

# Organic Chemistry

University of Siegen

Department of Chemistry and Biology



# Contents

## Institute

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## Research Group Leaders

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**Prof. Dr. Heiko Ihmels**

**Dr. Thomas Paululat**

**PD Dr. Daria Berdnikova**

**Prof. Dr. Anna McConnell**

## Retired Professors

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**Prof. Dr. Harald Günther**

**Prof. Dr. Adalbert Maercker**

**Prof. Dr. Michael Schmittel**

## Technical and Administrative Staff

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**Rochus Breuer**

**Dr. Emin Cinar**

**Jennifer Hermann**

**Sandra Münker**

**Sandra Uebach**

# Institute

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## Short History

The Division of Organic Chemistry in the Department of Chemistry was founded under the direction of Prof. Dr. A. Maercker who held the first lectures in organic chemistry in 1974 and Prof. Dr. H. Günther (1977). Over more than 25 years, their distinguished research in the field of organic (poly)lithium compounds and NMR spectroscopy established a prominent international reputation. Renowned scientists like J. A. Berson, L. Brandsmaa, E. L. Eliel, D. Ginsburg, S. Masamune, A. I. Scott, A. Streitwieser, J.- M. Lehn, R. R. Ernst and others already visited the Department in the early days. In addition, the Division of Organic Chemistry played a key role in awarding Prof. Vogel, University of Cologne, an honorary doctorate from the University of Siegen in 1997.

The first nationwide 400 MHz Bruker NMR spectrometer was installed in Siegen in 1979 and a solid-state NMR laboratory started with funds from the Volkswagenstiftung in 1991. Organic Chemistry contributed prominently to the Graduate School „Reactivity and Molecular Order“, the first established in the Siegen science departments.

After the retirement of Prof. Maercker and Prof. Günther, the chairs of organic chemistry were taken over by Prof. Dr. M. Schmittel (1999) and Prof. Dr. H. Ihmels (2003) and more recently, Prof. Dr. A. McConnell (2023) following the retirement of Prof. Schmittel.

In addition, research group leaders joined the Institute of Organic Chemistry: Dr. T. Paululat (2004), Dr. G. Nöll (2008–2020), Dr. Daria Berdnikova (2017).

Nowadays, the Institute of Organic Chemistry at the University of Siegen has established an international reputation and visibility in the field of physical organic and bioorganic chemistry. Because of its research accomplishments in topical areas, such as (supra)molecular machinery, supramolecular assembly, bioorganic chemistry, photochemistry, and natural product chemistry, the institute has moved into the center of various interdisciplinary activities at the University of Siegen, such as the *Research Center of Micro- and Nanochemistry and (Bio-)Technology (Cμ)*, the DFG research group FOR 516 “Lab-on-Microchip” and the Siegener Graduate School “Development of Integral Heterosensor Architectures for the n-Dimensional (Bio)chemical Analysis”.

## Instrumentation

The Institute of Organic Chemistry at the University of Siegen is well equipped for competitive research and attractive teaching with ample instrumentation for NMR spectroscopy, mass spectrometry, absorption, emission and IR spectroscopy, cyclic voltammetry, kinetics, and gas and liquid chromatography. Major research facilities include high resolution NMR spectrometers (Varian NMR System 600 MHz; Jeol ECZ 500 MHz), mass spectrometry (Hewlett Packard/Agilent 5988A GC/MS system, ESI mass spectrometer: LCQ Deca ThermoQuest), elemental analysis (Euro Vector Euro Analyzer), Fourier FT-IR Varian Scimitar 1000 (for surfaces), absorption and emission spectrometers (Varian Cary 100 Bio, Varian Cary Eclipse, Applied Photophysics Chirascan CD/LD spectrometer), laboratory for bioorganic experiments (lyophilizer: Christ ALPHA 1-2 LD/RVC 2-25; gel electrophoresis and gel documentation: IntasGel Jet Imager 2000), electroanalysis (PARSTAT 2273), Biologics stopped-flow kinetics, vapor pressure osmometry (Knauer K 7000), and ample equipment for separations (HPLC, GC, MPLC, countercurrent chromatography, etc.).

## Research Group Leaders

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Prof. Dr. Heiko Ihmels

Dr. Thomas Paululat

PD Dr. Daria Berdnikova

Prof. Dr. Anna McConnell

## Heiko Ihmels

b. 1966; Diploma in Chemistry (1992, Univ. Göttingen), Dr. rer. nat. (1995, Univ. Göttingen, Prof. A. de Meijere/ Dr. J. Belzner), postdoctoral fellow at the University of British Columbia, Vancouver (1995–1996, with Prof. J. R. Scheffer), Habilitation (2002, Univ. Würzburg, Mentor: Prof. W Adam), lecturer (PD) (2002–2003, Univ. Würzburg), Full Professor at University of Siegen (since 2003).

Awards: PhD fellowship from Friedrich-Ebert-Stiftung (1993–1995); postdoctoral fellowship from Deutsche Forschungsgemeinschaft (1995–1996); Liebig fellowship (1997–1999), DFG fellowship (1999–2001).

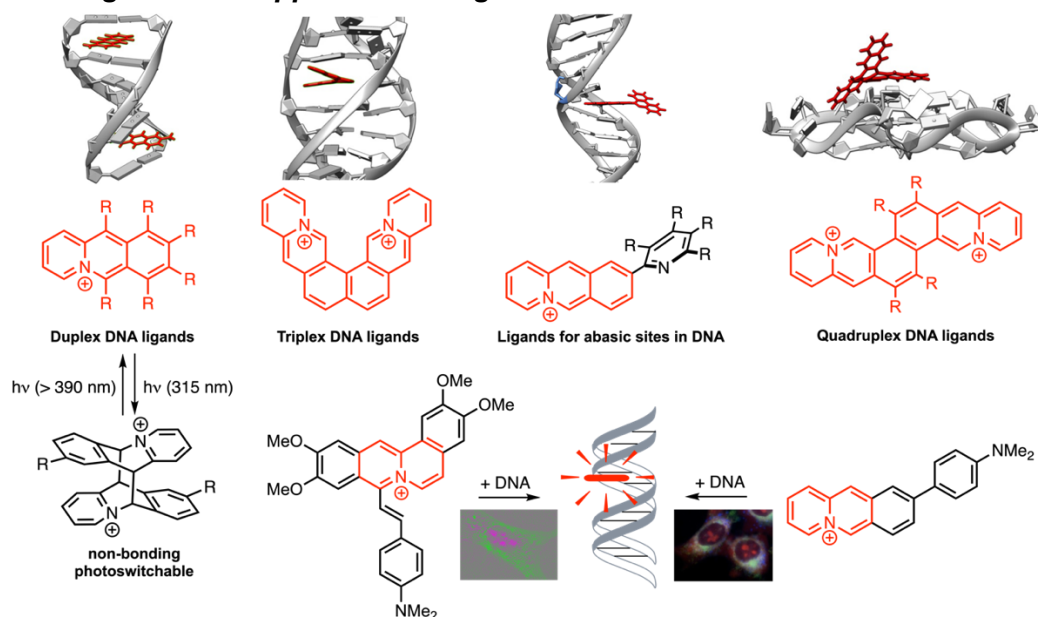
Professional Activities: Spokesperson of the *Research Center of Micro- and Nanochemistry and – Engineering*, University of Siegen (since 2017); advisor/liaison officer (Vertrauensdozent) of the Friedrich-Ebert-Stiftung (since 2013); board member of the GDCh-Section "Photochemistry" (2014–2018; 2018–2022); chair of the DECHEMA-Fachgruppe "Kinetics and Reaction mechanisms (2023–2026); guest editor in *Beilstein J. Org. Chem.*, *ARKIVOC*, *J. Phys. Org. Chem.*

E-mail: ihmels@chemie.uni-siegen.de

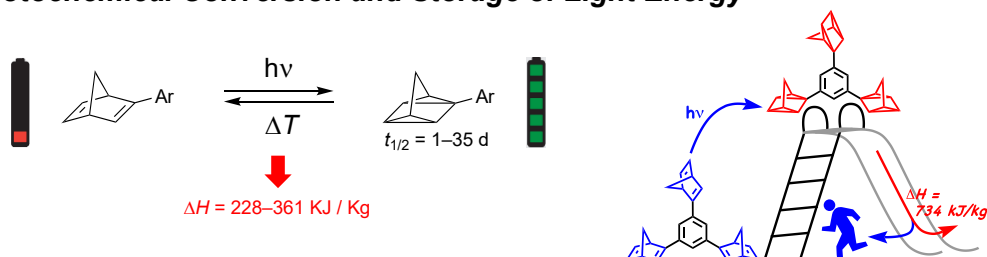
ORCID-ID: [0000-0003-0969-0426](https://orcid.org/0000-0003-0969-0426)

*Fields of research:* Association of organic ligands to nucleic acids; photoswitchable ligand-DNA interactions; molecular solar thermal energy storage; photoreactions in constrained media.

### Investigation and application of ligand-DNA interactions



### Photochemical Conversion and Storage of Light Energy



## Publications

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2025

### Photoinduced Electron Transfer (PET) as Key to Accelerate the Cycloreversion Reaction of Arylquadricyclanes

J. F. M. Hebborn, H. Ihmels, M. Löcker, T. Paululat, R. Schulte, *Chem. Eur. J.* **2025**, e02413.  
<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/chem.202502413>.

### Toyaburgine, a Synthetic *N*-Biphenyl-dihydroisoquinoline Inspired by Related *N,C*-Coupled Naphthylisoquinoline Alkaloids, with High in Vivo Efficacy in Preclinical Pancreatic Cancer Models

S. Awale, J. Maneenet, N. D. Phan, H. H. Nguyen, T. Fujii, H. Ihmels, D. Soost, N. Tajuddeen, D. Feineis, G. Bringmann, *ACS Chem. Biol.* **2025**, *20*, 917-929.  
<https://doi.org/10.1021/acscchembio.4c00870>.

