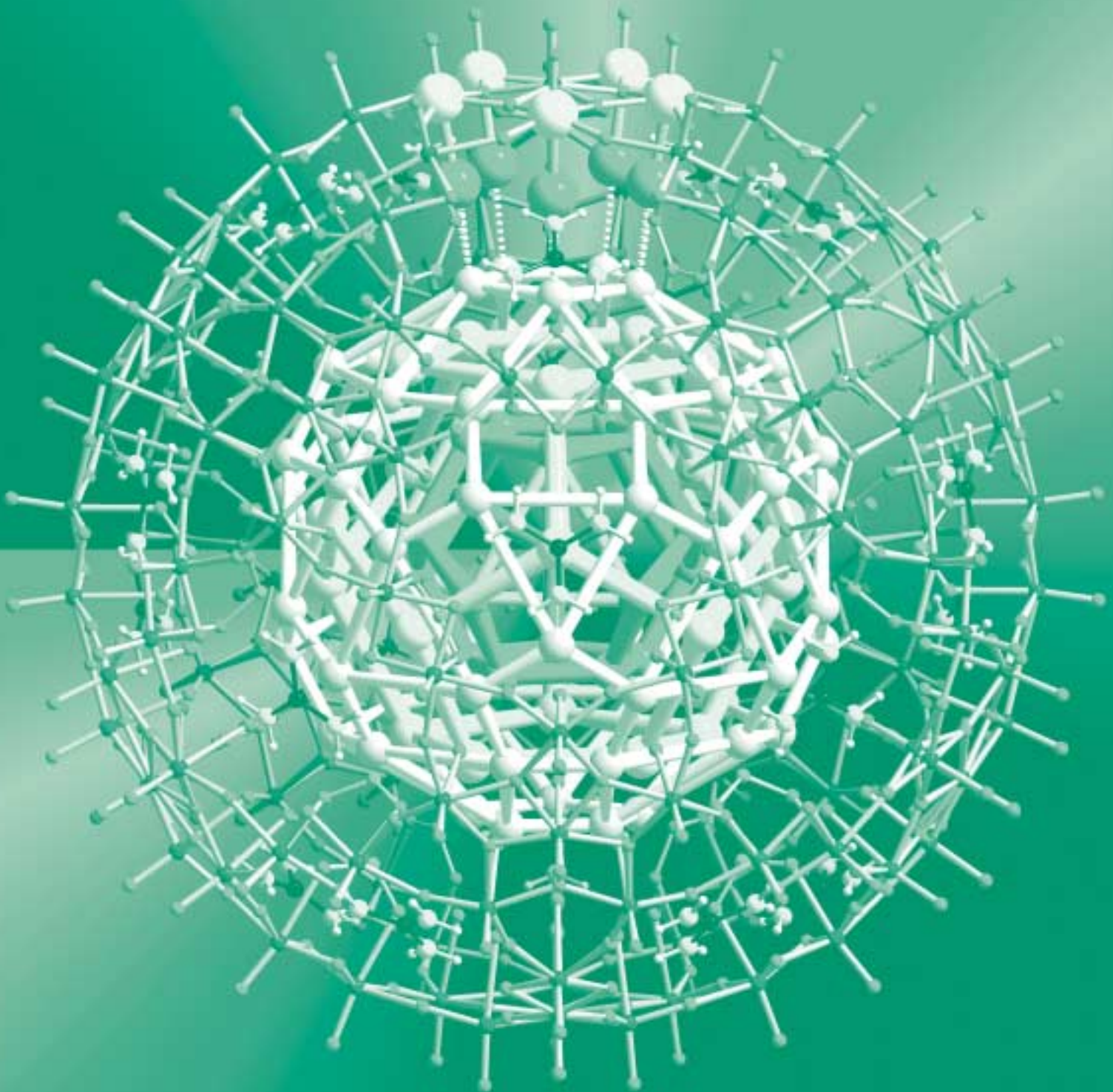


Universität Bielefeld

Ausgabe 7/2005

Fakultät für Chemie



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Willkommen

Chemie ist Leben. Chemie ist Veränderung. Chemie ist Fortschritt. Chemie bedeutet, sich aktiv an der Gestaltung unserer Zukunft zu beteiligen. Chemie ist Spaß an der Zukunft. Wir brauchen engagierte, aufgeschlossene, junge Menschen, die sich den zukünftigen Aufgaben in der Chemie stellen.

Wir freuen uns deshalb ganz besonders über Ihr Interesse und möchten Ihnen auf den nächsten Seiten die Fakultät für Chemie der Universität Bielefeld vorstellen. Wir möchten Ihnen die vielfältigen Möglichkeiten zeigen, die die Fakultät bietet, Sie auf die zukünftigen Herausforderungen in der Chemie vorzubereiten.

Die Fakultät wurde 1975 gegründet. Sie ist damit noch vergleichsweise jung. Zur Zeit forschen hier 16 Professorinnen und Professoren sowie 3 Dozenten mit ihren Mitarbeiterinnen und Mitarbeitern. Die Bielefelder Chemiker haben in den zurückliegenden Jahren immer wieder herausragende und vielbeachtete Forschungsarbeiten in den unterschiedlichsten Bereichen der Chemie geleistet und damit wichtige Beiträge zum Grundverständnis elementarer Prozesse in der Natur geliefert. Viele Mitglieder der Fakultät wurden für ihre Arbeiten mit national und international hochrangigen Preisen, Mitgliedschaften in Wissenschaftsakademien und Gastprofessuren ausgezeichnet.

Alles unter einem Dach

Die Aufgaben der Zukunft werden zunehmend komplexer. Grenzen in der Wissenschaft verschwinden, werden durch interdisziplinäres Arbeiten überwunden.

Das Konzept der kurzen Wege innerhalb der Universität Bielefeld eröffnet vielfältige Möglichkeiten zur Kooperation sowohl innerhalb der Fakultät als auch interdisziplinär zwischen den einzelnen Fakultäten. Wir nutzen diese Chancen durch Einrichtung von Sonderforschungsbereichen und Forschergruppen, in denen wir uns beispielsweise mit biochemischen Grundlagen von medizinischen und biologischen Prozessen, Anwendungen von Computern in der Biochemie, Nano-Strukturen und intelligenten Materialien beschäftigen.

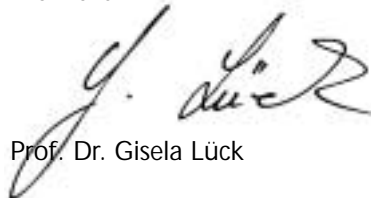


Räumliche Grenzen verschwinden

Bei uns ist Internationalität kein Fremdwort. Wir fördern aktiv einen umfangreichen Austausch von Studentinnen und Studenten mit international renommierten Universitäten und Forschungseinrichtungen. Sie haben bei uns die Chance, Erfahrungen im Ausland zu sammeln.

Sprechen Sie mit uns. Wir freuen uns auf Sie.

Die Dekanin



Prof. Dr. Gisela Lück

Der Prodekan



Prof. Dr. Uwe Manthe

Studiendekan



Dr. Hans-Georg Stammer

Welcome

Chemistry is change, evolution, life. Chemistry plays an important role in shaping our future, and taking part in this process is certainly rewarding. We need open-minded, motivated talented young men and women who adapt this challenge, and who see their own future to these vast and attractive possibilities. Thank you for your interest in the Faculty of Chemistry at Bielefeld University which we introduce to you in the following pages. On this occasion, we would also like to give you an overview of modern chemistry and inform you about the possibilities to shape up for chemical problems of tomorrow with the aid of our research and education programmes.

Our faculty is still quite young and was founded in 1975; at present, 16 professors and 3 lecturers represent the faculty together with their associates in teaching and research. Bielefeld chemists have continuously contributed with excellent and internationally well-received results in a variety of fields to the detailed understanding of chemical processes in nature, technology and life. Bielefeld scientists have been rewarded with high-ranking prizes, academy memberships and prestigious lectureships.

Interdisciplinary Approaches

The increasing complexity in research and education needs interdisciplinary approaches. Limits between disciplines tend to vanish, and collaborative efforts of teams joining different expertise and backgrounds are needed to tackle the questions and problems of the future. Short distances in the unique university building facilitate collaboration within the faculty and with other disciplines. The success of this Bielefeld concept is demonstrated and corroborated by the establishment of large interdisciplinary research structures, addressing e.g. biochemical implications of medical and biotechnological processes, computer methods in biochemistry, nanostructures and smart materials, and other developing areas.



Crossing Boundaries

Interdisciplinarity is matched by an international approach. We actively support international exchange of students and research associates with a large number of renowned institutions all over the world. You are welcome from abroad to study chemistry in Bielefeld. You are welcome to Bielefeld to pursue part of your education abroad.

Do meet us. We look forward to meeting you and welcome you to Bielefeld.

Dean

A handwritten signature in black ink, appearing to read "G. Lück".

Prof. Dr. Gisela Lück

Vice-Deans

A handwritten signature in black ink, appearing to read "U. Manthe".

Prof. Dr. Uwe Manthe

A handwritten signature in black ink, appearing to read "H.-G. Stammer".

Dr. Hans-Georg Stammer

The Faculty of Chemistry

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Studiengänge

Im Zuge der europaweiten Harmonisierung des Ausbildungs- und Arbeitsmarktes hat die Fakultät für Chemie ihre Diplom- und Lehramtsstudiengänge zum Wintersemester 2004/2005 vollständig auf das Bachelor/Master System umgestellt. Dies schafft eine internationale Vergleichbarkeit und Transparenz der Studienleistungen und eröffnet die Möglichkeit, flexibler und früher als bisher einen Abschluss zu erlangen, der berufliche Einstiegsoptionen eröffnet.

Bachelor-Studiengänge in Chemie und Biochemie

Die Bachelor-Studiengänge sehen eine breit angelegte modulare Ausbildung vor. Dabei kann Chemie als Kern- oder Nebenfach gewählt und mit einem beliebigen Fach kombiniert werden. Die Ein-Fach-Struktur des Diploms in Chemie bzw. Biochemie wird über die Kombination des Kernfaches Chemie mit dem Nebenfach „Chemie der Materialwissenschaften“ bzw. „Chemie der Lebenswissenschaften“ in das Konsekutivmodell überführt. Bei Wahl eines nicht-chemischen Nebenfaches werden im Kernfach folgende Profile angeboten:

- Grundlagen der Chemie
- Vermittlung der Naturwissenschaften (Berufsziel Lehrer Grund-, Haupt- und Realschule)
- Gymnasium/Gesamtschule (Berufsziel Lehrer Gymnasium/Gesamtschule)

In den ersten beiden Semestern des Bachelor-Studiengang werden Grundlagen in Allgemeiner Chemie sowie je nach Profilwahl in Mathematik und Physik oder Biologie vermittelt (Basis-Module). Im dritten und vierten Semester sind Vertiefungsmodule aus den einzelnen Teilbereichen der Chemie vorgesehen. Im fünften und sechsten Semester erfolgt eine Vertiefung der einzelnen Teilbereiche der Chemie je nach Profilwahl in den Wahlpflichtmodulen. Den Abschluss des Studienganges bildet eine Bachelor-Arbeit im 6. Semester.



Master-Studiengänge

Die weiterführenden, 4-semestrigen Master-Studiengänge in Chemie und Biochemie bauen auf dem Bachelor-Studiengang auf. Sie sehen eine Spezialisierung durch entsprechende Profilwahl in einem Teilbereich der Chemie vor. Der Studiengang ist ebenfalls modular aufgebaut. Den Abschluss bildet eine Master-Arbeit im zehnten Semester. Der Master-Grad ersetzt das bisherige Diplom und berechtigt zum Promotionsstudiengang.

Promotionsstudiengang

Der Promotionsstudiengang sieht die Anfertigung einer wissenschaftlichen Forschungsarbeit in einem Fachbereich der Chemie vor. Den Abschluss bildet die Promotion mit Verleihung des Doktorgrades.

