 %) and CO_2 (30-50%), or hydrogen, H_2. Microbial biofuels are generally produced in large quantities from a wide range of different microbes under *anaerobic* conditions.

The microbiology and biochemistry of methane synthesis has been the objective of intensive studies in the last 3 decades. In nature almost all the biological processes linked to biogas production take place within microbial communities. Although microbial communities are being used for the production of biogases since many years, our knowledge of the complex processes and interactions in these microbial communities are very limited.

Within the GS+FEYR we will follow several complementary lines of work. On the one hand it will be very promising to analyze the genomic contents of complex microbial communities involved in biofuel production (Scherer & Streit). For this small model microbial communities could be selected. The idea of modelling such a community is intriguing and will be pursued. Furthermore, it is planned to include bioinformatic as well as metaproteomics and metatranscriptomics approaches (Streit & Antranikian). New techniques will allow us to obtain the sequence of the genomes of all the organisms in such microbial community in a rather short period of time.[*] This opens up a new horizon to

[*] Metagenomics or microcomgenomics for microbial community genomics.

decipher the metabolism and regulation of microbial communities and the role of an individual organism in a community as recently demonstrated for an anammox bacterium (Nature, 440, 790, 2006).

The situation is probably going to dramatically change due to the rapid developments in genome sequencing, functional genomics, transcriptomics, structural genomics and more recently in systems biology. Therefore, in this research network of the GS, we will focus on the microbial gas and novel fuel production using a wide range of the novel and sophisticated genomics technologies at the different partner universities in Hamburg. The ultimate goal is to gain a better understanding of all biological processes linked to the production of the biogases and biofuel in microbial communities and individual microorganisms.

For the production of novel biofuels (alcohols), it will be most important to identify novel enzymes with properties for efficient alcohol production. This is especially needed for the use of biomass other than starch. For instance cellulose from wood and straw is an interesting source for the biofuel production. Here novel cellulases compatible with ionic liquids, which are used to extract the cellulose from wood, are urgently needed. Also, pectin is addressed as resource for the production of biofuels. In addition, new approaches for the conversion of *so far inaccessible* resources like hemicelluloses and lignin have to be developed. Search for new enzymes will be pursued by the groups of Antranikian, Müller and Streit. New enzymes (e.g. cellulases) will be characterized in view of their application in non aqueous solvents (Liese). The major task of the Liese group is to develop and establish sustainable processes under extreme conditions suiting the novel biocatalysts. Here one important aspect is the pre-treatment of the raw materials (biomasses). The required selective separation and purification of the biofuels will be also studied (Niemeyer). Combined methods including chemical, physical and biological treatment have to be developed for compounds, for which no biological conversion to fuels is available so far. This will be done in close collaboration between different participating groups of the GS.

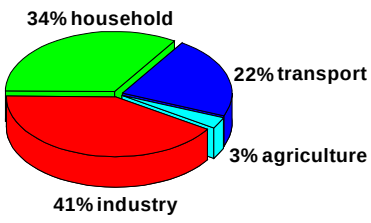
Additional chemical, physical and biochemical measurements will be employed to compare and correlate the performance of these novel enzymes with previously established ones. Structure-function-analysis of enzymes and other proteins applying different biophysical methods, such as X-ray crystallography, small angle X-ray scattering and laser light scattering is the domain of the Betzel group. Eventually, enzymes will be stabilized to reach higher turn over numbers (Niemeyer).

Furthermore, the synthesis of novel polymeric materials from abundant raw materials e.g. starch, sucrose, cellulose, hemicelluloses etc. is envisaged. It is an attractive approach to arrive at such novel components with decisive natural structure elements. In addition to studies of their properties, in which they will have to compete with materials obtained from oil-based chemistry, the novel materials will be employed due to their anticipated more favourable thermal biodegradation (Thiem).

Thermochemical conversion such as fast pyrolysis is another process for converting lignocellulosic biomass into a liquid called bio-oil. The motivation is based on i) creating new energy carriers for the future, ii) decreasing greenhouse emissions and iii) securing the supply of energy and chemicals as in the concept of a bio-refinery. New separation techniques are necessary to isolate valuable fractions from bio-oils. Together with Prof. Scherer also the methanization of bio-oils will be studied as preliminary results were very promising (Meier).

Furthermore, the use of plastic wastes as a resource for hydrocarbons is considered. The amount of waste is extremely fast growing and has reached in Germany more than 3 million tons a year. Methane, hydrogen and other hydrocarbons can be recovered up to 90 % in a fluidized bed pyrolysis process, carried out at the Hamburg University. The same process is used for the flash pyrolysis of biomass (Kaminsky, Meier).

I3. Chemical Transformation: The well-established term "carbon management" is considered a key to success for the GS+FEYR. It becomes immediately apparent from the graph on the right hand side showing the current global intertwined carbon/energy usage for different sections and recognizes the link between fossil and future energy resources. It is quite certain that *coal* will play a decisive role with regard to future energy resources. Future technology will therefore require significant progress in the following two areas: Improvement of catalytic conversions of syngas



(CO_x, H_2, item **I3.1**) and development of a selective aerobic oxidation process of methane to methanol (item **I3.2**). It deserves a special mention that these goals have been conceived independently by a variety of agencies, e.g. the "Connecat" subunit of the DECHEMA and "SUSCHEM", the (industrially oriented) European technology platform for sustainable chemistry (www.suschem.org).

I3.1. CO and CO_2 Hydrogenation: Traditionally, syngas is obtained by gasification of fossil carbon sources, i.e. lignite and anthracite through a steam reforming process ($C + H_2O \rightarrow CO + H_2$). Further hydrogen can be obtained by the water gas shift reaction $CO + H_2O \leftrightarrows CO_2 + H_2$. The hydrogenation of carbon monoxide to organic products, e.g. methanol and gasoline was invented by Mittasch and Fischer & Tropsch at BASF AG. Improved processes were developed by several companies, e.g. Sasol in South Africa and were motivated by the embargo from the global oil market and the local availability of coal. Methanex, ICI/Lurgi and other companies on the other hand were intrigued by the idea to use natural gas rather than coal as purer feedstock for CO from the steam reforming process, $CH_4 + H_2O \rightarrow CO + 3\ H_2$. The latter transformation is endothermic and hence cost and energy intensive. As a side remark, it should be noted that this is the major source of hydrogen in industry (48 %). The latter is mostly used for the synthesis of ammonia, which contributes to over 2% to the total global energy budget! [*]

Hydrogenation of CO is predominantly employed for the large-scale synthesis of methanol. The worldwide production of methanol is steadily increasing and has reached ca. 33 Mio.T/y in 2005. This amount should be compared to the requirement of 350 Mio.T/y of methanol, which would be needed to replace just 10% of the current worldwide transportation fuel per year! While current process technology makes up for the low activities of the *heterogeneous* catalysts through high product selectivity, significant improvements of the catalysts are required to allow the introduction of smaller and local production sites. Current research activities in the Prosenc and Burger groups are focused on the development of novel transition metal complexes displaying substantially higher activities and a comparable selectivity for CO hydrogenation. The search for new catalysts will be guided by a combination of quantum-chemical calculations, e.g. DFT methods and synthetic/kinetic studies. As soon as H_2 will become readily available at reasonable costs from the solar energy conversion, the hydrogenation of CO_2 will render into an utmost important process. While current catalysts, e.g. for the water gas shift reactions are established, improved catalytic systems are urgently sought.

Research in this area will also employ a new type of catalyst, i.e. nanomaterials (Weller). Metal nanoparticles exhibit a high potential for improving catalytic efficiency, selectivity, and specificity. Especially the ability to precisely control the size and surface properties of nanoparticles in combination with the self-assembling properties makes chemically prepared metal and metal-oxide nanoparticles attractive candidates for such catalytic applications. Utilizing size quantization effects in order to tune the electronic structure of the catalytic particles in combination with the ability of controlling interparticle spacings on a carrier material will open novel approaches in CO_2 hydrogenation catalysis. The Heck group is also part of this team and has previously acquainted experience in the use of capillary reactors for the study of heterogeneous catalytical processes.

I3.2. Aerobic Methane Oxidation: The direct aerobic conversion of methane to methanol, $CH_4 + ½\ O_2 \rightarrow CH_3OH$, is a highly desirable reaction, since it bypasses the aforementioned energy intense endothermic steam reforming process. In contrast to the observed high selectivity observed in biological systems, e.g. methane monooxygenases, MMOs, which operate at ambient conditions and display a high product selectivity, invented systems are far away from this goal. The best systems related to the methane oxidation was reported so far by Periana et al. for a homogenous Pt catalyst displaying selectivities in the range of 80%.[**] The GS+FEYR will include a research programme in this difficult area using homogeneous (Burger and Prosenc) and nanoscalar hybrid metal oxide catalysts (Fröba). The Burger group builds on a long experience in the C-H activation process, including CH_4, and intends to establish a promising yet only partially operational working model for the catalytic aerobic oxidation of methane. This will be guided by high-throughput quantum-chemical methods, which are currently developed within the framework of a different research project funded by the DFG (Burger). The latter groups intend to anchor their systems eventually in mesoporous materials, providing a link to the Fröba group.

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[*] Novel less energy intense routes to ammonia could be therefore envisioned for an extension of the research programme of the GS+FEYR at a later stage.

[**] Due to the required harsh reaction conditions novel improved methods are urgently sought.

To overcome the challenging selectivity problems, additional approaches will be pursued in collaboration with further colleagues from bioinorganic chemistry and biochemistry. This will encompass directed evolution methodology of soluble cytochrome P450 enzymes, e.g. P450 BM3 enzymes. For the latter, great advances have recently reported toward the mutagenesis enabling the oxidative conversion of short chain alkanes, e.g. propane to 1-propanol. Further efforts to allow the oxidation of methane will build on the expertise of the Hahn group with these systems. The latter is assisted by protein crystallographic work (Betzel) and kinetic and QM/MM studies (Burger). Further support will be provided through the bioinorganic expertise of the Rehder group, while Prof. Niemeyer will be of great assistance with regard to the long-term stabilization of these enzymes. The challenging problem arising from the consumption of the expensive NADP(H) cofactors in these systems will be addressed through the incorporation of novel hydridic transition metal donor complexes (Burger).

I4. Solar Energy: The research on solar energy resources will place an emphasis on the study of *dye* sensitized photovoltaic cells and novel systems for the direct solar production of hydrogen, H_2. The usage of photosensitizers (dyes) is common to both research fields in that a short description of this type of material is prepended. Traditionally, transition metal complexes, e.g. $[Ru(bpy)_3]^{2+}$, and semiconducting solid state materials, e.g. ZnO or TiO_2 were used as photosensitizers. Upon irradiation with the electronic transition or band gap dependent visible or UV light, charge separation occurs, which can foster electrochemical processes or can be applied in a voltaic cell. Apart from stability and quantum yields, the major obstacle for *efficient* solar light harvesting is the required overlap of the *absorption* spectrum of the dye with the solar *emission* spectrum. Currently, the application of systems with excellent quantum yields is frequently abated by their lack to display absorptions in the near infrared, NIR, which is a range of strong solar emission. Therefore, there is large demand for novel materials with improved "solar compatible" absorption properties. Based on their absorption spectra, water and photostability and fully reversible electrochemical processes, novel mononuclear Re, Ru and dinuclear Mo, W complexes studied by the Heck and Burger groups are deemed excellent starting points. This is also the case for novel semiconductor quantum dots, which exhibit a highly improved photostability compared to many other conventional dye molecules. Due to the size quantization effect, their light absorbing properties (band gap) can be tailored by the precise adjustment of the nanoparticle size. The research in the area of nanomaterial will be pursued by the Weller group and extended to mesoporous hosts by Prof. Fröba.

The team will be completed by Prof. Broekaert, who will provide the necessary analytical support for the determination of additional *dotation* dependent band gaps. This will include the analysis of impurities and minor constituent concentrations and their distribution in the material at the microscale. Frontier methods such as the high-precision analysis with CCD-based atomic emission spectrometry with the inductively coupled plasma (ICP-AES) and ICP/time of flight mass spectrometry will be employed. In combination with single laser spikes multielement major, minor and trace determinations with high spatial resolution can be obtained. Further non-destructive spatially resolved multielement analysis will be performed by X-ray fluorescence with focused synchrotron X-ray radiation at the Hasylab (DESY Hamburg). It deserves a special mention that this type of analysis is complementary to the spatially resolved EXAFS and XANES measurements of the Fröba group at the same institution.

The research in the area of solar energy conversion has two scientific goals: Firstly, the design of new photovoltaic cells is envisaged (item **I4.1**) and, secondly efficient systems for the water splitting process, $H_2O + h\nu \rightarrow H_2 + ½\ O_2$ will be developed (item **I4.2**).

I4.1. Photovoltaic Cells: So far most of the commercial photovoltaic cells are based on silicon technology. Since current cells display an unattractive total energy balance of the electrical energy produced during the lifetime and the energy required for silicon production, new designs are sought. A highly promising alternative is the Grätzel Cell, which employs inorganic photosensitizers on nanoscale TiO_2 immersed in an electrolyte solution. This will serve as base for our own research direction with molecular Re, Ru, Mo and W complexes and quantum dot photosensitizers (vide supra). This research will be extended to *pure solid state* cells for which promising results are still missing. The focus will be placed on the self-organized assembly of nano-hetero structures, which consist of a P- and N-doped nanostructured compound. The latter form an interpenetrating network with a high contact area between N- and P-doped material. Such structures could realize efficient light harvesting and charge separation across the interface followed by a selective transport of electrons and

holes to the outer contacts. Materials of interest are nanostructured semiconductor polymer hybrid systems or purely inorganic materials combinations. In collaboration with the Kaminsky and Fröba group hybrid materials of this type with polymers and mesoporous compounds will be investigated.

I4.2. Photochemical Water Splitting: The utilization of fossil energy sources, e.g. coal, inevitably leads to the formation of the undesirable greenhouse gas CO_2. Therefore hydrogen, H_2, has been proposed as *the* ultimate clean future energy source for use in fuel cells. However, in contrast to primary fossil *energy sources*, H_2 is an *energy carrier* and requires prior production. On a large-scale the water electrolysis or the endothermic steam reforming process of methane, $CH_4 + H_2O \rightarrow CO + 3\ H_2$ can be envisaged. Since both methods have either major economic or ecologic (CO_2) drawbacks, novel access routes to H_2 have been quested by leading experts. In particular the intriguing (*solar*) photochemical water splitting process, $H_2O + h\nu \rightarrow H_2 + ½\ O_2$, has been put forward. Research in this area by the Heck and Burger groups will focus on the aforementioned transition metal complexes and will be complemented by the usage of nanomaterials (Weller and Fröba). For the rational design of novel systems quantum-chemical methods will be employed. This will include TD-DFT calculations for the prediction of optical and electrochemical properties (Burger, Prosenc). Finally, it deserves a special mention that research in this field will perfectly suit into the Hamburg centered hydrogen network on H_2 fuel cell research at the TU Hamburg-Harburg and the GKSS.

I5. Storage: Methane and hydrogen will be obtained from the conversion of biological/organic mass, while H_2 is produced by solar water splitting. Quite likely, the H_2 and CH_4 production sites are either locally scattered (bio) or far away (solar) from the large scale chemical industry. Hence, without the installation of an unconceivable network of pipelines or the establishment of *a gas storage infrastructure*, H_2 and CH_4 ought to be consumed *locally* and *immediately* at the production sites to generate either electricity in fuel cells or heat. Based on these considerations, it becomes clearly evident that either the local conversion to another more convenient liquid form, e.g. methanol or the temporary storage is a highly desirable goal. This way, energy is available on demand, i.e. can be stored. At this point, we will focus on the gas storage and refer to the methanol synthesis above. Unfortunately, the technology for the large-volume storage of methane, and in particular hydrogen is not very advanced yet.[*] Therefore new materials are urgently required. High-surface mesoporous compounds and metal-organic frameworks (MOFs) have recently shown promising properties with this regard. Further applications of hydrogen storage devices are for transportation fueling, i.e. cars, which is currently strongly promoted in the USA by the DOE. The Fröba group has leading experience in this field and was awarded a BMBF grant together with industrial partners. This research will be complemented by quantum mechanical modelling of the Burger and Prosenc groups. These groups have also a particular interest in the formation and storage of gases in chlathrates providing a link to the geoscientific research groups of Gajewski and Michaelis.

I6. Economy and Energy Economization: The economic part will be integrated mostly at the educational level at the set-up phase of the GS (Straubhaar, Bräuninger). It is nevertheless included in the scientific aims, since a profound knowledge of economic principles is anticipated as a highly valuable tool to evaluate the economic consequences of the research. It will also teach the involved economic research groups some basic *natural science*, which is deemed a great surplus for their own studies. The specific aspects of this course (which is also recommended to non-economic PIs !) are briefly summarized below. The economic part of the GS is designed to raise understanding of economic processes in markets of exhaustible resources. There are two parts to the course. The first part (item **i**) explains market reactions and price movements. The second part analyses investment decisions (item **ii**).

i) *Prices and markets*: This part of the course explains the price mechanism for exhaustible resources and addresses market reactions. When resources become scarcer, the statistical duration of resources declines and prices increase. On the supply side, this induces the development of new deposits and better exploitation of existing deposits. In addition to this, new material is developed to substitute exhaustible resources. On the demand side, price increases lead to reduced use of raw material and to substitutions. Reactions on both the demand and supply sides increase the statistical duration of exhaustible resources.

[*] Cryostorage is energetically expensive; for the pressurized storage of H_2 costly, specialized materials are required.

ii) Investment. This part of the course focuses on the firm's investment decision. Investment decisions in markets for exhaustible resources are typically long-term and bear a great degree of uncertainty. The course will develop criteria for the assessment of investment decisions in this context.

Synergy Effects: This course is designed to encourage PhD students from the natural sciences to consider both technological possibilities and their economic feasibility. Furthermore, the course will show that market conditions are not static. Prices changes lead to changes in behaviour which, in turn, affect prices. The natural sciences courses allow PhD students in the field of economics to obtain an idea of technological possibilities. Therefore the courses will lead to a better understanding of energy resource substitution possibilities. The market process described above can be analyzed not only on an abstract level, but also in relation to the potential development of new products. This increases the direct relevance of economic research.

A special link between the natural science and economy worlds will be provided by Prof. Vahrenholt (Repower AG), Prof. Kaltschmitt and the associated member Prof. Tol, a former member of the University Hamburg, who was recently appointed by the Economic and Social Research Institute, Dublin, Ireland. All are leading experts in the field of future energy and energy economization and will be integrated as lecturers in this course. It should be noted that attention will be paid to fill the gap that Prof. Tol has left through the installation of an endowed chair with a natural science background.

3b. Integration into the University's Academic Profile and Development

The main objective of the GS+FEYR is the establishment of a highly competitive PhD programme in the area of one of the central problems of the 21st century. This calls for an interdisciplinary scientific and educational approach and demands for highly talented, strongly dedicated PhD students, which will be recruited worldwide. The admission of the PhD students will be affirmed by the Panel of the GS+FEYR, which will ensure the quality of their educational level. The students can enroll once per year into their *own class*. The class character will quite naturally lead to a highly interdisciplinary character, which is considered a big surplus for both the docents and students. This point is an appreciated (desired) strong deviation from current research training groups (GKs) and will foster more "inter-scientific" discussions. This is further strengthened by the request for the composition of two research proposals (see section 4). Together with the requirement for two publications arising from the PhD Thesis and further key qualifications acquired in project management and economy, this will render our graduates highly competitive. In conclusion, we anticipate that our graduates will be best equipped for their professional academic or industrial career. It is anticipated that this performance oriented training is a necessary and highly beneficial reversal from the gradually observed previous trend of a (student's) jobholder rather than a scientist mentality. With this regard, we strongly anticipate that the GS+FEYR will shine its light onto other areas of the participating institutions and will contribute to similar (appreciated) changes.

Of course, this line of thought will be only operational if all elements of the GS will shine brightly, thus requiring excellent performance at all levels. With regard to the organizational structure this demands for an *active* management rather than a mere administration. This will be fostered by flexible and transparent regulations ensuring a slim bureaucracy. Furthermore, the *strict no-automatism funding policy* of the GS will also warrant the high scientific quality of the research programme. Funding will be only granted to awarded peer-reviewed application drafts (see section 5 for details), which is a model practiced with great success at the ETH Zürich. Considering the availability of 20 new stipends every year, this type of quality based funding allocation provides the intriguing opportunity to easily include new researchers interested in the programme of the GS+FEYR, who were not incorporated in the start-up phase. This is an excellent chance for the advancement of junior professors and newly appointed professors and is anticipated as a particular *advantage* over research training groups (GKs). This will also provide incentives and spark new ideas in the field of the GS+FEYR by researchers from other fields, e.g. physicists and may eventually even include grant applications of PIs from sociology or law. Finally, it is deemed that particularly scientifically and educationally engaged PIs of the GS should be promoted to a reduction of their teaching load by their institutions upon suggestion of the Panel and reconfirmation by the International Advisory Board. Note that this in full agreement with the Hamburg regulations.

The aforementioned changes clearly reflect the structure of highly successful North American graduate schools, with which most PIs of the GS are well acquainted. Nevertheless, apart from the sur-

rounding environment this might perhaps also require a *slight mentality* change of the involved PIs. It deserves a special mention, however, that the newly founded MIN faculty (mathematics, informatics, natural sciences) at the University Hamburg will eventually establish a similar system for the performance-based allocation of resources in that the GS+FEYR could act as test base for this large faculty. From a scientific perspective, the GS+FEYR is considered an excellent "melting pot" (geoscience, biology, chemistry) to integrate the departments into the new faculty.

Finally, the conceptual approach to integrate *retired* highly-reputed yet active and engaged researchers into different quality assurance positions of the graduate school deserves a special mention (see section 4 and 5). This will allow a better quality management, which can be traced to the more relaxed time budget of the retired scientists.

4. Doctoral Training

The challenging subject of the GS+FEYR demands for the most talented students worldwide. It is anticipated that as soon as the initial advertisement measures have gained recognition (cf. section 5), the exciting subject of the graduate school will certainly assist to attract these students. Furthermore, the innovative structure of the graduate school is thought to provide further incentives for potential candidates, i.e. optimal training conditions and a shorter pathway to receive a PhD. It will become clear below that quite a few components are adapted from highly successive graduate programs in the USA, which are well-known to a number of the PIs of the GS+FEYR. The viability to include elements of North American graduate schools in a German PhD training programme has been demonstrated in the graduate school $^{Int}GSC_{20}$-MS^{+} at the Chemistry Department of the University of Münster previously, which also served for a number of additional ideas.

The main objective of the doctoral training is the significantly more pronounced scientific and professional qualification of our graduates compared to the current standards of the PhD programmes at Hamburg and most other places in Germany. This will facilitate the transition of our graduates into either their academic or industrial careers. In this respect, the additional qualification in project management has been identified as an important element. Beyond excellent scientific training, coursework on this subject will be integral part of the GS and will be practiced through the integration into decision-making processes and organisation of the graduate school and through hands-on experience in proposal and publication writing. The necessary background in basic economics and interdisciplinary projects will be gained quite "naturally" due to the requirements of the comprehensive subjects of the graduate school. We are therefore highly confident that our graduates will be an extremely well equipped new scientific generation capable of solving upcoming problems of future energy resources and of initiating new unprecedented directions.

The recruitment process, i.e. the creation of incentives for potential candidates, the appropriate evaluation and eventual admission of excellent students is certainly a key to success of the graduate school and will be discussed under 4a). This is complemented by the description of the innovative structure of the proposed graduate school and qualification steps (item 4b)), and is endorsed by the accompanying quality control and mentoring measures (item 4c)). Further goals and anticipated accomplishments are summarized under item 4d).

4a. Recruitment, Admission and Requirements of the Doctoral Candidates

It is intended to enrol students into our PhD programme with Diploma/MSc degrees or European/ North American BSc *with honours* certificates using a modified training scheme for these different groups. It deserves a special mention that students with a BSc entry will skip the MSc stage and aim directly for a PhD. Along with English as the *exclusive* language at all levels of the graduate school (courses, research seminars, work-shops, forms, examination regulations..) this will make our programme not only attractive for European students but is also a measure to "lure" talented North American students. Currently, the number of American and Canadian PhD students in Germany is exceedingly low, which is notably attributed to the non-compatible education programs and language problems. In addition, we have contacted good colleagues of us at top US colleges, e.g. UC Berkeley and Stanford, who are research leaders in the field of our GS, and were promised their support to promote the GS+FEYR at their institutions. In contrast to the well-established mobility of North American students in their transition from undergraduate colleges to graduate schools, German (European) MSc/Diploma students have not demonstrated this degree of flexibility previously. Along with

the timely and exciting subject of the graduate school, it is anticipated that the aforementioned measures will also provide an incentive for the Europe-wide enrolment of students. In addition, we plan to accompany the promotion of the graduate school in Europe through annual workshops with world-class invited speakers, which will be announced through flyers and posters in universities. Talented students from these institutions, demonstrating a serious interest as potential candidates in our graduate school, can apply for travel stipends for this meeting from the graduate school. In the course of the meeting, these potential candidates will be given a tour through our research facilities and will be interviewed for our graduate school. For Asian applicants of the GS, we will rather pursue an on-site recruiting model in India, which is practiced with great success in the graduate school at the University of Münster. Colleagues from Münster already agreed to assist us at initial stages of this interviewing procedure. It deserves a special mention that not only students from India, but also from China, Russia etc. will be included in the on-site recruiting workshop. Students can apply through a website accessible application form and are preselected based on their educational and scientific records, English tests, etc..

In order to ensure the high standards of the GS, the acceptance of the graduate students has to be affirmed by the Panel of the GS, which will also take the application drafts of the PI into account (cf. section 5). The recruiting process will be also monitored by the International Advisory Board. This is a clear deviation from the currently practiced, more relaxed procedure of the participating institutions, where the student is selected only by the PI, which is later confirmed by the graduate committee. Finally, it should be stated that the Panel also has to ascertain that the intended goal of 50% female graduate students is achieved (cf. section 7).

4b. Structure of the Graduate School and Training

As previously stated, the GS will accept graduate students with both excellent BSc degrees and MSc/Diploma certificates. In accordance with the Bologna process, BSc/MSc programmes of the participating institutions in Hamburg are already active or will be implemented in due course; similar situations can be found at most European universities. It is therefore anticipated that the number of students with a BSc degree will outweigh the group with MSc/Diploma certificates within the next 5-7 years. We have nevertheless constructed training schemes for both groups, which are shown below as flowcharts in Fig. 1.

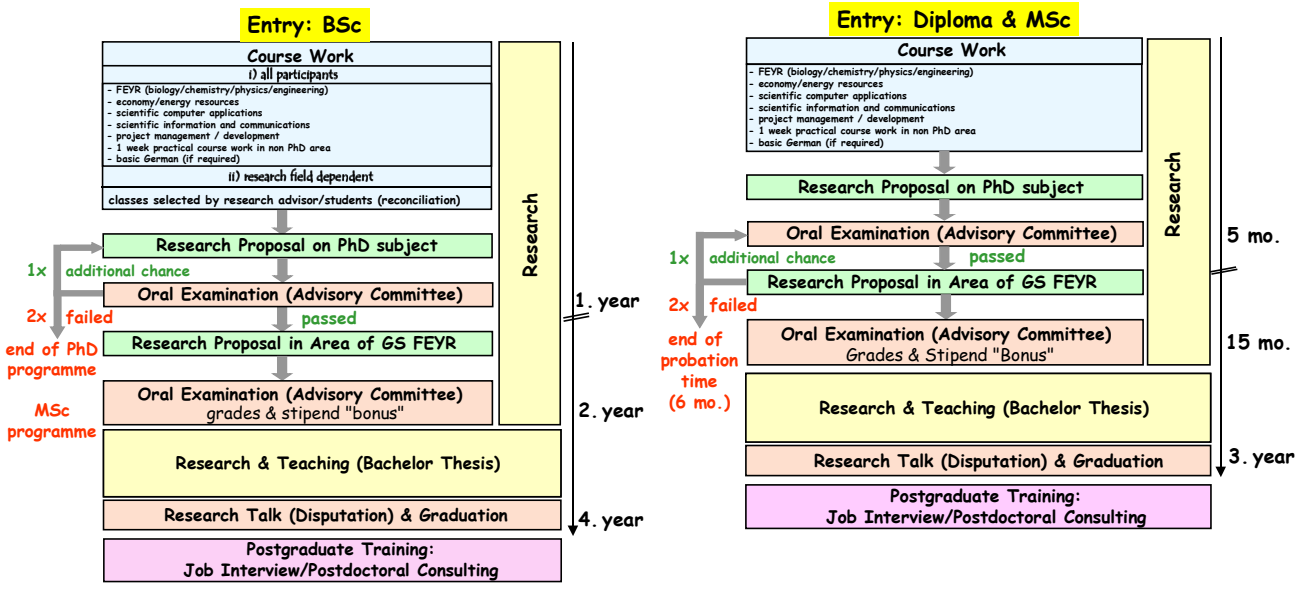

Fig. 1. PhD programme of the GS+FEYR for students with BSc and MSc/Diploma degree entries.