### Gilding the Lily: Studies on the Effects of Successive Loading of Light Energy-Storing Molecules with Norbornadiene Units

R. Schulte, D. Schade, T. Paululat, H. Ihmels, *Eur. J. Org. Chem.* **2025**, *28*, e202401090.  
<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/ejoc.202401090>.

### Triplet-Sensitized Switching of High-Energy-Density Norbornadienes for Molecular Solar Thermal Energy Storage with Visible Light

T. J. B. Zähringer, N. Perez Lopez, R. Schulte, M. Schmitz, H. Ihmels, C. Kerzig, *Angew. Chem. Int. Ed.* **2025**, *64*, e202414733.  
<https://onlinelibrary.wiley.com/doi/abs/10.1002/anie.202414733>.

2024

### The *N*-Biphenyldihydroisoquinolinium Scaffold as a Novel Motif for Selective Fluorimetric Detection of Quadruplex DNA

D. Soost, G. Bringmann, H. Ihmels, *Org. Chem. Front.* **2024**, *11*, 5754-5761.  
<http://dx.doi.org/10.1039/D4QO01193G>.

### Spectroscopic Investigation of the Quadruplex DNA-Binding Properties of 9-Aryl-Substituted Isoquinolinium Derivatives

P. Groß, S. I. Druzhinin, H. Schönherr, H. Ihmels, *ChemPhotoChem* **2024**, *8*, e202400241.  
<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/cptc.202400241>.

### Extension of the $\pi$ -System of Monoaryl-Substituted Norbornadienes with Acetylene Bridges: Influence on the Photochemical Conversion and Storage of Light Energy

R. Schulte, D. Schade, T. Paululat, T. J. B. Zähringer, C. Kerzig, H. Ihmels, *Beilstein J. Org. Chem.* **2024**, *20*, 3061-3068.  
<https://doi.org/10.3762/bjoc.20.254>.

### Photoinduced [2+2] and [4+4] Cycloaddition and Cycloreversion Reactions for the Development of Photocontrollable DNA Binders

C. Dohmen, H. Ihmels, *ChemPhotoChem* **2024**, *8*, e202300318.  
<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/cptc.202300318>.

### Photocontrolled Binding of Styrylnaphthyridine Ligands to Abasic Site-Containing DNA by Reversible [2+2] Cycloaddition and Cycloreversion

J. Schlosser, H. Ihmels, *Chem. Eur. J.* **2024**, *30*, e202400423.  
<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/chem.202400423>.

**Reversible Restrain and Release of the Dynamic Valence Isomerization in a Shape-Shifting Bullvalene by Complex Formation**

C. Dohmen, T. Paululat, H. Ihmels, *Chem. Eur. J.* **2024**, *30*, e202304311.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/chem.202304311>.

**6-Aryl-Substituted Harmanium Derivatives as Light-up Probes for Fluorimetric DNA Detection and Staining of Eukaryotic Cells**

P. Groß, R. S. Hoffmann, M. Müller, H. Schönherr, H. Ihmels, *ChemistryEurope* **2024**, *2*, e202300045.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/ceur.202300045>.

**Photoinduced in Situ Generation of DNA-Targeting Ligands: DNA-Binding and DNA-Photodamaging Properties of Benzo[c]quinolininium Ions**

J. Schlosser, O. Fedorova, Y. Fedorov, H. Ihmels, *Beilstein J. Org. Chem.* **2024**, *20*, 101-117.

<https://doi.org/10.3762/bjoc.20.11>.

**Fluorimetric Cell Analysis with 9-Aryl-Substituted Berberine Derivatives as DNA-Targeting Fluorescent Probes**

P. Groß, R. S. Hoffmann, M. Müller, H. Schönherr, H. Ihmels, *ChemBioChem* **2024**, *25*, e202300761.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/cbic.202300761>.

**2023**

**Switching between DNA Binding Modes with a Photo- and Redox-Active DNA-Targeting Ligand**

C. Dohmen, H. Ihmels, *Org. Biomol. Chem.* **2023**, *21*, 1958-1966.

<http://dx.doi.org/10.1039/D3OB00013C>.

**Switching between DNA Binding Modes with a Photo- and Redox-Active DNA-Targeting Ligand, Part II: The Influence of the Substitution Pattern**

C. Dohmen, H. Ihmels, *Org. Biomol. Chem.* **2023**, *21*, 5799-5808.

<http://dx.doi.org/10.1039/D3OB000879G>.

**Photoinduced Reactions of Styrylpyridine Derivatives for the in Situ Formation of Selective Ligands for Apyrimidinic DNA**

J. Schlosser, N. Stötzel, Y. Fedorov, H. Ihmels, *ChemPhotoChem* **2023**, *7*, e202300159.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/cptc.202300159>.

**Bis- and Tris-Norbornadienes with High Energy Densities for Efficient Molecular Solar Thermal Energy Storage**

R. Schulte, S. Afflerbach, T. Paululat, H. Ihmels, *Angew. Chem. Int. Ed.* **2023**, *62*, e202309544.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/anie.202309544>.

**Selective Fluorimetric Detection of Pyrimidine Nucleotides in Neutral Aqueous Solution with a Styrylpyridine-Based Cyclophane**

J. Schlosser, J. F. M. Hebborn, D. V. Berdnikova, H. Ihmels, *Chemistry* **2023**, *5*, 1220-1232.

<https://www.mdpi.com/2624-8549/5/2/82>.

**Iboga-Type Alkaloids from the Leaves of *Tabernaemontana Penduliflora* (Apocynaceae)**

A. B. Nama, T. Paululat, G. R. Ebede, P. H. D. Betote, D. E. Pegnyemb, J. N. Mbing, J. T. Ndongo, H. Ihmels, H. Laatsch, *Phytochem. Lett.* **2023**, *54*, 63-69.

<https://www.sciencedirect.com/science/article/pii/S1874390023000204>.

### **Ligands for Abasic Site-Containing DNA and Their Use as Fluorescent Probes**

S. Julika, I. Heiko, *Current Organic Synthesis* **2023**, *20*, 96-113.

<http://www.eurekaselect.com/article/120917>.

### **Monoaryl-Substituted Norbornadiene Photoswitches as Molecular Solar Thermal Energy Storage Compounds: Synthesis and Investigation**

R. Schulte, S. Afflerbach, H. Ihmels, *Eur. J. Org. Chem.* **2023**, *26*, e202201398.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/ejoc.202201398>.

### **Pushing Photochemistry into Water: Acceleration of the Di- $\pi$ -Methane Rearrangement and the Paternó-Büchi Reaction “on-Water”**

R. Schulte, M. Löcker, H. Ihmels, M. Heide, C. Engelhard, *Chem. Eur. J.* **2023**, *29*, e202203203.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/chem.202203203>.

## **2022**

### **9-Nitrobenzo[*b*]quinolizinium as a Fluorogenic Probe for the Detection of Nitroreductase in Vitro and in Escherichia Coli**

P. J. Wickhorst, H. Ihmels, M. M. Lammert-Baumgartner, M. Müller, H. Schönherr, *New J. Chem.* **2022**, *46*, 39-43.

<http://dx.doi.org/10.1039/D1NJ05230F>.

### **Towards an Understanding of the Biological Activity of Naphthylisoquinoline Alkaloids: DNA-Binding Properties of Dioncophyllines A, B, and C**

D. Soost, G. Bringmann, H. Ihmels, *New J. Chem.* **2022**, *46*, 20292-20298.

<http://dx.doi.org/10.1039/D2NJ04081F>.

### **The Journey to Fluorescent Bullvalenes: Pitfalls and Prospects**

C. Dohmen, H. Ihmels, T. Paululat, *Eur. J. Org. Chem.* **2022**, *2022*, e202201172.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/ejoc.202201172>.

### **The Stereoselective Total Synthesis of Axially Chiral Naphthylisoquinoline Alkaloids**

N. Tajuddeen, D. Feineis, H. Ihmels, G. Bringmann, *Acc. Chem. Res.* **2022**, *55*, 2370-2383.

<https://doi.org/10.1021/acs.accounts.2c00432>.

### **Borylated Norbornadiene Derivatives: Synthesis and Application in Pd-Catalyzed Suzuki-Miyaura Coupling Reactions**

R. Schulte, H. Ihmels, *Beilstein J. Org. Chem.* **2022**, *18*, 368-373.

<https://doi.org/10.3762/bjoc.18.41>.

### **Synthesis of Fluorescent, DNA-Binding Benzo[*b*]indolonaphthyridinium Derivatives by a Misguided Westphal Condensation**

P. Groß, H. Ihmels, *J. Org. Chem.* **2022**, *87*, 4010-4017.

<https://doi.org/10.1021/acs.joc.1c02755>.

## **2021**

### **Synthesis, DNA-Binding and Antiproliferative Properties of Diarylquinolizinium Derivatives**

R. Bortolozzi, H. Ihmels, R. Schulte, C. Stremmel, G. Viola, *Org. Biomol. Chem.* **2021**, *19*, 878-890.

<http://dx.doi.org/10.1039/D0OB02298E>.

**A Dimethylaminophenyl-Substituted Naphtho[1,2-*b*]Quinolizinium as a Multicolor NIR Probe for the Fluorimetric Detection of Intracellular Nucleic Acids and Proteins**

P. J. Wickhorst, S. I. Druzhinin, H. Ihmels, M. Müller, M. Sutura Sardo, H. Schönherr, G. Viola, *ChemPhotoChem* **2021**, *5*, 1079-1088.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/cptc.202100148>.

**Studies on the Interactions of 3,11-Difluoro-6,8,13-trimethyl-8*H*-quino[4,3,2-*k*]Acridinium and Insulin with the Quadruplex-Forming Oligonucleotide Sequence  $\alpha 2$  from the Insulin-Linked Polymorphic Region**

P. J. Wickhorst, H. Ihmels, T. Paululat, *Molecules* **2021**, *26*, 6595.

<https://www.mdpi.com/1420-3049/26/21/6595>.