Studienberatung

Dr. Herbert Wenzel	Raum F4-133 Tel. 05 21/1 06 -20 91
Dr. Ulrich Neuert	Raum F3-133 Tel. 05 21/1 06 -20 70
Dr. Hans-Georg Stammler	Raum E4-118 Tel. 0521/106-6165

Weitere Informationen auf der Homepage
<http://www.uni-bielefeld.de/chemie/fachschaft>

Courses of Chemistry

In the wake of a harmonized European educational and employment standard, the Department of the Chemistry of University of Bielefeld has switched to Bachelors' and Masters' studies from the 2004/2005 winter-semester. This restructuring essentially enables the courses to be internationally comparable, more transparent in the context of student evaluation; early completion of course works hitherto not possible; and thereby opening up new possibilities in the context of employment opportunities.

Bachelor studies in Chemistry and Biochemistry

The Bachelor's study provides a broad and flexible module of education. Chemistry can be chosen as a core or a parallel course and can be combined with any other courses. The single Bachelor study (Ein-Fach-Bachelor) replaces the Diploma study in Chemistry and Biochemistry by combining the core study Chemistry with the parallel course "Chemistry of Materials Science" or "Chemistry of Life Science", respectively. In combination with a non-chemical parallel course the following profiles are offered:

- Fundamentals of Chemistry
- Teaching Chemistry (intended career: teacher at primary schools and the first level of secondary schools (Grund-, Haupt- und Realschule)).
- Teaching Chemistry (intended career: teacher at the second (senior) level of secondary schools (Gymnasiale Oberstufe)).

In the first two semesters of Bachelor's study the fundamentals of general chemistry can be studied together with mathematics and physics or biology (Basic modules). The third and fourth semester are scheduled for a 'deepening of understanding' on any sub-discipline of chemistry. The fifth and sixth semester is scheduled for further deepening on any sub-discipline of chemistry as per the profile opted by the student. The Bachelor's study ends with the successful completion of a Bachelor-thesis (Bachelor-Arbeit) in sixth semester.



Master's studies:

The Master's studies in Chemistry and Biochemistry, follows for 4 semester after successful completion of the Bachelor's studies. The specialization in the Master's can be done in any available sub-discipline in chemistry as per the profile opted by the student. The structure of the Master's study is also modular. The study ends as well with the successful completion of Master's thesis (Master-Arbeit) in tenth semester. The Master's graduate is equivalent to the previous Diplom graduates and is eligible for doctoral studies (Promotion).

Doctoral studies:

The doctoral studies in Chemistry involve fundamental research in any of the disciplines of interest of the subject and are completed with the successful completion of the doctoral dissertation and defence of the thesis.

Further Information

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Homepage
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Forschung

In der Forschung an der Fakultät für Chemie der Universität Bielefeld werden aktuelle Themen aus den folgenden Bereichen der Grundlagenforschung bearbeitet:

- Neue Materialien
- Molekulare Erkennung
- Biochemische Grundlagen medizinischer und biotechnologischer Prozesse

Das offene Konzept unserer Universität fördert Interdisziplinarität sowohl innerhalb der klassischen Bereiche der Chemie als auch fakultätsübergreifend. Viele dieser Projekte werden in Sonderforschungsbereichen und Forschergruppen durch die Deutsche Forschungsgemeinschaft finanziell gefördert.

Anorganische und Bioanorganische Chemie

Die Forschung in diesem Bereich beschäftigt sich im Wesentlichen mit der Synthese von supramolekularen anorganischen und metallorganischen Verbindungen und mit Aspekten aus dem Bereich der physikalisch-anorganischen Chemie. Die Themen reichen von der Entwicklung neuer leistungsfähiger Katalysatoren in der Alken- und Alkinpolymerisation bis hin zu maßgeschneiderten Ausgangsverbindungen für die Dünnschicht-Technologie. Hauptgruppenelemente in ungewöhnlichen Oxidationsstufen und Bindungssituationen werden ebenfalls untersucht. Unterschiedlichste Aspekte aus dem Bereich der supramolekularen anorganischen Chemie, z.B. Selbstorganisation von ball- und radförmigen Strukturen und ihre Anwendung als nützliche Materialien sind ebenfalls Herausforderungen in der Forschung. Als Bindeglied zu den Bio-Wissenschaften werden Modellsubstanzen für die biologische Stickstoff-Fixierung entwickelt und die elementaren Mechanismen der an diesem biologisch wichtigen Prozess beteiligten Enzyme untersucht.

Organische, Bio-Organische und Physikalisch-Organische Chemie

Unsere Forschungsinteressen reichen von Untersuchungen der Grundlagen chemischer Reaktionen bis zu Mehrstufen-Synthesen und Anwendungen speziell entwickelter organischer Verbindungen in Technik und Biochemie. Die Forschungsthemen beinhalten den Aufbau ungewöhnlicher Gerüst-Strukturen zur Untersuchung intrinsischer molekularer Eigenschaften, zur Erzeugung spezieller Synthese-Bausteine und zur Identifizierung spezieller intermolekularer Wechselwirkungen in der Supramolekularen Chemie. Hier werden unter anderem auch gezielt grundlegende photochemische Reaktionen verwendet. Die Prinzipien der molekularen Erkennung werden an künstlichen und natürlichen Rezeptorsystemen mit Hilfe moderner spektro-

skopischer Methoden untersucht (Einzelmolekül-Prozesse). Neuartige Makromoleküle werden hergestellt und hinsichtlich ihrer Materialeigenschaften studiert. Natürliche und nicht-natürliche Verbindungen werden synthetisiert, um die Wechselwirkung zwischen Bio-Molekülen zu beeinflussen und daraus neue Erkenntnisse über biochemische und biologische Prozesse zu gewinnen. Auch Pflanzeninhaltsstoffe werden aus natürlichen Quellen isoliert oder im Labor synthetisiert. All diese Aktivitäten sind eng mit der Entwicklung struktureller und funktionaler Eigenschaften von Molekülen in biologischen Systemen verknüpft.

Physikalische und Bio-Physikalische Chemie

Forschung auf diesem Gebiet umfasst die Analyse und Charakterisierung komplexer Reaktionssysteme mit Hilfe von Laser-Techniken und speziellen massenspektrometrischen Methoden. Beispiele sind die Bildung umwelt-relevanter Stoffe in Verbrennungsprozessen und das Wachstum von Halbleitermaterialien oder katalytisch aktiver dünnen Schichten und Strukturen in der Gasphasen-Abscheidung. Kurzzeit-Lasermethoden werden für die Untersuchung biochemische Systeme genutzt. Die Forschung und Lehre beinhaltet auch die Untersuchung der molekularen Mechanismen chemisch-elektrischer Feldeffekte, wie zum Beispiel Ionenkanal-Aktivität in Membranen, sowie die Grundlage von Nerven- und Muskelfunktionen.

Biochemie

Eine Forschungsrichtung beschäftigt sich mit den Sulfatasen, Enzymen mit erheblicher medizinischer Relevanz. Biochemische Studien werden begleitet von struktur- und zellbiologischen Untersuchungen unter Einbeziehung von Maus knock-out Modellen. Als Substrate stehen Heparansulfatproteoglycane im Mittelpunkt des Interesses. Ihre Sulfatierungsmuster vermitteln auf der Zelloberfläche Informationen für die korrekte Entwicklung und Homöostase von Geweben. Einen anderen Schwerpunkt bildet die Analyse von molekularen Mechanismen des intrazellulären Transports. Dabei werden insbesondere Proteine



untersucht, die an der Erkennung von Membranen und an deren Fusion beteiligt sind. Als Modellsysteme werden dazu Bäckerhefe und genetisch veränderte Mäuse bzw. deren Zellen verwendet.

Weitere Aktivitäten konzentrieren sich auf die Untersuchung der Rolle von membranständigen Matrix-Metalloproteinasen (MT-MMPs) bei Wundheilungsprozessen, neurodegenerativen Krankheiten und smooth muscle cells. Außerdem werden sog. ADAMs, eine weitere Klasse Membran-gebundener Metallo-Proteinasen in Lymphocyten zur proteolytischen Abspaltung (shedding) von Oberflächenrezeptoren und Liganden und die Rolle von Calciumkanälen untersucht, die durch Säugetier-Trp-Homologe bei der Lymphocyten-Aktivierung gebildet werden.

Theoretische Chemie

Die Forschung in diesem Bereich beschäftigt sich mit der Dynamik chemischer Reaktionen und der elektronischen Struktur organischer und anorganischer Verbindungen. Ein wichtiges Themenfeld ist die genaue Beschreibung elementarer chemischer Reaktionsprozesse in der Gasphase und an Oberflächen und die Untersuchung photochemischer Reaktionen, die auf einer Femtosekunden-Zeitskala ablaufen. Dazu werden quantenmechanische Effekte in den Computersimulationen zur molekularen Dynamik berücksichtigt und Methoden für hochdimensionale Quantendynamikrechnungen entwickelt. Ein anderes Themenfeld sind quantenchemische Rechnungen zur Beschreibung organischer und anorganischer Moleküle mit interessanten Eigenschaften oder Strukturen. Neben diesen anwendungsbezogenen Rechnungen wird auch an der Entwicklung neuer relativistischer und nicht-relativistischer *ab initio* Methoden gearbeitet.

Chemie-Didaktik

Die Arbeiten auf diesem Gebiet beschäftigen sich mit der Entwicklung chemischer Experimente für das frühe Kindheitsalter (Kindergarten und ersten Klassen der Primarstufe), ein bis heute immer noch nahezu unerforschtes Feld. Ein weiterer Teilbereich



unserer Forschung umfasst die Evaluierung von Lernmedien für das frühe Kindheitsalter (TV, Bücher, chemische Zeitschriften). Außerdem untersuchen wir die Lehre mit empirischen Methoden, um fehlendes Verständnis und Vorbehalte gegenüber der Chemie in der Öffentlichkeit abzubauen.

Ausstattung

Die Fakultät für Chemie bietet hervorragende Möglichkeiten sowohl in der Forschung als auch in der Lehre. Alle Laboratorien und Geräte sind „unter einem Dach“ untergebracht und sind in kürzester Zeit erreichbar. Dies ist einzigartig und ein Markenzeichen der Universität Bielefeld. Zwei Millionen Bücher und Zeitschriftenbände der Bibliothek sind frei zugänglich bis in die Nachtstunden und an Wochenenden ebenso wie der Computerzugang zu wichtigen Zeitschriften und Katalogen. Die Laboratorien und instrumentelle Spezialausrüstungen sind hervorragend ausgestattet. Für die ständig wachsenden Aufgaben im analytischen Bereich stehen unter anderem mehrere Hochfeld-Kernresonanz- (NMR-) Spektrometer, verschiedene Massenspektrometer (u.a. FT-ICR-MS) und Röntgen-Diffraktometer zur Verfügung – alle auf dem neuesten Stand der Technik. FT-IR-, Raman, UV-VIS-, ESR- und kleinere GC/MS- und NMR-Spektrometer sowie eine Vielzahl weiterer Geräte für die verschiedensten Anwendungsbereiche sind in den einzelnen Arbeitsgruppen vorhanden. Nahezu alle Büros sind mit Computern und Internetzugang ausgestattet. Für Studierende gibt es Internet-Zugangsmöglichkeiten sowohl innerhalb der Fakultät als auch im Rechenzentrum der Universität. Die Fakultät unterhält eigene Elektronik-, Mechanik- und Glasbläserwerkstätten. Dies ermöglicht sowohl kurze Reparaturzeiten als auch die schnelle Anfertigung komplexer individueller Apparaturen.



Research

The Faculty of Chemistry at the University of Bielefeld concentrates on fundamental research in the following main themes:

- New materials
- Molecular recognition
- Biochemical basis of medical and biotechnological processes.

The open concept of our university promotes interdisciplinarity between the classical disciplines of chemistry and also spans the faculties. Many of these are financially supported in research structures (Sonderforschungsbereiche and Forschergruppen) by the Deutsche Forschungsgemeinschaft.

Inorganic and Bio-Inorganic Chemistry

Research in this field is dominated by supramolecular inorganic and organometallic synthesis as well as by aspects of physical inorganic chemistry. Topics span from the development of new powerful catalysts in alkene and alkyne polymerisation to tailor-made precursors for thin film technology. Main group elements in unusual oxidation states and bonding situations are also studied. Several aspects of supramolecular inorganic chemistry, e.g. the self-organisation of ball- and wheel-shaped structures and their use as versatile materials are challenging frontiers of research. As an interface to life sciences, model substances for the biological nitrogen fixation are developed and the elemental mechanisms of related enzymes involved in this biologically important process are elucidated.