BSc Entry: The PhD pogramme spans 4 years and ends with the PhD graduation. It consists of different educational stages with varying teaching/research ratios. In the first year, the emphasis is placed on mandatory course work, which is divided in a section for all participants (i)) and another part ii) which is research field dependent.

The heart of section i) is the class FEYR, where all currently proposed approaches in the area of future energy are introduced and evaluated. In areas not covered by research of the GS, e.g. nuclear

fusion, leading external lecturers will be included. The class is complemented by an introduction to economy placed in context with energy resources. The strategic class on project management has been previously mentioned and has strong links to the class on scientific information and communications, where practical grounds on proposal and publication writing will be laid. The practical lab rotation course will provide the students some basic hands-on experience in the field of adjacent research areas. The objective is to gain some insight into practical aspects of the research areas of the GS+FEYR, which is deemed to provide valuable input for the future assessment of developments in these fields. In addition, this will help to reduce "*research language"* barriers between the GS participants, i.e. chemists, biologists, engineers etc.. German classes will be provided to foreign graduate students to facilitate the everyday life and the interaction with technicians.* Furthermore an extension of the well-established and successful class "English for Chemists" in the Department of Chemistry to other research areas of the GS might be necessary in order to achieve the desired and required level in English for publications in world-class journals. Finally, it deserves a special mention that all classes will be also opened to further interested students of the participating institutions based on the provision of available seats. This is considered a real surplus for these departments.

Section ii) is readily explained and will make sure that the graduate students are well acquainted with advanced topics of their own research area above the BSc level. The selection of these mandatory courses will be arranged by the graduate student together with the PI and the Advisory Committee (cf. 4c) and will be based on their previous knowledge. The latter can also provide advice for the students' individual choice of classes, e.g. on climate research provided by the Centre for Marine and Atmospheric Sciences, to ensure a reasonable time management. All classes of sections i) and ii) will be completed by final examinations, and their successful fulfilment is a requirement for further progress in the GS.

Parallel to the coursework, the students start their own independent research in the peer-reviewed project of the participating PIs of the GS+FEYR (cf. section 5). At the end of the first year, the student has to submit an *extended* research report, which is augmented by two sections, i.e. i) a state of the art and ii) proposed research chapter. This research report will be the basis for a *challenging* oral examination by the Advisory Committee. This will serve for the *critical* assessment of the required knowledge, skills and accomplishments of the graduate student to maintain high scientific standards. In case of failure this examination can be repeated once; another unsuccessful attempt will lead to the irrevocable end of the enrolment in the *programme* of the GS. Although MSc degrees are not offered by the GS, we will fix the regulations of the participating departments to ensure the continuation of the latter students in their MSc programmes. In this way, the students will be able to finish with a MSc degree in the regular two years timeframe.

In the second year, emphasis is placed on *research* in the GS+FEYR. Nevertheless, students will be encouraged to enrol in classes of other research areas of the GS. This will alleviate the student to compose a research proposal on a subject in the fields of the GS+FEYR. This research proposal also marks the end of the second year in the GS. The objective of the proposal is two-fold: Firstly, the students become acquainted with other fields of the GS and secondly, their skills in scientific writing, creativity and project management are strengthened. The proposal will be reviewed by the Advisory Committee of the student and is the basis for the final oral examination. The latter will include a short presentation and defence of the proposal, which will help to sharpen the student's communications and scientific argumentation skills. Apart from the grade, the main incentive for the student is a flexible stipend bonus, which is depending on the performance of the student. For outstanding proposals students will receive an even greater scientific award, i.e. the chance to put their projects into the "real world". This will include a financial budget for the proposed research, which is *headed* by the PhD student with support (not guidance !) by the PhD supervisor. It is anticipated that this immediate chance will certainly foster the quality of the proposals and provides the incredible opportunity to lead an *own* extended research project at such an early level of the career.

The third and fourth year have a focus on research and provide the additional chance to suggest subjects and supervise individual final BSc projects (Ger. Bachelorarbeit) of the undergraduates. It should be noted that a similar scheme is well established in Dutch chemistry PhD programmes. It is

* It should be emphasized that the latter class is not intended to replace English as the exclusive language of the graduate school, which will be manifest at all levels, i.e. scientific and administrative areas.

anticipated that the PhD students' skills in project management, social responsibility and supervision will be accelerated in this way. The fourth year will end with the submission of the Thesis (in English) and graduation. Depending on the number of publications in peer-reviewed journals, the Thesis can be also submitted in cumulative form. In general, at least two publications as main author in top journals are *expected*. This will not only ensure the visibility of the GS+FEYR but will also ascertain significantly improved career opportunities of our graduates. In combination with the training in proposal writing, this will increase their chances to receive funding for postdoctoral fellowships from competitive programmes. In addition, the publication records of the students of the GS will be monitored and are cornerstones for the future funding allocation projects of the supervising PI (cf. section 5).

Finally, near the end of the graduation, the graduate school will establish further measures to facilitate the transition to the future individual career. This will include for instance advice for business start-ups in the area of the GS+FEYR, training for job interviews and assessment centers etc.. Furthermore, consultation for postgraduate work in academia, i.e. fellowship and scientific career advisory will be provided. For both industrial and academic tracks, the incorporation of the International Advisory Board in combination with the Advisory Committee, and the contact with alumni of the GS is considered highly beneficial. Finally, it should be noted that the proposed structure of the GS+FEYR might require some adjustments to the general regulations of the participating institutions, but is otherwise in accordance with them.

MSc/Diploma Entry: The research training for students with a MSc or Diploma degree is quite similar to the one described above (Fig. 1). In recognition of their previous additional education, they will be exempted from the course work described under ii) (vide supra) providing additional time for their own research. Also with regard to their previous experience in scientific writing, we have hence adjusted the time schedule accordingly. The oral examination of the research proposal is already due after 5 months and has to be repeated within 1 month in the case of failure. In agreement with the BSc entry scheme (see Fig. 1), a second failure will require the students to leave the GS, thus adding up to a total of 6 months. Note that this ½ year period is identical to the standard 6 months probation time of PhD contracts at the participating institutions. Furthermore, the successful students are requested to submit their second proposal after 15 months and eventually their PhD Thesis after 3 years.

4c. Quality Control and Mentoring Measures

Quality Control: The participating PIs have an excellent record in the successful supervision of PhD Theses and have worked with highly motivated and excellent PhD students within the currently installed PhD programmes. Nevertheless, we also had to witness the gradual deterioration of the scholarly education in combination with an apparently attenuated self-motivation of the students to solve scientific questions. This has prompted us to consider a radical change of the PhD programme to reverse this trend and concomitantly raise the educational standards. We have therefore decided to establish a significantly more scientifically oriented programme within the GS+FEYR. This builds on accompanying new incentives for the students to recognize themselves as important and influential members of the graduate school with an impact on decision making processes. This is perhaps best summarized in the simple well-known phrase "work *with* rather than *for* your PhD supervisor", i.e. we are *colleagues* at junior and at senior levels. This spirit is considered a maxim of the GS. Furthermore, the extremely challenging scientific questions addressed in the GS require not only talented students but also a high level of *dedication* of *all* members of the GS. The participating PIs uniformly demonstrate an extraordinary level of (scientific) motivation. Nevertheless, further transparent measures, will be put in place to ensure and highlight the PIs as active role models. The absence of an automatism to provide funding to the PIs, i.e. the need to submit a peer-reviewed grant proposal to receive financial support from the GS is an excellent example of such an action (cf. section 5).

Before further aspects of the quality management will be described, the general problem of constrained time budgets, which applies to *all* members of the GS, needs to be addressed. A further conceptual approach of the graduate school will be only briefly presented at this point since details will be described in section 5. While it is anticipated that the steps described under a) are effective and sufficient for our graduate students, issues are more complex and severe at the professorial level and for members from industry. In the graduate school, it is therefore intended to include retired

highly respected and motivated academic and industrial senior members, who were forced to retire for reasons of age. It is anticipated that the required excellent quality of the management of the GS can be actually achieved due to the significantly more *relaxed time budget* of this group.

Beyond standard type monitoring of the performance of the GS, e.g. the mandatory evaluation of the courses, the graduate school will put a further self-evaluation mechanism of the programme in place. All members of the graduate school, i.e. students, involved staff, professors etc. will participate in this *annual* self-evaluation process of the programme, which will cover general subjects in addition to topics specific to each group, e.g. workload, foreign student affairs or gender related questions. This process will be surveyed by the Graduate Dean, who will summarize the results. The latter will report to the Panel and, in particular, to the International Advisory Board to support their strategic decisions. In addition, this report will be made available to all participants of the survey. The retrospective evaluation of our (forthcoming) alumni (vide 4d)) five years after their graduation is also of utmost importance and will provide highly valuable feedback for future training processes.

Mentoring: Mentoring has been recognized as a very important tool to advance graduate schools. In the GS+FEYR, we intend to establish an Advisory Committee, which serves for the *individual* mentoring board to the student. It will consist of three PIs, the PhD supervisor, another PI working in the students' research area and one further PI working in a different field. Due to the highly interdisciplinary character of the GS+FEYR, it is anticipated that quite a few joint projects will be lead by two PIs working in different areas. In these cases, both PIs will be on the Advisory Committee, which will facilitate the selection process of the external members.

This Advisory Committee will be assigned by the Graduate Dean to each student during the enrolment phase for the whole period in the GS+FEYR. Complaints of the students in case of "interpersonal incompatibilities" will be taken into account. The Advisory Committee will accompany and monitor the progress of the students in the GS with regard to social competence, scientific accomplishments and organizational skills. It will also provide advice for the research project and proposals of the student and will counsel in personal problems etc.. In addition, the Advisory Committee constitutes the members of the examination panel for the oral examinations of both research proposals. The Advisory Committee will also collect and examine the mandatory annual research reports of the graduate student, which will ensure the timely graduation of the students. The Graduate Dean surveys the mentoring process and can be contacted by the student anytime. Further mentoring will be pursued through senior PhD students (vide infra) and through discussions with the International Advisory Board.

4d. Doctoral Culture and Miscellaneous

Albeit highly desirable, doctoral culture is yet underrated at most German research institutions while it has found wide recognition at Anglo-Saxon universities. The term itself has at least two facets, which are equally important for the success of the GS+FEYR. The first facet can be looked upon from an academic viewpoint and has the objective of a scientifically challenging and competitive research environment with a yet teamwork oriented creative atmosphere. While a number of the required elements, e.g. research group meetings, are already in place to ensure this desired state, there is definitely room for improvement at the participating institutions. We intend, for instance, to establish mandatory student organized journal clubs covering the topics of GS+FEYR. This is complementary to the class on scientific information and communication and will improve the scientific knowledge in the area of the GS+FEYR and strengthen the information skills of the students. Lunch seminars or off-hour group meetings with snacks etc. may be another potential measures to demonstrate that we "live science" in the GS+FEYR rather than administer it.

In addition, the obligatory composition of research proposals with consecutive oral examinations will certainly propel the scientific discussions among the students based on experience at other graduate schools. It will also foster teamwork, which leads over to the second anticipated facet of doctoral culture. Teamwork is certainly a key qualification and will be strengthened at all levels of the GS through the senior/junior researcher spirit. This type of interaction will be acquired and cultivated through the cooperative composition and maintenance of a "graduate student handbook". This type of "manual" for a GS has a long tradition in North-American graduate schools. It is a highly beneficial source of information for novices in the GS since it typically provides details on the procedures of the GS (dai-

ly life issues, course work, journal club, research reports). It may for instance also contain valuable information and advice on the oral examination process from a student and examiner perspective.*

The spirit of teamwork is also visible from the membership of a student elected member in the Panel of the GS. In particular, this is reflected in the responsibility of the graduate students to organize at least 50% of the seminar program of the GS+FEYR and schedule the research talks. In addition, the students will take care of workshops of the GS+FEYR on related topics not covered by our research programme. It should be noted that there is worldwide ample excellent experience with this type of workload-sharing between PIs and students. Obviously, this will require own offices for the graduate students with appropriate infrastructure (computers, phone, FAX..), which will be offered at both major research sites of the GS, i.e. the University of Hamburg and the Technical University Hamburg-Harburg. We are absolutely certain that these combined measures will greatly improve the self-confidence of the students and contribute significantly to their scientific independence.

Ideally, all these measures will help to establish a doctoral culture, which yet demands for a further ingredient, namely *academic* corporate identity. The latter point is obviously important for all members of the GS+FEYR and will likely require some time to develop. It is anticipated that the enrolment once per year into the "own" graduate class will certainly contribute. An additional measure will be a seminar day of all novices where their BSc and MSc research projects will be presented.

Overall, these steps will assist to establish an "alumni culture", which may be considered an important facet of doctoral culture. The alumni culture will be cultivated from the very beginning of the graduate school. It is deemed important with regard to networking, i.e. mentoring and advice for career planning of current students and, obviously, as external source for fund-raising. Finally, the integration of the alumni into the evaluation process of the GS+FEYR shall be reiterated at this point.

Miscellaneous: The active participation of our graduate students in the scientific community through publications in peer-reviewed journals has been previously mentioned. In addition, the presentation of their results at international conferences and meetings is highly desired and will foster their motivation. We will provide a significant amount of funding of the GS for travel grants, which will be awarded through competitive grant applications. In addition, we will offer excursions to leading companies active in the area of the GS+FEYR. Due to the excellent industrial contacts of the GS member Prof. Vahrenholt, discussions with top managers can be arranged during these excursions. Finally, our students will be encouraged to present the goals and subjects of the GS+FEYR in schools (cf. section 5).

5. Organisational Structure

The GS+FEYR will undoubtedly demand a high level of dedication of all members, in particular during its initiating and establishment phase (first 5 years). We will therefore make sure that a scenario, best metaphorically described by "preach water and drink wine" is strictly avoided at all levels of the GS. This will certainly require quite a few measures, e.g. self-evaluation, performance monitoring etc., which have to be fixed in transparent and *flexible* regulations. At the same time, we want to ensure a competitive scientific environment, which is not governed or conditioned by bureaucracy. This requires a slim yet highly effective structure, with an *undesirable* dictatorial style, which will be accomplished through incentives for all members of the GS (vide infra). The particular goal is hence an excellent *active* professional scientific management rather than pure (post) administration.

In comparison, the success of top private and state-run graduate schools worldwide, e.g. Caltech or the ETH Zürich is often *exclusively* attributed to their remarkable financial situation. However, their excellent GS management is at least an *equally* important key to their success. This is best seen from the highly rated University of California Berkeley, which is of comparable size and has a state funded financial situation in the range of the University of Hamburg. In contrast, the aforementioned goal was often attempted and rarely achieved in *established* university systems, including the participating universities of the GS+FEYR. The setup of a new management structure of the GS+FEYR is therefore actually regarded as a huge opportunity!

This will be based on the organisational structure, which will be described below with regard to its structure (item a), funding allocation (item b), and the development of the GS (item c).

* An excellent example can be found at http://chem.berkeley.edu/grad_info/gsh.pdf.

5a. Bodies of the GS+FEYR

The overall structure of the graduate school is considered standard and was oriented toward successive graduate schools worldwide. Some components of the proposed organizational structure of the GS+FEYR are nevertheless innovative and will be highlighted along with their description. Different colors are used in Figure 2 to indicate the individual bodies of the GS, which consists of the "Panel" (blue), the "International Advisory Board" (lilac), the "Graduate School Management", GSM, (yellow) and obviously all "Researchers" including further supporting staff (green).

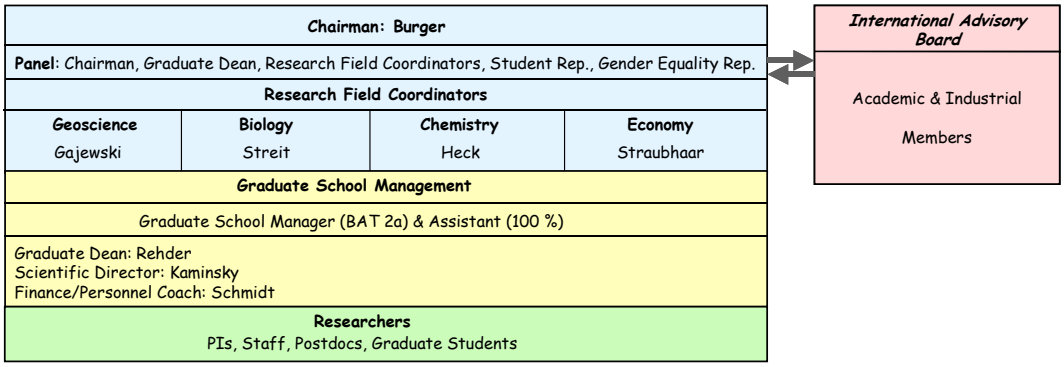

Fig. 2. Organisational Structure of the GS+FEYR.

Before the individual bodies and their interaction will be described, an anticipated innovative concept of the GS+FEYR will be presented. As briefly stated in section 4, we intend to include *retired world-class* senior scientific and industrial members in important positions of the graduate school management. The purpose is self-explanatory, i.e. due to the significantly reduced day-to-day business their increased time budget will allow them to *actively* participate in the GS. This aspect is also of utmost importance for the constitution of the International Advisory Board, which is thought to coordinate the critical peer-review process of the research grants of the GS members (cf. below). We have already contacted potential candidates, which have recently retired or will retire soon and have received very positive feedbacks. Their names will be disclosed in the main proposal; the seriousness of our concept can be demonstrated through the appointment of the Graduate Dean of the GS (Rehder) the Scientific Director (Kaminsky) and the Finance/Personnel Coach (Schmidt). All of them have recently retired or at the virge of retirement and have excellent professional records in the assigned areas. We are also confident that we can substitute them if they decide to retreat to the private life eventually. Obviously, we are glad to establish an excellent professional management and can yet secure funding of the GS in this way.

The day-to-day business will nevertheless demand for a full-time graduate school manager, who will be assisted by a full-time assistant. This team is part of the graduate school management, GSM, which is completed by the aforementioned three senior-level members. Firstly, the GSM will have a *Scientific Director*, who will survey new grant initiatives, e.g. EU, DFG or BMBF projects in the area of the GS+FEYR. The Scientific Director assists the GS manager and PIs with scientific questions related to the research grant programme of the GS. The Scientific Director will also assist the students with the organization of the scientific programme of the annual workshop. Furthermore, the Scientific Director is in charge of the annual scientific report of the graduate school, which will be distributed among all members of the GS. Secondly, the GSM will have a *Graduate Dean*, who was mentioned in section 4 on several occasions in that the specific fields of responsibility shall be only briefly reiterated. The Graduate Dean will survey the quality of the educational part of the GS, i.e. the coursework and in particular its evaluation, which will serve as the basis for a report. In addition, the examinations (classes, proposal defence, PhD Thesis) will be monitored by the Graduate Dean. Thirdly, the GS+FEYR will have a Finance/Personnel Coach. This position will be filled by the ultimate choice, Prof. Schmidt, who is close to retirement as renowned professor of business administration at the University of Hamburg. He is also a long-term member of the scientific staff council at the University of Hamburg and has recently become its chairman. As a great supporter of the term "excellence of administration", he will certainly be of great assistance for the survey of administrational and financial affairs. At the same time he will remind the GS+FEYR to keep the administration slim and yet assure its financial security. Finally, it deserves a special mention that his hands-on experience with the US educational system at the professorial level is certainly a great surplus.

The GSM will be located with offices in the department of chemistry, which will make use of the reduced space requirements of the administration due to the shift of tasks to the recently founded MIN (math, informatics and natural science) faculty of the University of Hamburg. The list of tasks of the graduate school management is manifold and too long to be discussed here in every detail. It will be therefore focused on managerial functions and innovative issues specific to the GS+FEYR. Some important issues are compiled below:

- Regulations: An emphasis is made on flexible and transparent rather than black & white regulations.
- Recruitment, Admission, Enrolment: The GSM will provide administrative support for the Panel and organize the enrolment of the students, e.g. work out the stipend contracts (cf. section 4)
- Education, Examinations: The organization of the course program is a responsibility of the GSM. This includes the evaluation of the classes, which will be summarized by the Graduate Dean and disclosed to all members of the GS+FEYR and, explicitly including the International Advisory Board. Furthermore, the examination certificates, PhD Thesis submission, schedule of the student proposals and corresponding oral examinations are administered, respectively organized by the GSM.
- Post-Graduation Support, Alumni: As detailed in section 4, we will install a program to ease the transition of our graduates into their industrial or scientific careers. In addition the GSM will establish an alumni database and will stay in contact with the alumni, for instance, through a newsletter of the GS+FEYR. This will facilitate to include them in the highly valuated self-evaluation process.
- Business Plan, Accounting, Grants & Stipends: The business plan will be developed by the Panel in collaboration with the GS manager and guidance of the Finance/Personnel Coach. The accounting will be performed by the GS manager using an *independent SAP* license provided by the university to ensure higher flexibility of the GS. The amount of the awarded independent travel and research grants (stipends) will be summarized in an annual financial report. In contrast to previous procedures, the latter will be presented to all members of the GS to ensure full transparency.
- Self-Evaluation: The self-evaluation system of the GS+FEYR will be arranged by the GS manager in accordance with directions of the Panel. It will address general questions applicable to all member of the GS, e.g. the organization of the GS+FEYR or its administrative procedures as well as further aspects specific to the groups of the PIs, students and staff. In addition, gender and foreign affair topics will be included. The self-evaluation of the programme will be carried annually and is deemed to provide in particular highly valuable information at the initiating phase (5 years) of the GS+FEYR. In combination with the incorporation of the alumni at a later stage, it is anticipated an important valuable tool to enhance the quality of the GS. The evaluation report will be presented to the International Advisory Board and in keeping with the transparency principle to all GS members.
- Student and Gender Specific Affairs: We envision the enrolment of a substantial number of foreigners into the GS+FEYR, requiring *active* support of our students by the GS manager and the assistant with visa and accommodation affairs, health insurance, bank account, registrations. This is not only of utmost importance to ease the enrolment process but also to demonstrate the seriousness of our young/senior researcher spirit right at the start. During the enrolment period, senior graduate students of the GS will help with daily affairs and set-up a social program for the novices, which will certainly foster the doctoral culture. Another important task of the GSM is related to gender specific issues, e.g. childcare (cf. section 7). The points raised here will be specifically addressed in the self-evaluation of the programme by the student group and will have an effect on the salary bonus on the GS manager and the assistant within the new 2007 TDöV tariff structure.
- Links and External Visibility: The GSM is the direct link of the GS to the administrations of the participating institutions and will negotiate with them administrative and educational affairs etc.. This will be further supported by the Chairman, who is in contact with the university authorities (faculty deans, president). Furthermore, the GSM will assist the Panel in the setup of a network for the collaboration with institutions working in research field of the graduate school (cf. section 6). Finally, the marketing strategy of the GS+FEYR will be coordinated by the GSM. This will include flyers, posters, the contact to industry as well as the presentation of the GS+FEYR in the journals of the relevant research societies worldwide.
- **Miscellaneous:** Similarly to the "graduate student handbook" providing insights for students, a "graduate management handbook" will be composed and is deemed highly valuable for PIs and staff, in particular for newly hired faculty. It will include the description of educational, scientific and administrative procedures from a manager and scientist perspective.

In the following, the additional bodies of the GS+FEYR are summarized:

Panel: The Panel is constituted by the Chairman, the Graduate Dean, the Student Representative, Gender Equality Representative and the Research Field Coordinators. The latter are heading the research sections of the GS+FEYR, which were divided into the classical domains geoscience, biology, chemistry and economy. This certainly bears the risk to devaluate the immediate visibility of our highly *interdisciplinary research*. We have nevertheless decided to proceed in this way initially to enable the facile recognition of the areas for students and will change their names anytime if required. The Research Field Coordinators monitor and direct the scientific progress of their fields and are the first contact persons for the chairman and the graduate school manager.

The Panel directs the overall scientific program of the GS+FEYR and will be consulted by the International Advisory Board, which also monitors the performance of the GS (vide infra). The Panel also surveys the progress of the educational structure the GS, which will be organized by the Graduate Dean. The structure and contents of the mandatory strategic class "FEYR" (cf. Fig 1), will be also the responsibility of the Panel. For these reasons and for the composition of student relevant questions in the evaluation process, the Panel will include a Student Representative. Finally, the Panel will be completed by a Representative dealing with gender equality questions, with an emphasis on scientific career and admission issues. It should be noted that the recruitment and in particular the admission process will diverge from the currently established process (cf. section 4). Rather than being *directly* accepted by the PI with consecutive affirmation by the department, the candidate will be admitted by the Panel of the graduate school. The decision will take the proposal of the PI and the pre-qualifications of the candidates into account. In the less likely case that the number of qualified candidates is smaller than the number of available stipends, further attempts have to be made to seek for qualified students. If this proves to be unsuccessful, the GS+FEYR will start with a smaller number of students to ensure high quality standards. The admission process is surveyed by the International Advisory Board, which will also handle appeals of the PI together with the Chairman of the GS. An interview with the candidate is mandatory and will be pursued by two PIs; for Hamburg based or videoconferencing interviews this will include the potential PhD supervisor. For the on-site recruitment process in India, which is initially guided by the colleagues of the University of Münster, the Panel will select two experienced colleagues. The Panel is headed by the Chairman of the GS+FEYR, who will be the spokesperson for the DFG and the involved universities of the GS. The Chairman is assisted by the GS management and stays in firm contact with the International Advisory Board.

The *active* participation of the members of the International Advisory Board is a prerequisite for the success and operation of GS+FEYR. The appointment of retired yet highly motivated/active world-class international scientists from industry and academia in the area of GS+FEYR is therefore of utmost importance (vide supra). Their significantly relaxed time budget will allow them to coordinate the peer-review of the grant proposals of the PIs. This is considered a *conditio sine qua non* since we have decided to allocate funding solely upon a grant application of PIs to ensure the quality of the programme. In addition, the International Advisory Board is sought for strategic directions of the GS+FEYR. Furthermore, the career advice to our graduates are certainly also highly valuable.

Finally, our highly motivated Researchers, which constitute the heart of the GS+FEYR, shall not be forgotten. A high level of dedication will be certainly required for the success of the GS+FEYR, in particular to get the GS+FEYR started and constantly improve the quality at all levels. A special type of reimbursement for the PIs will soon become apparent: Due to the emphasis on the scientific education of the GS, which is further pronounced by the junior/senior level spirit, there will be significant larger amount of "*premium time"* for the PIs, i.e., discussion at more sophisticated levels with the junior researcher, who will be better equipped to concept and write publication drafts. The latter will free time for the PI and synergistically strengthen the students' scientific communication skills. Finally, the work-load sharing for the organization of the research programme is also worth mentioning.

5b. Funding Allocation

The enrolment of the GS+FEYR will be *once per year* and will require admission of the student by the Panel independent of their funding source. It is expected that the PIs will include at least one third party funded student in the GS. Further students of the PIs can be funded through research stipends available to the students working on a project granted by the GS. It should be clearly restated here that there is *no automatism* for the funding allocation to the PIs. The PIs have to submit a 5

page (max.) application draft to the GSM, which will organize the peer reviewing process by the International Advisory Board. The latter will rank the proposals and provide funding suggestions to the Panel, which will make the final decisions. Since funding of postdoctoral fellows by the GS would severely cut on the number of available stipends for graduate students, only PhD students will be supported by grants of the GS initially. This will allow the GS to gain the desired momentum (critical mass), i.e. establish a "real" graduate programme. PIs are highly encouraged to include post-doctoral fellows to work in the GS+FEYR, who are sought to bring in external expertise. This will be stimulated through an additional award to the PI, for example a bonus for the consumables, e.g. 1000-2000 €/year, for the GS funded postdoctoral fellow of the PI. The same measure will be also put in place for an additional third party funded student of the PI. Furthermore, instruments can be funded through applications to the GS, but will have a significantly lower priority than either stipends or travel grants. Travel grants for conferences and extended research stays can be obtained at anytime by all Researchers through applications to the GS and will be reviewed and awarded by the Panel. All awarded stipend projects, travel grants and instruments will be listed with their actual amounts in the annual financial report, which will be brought to the attention of all members. We intend to provide *stipends* rather than BAT2a/2 positions to have an increased flexibility, e.g. a per-formance dependent stipend bonus. A potential model for the stipend and consumable amounts is presented in Tables 1 and 2. The latter served for the estimation of the development of the financial demand of the GS+FEYR (cf. section 9). As can be immediately seen from Tables 1 and 2, we consider a staged model for the stipend and consumables.