**DNA-Triggered Enhancement of Singlet Oxygen Production by Pyridinium Alkynylanthracenes**

W. Fudickar, M. Bauch, H. Ihmels, T. Linker, *Chem. Eur. J.* **2021**, *27*, 13591-13604.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/chem.202101918>.

**Selective, pH-Dependent Colorimetric and Fluorimetric Detection of Quadruplex DNA with 4-Dimethylamino(phenyl)-Substituted Berberine Derivatives**

P. J. Wickhorst, H. Ihmels, *Chem. Eur. J.* **2021**, *27*, 8580-8589.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/chem.202100297>.

**Berberrubine Phosphate: A Selective Fluorescent Probe for Quadruplex DNA**

P. J. Wickhorst, H. Ihmels, *Molecules* **2021**, *26*, 2566.

<https://www.mdpi.com/1420-3049/26/9/2566>.

**Fluorimetric Detection of  $Zn^{2+}$ ,  $Mg^{2+}$ , and  $Fe^{2+}$  with 3-Hydroxy-4-pyridylisoquinoline as Fluorescent Probe**

G. E. Gomez Pinheiro, H. Ihmels, *J. Fluoresc.* **2021**, *31*, 269-277.

<https://doi.org/10.1007/s10895-020-02666-0>.

**2020**

**Synthesis and Investigation of Quadruplex-DNA-Binding, 9-*O*-Substituted Berberine Derivatives**

J. Becher, D. V. Berdnikova, H. Ihmels, C. Stremmel, *Beilstein J. Org. Chem.* **2020**, *16*, 2795-2806.

<https://doi.org/10.3762/bjoc.16.230>.

**Photoinduced Release of DNA-Binding Ligands from the [4+4] Dimers of Benzo[*b*]quinolizinium and Anthracene Derivatives**

D. V. Berdnikova, J. Heider, H. Ihmels, N. Sewald, P. M. Pithan, *ChemPhotoChem* **2020**, *4*, 520-525.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/cptc.202000015>.

**Cation-Induced Ring-Opening and Oxidation Reaction of Photoreluctant Spirooxazine-Quinolizinium Conjugates**

P. M. Pithan, S. Steup, H. Ihmels, *Beilstein J. Org. Chem.* **2020**, *16*, 904-916.

<https://doi.org/10.3762/bjoc.16.82>.

**Studies on the Photocyclization Reaction of 8-Styryl-Substituted Coralyne Derivatives**

P. M. Pithan, H. Ihmels, *J. Heterocycl. Chem.* **2020**, *57*, 1435-1441.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/jhet.3858>.

**Visible-Light-Induced Di- $\pi$ -Methane Rearrangement of Dibenzobarrelene Derivatives**

J. Schlosser, R. Cibulka, P. Groß, H. Ihmels, C. J. Mohrschladt, *ChemPhotoChem* **2020**, *4*, 132-137.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/cptc.201900221>.

**Reversible Photoswitching of the DNA-Binding Properties of Styrylquinolinium Derivatives through Photochromic [2 + 2] Cycloaddition and Cycloreversion**

S. Kölsch, H. Ihmels, J. Mattay, N. Sewald, B. O. Patrick, *Beilstein J. Org. Chem.* **2020**, *16*, 111-124.

<https://doi.org/10.3762/bjoc.16.13>.

**Photocontrolled DNA Minor Groove Interactions of Imidazole/Pyrrole Polyamides**

S. Müller, J. Paulus, J. Mattay, H. Ihmels, V. I. Doderer, N. Sewald, *Beilstein J. Org. Chem.* **2020**, *16*, 60-70.

<https://doi.org/10.3762/bjoc.16.8>.

## Funding

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DFG IH 24/15-1: Photoinduced *in situ* generation of DNA-targeting ligands: Novel approaches towards cytotoxic DNA-binding and DNA-damaging agents

DFG IH 24/17-1: Entwicklung von Naturstoffderivaten für die fluorimetrische DNA-Detektion in Zellen

DFG IH 24/19-1: Tiefenaufgelöste Analysen der Wasserpenetration während der dynamischen Benetzung in Gradienten von solvatochromen Farbstoffen in Polymerbürsten durch zeitaufgelösten Fluoreszenz

DFG IH 24/20-1: Entwicklung und Untersuchung neuartiger Norbornadien- und Anthracenderivate für die effiziente photochemische Umwandlung und Speicherung von (Sonnen-)Licht

AvH: Postdoc fellowship for Dr. Joseph Thierry Ndongo

AvH: Postdoc fellowship for Dr. Nasir Tajudeen

## Graduations

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Peter Jonas Wickhorst (2022)

*Synthesis and Investigation of Berberine-Type Derivatives as Fluorescent Probes and Ligands for Biologically Relevant Targets*

Phil Pithan (2022)

*Synthesis and Investigation of Heteroaromatic Compounds as Optical Probes for Solvent Polarity, Metal Cations, and Nucleic Acids*

Julika Schlosser (2024)

*Synthesis and Investigation of Styryl-N-Heterocycles as Selective Host Molecules for Nucleotides and as Photoactive Ligands for Regularly Paired and Abasic Site-Containing DNA*

Christoph Dohmen (2024)

*Synthesis and Investigation of Photochemically and Thermally Induced Shape-Shifting Molecules for Development of Selective DNA- or Metal Cation-Targeting Compounds*

Philipp Groß (2024)

*Exploration of Natural Products as Fluorescent Probes for the Fluorimetric Cell Analysis*

Robin Schulte (2025)

*Synthesis and Investigation of Monoaryl-Substituted Norbornadienes for the Photochemical Conversion and Storage of Light Energy*

## Thomas Paululat

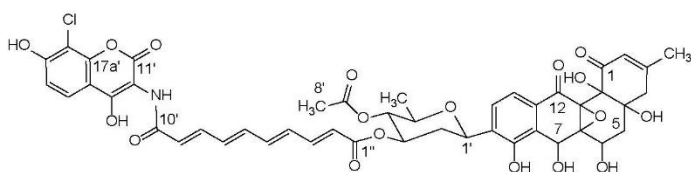
b.1967, Diploma in Chemistry (1994, Univ. Göttingen), Dr. rer. nat. (1997, Univ. Göttingen, A. Zeeck), Postdoctoral fellow (1997-98, Hans-Knöll-Institute of Natural Products Research, Jena, R. Thiericke), Head of NMR (1999-2003, bioLeads GmbH), Head of Analytics (2003-04, Biofrontera Discovery), Head of NMR facilities and Research Associate (2004-now, Siegen)

E-mail: paululat@chemie.uni-siegen.de

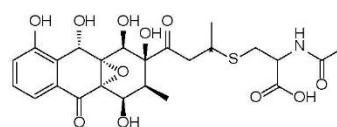
ORCID-ID: [0000-0002-0928-9715](https://orcid.org/0000-0002-0928-9715)

*Fields of research:* Natural product chemistry, structure elucidation, biosynthesis, derivatization and synthesis of small natural quinones, NMR spectroscopy.

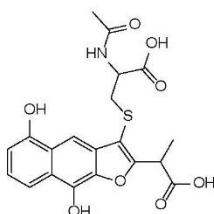
### Structure elucidation of secondary metabolites:



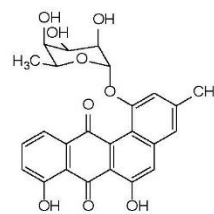
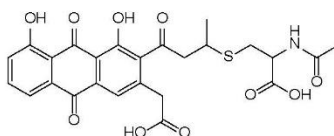
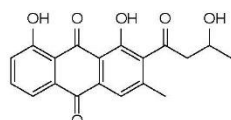
*ACS Chem. Biol.* **2016**, *11*, 241-250.



*ChemBioChem.* **2014**, *15*, 749-756



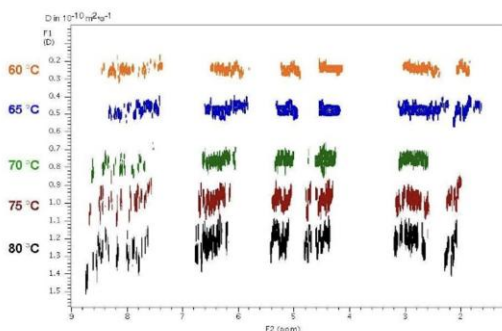
*ChemBioChem.* **2015**, *16* (8), 1175-1182



*Tetrahedron Lett.* **2014**, *55*, 5771-5773

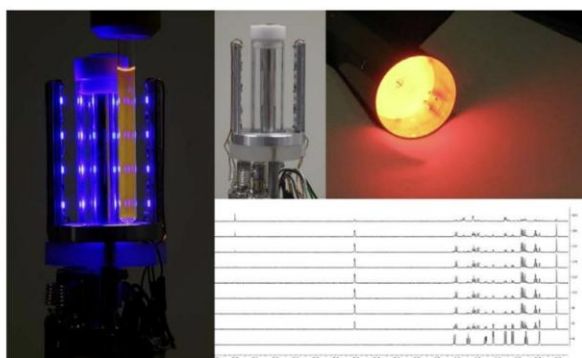
### NMR spectroscopy

#### Diffusion studies on DNA hydrogels



*Angew. Chem. Int. Ed.* **2014**, *53*, 1-6

#### Monitoring of photoreactions via NMR, Modification of an NMRprobe



*J. Magn. Reson.* **2021**, *323*, Article 106990 (Journal Cover article)

## Publications

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2025

### Photoinduced Electron Transfer (PET) as Key to Accelerate the Cycloreversion Reaction of Arylquadricyclanes

J. F. M. Hebborn, H. Ihmels, M. Löcker, T. Paululat, R. Schulte, *Chem. Eur. J.* **2025**, e02413.  
<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/chem.202502413>.