Organic, Bio-Organic and Physical Organic Chemistry

Our research activities range from investigations on the fundamentals of chemical reactions to multistep syntheses and application of specifically designed organic compounds in technology and biochemistry. The topics include the construction of unusual molecular frameworks in order to study intrinsic molecular properties and to generate suitable building blocks and specific intermolecular interactions for supramolecular chemistry. Among others, basic photochemical processes are utilized in some of the approaches. Artificial and natural receptor systems are studied by means of modern spectroscopic methods in order to gain insight into the principles of molecular recognition (single molecule processes).

Novel macromolecular assemblies are synthesized and their material properties are investigated. Natural and non-natural compounds are synthesized in order to affect, for example, the interaction between biomolecules or to gain new information about biochemical and biological processes. Natural products are either isolated from plants or synthesized. All these approaches are intimately connected with the evaluation of the structural and functional properties of the molecules in biological systems.

Physical and Biophysical Chemistry

Research in this area includes the analysis and characterisation of complex reaction systems by laser techniques and advanced mass spectrometric methods. Examples are the formation of pollutants in combustion systems and the growth of semiconductor materials or catalytically active films and structures in chemical vapour deposition. Short-pulse laser methods are used for the investigation of biochemical systems.

Research and teaching also address the molecular mechanisms of chemical electric field effects such as, e. g. membrane ion channel activity underlying nerve and muscle functions.

Biochemistry

Research is directed towards sulfatases, enzymes with considerable medical impact. Biochemical, structural and cell biological investigations are performed including the generation and analysis of mouse knock-out models. As substrates, heparan sulfate proteoglycans are of major interest. Their sulfation patterns at the cell surface carry important information for the development and homeostasis of various tissues.



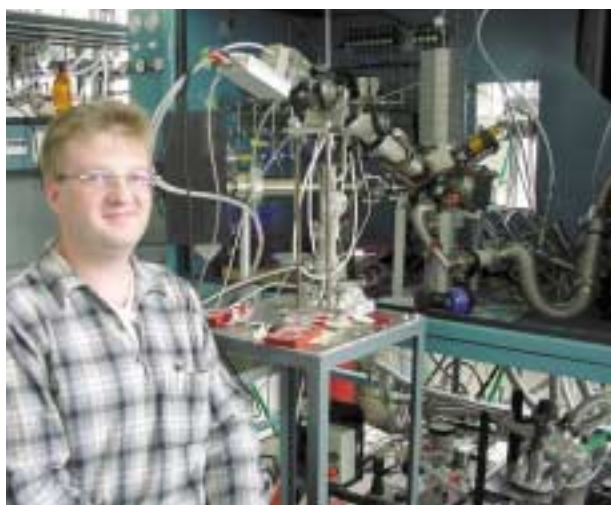
Another focus is the investigation of molecular mechanisms of membrane traffic. Proteins are studied which participate in the recognition and fusion of membranes. Baker's yeast as well as genetically modified mice and their cells are used as model systems. Further activities concentrate on the function of ADAMs, another class of membrane bound metallo-proteinases in lymphocytes, for the proteolytic release (shedding) of surface receptors and ligands. Finally, the role of calcium permeable channels formed by mammalian Trp homologues in lymphocyte activation is investigated.

Theoretical Chemistry

The Theoretical Chemistry group investigates the dynamics of chemical reactions and the electronic structure of organic and inorganic compounds. An important area of research is the accurate description of elementary chemical reaction processes in the gas phase and at surfaces and the investigation of photochemical reactions proceeding on a femtosecond time scale. Quantum effects are included in computer simulations studying the molecular dynamics of the processes. Methods for these multi-dimensional quantum dynamics calculations are being developed. Another research direction uses quantum chemical calculations to investigate organic and inorganic molecules with interesting structures or properties. Beside these applications also new relativistic and non-relativistic *ab initio* methods are developed.

Chemical Education

Work in this addresses to the development of chemical experiments specially for the early childhood (kindergarten and the first years of primary school) which is till now a mostly unknown field.



Another part concentrates on the evaluation of educational media for the early childhood (TV, books, journals with chemical subjects).

Furthermore, teaching is empirically investigated in order to reduce lacking comprehension and missing acceptance of chemistry.

Recources and Facilities

The Faculty of Chemistry offers excellent possibilities both in research and in teaching. All laboratories and facilities are under one roof and can be reached within a matter of minutes, a unique feature and trademark of Bielefeld University. The excellent open-access university library contains about 2 million books and provides long and user-friendly hours extending into nights and weekends as well as computer access to important journals and catalogues. Chemistry laboratories and facilities are excellently equipped. Comprehensive and modern equipment is available for the continually growing tasks in the analytical field including, amongst others, several high-field NMR spectrometers, mass spectrometers and X-ray diffractometers – all of them meeting the latest technical specifications.

FTIR, Raman, UV-VIS, EPR and smaller NMR spectrometers and a multitude of other apparatus for the diverse areas of application are available in the individual work groups. Nearly all the offices are equipped with computers, and information can be obtained quickly and directly from the Internet. The faculty, as well as the University Computer Centre, also makes computers available for the students.

The faculty avails of its own electronic, mechanical and glass workshops. This allows on-the-spot repairs as well as a speedy construction of complex individual apparatus.



Kontakte

Die Fakultät für Chemie bietet für naturwissenschaftlich interessierte Schülerinnen und Schüler vielfältige Möglichkeiten zum Erkunden der Chemie, ihrer experimentellen Methoden und ihrer Forschungswelt, "vor Ort". Neugierige Besuchergruppen, aber auch Einzelpersonen sind jederzeit willkommen, wie auch Lehrerinnen und Lehrer, die ihre Kontakte zur Universität und ihre Kenntnis über zeitgemäße ("moderne") Forschungsrichtungen und Arbeitstechniken auffrischen möchten. Wir freuen uns über alle diese Gäste und organisieren gern ein individuelles Besuchsprogramm.

Mit zunehmender Resonanz führen wir berufs- bzw. fachorientierende Praktika für einzelne Schülerinnen und Schüler durch. Dies schließt nicht nur im Lehrplan der Schulen obligaten Praktika, sondern auch (freiwillige!) Ferienpraktika ein. Diese potentiellen "Jungchemiker" werden von Doktorandinnen oder Doktoranden verschiedener Forschungsgruppen – soweit möglich unter Berücksichtigung der bevorzugten Fachrichtung – in deren eigenen Laboratorien betreut und können dort in die reale und vielseitige Welt der Forschung eintauchen.

Dies erlaubt eine konkrete Orientierung über die Arbeitsweisen und die Berufswelt der Naturwissenschaftler und Forscher sowie auch über Technische Berufe (z.B. Chemotechniker, Laboranten) der Chemie.

Neben diesen individuellen Angeboten führt die Fakultät in unregelmäßigen Abständen "Schnupper-Studientage", "Tage der Offenen Tür" und bundesweit organisierte "Tage der Chemie" durch. Ferner gibt es die Möglichkeit, an von der Universität zentral organisierten Besuchstagen die Fakultät für Chemie zu besichtigen. Für Lehrerinnen und Lehrer werden, gern auch auf besonderen Wunsch, Fortbildungsveranstaltungen und Besuchstage organisiert. Und schließlich: Für ganze Schulklassen mit ihren Lehrerinnen und Lehrern öffnet zum Selbst-Experimentieren das **teutolab** seine Räume (s.u.).

Also: Alle Initiativen werden gerne aufgenommen! Melden Sie sich bitte schriftlich oder telefonisch bei einer der u.a. Adressen – oder benutzen Sie für erste Kontakte einfach eine der Adressen auf der Internet-Seite der Fakultät.

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Contacts

The Department of Chemistry offers students interested in the natural sciences a variety of possibilities to investigate chemistry, its experimental methods and its research "where it all happens". Interested groups of visitors, as well as individual persons, are welcome anytime, as are teachers who wish to renew their contacts to universities and brush up on their knowledge of contemporary ("modern") research trends and work techniques. We are more than pleased to see all these guests and would be glad to organise an individually planned visitors' programme. Our career-oriented practical training for individual pupils has found increasing resonance. This does not only include the obligatory practical training in the schools' curriculum, but also (voluntary!) practical training. These potential "young chemists" are supervised by post-graduates from the different research groups – as far as possible considering the major interests – in their own laboratories, and can immerse themselves in the real and varied world of research.

This affords an informed insight into the working techniques and professional world of natural scientists and researchers as well as into that of the technical professions (e.g. chemical technician, laboratory assistant) in the field of chemistry.

In addition to these individual offers, the department also organises – at irregular intervals – "Info-Courses", "Open Days" and nation-wide "Chemistry Days". It is also possible to visit the Department of Chemistry on the "Open Days" organised by the University. And, last but not least: The **teutolab** can be visited by teachers with their classes (see below).

So: All initiatives are welcome. Please get in touch with us, by writing or by phoning, to one of the addresses below – or, for a first contact, by simply using one of the addresses on the faculty's Internet site.

Prof. Dr. Dietmar Kuck	Public contacts officer Organic Chemistry (OC I) Room F 3-126, Tel. 1 06 -20 60 (Secr. -69 20)
Sandra Holtmann RA	Faculty Administration Room E3-110, Tel. 1 06 -61 34
Professor Dr. Rüdiger Blume	Chemistry and its Didactics (DC II) Room F 1-136, Tel. 1 06 -20 40
Dr. Ekkehard Diemann	Inorganic Chemistry (AC I) Room E3-131, Tel. 1 06 -61 52
Dr. Andreas Mix	Inorganic Chemistry (AC III) Room E 4-129, Tel. 1 06 -61 80
Dr. Herbert Wenzel	Biochemistry (BC I) Room F 4-133, Tel. 1 06 -20 91

teutolab

The laboratory teutolab at the Chemistry Faculty is the domain of children and young people. It was founded in 1999 to attract boys and girls from regional schools to science. Since February 2000, it offers activities for the age group of 8-12. Typically, school classes from 3rd to 5th grade spend an intense laboratory course with 3-4 hours of hands-on activities, accompanied by their teachers who fit this special chemistry visit into their regular school program. teutolab is designed to counteract the declining interest of young adults in science and the increasing tendency to actively avoid chemistry in the higher grades of school education; in the long run, we hope also to encourage future generations of students to choose chemistry as their subject! The approach to start at an early age may seem unusual, but has a solid foundation in novel science education concepts.

Visitors and staff enjoy the intense and creative atmosphere in the teutolab, and the young "scien-

tists" who have performed experiments - dressed up in lab coat and goggles - return home exhausted but happy. Supervised by the teutolab team consisting of experienced teachers and chemistry students, they learn to see chemistry in everyday life - experimental series are centred e.g. around milk and fruit, paper and ink. The concept focuses on subjects like chemical production, energy, environmental aspects as well as on naturally occurring chemicals including flavours and colouring agents. To extend the concept, cooperation with 22 regional schools has been formally established, starting 2003 by the formation of the teutolab network.

Building on the success with the present age group, teutolab meanwhile offers activities also for age 13-13, and research-oriented science projects are being designed for age 16-19. Also, the effects of these activities were evaluated by an interdisciplinary team of researchers. The message of teutolab to all: Chemistry is fun!



Faculty Profiles

Dirk Andrae
Rüdiger Blume
Thomas Braun
Andreas Brockhinke
Thomas Dierks
Gabriele Fischer von Mollard
Jürgen Frey
Adelheid Godt
Peter Jutzi
Katharina Kohse-Höinghaus
Thomas Koop
Dietmar Kuck
Gisela Lück
Uwe Manthe
Jochen Mattay
Achim Müller
Eberhard Neumann
Wolfgang Schoeller
Norbert Sewald
Lothar Weber

Professors Emeriti

Hans Brockmann
Eckehard Dehmlow
Thomas Dorfmueller
Hans-Friedrich Grützmaker
Jürgen Hinze
Wilhelm Knoche
Harald Tschesche
Helmut Wenck

PD Dr. Dirk Andrae

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Habilitation, University of Bielefeld, 2001

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Numerical Methods for Electronic Structure Calculations

Numerical, i.e. basis set free, non-relativistic (one-component Hartree-Fock and Kohn-Sham) and relativistic (four-component Dirac-Fock) calculations for atoms, including arbitrary nuclear models (e.g. point-like, homogeneous, Gauss or Fermi models) and suitable effective core potentials (ECPs). Development of methods for numerical electronic structure calculations on arbitrary molecules. The results thus obtained are also useful as reference data for calculations relying on basis functions.