Table 1: Monthly PhD Stipends in €.

Year	BSc Entry	Diploma/MSc Entry
1	800	1200
2	1200	1300-1500*
3	1300-1500*	1300-1500*
4	1300-1500*	

*depending on stipend bonus

Table 2: Annual Consumables in €.

Year	BSc Entry	Diploma/MSc Entry
1	1000	3000
2	4000	5000
3	5000	4000
4	4000	

The steep increase of the stipend for students entering the GS with a BSc degree can be justified by the significant amount of course work in their first year. Students with a MSc or Diploma certificate on the other hand will perform more research and will receive a higher stipend accordingly. Overall the stipends have been adjusted to be competitive with the net income of students with a BAT2a/2 position. Table 1 also reveals the previously mentioned stipend bonus, which will be provided according to the performance in the GS (cf. section 4).

5c. Development of the GS+FEYR

The GS+FEYR would open its gates in fall 2008, ensuring sufficient time for the initial setup and appointment of the GS manager and the assistant. The latter team will take care of the overall and administrative infrastructure and will be of great assistance for the definition of the GS regulations and the establishment of the recruiting process including advertisement. Based on our stipend model presented in Table 1, we have modelled the financial demand of the GS. Based on this data, we intend to provide 20 stipends every year, which compares very well with the number of stipends and budgetary model of the University of Münster. Based on a 1 : 1 ratio of students with BSc and MSc degrees, the development of students with stipends from the GS will reach 70 students within 4 years. The estimated total number is 110 students if two third party funded PhD students of each participating PI of the GS will be included. This number justifies the efforts to establish the GS and shows that the term "graduate programme" for the GS+FEYR were definitely deserved.

6. Networking

The frontier research fields of the GS will strongly alleviate the integration of the graduate school into both the academic and industrial scientific worlds (item a). The timely subject will facilitate the acceptance of the GS in the public, which will also contribute to its success (item b). Both points are addressed below and will include a section on the perception of the GS from a students' perspective at the stage of i) a potential candidate, ii) as member and iii) eventually as alumni of the GS (item c).

6a. Scientific Integration of the Graduate School: The integration of the GS+FEYR into the academic network world will be pursued at both the educational and research levels. The GS+FEYR intends to corporate with the well-established postgraduate (MSc) programme renewable energy at the University of Oldenburg, which will strengthen this area of research in the North German area. Preliminary negotiations with its chairman Prof. Parisi were promising and stimulating. At a later stage the GSM will get in touch with similar European initiatives, e.g. EUREC. This will be extended to the USA and builds on excellent contacts with colleagues at the UC Berkeley[*] and Stanford working in the area of the GS. This will be also helpful with regard to the international scientific integration of the GS+FEYR, which will be additionally promoted by the annual workshop on future energy resources. The latter will be supposedly co-sponsored by the Hamburg state funded initiative "New Energy Concepts" and will be held in connection with the Hamburg based exposition on hydrogen technology, "H_2-Expo". *Strategic* partnerships with selected institutions worldwide, e.g. the Loker Hydrocarbon Research Institute[**] are considered highly beneficial and will be attempted at a later stage. We intend to establish a German-wide network and have received positive feedbacks from the speaker (Prof. Laschat) of the SFB 706 "Selective catalytic oxidation of C–H Bonds with molecular oxygen" at the University Stuttgart and Prof. Dinjus, who is head of a research group working on biofuels at the FKZ (Karlsruhe). An extension to other Helmholtz research centers, e.g. at the GKSS was already established with Dr. Peinemann and provides a link to fuel cells. Finally, it shall be noted that we intend to find a roof with further groups under the BMBF funded program "Network Fundamental Research on Renewable Energy...", which was promised to be reopened in 2007. Furthermore, industrial contacts of the GS are anticipated to provide a view into industrial research in the area of the GS+FEYR, e.g. BASF or SHELL. We are confident that the excellent connections of the GS+FEYR members Prof. Kaminsky and Prof. Vahrenholt, who is the CEO of the Hamburg based wind power company, Repower, will be highly helpful with this regard.

6b. Public Outreach: The public acceptance of the GS is certainly a highly desirable goal of the GS and is sought through open house days providing expert information on this top priority problem of the 21st century for the public. Furthermore, we will offer a service to schools to visit the GS and also send PhD students to schools to promote and present our challenging research to forthcoming generations of scientists. This will be also a "challenge" for the PhD students and will train them to "strip down" their research vocabulary to a comprehensible level for laymen. The latter skill will be of great assistance for their professional career and promote the public outreach of science in general.

6c. External and Internal students' Perceptive of the GS: Prospective students will learn worldwide about the 21st century frontier research areas and objectives of the GS. This will be achieved through flyers/posters of the GS in their colleges, the aforementioned workshop, the website of the GS, the DAAD etc.. The objective of our advertisement is that apart from the excellent conditions in the departments, the highly scientifically oriented and competitive programme will be perceived. Furthermore, the opportunity to enter the PhD programme already with a BSc degree together with the "English exclusive" nature of the GS at all levels is anticipated a large incentive to bring excellent students from North America into the PhD programme. Together with the measures described in section 4, this will ensure a worldwide student population of the GS. The students admitted to the GS will be embraced by the professional assistance of the GSM providing support with visa affairs, contracts, housing, insurances, registrations. The class enrolment and common classes will allow the facile integration of foreign students into the GS. Furthermore the organization of the seminar programme and workshops will strengthen the interrelation between the students. The available travel grants for conferences and extended research stays will introduce our students to the scientific world surrounding the GS. Nearing graduation, students will be coached with regard to their transition to their professional careers (cf. section 4). It is anticipated that a sizable percentage of students will aim for a position in academia in that special attention will be paid to the counselling of their career planning. This will include advice on fellowships, the postdoctoral host with regard to the intended future own research subject etc.. We are highly confident that our graduates will be highly competitive candidates due to their training in proposal writing, (requested) publications and practice of the English language.

[*] e.g. R.G. Bergman, P. Allivisatos, both UC Berkeley.
[**] University of Southern California, Los Angeles, USA.

7. Gender Equality

The equal opportunity concept of the GS+FEYR builds on the gender programs at the main research sites, i.e. the University of Hamburg and the TU Hamburg-Harburg. Our approach aims at the improvement of the situation of the female scientists of our programme and will ensure a 50 % ratio of women at all levels of the GS. To achieve this goal, the Panel will define milestones, which will be promoted by an extra amount for the consumables available to the involved PIs. The current situation of female scientists in the major fields of the GS+FEYR is summarized in Table 3.

Table 3: *Percentage* of female scientists at different stages of their academic career at the University of Hamburg in 2004. (Total numbers are given in parentheses)

Field	Diploma	Dissertation	Habilitation	Professorships
Biology	56(151)	43(80)	60(5)	19(31)
Chemistry	51(127)	33(52)	0(1)	16(32)
Geoscience	51(55)	42(38)	100(2)	9(33)
Economy	33(371)	31(49)	0(2)	0(26)

Table 3 reveals that the situation is very promising up to the Diploma level in the natural sciences with a notable drop upon the transition to the PhD programme. We are confident that the *shorter* pathway to receive a PhD in the GS+FEYR with a BSc degree entry will provide an incentive for the latter group to join the GS. It will allow them to have *one more year* to establish their independent industrial or academic professional career prior to maternity. Nevertheless, the Panel of the GS will ensure that the gender equality is achieved in the admission process and will pay attention to the number of female economy students in particular. Furthermore, the *seemingly* incompatibility between maternity and professional career will be addressed in the graduate school. The research seminar programme of the GS-FEYR will aim at a high number of world-class female seminar speakers. The latter will be asked to discuss dual career problems, i.e. maternity/career and partnership issues, with the female graduate students in a timely secured slot of their visit. Support for partnership related dual-career problems will be also a field of responsibility of the GSM and will seek special assistance from its senior members. Due to their long grown contacts with members of other university faculties as well as their connections/network within Hamburg, they are considered particularly helpful as contact persons. These combined measures may eventually also convince more female scientists to enter the professorial track and lead to an increased number of female professorial members. At the moment, the percentage of female professors in the participating fields can be at best described as "disillusioning". Following established regulations of the participating institutions we will apply *active* measures to identify and appoint female PIs to achieve gender equality also at this level of the GS. It should be noted that local female professors are anticipated as active role models to encourage our female students to strive for a position in academia.

In addition, the GSM will provide assistance for pregnant female members or those with children. Due to the laborious nature of most fields of the GS+FEYR, this will impose a challenging task for the GSM and will also require full alertness of the PIs. The GSM will assist the students in the search for a day nursery and also make use of the infrastructure of the participating institutions. Currently, a day nursery for the university members is in the planning phase, but yet lacks solid funding sources. The GS+FEYR will therefore attempt to persuade the university authorities to use a substantial amount of the grant overhead of the GS for the establishment of this day nursery. Frequently, however unexpected events cause also a great challenge for students with children, e.g. in the case of sickness of the day mother during final examinations.

The GS will a put a "student for student" *emergency* care plan in place for these circumstances. This will be organized by the GSM in form of a weekly list, where (preferably parental) students with (children) will sign up. The PIs will be requested to encourage their students to participate in this emergency care plan and have to make sure that the male or female student nanny can fulfil the duties in an emergency case. This will certainly require a substantial amount of confidence of the parental student. In addition, adequate locations are necessary. It is deemed that small "infrastructural changes", e.g. the availability of toys, in the lounges of the research groups will be mostly adequate due to the expected short periods of time of the childcare. It should be noted that this type of student for student might be a criterion for the award of the stipend bonus.

8. Statement by the Host University

The University of Hamburg and the participating institutions strongly support the proposed Graduate School “Future Energy Resources, FEYR”, which is based on research groups of the Faculty for Mathematics, Informatics and Natural Sciences at the University of Hamburg, cooperating with groups from the Technical University Hamburg-Harburg, the Hamburg University of Applied Sciences, the Helmut Schmidt University and several non-university institutions, i.e. in the Federal Research Center for Forestry and Forest Products or the Hamburg Institute of International Economics, HWWI and Repower AG.

The planned graduate school will play a key role in the future doctoral education of the involved disciplines. The highly competitive and scientific atmosphere in combination with the performance oriented funding allocation will certainly give an example for other faculties.

The proposed graduate school will advance the integration of various disciplines by offering a joint research focus in a highly relevant field. This will be further alleviated by the funding allocation of the graduate school, which will encourage and accept excellent grant applications from further interested research groups not involved in the set-up phase. This will certainly offer an unique chance to establish a center of excellence in the field of future energy resources in Hamburg.

The proposed graduate school will attract talented doctoral students (to a significant degree non-German) worldwide to pursue their dissertation projects. Their integration in the doctoral studies programme with highest academic standards will be facilitated through the annual enrolment into the graduate school and its North-American compatible structure, e.g. entries with both MSc/Diploma and BSc degrees. With these aims the planned graduate school will contribute to central strategic institutional goals of the University of Hamburg:

- to offer interdisciplinary doctoral study programmes at the highest academic level,
- to attract talented junior researchers worldwide,
- to intensify scientific cooperation with research institutes outside the university.

In view of these expectations the University of Hamburg is prepared to finance the proposed Graduate School “Future Energy Resources, FEYR” after the end of the funding. Furthermore, support for the appointment of an endowed chair in the area of energy economization as successor for Professor Tol, will be provided. Together with the participating institutions a concept for the further development of the school will be developed which will ensure the sustainability of the planned school. The University of Hamburg will contribute to the future development of the school by its innovation budget and a central pool of positions for researchers. Additional support by private science investors (e.g. foundations) will be raised. First contacts in this field showed a general willingness to support a successful graduate school already in the funding phase.

9. Requested Funding:

The annual enrolment of 20 new students with stipends from the GS will lead to a population of 70 PhD students. This explains the increase of the requested funding between 2007 and 2012 (Table 4).

Table 4. Requested funding of the GS+FEYR in T€.

Nov.-Dec. 2007	2008	2009	2010	2011	Jan.-Oct. 2012
50	500	900	1'400	1'500	1'300

This will allow to establish a self-maintained PhD programme, which has financial requests surpassing the annual amount of 1 Mio. €/year after the 5 year start-up phase eventually. We are highly confident that the exciting subject of the GS+FEYR and the gathered recognition and reputation of the GS after this period of time will attract excellent students supplied with their own fellowships. Furthermore, the anticipated scientific accomplishments of the GS+FEYR will certainly lead to an increased number of third party funded PhD students. The latter will be further alleviated through efforts to establish graduate colleges (GK) on specific subjects of the graduate school under the roof of the GS+FEYR. These measures will allow to decrease the number of annual fellowships of the GS if required and yet keep its momentum with a total size of 110 students in the PhD programme.

Appendix I. Host Universities

a) University of Hamburg

Faculties and Disciplines

The University of Hamburg has 6 faculties with a total of 19 disciplines:

- Faculty of Law
- Faculty Economics and Social Sciences
  (economics and business administration, social sciences, economics and politics)
- Faculty of Medicine
- Faculty of Education, Psychology and Human Movement
  (education, psychology, human movement)
- Faculty of Humanities
  (protestant theology, languages, literature and media, philosophy and history, cultural history and contemporary culture, asia-africa studies)
- Faculty of Mathematics, Informatics and Natural Sciences
  (mathematics, computer science, physics, chemistry, biology, earth sciences)

Total number of students (including doctoral students): **38'941** (2005/2006)

Students graduating

Total number of diploma degrees awarded per year: **1'119** (2003)

Total number of students in the relevant subject areas:

Chemistry: **1'479** (2005)
Biology: **1'167** (2005)
Earth Sciences: **824** (2005)

Students graduating in the relevant subject areas:

Chemistry: **36** (2005)
Biology: **102** (2004)
Earth Sciences: **59** (2004)

Doctorates awarded

Total number of doctoral degrees awarded per year: **822** (2003)

Doctorates awarded per year in the *relevant* subject areas:

Chemistry: **52** (2005)
Biology: **65** (2004)
Earth Sciences **25** (2004)

The academic staff consists of 1,509 persons and the technical and administrative staff of 1,586.

b) Technical University Hamburg-Harburg

Faculties and Disciplines

The Technical University Hamburg-Harburg has 6 research departments (FSPs):

- FSP 1: Town, Environment, Technology
- FSP 2: Systems Engineering
- FSP 3: Civil Engineering and Marine Technology
- FSP 4: Information and Communication Technology
- FSP 5: Materials, Design, Manufacturing
- FSP 6: Processing Technology and Energy Systems

Total number of students (including doctoral students) **4561** (2005)

Students graduating

Total number of diploma degrees awarded per year: **448** (2005)

Total number of students in the relevant subject areas:

Systems Engineering: **468** (2005)

Students graduating in the relevant subject areas:

Systems Engineering: **50** (2005)

Doctorates awarded:

Total number of doctoral degrees awarded per year: **82** (2005)

Doctorates awarded per year in the relevant subject areas:

Systems Engineering: **21** (2005)

Appendix II. The 25 Most Important Publications

[1] U. Deppe, H.-H. Richnow, W. Michaelis and G. Antranikian
"Degradation of crude oil by an arctic microbial consortium",
Extremophiles **9**, 461 (2005)

[2] O. Fütterer, A. Angelov, H. Liesegang, G. Gottschalk, C. Schleper, B. Schepers, C. Dock, G. Antranikian and W. Liebl
"Genome sequence of *Picrophilus torridus* and its implications for life around pH 0"
Proc. Natl. Acad. Sci. USA **101**, 9091 (2004)

[3] M. Bräuninger and K. Matthies
"Langfristige Entwicklungen auf den Märkten für Energierohstoffe"
Wirtschaftsdienst, **8**, 528 (2005)

[4] B.U. Peschel, U. E. A. Fittschen, G. Pepponi, C. Jakubonis, C. Streli, P. Wobrauschek, G. Falkenberg and J.A.C. Broekaert
"Direct analysis of Al_2O_3 powders by total reflection X-ray fluorescence spectrometry"
Anal. and Bioanal. Chem. **382**, 1958 (2005)

[5] C. Cremer and P. Burger
"Tuning the Redox Potentials of Dinuclear Tungsten Oxo Complexes $[(Cp^*W(R_2bpy)(\mu\text{-}O))_2]^{2+}$ toward Photochemical Water Splitting"
Chemistry, Eur. J. **9**, 3583 (2003)

[6] S. Nückel and P. Burger
"Transition Metal Complexes with Sterically Demanding Ligands, IV[1] Facile Thermal Intermolecular C-H bond activation in a Square-Planar Diimine, Pyridine Ir(I) Methyl Complex"
Angew. Chem., Int. Ed. **42**, 1632 (2003)

[7] M. Perbandt, E. Guthöhrlein, W. Rypniewski, K. Idakieva, St. Stoeva, W. Voelter, N. Genov and Ch. Betzel
"The Structure of a Functional Unit from the Wall of a Gastropod Hemocyanin Offers a Possible Mechanism for Cooperativity"
Biochemistry **42**, 6341 (2003)

[8] F. J. Brieler, P. Grundmann, M. Fröba, L. Chen, P. J. Klar, W. Heimbrodt, H.-A. Krug von Nidda, T. Kurz, A. Loidl
"Formation of $Zn_{1-x}Mn_xS$ Nanowires within Mesoporous Silica of Different Pore Sizes"
J. Am. Chem. Soc. **126**, 797 (2004)

[9] F. J. Brieler, P. Grundmann, M. Fröba, L. Chen, P. J. Klar, W. Heimbrodt, H.-A. Krug von Nidda, T. Kurz, A. Loidl
"Size dependence of magnetic and optical properties of $Cd_{1-x}Mn_xS$ nanostructures confined in mesoporous silica"
Chem. Mater. **17**, 795 (2005)

[10] D. Gajewski
KRISP Working Party "Large scale variations in lithospheric structure along and across the Kenya Rift",
Nature **354**, 223 (1992)

[11] M. Struhalla, R. Czaja and U. Hahn
"Adressing the Challenge of Changing the Specificity of RNase T1 with Rational and Evolutionary Approaches"
ChemBioChem. **5**, 200 (2004)

[12] F. Zhang, V. Vill and J. Heck
"Cellulose Based Polymers with Long Chain Pendant Ferrocene Derivatives as Organometallic Chromophores"
Organometallics, **23**, 3853 (2004)

[13] J. Witt, M. Kaltschmitt
"Weltweite Nutzung regenerativer Energien"
BWK **57**, 43,(2005)

[14] K. Wiemann, W. Kaminsky, F.H. Gojny and K. Schulte
"Synthesis and Properties of Syndiotactic Polypropylene/Carbon Nanofiber and Nanotube Composites"
Macro. Chem. Phys. **206**, 1472 (2005)

[15] I. Schröder, E. Steckhan and A. Liese
"In situ $NAD(P)^+$ regeneration using 2,2'-azinobis(3-ethylbenzothiazolin-6-sulfonate) as an electron transfer mediator"
J. Electroanal. Chem. **541,** 109 (2003)

[16] T. Willner, P. Scherer, D. Meier and W. Vanselow
"Fermentation of wood flash pyrolysis oil to biogas"
Chem. Ing. Tech. **6**, 838 (2004)

[17] W. Michaelis, R. Seifert, K. Nauhaus, T. Treude, V. Thiel, M. Blumenberg, K. Knittel, A. Gieseke, K. Peterknecht, T. Pape, A. Boetius, R. Amann, B. B. Jørgensen, F. Widdel, J. Peckmann, N. V. Pimenov and M. B. Gulin
"Microbial reefs in the Black Sea fueled by anaerobic oxidation of methane"
Science **297**, 1013 (2002)

[18] K. Zengler, H. H. Richnow, R. Rossello-Mora, W. Michaelis and F. Widdel
"Methane formation from long-chain saturated hydrocarbons in an anaerobic bacterial community"
Nature **401**, 266 (1999)

[19] U. Kirchner, A.H. Westphal, R. Müller and W.J.H. van Berkel
"Phenol hydroxylase from Bacillus thermoglucosidasius A7, a two-protein component monooxygenase with a dual role for FAD^+"
J. Biol. Chem. **278**, 47545 (2003)

[20] M. Brookhart, B.E. Grant, C.P. Lenges, M.H. Prosenc and P.S. White
"High Oxidation State Organometallic Cobalt Complexes: Synthesis and Characterization of Dihydridodisilyl Cobalt(V) Species"
Angew. Chem. **112**, 1742 (2000)

[21] C. Woitha, D. Rehder
"Functional models for the alternative nitrogenase"
Angew. Chem., Int. Ed. **29**,1438 (1990)

[22] S. Voget, C. Leggewie, A. Uesbeck, C. Raasch, K. E. Jaeger and W. R. Streit
"Prospecting for novel biocatalysts in a soil metagenome"
Appl. Environ. Microbiol. **69**, 6235 (2003)

[23] B. Neubacher, S. Scheid, S. Kelm, A. C. Frasch, B. Meyer and J. Thiem
"Synthesis of Neu5Ac oligosaccharides and analogues by transglycosylation and their binding properties as ligands to MAG"
ChemBioChem. **7**, 896 (2006)

[24] F. Vahrenholt
"Die Zeit des billigen Öels ist vorbei - endliche Ressourcen erfordern neuen Energiemix"
Internationale Politik, Nr.1, S.11, (2001)

[25] J. Muller, J.M. Lupton, A.L. Rogach, J. Feldmann, D.V. Talapin and H. Weller
"Monitoring surface charge migration in the spectral dynamics of single CdSe/CdS nanodot/nanorod heterostructures"
Phys. Rev. B **72**, 205339/1 (2005)

Appendix III. Demonstrated Research Performance

Year	Name	Prize/Award
2005	Prof. F. Vahrenholt	Member of the Advisory Council on Sustainable Development of the German Government
2005	Prof. F. Vahrenholt	Member of the Sustainable Panel of the French electricity producer EDF
2001-2005	Prof. T. Straubhaar	President of the ARGE (Arbeitsgemeinschaft deutscher wirtschaftswissenschaftlicher Forschungsinstitute - Working Group of the German Economic Research Institutes)
2005	Prof. J. Heck	Member of the Academy of Science in Hamburg.
2005	Prof. M. Fröba	President of the German Zeolite Association
2004	Prof. P. Scherer	Patent DE 10 2004 037 798: Process to Digest Anaerobically Biomass
2003	Prof. A. Liese	Member of the Advisory Board of the Journal of Molecular Catalysis, B
2003	Prof. A. Liese	Award for Up-and-Coming Teachers in Higher Education in the field of biotechnology (DECHEMA, Germany)
2003	Prof. W. Kaminsky	Hermann Staudinger Prize of the GDCh
2001	Prof. G. Antranikian	Editor of the Journals Extremophiles, Archives of Microbiology and Marine Biotechnology
2001	Prof. W. Thiem	Heyrovsky Medal, Czech Academy of Sciences, Prague, CZ
2000	Prof. U. Hahn	Associate Editor, Biological Chemistry
1999	Prof. W. Kaminsky	Benjamin Franklin Medal (USA)
1997-2002	Prof. D. Gajewski	Associate Editor for Geophysical Prospecting
1997	Prof. W. Kaminsky	Carothers Award of the American Chemical Society
1997	Prof. W. Kaminsky	Walter Ahlström Prize of the Finnish Academies of Technology
1995	Prof. P. Scherer	Patent DE 195 16 378: Process to Digest Anaerobically Organic Residues
1991	Prof. W. Kaminsky	Karl Heinz Beckurts Prize of the Karl Heinz Beckurts Foundation
1991	Prof. H. Weller	Nernst-Haber-Bodenstein Prize of the Deutsche Bunsengesellschaft for Physical Chemistry

No.	Funding Body	Type of Funding	Title	Coordinator	Start	Finish	Amount (annual average in thousand €)
1	DFG	Collaborative Research Centre, SFB 470	Glycostructures in Biological Systems	Thiem, Meyer	1997	2009	745
2	DFG	Research Training Group 611	Design and Characterization of Functional Materials	Rehder	2001	2009	543
3	DFG/SFB	Collaborative Research Centre, SFB 508	Quantenmaterialien Teilprojekt C1: Synthese und Spektroskopie von III-V-Halbleiter Nanoclustern	Weller	2006	2009	414
4	DFG/NSF	Cooperative Activities in Chemistry Between U.S. and German Investigators	Computationally Guided Design of Catalysts for Fluoroolefin Polymerization" (Development of High Throughput Quantum Chemistry Methods)	Burger	2006	2009	65
5	BMBF	Network Project	Verbundprojekt GHOSTDABS: Gas Hydrates: Occurence, Stability, Transformation, Dynamic, and Biology in the Black Sea	Michaelis	2001	2006	225
6	EU	Network Project	Design and Fabrication of Optoelectronic Devices Based on Innovative Second-Order Non-Linear Organic Nanomaterials (ODEON)	Heck	2004	2007	102
7	DFG	Priority Programme, SPP 1135	Dynamics of sedimentary systems (initiators: Bayer, Gajewski, Littke, coordinator: Littke)	Gajewski	2002	2008	1'000

No.	Funding Body	Type of Funding	Title	Coordinator	Start	Finish	Amount (annual average in thousand €)
8	BMBF	Network Program WING	Nanoporöse Hybridmaterialien für die mobile Gasspeicherung (NANOSORB)	Fröba	2006	2009	84
9	BMBF	Network Project	MetaGenoMik network Göttingen, project: "Screening strategies for unlocking the potential of extremophiles"	Antranikian	2006	2009	90
10	DFG/SFB	Collaborative Research Centre, SFB 610	Variation in Protein Conformation: Cellbiological and Pathological Relevance	Hahn	2003	2005	90
11	DFG	Joint Research Project	CERC3: Sustainability by Advanced Chemoenzymatic Technologies	Liese	2003	2007	68
12	EU	Network Project	Manufacture of adhesives from bio-oils	Meier	2003	2006	220
13	BMBF	Network Project	Optimization of the Automated High Throughput Anaerobic Digestion of Fodder Beet Silage	Scherer	2006	2009	120
14	BMBF	Network Project	GenomikPlus	Streit	2006	2009	397
15	DFG KA507/71	Individual Grants Programme	Mathematische Modellierung und experimentelle Untersuchungen zur Pyrolyse von Abfällen in einer Wirbelschicht und an einem Drehrohr im Pilotmaßstab	Kaminsky	2002	2005	60
	Individual grants (total annual average since 2003 for all principal investigators involved)						3'200

Appendix V. Curricula Vitae and Selected Publications

Prof. Dr. Dr. h.c. Garabed Antranikian

born 30.04.1951

www.technical-microbiology.de

1964 - 1970	Studies of Biology at the American University of Beirut Degree: "Bachelor of Science"
1974 - 1976	Studies of Biology at the American University of Beirut Degree: "Master of Science"
1977 - 1980	PhD Thesis under the supervision of Prof. Dr. G. Gottschalk at the Georg-August-University Göttingen, Institute of Microbiology and Genetics
1980	PhD in Microbiology
1980 - 1984	Postdoctoral Fellow at the Georg-August-University Göttingen, Institute of Microbiology and Genetics
1988	Habilitation
1989	Professorship for Microbiology at the Technical University Hamburg-Harburg
since 1990	Head of the Institute of Technical Microbiology at the Technical University Hamburg-Harburg
1993 - 1996	Coordinator of the European Network Project "Biotechnology of Extremophiles" (39 partners)
1997 - 1999	Coordinator of the European Network Project "Extremophiles as Cell Factories" (58 partners including 13 industries)
2000 - 2003	Coordinator of the network project "Biocatalysis" (30 partners) supported by the German Federal Environmental Foundation (DBU)
since 2001	Editor of the journals *Extremophiles*, *Archives of Microbiology* and *Marine Biotechnology*
2002 - 2004	Dean of Process Engineering and Biotechnology at the University of Technology Hamburg-Harburg
since 2002	Coordinator of the DBU initiative "Innovations Centrum Biokatalyse" (ICBio) with 32 projects involving 100 partners
Expertise:	Physiology, metabolism and application of extremophilic microorganisms (thermophilic, psychrophilic, alkali- and acidophilic bacteria and archaea)
since 2000:	Fund raising: 2.8 Mio Euros from competitive, peer-reviewed research projects (DBU, BMBF, EU)
since 1978:	more than 138 publications in international, scientific, refereed journals

Selection of Publications

[1] P. Mueller, K. Egorova, C. E. Vorgias, E. Boutou, H. Trauthwein, S. Verseck and G. Antranikian
"Cloning, overexpression and characterization of a thermoactive nitrilase from the hyperthermophilic archaeon"
Pyrococcus abyssi. Prot Expr Purif **47**, 672 (2006)

[2] G. Antranikian (ed.)
"Angewandte Mikrobiologie"
Springer-Verlag Berlin Heidelberg New York (2005)