### Gilding the Lily: Studies on the Effects of Successive Loading of Light Energy-Storing Molecules with Norbornadiene Units

R. Schulte, D. Schade, T. Paululat, H. Ihmels, *Eur. J. Org. Chem.* **2025**, 28, e202401090.  
<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/ejoc.202401090>.

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M. Andruschko, M. Luksin, P. Frank, T. Paululat, U. Jonas, S. Fuchs, *Polym. Degrad. Stab.* **2025**, 232, 111141.  
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E. Elramadi, S. Kundu, D. Mondal, T. Paululat, M. Schmittel, *Angew. Chem. Int. Ed.* **2024**, 63, e202404444.  
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R. Schulte, D. Schade, T. Paululat, T. J. B. Zähringer, C. Kerzig, H. Ihmels, *Beilstein J. Org. Chem.* **2024**, 20, 3061-3068.  
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2023

### Iboga-Type Alkaloids from the Leaves of *Tabernaemontana Penduliflora* (Apocynaceae)

A. B. Nama, T. Paululat, G. R. Ebede, P. H. D. Betote, D. E. Pegnyemb, J. N. Mbing, J. T. Ndongo, H. Ihmels, H. Laatsch, *Phytochem. Lett.* **2023**, 54, 63-69.  
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### Bis- and Tris-Norbornadienes with High Energy Densities for Efficient Molecular Solar Thermal Energy Storage

R. Schulte, S. Afflerbach, T. Paululat, H. Ihmels, *Angew. Chem. Int. Ed.* **2023**, 62, e202309544.  
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E. Elramadi, A. Ghosh, I. Valiyev, P. K. Biswas, T. Paululat, M. Schmittel, *Chem. Commun.* **2022**, 58, 8073-8076.

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D. V. Berdnikova, B. M. Kriesche, T. Paululat, T. S. Hofer, *Chem. Eur. J.* **2022**, 28, e202202752.

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V. V. Rajasekaran, A. Ghosh, S. Kundu, D. Mondal, T. Paululat, M. Schmittel, *Angew. Chem. Int. Ed.* **2022**, 61, e202212473.

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2021

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O. Tsyplik, R. Makitrynsky, X. Yan, H.-G. Koch, T. Paululat, A. Bechthold, *Microorganisms* **2021**, 9, 374.

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**Studies on the Interactions of 3,11-Difluoro-6,8,13-Trimethyl-8H-Quino[4,3,2-*k*]Acridinium and Insulin with the Quadruplex-Forming Oligonucleotide Sequence a2 from the Insulin-Linked Polymorphic Region**

P. J. Wickhorst, H. Ihmels, T. Paululat, *Molecules* **2021**, 26, 6595.

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2020

**Secondary Nucleotide Messenger C-Di-Gmp Exerts a Global Control on Natural Product Biosynthesis in *Streptomyces***

R. Makitrynsky, O. Tsyplik, D. Nuzzo, T. Paululat, D. L. Zechel, A. Bechthold, *Nucleic Acids Res.* **2020**, 48, 1583-1598.

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**Novel Fredericamycin Variant Overproduced by a Streptomycin-Resistant Streptomyces Albus Subsp. Chlorinus Strain**

M. Rodríguez Estévez, M. Myronovskyi, B. Rosenkränzer, T. Paululat, L. Petzke, J. Ristau, A. Luzhetskyy, *Mar. Drugs* **2020**, *18*, 284.

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**Chemical Constituents from Phlomis Bovei Noë and Their Chemotaxonomic Significance**

W. Khitri, D. Smati, A.-C. Mitaine-Offer, T. Paululat, M.-A. Lacaille-Dubois, *Biochemical Systematics and Ecology* **2020**, *91*, 104054.

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**Identification and Characterization of a Novel N- and O-Glycosyltransferase from Saccharopolyspora Erythraea**

F. Gutacker, Y.-I. Schmidt-Bohli, T. Strobel, D. Qiu, H. Jessen, T. Paululat, A. Bechthold, *Molecules* **2020**, *25*, 3400.

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**Triterpene Saponins from the Roots of Bupleurum Spinosum Gouan**

A. Dahmoune, D. Smati, A.-C. Mitaine-Offer, T. Miyamoto, C. Tanaka, T. Paululat, M.-A. Lacaille-Dubois, *Phytochem. Lett.* **2020**, *39*, 157-161.

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**Allosteric Regulation of Rotational, Optical and Catalytic Properties within Multicomponent Machinery**

S. Saha, A. Ghosh, T. Paululat, M. Schmittel, *Dalton Trans.* **2020**, *49*, 8693-8700.

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## Daria Berdnikova

b.1987; Diploma in Chemical Engineering (2009, Engineer with specialty "Nanomaterials", Mendeleev University of Chemical Technology of Russia, Moscow), Translator Diploma (2008, English, Mendeleev University of Chemical Technology of Russia, Moscow), PhD in Organic Chemistry and Physical Chemistry (2012, Nesmeyanov Institute of Organoelement Compounds, Russian Academy of Sciences, Moscow, Russia, Prof. O. Fedorova / Dr. Yu. Fedorov), Postdoctoral fellow at the University of Siegen, (2013–2014, with Prof. H. Ihmels), Junior research group leader (2017–2024, Univ. Siegen), Substitute professor (Vertretungsprofessorin) of organic chemistry (2024–2025, Univ. Hamburg), Habilitation (2025, Univ. Siegen, Mentor: Prof. H. Ihmels), Privatdozentin (since 2025, Univ. Siegen).

Awards: Marie Skłodowska-Curie Individual Fellowship (2017–2019).

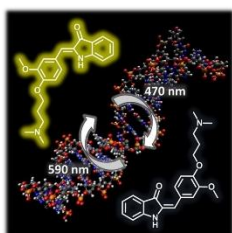
Professional Activities: Chair of the local branch (Ortsverbandsvorsitzende) of the German Chemical Society (GDCh) in Siegen (since 2026).

E-mail: [berdnikova@chemie-bio.uni-siegen.de](mailto:berdnikova@chemie-bio.uni-siegen.de)

ORCID-ID: [0000-0002-0787-5753](https://orcid.org/0000-0002-0787-5753)

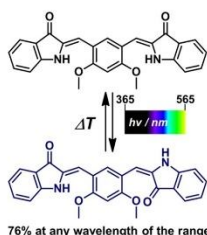
*Fields of research:* Design and organic synthesis of photoactive compounds, photopharmacology, light-controllable interactions with nucleic acids, supramolecular photochemistry, staining of nucleic acids, organic solid-state emitters.

### Photoswitchable RNA/DNA binders



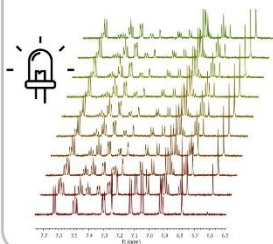
Design, synthesis and investigation of photoswitchable ligands for natural therapeutically relevant nucleic acids.

### Organic multiphotochromes



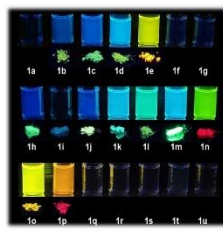
Design, synthesis and investigation of organic photochromes comprising more than one photoactive unit in a molecule.

### Real-time NMR spectroscopy with *in situ* irradiation



Real-time NMR monitoring of photochemical reactions (in cooperation with Dr. Thomas Paululat).

### Dual-state emissive (DSE) fluorophores



Design, synthesis and investigation of novel organic fluorophores emitting both in solution and in the condensed state as molecular solids.

## Publications

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2025

### Photoskunks: Molecules for Light-Induced Thiol Generation

A. V. Stepanov, A. A. Shatrova, D. V. Berdnikova, A. G. Lvov, *Org. Biomol. Chem.* **2025**, *23*, 5908-5928.

<http://dx.doi.org/10.1039/D5OB00191A>.

### Detecting Emerging Surfactant Pollutants with a Highly Fluorescent Host-Guest Ensemble

T. Naik, D. V. Berdnikova, S. Dutta Choudhury, *J. Mol. Liq.* **2025**, *428*, 127546.

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### A Novel Aurone RNA CAG Binder Inhibits the Huntingtin RNA-Protein Interaction

G. Ballarin, M. Biasiotto, A. Reisbitzer, M. Hegels, M. Bolte, S. Krauß, D. V. Berdnikova, *RSC Med. Chem.* **2024**, *15*, 3092-3096.

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### Rubizhne Institute – a Birthplace of Photochromic Molecules

A. G. Lvov, D. V. Berdnikova, *Chem. Rec.* **2024**, *24*, e202400143.

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### Manifold Fluorescence Enhancement of a Styryl(Pyridinium)-Chromene Hybrid Dye upon Binding with an Elongated $\beta$ -Cyclodextrin Cavity

T. Naik, D. V. Berdnikova, M. Sundararajan, S. Dutta Choudhury, *J. Phys. Chem. B* **2024**, *128*, 9396-9404.

<https://doi.org/10.1021/acs.jpcc.4c04608>.

### Aurones: Unexplored Visible-Light Photoswitches for Aqueous Medium

D. V. Berdnikova, *Chem. Eur. J.* **2024**, *30*, e202304237.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/chem.202304237>.