Pseudopotentials for Atoms and for Molecular Fragments

Development of pseudopotentials for atoms (effective core potentials) and for molecular fragments (effective fragment potentials). Application of these in molecular electronic structure calculations for systems including (heavy) metal atoms.

Molecular and Electronic Structure of Polyoxometallate Ions

Calculation of the molecular and electronic structure of polyoxometallate ions of molybdenum and tungsten. Derivation of force-field parameters to represent these ions in MD simulations.

Molecular Knots and Links

Development of methods to build up and handle knotted and linked molecular structures (knotted peptides or proteins, plasmidic nucleic acids). Development of a hierarchy of methods to describe the molecular structure, from ab initio quantum chemistry to the theory of elasticity.

Selected Publications

D. Andrae, M. Reiher, J. Hinze
A comparative study of finite nucleus models for low-lying states of few-electron high-Z atoms
Chem. Phys. Lett. **2000**, *320*, 457-468.

D. Andrae
Finite nuclear charge density distributions in electronic structure calculations for atoms and molecules
Phys. Rep. **2000**, *336*, 413-525.

D. Andrae, R. Brodbeck, J. Hinze
Examination of Several Density Functionals in Numerical Kohn-Sham Calculations for Atoms
Int. J. Quantum Chem. **2001**, *82*, 227-241.

D. Andrae
Numerical self-consistent field method for polyatomic molecules
Mol. Phys. **2001**, *99*, 327-334.

T. C. Scott, M. Aubert-Frécon, G. Hadinger, D. Andrae, J. Grotendorst, J. D. Morgan III
Asymptotically exact calculation of exchange energies of one-active electron diatomic ions with the surface integral method
J. Phys. B: At. Mol. Opt. Phys. **2004**, *37*, 4451-4469.



Prof. Dr. Rüdiger Blume

Diplom-Biochemiker, University of Tübingen, 1973
Dissertation, University of Tübingen, 1975
Habilitation, Pädagogische Hochschule Westfalen-Lippe, 1978
University of Bielefeld, 1980

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Selected Publications

„Erstellung und Erprobung von modernen Medien im Verbund“
Schalk-Trietschen, R. Blume und M. Behrendt in: A. Kometz (Editor):
Chemieunterricht im Spannungsfeld
Gesellschaft – Chemie – Unterricht.
Cornelsen Verlag, Berlin 1998.

School-Books e. g.:

„Chemie für Gymnasien Klassen 8,
9/10 und 11 (Sachsen-Anhalt)“
R. Blume, W. Kunze, H. Obst, E. Rossa
und H. Schönemann, Cornelsen Verlag,
Berlin 2001.

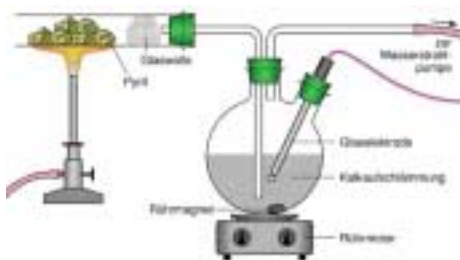
„Chemie interaktiv“
R. Blume and I. Eilks (Editors),
Cornelsen Verlag, Berlin 2005.

Modern Media in Environmental Chemistry

There is much talk about problems of the environment among pedagogues and politicians. In everyday classroom practise, the issue, however, is hardly present. This sad result documented by studies is mainly due to the fact that there has hitherto been only a scant supply in simple and at the same time comprehensive teaching materials with reference to environmental instruction for experimentally oriented teaching of the natural sciences. To mend this state of affairs is a task for educators. This is why we are developing a program containing a large number of model experiments for the entire field of environmental chemistry accessible to experimentation. This program is intended to contribute towards establishing a basis for developing teaching units for chemistry, physics and biology, as well as for higher education in environmental science. Another modern aspect in chemistry treated by us is the technology of renewable raw materials.

Chemical Education

A good chemical education needs good media as well. For the presentation of our results we pursue a server www.chemieunterricht.de which is contacted more than 100.000 times – daily. Naturally, we still are engaged in the development of a lot of books for multimedial school purposes.



PD Dr. Thomas Braun

Diplom, Chemistry, University of Würzburg, 1993
Stay at the University of Rennes, 1995
Dissertation, University of Würzburg, 1997
Research Fellow, University of York, 1997-2000
Habilitation, University of Bielefeld, 2003

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Metal Mediated Synthesis of Fluorinated Molecules by C-F Activation

The introduction of fluorinated groups into organic molecules can cause a dramatic change in their physical properties, chemical reactivity and physiological activity. Nevertheless, it is still a challenge for synthetic chemists to prepare the desired compounds. One of our strategies for the synthesis of highly fluorinated aromatics, olefins or alkanes is initiated by the selective replacement of a fluorine atom by a transition metal. After these C-F activation reactions, the fluorinated organic ligands can be derivatised to yield fluoro-organic molecules, which are often not accessible by any other means. The characterization of the organometallic compounds often requires sophisticated NMR spectroscopic techniques, such as isotope labeling techniques, simulation of NMR spectra, and multidimensional NMR spectroscopy at low temperature.

Synthesis and Reactivity of Metal Complexes Bearing a Fluoro Ligand

There is a growing interest in the study of transition metal organometallic fluoro complexes, because the unique properties of fluorine impart an unusual reactivity to the metal-fluorine bond which can be exploited in preparative organometallic chemistry or in catalysis. Our investigations focus on the synthesis and reactivity of new palladium, platinum and rhodium complexes, which definitely hold promise for future applications such as stereoselective fluorination reactions.

Reactivity and Structure of Peroxo Complexes

Transition metal complexes bearing peroxo ligands play an important role in various catalytic or stoichiometric transformations. We are interested in the development of new routes for the oxygenation of inorganic and organic substrates. The project involves studies on the synthesis and reactivity of unusual rhodium peroxo and hydroperoxo complexes as well as related compounds with a RhOOSiMe₃ unit. These compounds have to be characterized by infrared spectroscopy using isotope labeling techniques.



Selected Publications

"Conversion of Hexafluoropropene into 1,1,1-Trifluoropropane by C-F Activation at Rhodium"

T. Braun, D. Noveski, B. Neumann, H.-G. Stammler, *Angew. Chem.* **2002**, *15*, 2870-2873.

"Routes to Fluorinated Organic Derivatives by Nickel Mediated C-F Activation of Heteroaromatics"

T. Braun, R. N. Perutz, *Chem. Commun.* **2002**, 2749-2757.

"C-F activation and hydrodefluorination of fluorinated alkenes at rhodium", D. Noveski, T. Braun, M. Schulte, B. Neumann, H.-G. Stammler, *Dalton Trans.* **2003**, 4075-4083.

"Synthesis and Reactivity of Rhodium Fluoro Complexes", D. Noveski, T. Braun, S. Krückemeier, *J. Fluorine Chem.* **2004**, *125*, 966.



A metal complex obtained after replacement of a fluorine in hexafluoropropene by rhodium



HD Dr. Andreas Brockhinke

Diplom, Physics, University of Bielefeld, 1993
Dissertation, Physics, University of Bielefeld, 1996
Habilitation, Physical Chemistry, University of Bielefeld, 2003
Research visits: Colorado School of Mines (Golden, USA), Lund Laser Centre (Lund, Sweden), Oxford Institute for Laser Science (Oxford, UK)
Award of the Westfälisch-Lippische Universitätsgesellschaft, 1996

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Selected Publications

"Energy transfer in the OH A²P state: The role of polarization and of multi-quantum energy transfer"

A. Brockhinke, U. Lenhard, A. Bülter, K. Kohse-Höinghaus, *Phys. Chem. Chem. Phys.* **2004**, *7*, 874-881.

"Structural changes in the Ras protein revealed by fluorescence spectroscopy"

A. Brockhinke, R. Plessow, K. Kohse-Höinghaus, Ch. Herrmann, *Phys. Chem. Chem. Phys.* **2003**, *5*, 3498-3506.

"Cavity ring-down measurements in flames using a novel single-mode tunable laser system"

A. Schocker, K. Bultitude, P. Ewart, A. Brockhinke, *Appl. Phys. B* **2003**, *77*, 101-108.

"Short-pulse techniques: Picosecond fluorescence, energy transfer and 'quench-free' measurements"

A. Brockhinke, M. Linne, in: "Applied Combustion Diagnostics", Taylor and Francis, New York, 128-154, **2002**.

Main Target

In contrast to many conventional techniques, optical spectroscopy has the advantages of being non-intrusive, highly sensitive and selective and offers an excellent spatial and temporal resolution. These properties allow a wide field of applications in basic sciences, industry, environmental analysis and medicine.

Quantitative Species Detection

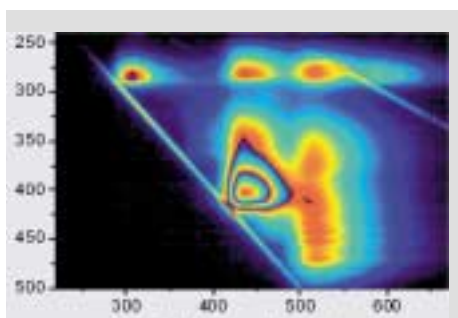
We develop novel techniques such as two-dimensional Excitation-Emission Spectroscopy (EES) and Cavity Ring-down Spectroscopy (CRDS). These methods allow the detection of trace species in the gas phase down to the ppt range and the temperature and are used to analyze chemical reactions at high temperatures - for example, in combustion.

Collisional Processes

When laser-excited radicals collide with other molecules, they tend to lose part of the initial information: other quantum states are populated, and emission spectra change significantly. These processes are investigated with ultra-fast picosecond lasers and numerical modelling. Results are both of fundamental interest, and a prerequisite for quantitative measurements with the LIF technique.

Applications in Biochemistry

Optical spectroscopy is a powerful tool to validate structural models and to reveal conformational changes in biologic macromolecules. Additionally, these techniques are used to study protein-substrate reactions under physiological conditions and to determine kinetic constants.



Prof. Dr. Thomas Dierks

Diploma, University of Tübingen, 1987
Dissertation, Forschungszentrum Jülich/University of Düsseldorf, 1990
Guest Researcher, Università di Bari (Italy), 1991
Research Associate, University of Göttingen, 1992-1996
Habilitation fellow (DFG), University of Göttingen, 1996-1999
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University of Bielefeld, 2004

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Formylglycine - a novel protein modification

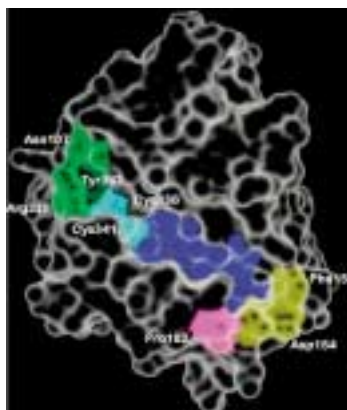
Sulfatases are a family of enzymes that contain at their active site a unique amino acid, C α -formylglycine (FGly). FGly directly participates in catalysis. FGly is post-translationally generated by oxidation of cysteine (eukaryotes and prokaryotes) or serine (prokaryotes). In mammals, this oxidation is carried out by the FGly-generating enzyme (FGE) during translocation of sulfatases into the endoplasmic reticulum.

We recently identified FGE and determined its 3D structure. FGE defines a new protein family that is conserved in evolution. Structural and functional data suggest that FGE is an unusual oxygenase utilizing molecular oxygen as terminal electron acceptor without requirement of metals or other activating cofactors.

In a number of bacterial sulfatases a serine residue is oxidized to FGly by a cytosolic protein termed AtsB. With the help of FeS centers and S-adenosylmethionine, AtsB generates a deoxyadenosyl radical, thereby initiating single electron transfer steps associated with serine oxidation.

Sulfatases - an extraordinary enzyme family

We furthermore are characterizing novel human sulfatases. Mouse knock-out models were generated. Sulf1 plays an important role in embryonic tissue differentiation, homeostasis and other essential cellular processes, which rely on heparan sulfate dependent signal transduction pathways. In addition, a tumor suppressor function was ascribed to Sulf1.



Substrate binding groove of the formylglycine-generating enzyme stretching from the site of substrate crosslinking (Pro182) to the redox-active Cys336/Cys341 pair.