[3] G. Antranikian, C. E. Vorgias, and C. Bertoldo
"Extreme Environments as a Resource for Microorganisms and Novel Biocatalysts"
Adv. Biochem. Engin./Biotechnol. **96**, 219 (2005)

[4] U. Deppe, H.-H. Richnow, W. Michaelis and G. Antranikian
"Degradation of crude oil by an arctic microbial consortium"
Extremophiles **9**, 461(2005)

[5] C. Bertoldo, M. Armbrecht, F. Becker, T. Schäfer, G. Antranikian and W. Liebl
"Cloning, sequencing, and characterization of a heat- and alkali-stable type I pullulanase from Anaerobranca gottschalkii."
Appl. Environ. Microbiol. **70**, 3407 (2005)

[6] O. Fütterer, A. Angelov, H. Liesegang, G. Gottschalk, C. Schleper, B. Schepers, C. Dock, G. Antranikian and W. Liebl
"Genome sequence of *Picrophilus torridus* and its implications for life around pH 0"
Proc. Nat. Acad. Sci. USA **101**, 9091 (2004)

[7] A. Linden, O. Mayans, W. Meyer-Klaucke, G. Antranikian and M. Wilmanns
"Differential regulation of a hyperthermophilic a-amylase with a novel (Ca,Zn) two metal center by Zinc"
J. Biol. Chem. **278**, 9875 (2003)

[8] C. Bertoldo, R. Grote and G. Antranikian,
"Biocatalysis under extreme conditions"
Biotechnology **10**, 61 (2001)

[9] M. Kähler and G. Antranikian
"Cloning and characterization of a family B DNA polymerase from the hyperthermophilic crenarchaeon *Pyrobaculum islandicum*"
J. Bacteriol. **182 (3**), 655 (2000)

[10] F. Duffner, C. Bertoldo, T. J. Andersen, K. Wagner and G. Antranikian,
"A new thermoactive pullulanase from *Desulfurococcus mucosus*: Cloning, sequencing, purification, and characterization of the recombinant enzyme after expression in *Bacillus subtilis*"
J. Bacteriol. **182**, 6331 (2000)

PhD Students since 2001

Group	Name	Year	Title
Antranikian	T. Groudieva	2002	Isolation, Identification and Characterization of Psychrophilic Microorganisms and Screening for their Cold-active Hydrolytic Enzymes
Antranikian	C. Gödde	2002	Klonierung und Expression thermostabiler Proteasen aus Bakterien der Ordnung Thermotogales
Antranikian	P. Müller	2003	Klonierung, Expression und Charakterisierung einer thermoaktiven Nitrilase aus Pyrococcus abysii
Antranikian	U. Deppe	2003	Degradation of Crude Oil at low Tmperatures by a Newly Isolated Psychrotolerand Bacterial Consortium
Antranikian	K. Egorova	2003	Screening and Biochemical Characterization of Novel Amidases from Psychro-and Thermophilic Microorganisms
Antranikian	S. Markosyan	2003	Isolierung des neuen thermophilen, Öl abbauenden Stammes Geobacillus thermoleovorans IHI-91. Klonierung, Reinigung und Charakterisierung einer Esterase und Lipase
Antranikian	V. Thiemann	2005	Characterization of the Branching Enzyme and the Cyclodextrin Glycosyltransferase from the Thermoalkaliphilic Bacterium Anaerobranca Gottschalkii
Antranikian	B. Schepers	2005	Cloning and Characterization of a Novel Glucoamylase from the Thermoacidophilic Archaeon Picrophilus Torridus
Antranikian	D. Weber	2005	Oligonucleotide Microarrays for the Detection and Identification of Beer Spoilage Bacteria
Antranikian	Borchert, Martin	2005	Identification, Cloning and Recombinant Expression of Novel Enzymes with Industrial Relevance from a Marine Sponge Associated Bacillus Species
Antranikian	C. Dock	2005	Hitze- und säurestabile Glucoamylasen aus Archaeen
Antranikian	F. Qoura	2006	Isolation and Characterization of new Psychrophilic Bacteria; Cloning and Characterization of Industrial Relevant Pullulanase and Serine Protease
Antranikian	O. Wirth	2006	Screening for Biofilm Degrading Enzymes from Extremophiles
Antranikian	M. Royter	2006	Cloning and Characterization of Thermostable Lipases from Thermophilic Anaerobic Bacteria

Prof. Dr. Dr. Christian Betzel

born 24.12.1956

www.chemie.uni-hamburg.de/bc/betzel/index.html

1975 - 1982	Studies of Physics, University of Göttingen, Germany
1982	Diploma in Physics (Topic: Untersuchung über die Struktur des linearen Polyjodids als Einschlussverbindung im b-Cyclodextrin und Neutronenstrukturverfeinerung des β-Cyclodextrin Dodecahydrates) with Professor Dr. W. Saenger
1986	Dr. rer. nat. ("summa cum laude") at the University of Berlin (" High resolution structure analysis and refinement of the enzyme Proteinase K using Synchrotron Radiation) Thesis advisor: Prof. Dr. W. Saenger
1986 - 1995	Scientific Staff Member and Group Leader at the EMBL-Outstation Hamburg
1995	Habilitation in Chemistry, Free University of Berlin
1995 - 2005	Assistant Professor (C2), Universität Hamburg
2000	Professor (Apl.), Universität Hamburg
2002	Dr. of Science, Akademy of Sciences, Bulgaria, Department of Chemistry, Sofia, Bulgaria
since 2004	C3 Professor for "Biochemistry and Molecular Biology", University of Hamburg
since 1982	approx. 160 publications in international, scientific, refereed journals
	approx. 80 invited talks at international conferences, universities, research institutions and industry laboratories fund raising since 2003: approx. 1'100'000 Euro from competitive, peer-reviewed research projects (BMBF, DFG, DAAD, Industry).

Selection of Publications:

[1] L. Redecke, M. Bergen, J. Clos, P. Konarev, D. Svergun, U. E.A. Fittschen, J.A.C. Breckaert, O. Bruns, D. Georgieva, E. Mandelkow, N. Genov and Ch. Betzel
"Structurally Distinct β-Sheeted Oligomers are formed on the Pathway of Oxidative Prion Protein Aggregation *in vitro*"
Journal of Structural Biology (2006) in press

[2] W. Rypniewski, M. Vallazza, M. Perbandt, S. Klussmann, L.J. DeLucas, Ch. Betzel and V.A. Erdmann
"The first crystal structure of RNA Racemate"
Acta Cryst **D62**, 659 (2006)

[3] L. Redecke, W. Meyer-Klaucke, M. Koker, J. Clos, D. Georgieva, N. Genov, H. Echner, H. Kalbacher, M. Perbandt, R. Bredehorst, W. Voelter and Ch. Betzel
"Comparative analysis of the human and chicken PrP copper binding region at pH 6.5"
J. Biol. Chem. **280**, 13987 (2005)

[4] M. Perbandt, J. Höppner, Ch. Betzel, R.D. Walter and E. Liebau
"Structure of the major cytosolic glutathione S-transferase from the parasitic nematode *Onchocerca volvulus*"
J. Biol. Chem. **280**, 12630 (2005)

[5] D. Georgieva, D. Schwark, P. Nikolov, K. Idakieva, K. Parvanova, K. Dierks, N. Genov and Ch. Betzel
"Conformational States of the *Rapana thomasiana* Hemocyanin and its Substructures Studied by Dynamic Light Scattering and Time Resolved Fluorescence Spectroscopy"
Biopyhs. J. **88**, 1276 (2005)

[6] D. Georgieva, W. Rypniewski, H. Echner, M. Perbandt, M. Koker, C. Clos, L. Redecke, R. Bredehorst, W. Voelter, N. Genov and Ch. Betzel
"Synthetic human prion protein octapeptide repeat binds to the proteinase K active site"
Biophy. Biochem. Research Comm. **325**, 1406 (2004)

[7] D. Georgieva, N. Genov, K. Hristrov, K. Dierks and Ch. Betzel
"Interactions of the Neurotoxin Vipoxin in Solution Studied by Dynamic Light Scattering"
Biophys. J. **86**, 46 (2004)

[8] D. Georgieva, M. Koker, L. Redecke, M. Perbandt, J. Clos, R. Bredehorst, N. Genov and Ch. Betzel
"Oligomerization of the proteolytic products is an intrinsic property of prion proteins. Optimization of the prion proteolysis"
Biophy. Biochem. Research Comm. **323**, 1278 (2004)

[9] M. Perbandt, E. Guthöhrlein, W. Rypniewski, K. Idakieva, St. Stoeva, W. Voelter, N. Genov and Ch. Betzel
"The Structure of a Functional Unit from the Wall of a Gastropod Hemocyanin Offers a Possible Mechanism for Cooperativity"
Biochemistry **42**, 6341 (2003)

[10] Ch. Betzel, N. Genov, K.R. Rajashankar and T.P. Singh
"Modulation of phospholipase A_2 Activity generated by molecular evolution: a model for structure based drug design"
Cellular and Molecular Life Sciences **56**, 384 (1999)

PhD Students since 2001

Group	Name	Year	Title
Betzel	M. Vallazza	2001	Wege zum Thermus flavus 5S rRNA KristallMoleküldesign, RNA-Komplexierung und strukturelle Fragmente
Betzel	P. Kumar	2001	Three-Dimensional Structure Determination of Lactoferrin
Betzel	R. Krauspenhaar	2002	Struktur-Funktions-Analyse des Proteinkomplexes Mistellektin I aus Viscum album
Betzel	J. A. Khan	2002	Structural Studies on Lactoferrin
Betzel	L. Redecke	2005	Stabilisierungsmechanismen extremophiler Proteine am Beispiel bakterieller Dihydrofolatreduktasen
Betzel	V. Kumar Goel	2005	Design of Peptides α, β -Dehydro- Residues and Development of Specific Inhibitors of Phospholipase A_2 and Cyclooxygenases

PD Dr. Michael Bräuninger

born 19.06.1963

www.hwwi.org/Michael_Braeuninger.83.0.html

1982 - 1987	Studies of Economics at the Universities of Münster, Edinburgh, and Hamburg
1988	Diploma in Economics at the University of Hamburg
1988 - 1992	Research Assistant, Institute for Statistics and Econometrics, University of Hamburg
1992	Doctoral Dissertation at the University of Hamburg
1993 - 1999	Assistant Professor Helmut Schmidt University, Hamburg
1999	Habilitation at the Helmut Schmidt University, Hamburg, entitled: "Rentenversicherung und Kapitalbildung"
1999 - 2004	Associate Professor, Helmut Schmidt University, Hamburg
2004 - 2005	Associate Professor of Economics (temporary position) Institute for International Economics, University of Hamburg
2005 - 2006	Responsible for Research in Public Finance at the Hamburg Institute for International Economics (HWWA)
since 2006	Head of Research Program: Economic Trends at Hamburg Institute for International Economics (HWWI)

since 1992

- 16 publications in international, scientific, refereed journals
- 4 books
- 7 articles in books, 5 policy reports
- about 50 presentations at international conferences or universities

Selection of Publications:

[1] M. Bräuninger and K. Matthies
"Langfristige Entwicklungen auf den Märkten für Energierohstoffe"
Wirtschaftsdienst, **8**, 528 (2005)

[2] M. Bräuninger, K. Matthies and Günther Weinert
"Strategie 2030 - Energierohstoffe"
Report Hamburg (2005)

[3] M. Bräuninger
"The Budget Deficit, Public Debt and Endogenous Growth"
Journal of Public Economic Theory **7**, 827 (2005)

[4] M. Bräuninger
"Social Security, Unemployment and Growth"
International Tax and Public Finance 12 4, 423 (2005)

[5] M. Bräuninger and Markus Pannenberg
"Unemployment and Productivity Growth: An Empirical Analysis within the Augmented Solow Model"
Economic Modelling **19**, 105 (2002)

[6] M. Bräuninger
"Wage Bargaining, Unemployment and Growth"
Journal of Institutional and Theoretical Economics 156 4, 646 (2000)

[7] M. Bräuninger
"Unemployment Insurance, Wage Differentials and Unemployment"
FinanzArchiv **57** 4, 485 (2000)

[8] M. Bräuninger
"Generalised Social Security Finance in a Two Country World"
Scottish Journal of Political Economy **46**, 287 (1999)

[9] M. Bräuninger and Jean-Pierre Vidal
"Private versus Public Financing of Education and Endogenous Growth"
Journal of Population Economics **13**, 387 (2000)

[10] M. Bräuninger
"Dynamics of Optimal Social Security Finance"
Public Finance **4**, 507 (1996)

Prof. Dr. José A.C. Broekaert

born 07.09.1948

www.chemie.uni-hamburg.de/ac/Aks/Broekaert

1966 - 1970	Studies of Chemistry at the University of Gent, Belgium
1970	Diploma in Chemistry (Topic: A contribution to the Co(II) complexes of bis(2-aminoethylsulfide) with Professor Z. Eeckhaut
1974 - 1975	military service (September 1, 1974 - August 31, 1975)
1976	Dr. rer. nat. at the University of Gent (Topic: A contribution to the sudy of the hollow cathode as radiation source for atomic emission spectrometry) with Professors F.M. Bosch and Z. Eeckhaut
1977	Alexander-von-Humboldt fellow, ISAS-Institute for Analytical Sciences, Dortmund, Germany (Prof. Dr. K. Laqua)
1978 - 1991	Senior Scientist at ISAS-Institute for Analytical Sciences, Dortmund
1983	3-months research stay at "Council for Scientific and Industrial Research - National Physical research Laboratory" and "University of Stellenbosch, Republic of South-Africa)
since 1983	Lecturing of graduate course at University of Antwerp, Belgium
1985	Habilitation at the University of Antwerp, Belgium, entitled: "Atomic spectrometry with high-frequency and microwave induced plasma sources"
1988 - 2005	7 biannual 2-month research stays at Indiana University, Bloomington (Prof. Dr. Gary Hieftje, atomic spectrometry)
1990	Offer of a C3 Professorship for Analytical Chemistry at Technical University of Munich, declined
1991 - 1998	C3 Professor for Inorganic/Analytical Chemistry at University of Dortmund
1998	Visiting Fulbright Research Scholar at Indiana University (Prof. Dr. Gary Hieftje), 3 months
1998 - 2002	C4 Professor for Analytical Chemistry at the University of Leipzig
since 2002	C4 Professor for Analytical Chemistry at the University of Hamburg
since 2003	Member of the Graduate School GK611 "Design and Characterization of new functional Materials"
since 2004	Adjunct professor of Chemistry at Indiana University (Bloomington, IN, USA)

- ca. 190 publications in international, scientific, refereed journals
- ca. 100 (invited) talks at international conferences, universities, research institutions, and industry laboratories
- ca. 200 oral/poster presentations at international conferences
- fund raising:
- ca. 2'000'000 Euro from competitive, peer-reviewed research projects (5 DFG grants in "Normalverfahren", DFG grant in SPP keramische Hochleistungswerkstoffe" (1988-1994) including ICP-MS apparatus
- coordinator 1 Human Capital and Mobility Network (EU) (1993-1996), 1 NATO Collaborative Research Grant (1990-1995), Grant in research programme "Solarforschung" (NRW, 1991-2000), 2 Collaborative research grants of Volkswagen-Foundation, 3 Research grants of BMBF

Selection of Publications:

[1] W.C. Wetzel, F.J. Andrade, J.A.C. Broekaert and G.M. Hieftje
"Development of a direct He atmospheric-pressure glow discharge as an ionization source for elemental mass spectrometry via hydride generation"
J. Anal. Atom. Spectrom. **21**, 750 (2006)

[2] B.U. Peschel, U.E.A. Fittschen, G. Pepponi, C. Jakubonis, C. Streli, P. Wobrauschek, G. Falkenberg and J.A.C. Broekaert
"Direct analysis of Al_2O_3 powders by total reflection X-ray fluorescence spectrometry"
Anal. and Bioanal. Chem. **382**, 1958 (2005)

[3] J.A.C. Broekaert
"Analytical atomic spectrometry with flames and plasmas" Second, completely revised and extended edition, Wiley-VCH, Weinheim (2005)

[4] B. Özmen, F.-M. Matysik, N.H. Bings and J.A.C. Broekaert
"Optimization and evaluation of different chemical and electrochemical hydride generation systems for the determination of arsenic by microwave plasma torch atomic emission spectrometry"
Spectrochim. Acta, Part B **59**, 941 (2004)

[5] R.K. Marcus and J.A.C. Broekaert
"Glow discharge plasmas in analytical spectroscopy"
Wiley, Sussex (2002)

[6] U. Engel, A.M. Bilgic, O. Haase, E. Voges and J.A.C. Broekaert
"A new microwave induced plasma based on microstrip technology and its use for the atomic emission spectrometric determinattion of mercury with the aid of the cold-vapour technique"
Anal. Chem. **72**, 193 (2000)

[7] C.M. Andrle, N. Jakubowski and J.A.C. Broekaert
"Speciation of Chromium using reversed phase-high performance liquid chromatography coupled to different spüectroscopic detection methods"
Spectrochim. Acta, Part B **52**, 189 (1997)

[8] A. Aziz, J.A.C. Broekaert, K. Laqua and F. Leis
"A study of direct analysis of solid samples using spark ablation combined with excitation in an inductively coupled plasma"
Spectrochim. Acta, Part B **39**, 1091 (1984)

[9] J.A.C. Broekaert, F. Leis and K. Laqua
"The application of an inductively coupled plasma for the emission spectroscopic determination of rare earths in mineralogical samples"
Spectrochim. Acta, Part B **34**, 73 (1979)

[10] F.M. Bosch and J.A.C. Broekaert
" An alternative method for the calculation of the detection limit in spectrographic analysis"
Anal. Chem. **47**, 188 (1975)

PhD Students since 2001

Group	Name	Year	Title
Broekaert	B. Özmen	2003	The use of Atomic Emission Spectrometry with a Microwave Plasma Torch Combined to Different Types of Hydride Generation Techniques for the Determination of Arsenic
Broekaert	I. Hastiawan	2003	Determination of Rare Earth Elements (REE) in Minerals by ICP-Atomic Emission Spectrometry using CCD-Detection Subsequent to Microwave-assisted Sample Dissolution
Broekaert	A. Saiz Zens	2005	Rasterkraftmikroskopie an Stahlgefüge
Broekaert	B. Peschel	sub-mitted	Atomspektrometrische Direktanalyse von Aluminiumoxidpulvern mittels Totalreflexions-Röntgenfluoreszenzspektrometrie sowie Massenspektrometrie mit induktiv gekoppeltem Plasma und elektrothermischer Verdampfung
Broekaert	Y. Zimmermann	ongoing	Bestimmung und Abtrennung organischer Spurenbestandteile aus Gewässern am Beispiel von TNT-Rückständen und den Metaboliten
Broekaert	B. Crone	ongoing	Einsatz der Laseremissionsspektrometrie zur Untersuchung metallischer und oxidischer Materialien
Broekaert	I. Jimenez-Zapata	ongoing	Studies on a Microwave-induced Microplasma for Chemical Analysis
Broekaert	M. Bauer	ongoing	Untersuchungen zur Analyse neuer anorganischer Materialien mittels Plasmaspektrometrie und Gasmassenspektrometrie
Broekaert	A. Kiera	ongoing	Untersuchungen zum Einsatz der ICP-Flugzeit-massenspektrometrie

Prof. Dr. Peter Burger (Coordinator/Chairman)

born 23.03.1962

www.chemie.uni-hamburg.de/ac/Aks/Burger

1982 - 1987	Studies of Chemistry at the University of Konstanz, Germany
1987	Diploma in Chemistry (Topic: Configurationally Stable ansa-Titanocene Complexes) with Prof. H.-H. Brintzinger
1991	Research stay at Oxford University, UK with Prof. M.L.H. Green. Project: "Metal Vapor Synthesis"
1991	Dr. rer. nat. ("summa cum laude") at the University of Konstanz (Topic: Experimental and Computational Studies of ansa-Metallocenes) with Prof. H.-H. Brintzinger
1991 - 1993	DFG postdoctoral fellow at the University of California, Berkeley, USA (Prof. R.G. Bergman)
1993	"Oberassistent" at the Institute of Inorganic Chemistry, University of Zürich, Switzerland (Prof. H. Berke)
1995	Research stay at the Ecole Normale Supérieure, Paris, France (Prof. C. Amatore, electrochemistry)
1996	Research stay at the Brookhaven National Lab, USA, (Dr. T. Koetzle, neutron diffraction)
1999	Research stay at the University of Konstanz (Prof. U. Steiner, time resolved spectroscopy)
2000	Research stay at the Tel Aviv University, Israel (Prof. S. Rozen, elemental fluorine chemistry)
2002	Submission of the Habilitation Thesis at the University of Zürch, entitled "Neue Ansätze zur übergangsmetallkatalysierten Funktionalisierung von Alkanen und Energiespeicherung"
2002	Offer of a C3 professorship in Inorganic Chemistry at the University of Hamburg
since 2002	C3 professor at the University of Hamburg: Experimental and computational inorganic chemistry
2003	Venia Legendi for Inorganic Chemistry by the Mathematisch-Naturwissenschaftliche Fakultät of the University of Zürich
2004	Member of the state funded program "E-learning: Molecular Orbital Theory"
since 2004	Member of the DFG-priority program 1178 "Experimental Electron Density"
since 1988	- ca. 35 publications in international, scientific, refereed journals, - ca. 50 (invited) talks at international conferences, universities etc. - co-organizer Fechem Conference on Inorganic Chemistry 2003, Zürich - ca. 50 poster presentations at international conferences, - fund raising: ca. 500.000 Euro from competitive, peer-reviewed research projects (3 Swiss National Science Foundation grants and; DFG grants: DFG Normalverfahren "Oxidation" and SPP 1178 (vide supra)) and ca. 50.000 Euro for investments in equipment. A further grant within the framework "Cooperative activities in chemistry between U.S. and German Investigators, DFG/NSF" has been recently awarded.

Selection of Publications:

[1] C. Cremer and P. Burger
"Tuning the Redox Potentials of Dinuclear Tungsten Oxo Complexes $[(Cp^*W(R_2bpy)(\mu\text{-}O))_2]^{2+}$ toward Photochemical Water Splitting"
Chem. Eur. J. **9**, 3583 (2003)

[2] C. Cremer and P. Burger
"Experimental and Theoretical Study of a Solvent and Ligand Stabilized Singlet Ground State Leading to a Thermally Induced Singlet-Triplet Spin State Interconversion"
J. Am. Chem. Soc. **125**, 7664 (2003)

[3] S. Nückel and P. Burger
"Transition Metal Complexes with Sterically Demanding Ligands, IV[1] Facile Thermal Intermolecular C-H bond activation in a Square-Planar Diimine, Pyridine Ir(I) Methyl Complex"
Angew. Chem.,Int. Ed. **42**, 1632 (2003)

[4] P. Burger
"$[Me_2C(\eta^5\text{-}C_5H_4)_2Ru_2(CO)_4$ - An Organometallic Thermo-Optical Switch"
Angew. Chem. Int. Ed. **40**, 1917 (2001)

[5] S. Nückel and P. Burger
"Transition Metal Complexes with Sterically Demanding Ligands III[1] Synthetic Access to Square-Planar Terdentate Diimine, Pyridine Rh(I) and Ir(I) Methyl Complexes - Successful Detour via Reactive Triflate and Methoxide Complexes"
Organometallics **20**, 4345 (2001)

[6] S. Nückel and P. Burger
"Transition Metal Complexes with Sterically Demanding Ligands 2. Meisenheimer Complex Formation and Deprotonation Reactions of a Sterically Demanding Aromatic Diimine"
Organometallics **19**, 3305 (2000)

[7] T. Fox and P. Burger
"Photochemically Induced Si-C Carbon Bond Cleavage in a Dimethylsilyl Bridged Dicyclopentadienyl Diruthenium Complex"
Eur. J. Inorg. Chem. **795** (2001)

[8] C. Cremer and P. Burger
"Synthesis and X-ray Crystal Structure of the 16 e^- Cationic Tungsten(IV) Complex, $Cp^*W(4,4'\text{-}Me_2\text{-bipy})Cl_2^+BPh_4^-$"
J. Chem. Soc. Dalton Trans. 1967 (1999)

[9] D. G. Gusev, R. Hübener, P. Burger, O. Orama and H. Berke
"Synthesis, Structural Diversity, Dynamics and Acidity of the M(II) and M(IV) Complexes $[MH_3(PR_3)_4]^+$ (M = Fe,Ru,Os; R = Me, Et)"
J. Am. Chem. Soc. **119**, 3716 (1997)

[10] P. Burger and R. G. Bergman
"Facile Intermolecular Activation of C-H Bonds in Methane and Other Hydrocarbons and Si-H Bonds in Silanes with the Ir(III) Complex $Cp^*(PMe_3)Ir(CH_3)(OTf)$"
J. Am. Chem. Soc. **115**, 10462 (1993)

PhD Students since 2001

Group	Name	Year	Title
Burger	S. Nückel	2002	Synthese und Eigenschaften von Rhodium- und Iridium-komplexen mit sterisch anspruchsvollen terdentaten N-Donorliganden
Burger	N. Šušnjar	2006	Towards Rhodium and Iridium Oxo Complexes
Burger	J. Schöffel	ongoing	Towards the Aerobic Hydrocarbon Oxidation with Rhodium and Iridium Oxo Catalysts

Prof. Dr. Michael Fröba

born 17.10.1962

www.chemie.uni-giessen.de/home/froeba/

1982 - 1989	Studies of Chemistry at the Universities of Würzburg and Hamburg, Germany
1989	Diploma in Chemistry (Topic: Investigations of the mosaic structure of graphit and several graphite intercalation compounds) with Professor Dr. W. Metz
1993	Dr. rer. nat. ("summa cum laude") at the University of Hamburg (Topic: Theoretical and experimental investigations of the structure of graphite intercalation compounds using X-ray diffraction and X-ray absorption spectroscopy) with Professor Dr. W. Metz
1994 - 1996	Feodor Lynen postdoctoral fellowship (Alexander von Humboldt) at the Lawrence Livermore National Laboratory (LLNL), Livermore, CA, USA (Dr. Joe Wong)
1996 - 2000	Habilitation for Inorganic Chemistry at the Institute of Inorganic and Applied Chemistry, University of Hamburg (Topic: Mesostructured Materials: Synthesis and Characterization)
2000 - 2001	Associate Professor of Inorganic Chemistry (C3) at the University of Erlangen-Nuremberg
since 2001	Full Professor of Inorganic Chemistry (C4) at the Justus Liebig University Giessen
06/2006	Offer of a W3 professorship in Inorganic Chemistry at the University of Hamburg

2002 - 2005	President of the Giessener GDCh section
since 2004	Member of the Executive Board of the GDCh section "Radio analysis and analysis with high energy radiation sources"
since 2005	President of the German Zeolite Association

Fellowships

1989 - 1991	Fellowship of the Freie and Hansestadt Hamburg
1994 - 1996	Feodor-Lynen Research Fellowship of the Alexander von Humboldt Foundation (AvH)
1998 - 2000	Habilitation Fellowship of the Deutsche Forschungsgemeinschaft (DFG)

since 1993
- ca. 110 publications in international, scientific, refereed journals,
- ca. 75 (invited) talks at international conferences, universities, research institutions, and industry laboratories,
- ca. 200 poster presentations at international conferences,

since 2000
- fund raising: ca. 1.825.000 Euro in total from competitive, peer-reviewed research projects: 10 DFG grants (ca. 800.000 Euro), 4 BMBF grants (ca. 1.000.000 Euro) and various FCI grants (ca. 25.000 Euro).