### Photochromic Derivatives of Indigo: Historical Overview of Development, Challenges and Applications

G. Kaplan, Z. Seferoğlu, D. V. Berdnikova, *Beilstein J. Org. Chem.* **2024**, *20*, 228-242.

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2023

### Fluorescence and Phosphorescence Energy Transfer in Cucurbituril-Based Supramolecular Systems

D. V. Berdnikova, E. Y. Chernikova, *ChemPhotoChem* **2024**, *8*, e202300140.

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### Selective Fluorimetric Detection of Pyrimidine Nucleotides in Neutral Aqueous Solution with a Styrylpyridine-Based Cyclophane

J. Schlosser, J. F. M. Hebborn, D. V. Berdnikova, H. Ihmels, *Chemistry* **2023**, *5*, 1220-1232.

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### Design of Aurone-Based Dual-State Emissive (DSE) Fluorophores

D. V. Berdnikova, S. Steup, M. Bolte, M. Suta, *Chem. Eur. J.* **2023**, *29*, e202300356.

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**Fused Bis(Hemi-Indigo): Broad-Range Wavelength-Independent Photoswitches**

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**Photoswitches for Controllable RNA Binding: A Future Approach in the RNA-Targeting Therapy**

D. V. Berdnikova, *Chem. Commun.* **2021**, *57*, 10819-10826.

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**Modification of an NMR Probe for Monitoring of Photoreactions**

T. Paululat, M. Rabe, D. V. Berdnikova, *J. Magn. Reson.* **2021**, *327*, 106990.

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**Role and Perspective of Molecular Simulation-Based Investigation of RNA–Ligand Interaction: From Small Molecules and Peptides to Photoswitchable RNA Binding**

D. V. Berdnikova, P. Carloni, S. Krauß, G. Rossetti, *Molecules* **2021**, *26*, 3384.

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2020

**Cucurbiturils in Nucleic Acids Research**

E. Y. Chernikova, D. V. Berdnikova, *Chem. Commun.* **2020**, *56*, 15360-15376.

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**Synthesis and Investigation of Quadruplex-DNA-Binding, 9-O-Substituted Berberine Derivatives**

J. Becher, D. V. Berdnikova, H. Ihmels, C. Stremmel, *Beilstein J. Org. Chem.* **2020**, *16*, 2795-2806.

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**Photoinduced Release of DNA-Binding Ligands from the [4+4] Dimers of Benzo[*b*]Quinolizinium and Anthracene Derivatives**

D. V. Berdnikova, J. Heider, H. Ihmels, N. Sewald, P. M. Pithan, *ChemPhotoChem* **2020**, *4*, 520-525.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/cptc.202000015>.

**Encapsulation-Controlled Photoisomerization of a Styryl Derivative: Stereoselective Formation of the Anti *Z*-Isomer in the Cucurbit[7]uril Cavity**

E. Y. Chernikova, D. V. Berdnikova, A. S. Peregudov, O. A. Fedorova, Y. V. Fedorov, *ChemPhysChem* **2020**, *21*, 442-449.

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## **Funding**

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MSCA-IF PHOTORNA – 749788: Development of photoswitchable ligands for the reversible and selective assembly with RNA

EaSE 2020 RNATrap: Development of the creation paradigm for light-operated RNA-targeting drugs

DFG BE 7202/1-1: Synthesis, photoswitching and RNA-binding properties of aurone derivatives and conjugates of 2-deoxystreptamine with hemi-indigo-type photochromes

DFG BE 7202/1-3: Synthesis, photoswitching and RNA-binding properties of aurone derivatives and conjugates of 2-deoxystreptamine with hemi-indigo-type photochromes II

## Anna McConnell

Bachelor of Science with 1st Class Honours in Chemistry (2005, University of Canterbury), D.Phil. in Inorganic Chemistry (2010, University of Oxford, Prof. P. Beer), Postdoctoral Scholar in Chemistry at the California Institute of Technology, Pasadena, USA (2010–2013, with Prof. J. K. Barton), Postdoctoral Research Associate at the University of Cambridge (2013–2016, with Prof. J. R. Nitschke), Junior Professor at Christian-Albrechts-Universität zu Kiel (2016–2023), Junior Professor at University of Siegen (since 2023).

Awards: Woolf Fisher Scholarship (2006–2010), Lindemann Trust Fellowship (2010–2011), Münster Symposium on Cooperative Effects in Chemistry (MSCEC) Young Researcher Award (2018), Kiel Nano, Surface and Interface Science (KiNSIS) Early Career Award (2020), GDCh Hildegard-Hamm-Brücher Prize for Equal Opportunities (2023) as Board member of Women in Supramolecular Chemistry network.

Professional Activities: Co-founder, Board member (2019–2025, Chair 2023–2025) and Advisory Board member (since 2026) of Women in Supramolecular Chemistry (WISC) network, member of International Advisory Board of *ChemPlusChem* (since 2021), Board member of GDCh AG SupraChem (elected September 2025, 2026–2029), member of Editorial Advisory Board of *Chemistry– A European Journal* (since 2026).

E-mail: [anna.mcconnell@uni-siegen.de](mailto:anna.mcconnell@uni-siegen.de)

ORCID-ID: [0000-0001-7239-4319](https://orcid.org/0000-0001-7239-4319)

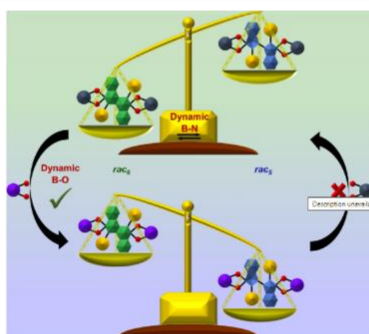
*Fields of research:* Stimuli-responsive metal-organic cages (particularly light-responsive and spin-crossover cages), the synthesis and dynamic covalent chemistry of amidoboronates.



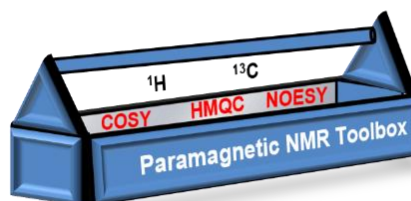
*Dalton Trans.* **2023**, 52,  
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*Dalton Trans.* **2022**, 51, 6936-6943.



*ChemPlusChem* **2022**, 87,  
e202200022.



*Angew. Chem. Int. Ed.* **2020**, 59,  
19344-19351.

## Publications

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2025

### **Diastereoselective Amidoboronate Formation and Transformation from a *rac* to a Different *meso* Amidoboronate Via Dynamic C-C Bonds**

P. Harders, T. Raeker, L. Pietsch, C. Näther, B. Hartke, A. J. McConnell, *Org. Biomol. Chem.* **2025**, *23*, 10174-10185.

<https://doi.org/10.1039/D5OB01479D>.

### **Being a First Generation University Graduate, the Impact on a Career in Science**

M. Yacoub, S. Koops, P. Axelithioti, C. Caltagirone, E. R. Draper, C. J. E. Haynes, C. K. Hind, M. Kieffer, L. K. S. von Krbek, A. J. McConnell, S. Pike, A. G. Slater, J. R. Hiscock, J. S. Leigh, *Chem. Sci.* **2025**, *16*, 10386-10396.

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### **Ultrafast Competition between CO Release and Spin Crossover Upon Photoexcitation of a Cyclopropanone-Bipyridyl Fe<sup>II</sup> Complex**

S. Megow, A. Prax, T. Neumann, M. Lehr, A. J. McConnell, F. Temps, *Phys. Chem. Chem. Phys.* **2025**, *27*, 9152-9158.

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2024

### **Analysing Creative Multimodal Data for a Scientific Audience,**

J. S. Leigh, J. R. Hiscock, S. Koops, A. J. McConnell, C. J. E. Haynes, C. Caltagirone, M. Kieffer, E. R. Draper, A. G. Slater, K. M. Hutchins, D. Watkins, N. Busschaert, L. K. S. von Krbek, in *The Handbook of Creative Data Analysis*, Ed. H. Kara, D. Mannay, A. Roy, **2024**, Policy Press, Bristol.

<https://policy.bristoluniversitypress.co.uk/the-handbook-of-creative-data-analysis>

### **MASC 2023: Remembering the Past, Celebrating the Present and Looking to the Future**

J. E. M. Lewis, T. L. Easun, T. A. Barendt, B. E. Barber, J. L. Greenfield, A. J. McConnell, G. R. F. Orton, S. C. Patrick, C. Prior, J. Wu, *Supramol. Chem.* **2024**, 1-4.

<https://doi.org/10.1080/10610278.2024.2381542>.

2023

### **Women in Supramolecular Chemistry**

C. Caltagirone, E. Draper, C. Haynes, C. Hind, J. Hiscock, M. Kieffer, L. von Krbek, L. Leigh, A. McConnell, S. Pike, P. Posocco, A. Slater, *Nachr. Chem.* **2023**, *71*, 19-20.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/nadc.20234137447>.

### **Tuning the Spin-Crossover Properties of Fe<sup>II</sup>L<sub>6</sub> Cages Via the Interplay of Coordination Motif and Linker Modifications**

T. Paschelke, E. Trumpf, D. Grantz, M. Pankau, N. Grocholski, C. Näther, F. D. Sönnichsen, A. J. McConnell, *Dalton Trans.* **2023**, *52*, 12789-12795.

<http://dx.doi.org/10.1039/D3DT01569F>.

### **Amidoboronates: Bringing Together the Synthesis of BN-Heterocycles Via a Reductive Coupling and Dynamic Covalent Chemistry**

A. J. McConnell, *Dalton Trans.* **2023**, *52*, 9189-9201.

<http://dx.doi.org/10.1039/D3DT01863F>.

### **Women in Supramolecular Chemistry- Narratives of Resilience and Community Building in a Gender Constrained Field**

J. Leigh, J. Hiscock, A. McConnell, C. Haynes, M. Kieffer, C. Caltagirone, K. Hutchins, D. Watkins, A. Slater, L. von Krbek, E. Draper, N. Busschaert, in *Academic women: Voicing narratives of*

*gendered experiences*, Ed. M. Ronksley-Pavia, M. M. Neumann, J. F. Manakil, K. Pickard-Smith, **2023**, Bloomsbury, 147-160.

<https://www.bloomsbury.com/uk/academic-women-9781350274297/>

### **Light-Controlled Destruction and Assembly: Switching between Two Differently Composed Cage-Type Complexes**

D. Hugenbusch, M. Lehr, J.-S. von Glasenapp, A. J. McConnell, R. Herges, *Angew. Chem. Int. Ed.* **2023**, 62, e202212571.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/anie.202212571>.