Selected Publications

"Sequence determinants directing conversion of cysteine to formylglycine in eukaryotic sulfatases"

T. Dierks, M. R. Lecca, P. Schlotterhose, B. Schmidt, K. von Figura, *EMBO J.* **1999**, *18*, 2084-2091.

"Multiple Sulfatase Deficiency is caused by mutations in the gene encoding the human C α -formylglycine generating enzyme"

T. Dierks, B. Schmidt, L.V. Borissenko, J. Peng, A. Preusser, M. Mariappan, K. von Figura, *Cell* **2003**, *113*, 435-444.

"Post-translational formylglycine modification by the radical SAM protein AtsB"

Q. Fang, J. Peng, T. Dierks, *J. Biol. Chem.* **2004**, *279*, 14570-14578.

"Molecular characterization of the human C α -formylglycine generating enzyme"

A. Preusser-Kunze, M. Mariappan, B. Schmidt, S. L. Gande, K. Mutenda, D. Wenzel, K. von Figura, T. Dierks, *J. Biol. Chem.* **2005**, *280*, 14900-14910.

"Molecular basis for multiple sulfatase deficiency and catalytic mechanism for formylglycine generation of the human formylglycine generating enzyme"

T. Dierks, A. Dickmanns, A. Preusser-Kunze, B. Schmidt, M. Mariappan, K. von Figura, R. Ficner, M. G. Rudolph, *Cell* **2005**, *121*, 541-552.



Prof. Dr. Gabriele Fischer von Mollard

Dissertation, Max Planck Institute for Psychiatry, Munic, 1992
Postdoc, University of Oregon, Eugene
Junior group leader, University of Göttingen, 1998
Habilitation, University of Göttingen, 2002
University of Bochum, 2004
University of Bielefeld, 2005

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Selected Publications

"Specific interaction between SNAREs and ENTH domains of epsin-related proteins in TGN to endosome transport"
Chidambaram, S., Müllers, N., Wiederhold, K., Haucke, V., Fischer von Mollard, G., *J. Biol. Chem.* **2004**, *279*, 4175-4179.

"Deletion of the SNARE vti1b in mice results in loss of a single SNARE partner, syntaxin 8"
Atlashkin, V., Kreykenbohm, V., Eskelinen, E.L., Wenzel, D.; Fayyazi, A., Fischer von Mollard, G., *Mol. Cell. Biol.* **2003**, *23*, 5198-5207.

"Use1p is a yeast SNARE protein required for retrograde traffic to the ER"
Dilcher, M., Veith, B., Chidambaram, S., Hartmann, E., Schmitt, HD., Fischer von Mollard, G., *EMBO J.* **2003**, *22*, 3664-3674

"The SNAREs vti1a and vti1b have distinct localization and SNARE complex partners"
Kreykenbohm, V., Wenzel, D., Antonin, W., Atlachkine, V., Fischer von Mollard, G., *Eur. J. Cell Biol.* **2002**, *81*, 273-280.

"Genetic interactions with the yeast Q-SNARE *VTI1* reveal novel functions for the R-SNARE *YKT6*"
Dilcher, M., Köhler, B., Fischer von Mollard, G., *J. Biol. Chem.* **2001**, *276*, 34537-34544.

Research Interests

One of the fundamental questions in cell biology is how proteins are transported between different organelles. This traffic requires transport vesicles which bud from the donor and fuse with the target organelle. Our group is interested in the family of SNARE proteins which are required for recognition between transport vesicle and target membrane and for their subsequent fusion. Different SNARE proteins are found on transport vesicles and target membranes and form specific complexes. We focus on SNAREs which are required in transport between the Golgi, endosome and lysosome/vacuole. Such endosomal pathways are important for the supply of the cell, for signal transduction, for immune defense and also for entry of pathogens. As these proteins are conserved in evolution we can study similar processes in yeast and mammals.

Yeast projects

We use baker's yeast as one model system because of powerful genetic approaches. Mutant genes can be generated easily and defects analyzed. Genes required in the same step can be identified by genetic interactions. Using these techniques we demonstrated that:

- the SNAREs Vti1p and Ykt6p act in several different transport pathways in the endosomal system
- identified a new SNARE Use1p in retrograde transport from the Golgi to the ER
- characterized a protein required for vesicle budding, Ent3p, as interaction partner for Vti1p.

Mouse projects

Our second focus are endosomal SNAREs in mouse, especially Vti1a and Vti1b. We are studying their subcellular distribution using immunofluorescence microscopy and are identifying SNARE partners by co-immunoprecipitation. We used the yeast two hybrid system to identify new binding proteins for SNAREs. We generated SNARE knock out mice and are studying their phenotype. Cell lines derived from these mice are used to analyze distribution of different proteins and endosomal transport.

Prof. Dr. Jürgen Frey

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University of Bielefeld, 1988

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Membrane Type Matrix Metalloproteinases (MT-MMPs)

MT-MMPs play a significant role for the turnover of the extracellular matrix (ECM), a process that is also imbalanced during tumour cell invasion.

Our research is focussed on the role of MT1,2,3-MMP during wound healing as well as in neurodegenerative disorders. Using mouse mutants suffering from neurodegeneration we study the expression of MT-MMPs in affected regions of the brain. We established transgenic mouse lines which either constitutively or regulatably express MT-MMPs in a broad tissue range or tissue specific. The contribution of these enzymes in wound healing, smooth muscle cell growth as well as brain functions are investigated.

Shedding of Receptors and Ligands by ADAMs

The family of ADAM (a disintegrin and metalloprotease) proteins contains about 30 members expressed in cells from *C. elegans*, *Drosophila*, mouse and man. Eight out of twenty four known to be expressed in mouse and man, are supposed to contain a catalytically active metalloprotease domain. One of the functions of ADAMs is shedding (proteolytic release) of surface molecules (receptors, ligands, cytokines etc.). We recently identified the sheddase for the low affinity IgE receptor (CD23) that plays a significant role in allergic reactions and rheumatoid arthritis. Further aims of our work are the analysis of the substrate specificity of the sheddase as well as the development of specific inhibitors.

Characterisation of Calcium Channels in Lymphocytes

The long term objective of our research interest is to unravel the detailed mechanisms of calcium channel activation and deactivation in lymphocytes. To achieve this major goal we focus our research interest on three subjects: a) molecular cloning of candidate calcium channel cDNAs b) characterisation of the subunit structure and c) the role of associated proteins in gating of the calcium channel activity.



Selected Publications

"In vitro and in vivo specificity of protein tyrosine kinases for immunoglobulin G receptor (Fc γ RII) phosphorylation"

N. Bewarder, V. Weinrich, P. Budde, D. Hartmann, H. Flaswinkel, M. Reth, J. Frey, *Mol. Cell. Biol.* **1996**, *16*, 4735-4743.

"Characterization and crystallization of soluble human Fc γ receptor II (CD32) isoforms produced in insect cells"

P. Sondermann, U. Jacob, C. Kutscher, J. Frey, *Biochemistry* **1999**, *38*, 8469-8477.

"Elevated expression of membrane type 1 metallo-proteinase (MT1-MMP) in reactive astrocytes following neurodegeneration in mouse central nervous system"

S. Rathke-Hartlieb, P. Budde, S. Ewert, U. Schlomann, M.S. Staeger, H. Jockusch, J.W. Bartsch, J. Frey, *FEBS Lett* **2000**, *481*, 227-234.

"Differential modulation of stimulatory and inhibitory Fc γ receptors on human monocytes by TH1 and TH2 cytokines"

L. Pricop, P. Redecha, J.-L. Teillaud, J. Frey, W.H. Fridman, C. Sautès-Fridman, J.E. Salmon, *J. Immunol.* **2000**, in press.



Prof. Dr. Adelheid Godt

Diplom, LMU München, 1988

Dissertation, Max Planck Institute for Polymer Research, Mainz, 1991

Postdoctoral Fellow, Cornell University, Ithaca, N.Y., 1991-1993

Habilitation, Max Planck Institute for Polymer Research, Mainz/Free University Berlin, 2001

Visiting Professor, International University Bremen, 2003

Professor, University of Bielefeld 2003

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Selected Publications

"A Facile Access to Monodisperse Ultralarge Rings"

M. R. Shah, S. Duda, B. Müller, A. Godt, A. Malik, *J. Am. Chem. Soc.* **2003**, *125*, 5408-5414.

"Non-Rusty [2]Catenanes with Huge Rings and Their Polymers"

A. Godt, *Eur. J. Org. Chem.* **2004**, 1639-1654.

"EPR Probes With Well Defined, Long Distances between Two or Three Unpaired Electrons"

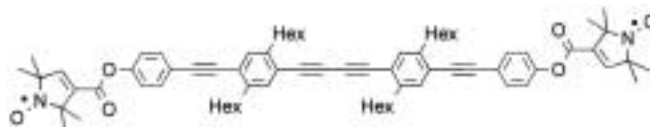
A. Godt, C. Franzen, S. Veit, V. Enkelmann, M. Pannier, G. Jeschke, *J. Org. Chem.* **2000**, *65*, 7575-7582.

"Co-Conformational Distribution of Nanosized [2]Catenanes Determined by Pulse EPR Measurements"

G. Jeschke, A. Godt, *ChemPhysChem* **2003**, *4*, 1328-1334.

Monodisperse oligo(phenyleneethynylene)s as synthetic modules for

- rod-coil block copolymers as thermotropic, light emitting materials and as model compounds to study molecular recognition at structured surfaces in collaboration with Prof.s F. Schmidt and A. Gölzhäuser, University of Bielefeld
- hybrid organic/inorganic, ordered nanocomposites in collaboration with Prof. M. Lahav, Weizmann Institute in Rehovot, Israel
- geometrically well defined spin labelled molecules in collaboration with Dr. G. Jeschke, Max Planck Institute for Polymer Research, Mainz
- diradicals to study dynamic nuclear polarisation in collaboration with Dr. van den Brandt, Paul Scherrer Institute in Villigen, Schweiz.

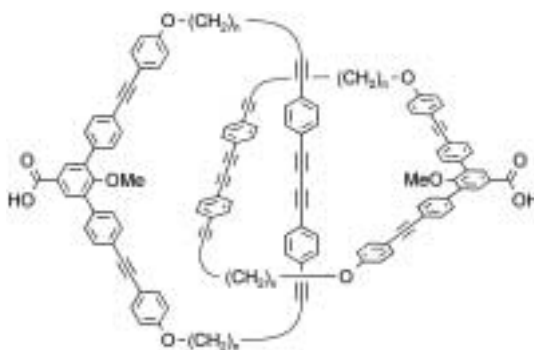


Ultralarge Cycles

- synthetic strategies
- building blocks for catenanes

Catenanes

- synthesis of [2]catenanes with ultralarge, non interacting rings
- study of their dynamics



Prof. Dr. Peter Jutzi

Dissertation, University of Marburg, 1965
Habilitation, University of Würzburg, 1971
University of Bielefeld, 1979

Wacker-Silicon-Preis, 1987
Max-Planck-Forschungspreis, 1992
Stanley Kipping Award, 2000
Alfred Stock Gedächtnispreis, 2002

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Cyclopentadienyl Chemistry of Main Group Elements

Synthetic strategies in the cyclopentadienyl (Cp) chemistry of main group elements are based on the following phenomena [1]:

- ionic or covalent C(Cp) bonding
- low barriers for haptotropic and dyotropic shifts, for sigmatropic rearrangements, and for other types of Cp migration
- stabilization of elements in their low oxidation state by π -complexation
- tuning of steric and electronic effects by suitable ring substituents
- easy homolytic or heterolytic cleavage of EI-C(Cp) bonds

Actually, the chemistry of $\text{Me}_5\text{C}_5\text{Si}^+$ [2] and of $\text{Me}_5\text{C}_5\text{Ga}$ [3] is studied in more detail.

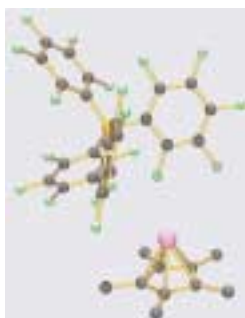
Synthesis and Funktionalization of Metallic Nanoparticles

Metallic Nanoparticles can be formed by decomposition of organometallic precursors in the liquid phase. The particles are stabilized by covering them with amphiphilic molecules (ligands). We are interested in the processes involved during precursor decomposition, particle growth, and ligand attachment. The synthesis and evaluation of new precursors and ligands is another field of our interest.