Selection of Publications:

[1] V. Rebbin, R. Schmidt and M. Fröba
"Spherical phenylene-bridged periodic mesoporous organosilicas (sph-PMOs): A new material for high performance liquid chromatography (HPLC)"
Angew. Chem. Int. Ed. **45**, 5210 (2006)

[2] F. Hoffmann, M. Cornelius, J. Morell and M. Fröba
"Mesoporous organic-inorganic hybrid materials on silica basis"
Angew. Chem. Int. Ed. **45**, 3216 (2006)

[3] J. Morell, M. Güngerich, G. Wolter, J. Jiao, M. Hunger, P.J. Klar, and M. Fröba
"Synthesis and characterisation of highly ordered bifunctional aromatic periodic mesoporous organosilicas with different pore sizes"
J. Mater. Chem. **16**, 2809 (2006)

[4] H. Huwe and M. Fröba
"Temperature-resolved *in-situ* X-ray absorption spectroscopic study on the reduction of nanostructured Fe_2O_3 within the pore system of mesoporous carbon CMK-1"
J. Synchrotron Rad. **13**, 275 (2006)

[5] F. Hoffmann, M. Cornelius, J. Morell, and M. Fröba
"Periodic Mesoporous Organosilicas (PMOs): Past, Present, and Future"
J. Nanosci. Nanotechn. **6**, 265 (2006)

[6] M. Cornelius, F. Hoffmann, and M. Fröba
Periodic Mesoporous Organosilicas with a Bifunctional Conjugated Organic Unit and Crystal-like Pore Walls"
Chem. Mater. **17**, 6674 (2005)

[7] F.J. Brieler, P. Grundmann, M. Fröba, L. Chen, P.J. Klar, W. Heimbrodt, H.-A. Krug von Nidda, T. Kurz, A. Loidl
"Comparison of the magnetic and optical properties of wide-gap (II,Mn)VI nano-structures confined in mesoporous silica"
Eur. J. Inorg. Chem. **18**, 3597 (2005)

[8] A. V. Kouzema, M. Fröba, L. Chen, P.J. Klar, and W. Heimbrodt,
"$Cd_{1-x}Mn_xS$ diluted magnetic semiconductors as nanostructured guest species in mesoporous thin film silica host media"
Adv. Func. Mater. **15**, 168 (2005)

[9] F. J. Brieler, P. Grundmann, M. Fröba, L. Chen, P.J. Klar, W. Heimbrodt, H.-A. Krug von Nidda, T. Kurz, A. Loidl
"Size dependence of magnetic and optical properties of $Cd_{1-x}Mn_xS$ nanostructures confined in mesoporous silica"
Chem. Mater. **17**, 795 (2005)

[10] F. J. Brieler, P. Grundmann, M. Fröba, L. Chen, P.J. Klar, W. Heimbrodt, H.-A. Krug von Nidda, T. Kurz, A. Loidl
Formation of $Zn_{1-x}Mn_xS$ Nanowires within Mesoporous Silica of Different Pore Sizes"
J. Am. Chem. Soc. **126**, 797 (2004)

PhD Students since 2001

Group	Name	Year	Title
Fröba	M. Tiemann	2001	Mesostructured Aluminium Phosphates Synthesised by Supramolecular Structure-direction
Fröba	R. Köhn	2001	Synthesis, Characterization, and Modification of Various Mesoporous Silica Phases
Fröba	D. Kempe	2001	Mesostrukturierte Selenogermanate - Strukturdirigierte Synthese und Charakterisierung
Fröba	N. Oberender	2002	Synthese und Charakterisierung mesostrukturierter und mesoporöser Thiogermanate
Fröba	F. Brieler	2005	Nanostructured Diluted Magnetic Semiconductors within Mesoporous Silica
Fröba	S. Kroker	ongoing	Halbleiternanopartikel in mesoporösen Organosilicas
Fröba	H. Huwe	ongoing	Synthese und Charakterisierung von Metall- bzw. Metalloxidnanopartikeln in mesoporösen Kohlenstoffen
Fröba	V. Rebbin	ongoing	Periodischer, mesoporöser Organosilicas und deren Einsatz in der Chromatographie
Fröba	M. Cornelius	ongoing	Nanoporöse Organosilicas mit speziellen Koordinationsstellen
Fröba	J. Morell	ongoing	Periodische, mesoporöse Organosilicas mit aromatischen Funktionalitäten
Fröba	T. Stumpf	ongoing	Synthese und Charakterisierung nanoporöser Organosilicas mit adamantanoiden organischen Funktionalitäten
Fröba	J. Roggenbuck	ongoing	Mesoporöse Metalloxide
Fröba	A. Lotz	ongoing	Anodische Oxidation von Aluminium und dessen weitere Funktionalisierung
Fröba	T. Waitz	ongoing	Synthese und Charakterisierung nanoporöser Übergangsmetalloxide

Prof. Dr. Dirk Gajewski (Research Field Coordinator)

born 15.7.1956

www.geophysics.zmaw.de/

1981	Diploma in Geophysics
1987	PhD at the Faculty of Physics, University of Karlsruhe, Germany.
1981 - 1987	research associate in the special interdisciplinary research program "Stress and Stress Release in the Lithosphere", Geophysical Institute, University of Karlsruhe, Germany.
1987 - 1989	Visiting scholar at the Geophysics Department, Stanford University, California and at the Center for Computational Seismology, Lawrence Berkeley Lab, Berkeley, California.
1989 - 1993	Assistant Professor at the Institute for Geophysics, University of Clausthal, Germany.
1993	Associate Professor at the Institute for Geophysics, University of Hamburg, Germany.
2001	Visiting professor at the University of Calgary, Canada
2003	Visiting professor at the the University of Campinas, Brazil
2004	Appointed to the chair Physics of the Earth, University of Vienna, Austria
2005	Visiting professor at the the University of Campinas, Brazil
April 2006	Professor, Chair of Applied Seismics, University of Hamburg, Germany
2006	Visiting professor at the Colorado School of Mines, Golden, Colorado, USA
	Director of the Institute of Geophysics, University of Hamburg
	Director of the industry sponsored Wave Inversion Technology (WIT) international consortium (http://www.wit-consortium.de)
	Editor of the yearly WIT research report (together with P. Hubral, M. Tygel and S. Shapiro)
1995 - 2002	Academic Advisor to the Technical Program Committee of the European Association of Geoscientists and Engineers (EAGE)
1997 - 2002	Associate Editor for Geophysical Prospecting
2002 - 2004	Member of the Board of the Deutsche Geophysikalische Gesellschaft (DGG, German Geophysical Society)
since 2002	Member of the steering committee of the Geophysical Instrumental Pool Potsdam (GIPP)
2002	Host of the 10th International Workshop on Seismic Anisotropy
	Expert to national and international PhD committees
	Expert to national and international search committees
	Consultant to national and international funding agencies for proposal evaluation
	DG has edited three books and published more than 60 papers in reviewed international journals. He is a member of AGU, DGG, EAGE, SEG.

Selection of Publications

[1] D. Gajewski and E. Tessmer
"Reverse modelling for seismic event characterization"
Geophys. J. Int. **164**, 276 (2005)

[2] D. Gajewski, R. Coman and C. Vanelle
"Amplitude preserving Kirchhoff migration: a traveltime based strategy"
Studia geophysica et geodaetica **46**, 193 (2002)

[3] D. Gajewski
"Radiation from point sources in general anisotropic media"
Geophys. J. Int. **113**, 229 (1993)

[4] D. Gajewski and I. Pšenčík
"Vector wave fields for weakly attenuating anisotropic media by the ray method"
Geophysics, **57**, 27 (1992)

[5] KRISP Working Party
"Large scale variations in lithospheric structure along and across the Kenya Rift"
Nature **354**, 223 (1992)

[6] D. Gajewski
"Compressional- and shear-wave velocity models of theSchwarzwald derived from seismic refraction data"
in: The German Deep Drilling Program, Emmermann, R., Wohlenberg, J. (Eds.) Springer, Heidelberg, 363 (1989)

[7] D. Gajewski and I. Pšenčík
"High frequency seismic wave fields in laterally inhomogeneous anisotropic media"
Geophys. J. R. astr. Soc. **91**, 383 (1987)

[8] D. Gajewski and C. Prodehl
"Crustal structure beneath the Swabian Jura, SW-Germany, from seismic refraction investigations"
J. Geophys. **56**, 69 (1985)

Books

[1] D. Gajewski and W. Rabbel (Eds.)
"Seismic Exploration of the Deep Continental Crust, The DEKORP Project"
special issue, Pure appl. Geophys. **156**, Nos. 1/2, 370p (1989)

[2] D. Gajewski, C. Vanelle, I. Pšenčík, (Eds.)
"Advances in Seismic Anisotropy: Proceedings of the Tenth International Workshop on Seismic Anisotropy (10IWSA)"
special issue, Journal of Applied Geophysics **54**, 161 (2003)

[3] U. Bayer, D. Gajewski, R. Littke (Eds)
"Dynamics of Sedimentary Systems"
Special Issue, International Journal of Earth Sciences. (2005)

PhD Students since 2001

Group	Name	Year	Title
Gajewski	C. Vanelle	2002	Traveltime-based True-amplitude Migration (received the 2002 Shell-She-Study Award)
Gajewski	E. M. Menyoli	2002	Model Building and Imaging with Reflection Data
Gajewski	R. Coman	2003	Computation of Multivalued Traveltimes in Three-dimensional Heterogeneous Media
Gajewski	S. Golownina	2004	Modeling and Inversion in Weakly Anisotropic Media,
Gajewski	A.l Ehrhardt	2005	Seismic and Hydroacoustic Studies of Surficial Sediment Tectonics along the Northern Red Sea Rift and the Dead Sea Transform Fault
Gajewski	G. Netzeband	2006	The Levantine Basin - a Seismic Investigation of the Crustal Structure and the Evolution of the Messinian Evaporites
Gajewski	M. Bak Hansen	2006	Structure and Evolution of the Northern Part of the Northeast German Basin Revealed from Seismic Interpretation and 3D Structural Modelling
Gajewski	T. Kaschwich	2006	Traveltime Computation and Migration in Anisotropic Media
Gajewski	M. Baykulov	ongoing	Crustal Structure of the North German Basin from Seismic Reflection Data
Gajewski	S. Dümmong	ongoing	Multi-parameter Stacking and Multiple Supression
Gajewski	M. Tisljar	ongoing	Seismic Source Location by Back Projection

Prof. Dr. Ulrich Hahn

born 14.12.1950

www.chemie.uni-hamburg.de/bc/hahn.html

1971 - 1977	Studies of Agriculture and Biology, University of Göttingen, Pre-diploma in Agriculture, Diploma in Biology (Major: Microbiology, Minors: Biochemistry and Physical Chemistry); Fellow of the 'Hermann-Schlosser-Stiftung
1977	Diploma thesis under the supervision of Prof. Frank Mayer, Institute for Microbiology "Dark field electron microscopy of DNA"
1977 - 1980	PhD; practical work in Prof. Hans Küntzel's group, Department of Chemistry (Max-Planck-Institute (MPI) for Experimental Medicine in Göttingen "Mapping of the genes for ribosomal RNAs in mitochondria"
1980 - 1982	Postdoctoral Fellow at the MPI for Experimental Medicine in Göttingen
1982 - 1993	Staff scientist at the Institute for Crystallography at the Free University (FU) Berlin in the Department of Prof. Wolfram Saenger
1989	Habilitation for Biochemistry at the FU Berlin
1993 - 1994	University lecturer (C2) at the Medical University of Lübeck in the Institute for Biochemistry
1994 - 2002	Full professor (C4) for "Common and Microbial Biochemistry" at the Institute for Biochemistry at the Faculty for Biosciences Pharmacy & Psychology at the University of Leipzig
since 1995	Advisor for the "Studienstiftung des deutschen Volkes"
	Acting referee in molecular biology and biochemistry for the German Research Council (DFG)
	Member of the Gesellschaft Deutscher Chemiker (GDCh), RNA Society, Vereinigung für allgemeine und angewandte Mikrobiologie (VAAM)
since 1996	Founding member of the Institute for Interdisciplinary Isotope Research (IIF), Leipzig
since 2000	Associate Editor, Biological Chemistry
since 2001	Member of the Gesellschaft für Biochemie und Molekularbiologie (GBM) advisory board
2002	Speaker of the DFG Collaborative Research Centre 610 "Variation in Protein Conformation: Cellbiological and Pathological Relevance"
since 2002	Full professor (C4) for "Biochemistry and Molecular Biology" at the University of Hamburg, Chemistry Department
since 2004	Chairman of the graduate committee for Biochemistry, Hamburg University
since 2006	Vice Dean for research of the Faculty of Mathematics, Informatics and Natural Sciences

Research areas:

Biochemistry and molecular biology, molecular enzymology and protein design with RNase T1, RNA/protein-interaction, RNA biochemistry, in vitro evolution, aptamers, protein and RNA crystallisation, fluorescence correlation spectroscopy (FCS

Selection of Publications:

[1] M. Salomo, K. Kroy, K. Kegler, C. Gutsche, J. Reinmuth, W. Skokow, M. Struhalla, C. Immisch, U. Hahn and F. Kremer
"Cooperative binding of TmHU to single ds-DNA as observed by optical tweezers"
J. Mol. Biol. **359**, 769 (2006)

[2] R. Czaja, M. Perbandt, Ch. Betzel, and U. Hahn
"Purine activity of RNase T1RV is further improved by substitution of Trp59 by tyrosine"
Biochem. Biophys. Res. Commun. **336**, 882 (2005)

[3] R. Czaja, M. Struhalla, K. Höschler, W. Saenger, N. Sträter and U. Hahn
"RNase T1 variant RV cleaves single stranded RNA after purines due to specific recongnition by the Asn46 side chain amide"
Biochemistry **43**, 2854 (2004)

[4] M. Struhalla, R. Czaja and U. Hahn
"Adressing the Challenge of Changing the Specificity of RNase T1 with Rational and Evolutionary Approaches"
ChemBioChem. **5**, 200 (2004)

[5] R. Moritz, H. Fabian, U. Hahn, M. Diem and D. Naumann
"Impact of Four ^{13}C-Proline Isotope Labels on the Infrared Spectra of Ribonuclease T1"
J. Am.Chem.Soc. **124**, 6259 (2002)

[6] T. Maier, H.-H. Förster, O. Asperger and U. Hahn
"Molecular Characterization of the 56 kDa CYP153 from Acinetobacter sp. EB104"
Biochem. Biophys. Res. Commun. **286**, 652 (2001)

[7] G. Kuhnle, J. P. E. Spencer, G. Chowrimootoo, H. Schroeter, E. S. Debnam, S. K. Srai, C. Rice-Evans and U. Hahn
"Resveratrol is Absorbed in the Small Intestine as Resveratrol Glucuronide"
Biochem. Biophys. Res. Commun. **272**, 212 (2000)

[8] K. Korn, S. Wennmalm, H.-H. Förster, U. Hahn and R. Rigler
"Analysis of the RNase T1 Mediated Cleavage of an Immobilized Gapped Heteroduplex via Fluorescence Correlation Spectroscopy"
Biol. Chem. **381**, 259 (2000)

[9] K. Höschler, H. Hoier, B. Hubner, W. Saenger, P. Orth and U. Hahn
"Structural analysis of an RNase T1 variant with an altered guanine binding segment"
J. Mol. Biol. **294**, 1231 (1999)

[10] B. Hubner, M. Hänsler and U. Hahn
"Modification of Ribonuclease T1 Specificity by Random Mutagenesis of the Substrate Binding Segment"
Biochemistry **38**, 1371 (1999)

PhD Students since 2001

Group	Name	Year	Title
Hahn	G. Kuhnle	2001	Investigations of Enzymatic Reactions Using Mass Spectrometry
Hahn	T. Meier	2001	Klonierung und Charakterisierung des Operons der P450-abhängigen Alkan-Monooxygenase aus Acinetobacter calcoaceticus EB104
Hahn	M. Struhalla	2003	Veränderung der Substratspezifität von Ribonuklease T1 und Einsatz des Enzyms in Immunotoxinen
Hahn	A. Hansen	2003	Isolierung und Charakterisierung von RNase-resistenten RNA-Molekülen (Stabilimeren) und deren Nutzung zur Stabilisierung eines RNA-Aptamers
Hahn	M. Ludewig	2004	Genetische Beweglichkeit und heterologe Expression von cyp153A1 - Gen der P450-abhängigen Alkanmonooxygenase aus Acinetobacter sp. EB104
Hahn	R. Czaja	2006	Strukturelle Untersuchungen zur Substratspezifität von Ribonuclease T1
Hahn	S. Kainz	2006	Selektion und Charakterisierung von Aptameren, spezifisch für das Virus der Infektiösen Bursitis
Hahn	H. Fickert	ongoing	Selection and Preliminary Characterization of p53 Aptamers
Hahn	A. Werner	ongoing	RNA Dynamics in Cells
Hahn	M. Salomon	ongoing	Studies of Nucleic Acids with Optical Tweezers
Hahn	I. Obi	ongoing	Studies on the Helicase Domain of Dicer
Hahn	C. Meyer	ongoing	Detailed Characterization, Crystallisation and Application of p53 Aptamers

Prof. Dr. Jürgen Heck (Research Field Coordinator)

born 28.09.1950

http://www.chemie.uni-hamburg.de/ac/heck/

1970	Basic Studies of Chemistry at the Technical University of Braunschweig, Germany
1973	Undergraduate study at the University of Marburg, Germany
1977	Diploma in Chemistry (Topic: Preparative and ESR Spectroscopic Investigations concerning the Problem of the Spinlocalization in Mono- and Dinuclear Bis(η^6-arene)chromium Complexes) with Professor Dr. Ch. Elschenbroich
1981	Dr. rer. nat. (summa cum laude) with Professor Dr. Ch. Elschenbroich at the University of Marburg (Topic: Preparative and ESR Spectroscopic Investigations concerning the Problem of the Spinlocalization of Mono- and Dinuclear Bis(η^6-arene)chromium and vanadium Complexes)
1981 - 1982	Postdoctoral Fellow at the Chemistry Faculty, University of Marburg
1982 - 1983	Postdoctoral Fellow at the Institute of Inorganic Chemistry, University of Zürich, with Prof. Dr. J. H. Ammeter
1983 - 1989	Assistant Professor at the Chemistry Faculty, University of Marburg
2002	Habilitation at the Chemistry Faculty, University of Marburg (Topic: "Cooperative Interactions in π-Ligand-Bridged Dinuclear Complexes")
1989 - 1992	Senior Lecturer at the Institute of Inorganic Chemistry, University of Nijmegen, Netherlands
since 1992	Full professor (C4) of Inorganic Chemistry at the Institute of Inorganic and Applied Chemistry, University of Hamburg, Germany
1995 - 1999	Director and Vice Director of the Institute of Inorganic and Applied Chemistry, University of Hamburg, Germany
1999 - 2002	Dean of the Chemistry Faculty in Hamburg, Germany
1999 - 2006	Member of the Joachim Jungius-Gesellschaft der Wissenschaften, Hamburg
2002	Vice Dean of the Chemistry Faculty in Hamburg, Germany
since 2003	Member of the DFG-priority program 1118: "Secondary Interactions as Steering Principles for the Selective Functionalization of Non-Reactive Substrates"
since 2005	Member of the Academy of Science in Hamburg
since 2005	Member of the council of the Faculty of Science, University of Hamburg
2003 - 2005	Vice Director of the Institute of Inorganic and Applied Chemistry University of Hamburg, Germany
since 2005	Director of the Institute of Inorganic and Applied Chemistry, University of Hamburg, Germany
since 2006	Member of the DFG-Collaborative Research Centre SFB 668: "Magnetism from the Single Atom to the Nanostructure"
since 1977	- ca. 80 publications in international scientific, refereed journals,
since 1983	- fund raising: ca. 1.700.000 Euro from peer-review based research projects

Selection of Publications:

[1] M. Malessa, J. Heck, J. Kopf and M. H. Garcia
"Polar Cofacially Fixed Sandwich Complexes: Do they Demonstrate Second Harmonic Generation (SHG)?"
Eur. J. Inorg. Chem. 857 (2006)

[2] F. Zhang, M.H. Prosenc and J. Heck
"Synthesis and characterization of dinuclear monohydro sesquifulvalene complexes with potential NLO properties"
J. Organomet. Chem. **691**, 455 (2006)

[3] D. Kuentzer, L. Jessen and J. Heck
"Sugar ligands in organotitanium complexes"
Chem. Comm. 5653 (2005)

[4] F. Zhang, V. Vill and J. Heck
"Cellulose Based Polymers with Long Chain Pendant Ferrocene Derivatives as Organometallic Chromophores"
Organometallics **23**, 3853 (2004)

[5] T. Meyer-Friedrichsen, H. Wong, M.H. Prosenc and J. Heck.
"Vinylogue Mono- and Bimetallic Cationic Sesquifulvalene and Monhydro Sesquifulvalene Complexes for Second Harmonic Generation"
Eur. J. Inorg. Chem. 936 (2003)

[6] T. Meyer-Friedrichsen, C. Mecker, M.H. Prosenc and J. Heck
"Donor-Acceptor Interaction in Cationic Archetype Mono- and Dinuclear Sesquifulvalene Complexes $[(\eta^5\text{-}C_5H_5)Fe\{\mu\text{-}(\eta^5\text{-}C_5H_4)(\eta^7\text{-}C_7H_6)\}M'L']^{n+}$ (n = 1,2)"
Eur. J. Inorg. Chem. 239 (2002)

[7] J. Heck, S. Dabek, T. Meyer-Friedrichsen and H. Wong
"Mono- and Dinuklear Sesquifulvalene Complexes, Organometallic Materials with Large Nonlinear Optical Properties"
Coord. Chem. Rev. **190-192**, 1217 (1999)

[8] J. Heck, G. Lange, M. Malessa, R. Boese and D. Bläser
"Synfacially Structured $[(CpRu)_2\mu\text{-cot}]$ - What a Difference the Coordination Side Makes"
Chem. Eur. J. **5**, 659 (1999)

[9] B. Bachman, J. Heck, G. Meyer and T. Schleid
"Cooperative Effects in π-Ligand Bridged Dinuclear Complexes, 11. Three Different Positional Isomers of Paramagnetic Bis[η^5-cyclopentadienyl)vanadium]μ-[$\eta^{7:7}$-di(cyclooctatrienyl)]: Strong Influence on Magnetic Properties Caused by the Different Kind of Linkages"
Inorg. Chem. **31**, 607 (1992)

[10] B. Bachmann, F. Hahn, J. Heck and M. Wünsch.
"Cooperative Effects in π-Ligand Bridged Binuclear Complexes, 8. Cyclic Voltammetric, NMR, and ESR Studies of Electron-Poor Synfacial Bis[(η^5-cyclopentadienyl)metal] μ-Cyclooctatetraene Complexes of Chromium and Vanadium"
Organometallics **8**, 2523 (1989)

Patents:

Deutsche Patentanmeldung Nr. 198 52 722.5-45
"Verfahren zur Innenbeschichtung von Kapillaren und deren Verwendung"
Prof. Dr. J. Heck, Prof. Dr. A. Knöchel, Dr. Haller, Dr. Kneip, Dr. Moritz

PhD Students since 2001

Group	Name	Year	Title
Heck	M. Malessa	2001	Through-space"-Donor-Akzeptor-Wechselwirkungen in peri-substituierten Naphthalinderivaten und die hyper-Rayleigh-Streuung als Methode zur Untersuchung der NLO-Eigenschaften
Heck	O. Reimelt	2001	Stereoselektive Derivatisierung metallgebundener cyclo-C_8-Liganden als mögliche Vorstufen für Naturstoffsynthesen
Heck	S. Dabek	2001	Cobalt- und Nickel-Sandwichkomplexe als neuartige Elektronendonatoren in Organometallkomplexen mit nichtlinear optischen Eigenschaften
Heck	B. Unrecht	2001	Chemische Gasphasenabscheidung: Ein Verfahren zur Erzeugung heterogenkatalytisch aktiver Oberflächen
Heck	M. Brunnbauer	2003	Röntgenstabilität und Struktur von Monolagen aliphatischer Thiole auf Münzmetallen - Eine Synchrotronstudie
Heck	S. Steffens	2005	Metallocen substituierte 6π-Aromaten als 2D- und 3D-NLO-Chromophore und Anwendung der hyper-Rayleigh-Streuungs-Methode zur Bestimmung der ersten Hyperpolarisierbarkeit
Heck	J. Holtmann	ongoing	Dendritische Strukturen zur Erzeugung der zweiten Harmonischen
Heck	D. Küntzer	ongoing	Zuckerliganden in der Organotitan-Chemie
Heck	P. Kitaev	ongoing	Chirale Erkennung mit Organozirkonium-Zuckerkomplexen
Heck	S. Schörshusen	ongoing	Stereoselektive Derivatisierung metallgebundener Cyclooctatetraen-Liganden
Heck	M. Werner	ongoing	Taugen "through-space"-Donor-Akzeptor-Wechselwirkungen in peri-substituierten Naphthalinderivaten zur Erzeugung der zweiten Harmonischen?
Heck	J. Wochnowski	ongoing	Chemische Gasphasenabscheidung in Kapillaren für katalytische und optische Anwendungen
Heck	C. Fowelin	ongoing	Derivatisierte Glukoseliganden in Organometallkomplexen
Heck	M. Schmidt	ongoing	Synthese von Single-source Precursoren für die chemische Gasphasenabscheidung
Heck	N. Pagels	ongoing	Synthese und Charakterisierung cofacial gestapelter, paramagnetischer Metallocene

Prof. Dr. Martin Kaltschmitt

born 18.04.1961

www.tu-harburg.de/ut/

1980 - 1986	Technical University Clausthal-Zellerfeld
1986 - 1992	PhD Thesis (Dr. Ing.) University of Stuttgart
1990	PhD University of Stuttgart
1992 - 1993	Head of Department "Environment and Energy" at KTBL, Darmstadt
1997	Habilitation in the field "Renewable Energy" at the University of Stuttgart
1993 - 2000	Head of Department "New Energy Technologies and Technology Assessment (NET)" at the Institute for Energy Economics and the Rational Use of Energy (IER), University of Stuttgart
1998 - 1999	Senior Research Scholar at the Biomass Research Group, King's College London, University of London
1999 - 2000	Senior Research Scholar at the Energy and Resources Group (ERG), University of California, Berkeley and at Institute for Energy Economics and the Rational Use of Energy (IER), University of Stuttgart
2001 - 2005	Managing Director of the Institute for Energy and Environment (IE) gGmbH, Leipzig
since 07/2006	W3 Professor at Technical University Hamburg-Harburg Institute of Environmental Technology and Energy Economics

since 1986 15 book publications in the field of renewable energy and especially biomass, approx. 110 articles in magazines and about 10 contributions to books on renewable energy and more than 260 conference contributions.