**2022**

### **Planning a Family**

J. S. Leigh, N. Busschaert, C. J. E. Haynes, J. R. Hiscock, K. M. Hutchins, L. K. S. von Krbek, A. J. McConnell, A. G. Slater, D. K. Smith, E. R. Draper, *Nat. Rev. Chem.* **2022**, 6, 673-675.

<https://doi.org/10.1038/s41570-022-00427-0>.

### **M-CPOs: Transition Metal Complexes with Cyclopropanone-Based Ligands for Light-Triggered Carbon Monoxide Release**

M. Lehr, T. Neumann, C. Näther, A. J. McConnell, *Dalton Trans.* **2022**, 51, 6936-6943.

<https://doi.org/10.1039/D2DT00835A>.

### **Metallosupramolecular Cages: From Design Principles and Characterisation Techniques to Applications**

A. J. McConnell, *Chem. Soc. Rev.* **2022**, 51, 2957-2971.

<https://doi.org/10.1039/D1CS01143J>.

### **The Dynamic Covalent Chemistry of Amidoboronates: Controlling the *rac*<sub>5</sub>/*rac*<sub>6</sub> Ratio Via the B-N and B-O Bonds**

P. Harders, T. Griebenow, A. Businski, A. J. Kaus, L. Pietsch, C. Näther, A. J. McConnell, *ChemPlusChem* **2022**, 87, e202200022.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/full/10.1002/cplu.202200022>.

### **Managing Research Throughout COVID-19: Lived Experiences of Supramolecular Chemists**

J. S. Leigh, J. R. Hiscock, S. Koops, A. J. McConnell, C. J. E. Haynes, C. Caltagirone, M. Kieffer, E. R. Draper, A. G. Slater, K. M. Hutchins, D. Watkins, N. Busschaert, L. K. S. von Krbek, K. A. Jolliffe, M. J. Hardie, *Chem* **2022**, 8, 299-311.

<https://doi.org/10.1016/j.chempr.2022.01.001>.

### **Women in Supramolecular Chemistry: Collectively Crafting the Rhythm of Our Lives and Work in STEM**

J. Leigh, J. Hiscock, A. McConnell, C. Haynes, C. Caltagirone, M. Kieffer, E. Draper, A. Slater, L. von Krbek, K. Hutchins, D. Watkins, N. Busschaert, Policy Press, Bristol, **2022**.

<https://policy.bristoluniversitypress.co.uk/women-in-supramolecular-chemistry>.

**2021**

### **Copper-Free One-Pot Sonogashira-Type Coupling for the Efficient Preparation of Symmetric Diarylalkyne Ligands for Metal-Organic Cages**

M. Lehr, T. Paschelke, V. Bendt, A. Petersen, L. Pietsch, P. Harders, A. J. McConnell, *Eur. J. Org. Chem.* **2021**, 2728-2735.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/full/10.1002/ejoc.202100275>.

**An Area-Specific, International Community-Led Approach to Understanding and Addressing Equality, Diversity, and Inclusion Issues within Supramolecular Chemistry**

C. Caltagirone, E. R. Draper, M. J. Hardie, C. J. E. Haynes, J. R. Hiscock, K. A. Jolliffe, M. Kieffer, A. J. McConnell, J. S. Leigh, *Angew. Chem. Int. Ed.* **2021**, *60*, 11572-11579.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/anie.202015297>.

**2020**

**Supramolecular Chemistry: Young Talents and Their Mentors**

A. J. McConnell, C. J. E. Haynes, C. Caltagirone, J. R. Hiscock, *ChemPlusChem* **2020**, *85*, 2544-2545.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/cplu.202000668>.

**From Heteroditopic to Multitopic Receptors for Ion-Pair Recognition: Advances in Receptor Design and Applications**

A. J. McConnell, A. Docker, P. D. Beer, *ChemPlusChem* **2020**, *85*, 1824-1841.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/full/10.1002/cplu.202000484>.

**A Paramagnetic NMR Spectroscopy Toolbox for the Characterisation of Paramagnetic/Spin-Crossover Coordination Complexes and Metal-Organic Cages**

M. Lehr, T. Paschelke, E. Trunpf, A.-M. Vogt, C. Näther, F. D. Sönnichsen, A. J. McConnell, *Angew. Chem. Int. Ed.* **2020**, *59*, 19344-19351.

<https://onlinelibrary.wiley.com/doi/10.1002/anie.202008439>.

## **Funding**

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DFG 560861966: Dual Stimuli Spin-Crossover Cages in Solution – Theory and Experiment

DFG 413396832: Photo-Responsive Metal-Organic Cages (1<sup>st</sup> and 2<sup>nd</sup> funding period)

DFG 429518153: Dual-Responsive Spin-Crossover Cages

DFG 447862786: The Dynamic Covalent Chemistry and Applications of Amidoboronates from the Reductive Coupling of *N*-Aryl Iminoboronates

## **Graduations**

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Marc Lehr (2023, CAU Kiel)

*Development and Synthesis of MOC-CPOnes: Metal-Organic Cages Based on Photo-Responsive Cyclopropanone Ligands*

Tobias Paschelke (2023, CAU Kiel)

*Dual-Responsive Spin-Crossover Cages*

## Michael Schmittel

b.1956; Diploma in Chemistry (1980, Univ. Freiburg), Diplôme de Langue et Civilisation Française (1981, Sorbonne, Paris), Dr. rer. nat. (1985, Univ. Freiburg, Ch. Rüchardt), Postdoctoral fellow (1985-87, Univ. of Rochester, J.P. Dinnocenzo), Habilitation (1992, Univ. Freiburg), Associate professor (1993-1999, Univ. Würzburg), Full professor (1999-now, Siegen).

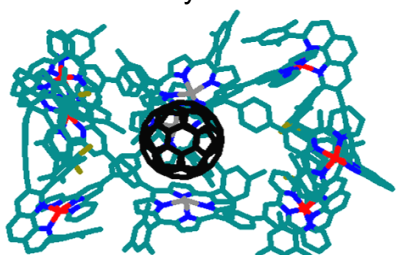
Awards: BASF Award 1975, Studienstiftung des Deutschen Volkes 1977-1981, DAAD-NATO fellow 1985-1987, Liebig fellowship 1987-1989, Gödecke Award 1987, INSA Lectureship 2000, JSPS Lectureship 2004.

Professional Activities: Associate Editor of *J. Phys. Org. Chem.* (2001-now), chair of the GDCh-Ortsverband (2001-2011), Chair of the „Reactive Radical Ion Workshop 2002“, Chair of Gordon Research Conference on „Free Radical Reactions“ in 2005. Director of the Research Center of Micro- and Nanochemistry and –Engineering in Siegen (2005-2017); Speaker of the DFG-Research Center „Lab-on-Mikrochip“ (2005-2010). Speaker of the Graduiertenkolleg “Heterosensor Architectures” (2007-2011). Dean of the Fachbereich Chemie (2009-2011). Distinguished Honorary Professor at IIT Kanpur since 2016. Visiting professor at the University of Strasbourg in 2018. Rudolf-Gompper-Memorial Award Lecture in 2022.

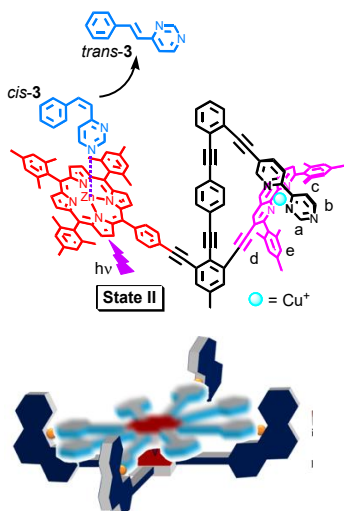
E-mail: [schmittel@chemie.uni-siegen.de](mailto:schmittel@chemie.uni-siegen.de)

*Fields of research:* nanomechanical switches = nanoswitches and nano machines. Formerly: Electron transfer activation, electrochemiluminescent chemosensors, lab-on-molecules, enediyne and enyne-allene cyclizations, dynamic non-statistical effects, metal phenanthrolines, redox active materials for surface wetting, supramolecular coordination complexes.

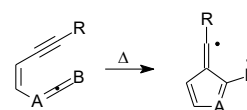
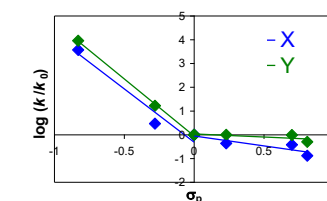
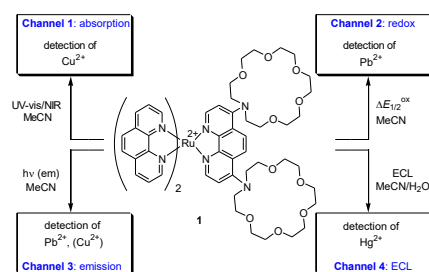
(Supra)molecular  
Nanochemistry



Nanoswitches  
nanomachines

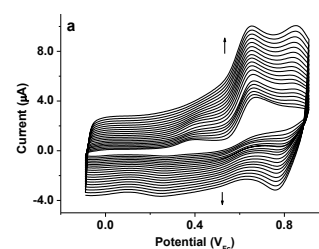
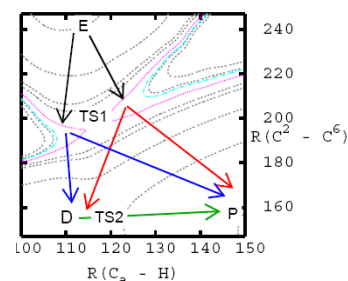
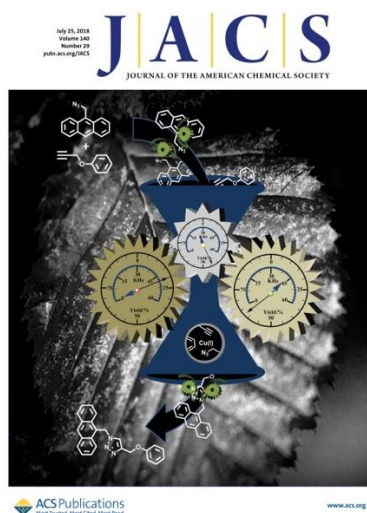


Organic Technology for Lab on Diradicals in Cyclizations  
Chip



A=CH; B=CHR  
A=N; B=CHR  
A=N; B=NR

and



## Publications

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2025

### Chemical Fuel-Driven Networked Catalytic Machinery

A. Ghosh, S. Kundu, M. Schmittel, *Chem. Eur. J.* **2025**, 31, e202501714.

<https://doi.org/10.1002/chem.202501714>

### Noble Gas Provides a Solution to the Synthesis-on-Inert-Surfaces Challenge for Extended Covalent Nanostructures

L. Grossmann, S. Korn, R. Breuer, M. Schmittel, H. B. Weber, W. M. Heckl, M. Lackinger, *Angew. Chem. Int. Ed.* **2025**, 64, e202422521.