Actually, we investigate magnetic FeCo and Co particles and their stabilization with multidentate ligands [4].

Dynamic Covalent Chemistry as a Tool for Novel Organogallium Compounds

The synthesis of molecular compounds is controlled either thermodynamically or kinetically. The thermodynamic control is based on affecting reversible reactions which are dynamic systems. We use the concept of "dynamic covalent chemistry" to synthesize triorganogallium compounds with novel structural features [5].



$[\text{Me}_5\text{C}_5\text{Si}]^+[\text{B}(\text{C}_6\text{F}_5)_4]^-$

Selected Publications

[1] "Strategies in the Cyclopentadienyl Chemistry of p-Block Elements"
P. Jutzi, *Pure and Appl. Chem.* **2003**, *75*, 483-494.

[2] "The $\text{C}_5\text{Me}_5\text{Si}^+$ Cation: A Stable Derivative of SiH^+ "
P. Jutzi, A. Mix, B. Rummel, W. W. Schoeller, B. Neumann and H.-G. Stammler, *Science* **2004**, *305*, 849-851.

[3] "Cp* Chemistry of main-group elements"
P. Jutzi, G. Reumann, *J. Chem. Soc., Dalton Trans.* **2000**, *14*, 2237.

[4] "New magnetic particles for biotechnology"
A. Hütten, D. Sudfeld, I. Ennen, G. Reiss, W. Hachmann, U. Heinzmann, K. Wojczykowski, P. Jutzi, W. Saikaly, G. Thomas, *J. Biotech.* **2004**, *112*, 47.

[5] "[$\{\text{Fe}(\text{C}_5\text{H}_4)_2\}_3\{\text{Ga}(\text{C}_5\text{H}_5\text{N})_2\}$] – ein dreikerniges galliumverbrücktes Ferrocenophan mit Karussellstruktur"
P. Jutzi, N. Lenze, B. Neumann, H.-G. Stammler, *Angew. Chem.* **2001** *113*, 1470-1473; *Angew. Chem. Int. Ed. Engl.* **2001**, *40*, 1424-1427.



Prof. Dr. Katharina Kohse-Höinghaus

Diplom, Chemistry, University of Bochum, 1975
Dissertation, University of Bochum, 1978
Habilitation, University of Stuttgart, 1992
Work at DLR, Stuttgart, ONERA, Paris, Stanford University, SRI International, USA
Heisenberg Fellow (DFG), 1993-1994
University of Bielefeld, since 1994
Baetjer Lectures in Engineering, Princeton, 1993
PUSH awards (Stifterverband), 2000 and 2002
Board of Directors (International Combustion Institute), since 2002
Board of Trustees (Volkswagenstiftung), since 2002

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Selected Publications

"Combustion at the focus: laser diagnostics and control"

K. Kohse-Höinghaus, R. S. Barlow, M. Aldén, J. Wolfrum, *Proc. Combust. Inst.* **2005**, *30*, 89-123.

"Applied Combustion Diagnostics"

K. Kohse-Höinghaus, J. B. Jeffries (Eds.), Taylor and Francis, New York, **2002**.

"CVD with Tri-nbutylphosphine Silver(I) Complexes: Mass Spectrometric Investigations and Depositions"

T. Haase, K. Kohse-Höinghaus, N. Bahlawane, P. Djiele, A. Jakob, H. Lang, *Chem. Vap. Deposition* **2005**, *11*, 195-205.



Laser probing of biomolecules

Laser Techniques

Modern analytical methods increasingly use lasers because of their potential for non-invasive measurements. In reacting media, including combustion and chemical vapor deposition, we determine the concentrations of main compounds and trace gases using short-pulse lasers. Also, we investigate structural changes in biochemical and biological systems using picosecond laser-induced fluorescence. We participate in the development of novel quantitative measurement techniques.

Energy Transfer

When laser-excited molecules interact with their surroundings, new features may appear in their characteristic spectra due to energy transfer between different quantum states. We investigate these processes for small molecules to understand the underlying mechanism. Also, we employ energy transfer strategies between fluorescent sections in biomolecules to study biomolecular interactions.

Combustion

Combustion research today aims at the understanding and prediction of pollutant formation from practical systems. We investigate different combustion situations with respect to the generation of polyaromatic hydrocarbons and soot and study the interaction of flame chemistry and turbulence. Reaction mechanisms are analyzed in conjunction with these experiments.

Materials for Catalysis, Coatings and Information Technology

A variety of materials with interesting properties may be obtained using chemical vapor deposition techniques. We study the gas phase of such processes to find correlations between chemical composition and material properties with the aim of process optimization.

Chemical Education

With a novel chemical laboratory for children, we attempt to stimulate long-term interest in science.

Prof. Dr. Thomas Koop

Dissertation, Max Planck Institute for Chemistry Mainz, 1996
Postdoc, Massachusetts Institute of Technology, 1997-1998
Habilitation, ETH Zurich, 2004
University of Bielefeld, 2004

Otto Hahn Medal, 1997
Latsis Prize ETH Zurich, 2003
Elected Member of 'Die Junge Akademie', 2003

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Water and aqueous solutions

Water is without doubt the most important liquid on Earth. In many environmental systems liquid water is found in a supercooled metastable state below its equilibrium melting temperature. However, the unique properties of water and aqueous solutions in the supercooled state are not fully understood. In particular, the conditions and mechanisms of the liquid-to-solid phase transition of supercooled water and aqueous solutions to ice have remained unresolved. We investigate, both experimentally and theoretically, homogeneous and heterogeneous ice nucleation processes in supercooled water and aqueous solutions with applications to atmospheric processes and cryobiological systems. In addition, we study the thermodynamic properties of aqueous solutions containing ions, organic solutes, or polymers.

Aerosols and Clouds

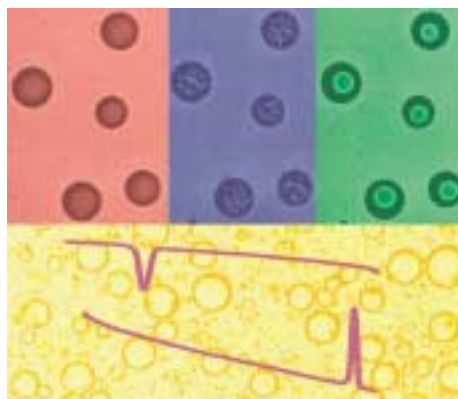
Aerosols and clouds affect atmospheric chemistry and the Earth's climate. We are particularly interested in the formation mechanisms of polar stratospheric clouds, and the conditions that lead to ice particle formation in atmospheric cirrus clouds.

Experimental Methods

We employ various experimental techniques in our research:

- Differential Scanning Calorimetry
- Optical Cryo-Microscopy
- Emulsions and droplet arrays
- Raman Microscopy

Ice nucleation in micrometer sized aqueous droplets and DSC trace of the freezing and melting of a water/oil emulsion



Selected Publications

"Homogeneous Ice Nucleation in Water and Aqueous Solutions (Review Article)"

T. Koop, *Z. Phys. Chem.* **2004**, *218*, 1231-1258.

"Water activity as the determinant for homogeneous ice nucleation in aqueous solutions"

T. Koop, B.P. Luo, A. Tsias, T. Peter, *Nature* **2000**, *406*, 611-614.

"A New Optical Technique to Study Aerosol Phase Transitions"

T. Koop, H.P. Ng, L.T. Molina, M.J. Molina, *J. Phys. Chem. A* **1998**, *102*, 8924-8931.

"Melting of $\text{H}_2\text{SO}_4 \cdot 4\text{H}_2\text{O}$ Particles Upon Cooling: Implications for Polar Stratospheric Clouds"

T. Koop, K.S. Carslaw, *Science*, **1996**, *272*, 1638-1641.



Prof. Dr. Dietmar Kuck

Studies of Chemistry, University of Hamburg, 1968-1972
(Diploma)

Promotion (Dr. rer. nat.), Bielefeld, 1976

Postdoc research, University of Amsterdam, 1983

Habilitation, University of Paderborn, 1995

Umhabilitation, University of Bielefeld, 2000

apl. Professor, University of Bielefeld, 2002

Mattauch-Herzog-Förderpreis für Massenspektrometrie, 1988

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Selected Publications

Benzoannelated *cis,cis,cis,trans*-[5.5.5.6]Fenestranes. Syntheses, Base Lability and Flattened Molecular Structure of Strained Epimers of the all-cis Series

B. Bredenköter, U. Flörke, D. Kuck, *Chem. Eur. J.* **2001**, *7*, 3387-3400.

Half a Century of Scrambling in Organic Ions: Complete, Incomplete, Progressive and Composite Atom Interchange

D. Kuck, *Int. J. Mass Spectrom.* **2002**, *213*, 101-144.

The Gas-phase Basicity and Proton Affinity of 1,3,5-Cycloheptatriene - Energetics, Structure and Interconversion of Dihydrotropylium Ions

J.-Y. Salpin, M. Mormann, J. Tortajada, M. T. Nguyen, D. Kuck, *Eur. J. Mass Spectrom.*, **2003**, *9*, 361-376.

2,3,6,7,10,11-Hexamethoxytribenzotriquinacene: Synthesis, Solid-state Structure and Functionalization of a Rigid Analogue of Cyclotriveratrylene

M. Harig, B. Neumann, H.-G. Stammler, D. Kuck, *Eur. J. Org. Chem.* **2004**, 2381-2397.

Methoxy-substituted Centrohexasindanes Through the Fenestrane Route

J. Tellenbröcker, D. Barth, B. Neumann, H.-G. Stammler and D. Kuck, *Org. Biomol. Chem.* **2005**, *3*, 570-571.

Main fields of research

- Synthesis of non-natural polycyclic carbon frameworks
- Gas-phase ion chemistry and mass spectrometry

Unusual Molecular Architecture

We use both established and "modern" methods of organic synthesis to construct novel compounds consisting of unusual molecular frameworks. We have developed a complete family of highly condensed aromatic hydrocarbons (the "centrohexasindanes"), which comprise the first topologically nonplanar K_5 -hydrocarbon ("centrohexasindane"), in which six independent cyclopentane rings contain one common carbon atom.

Benzoannelated Fenestranes, triquinacenes and propellanes

Owing to their reactive bridgehead positions and aromatic periphery, the centropolyindanes bear a high potential to explore the fascinating field of highly unusual non-natural host-guest and dendrimer chemistry.

Graphite cuttings and other supermolecular framework based on tribenzotriquinacenes

We have designed challenging possibilities and are undertaking efforts to synthesize extended covalently bound carbon frameworks consisting of bowl-shaped graphite cuttings, polyfunctionalized super-cubes and super-tetrahedra.

Chemistry of Organic Ions in the Gas Phase and Mass Spectrometry

The chemistry of organic ions lacking the presence of solvent molecules and counter-ions can be favourably studied in the vacuum of a mass spectrometer. We are studying the unimolecular and bimolecular ("elementary") processes and intrinsic properties of isolated organic ions and ion/molecule complexes. Insights obtained from these studies are of major importance for understanding general organic chemistry, including the wide-spread analytical application of mass spectrometry.

Prof. Dr. Gisela Lück

Dissertation: Universität zu Köln, 1985 (Dr. phil)
Henkel KGaA 1986 - 1995
Habilitation, Universität zu Kiel, 1999
Professor Universität Essen (2000), Universität Bielefeld 2002
Preise: Friedrich Gmelin-Preis der GDCh, 1999

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Frühzeitige Vermittlung naturwissenschaftlicher Inhalte im Elementarbereich und Primarstufe

- Entwicklung geeigneter Experimente
- Evaluierung der Experimente und deren Deutung in Bezug auf Erinnerungsfähigkeit und Langzeitwirkung
- Untersuchungen zum bereichsspezifischen, intuitiven chemischen Wissen von Kleinkindern
- Untersuchungen zur Naturwissenschaftsvermittlung bei behinderten Kindern

Außerschulische Medien

- Analyse von naturwissenschaftlichen Fernsehsendungen für Kinder und Erwachsene
- Sach- und Kinderbuchanalyse
- Entwicklung chemischer Exponate in Science Centern

Sprachphilosophie und Naturwissenschaftsvermittlung

Untersuchungen zur Verwendung von Animismen und Analogien im Chemieunterricht

Untersuchungen zur Rolle der Sprache auf Fehlvorstellungen im naturwissenschaftlichen Vermittlungsprozess

Selected Publications

LÜCK, GISELA: Handbuch der naturwissenschaftlichen Bildung. Theorie und Praxis für die Arbeit in Kindertageseinrichtungen. Herder, Freiburg, 2003.