5 PhD Thesis finalized within the last years in the field of biomass for energy; 6 PhD-students work on their thesis within our Institute

Funding: 3 Million €/year at the Institute for Energy and Environment (IE) gGmbH, Leipzig

Selection of Publications

[1] M. Kaltschmitt, W. Streicher, A. Wiese
(Hrsg.): "Erneuerbare Energien: Systemtechnik, Wirtschaftlichkeit, Umweltaspekte"
Springer, Berlin, Heidelberg, 4. Auflage (2006)

[2] M. Kaltschmitt, H. Hartmann (Hrsg.)
"Energie aus Biomasse"
Springer Berlin, Heidelberg (2001)

[3] A. Freibauer, M. Kaltschmitt
"Controls and Models for Estimating Direct Nitrous Oxide Emissions from Temperate and Sub-boreal Agricultural Mineral Soils in Europe"
Biogeochemisty **63**, 93 (2003)

[4] A. Heinz, M. Kaltschmitt, H. Hofbauer
"Anwendung energetischer und nicht-energetischer Ressourcen in Energiesystemen: Vergleichende Bewertung; Teil 1: Methodik und exemplarisch ausgewählte Lebenswege"
Zeitschrift für Umweltchemie und Ökotoxikologie **17**, 147 (2005)

5] A. Weiske, A. Vabitsch, J.E. Olesen, K.Schelde, J. Michel, R. Friedrich, M. Kaltschmitt
"Mitigation of Greenhouse Gas Emissions in European Conventional and Organic Dairy Farming; Agriculture"
Ecosystems and Environment **112**, 221 (2006)

[6] D. Thrän, M. Kaltschmitt
"Hemmnisse bei der energetischen Nutzung biogener Festbrennstoffe"
ZFE **28**, 35 (2004)

[7] J. Witt, M. Kaltschmitt
"Weltweite Nutzung regenerativer Energien"
BWK **57**, 43,(2005)

[8] V. Lenz, M. Kaltschmitt
"Erneuerbare Energien"
BWK **58**, 83 (2006)

[9] M. Kaltschmitt, D. Thrän
"Logistik bei der Versorgung mit biogenen Festbrennstoffen"
AFZ Der Wald **61**, 550 (2006)

[10] M. Kaltschmitt, M. Müller
"Geothermische Stromerzeugung in Deutschland - Stand und Perspektiven
Die neue Rolle der Geothermie"
8. Geothermische Fachtagung Landau, November, Tagungsband (2004)

Prof. Dr. Walter Kaminsky (Scientific Director)

born 7.05.1941

www.chemie.uni-hamburg.de/tmc/kaminsky/

1962 - 1968	Studies of Chemistry at the University of Hamburg
1971	Doctoral Degree (in the group of Prof. Sinn), "Side reactions in homogeneous Ziegler-Natta catalysts"
1977	Assistant Professor at the University of Hamburg
1978	First use of alumoxane as cocatalyst in olefin polymerization
1979	Full Professor at the University of Oldenburg for Technical Chemistry
1980	Full Professor at the University of Hamburg
1982	Habilitation, "Pyrolysis of plastics and tires in a fluidized bed"
1986	Call as Professor for Polymer Chemistry at Karlsruhe University (declined)
1987 - 1989	Dean of the Chemistry Department
1987 - 1991	President of the German Chemical Society GDCh, section Hamburg
1989 - 2001	Director, Institute for Technical and Marcomolecular Chemistry, Hamburg
since 2002	Vice-Dean, Chemistry Department, University of Hamburg
since 2002	Member of the DFG program "From molecule to material"
since 1997	Member of the Toepfer Foundation
since 2002	Member of the Jung Foundation
since 1975	- more than 320 publications in international, scientific journals and books - more than 20 patents - member of programme committees of more than 30 international conferences - supervising 110 PhD students
since 1980	Fund raising of more than 5 Mio Euro from DFG, BMBF, Volkswagen, Industry

Selection of Publications:

[1] Ch. Piel, J. Stadler, J. Kaschta, S. Rulhoff, H. Münstedt and W. Kaminsky
"Structure-Property Relationships of Linear and Long-Chain Branched Metallocene High-Density Polyethylenes Characterized by Shear Rheology and SEC-Malls"
Macromol. Chem. Phys. **207**, 26 (2006)

[2] K. Wiemann, W. Kaminsky, F.H. Gojny and K. Schulte
"Synthesis and Properties of Syndiotactic Polypropylene/Carbon Nanofiber and Nanotube Composites"
Macro. Chem. Phys. **206**, 1472 (2005)

[3] B. Heuer and W. Kaminsky
"Alternating Ethene/Propene Copolymers by C_1-Symmetric Metallocene/MAO Catalysts"
Macromolecules **38**, 3054 (2005)

[4] W. Kaminsky
"The Discovery of Metallocene Catalysts and Their Present State of the Art"
J. Polym. Sci.: Part A: Polymer Chemistry **42**, 3911 (2004)

[5] W. Kaminsky and K. Wiemann
"Polypropene/Silica-Nanocomposites synthesized by in-situ Polymerization"
Expected Materials for the Future, Japan, **3**, 6 (2003)

[6] O. Sperber and W. Kaminsky
"Synthesis of Long-Chain Branched Comp-Structured Polyethylene from Ethylene by Tandem Action of Two Single-Site Catalysts"
Macromolecules **36**, 9014 (2003)

[7] W. Kaminsky, P.J. Lemstra, J. Loos, F. Müller, J.W. Niemantsverdriet, P.C. Thüne, and U. Weingarten
"Surface Model for Gas-Phase Polymerizations of Ethylene and Propylene Using Supported Metallocene/Methylalumoxane Catalysts"
Israel J. Chem. **42**, 367 (2002)

[8] W. Kaminsky
"Olefin Polymerization Catalyzed by Metallocenes"
Adv. Catal. **46**, 89 (2001)

[9] W. Kaminsky, K. Külper, H.H. Brintzinger and F.R.W.P. Wild
"Polymerization of Propene and Butene With a Chiral Zirconocene and Methylalumoxane Cocatalyst"
Angew. Chem. Int. Ed. Engl. **24**, 507 (1985)

[10] H. Sinn and W. Kaminsky
"Ziegler-Natta-Catalysis"
Adv. Organomet. Chem. **18**, 99 (1980)

PhD Students since 2001

Group	Name	Year	Title
Kaminsky	C. Gerdes	2001	Pyrolyse von Biomasse-Abfall: Thermochemische Konversion mit dem Hamburger-Wirbelschichtverfahren
Kaminsky	I. Albers	2002	Homo- und Copolymerisation von Ethen und Styrol mit Metallocenen und weiteren Single Site Katalysatoren
Kaminsky	C. Hanser	2002	Strukturelle Untersuchungen, Reaktionen und Anwendung von Flash-Pyrolyseölen aus Biomasse
Kaminsky	A. Hopf	2002	Homo- und Copolymerisation von Propen/Ethen mit Cs-symmetrischen Metallocen/MAO-Katalysatoren
Kaminsky	C. Mennerich	2002	Untersuchungen zum chemischen Recycling von Elastomerabfällen durch Pyrolyse
Kaminsky	A. Eisenhardt	2003	Untersuchung verschiedener constrained geometry-Katalysatoren in der Polymerisation von Ethen, Propen und Dien sowie Entwicklung neuer hochaktiver Cokatalysatoren für die heterogene Ziegler-Natta-Olefin-Polymerisation
Kaminsky	G. Grause	2003	Chemisches Recycling von Polyethylentere-phthalat
Kaminsky	F. Hartmann	2003	Modellierung und Simulation der Wirbelschicht-Pyrolyse von Polyethylen
Kaminsky	A. Kirsten	2003	Chemisches Recycling von PVC-haltigen gemischten Polyolefinabfällen sowie COC-Materialien durch Pyrolyse und Optimierung von Versuchsparametern mittels Pyrolyse-GC/MS
Kaminsky	F. Müller	2003	Polymerisationen von Ethen, Propen und 1,3-Butadien mit Metallocen/MAO-Trägerkatalysatoren
Kaminsky	O. Sperber	2003	Synthese und Polymerisationseigenschaften neuartiger C1-symmetrischer Doppelhenkel-Zirconocene sowie verschiedene Applikationen von Oligoethenwachsen für die Ethen-Copolymerisation
Kaminsky	P.-D. Tran	2003	Ethen/Norbornen-Copolymerisation durch single-site-Katalysatoren/MAO
Kaminsky	M. Frediani	2004	Polymerization of olefins by early and late transition metal catalysis
Kaminsky	B. Heuer	2004	Alternierende Copolymerisation von Ethen und Propen mit C1-symmetrischen Metallocen/MAO-Katalysatoren

Group	Name	Year	Title
Kaminsky	O. Stojković	2004	Syndiospezifische Polymerisation von Styrol mit arylsubstituierten Indenylhalbsandwichtitanocenen/MAO und Untersuchungen zur in situ-Fluorierung von Halbsandwichverbindungen für die Styrolpolymerisation
Kaminsky	K. Wiemann	2004	Synthesis of Polypropylene Nanocomposites by in situ Polymerization of Propylene with Metallocene/MAO Catalysts
Kaminsky	B. Hinrichs	2005	Copolymerisation von Ethen und 1,3-Butadien mittels Metallocen/MAO-Kataly-satoren
Kaminsky	J. Kiesewetter	2005	Homo- und Copolymerisation von Olefinen mit Katalysatoren auf Basis später Übergangsmetalle
Kaminsky	C. Piel	2005	Polymerization of Ethene and Ethene-co-α-Olefin: Investigations on Short- and Long-Chain Branching and Structure-Property Relationships
Kaminsky	M, Donner	2006	Synthese und Pyrolyse von metallocen-katalysierten Ethen/Norbornen-Copolymeren
Kaminsky	B. Arikan	ongoing	Synthese von langkettenverzweigten Polyethylenen mit amorphen Seitengruppen
Kaminsky	S. Derlin	ongoing	Copolymerisate von Ethen mit sperrigen Comonomeren durch Metallocen-Katalysatoren
Kaminsky	M. Fernandes	ongoing	Copolymerisate von Ethen mit polaren Vinylethern durch Metallocen-Katalysatoren
Kaminsky	Andreas Funck	ongoing	Nanotube-Polypropylen-Composites durch in situ-Polymerisation
Kaminsky	M. Hoff	ongoing	LLDPE durch Copolymerisation von Ethen mit 1-Okten sowie Wachs-Synthese mit Metallocen-Katalysatoren
Kaminsky	I. Nuñez	ongoing	Catalytic Pyrolysis of Polyolefins
Kaminsky	S. Rulhoff	ongoing	Synthese und Charakterisierung langketten-verzweigter Polypropylene durch Metallocen-Katalyse
Kaminsky	K. Scharlach	ongoing	Nanocomposites von Polyolefinen durch in situ-Polymerisation
Kaminsky	A. Laban	ongoing	Polymerisation von Propen mittels heterogenisierter Metallocen/MAO- und Ziegler-Natta-Katalysatorsysteme
Kaminsky	C. Schwecke	ongoing	Homo- und Copolymerisation von Styrol mit Alkylstyrolen sowie Homopolymerisation von 1,3-Butadien mit Halbsandwich-Katalysatoren

Prof. Dr. Andreas Liese

born 29.10.1966

www.technical-biocatalysis.com

1987 - 1994	Studies of Chemistry at the University of Bonn
1994	Diploma in Chemistry University of Bonn
1998	University of Bonn (Research Center Jülich), PhD-Thesis (supervisor Prof. Dr. C. Wandrey) in corporation with DSM research, Netherlands: Title: "Reaktorkonzepte für Biotransformationen in Zweiphasensystemen"
1998 - 2003	Head of the "Enzyme Group" (Institute of Biotechnology II, Research Center Jülich) and assistant professor (Kekulé Institute of Organic Chemistry, University of Bonn)
2000	Pfizer Global Research & Development, San Diego, USA: setup of a bio-transformation group
2003	University of Bonn, Habilitation
2003 - 2004	Professor of Biotechnology, University of Münster
since 2004	Professor of Technical Biocatalysis and Director the Institute for Technical Biocatalysis, Technical University Hamburg-Harburg
2003	Young scientist price for biotechnology (DECHEMA e. V.)
since 2002	Member of "Zukunftsforums Biotechnologie" der DECHEMA e.
since 2003	Member of the Advisory Board of "Journal of Molecular Catalysis B"
since 2003	Member of the section "Weiße Biotechnologie" (DECHEMA e.V.)
since 2005	Member of the steering committee "biotechnology" of the DECHEMA e.V.

Selection of Publications

[1] K. Goldberg, K. Edegger, W. Kroutil and A. Liese
"Overcoming the thermodynamic limitation in asymmetric hydrogen transfer reactions catalyzed by whole cells",
Biotech. Bioeng. (in press) (2006)

[2] A. Liese, K. Seelbach and C. Wandrey
"Industrial Biotransformation",
Wiley-VCH, 2nd edition, p. 556 (2006)

[3] P. Dominguez de Maria, T. Stillger, M. Pohl, S. Wallert, K. Drauz, H. Gröger, H. Trautwein and A. Liese
"Preparative enantioselective synthesis of benzoins and (R)-2-hydroxy-1-phenylpropanone by using benzaldehyde-lyase",
J. Mol. Cat. B: Enzymatic **38**, 43 (2006)

[4] A. Liese
"Technical application of biological principles in asymmetric catalysis",
Adv. Bioch. Eng. Biotech. **92**, 197 (2005)

[5] N. Kurlemann and A. Liese
"Immobilization of benzaldehyde lyase and application as heterogeneous catalyst in the continuous synthesis of a chiral 2-hydroxy ketone",
Tetrahed. Asymmetry **15**, 2955 (2004)

[6] S. Lütz, E. Steckhan and A. Liese
"First asymmetric electroenzymatic oxidation catalyzed by a peroxidase",
Electrochem. Comm. **6**, 583 (2004)

[7] I. Schröder, E. Steckhan and A. Liese
"In situ NAD(P)+ regeneration using 2,2'-azinobis(3-ethylbenzothiazolin-6-sulfonate) as an electron transfer mediator",
J. Electroanal. Chem. **541**, 109 (2003)

[8] J. Haberland, W. Hummel, T. Dausmann and A. Liese
"New continuous production process for enantiopure (2R,5R)-hexanediol",
Org. Proc. Res. & Devel. **6**, 458 (2002)

[9] S. Laue, L. Greiner, J. Wöltinger and A. Liese
"Continuous application of chemzymes in a membrane reactor: Asymmetric transfer hydrogenation of acetophenone",
Adv. Synth. & Catal. **343**, 711 (2001)

[10] H. Iding, P. Siegert, T. Dünnwald, M. Müller, L. Greiner, A. Liese, J. Grötzinger, A. Demir and M. Pohl
"Benzoylformate decarboxylase from Pseudomonas putida as stable catalyst for the synthesis of chiral 2-hydroxy ketones",
Chemistry, Eur. J. **6**, 1483 (2000)

PhD Students since 2001

Group	Name	Year	Title
Liese	N. Brinkmann	2002	Polymerunterstützte Synthese von Oligo-sacchariden in homogener flüssiger Phase
Liese	S. Laue,	2002	Asymmetrische Transferhydrierung in chemischen Membranreaktoren
Liese	J. Beliczey	2003	Reaktionstechnische Untersuchungen zur präparativen enzymatischen Synthese und Aktivierung der Neuraminsäurederivate 3-Fluorneuraminsäure und Glycolylneuraminsäure
Liese	L. Greiner	2003	Prozessentwicklung für die katalytische Reduktion mit molekularem Wasserstoff - Membranverfahren für die homogene Katalyse mit Enzymen und Chemzymen
Liese	J. Haberland	2003	Verfahrensentwicklung zur Darstellung von (2R,5R)-Hexandiol mit Lactobacillus Kefir DSM20587
Liese	I. Schröder	2003	Elektrochemische Oxidation von Nukleotidkofaktoren - Charakterisierung und Prozessentwicklung asymmetrischer enzymatischer Katalysesysteme
Liese	M. Villela	2003	Enantioselektive enzymatische Reduktion von Ketonen in Zwei-Phasen Reaktoren
Liese	C. Hoh	2004	Reaktionstechnik der in vitro enzymatischen Synthese von Nukleotidzuckern und Derivaten
Liese	S. Lütz	2004	Prozessentwicklung für elektroenzymatische Oxidationen
Liese	T. Stillger	2004	Reaktionstechnik der Benzaldehydlyase
Liese	I. Tan,	2006	Optimierung der diastereoselektive Reduktion von substituierten Diketonen
Liese	D. Kihumbu	ongoing	Diastereoselektive Synthese von 1,2-Diolen mit enzymatischen Reaktionskaskaden
Liese	R. Mertens	ongoing	Reaktionstechnik der biokatalytischen Hydrierung mit molekularem Wasserstoff

Group	Name	Year	Title
Liese	M. Beigi	ongoing	Sustainability by Advanced Chemoenzymatic Technologies - Development of a Diels-Alder Chemzyme
Liese	M. Berheide	ongoing	Investigation of Molecular Aspects Influencing the Selectivity of ThDP-Dependent Enzymes
Liese	S. Briechle	ongoing	Sustainability by Advanced Chemoenzymatic Technologies - Process Development for a Chemoenzymatic Reaction Sequence
Liese	K. Goldberg	ongoing	Oxidations Catalyzed by Whole Cells of R. Ruber
Liese	L. Hilterhaus	ongoing	Enzymatische Herstellung von neuartigen Esterölen
Liese	N. Kurlemann	ongoing	Reaction Engineering of Enzymatic C-C-bond Formations
Liese	R. Pawelke	ongoing	Reversible Immobilization Technologies of Enzymes for Use in Microreactors
Liese	R. Yuryev	ongoing	Reaction Engineering of Hydroxynitrile Lyase-Catalyzed Henry Reaction

Dr. Dietrich Meier

born 18.11.1950 in Göttingen

www.bfafh.de/bfh-pers/meier.htm

1972 - 1977	Studies of Wood Science and Technology, University of Hamburg
1977	Diploma in "Wood Science" (Dept. Biology) Title: "Properties and pyrolyis of ethanol-water lignins" with Prof. Schweers
1977 - 1980	PhD. student at Federal Research Centre for Forestry and Forest Products in the Institute for Wood Chemistry and Chemical Technology of Wood, Hamburg, with Prof. Schweers. Title of PhD thesis: Uitilization of ethanol-water lignins by oxidation and hydrogenolysis and their chemical and spectroscopic characterization
1980	Dr. rer. nat. ("summa cum laude") at the University of Hamburg with Prof. Dietrichs
1980 - 1982	Postdoctoral Fellow at the University of Guadalajara, Institute for Wood, Celulose and Paper, guest professorship of the German Academic Exchange Service (DAAD)
1982 -1992	Research Scientist at the Federal Research Centre for Forestry and Forest Products in the Institute for Wood Chemistry and Chemical Technology of Wood, Hamburg,
since 1992	Head of lignin department in the institute and appointment as scientific director
1993	German Member of the European Network on Biomass Pyrolysis (PYNE)
2002	Member of the German Scientific Society for petroleum, natural gas and coal (DGMK)
2004	Appointment as expert of the European Food Safety Authority (EFSA) for the working group of food additives (liquid smoke)
2006	Appointment as National Task Leader (NTL) of the International Energy Agency (IEA), Section Bioenergy, task 34 pyrolysis
since 1980	58 publications in refereed journals,
since 1980	ca. 20 supervisions of a diploma thesis
	8 supervisions of PhD thesis
	20 poster presentations
	50 oral presentations in national and international conferences
	5 book chapters
	2 patents

Selection of Publications

[1] G. Ucar, D. Meier, O. Faix and G. Wegener
"Analytical pyrolysis and FTIR spectroscopy of fossil Sequoiadendron giganteum (Lindl.) wood and MWLs isolated hereof"
Holz Als Roh- und Werkstoff **1**, 57 (2005)

[2] A. Oasmaa, C. Peacocke, S. Gust, D. Meier and R. McLellan
"Norms and standards for pyrolysis liquids. End-user requirements and specifications"
Energy & Fuels **1**, 2155 (2005)

[3] A. Oasmaa and D. Meier
"Norms and standards for fast pyrolysis liquids - 1. Round robin test"
J. Anal. Appl. Pyr. **2**, 323 (2005)

[4] D. Meier, I. Fortmann, J. Odermatt and O. Faix
"Discrimination of genetically modified poplar clones by analytical pyrolysis-gas chromatography and principal component analysis"
J. Anal. Appl. Pyr. **1-2**, 129 (2005)

[5] A. Klingberg, J. Odermatt and D. Meier
"Influence of parameters on pyrolysis-GC/MS of lignin in the presence of tetramethylammonium hydroxide"
J. Anal. Appl. Pyr. **1-2**, 104 (2005)

[6] G. Dobele, G. Rossinskaja, T. Diazbite, G. Telysheva, D. Meier and O. Faix
"Application of catalysts for obtaining 1,6-anhydrosaccharides from cellulose and wood by fast pyrolysis"
J. Anal. Appl. Pyr. **1-2**, 401 (2005)

[7] T. Willner, P. Scherer, D. Meier and W. Vanselow
"Fermentation of wood flash pyrolysis oil to biogas"
Chem. Ing. Tech. **6**, 838 (2004)

[8] B. Scholze and D. Meier
"Characterization of the water-insoluble fraction from pyrolysis oil (pyrolytic lignin). Part I. PY-GC/MS, FTIR, and functional groups"
J. Anal. Appl. Pyrol. **1**, 41 (2001)

[9] C. Gerdes, C. M. Simon, T. Ollesch, D. Meier and W. Kaminsky
"Design, construction, and operation of a flash pyrolysis plant for biomass"
Chem. Ing. Tech. 1207 (2001)

[10] G. Dobele, D. Meier, O. Faix, S. Radtke, G. Rossinskaja, G. Telysheva
"Volatile products of catalytic flash pyrolysis of celluloses"
J. Anal. Appl. Pyrol. 453 (2001)

Prof. Dr. Walter Michaelis

Born 10.07.1944

www.geowiss.uni-hamburg.de/i-bioge/start.html

1968	M.S. in Chemistry, University of Göttingen
1967	B.A. in Chemistry, University of Göttingen
1971	Ph. D. in Organic Chemistry, University Göttingen
1972 - 1973	Postdoctoral Scientist, Insitut de Chimie, Université Louis Pasteur, Strasbourg
1973 - 1974	Research chemist, BASF AG, Ludwigshafen
1974 - 1979	Staff research scientist, Geological-Palaeontological Institute and Museum, University of Hamburg
1979	Institut de Chimie, Université Louis Pasteur, French-German exchange program of professors
1980 - 1998	Assistant professor, Organic Geochemistry Department, Institute of Biogeochemistry and Marine Chemistry, University of Hamburg
1990	Habilitation, University of Hamburg
since 1998	Professor of Organic Geochemistry, University of Hamburg teaching portfolio: Organic Geochemistry, Geomicrobiology, Environmental Geochemistry, Stable Isotope Geochemistry

since 1971 ca.100 publications in international, scientific, refereed journals including 7 publications in Nature and Science

ca. 70 (invited) talks at international conferences, universities, research institutions, and industry laboratories

ca. 80 poster presentations at international conferences

ca. 2.500.000 Euro fund raising from competitive, peer-reviewed research projects (DFG, BMBF, EU)

Affiliations: Member, The Geochemical Society (GdCH)
Board Member, European Association of Organic Geochemists

Selection of Publications:

[1] M. Blumenberg, R. Seifert and W. Michaelis
"Aerobic methanotrophy in the oxic-anoxic transition zone of the Black Sea water column"
Organic Geochemistry (in press)

[2] R. Seifert, K. Nauhaus, M. Blumenberg, M. Kruger and W. Michaelis
"Methane dynamics in a microbial community of the Black Sea traced by stable carbon isotopes in vitro"
Organic Geochemistry. (in press)

[3] U. Deppe, H.-H. Richnow, W. Michaelis and G. Antranikian
"Degradation of crude oil by an arctic microbial consortium"
Extremophiles **9**, 461 (2005)

[4] A. Steinbach, R. Seifert, E. Annweiler and W. Michaelis
"Hydrogen and carbon isotope fractionation during anaerobic biodegradation of aromatic hydrocarbons- a field study"
Environ. Sci. Technol. **38**, 609 (2004)

[5] M. Blumenberg, R. Seifert, J. Reitner, T. Pape and W. Michaelis
"Membrane lipid patterns typify distinct anaerobic methanotrophic consortia"
Proc. Natl. Acad. Sci. USA **101**, 11111 (2004).

[6] W. Michaelis, R. Seifert, K. Nauhaus, T. Treude, V. Thiel, M. Blumenberg, K. Knittel, A. Gieseke, K. Peterknecht, T. Pape, A. Boetius, R. Amann, B.B. Jørgensen, F. Widdel, J. Peckmann, N.V. Pimenov and M. B. Gulin
"Microbial reefs in the Black Sea fueled by anaerobic oxidation of methane"
Science **297**, 1013 (2002)

[7] V. Thiel, J. Peckmann, H.H. Richnow, U. Luth, J. Reitner and W. Michaelis
"Molecular signals for anaerobic methane oxidation in Black Sea seep carbonates and a microbial mat"
Marine Chemistry **73**, 97 (2001)

[8] A. Jenisch-Anton, Adam P., W. Michaelis, J. Connan, D. Herrmann, M. Rohmer and P. Albrecht
"Molecular evidence for biodegradation of geomacromolecules"
Geochim. Cosmoch. Acta **64**, 3525 (2000)

[9] K. Zengler, H. H. Richnow, R. Rossello-Mora, W. Michaelis and F. Widdel
"Methane formation from long-chain saturated hydrocarbons in an anaerobic bacterial community"
Nature **401**, 266 (1999)

[10] B. Chappe, P. Albrecht and W. Michaelis
"Polar lipids of archaebacteria in sediments and petroleums"
Science **217**, 65 (1982)

PhD Students since 2001

Group	Name	Year	Title
Michaelis	O. Christof	2001	Leichtflüchtige halogenierte Kohlenwasserstoffe - Vorkommen, Verhalten und Bedeutung in Küstengebieten
Michaelis	N. Delling	2002	Leichtflüchtige Kohlenwasserstoffe im Arabischen Meer - Verteilung, Genese und Bilanzierung
Michaelis	A. Steinbach	ongoing	Isotopenfraktionierung als Indikator für den biotischen Abbau von Xenobiotika in Grund-wasserleitern
Michaelis	M. Blumenberg	ongoing	Biomarker aus Kaltwasser- und Tiefsee-Kielselschwämmen
Michaelis	T. Pape	ongoing	Lipidbiomarker schwammassoziierter Bakterien und Archaeen
Michaelis	M. Holzwarth	ongoing	Untersuchungen zum Primär- und Sekundärstoff-inventar von Kaltwasserschwämmen
Michaelis	A. Seraphin	ongoing	Umsetzungen natürlicher organischer Komponenten in Böden - Untersuchungen anhand ^{13}C-markierter Substanzen
Michaelis	S. Weber	ongoing	Biogeochemistry of Methane and Hydrogen in Hydrothermal Systems of the Mid-Atalantic Ridge
Michaelis	J.-H. Klock	ongoing	The Relevance of Extracellular Polymeric Substances (EPS) for the Biodegradation of Crude Oil Components
Michaelis	P. Koelle	ongoing	Organische Geochemie holozäner Sedimente des Schwarzen Meeres
Michaelis	B. Oppermann	ongoing	Lipid Biomarker and Stable Isotope Studies on Microorganisms Envolved in the Anaerobic Oxidation of Methane
Michaelis	S. Solloch	ongoing	Emission and Dynamics of Volatile Halogenated Hydrocarbons in Coastal Areas
Michaelis	A. Valtanen	ongoing	Isotope-geochemical Studies on Halogenated Organic Ccompounds from Halophilic Plants

Prof. Dr. Rudolf Müller

born 27.01.1951

www.tu-harburg.de/itb

1969 - 1974	Studies of Chemistry at the University of Stuttgart, Germany
1974	Diploma in Chemistry
1977	Dr. rer. nat. ("summa cum laude") at the University of Hohenheim (Topic: "Microbial Degradation of 5-Amino-4-chlor-2(2,3-dihydroxyphenyl)-3(2H)-pyridazinon) with Professor Dr. F. Lingens
1978 - 1989	Research associate at the Institut for Microbiology, University Hohenheim, Germany (Prof. Dr. F. Lingens)
1981 - 1982	Research stay as Alexander von Humboldt fellow at the Institute for Medical Chemistry, Kyoto University, Japan (Prof. O. Hyaishi)
1985 - 1986	Research stay with a fellowship from the European Union in the program "Training in Molecular Biology" at the Institute of Science and Technology, University of Wales, Cardiff, UK (Prof. H. Slater)
1987	Appointment as staff scientist at the Institute for Microbiology, University Hohenheim, Stuttgart, Germany.
1989	Habilitation in Microbiology at the University Hohenheim, Stuttgart, Germany.
1990	Appointment as Professor for Technical Biochemistry at the technical University Hamburg-Harburg.
1991	Research stay at the National Institute for Agro- Environmental Sciences in Tsukuba, Japan
	Visiting Professor at the National Research Center
2003 - 2006	for Environmental and Hazardous Waste Management Chulalongkorn University Bangkok
	Teaching a course in Environmental Microbiology for PhD students

since 1974

- 63 publications in international, scientific, refereed journals
- more than 100 (invited) talks at international conferences, universities, research institutions, and industry laboratories
- more than100 poster presentations at international conferences
- fund raising: Research grants from:
- DFG: 6 years SFB188, 9 years "Graduiertenkolleg Biotechnologie"
- BMBF: 3 years "Biodegradation of odors", 3 years "Production of high quality natural fibres".
- DBU: 3 years "Thermophilic degradation of fats"
- Innovationsstiftung Hamburg: 3 years "Enzymatic production of foaming agents from keratin"
- Industrial funding

Selection of Publications:

[1] S. Rappert and R. Müller
"Microbial degradation of selected odorous substances"
Waste Management **25**, 940 (2005)

[2] S. Rappert and R. Müller
"Odor compounds in waste gas emissions from agricultural operations and food industries"
Waste Management **25**, 887 (2005)

[3] S. Rappert, K. Botsch, S. Nagorny, W. Francke and R. Müller
"Degradation of 2,3-diethyl-5-methylpyrazine by a newly discovered bacterium Mycobacterium sp. strain DM-11"
Appl. Environ. Microbiol. **72**, 1437 (2005)

[4] S. Rappert, R. Ayoub, R. Li, K. Botsch, I. Obi, R. Müller
"Biologischer Abbau von geruchsaktiven Einzelstoffen und von realen Vielstoffgemischen. Erfassung und Minimierung von Gerüchen."
in: "Messung und Minimierung von Gerüchen, Hamberburger Berichte 23",
B. Niemeyer, A. Robers, P. Thiesen (Eds.)
Verlag Abfall aktuell, Stuttgart, Germany, pp. **203** (2004)

[5] U. Kirchner, A. H. Westphal, R. Müller and W.J.H. van Berkel
"Phenol hydroxylase from Bacillus thermoglucosidasius A7, a two-protein component monooxygenase with a dual role for FAD^{+}"
J. Biol. Chem. **278**, 47545 (2003)

[6] H. Feitkenhauer, R. Müller, H. Märkl
"Degradation of polycyclic aromatic hydrocarbons and long chain alkanes at 60-70℃ by Thermus and Bacillus sp"
Biodegradation **14**, 367 (2003)

[7] H. Feitkenhauer, S. Schnicke, R. Müller and H. Märkl
"Kinetic parameters of continuous cultures of Bacillus thermoleovorans sp. A2 degrading phenol at 65℃"
J. Biotechnol. **103**, 129 (2003)