<https://doi.org/10.1002/anie.202422521>

### (Supra)Molecular Switches Controlled by Artificial Signaling Cascades

J. Venkatesh, A. Sharma, S. De, Soumen, S. Pramanik, M. Schmittel, *Synlett* **2025**, 36, 1868–1888.

<https://doi.org/10.1055/s-0043-1775490>

2024

### Dissipative Sequential Catalysis Via Six-Component Machinery

D. Mondal, E. Elramadi, S. Kundu, M. Schmittel, *Chem. Commun.* **2024**, 60, 4659-4662.

<http://dx.doi.org/10.1039/D4CC00786G>.

### Dynamic Negative Allosteric Effect: Regulation of Catalysis Via Multicomponent Rotor Speed

I. Paul, I. Valiyev, A. Ghosh, M. Schmittel, *Chem. Commun.* **2024**, 60, 7085-7088.

<http://dx.doi.org/10.1039/D4CC02144D>.

### Interconversion between Multicomponent Slider-on-Deck and Palladium Capsule: Regulation of Catalysis and Encapsulation

I. Valiyev, I. Paul, Y.-F. Li, E. Elramadi, M. Schmittel, *Dalton Trans.* **2024**, 53, 3454-3458.

<http://dx.doi.org/10.1039/D3DT04300B>.

### Mechanistic Insights into on-Surface Reactions from Isothermal Temperature-Programmed X-Ray Photoelectron Spectroscopy

L. Grossmann, M. Hocke, G. Galeotti, G. Contini, L. Floreano, A. Cossaro, A. Ghosh, M. Schmittel, J. Rosen, W. M. Heckl, J. Björk, M. Lackinger, *Nanoscale* **2024**, 16, 7612-7625.

<http://dx.doi.org/10.1039/D4NR00468J>.

### Networked Multicomponent Ensemble as and Gate with Fret Output

P. Kumar Biswas, I. Paul, M. Schmittel, *Chem. Eur. J.* **2024**, 30, e202402979.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/chem.202402979>.

### Stepwise Dissipative Control of Multimodal Motion in a Silver(I) Catenate

E. Elramadi, S. Kundu, D. Mondal, T. Paululat, M. Schmittel, *Angew. Chem. Int. Ed.* **2024**, 63, e202404444.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/anie.202404444>.

### Chemically Fueled Logic and Gate with Double Encoding in the Time Domain

I. Paul, I. Valiyev, M. Schmittel, *J. Am. Chem. Soc.* **2024**, 146, 2435-2444.

<https://doi.org/10.1021/jacs.3c09838>.

2023

**Concurrent Tandem Catalysis Enabled by Nanomechanical Motion in Heteroleptic Four-Component Dual-Catalyst Machinery**

E. Elramadi, S. Kundu, D. Mondal, M. Schmittel, *Chem. Commun.* **2023**, 59, 4915-4918.  
<http://dx.doi.org/10.1039/D3CC00637A>.

**Fast and Slow Walking Driven by Chemical Fuel**

V. V. Rajasekaran, E. Elramadi, I. Valiyev, P. Howlader, M. Schmittel, *Chem. Commun.* **2023**, 59, 3886-3889.  
<http://dx.doi.org/10.1039/D3CC00357D>.

**Proton Transfer Network with Luminescence Display Controls Off/on Catalysis That Generates a High-Speed Slider-on-Deck**

S. Kundu, I. Valiyev, D. Mondal, V. V. Rajasekaran, A. Goswami, M. Schmittel, *RSC Adv.* **2023**, 13, 5168-5171.  
<http://dx.doi.org/10.1039/D3RA00062A>.

**Orthogonal Initiation of Molecular Motion Devices by Two Chemical Fuels**

D. Mondal, S. Kundu, E. Elramadi, V. V. Rajasekaran, M. Schmittel, *J. Am. Chem. Soc.* **2023**, 145, 26520-26524.  
<https://doi.org/10.1021/jacs.3c08134>.

**A Constitutionally Dynamic Cage Acts as a Convertible and Adaptable Information Manager in Supramolecular Logic**

V. V. Rajasekaran, S. Kundu, D. Mondal, M. Schmittel, *ChemSystemsChem* **2023**, 5, e202300009.  
<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/syst.202300009>.

**Self-Healing of a Copper(I) [2]Rotaxane Shuttle Monitored by Fluorescence**

D. Mondal, S. Kundu, E. Elramadi, I. Valiyev, M. Schmittel, *Org. Lett.* **2023**, 25, 933-937.  
<https://doi.org/10.1021/acs.orglett.2c04237>.

2022

**Catalytic Machinery in Motion: Controlling Catalysis Via Speed**

E. Elramadi, A. Ghosh, I. Valiyev, P. K. Biswas, T. Paululat, M. Schmittel, *Chem. Commun.* **2022**, 58, 8073-8076.  
<http://dx.doi.org/10.1039/D2CC02555H>.

**Concurrent Base and Silver(I) Catalysis Pulsed by Fuel Acid**

I. Valiyev, A. Ghosh, I. Paul, M. Schmittel, *Chem. Commun.* **2022**, 58, 1728-1731.  
<http://dx.doi.org/10.1039/D1CC06398G>.

**Dynamics of the Alkyne → Copper(I) Interaction and Its Use in a Heteroleptic Four-Component Catalytic Rotor**

S. Saha, S. Kundu, P. K. Biswas, M. Bolte, M. Schmittel, *Chem. Commun.* **2022**, 58, 13019-13022.  
<http://dx.doi.org/10.1039/D2CC04497H>.

**Evolution of Adsorption Heights in the on-Surface Synthesis and Decoupling of Covalent Organic Networks on Ag(111) by Normal-Incidence X-Ray Standing Wave**

L. Grossmann, D. A. Duncan, S. P. Jarvis, R. G. Jones, S. De, J. Rosen, M. Schmittel, W. M. Heckl, J. Björk, M. Lackinger, *Nanoscale Horiz.* **2022**, 7, 51-62.  
<http://dx.doi.org/10.1039/D1NH00486G>.

### **The Information Encoded in Structures: Theory and Application to Molecular Cybernetics**

A. Bielecki, M. Schmittel, *Foundations of Science* **2022**, *27*, 1327-1345.

<https://doi.org/10.1007/s10699-022-09830-8>.

### **Synchronizing Two Distinct Nano-Circular Sliding Motions in Six-Component Machinery for Double Catalysis**

V. V. Rajasekaran, A. Ghosh, S. Kundu, D. Mondal, T. Paululat, M. Schmittel, *Angew. Chem. Int. Ed.* **2022**, *61*, e202212473.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/anie.202212473>.

### **Three-Input Logic and Gate Drives Sequential Three-Step Catalysis by Parallel Activation of H<sup>+</sup> and Ag<sup>+</sup> as a Catalyst Duo**

S. Kundu, D. Mondal, V. V. Rajasekaran, A. Goswami, M. Schmittel, *Inorg. Chem.* **2022**, *61*, 17007-17011.

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### **Versatile Role of Molecule–Surface Interactions for Monolayer Self-Assembly at Liquid–Solid Interfaces: Substrate-Induced Polymorphism, Thermodynamic Stability, and New Polymorphs**

A. Badami-Behjat, P. S. Deimel, F. Allegretti, E. Ringel, K. Mahata, M. Schmittel, J. V. Barth, W. M. Heckl, M. Lackinger, *Chem. Mater.* **2022**, *34*, 8876-8884.

<https://doi.org/10.1021/acs.chemmater.2c02177>.

### **Potential-Dependent Adhesion Forces between Dsdna and Electroactive Surfaces**

J. Shao, R. Breuer, M. Schmittel, T. Ye, *Langmuir* **2022**, *38*, 11899-11908.

<https://doi.org/10.1021/acs.langmuir.2c01515>.

### **Parallel Allosteric Inhibition of Shuttling Motion and Catalysis in a Silver(I)-Loaded [2]Rotaxane**

S. Kundu, D. Mondal, E. Elramadi, I. Valiyev, M. Schmittel, *Org. Lett.* **2022**, *24*, 6609-6613.

<https://doi.org/10.1021/acs.orglett.2c02609>.

### **Multicomponent Pseudorotaxane Quadrilateral as Dual-Way Logic and Gate with Two Catalytic Outputs**

S. Kundu, A. Ghosh, I. Paul, M. Schmittel, *J. Am. Chem. Soc.* **2022**, *144*, 13039-13043.

<https://doi.org/10.1021/jacs.2c05065>.