LÜCK, GISELA: Leichte Experimente für Eltern und Kinder. Herder-Spektrum, Freiburg, 2000.

LÜCK, GISELA: Naturwissenschaften im frühen Kindesalter. Untersuchungen zur Primärbegegnung von Vorschulkindern mit Phänomenen der unbelebten Natur. In: Naturwissenschaften und Technik – Didaktik im Gespräch. Bd. 33. Münster, LIT, 2000.

FÖRSTER, HENDRIK; LÜCK, GISELA: Chemie zum Anfassen. Chemieexponate in Science Centern. In: *Grundschule* 2003, 35, 32-38.

LÜCK, GISELA: Naturwissenschaften im frühen Kindesalter. In: *Frühpädagogik international. Bildungsqualität im Blickpunkt.* Hrsg. von W.E. Fthenakis; P. Oberhuemer. Opladen: Leske + Budrich. 2004, S.331-343.

RISCH, BJÖRN; LÜCK, GISELA: Lehrplananalyse des naturwissenschaftlichen Anfangsunterrichts der Primarstufe. In: *Grundschule* 2004, 10, S.63-66

LÜCK, GISELA: Von einsamen Elektronenpaaren - Oder: Warum es auch in der Chemie ‚menschelt‘, In: Wenn der Geist die Materie küsst. Verlag Harri Deutsch, Frankfurt, 2004, S.163-175.



Prof. Dr. Uwe Manthe

Dissertation, Universität Heidelberg, Theoretische Chemie, 1991
Postdoctoral Fellow, UC Berkeley, 1992/3
Habilitation, Universität Freiburg, Fakultät für Physik, 1997
Heisenberg-Stipendiat, TU München, Theoretische Chemie, 1999-2003
Professor für Theoretische Chemie, Universität Bielefeld, 2004

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Selected Publications

"First principles Theory for the $H+CH_4$ H_2+CH_3 Reaction"
T. Wu, H.-J. Werner, and U. Manthe, *Science* **2004**, *306*, 2227.

"The ground state tunneling splitting of malonaldehyde: accurate full dimensional quantum dynamics calculations"
Mauricio D. Coutinho-Neto, Alexandra Viel, and Uwe Manthe, *J. Chem. Phys.* **2004**, *121*, 9207.

"The Sudden-Polarization Effect and its Role in the Ultrafast Photochemistry of Ethene"
A. Viel, R. P. Krawczyk, U. Manthe, and W. Domcke, *Angew. Chem. Int. Ed.* **2003**, *42*, 3434.

"Reaction Rates: Accurate quantum dynamical calculations for polyatomic systems"
U. Manthe, *J. Theor. Comp.Chem.* **2002**, *1*, 153.

Research Interests

Quantum Dynamics of Chemical Reactions:
thermal rate constants and reaction probabilities for gas phase reactions and reactions on surfaces.

Molecular Spectroscopy and Photochemistry:
femtochemistry, vibronic coupling and nonadiabatic dynamics, photodissoziation, isomerization, photoinduced reactions

Proton transfer

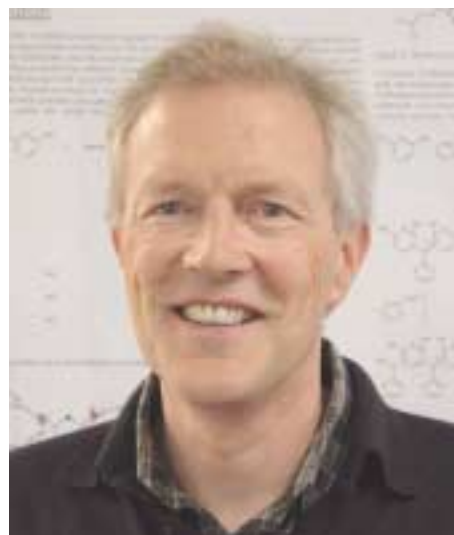
Numerical methods for Quantum Molecular Dynamics:
• accurate multi-dimensional wave packet dynamics: the multi-configurational time-dependent Hartree (MCTDH) approach,
• approximate methods for large systems: mixed quantum classical dynamics and reduced density matrix approaches.

Multi-dimensional potential energy surfaces:
Ab initio calculations (quantum chemistry) and interpolation approaches

Prof. Dr. Jochen Mattay

Dissertation, University (TH) of Aachen (1978)
Postdoctoral Fellow, Columbia University, N.Y. (1979/80)
Habilitation, University (TH) of Aachen (1984)
Professor, Universities of Aachen (1985), Münster (1989),
Kiel (1995), Bielefeld (1998)
Visiting Professor, Osaka University (Yamada Foundation 1995),
University of Berne (3ième cycle 1996)

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Supramolecular Chemistry

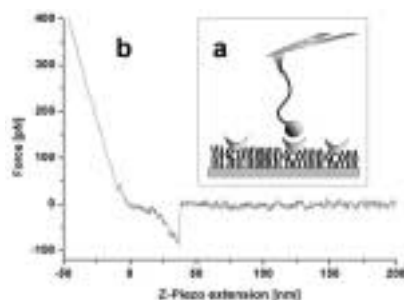
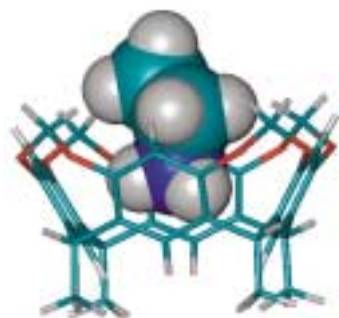
Synthesis of functionalized (chiral) calix- and resorcarenes
Octahydroxypyridine[4]arenes, a new type of calixarene
Host-guest complex formation, especially chiral discrimination effects
Self assembly of resorcarenes, molecular capsules, gel formation
Self assembled monolayers, LB films
Photoswitchable molecular receptor molecules
Supramolecular Chemistry in the gas phase
Single molecule studies (AFM)
CD spectroscopy

Photochemistry

Energy transfer, electron transfer
Radical cation cycloadditions
Radical ion fragmentation and cyclisation reactions
Photocatalysis
Solar photochemistry (Green Chemistry)

Organic and Stereoselective Synthesis

Macrocycles
Building blocks for Organic Synthesis
Polycyclic compounds
1,4-Naphthoquinones
Functionalized fullerenes and fullerooids



Selected Publications

"Preparation of photocyclizable dianthracene derivatives of resorc[4]arenes which are potential photo switches "
C. Schäfer, J. Mattay, *Photochem. Photobiol. Sci.* **2004**, *3*, 331-333.

"Supramolecular Chemistry at the Single Molecular Level"
R. Eckel, R. Ros, B. Decker, J. Mattay, D. Anselmetti, *Angew. Chem. Int. Ed. Engl.* **2005**, *44*, 484-488.

"Green Photochemistry: Solar photooxygenations with medium concentrated sunlight"
Michael Oelgemöller, Christian Jung, Jürgen Ortner, Jochen Mattay, Elmar Zimmermann, *Green Chemistry* **2005**, *7*, 35-38.

"Radical Cations of Phenyl-Substituted Aziridines: What are the Conditions for Ring-Opening?"
Carsten Gaebert, Jochen Mattay, Marion Toubartz, Steen Steenken, Beat Müller, Thomas Bally, *Chem. Eur. J.* **2005**, *11*, 1294-1304

"Self-Assembly of Resorcinarene-Stabilized Gold Nanoparticles: Influence of the Macrocyclic Headgroup"
Beomseok Kim, R. Balasubramaniam, Waleska Perez-Segarra, Alexander Wei, Björn Decker, and Jochen Mattay, *Supramolecular Chemistry* **2005**, *17*, 173-180.



Prof. Dr. Dr. h. c. mult. Achim Müller

Dissertation, University of Göttingen, 1965

Habilitation, University of Göttingen, 1967

University of Dortmund, 1971

University of Bielefeld, 1977

Numerous national and international awards and prizes, see homepage <http://www.uni-bielefeld.de/chemie/ac1/>

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Selected Publications

"Molecular growth from a Mo_{176} to a Mo_{248} cluster"

A. Müller, Syed Q. N. Shah, H. Bögge, M. Schmidtman, *Nature* **1999**, *397*, 48-50.

"Self-assembly in aqueous solution of wheel-shaped Mo_{154} oxide clusters into vesicles"

T. Liu, E. Diemann, H. Li, A. W. M. Dress, A. Müller, *Nature* **2003**, *426*, 59-62.

"Changeable Pore Sizes Allowing Effective and Specific Recognition by a Molybdenum-Oxide-Based "Nanosponge": En Route to Sphere-Surface and Nanoporous-Cluster Chemistry"

A. Müller, E. Krickemeyer, H. Bögge, M. Schmidtman, S. Roy, A. Berkle, *Angew. Chem. Int. Ed.* **2002**, *41*, 3604-3609.

"Trapping Cations in Specific Positions in Tuneable "Artificial Cell" Channels: New Nanochemistry Perspectives"

A. Müller, S. K. Das, S. Talismanov, S. Roy, E. Beckmann, H. Bögge, M. Schmidtman, A. Merca, A. Berkle, L. Allouche, Y. Zhou, L. Zhang, *Angew. Chem. Int. Ed.* **2003**, *42*, 5039-5044.

"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. Schmidtman, G. Heinze-Brückner, *Angew. Chem. Int. Ed.* **2004**, *43*, 4466-4470.

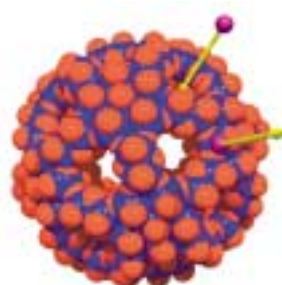
Unprecedented Chemistry under Confined Conditions

Structurally well defined metal-oxide based spherical porous nanocapsules/artificial cells allow unprecedented chemistry under confined conditions, e.g., encapsulation chemistry including related capsule-environment interactions. This includes studies of encapsulated nanomaterials (e.g. water with and without electrolytes), as well as of ion uptake-and-release equilibria through the pores and channels of the artificial membranes. In this respect some of Nature's pathways can be modelled, like cell response to stimuli as pore closing influences significantly encapsulates' structures. An interesting corresponding subject is coordination chemistry in capsules, allowing a new type of spectroscopic and magnetic studies while the capsules themselves can separate/position cations like a nano-ionchromatograph. A special aspect refers to the possibility of getting more information about confined water structures.

Important related points are: (1) the size of the capsules and their pores can be tuned, while the latter can be opened and closed, (2) the internal cavity shell functionality can be tuned from hydrophilic to hydrophobic, and (3) the twenty(!) abundant pores have crown-ether functions allowing sphere-surface as well as super-supramolecular chemistry including in principle the study of allosteric effects.

This area shows revolutionary routes to different disciplines, such as materials science in several directions, physics (regarding confined matter properties), and even mathematics (concerning the tiling problem of sphere surfaces).

This new type of chemistry is, besides several of our other research projects – from Bioinorganic Chemistry to Natural Philosophy – presently the most attractive research topic; see homepage <http://www.uni-bielefeld.de/chemie/ac1/>



Prof. Dr. Prof. h.c. Eberhard Neumann

Dissertation, University of Münster, 1967
Habilitation, University of Konstanz, 1973
Max-Planck-Institute of Biochemistry, Martinsried, 1975
University of Bielefeld, 1983

Academy Price of Chemistry, Göttingen, 1980
President, The Bioelectrochemical Society, 1992-1996
Saxonian Academy, Leipzig, 1998
Präsident, Deutsche Ges. f. Biophysik, seit 2003

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Biological Electricity:

Electric Field Effects of Macromolecules and Membranes
The membranes of biological cells are the carriers of vital electrical voltages: typically 100 mV, equivalent to a field strength of 100 kV/cm at an average membrane thickness of 10 nm. Breakdown of the membrane voltage finally causes cell death.