[8] H. Feitkenhauer, S. Schnicke, R. Müller and H. Märkl
Determination of the kinetic parameters of the phenol-degrading thermophile Bacillus thermoleovorans sp. A2"
Appl. Microbiol. Biotechnol. **57**, 744 (2001)

[9] B. Mahro, R, Müller and V. Kasche
"Bioavailability - the key factor of soil bioremediation"
in: "Treatment of contaminated soil"
R. Stegmann, G. Brunner, W. Calmano, G. Matz (eds.)
Springer Verlag, Heidelberg, 181 (2001)

[10] R. Müller and B. Mahro
"Bioaugmentation: Advantages and problems using microorganisms with special abilities in soil decontamination"
in: "Treatment of contaminated soil",
R. Stegmann, G. Brunner, W. Calmano, G. Matz (eds.)
Springer Verlag, Heidelberg 325 (2001)

PhD Students since 2001

Group	Name	Year	Title
Müller	K. Otto	2001	Characterisation of Thermostable Alkane Oxidising System
Müller	A. Abdel-Megeed	2004	Psychrophilic Degradation of Long Chain Alkanes
Müller	J. Schillbach	2005	Entwicklung und Optimierung eines biotechnologischen Verfahrens zur Herstellung von Proteinschaummitteln
Müller	A. Göttsche	2005	Die toxische Wirkung von Ölsäure auf Geobacillus thermoleovorans IHI-91 und Strategien zur Problemlösung

Prof. Dr. Bernd Niemeyer

born 10.12.1957

www.separations.hsu-hh.de
www.hsu-hh.de/MWEB/ift/fvs/fvs.html

1980 - 1986	Studies of Chemical Engineering at the University of Erlangen-Nuremberg, Germany (Graduation: Diplom-Ingenieur) (Professor Dr. H. Tiltscher)
1986 - 1990	Doctoral Thesis at the University of Erlangen-Nuremberg with Professor Dr. H. Tiltscher (Topic: "Reaction Engineering Investigations into Affinity Separation Technique at High Pressures") (Graduation: Dr.-Ing.)
1990 - 1991	DFG postdoctoral fellow at: Department of Scientific and Industrial Research (DSIR), Chemical and bio process engineering, Lower Hutt, New Zealand
1991 - 1995	Project engineer and Project leader: Concept, design, construction, and commencement of a waste incineration plant for special waste
1995 - 1996	Senior project manager with power of attorney: Economical evaluation and steering of several municipal waste incineration plants
since 1996	C3 professor for Process Engineering, with Focus on Separation Technologies (Helmut Schmidt University, HSU) in combination with the Head of the research group Selective Separations (GKSS Research Centre Geesthacht, GKSS)
1987 - 1990	DFG-SFB 222: Subproject C8 "Biospecific Separation Applying the Effect of High Pressures"
	1997 - 1999 DFG-SFB 188: Subproject A8 "Separation of PAH from Contaminated Soil
	Steam Stripping Technique"
1999	Organisation and Chairman of the Conference: "Contaminated Sludges - Treatment and Possibilities for Reuse of Fine Particle Waste"
2001 - 2004	Coordinator of the BMBF-Food network project: "Innovative Methods for Analyses and Reduction of Odour Emissions from Agriculture and Food Industry", each 9 partners from Universities and Industry, total financial volume: 2.9 Mio EUR
2004 - 2006	Coordinator of the BMBF-Food network project: "Selective Minimization of Odour Emissions from Food Industry", 6 partners from Universities, and 11 from Industry, Industry, total financial volume: 1.2 Mio EUR
2004, 2006	Organisation and Chairman of the BMBF status seminars: "Separation of Odorous Compounds"

since 1996

- ca. 35 publications in international, scientific, refereed journals
- ca. 40 (invited) oral presentations at international conferences universities, research institutions, and industry laboratories
- over 90 poster presentations at international conferences
- 15 PhD theses supervised and successfully finished
- 2 Habilitations supervised and successfully finished

Selection of Publications:

[1] B. Niemeyer and J. Jansen
"An Innovative Approach for Sorptive Separation of Amphiphilic Biomolecules Applying High Hydrostatic Pressure"
J. Supercritic. Fluids (2006) in print

[2] P. Konidala, L.-Z. He and B. Niemeyer
"Molecular Dynamics Characterization of n-Octyl-beta-D-Glucopyranoside Micelle Structure in Aqueous Solution"
J. Mol. Graph. Model. (2006) in print

[3] G. Butschak, U. Karsten, U. Schelhaas, H.Ott, A. Emmendörffer, B. Niemeyer, H. Helmholz and S. Goletz
"Detection, Isolation and Partial Characterization of an Immunostimulating Glycoprotein from Rhodococus fascians"
Int. Immunopharmacalog. **6**, 1441 (2006)

[4] P.H. Thiesen, H. Rosenfeld, P. Konidala, V.M. Garamus, L.-Z. He, A. Prange and B. Niemeyer
"Glycolipids from a Colloid Point of View"
J. of Biotechnol. **124**, 284 (2006)

[5] M. Siwek, B. Galunsky and B. Niemeyer
"Isolation of Selenium Organic Species from Antarctic Krill after Enzymatic Hydrolysis"
Anal. Bioanal. Chem. **381**, 737 (2005)

[6] H. Helmholz, S. Cartellieri, L.-Z. He, P.H. Thiesen and B. Niemeyer
"Process Development in Affinity Separation of Glycoconjugates with Lectins as Ligands"
J. Chromatography A **1006**, (2003)

[7] L.-Z. He and B. Niemeyer
"A Novel Correlation for Protein Diffusion Coefficients Based on Molecular Weight and Radius of Gyration"
Biotechnol. Prog. **19**, 544 (2003)

[8] L.-Z. He, S. Andre, H.-C. Siebert, H. Helmholz, B. Niemeyer and H.-J. Gabius
"Detection of Ligand- and Solvent-induced Shape Alteration of Cell-Growth-Regulatory Human Lectin Galectin-1 in Solution by Small Angle Neutron and X-ray Scattering"
Biophys. J. **85**, 511 (2003)

[9] L.-Z. He, V. Garamus, S.S. Funari, M. Malfois, R. Willumeit and B. Niemeyer
"Comparison of Small Angle Scattering Methods for the Structural Analysis of Octyl-beta -Maltopyranoside Micelles"
J. Phys. Chem. B **106**, 7596 (2003)

[10] B. Niemeyer, Th. Feilenreiter, and H. Tiltscher
"Theoretical Studies on Biospecific Adsorption for Large-Scale Affinity Separations"
Chem. Eng. Sci. **51**, 5263 (1996)

PhD Students since 2001

Group	Name	Year	Title
Niemeyer	J. Höhne	2001	Entwicklung eines Verfahrens zur Abtrennung organischer Schadstoffe aus feinkörnigen Bodenmaterialien durch gekoppelten Einsatz von Wasserdampfdestillation und Desorption
Niemeyer	O. Braaß	2002	Selektive Abtrennung von Alkoholdehydrogenase aus Bäckerhefe durch Anwendung hoher Drücke
Niemeyer	L. He	2002	Self-assembly and Fundamental Aspects of Affinity Adsorption of Glycoconjugates
Niemeyer	S. Cartellieri	2002	Entwicklung eines biospezifischen Trennverfahrens für die Fraktionierung und Aufreinigung von Glykokonjugaten
Niemeyer	K. Li	2004	The Dynamic Behaviour of Multi-stream Heat Exchangers and their Networks
Niemeyer	J. Jansen	2005	Steuerung der sorptiven Stofftrennung durch Wirkung hoher Drücke
Niemeyer	A. Cartellieri	2005	Entwicklung von Adsorptionstrennverfahren zur Geruchsminimierung
Niemeyer	V. Behrens	2005	Entwicklung und Markteinführung von Schutz-systemen mit regenerativen Filtermaterialien zur selektiven Adsorption von Luftschadstoffen
Niemeyer	H. Rosenfeld	2006	Interaction Investigations of Lectins to Glycoproteins and Glycolipids with Regard to their Application in Affinity Separation Processes
Niemeyer	P. Konidala	2006	Molecular Dynamics Simulations of Glycolipid and Carbohydrate Binding Protein Systems in the Explicit Water Environment
Niemeyer	Z. Wen	2006	Fundamental Studies of Affinity Separation of Glycoconjugates and its Combination with Expanded Bed Adsorption Technique

Prof. Dr. Marc Heinrich Prosenc

born 24.06.1966

www.chemie.uni-hamburg.de/ac/Aks/Prosenc

1986 - 1993	Studies of chemistry at the University of Konstanz, Germany
1993	Diploma in chemistry (Topic: Structures and Force Field Models of Ansa-Zicronocene Complexes) with Professor Dr. H. H. Brintzinger
1994	Research scholar at BASF AG, Ludwigshafen
	Project: "Calculations of Force Field Constants for Molecular Mechanics
	using Quantum Chemical Methods"
1998	Dr. rer. nat. ("summa cum laude") at the University of Konstanz (Topic: Calculations on Zirconocene Catalysis) with Professor Dr. H.-H. Brintzinger
1998 - 2000	Postdoctoral fellow at the University of North Carolina at Chapel Hill
2000	Guest professorship at the summer school of the University of Helsinki
2000 - 2003	Research fellow of the DFG at the University of Hamburg
2002	Teaching substitute for Professor Dr. J. Heck, University of Hamburg
since 2003	Offer for a juniorprofessor position (W1) for organometallic chemistry and catalysis at the University of Hamburg
since 2001	Member of the DFG-priority program 1118 "Secondary Interactions as Steering Principle the Selective Fictionalization of Non-Reactive Substrates"
since 2003	Member of the state funded program "Online Seminars and E-Learning"
since 2004	Member of the DFG-priority program 1178 "Experimental Electron Density".
since 2006	Member of the DFG-Collaborative Research Centre 668 "Magnetism from the Single Atom to Nanostructure"
since 2006	Member of the executive board of the Collaborative Research Centre 668
since 2006	Member of the applied (decision october 2006) Cluster of Excellence "Atomic Taylored Materials and Quantum Nanoprobes"
since 1989	- ca. 30 publications in international, scientific, refereed journals
	- ca. 15 (invited) talks at international conferences, universities, research institutions, and industry laboratories
	- ca. 20 poster presentations at international conferences
	- 1 patent
	- fund raising: ca. 475.000 Euro from peer-review based research projects and ca. 150.000 Euro for investments in buildings and big equipment

Selection of Publications:

[1] F. Zhang, M.H. Prosenc and J. Heck
"Synthesis and Characterization of Dinuclear monohydro Sesquifulvalene Complexes with Potential NLO Properties"
J. Organomet. Chem. **691**, 455 (2006)

[2] H.R. Kircheldorf, L. Vakhtangishvili, G. Schwarz and M.H. Prosenc
"Multicyclic Polyethers with Pendant Keto Groups by Polycondensation of Sylated 1,1,1-tris (4-hydroxyphenyl)ethane"
J. Polym. Sci. **43**, 6233 (2005)

[3] T. Meyer-Friedrichsen, H. Wong, M.H. Prosenc and J. Heck
"Vinylogue Mono- and Bimetallic Sesquifulvalene and Monohydro Sesquifulvalene Complexes for Second Harmonic Generation"
Eur. J. Inorg. Chem. 936 (2003)

[4] M. Brookhart, B. E. Grant, C. P. Lenges, M. H. Prosenc and P. S. White
"High Oxidation State Organometallic Cobalt Complexes: Synthesis and Characterization of Dihydridodisilyl Cobalt(V) Species"
Angew. Chem. **112**, 1742 (2000)

[5] S. Lieber, M.H. Prosenc and H.-H. Brintzinger
"Zirconocene allyl complexes - dynamics in solution, reactions with aluminum alkyls, $B(C_6F_5)_3$-induced propene insertion and density functional calculations on possible formation and reaction modes"
Organometallics **19**, 377 (2000)

[6] M.H. Prosenc, F. Schaper and H.H. Brintzinger
"Chain growth in zirconocene-catalyzed olefin polymerization - DFT studies on possible paths and the influence of a second olefin ligand"
in "Metalorganic catalysts for synthesis and polymerization", W. Kaminsky (ed.), Springer-Verlag, Berlin, 223 (1999)

[7] H.-H. Brintzinger, M.H. Prosenc, F. Schaper, A. Weber and U. Wieser
"Alternative force-field models for ansa-zirconocene complexes – vibrational and structural studies on Me_2Si-bridged and tert.-butyl-substituted representatives"
J. Mol. Structure **485/486**, 409 (1999)

[8] M.H. Prosenc and H.-H. Brintzinger
"Zr-Alkyl isomerizations in zirconocene catalyzed olefin polymerization: A density functional study"
Organometallics, **16**, 3889 (1997)

[9] S. Harder and M.H. Prosenc
"The heaviest alkali metallocene: Structure of an anionic cesocene triple-decker"
Angew. Chem., Int. Ed. **35**, 97 (1996)

[10] S. Harder and M.H. Prosenc
"The simplest metallocene sandwich - the lithocene anion"
Angew. Chem., Int. Ed. **33**, 1744 (1994)

PhD Students since 2001

Group	Name	Year	Title
Prosenc	J. He	ongoing	Synthesis and Reactivity of Dinuclear Schiff-Base Complexes
Prosenc	S. May	ongoing	Influence of an Axial Ligand on Electronic Properties of Cobalamine Model Complexes
Prosenc	T. Werner	ongoing	Synthesis of Late-Metal Hydride Complexes and their Reactivity towards CO_x
Prosenc	H. Henschel	ongoing	Molecular Embedding and Imprinting of Late-Transition Metal Catalysts
Prosenc	M. Dürkop	ongoing	Studies on Elemetary Reaction Steps of the Hydrogenation of CO

Prof. Dr. Dieter Rehder (Graduate Dean)

born 22.02.1941

www.chemie.uni-hamburg.de/ac/rehder/index.html

1961 - 1970	Studies of Chemistry at the University of Hamburg
1967	Diploma in Chemistry (Topic: Cyanovanadium Complexes) with Prof. Dr. R. Nast
1970	Dr. rer. nat. at the University of Hamburg (Topic: Mixed Carbonyl,- Cyano- and Cyclopentadienyl Complexes of V(+I), V(0) and V(-I)) with Prof. Dr. R. Nast
1968 - 1973	"Assistent" at the Chemistry Department, University of Hamburg
1970 - 1972	Lecturer at the College for Tobacco Technology and Bio-Engineering in Hamburg-Bergedorf
1973 - 1975	Lecturer at the College of Arts Science & Technology, Kingston/Jamaica (on behalf of the German Volunteer Service) and at the Institute for Sugar Technology in Kingston/Jamaica
1975 - 1979	"Assistent 2. Phase/Hochschulassistent", and habilitation at the University of Hamburg
1979	Habilitation (Topic: ^{51}V Nuclear Magnetic Resonance) and appointment as "Privatdozent", University of Hamburg
since 1984	C2 Professor, University of Hamburg
1990 - 1996	Member of the DFG priority programme "Bioinorganic Chemistry"
1999 - 2006	Coordinator of the COST actions D8-0022-99 and D21-0009-01 ("Insulin-mimetic Vanadium compounds") and member of the COST action D29-0016-03 ("Sustainable Oxidations with Hydrogen Peroxide and Molecular Oxygen")
- since 2001	Member and Coordinator (2001-2003, since Oct. 2005) of the Graduiertenkolleg 611 ("Design and Characterisation of Functional Materials")
	- Participant in various DAAD-supported projects, among these bilateral long-term ventures with France (E. Rose, Paris), Japan (T. Hirao, Kyoto and S. Yano, Nara) and Sweden (L. Pettersson, Umeå; E. Nordlander, Lund).
	- various DFG grants ("Normalverfahren")
	- Acting Director of the Institute of Inorganic and Applied Chemistry (1992/1993) and 2002/2003).
	- Granting of the "Vanadis Award", Sept. 2006 (on occasion of the ACS meeting/5th Int. Vanadium Symp. in San Francisco)

Research and teaching activities:

Biological and medicinal chemistry of vanadium, biomineralisation, organometallic chemistry of early transition metals, polyoxometalates, thiomolybdenum and -tungsten clusters, metal NMR spectroscopy

255 published papers in peer-reviewed journals, among these 23 review articles on metal NMR and biological/medicinal aspects of vanadium

Selection of publications

[1] D. Rehder, E.T.K. Haupt, H. Bögge, A. Müller
"Counter cation transport modelled by porous spherical molybdenum-oxide based nano-capsules"
Chem. Asian J. **1**, 76 (2006)

[2] M. Ebel and D. Rehder
"The interaction of vanadyl (VO^{2+}) with ligands containing serine, tyrosine and threonine"
Inorg. Chem. in press (2006)

[3] J. Gätjens, B. Meier, Y. Adah, H. Sakurai and D. Rehder
"Characterization and insulin-mimetic potential of oxovanadium(IV) complexes derived from 5-esters and 5-aminoacid amides of 2,5-dipicolinic acid",
Eur. J. Inorg. Chem. in press (2006)

[4] Artificial cells: Temperature-Dependent Reversible Li^+-Ion Uptake/Release Equilibrium at Metal-Oxide Nanocontainer Pores
A. Müller, D. Rehder, E.T.K. Haupt, A. Merca, H. Bögge, M. Schmidtmann, G. Heinze-Brückner
Angew. Chem. Int. Ed. **43**, 4466 (2004)

[5] M. Časný and D. Rehder
"Molecular and supramolecular features of oxo-peroxovanadium complexes containing O_3N, O_2N_2 and ON_3 donor sets",
J. Chem. Soc., Dalton Trans. 839 (2004)

[6] G. Santoni, G.M. Licini and D. Rehder
"Oxo-transfer to prochiral sulfides catalyzed by oxovanadium(V) compounds that model the active center of haloperoxidases",
Chem. Eur. J. **9**, 4700 (2003)

[7] D. Rehder, J. Costa Pessoa, C.F.G.C. Geraldes, M.M.C.A. CastroT. Kabanos, T. Kiss, B. Meier, G. Micera, L. Pettersson, M. Rangel, A. Salifoglou, I. Turel and D. Wang
"*In vitro* study of the insulin-mimetic behaviour of vanadium(IV, V) co-ordination compounds",
J. Biol. Inorg. Chem. ***7***, 384 (2002)

[8] D. Rehder
"Bioinorganic chemistry of vanadium"
Angew. Chem., Int. Ed. **30**, 148 (1991)

[9] C. Woitha, D. Rehder
"Functional models for the "alternative nitrogenase"
Angew. Chem., Int. Ed. Engl. **29**,1438 (1990)

[10] D. Rehder
"Vanadium-Nitrogenase"
J. Inorg. Biochem. **80**, 133 (2000)

PhD Students since 2001

Group	Name	Year	Title
Rehder	H. Nekola	2001	Vadiumkomplexe mit thiofunktionellen Liganden als Modellverbindungen für die Vanadium-Nitrogenase
Rehder	C. Grüning	2002	Modellverbindungen Vanadium-abhängiger Oxigenasen
Rehder	D. Wang	2002	Vanadium Complexes and Clusters for (Potential) Industrial and Medicinal Application
Rehder	M. Časný	2003	Oxoperoxokomplexe des Vanadiums als Modelle für das active Zentrum vanadatabhängiger Peroxidasen
Rehder	G. Santoni	2003	Modellkomplexe für die Sulfoxigenase-Aktivität vanadatabhängiger Haloperoxidasen
Rehder	J. Gätjens	2004	Insulin-mimetische Picolinatovanadium-Verbindungen
Rehder	A. Behrens	2005	Thiofunktionelle Vanadium- und Molybdänkomplexe
Rehder	M. Ebel	2005	Vanadium(IV)komplexe OH-funktioneller Aminosäuren
Rehder	C. Wikete	2006	Enantioselektive Oxidation prochiraler Sulfide mit Modellen vanadatabhängiger Haloperoxidasen
Rehder	V. Kraehmer	ongoing	Modelle für die Substratbindung durch vanadatabhängige Haloperoxidasen
Rehder	H. Esbak	ongoing	Insulin-mimetische Vanadiumverbindungen mit Aminosäurederivaten der 1,5-Dipicolinsäure
Rehder	P. Wu	ongoing	Sulfoxygenation with Molecular and Immobilised, Aminoalcoholate-based Vanadium Complexes

Prof. Dr. Paul Anton Scherer

born 20.11.1949

www.haw-hamburg.de/?4357 and www.haw-hamburg.de/?3423

1968 - 1971	Studies of Biology and Chemistry at the Technical University of Aachen, Germany
1971 - 1973	Studies of Biology and Chemistry at the Ruhr University of Bochum, Germany
1974	State examination in Biology with Prof. Dr. Dr. h.c.(mult) Karl Esser (Experimental Topic: Heterogenic Incompatibility and its Importance for Evolution, with Respect to Own Experimental Results), and Chemistry with Prof. A. Kettrup, Ruhr University of Bochum
1975 - 1978	Dr. rer. nat. ("summa cum laude") at the Ruhr University Bochum and at the Philipps University Marburg (Experimental Topic: Isolation and characterization of the CO_2-Reductase from Clostridium pasteurianum, a New Iron-Sulfur-Molybdoprotein) with Prof. Dr. R. Thauer Bochum/Marburg
1978 - 1982	Postdoctoral time at the Institute of Biotechnology of the Research Center Jülich (Prof. Dr. H. Sahm)
1982 - 1983	C1 assistant at the Department of Microbiology of the University of Hamburg (now part of the Biozentrum Klein Flottbek)
1983 - 1991	C2 professorship for Microbiology and Biotechnology at the University of Applied Sciences Weihenstephan. Building up with colleagues the new department of Biotechnology.
since 1991	Appointment as C3 professor to the Hamburg University of Applied Sciences (Campus Bergedorf). Setup of the new study path Biotechnology.
1992	Appointment as C3 professor for Microbiology of the Recycling Processes at the Justus Liebig University Giessen.
1996	Member of the research cooperation "Mechanical Biological Treatment of Waste to be Deposited", together with 16 working groups of research institutes and universities
1999	Appointment as speaker of the working group Anaerobic Digestion of the German Corporation of Environmental Engineering (DWA, 16 000 members, Bad Hennef, Germany)
2001	Speaker of the research center "Lifetec Process Engineering" of the Hamburg University of Applied Sciences
2005	Member of the research cooperation "Biogas Crops Network, together with 9 working groups of research institutes and universities, www.biogas-network.de.

since 1975	- ca. 25 publications in refereed journals, - ca. 25 book or review contributions - ca. 70 conference papers including qotable poster abstracts 5 enrollments of the German Patent office
since 1983	- 159 supervisions of a diploma thesis, most of them outside the HAW University, some in other countries

Selection of Publications:

[1] P. Scherer
"Anaerobically Digested Beets Cause Measurement Results"
Biogas Journal **1/06**, 14 (2006)

[2] P. Scherer, S. Dobler, S. Rohardt, R. Loock, B. Büttner, P. Nöldeke and A. Brettschuh
"Continuous biogas production from fodder beet silage as sole substrate"
Water Sci. Technol. **48(4)**, 229 (2003)

[3] P. Scherer
"Process Variants of Anaerobic Digestion"
In: Biological Waste Treatment, Encyclopedia of the Circuit Economy, p 373-403, K.J. Thomé-Kozmiensky, ed., EF Publisher of Energy and Environmental Engineering, Berlin (now TK Publisher, Neuruppin), (1995)

[4] P. Scherer
"Vanadium and molybdenum requirement for the fixation of molecular nitrogen by two Methanosarcina strains"
Arch. Microbiol. **151**, 44 (1989)

[5] P. Scherer, V. Höllriegel, C. Krug, M. Bokel and P. Renz
"On the biosynthesis of 5-hydroxybenzimidazolylcobamide (vitamin B12-Factor III) in Methanosarcina barkeri"
Arch. of Microbiol. **138**, 354 (1984)

[6] P. Scherer, A. Ludwig and P. Fortnagel
"Pool sizes of high-energy compounds during growth of Methanosarcina barkeri on methanol"
Syst. Appl. Microbiol. **5** (1984)

[7] P. Scherer and H. Kneifel
"Distribution of polyamines in methanogenic bacteria"
J. Bacteriol. **154**, 1315 (1983)

[8] P. Scherer, H. Lippert and G. Wolff
"Composition of the major elements and trace elements of 10 methanogenic bacteria as determined by inductively-coupled plasma emission spectrometry"
Biol. Trace Element Res. **5**, 149 (1983)

[9] R.K. Thauer, B. Käufer and P. Scherer
"The active species of "CO_2" utilized in ferredoxin-linked carboxylation reactions"
Arch. Microbiol. **104**, 273 (1975)

[10] P. Scherer and R.K. Thauer
"Purification and properties of reduced ferredoxin: CO_2 oxidoreductase from Clostridium pasteurianum, a molybdenum iron-sulfur-protein"
Eur. J. Biochem. **85**, 125 (1978)

PhD Students since 2001

Group	Name	Year	Title
Scherer	N. Krakat	ongoing	Molecular Investigations on the Population Dynamics in Automated High Throughput Anaerobic Digesters to Produce Biogas from Plant Biomass
Scherer	L. Neumann	ongoing	Characterization of the Microbial Diversity in Automated Biogas Reactors by Digital Image Analyses and Molecular Methods

Prof. Dr. Thomas Straubhaar (Research Field Coordinator)

born 2.08.1957

www.hwwi.org/Thomas_Straubhaar.85.0.html

1981	Lic. rer. pol., University of Berne
1983	PhD, University of Berne
1985 - 1986	Postdoctoral Fellow, University of California Berkeley, USA
1987	Habilitation, University of Berne, Switzerland
1990 - 1991	Guest Lecturer, University of Konstanz, Germany
1989 - 1992	Assistant Professor of Economics, University of Basel
1991 - 1992	Guest Professor of Economics, University of Freiburg i.Br., Germany
1992 - 1999	Professor of Economics, University of Federal Armed Forces, Hamburg
since 1991	Member of the Council for Population Economics at the Verein für Socialpolitik
1992 - 2004	CEPR Research Fellow, Centre for Economic Policy Research, London
since 1994	Member of the Council for Economic Policy at the Verein für Socialpolitik
	Ph.D. Advisor at the Friedrich-Naumann Foundation
since 1998	Director at the Europa-Kolleg Hamburg - Institute for Research on Integration Issues at the University of Hamburg)
	Dean of the post graduate school (Graduiertenkolleg) "PhD studies in European Integration Research" of the University of Hamburg/University of Federal Armed Forces, Hamburg
since 1999	Professor of Economics, University of Hamburg, Germany President of the Hamburgische Welt-Wirtschafts-Archiv (HWWA)
since 2001	Executive beard member of the ARGE Full member of the Joachim Jungius Society of Science, Hamburg
2001 -2 005:	President of the ARGE (Arbeitsgemeinschaft deutscher wirtschaftswissen-schaftlicher Forschungsinstitute - Working Group of the German Economic Research Institutes)
since 2004:	Research Fellow at the Institute for the Study of Labor, Bonn Responsible for programme planning of economics at the Bucerius Law School, Hamburg
since 2005:	Member of the Academy of Sciences Hamburg Director of the Hamburg Institute of International Economics (HWWI) Policy Fellow at the Institute for the Study of Labor, Bonn

Selected Publications

[1] T. Straubhaar
"Wachstum und Beschäftigung im Gesundheitswesen. Beschäftigungswirkungen eines modernen Krankenversicherungssystems"
Nomos Verlagsgesellschaft, Baden-Baden (2006)

[2] T. Straubhaar
"Abstieg eines Superstars? - Wirtschaftliches Wachstum und Wohlstand in Deutschland"
in: "Wirtschaftsstandort Deutschland", S. Empter, R.B. Vehrkamp (Hrsg.)
Schriften der Zeppelin Universität, 33 (2006)

[3] T. Straubhaar and R. Münz
"Migrants and the European Labor Market"
in: "Europe and its Immigrants in the 21st Century - A new Deal or a Continuing Dialogue of the Deaf?", D.G. Papademetriou (ed.)
Migration Policy Institute 121 (2006)

[4] T. Straubhaar und G. Weinert
"Der weltwirtschaftliche Aufschwung"
in: "Jahrbuch Internationale Politik 2003/2004"
R. Oldenbourg Verlag, München S. 143 (2006)

[5] T. Straubhaar
"Ökonomik der Reform"
in: "Innovation und Reform", N. Dallmann und M. Seiler (Hrsg.)
Lucius & Lucius, Stuttgart (2006)

[6] T. Straubhaar
"Der Wirtschaftsstandort Deutschland"
in: "Tatsachen über Deutschland", Societäts-Verlag, Frankfurt am Main (2005)

[7] T. Straubhaar und A. Michaelowa
"PPP in der Entwicklungszusammenarbeit"
in: "Das neue Miteinander Public Private Partnership für Deutschland",
L. Pauly (Hrsg.):
Hoffmann und Campe, Hamburg, S. 311 (2006)