### **Heteroleptic Metallosupramolecular Aggregates/Complexation for Supramolecular Catalysis**

P. Howlader, M. Schmittel, *Beilstein J. Org. Chem.* **2022**, *18*, 597-630.

<https://doi.org/10.3762/bjoc.18.62>.

### **Fuel Acid Drives Base Catalysis and Supramolecular Cage-to-Device Transformation under Dissipative Conditions**

D. Mondal, A. Ghosh, I. Paul, M. Schmittel, *Org. Lett.* **2022**, *24*, 69-73.

<https://doi.org/10.1021/acs.orglett.1c03654>.

### **Switchable Catalysis Using Allosteric Effects**

M. Schmittel, in *Supramolecular Catalysis: New Directions and Developments*, Eds. Piet van Leeuwen and Matthieu Raynal, Wiley **2022**, Chapter 39, p. 575-589.

Print ISBN:9783527349029

<https://doi.org/10.1002/9783527832033>

2021

**Evolution of Catalytic Machinery: Three-Component Nanorotor Catalyzes Formation of Four-Component Catalytic Machinery**

A. Goswami, M. S. Özer, I. Paul, M. Schmittel, *Chem. Commun.* **2021**, 57, 7180-7183.

<http://dx.doi.org/10.1039/D1CC02805G>.

**Off-Equilibrium Speed Control of a Multistage Molecular Rotor: 2-Fold Chemical Fueling by Acid or Silver(I)**

A. Goswami, S. Saha, E. Elramadi, A. Ghosh, M. Schmittel, *J. Am. Chem. Soc.* **2021**, 143, 14926-14935.

<https://doi.org/10.1021/jacs.1c08005>.

**Cooperative Effects in Switchable Catalysis: Enhancing Double-Click Reaction Yield of Symmetrical Rotaxanes**

A. Ghosh, I. Paul, M. Schmittel, *Angew. Chem. Int. Ed.* **2021**, 60, 20558-20562.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/anie.202108269>.

**Multitasking with Chemical Fuel: Dissipative Formation of a Pseudorotaxane Rotor from Five Distinct Components**

A. Ghosh, I. Paul, M. Schmittel, *J. Am. Chem. Soc.* **2021**, 143, 5319-5323.

<https://doi.org/10.1021/jacs.1c01948>.

**Toward Molecular Cybernetics – the Art of Communicating Chemical Systems**

M. Schmittel, P. Howlader, *Chem. Rec.* **2021**, 21, 523-543.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/tcr.202000126>.

**A Switchable Catalyst Duo for Acyl Transfer Proximity Catalysis and Regulation of Substrate Selectivity**

A. Goswami, S. Gaikwad, M. Schmittel, *Chem. Eur. J.* **2021**, 27, 2997-3001.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/chem.202004416>.

**Exchange Speed of Four-Component Nanorotors Correlates with Hammett Substituent Constants**

Y.-F. Li, A. Ghosh, P. K. Biswas, S. Saha, M. Schmittel, *Chemistry* **2021**, 3, 116-125.

<https://www.mdpi.com/2624-8549/3/1/9>.

2020

**Allosteric Regulation of Rotational, Optical and Catalytic Properties within Multicomponent Machinery**

S. Saha, A. Ghosh, T. Paululat, M. Schmittel, *Dalton Trans.* **2020**, 49, 8693-8700.

<http://dx.doi.org/10.1039/D0DT01961E>.

**Reversible Switching from a Three- to a Nine-Fold Degenerate Dynamic Slider-on-Deck through Catenation**

V. V. Rajasekaran, I. Paul, M. Schmittel, *Chem. Commun.* **2020**, 56, 12821-12824.

<http://dx.doi.org/10.1039/D0CC05578F>.

**Using Multiple Self-Sorting for Switching Functions in Discrete Multicomponent Systems**

A. Ghosh, M. Schmittel, *Beilstein J. Org. Chem.* **2020**, 16, 2831-2853.

<https://doi.org/10.3762/bjoc.16.233>.

### **Dynamics of Hydrogen Bonding in Three-Component Nanorotors**

P. K. Biswas, A. Goswami, S. Saha, M. Schmittel, *Chem. Eur. J.* **2020**, *26*, 14095-14099.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/chem.202002877>.

### **Double Rotors with Fluxional Axles: Domino Rotation and Azide–Alkyne Huisgen Cycloaddition Catalysis**

A. Goswami, M. Schmittel, *Angew. Chem. Int. Ed.* **2020**, *59*, 12362-12366.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/anie.202002739>.

### **Reversible Multicomponent AND Gate Triggered by Stoichiometric Chemical Pulses Commands the Self-Assembly and Actuation of Catalytic Machinery**

P. K. Biswas, S. Saha, S. Gaikwad, M. Schmittel, *J. Am. Chem. Soc.* **2020**, *142*, 7889-7897.

<https://doi.org/10.1021/jacs.0c01315>.

### **Remote Control of the Reversible Assembly/Disassembly of Supramolecular Aggregates**

N. Mittal, I. Paul, S. Pramanik, M. Schmittel, *Supramol. Chem.* **2020**, *32*, 133-138.

<https://doi.org/10.1080/10610278.2020.1711907>.

### **(Nano)Mechanical Motion Triggered by Metal Coordination: From Functional Devices to Networked Multicomponent Catalytic Machinery**

A. Goswami, S. Saha, P. K. Biswas, M. Schmittel, *Chem. Rev.* **2020**, *120*, 125-199.

<https://doi.org/10.1021/acs.chemrev.9b00159>.

### **Motion and Nanomechanical Effects in Supramolecular Catalysts,**

M. Schmittel, A. Goswami, I. Paul, P. K. Biswas, C. Joachim (ed.), *Building and Probing Small for Mechanics, Advances in Atom and Single Molecule Machines*, © Springer International Publishing, Springer Nature Switzerland AG, **2020**, p. 195-218.

ISBN 978-3-030-56777-4

<https://doi.org/10.1007/978-3-030-56777-4>

## Funding

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DFG Schm 647/19-2: Nanoswitches in Action II

DFG Schm 647/20-2: Nanomechanical and chemical aspects of rotation in multicomponent nanorotors II

DFG Schm 647/22-1: Chemisch ausgelöste Metallionen-Signale zur Erzeugung gepulster Funktionen

## Graduations

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Suchismita Saha (2020)

*From Standalone Supramolecular Devices to Cybernetically Controlled Molecular Machinery*

Indrajit Paul (2020)

*From Switchable Supramolecular Systems to Networked Dynamic Multicomponent Catalytic Machinery*

Pronay K. Biswas (2020)

*From Stand-Alone Multicomponent Nanorotors as Catalysts to Networking Catalytic Machinery Through Logic Gate Operation*

Abir Goswami (2020)

*Nanomechanical Motion for Switchable Catalysis: Networked Multi-Component Catalytic Machinery*

Amit Ghosh (2021)

*Towards Networked out-of-Equilibrium Molecular Devices and Machines*

Vishnu Verman Rajasekaran (2023)

*Functions Emerging from Motion in Multimode, Dissipative and Networked Multicomponent Systems*

Sohom Kundu (2023)

*From Multicomponent Dynamic Devices to Chemical Networks as Functional and Catalytic Systems*

Emad Elramadi (2024)

*Multicomponent Catalytic Machinery: The Role of Dynamics and Chemical Fuel*

Debabrata Mondal (2024)

*Dissipative Nanomechanical Motion-Based Artificial Molecular Machinery*

Isa Valiyev (2024)

*From Standalone Supramolecular Devices to Networked Dissipative Functional Systems*

## Harald Günther

---

b. 1935; Diploma in Chemistry (1959, Univ. Stuttgart), Dr. rer. nat (1961, Univ. Heidelberg, G. Wittig), Postdoctoral Fellow (1961-63 Mellon Institute, Pittsburgh, USA, Aksel A. Bothner-By), Habilitation (1968, Univ. Köln, E. Vogel), Associate professor (1970-77, Univ. Köln), Full professor (1978-2000, Univ. Siegen).

Awards: Studienstiftung des Deutschen Volkes 1968-71, Chemistry Award Academy of Sciences, Göttingen, 1973, Stipend of the Fonds der Chemischen Industrie 1973-78, member NRW Academy of Sciences and Arts 1995.

Academic activities: Editor-in-Chief of Magnetic Resonance in Chemistry 1992-2005, Editor NMR – Basic Principles and Progress 1986-97.

Professional Activities: Chair GDCh Ortsverband Siegen 1981-83, Chair German NMR Discussion group 1991-93, Dean Fachbereich Chemie 1992-93, 1997-99, member of the Apparateausschuss der Deutschen Forschungsgemeinschaft 1996-2002.

E-mail: [guenther@chemie.uni-siegen.de](mailto:guenther@chemie.uni-siegen.de)

## Publications

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**2020**

**NMR Spectroscopy of Organolithium Compounds, Part XXXIV: Cyclopropyllithium and Lithium Bromide (1:1) in Diethylether/Tetrahydrofuran—Identification of a Fluxional Mixed Tetramer**

O. Eppers, H. Günther, *Magn. Reson. Chem.* **2020**, *58*, 131-138.

<https://analyticalsciencejournals.onlinelibrary.wiley.com/doi/abs/10.1002/mrc.4952>.

## **Adalbert Maercker**

---

b. 1932; Diploma in Chemistry (1959, Univ. Heidelberg), Dr. rer. nat. (1962, Univ. Heidelberg, G. Wittig), Postdoctoral fellow (1963-1965, California Institute of Technology in Pasadena/ USA, J. D. Roberts), Habilitation (1968, Univ. Erlangen-Nürnberg), Associate professor (1969-1974, Univ. Erlangen-Nürnberg), Full professor (1974-1999 (Univ. Siegen), Emeritus (1999-now, Siegen).

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*Fields of research:* Carbanion chemistry, organoalkalimetal compounds, ring-chain rearrangements, ether cleavage reactions, polylithiumorganic compounds, reactivity of potassium anions (alkalides).