We address the molecular mechanisms by which the electric fields control structures and functions, for instance: gated ion transport underlying nerve and muscle function, specifically the neurotransmission system of the acetylcholine receptor, reconstituted in lipid bilayers, further on, ion transport caused by adsorbed annexin V; DNA and oligonucleotide transport.

New electro-optical and conductometric methods and instruments have been developed to investigate the very rapid (submicrosecond) electrical-chemical processes in biological cell membranes, cell pellets (as tissue models) and model membranes like lipid vesicles and planar lipid bilayers.

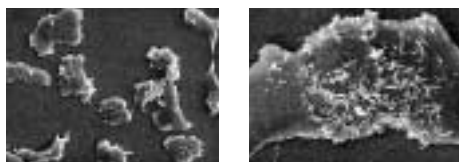
It has been found that lipid membrane systems in electric fields are globally deformed and locally electroporated such that the transient aqueous electropores conduct not only small ions but also larger ionic molecules (Dr. S. Kakorin).

Membrane Electroporation in Cell Biology and Medicine

A very successful application of high voltage pulses is the reversible electropermeabilization of the lipid part of cell membranes. In cell biology and genetic engineering this new technique is used to transfer naked gene DNA into cells (electrotransfection).

The method is applied to electroporate skin tissue to directly transfer therapeutical effector substances (Dr. U. Pliquett).

Recently, electroporation is used in medicine to efficiently introduce drugs and genes into tissue, particularly into tumors, now applied in the various phases of clinical trials (EU-Project Cliniporator).



Single cells (left) of the microorganism *Dictyostelium discoideum*, electroporated to viable, still chemotactically active large cells (right).

Selected Publications

Neumann, E., Electric and magnetic field reception. In: *Encyclopedia of Molecular Cell Biology and Molecular Medicine*, ed. R.A. Meyers, WILEY-VCH, New York (2004), Vol. 4, pp. 1-20.

Kakorin, S., Liese, T. and Neumann, E., Membrane curvature and high-field electroporation of lipid bilayer vesicles, *J. Phys. Chem. B* **107**, 10243-10251 (2003).

Griese, T., Kakorin, S. and Neumann, E., Conductometric and electrooptic relaxation spectrometry of lipid vesicle electroporation at high fields; *Phys. Chem. Chem. Phys.* **4**, 1217-1227 (2002).

Neumann, E., Kakorin, S., Electro-poration of curved lipid membranes in ionic strength gradients, *Biophys. Chem.* **85**, 249 - 271 (2000).

Renkes, R., Schäfer, H.J., Siemens, P.M., Neumann, E., Fatty acid-oligo(ethylene glycol) ester forms ion channels in lipid membranes, *Angew. Chem. Int. Ed.* **39**, 2512-2516 (2000).

Neumann, E., Digression on chemical electromagnetic field effects in membrane signal transduction – the experimental paradigm of the acetylcholine receptor, *Bioelectrochemistry* **52**, 43-49 (2000).



Prof. Dr. Wolfgang Schoeller

Dissertation, University of Stuttgart, 1969
Postdoctoral Fellow, University of Austin 1969-71
University (TH) of Bochum, 1971-77
Habilitation, University of Bielefeld, 1978

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E-Mail : wolfgang.schoeller@uni-bielefeld.de

Selected Publications

"Phosphorane-Iminato Complexes of Transition Metals with Heterocubane Structure: A Computational Study"
A. Sundermann, W.W. Schoeller, *J. Am. Chem. Soc.* **2000**, *122*, 4729-4734.

"Ring Structure Formation in Transition-Metal Nitrido Chlorides by Donor-Acceptor Formation"
W.W. Schoeller, A. Sundermann, *Inorg. Chem.* **1998**, *37*, 3034-3039.

"Isolation of a Benzene Valence Isomer with One-Electron Phosphorus-Phosphorus Bond"
Y. Canac, D. Bourissou, A. Baceiredo, H. Gornitzka, W.W. Schoeller, G. Bertrand, *Science* **1998**, *279*, 80-82.

"A Cyclic Carbanionic Valence Isomer of a Carbocation: Diphosphino Analogs of Daminocarocations"
T. Kato, H. Gornitzka, A. Baceiredo, W.W. Schoeller, G. Bertrand, *Science* **2000**, *289*, 754-756.

W.W. Schoeller, in *Multiple Bonds and Low-Coordination in Phosphorus Chemistry*, M. Regitz and O.J. Scherer (Eds.), Thieme Verlag, **1990**.

Molecular Modelling in Organic and Inorganic Chemistry

Low-Coordinated Phosphorus Chemistry

The quantum chemical modelling of the properties of low-coordinated phosphorus compounds is of particular interest with respect to the development of new chemical structures which are of interest for the design of new catalytic systems. With the aid of modern computer technology new facets of this class of compounds are predicted. The findings are further explored experimentally in collaboration with various European experimental laboratories.

Silicon-Oxygen Frameworks

Silicon-oxygen bonding is the basis for the formation of stones in nature. Its further elucidation is fundamental for the evaluation of bricks of chemical interest, such as transistors, polymeric materials etc. We model with the quantum chemical machinery the bonding features of such compounds, in order to enable a better understanding of the bonding properties and also for the laboratory design of new compounds in this field.

Transition-Metal Complexes

Transition metals in low and high oxidation states have proven as useful components for the design of various compounds which can function as catalysts. Of particular interest are transition metals in high oxidation states, coordinated to electronegative elements, such as nitrogen. These compounds are promising candidates for further design of chemical components for catalysis and promise to open a deeper understanding of the basic principle of nitrogen fixation in nature. A quantum chemical modelling of these structures help to understand the details which constitute bonding in these compounds.

Prof. Dr. Norbert Sewald

Dissertation, Technical University of Munich, 1991
Postdoctoral Fellow, University of Oxford, 1991/92
Habilitation, University of Leipzig, 1998
University of Bielefeld, 1999

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Main Targets:

Organic chemistry on the borderline to biology and medical sciences:

- Chiral reagents and catalysts
- Isolation and total synthesis of natural products
- Molecular tools for life science research
- Peptide-protein interactions, peptide-DNA interactions
- Conformational analysis using NMR and MD

Biologically Active Peptides

Peptides and proteins are naturally occurring biomolecules, composed of amino acids. In many cases the interaction between proteins, which is crucial for physiological events, can be influenced by peptides with a well-defined three-dimensional structure. The combination of NMR spectroscopy and molecular dynamics simulations provides a powerful tool for the elucidation of the solution structure of peptides and, hence, for the investigation of peptide-protein interactions. This methodology is complemented by binding studies with surface plasmon resonance enabling real-time monitoring of biomolecular binding events. Certain peptides may also be used for the selective delivery of toxic substances to tumour cells in order to reduce side effects in tumour therapy.

Molecular Tools for Life Science Research

The post-genome era will increasingly focus on proteins as the main effector molecules in biological systems. The analysis of the proteome, the entirety of all proteins expressed by a cell under certain conditions, is a new and very challenging task. Tailor-made chemical probes, obtained by synthesis, significantly contribute to the advanced methods of proteome analysis.



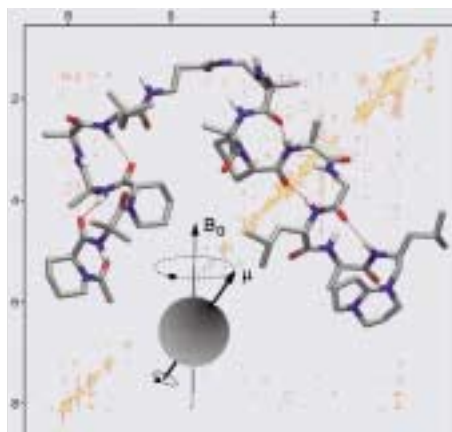
Selected Publications

"Are β -Amino Acids γ -Turn Mimetics? – Exploring A New Design Principle for Bioactive Cyclopeptides"
F. Schumann, A. Müller, M. Kokschi, G. Müller, N. Sewald, *J. Am. Chem. Soc.* **2000**, *122*, 12009.

"Peptides - Chemistry and Biology"
N. Sewald, H.-D. Jakubke, Wiley-VCH, Weinheim **2002**.

"The First Total Synthesis of Efrapeptin C"
M. Jost, J.-C. Greie, N. Stemmer, S. D. Wilking, K. Altendorf, N. Sewald, *Angew. Chem.* **2002**, *114*, 4438; *Angew. Chem. Int. Ed. Engl.* **2002**, *41*, 4267.

"Mechanism-Based Tagging of Protein Families - A New Concept in Functional Proteomics"
M. C. Hagenstein, J. H. Mussnug, K. Lotte, R. Plessow, A. Brockhinke, O. Kruse, N. Sewald, *Angew. Chem.* **2003**, *115*, 5793; *Angew. Chem. Int. Ed. Engl.* **2003**, *42*, 5635.





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Selected Publications

“Recent developments in the chemistry of metallo phosphalkenes”
L. Weber, *Coord. Chem. Rev.* **2005**, *249*, 741.

“Synthesis and Structure of the First η^3 -1,2-Diphosphaallyl Complexes [η^5 -C₅H₅](CO)₂M{ η^3 -RPPC(SiMe₃)₂}] (M= Mo, R= *t*Bu, Cy; M= W, R= *t*Bu) from [η^5 -C₅H₅](CO)₂M=P=C(SiMe₃)₂] (M= Mo, W) and inversely polarized Phosphaalkenes RP=C(NMe₂)₂ (R= *t*Bu, Cy)”

L. Weber, G. Noveski, U. Lassahn, H.-G. Stammler, B. Neumann, *Eur. J. Inorg. Chem.* **2005**, 1940.

“Synthesis and Structure of the Decanuclear Gold(I) Cluster Cation [Au₈(AuCl)₂{ μ_3 -P(*t*Bu)}₂{ μ_2 -P(*t*Bu)=C(NMe₂)₂}₆}]⁴⁺ with Bridging Phosphaalkene and Phosphanediide Ligands”

L. Weber, U. Lassahn, H.-G. Stammler, B. Neumann, K. Karaghiosoff, *Eur. J. Inorg. Chem.* **2002**, 3272.

“Synthese und Struktur hochfunktionalisierter 2,3-Dihydro-1*H*-1,3,2-Diazaborole”

L. Weber, A. Rausch, H.-G. Stammler, B. Neumann, *Z. Anorg. Allg. Chem.* **2004**, *630*, 2657.

“Stereospecific Tetramerization of 2-Propynol and Polymerization of Arylacetylenes by Means of [Pt(CO)₄][Sb₂F₁₁]₂”

L. Weber, M. Barlmeyer, J.-M. Quasdorff, H. L. Sievers, H.-G. Stammler, B. Neumann, *Organometallics* **1999**, *18*, 2497.

Multiple bond systems of heavier elements

Since three decades compounds with P=C, As=C, P=P and As=As double bonds have been intensively studied. We have investigated phospho- and arsa-alkenes with an inverse electron distribution about the double bond. This situation is encountered in molecules with one or two amino groups at the carbon atom of the double bond. Such compounds serve as convenient sources of carbenes and phosphinidenes which are cleanly transferred to electrophiles under very mild conditions.

Boron-Nitrogen Chemistry

In the recent years we were interested in the chemistry of boron-functionalized 1,3,2-diazaboroles. Besides a rich chemistry which occurred at the boron centre, reaction with ketenes led to oxazaborolidines. Moreover 1,3,2-diazaboroles can be conveniently attached to oligothiophenes to afford highly luminescent compounds which may be useful for organic light emitting diodes. Moreover, thermolysis of 1,3,2-diazaboroles in the gas phase led to the extrusion of a diazabutadiene with concomitant formation of borylenes BR. Condensation of the latter species led to phases of interesting structures and properties.

Novel Catalysts

The continuing demand for polymeric materials with well-defined properties is a motivation for the search for novel polymerization catalysts. We observed that superelectrophilic metal carbonyl cations catalyze the polymerization of olefins with unusually high turnover numbers. Addition of a few crystals of the catalyst effected spontaneous polymerization of the substrate. Hydroxy-functionalized alkynes, e.g. propynols, tetramerize forming dioxanes, whereas arylacetylenes were stereospecifically converted into polymers with trans-transoid microstructures.

The logo of the University of Bielefeld, consisting of two overlapping green rectangles of different sizes, with the text 'Universität Bielefeld' positioned to the right.

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