[8] T. Straubhaar, H. Rentsch, S. Flückiger, T. Held, Y. Heiniger
"Ökonomik der Reform - Wege zu mehr Wachstum in der Schweiz"
HWWA und Avenir Suisse, Orell Füssli Verlag, Zürich (2004)

[9] T. Straubhaar
"Migration im 21. Jahrhundert - Von der Bedrohung zur Rettung sozialer Marktwirtschaften?"
in: "Beiträge zur Ordnungstheorie und Ordnungspolitik des Walter Eucken Instituts"
Freiburg, Tübingen (2002)

[10] T. Straubhaar
"Gesamtwirtschaftliche Auswirkungen der Erhöhung der Versicherungsteuer"
"GDV Volkswirtschaft Themen & Analysen"
(Berlin), **5**, (2002)

PhD Students since 2001

Group	Name	Year	Title
Straubhaar	S. Mahroun	2001	The International Mobility of Academics: The UK Case
Straubhaar	P. Dreyhaupt	2001	Die Regionen Polens, Ungarns und der Tschechischen Republik vor dem EU-Beitritt (Interregionale Disparitäten, Bestimmungsfaktoren und Lösungsansätze)
Straubhaar	S. Greiner	2002	Lokale Agenda für globale Probleme? Zur Entwicklung und Umsetzung von Nachhaltigkeitsstrategien aus institutionenökonomischer Sicht
Straubhaar	H. Schmiedel	2003	Performance of International Securities Markets. A Study of Economies of Scale, Efficiency, and Innovation of Stock Exchanges and Securities Settlement Systems.
Straubhaar	H. Cigan	2004	On the Economic Geography of the Weightless Economy: An Econometric Analysis of the Location Choices of Internet Firms in Germany
Straubhaar	S. Shin	2004	Kyoto-Protokoll, internationaler Handel und WTO-Handelssystem: Neue Politische Ökonomie der Interaktionen zwischen Klima- und Handelspolitik
Straubhaar	S. Bode	2004	On the Design of the International Climate Policy Regime
Straubhaar	K. Kirchesch	2004	The Influence of Financial Risks on the Investment Decision of Enterprises
Straubhaar	M. Jung	2005	Integration forstlicher Senken und Weiterentwicklung der internationaler Klimapolitik
Straubhaar	S. Callsen	ongoing	Development of a Carbon Rating related to Emissions Trading
Straubhaar	M. Anwar	ongoing	The Political Economy of Aid to Pakistan
Straubhaar	F. Vadean	ongoing	The Economics of Migrants' Remittances
Straubhaar	M. Steinhardt	ongoing	Migration und Arbeitsmarkt

Prof. Dr. Wolfgang Streit (Research Field Coordinator)

born 02.03.1964

www.mikrobiologie-hamburg.de

1984 - 1989	Studies of Biology (Microbiology), University of Marburg
1989	Diploma in Biology
1990 - 1993	PhD Thesis in Marburg at the Dept. of Biology (Prof. Werner)
1994	Postdoctoral Fellow at the University of Marburg (Prof. Werner)
1995 - 1997	Feodor-Lynen (Alexander-von-Humboldt) Postdoctoral Fellow at the University of California, Davis
1998	Habilitation stipend of the Deutsche Bundesumweltstiftung and Postdoctoral Fellow at the University of Bielefeld (Prof. Pühler)
1998 - 2004	Group leader at the University of Göttingen (Microbiology Dept) and Habilitation
2003	Habilitation and *venia legendi* in microbiology
2004 - 2006	C3 Professor at the University of Essen for Molecular EnzymeTechnology
since 2006	W3 Professor at the University of Hamburg for Microbiology

since 1989

- 32 publications in peer-reviewed journals
- 20 invited talks at international conferences
- 50 poster presentations

Fund raising: A total of about 2.2 Mio .€ ; 1 EU project on metagenomics; BMBF Genomik network and GenomikPlus network ; 1 DBU grant and one ICBIO network project; about 150.000 Euro for equipment; and several industry projects

Selection of Publications:

[1] C. Elend, C. Schmeisser, C. Leggewie, P. Babiak, J.D. Carballeira, H.L. Steele, J.L. Reymond, K.E. Jaeger and W.R. Streit
"Isolation and biochemical characterization of two novel metagenome-derived esterases"
Appl Environ Microbiol **72**, 3637 (2006)

[2] S. Voget, H.L. Steele and W.R. Streit
"Characterization of a metagenome-derived halotolerant cellulose"
J. Biotechnol. in press *(*2006)

[3] W. Van Dessel, L. Van Mellaert, H. Liesegang, C. Raasch, S. De Keersmaeker, N. Geukens, E. Lammertyn, W.R. Streit and J. Anne
"Complete genomic nucleotide sequence and analysis of the temperate bacteriophage VWB"
Virology **331**, 325 (2005)

[4] W.R. Streit and R.A. Schmitz
"Metagenomics - the key to the uncultured microbes"
Curr. Opin. Microbiol. **7**, 492 (2005)

[5] W.R. Streit, R.A. Schmitz, X. Perret, C. Staehelin, W.J. Deakin, C. Raasch, H. Liesegang and W.J. Broughton
"An evolutionary hot spot: the pNGR234b replicon of Rhizobium sp. strain NGR234"
J. Bacteriol. **186**, 535 (2004)

[6] S. Voget, C. Leggewie, A. Uesbeck, C. Raasch, K.E. Jaeger and W.R. Streit
"Prospecting for novel biocatalysts in a soil metagenome"
Appl. Environ. Microbiol. **69**, 6235 (2003)

[7] C. Schmeisser, C. Stockigt, C. Raasch, J. Wingender, K.N. Timmis, D.F. Wenderoth, H. C. Flemming, H. Liesegang, R. A. Schmitz, K. E. Jaeger and W.R. Streit
"Metagenome survey of biofilms in drinking-water networks"
Appl. Environ. Microbiol. **69**, 7298 (2003)

[8] C. Raasch, M. Armbrecht, W. R. Streit, B. Hocker, N. Strater and W. Liebl
"Identification of residues important for NAD^+ binding by the Thermotoga maritima alpha-glucosidase AglA, a member of glycoside hydrolase family 4"
FEBS Lett. **517**, 267 (2002)

[9] P. Entcheva, W. Liebl, A. Johann, T. Hartsch and W.R. Streit
"Direct cloning from enrichment cultures, a reliable strategy for isolation of complete operons and genes from microbial consortia"
Appl. Environ. Microbiol. **67**, 89 (2001)

[10] C. Raasch C, W. R. Streit, J. Schanzer, M. Bibel, U. Gosslar and W. Liebl
"Thermotoga maritima AglA, an extremely thermostable NAD^+-, Mn^{2+}-, and thiol-dependent alpha-glucosidase"
Extremophiles **4**,189 (2000)

PhD Students since 2001

Group	Name	Year	Title
Streit	E. Heinz	2002	Molekulare Analyse des Biotin-regulatorischen Netzwerks in Sinorhizobium meliloti durch Proteomanalyse, Expressionsstudien und Mutagenesen
Streit	P. Entcheva	2003	Umwelt-Genomik als Quelle für die Isolierung von neuen Operons und Genclustern aus mikrobiellen Konsortien
Streit	C. Schmeisser	2004	Metagenomanalyse eines Multispezies-Biofilms: Biochemische Charakterisierung und Kristallisierung der ersten multimeren Esterase aus einem bisher nicht kultivierten Mikroorganismus
Streit	C. Stöckigt	2004	Konstruktion und Durchmusterung von Metagenombanken: Identifizierung und Charakterisierung von neuartigen amylolytischen Enzymen
Streit	S. Voget	2005	Metagenomanalyse eines hydrolytischen Konsortiums: Identifizierung und biochemische Charakterisierung von Polysaccharid-abbauenden Biokatalysatoren aus nicht kultivierten Mikroorganismen
Streit	C. Elend	2006	Metagenombasierte Isolierung und biochemische Charakterisierung neuartiger stereospezifischer und enantioselektiver Lipasen für biokatalytische Anwendungen
Streit	J. Nellen	2006	Metagenomanalysen von Space-Craft-Assembly Stationen
Streit	C. Schipper	ongoing	Quorum-Sensing Strategien in kultivierten und nicht-kultivierten Bodenorganismen
Streit	J. Pottkämper	ongoing	Enzymkatalyse in Ionischen Flüssigkeiten
Streit	Bijtenhoorn	ongoing	Kleine Signalmoleküle als Antagonisten im mikrobiellen Quorum-Sensing
Streit	D. Krysziakr	ongoing	Quorum-Sensing und Anti-Quorsum-Sensing-Mechanismen in Rhizobium sp. NGR234

Prof. Dr. Joachim Erich Thiem

born 10.12.1941

www.chemie.uni-hamburg.de/oc/thiem

1963 - 1969	Study of Chemistry at the University of Hamburg, Germany
1972	Dr. rer. nat., Organic Chemistry (Prof. Dr. H. Paulsen)
1978	Habilitation, Organic Chemistry, University of Hamburg, Germany
since 1982	J. Carbohydr. Chem., Regional Editor
1983 - 1989	C3 Professor, Westfälische Wilhelms-University of Münster, Germany
1984 - 1992	Coordinator, BMFT-Program Saccharides
1984 - 1985	Visiting Prof., University California, Berkeley, CA, USA
since 1987	German Representative, European Carbohydrate Organization (ECO)
since 1989	C4 Professor, University of Hamburg, Germany
1990 - 2002	Carbohydr. Res., Member Editorial Board
since 1990	German Representative, Internat. Carbohydrate Organization (ICO)
1990 - 1992	Acting Director, Institut of Organic Chemistry
1992	Call to Chair DTU, Lynby-Copenhagen, DK, declined
since 1992	Topics Curr. Chem., Member Editorial Board
1993	Visiting Prof., Victoria University and IRL, Wellington, NZ
1995	Visiting Prof., CERMAV-CNRS, Grenoble, France
since 1997	Speaker, Sonderforschungsbereich 470 "Glycostructures in Biosystems"
since 1998	Glycoscience I-III, Coeditor
1999 - 2004	Member, Graduiertenkolleg 464 "Glycoconjugates"
2000	Chairman 20th International Carbohydrate Symposium Hamburg
2001	Heyrovsky Medal, Czech Academy of Sciences, Prague, CZ
2002 - 2005	Dean, Department of Chemistry
2005 - 2006	Visiting Professor, The Scripps Research Institute, La Jolla, CA, USA

since 1971	- 388 publications including 25 patents - 292 lectures at universities, industries, symposia
since	- Fund rising from public funds (DFG, VW-Stiftung, BMBF) 710.000 DM and 485.000 €

Selection of Publications:

[1] L. Kröger, A. Scudlo and J. Thiem
"Subsequent Enzymatic Galactosylation and Sialylation Towards Sialylated Thomsen Friedenreich Antigen Components"
Adv. Synth. Catal. **348**, 1217 (2006)

[2] B. Neubacher, S. Scheid, S. Kelm, A. C. Frasch, B. Meyer and J. Thiem
"Synthesis of Neu5Ac oligosaccharides and analogues bytransglycosylation and their binding properties as ligands to MAG"
Chem.Bio.Chem. **7**, 896 (2006)

[3] D. Henkensmeier, B. C. Abele, A. Candussio and J. Thiem
"Synthesis of Carbohydrate-Segmented Polydimethylsiloxanes by Hydrosilylation"
J. Polym. Science A, Polym. Chem. **43**, 3814 (2005)

[4] B. Neubacher, D. Schmidt, P. Ziegelmüller and J. Thiem
"Preparation of Sialylated Oligosaccharides Employing Trans-Sialidase from *Trypanosama cruzi*"
Org. Biomol. Chem. **3**, 1551 (2005)

[5] D. Henkensmeier, B. C. Abele, A. Candussio and J. Thiem
"Synthesis and characterisation of terminal carbohydrate modified poly-(dimethylsiloxanes)"
Macromol. Chem. Phys. **205**, 1851 (2004)

[6] E. Farkas, U. Schmidt, J. Thiem, J. Kowalczyk, M. Kunz and M. Vogel
"Regioselective Synthesis of Galactosylated Tri- and Tetrasaccharides by Use of ß-Galactosidase from *Bacillus circulans*"
Synthesis 699 (2003)

[7] S. Thiering, C. E. Sowa and J. Thiem
"Stereoselective photochemical transformations of hexopyranosyl imides to highly functionalised heterocycles"
J. Chem. Soc., Perkin Trans. **1**, 801 (2001)

[8] D. Schmidt, B. Sauerbrei and J. Thiem
"Chemoenzymatic synthesis of sialyl oligosaccharides with sialidases employing transglycosylation methodology"
J. Org. Chem. **65**, 8518 (2000)

[9] D. Schmidt and J. Thiem
"Sialidase-catalyzed transsialylation using polymer-supported solution-phase techniques"
Chem. Comm. 1919 (2000)

[10] A. Schäfer and J. Thiem
"Synthesis of Novel Donor Mimetics of UDP-Gal, UDP-GlcNAc and UDP-GalNAc as Potential Transferase Inhibitors"
J. Org. Chem. **65**, 24 (2000)

PhD Students since 2001

Group	Name	Year	Title
Thiem	R. Suhr	2001	Synthese komplexer Steroidsaponin-Mimetika
Thiem	S. Thiering	2002	Synthese und photochemische Transformation Imido-substituierter Saccharid-Derivate
Thiem	S. Rutschow	2002	Synthese und Untersuchung membrangängiger Derivate von Mannose-1-Phosphat
Thiem	K. Gorziza	2002	Synthese sulfatierter Glucuronyl-N-acetyl-lactosamin-Strukturen als Vorläufer für das HNK-1 Kohlenhydratepitop
Thiem	A. Scheppokat	2003	Efficient Enzymatic Syntheses of L-Fucosylated and D-Galactosylated Oligosaccharides using Glycosyltransferases from Helixpomatia Albumen Glands
Thiem	D. Henkensmeier	2003	Synthese und Charakterisierung kohlenhydrat-modifizierter Polydimethylsiloxane
Thiem	S. Weingarten	2003	Chemo-enzymatische Synthese neuartiger Di- und Trisaccharid-Mimetika als Liganden für das NKR-P1-Rezeptorprotein natürlicher Killerzellen
Thiem	S. Schröder	2004	Präparativ-enzymatische Darstellung von Hetero-oligosacchariden mit synthetischen und natürlichen Donoren
Thiem	L. Kröger	2004	Darstellung und chemoenzymatische Umsetzung modifizierter Substrate zur Synthese von Ligand bausteinen für Myelin assoziiertes Glycoprotein
Thiem	N. Nagorny	2004	Synthese chiraler Cyclooctenone aus Kohlen-hydratvorstufen
Thiem	D. Lazarević	2005	Synthese neuartiger Uridindiphospho-N-acetyl-glycosaminyl-Derivate als Strukturanaloga biogener Transferase-Donoren
Thiem	B. Neubacher	2005	Chemoenzymatische Darstellung komplexer Glycoconjugate mit Trans-Sialidase aus Trypanosoma cruzi
Thiem	S. Jürs	2006	Die Claisen-Umlagerung von Kohlenhydrat-derivaten als Methode zum Aufbau hoch funk-tionalisierter Carbocyclen und Saccharidanaloga

Prof. Dr. Richard Simon Jozef Tol

born 2.12.1969

www.uni-hamburg.de/Wiss/FB/15/Sustainability/tol.html and www.esri.ie/

1988 - 1992	MSc: Econometrics Vrije Universiteit, Amsterdam, The Netherlands
1991 - 1992	Assistant, Department of Econometrics, Vrije Universiteit, Amsterdam, The Netherlands
since 1992	Research associate (since May 2000, principal researcher), Institute for Environmental Studies, Vrije Universiteit, Amsterdam, The Netherlands
1994	Visiting researcher, Canadian Centre for Climate Research, University of Victoria, British Columbia, Canada
1995	Visiting researcher, Centre for Social and Economic Research on the Global Environment, University College London, United Kingdom
1997	PhD: "A Decision-Analytic Treatise on the Enhanced Greenhouse Effect" Vrije Universiteit, Amsterdam, The Netherlands
1998 - 1999	Acting Programme manager Quantitative Environmental Economics Institute for Environmental Studies, Vrije Universiteit, Amsterdam, The Netherlands
since 1998	Visiting associate professor (since April 2000, adjunct professor), Department of Engineering and Public Policy, Carnegie Mellon University, Pittsburgh, PA, USA
2000 - 2006	Michael Otto Professor of Sustainability and Global Change, Departments of Geosciences and Economics
	Director, Research unit Sustainability and Global Change, Centre for Marine and Climate Research, Hamburg University and Centre for Marine and Atmospheric Science, Hamburg, Germany
since 8/2006	Senior Research Officer, Economic and Social Research Institute, Dublin, Ireland

Selection of Publications:

[1] K. Rehdanz, R.S.J. Tol and P. Wetzel
"Ocean Carbon Sinks and International Climate Policy"
Energy Policy in press (2006)

[2] M. Schwoon and R.S.J. Tol
"Optimal CO_2-abatement with socio-economic inertia and induced technological change"
Energy Journal **27**, 25 (2006)

[3] R. Roson and R.S.J. Tol
"An Integrated Assessment Model of Economy-Energy-Climate - The Model Wiagem: A Comment"
The Integrated Assessment Journal **6**, 75 (2006)

[4] S. Fankhauser and R.S.J. Tol
"On Climate Change and Economic Growth"
Resource and Energy Economics **27**, 1 (2005)

[5] R.S.J. Tol, T.E. Downing, O.J. Kuik and J.B. Smith
"Distributional Aspects of Climate Change Impacts"
Global Environmental Change, **14**, 259 (2004)

[6] R.S.J. Tol, R.J. Heintz and P.E.M. Lammers
"Methane Emission Reduction: An Application of FUND"
Climatic Change **57**, 71 (2003)

[7] C.C. Jaeger and R.S.J. Tol
"Sustainability and Economics: A Matter of Scale"
Integrated Assessment **3**, 151 (2002)

[8] R.S.J. Tol
"Equitable Cost-Benefit Analysis of Climate Change"
Ecological Economics **36**, 71 (2001)

[9] R.S.J. Tol
"Climate Coalitions in an Integrated Assessment Model"
Computational Economics **18**, 159 (2001)

[10] R.S.J. Tol
"On the Optimal Control of Carbon Dioxide Emissions - An Application of FUND"
Environmental Modelling and Assessment **2**, 151 (1997)

Prof. Dr. Fritz Vahrenholt

born 08.05.1949

www.repower.de/

1968 - 1972	Studies of Chemistry at the University of Münster
1972 - 1974	Work on PhD Thesis and graduation
1974 - 1975	Research at the University of Münster and the Max-Planck Institute for Coal Research, Mülheim
1976 - 1981	Federal Environmental Protection Agency Berlin
1981 - 1984	Environmental Ministry of Hessian
1984 - 1990	Councillor of State at the Environmental Authority Hamburg
1990 - 1991	Chairman of the Environmental Authority of Hamburg
1991 - 1997	Senator of the Environmental Authority of Hamburg
since 1991	Docent of the University of Hamburg and the TU Hamburg-Harburg (Fachbereich Chemie)
1999	Professor, University of Hamburg
1998 - 2001	Management Board Deutsche Shell AG
since 2001	Chairman of the Management Board of Repower Systems AG

currently: Member of Supervisory Boards:

- Thyssen Krupp Industries AG
- Norddeutsche Affinerie AG
- ErSol Solar Energy AG (Erfurt)
- Verbio AG (Chairman)

Member of:

- Sustainable Panel of the French electricity producer EDF
- Senate Commission of the Helmholtz community
- Advisory Council on Sustainable Development of the German Government

Selection of Publications:

[1] F. Vahrenholt
"Erneuerbare Energien: Strategische Entwicklung eines neuen Kerngeschäftes"
in: "Umweltschutz im globalen Wettbewerb", K. Fichter, U. Schneidewind (Hrsg.)
Springer, Berlin, Heidelberg S. 223 (2000)

[2] F. Vahrenholt
"Versorgungssicherheit - der Beitrag der regenerativen Energien"
in: "Deutsches Atomforum e. V., Energieversorgungskonzepte im 21. Jahrhundert - die Rolle der Kernenergie"
INFORUM Verlags- und Verwaltungs GmbH, Bonn, S. 93 (2002)

[3] F. Vahrenholt,
"Die Zukunft der Windenergie"
in: "Die Nachhaltige Energiepolitik, Herausforderungen der Zukunft",
B. Kummer, E. Schwanhold (Hrsg.)
Honnefer Verlagsgesellschaft, Honnef (2006) 124

[4] F. Vahrenholt
"Die Energiequellen von morgen"
in: "Die Umweltmacher, 20 Jahre BMU-Geschichte und Zukunft der Umweltpolitik"
Hoffmann und Campe Verlag, Hamburg 207 (2006)

[5] F. Vahrenholt
"Die Zeit des billigen Öels ist vorbei - endliche Ressourcen erfordern neuen Energiemix"
Internationale Politik, Nr.1, S.11, (2001)

[6] F. Vahrenholt
"Endzeit für das Öl"
Energie & Management 18 (2001)

[7] F. Vahrenholt
"Effizienz und Forschung für sichere Energiedienstleistungen - Nachhaltigkeitsrat kritisiert Widersprüche in der Energiepolitik"
Energiewirtschaftliche Tagesfragen, Nr. 12, 42, (2004)

[9] F. Vahrenholt et al-
"Perspektiven der Kohle in einer nachhaltigen Energiewirtschaft"
Rat für Nachhaltige Entwicklung, Berlin (2003)
(Advisory Council on Sustainable Development of the German Government)

[10] F. Vahrenholt et al.
"Effizienz und Energieforschung als Baustein einer konsistenten Energiepolitik"
Rat für Nachhaltige Entwicklung, Berlin (2004)
(Advisory Council on Sustainable Development of the German Government)

Prof. Dr. Horst Weller

born 21.10.1954

www.chemie.uni-hamburg.de/pc/weller/

1974 - 1979	Studies of Chemistry at the University of Göttingen
1979	Diploma in Physical Chemistry (Topic: Photochemistry of Aromatic Amines)
1979 - 1982	Ph. D. Thesis at the Max-Planck-Institut für Biophysikalische Chemie Göttingen (Topic: Photo-induced Proton Tunneling Reactions)
1982	Dr. rer. nat. at the University of Göttingen
1982	Scientific assistant at the Max-Planck-Insitut für Biophysikalische Chemie
1983	Post-doc at the Hahn-Meitner-Institut Berlin (HMI). Topic: Radiation Chemistry of colloids
1984 - 1994	Staff Scientist at the HMI. Topic: Semiconductor and Metal Nanoparticles
1989 - 1994	Vice Head of the Small Particle Research Department at the HMI
1992	Habilitation at the Technical University of Berlin (Topic: Chemistry and Physics of Semiconductor Nanoparticles)
1992 - 1994	Private lecturer at the Technical University of Berlin
1991	Nernst-Haber-Bodenstein Prize of the "Deutsche Bunsengesellschaft für Physikalische Chemie"
since 1994	Full Professor for Physical Chemistry at the University of Hamburg
since 1999	Managing Director of the Institute of Physical Chemistry
2000	Founding the company Nanosolutions
2000	Offer for a Full Professor Position at the University of Hannover (declined)
2000	Offer for a Director Position at the Research Center Karlsruhe (declined)
since 2001	Coordinator for Chemistry at the Interdisciplinary Nanoscience Center Hamburg (INCH)
2004 - 2005	Founding Coordinator of the Center of Applied Nanotechnology Hamburg
since 2005	CSO of the Center of Applied Nanotechnology Hamburg (CAN)
since 2005	Member of the Hamburg Academy of Sciences
1999 - 2001	Member of the DFG-Schwerpunktprogramm 1072 "Semiconductor and Metal Clusters as Building Blocks for Organized Structures"
since 2001	Member of the DFG-Graduiertenkolleg 611 "Design and Characterization of Functional Materials"
since 1979	- more than 200 publications in international, scientific, refereed journals - member of the Advisory Board of the Journals "Nano Letters", "Small", "Journal of Nanoscience and Nanotechnology" - Scientific Advisory Board Member of the Institute of Molecular Biophysics at the Jackson Laboratories, Bar Harbor, ME, USA - approx. 150 invited talks at international conferences, universities, research institutions, and industry laboratories - fund raising: 7 million Euros from peer-review based research projects and ca. 10 million Euros for investments in buildings and big equipment

Selection of Publications:

[1] J. Muller, J.M. Lupton, A.L. Rogach, J. Feldmann, D.V. Talapin and H. Weller
"Monitoring surface charge migration in the spectral dynamics of single CdSe/CdS nanodot/nanorod heterostructures"
Phys. Rev. B **72**, 205339/1 (2005)

[2] S.K. Poznyak, D.V. Talapin, E.V. Shevchenko and H. Weller
"Quantum Dot Chemiluminescence"
Nano Lett. **4**, 693 (2004)

[3] E.V. Shevchenko, D.V. Talapin, H. Schnablegger, A. Kornowski, O. Festin, P. Svedlindh, M. Haase and H. Weller
"Study of nucleation and growth in the organometallic synthesis of magnetic alloy nanocrystals: the role of nucleation rate in size control of $CoPt_3$ nanocrystals"
J. Am. Chem. Soc. **125**, 9090 (2003)

[4] D.V. Talapin, R. Koeppe, S. Goetzinger, A. Kornowski, J.M. Lupton, A.L. Rogach, O. Benson, J. Feldmann and H. Weller
"Highly emissive colloidal CdSe/CdS heterostructures of mixed dimensionality"
Nano Lett. **3**, 1677 (2003)

[5] A. Schroedter and H. Weller
"Ligand design and bioconjugation of colloidal gold nanoparticles"
Angew. Chem. Int. Ed. **41**, 3218 (2002)

[6] C. Pacholski, A. Kornowski and H. Weller
"Self-assembly of ZnO: from nanodots to nanorods"
Angew. Chem. Int. Ed. **41**, 1188 (2002)

[7] D.V. Talapin, A. L. Rogach, E.V. Shevchenko, A. Kornowski, M. Haase and H. Weller
"Dynamic Distribution of Growth Rates within the Ensembles of Colloidal II-VI and III-V Semiconductor Nanocrystals as a Factor Governing Their Photoluminescence Efficiency"
J. Am. Chem. Soc. **124**, 5782 (2002)

[8] J. Rockenberger, L. Troeger, A. Kornowski, T. Vossmeyer, A. Eychmueller, I.J. Feldhaus and H. Weller
"EXAFS Studies on the Size Dependence of Structural and Dynamic Properties of CdS Nanoparticles"
J. Phys. Chem. B **101**, 2691 (1997)

[9] T. Vossmeyer, G. Reck, L. Kastsikas, E.T.K. Haupt, B. Schulz and H. Weller
"A"double-diamond superlattice" built up of $Cd_{17}S_4(SCH_2CH_2OH)_{26}$ clusters"
Science **267**, 1476 (1995)

[10] H. Weller
"Colloidal semiconductor Q-particles: chemistry in the transition region between solid and molecular states"
Angew. Chem. **105**, 43 (1993)

PhD Students since 2001

Group	Name	Year	Title
Weller	A. Schroedter	2002	Biokonjugation und Selbstorganisation von Gold- und Halbleiter-Nanokristallen
Weller	D. Talapin	2002	Experimental and Theoretical Studies on the Formation of Highly Luminescent II-VI, III-V and Core-shell Semiconductor Nanocrystals
Weller	E. Shevchenkoa	2002	Monodisperse Magnetic Alloy Nano-crystals and their Superstructures
Weller	C. Pacholski	2002	Selbstorganisation von ZnO Nanoteilchen und Untersuchung der Ladungsträgerdynamik
Weller	J. Kolny	2002	Elektrostatische Wechselwirkung zwischen positiv und negativ geladenen Nanoteilchen und deren Aggregationsverhalten
Weller	H. Borchert	2003	Untersuchungen von Halbleiter-Nanokristallen mit Hilfe von Photoelektronenspektroskopie
Weller	C. Gimmler	2005	Leuchtdioden aus Halbleiternanokristall/Polymer-Kompositmaterialien
Weller	I. Mekis	2005	Untersuchungen an II-VI und III-V Halbleiternanostrukturen: Einführung der Core/shell/shell-Struktur und Darstellung von CdSe-Nanokristallen in einem automatisierten Verfahren
Weller	M. Krack	2006	Einbettung von Eisenoxid-Nanoteilchen in Blockco-polymervesikel
Weller	V. Aleksandrović	2006	$CoPt_3$ Nanoparticles: Ligand Exchange and Film Preparation
Weller	S. Sandra		Untersuchung des Phasenverhaltens von kleinen Partikeln unter hohen Drücken

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