

# Jun.-Prof. Dr. Robert Hein

## Juniorprofessor

Organic Chemistry Institute and Center for Soft Nanoscience, University of Münster, Germany

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## Research Interests

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My scientific interests are highly interdisciplinary and lie at the interface of molecular nanotechnology, materials, supramolecular and electrochemistry. A particular focus is the use of electrochemical tools to both study and control redox-active (supra)molecular systems, and their application as, among others, sensors, stimuli-responsive materials and redox-driven switches and machines.

## Employment

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04/2025 - to date	<b>University of Münster, Germany</b> W1 Juniorprofessor, Organic Chemistry Institute and Center for Soft Nanoscience (SoN)
07/2024 - 03/2025	<b>University of Münster, Germany</b> Independent Junior Research Group Leader, Organic Chemistry Institute Mentor: Prof. B. J. Ravoo
09/2022 - 06/2024	<b>University of Groningen, Netherlands</b> Marie Curie Postdoctoral Fellow with Prof. B. L. Feringa Project: Redox-driven molecular switches and motors
07/2020 - 07/2022	<b>University of Oxford, U.K.</b> Postdoctoral Research Associate in Supramolecular Chemistry with Prof. P. D. Beer Project: Development of fluorescent ion sensors

## Education

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10/2016 - 11/2020	<b>University of Oxford, Lady Margaret Hall, U.K.</b> DPhil (PhD) in the Department of Chemistry with Prof. P. D. Beer and Prof. J. J. Davis Thesis: "Electrochemical Anion Sensing in Solution and at Receptive Interfaces" (06.11.2020)
08/2013 - 06/2016	<b>Jacobs University Bremen, Germany</b> Bachelor of Science in Chemistry, GPA: 1.15 (Scale: 1.00 (best) - 5.00 (failing)) Research group of Prof. W. M. Nau Thesis: "Synthesis of BODIPY Dyes for Supramolecular Reporter Pairs"
08/2015 - 01/2016	<b>Cornell University, USA</b> Exchange Semester at the College of Agriculture and Life Sciences, GPA: 4.03 (Scale: 4.30 (best) - 0.00 (failing))

## Research Stays

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08/2019 - 09/2019	<b>Research Group of Prof. P. R. Bueno, UNESP Araraquara, Brazil</b> Collaboration: Origins of capacitive phenomena at ion-receptive interfaces
08/2015 - 01/2016	<b>Research Group of Prof. G. W. Coates, Cornell University, USA</b> Undergraduate Research: Catalyst development, Dehydrogenation polymerizations
06/2015 - 08/2015	<b>Research Group of Prof. O. A. Scherman, University of Cambridge, U.K.</b> Internship: Synthesis and characterization of biocompatible hydrogels as drug carriers
06/2014 - 08/2014	<b>Fraunhofer Institute for Polymers and Composites PYCO, Germany</b> Internship: Synthesis of ephedrine derivatives

## Publications

16 as first author, 7 as (co)corresponding author; Google Scholar Profile (09.11.2025): Citations: 1824, h-index: 17

† - Equal contribution, \* - Corresponding author

32. R. R. Weber, **R. Hein**<sup>\*</sup>, A. Ryabchun, Y. Gisbert, D. G. Romero, M. A. Loi, B. L. Feringa<sup>\*</sup>, "Light-gated redox switching and actuation in polymer hydrogels", *Nat. Commun.*, **2025**, *16*, 9106. (Editors' Highlight) Behind the paper: <https://go.nature.com/48H75zw>
31. E. Sidler<sup>\*</sup>, **R. Hein**, C. N. Stindt, B. L. Feringa<sup>\*</sup>, "Indeno[2,1-c]fluorene Quasi[8]circulenes Through Intramolecular Cyclization", *Angew. Chem. Int. Ed.*, **2025**, e202510583.
30. **R. Hein**<sup>†</sup>, E. Sidler<sup>†</sup>, Y. Gisbert, B. L. Feringa<sup>\*</sup>, "Chiral Induction and Memory via Supramolecular Deracemization", *Angew. Chem. Int. Ed.*, **2025**, e202510584. (HOT paper)
29. **R. Hein**<sup>\*</sup>, Y. Gisbert, B. L. Feringa<sup>\*</sup>, "Multi-State Redox and Light-Driven Switching of Pseudorotaxanation and Cation Shuttling", *J. Am. Chem. Soc.*, **2025**, *147*, 13649-13657.
28. K. I. Assaf<sup>\*</sup>, F. N. Tehrani, G. E. Quintero, **R. Hein**, M. E. Aliaga, W. M. Nau<sup>\*</sup>, "Regioselective Dimerization of Methylcyclopentadiene inside Cucurbit[7]uril", *Chem. Eur. J.*, **2024**, e202403964.
27. **R. Hein**<sup>\*</sup>, C. N. Stindt, B. L. Feringa<sup>\*</sup>, "Mix and Match Tuning of the Conformational and Multistate Redox Switching Properties of an Overcrowded Alkene", *J. Am. Chem. Soc.*, **2024**, *146*, 26275-26285.
26. M. Fellert<sup>†</sup>, **R. Hein**<sup>†</sup>, A. Ryabchun, Y. Gisbert, C. N. Stindt, B. L. Feringa<sup>\*</sup>, "A Multiresponsive Ferrocene-Based Chiral Overcrowded Alkene Twisting Liquid Crystals", *Angew. Chem. Int. Ed.*, **2024**, e202413047. (Highlighted in ChemistryViews)
25. S. C. Patrick, **R. Hein**, P. D. Beer, J. J. Davis<sup>\*</sup>, "Non-Faradaic Capacitive Cation Sensing Under Flow", *Chem. Sci.*, **2024**, *15*, 18310-18317. (Highlighted in *Chem. Sci.* **2024**, *15*, 18224-18226)
24. E. Sidler<sup>†</sup>, **R. Hein**<sup>†</sup>, D. Doellerer, B. L. Feringa<sup>\*</sup>, "Redox-Switchable Aromaticity in a Helically Extended Indeno[2,1-c]fluorene", *J. Am. Chem. Soc.*, **2024**, *146*, 19168-19176.
23. H. Bagha, **R. Hein**, W. K. Myers, M. R. Sambrook, P. D. Beer<sup>\*</sup>, "Phosphate selective binding and sensing by halogen bonding tripodal copper (II) metallo-receptors in aqueous media", *Dalton. Trans*, **2024**, *2024*, 53, 12338-12348.
22. A. J. Taylor<sup>†</sup>, **R. Hein**<sup>†\*</sup>, S. C. Patrick, J. J. Davis, P. D. Beer<sup>\*</sup>, "Anion Sensing through Redox-Modulated Fluorescent Halogen Bonding and Hydrogen Bonding Hosts", *Angew. Chem. Int. Ed.*, **2024**, *63*, e202315959.
21. H. Bagha, **R. Hein**, J. Y. C. Lim, C. B. Durr, M. R. Sambrook, P. D. Beer<sup>\*</sup>, "Halogen Bonding Tripodal Metallo-receptors for Phosphate Recognition and Sensing in Aqueous containing Organic Media", *Chem. Eur. J.*, **2023**, *30*, e202302775.
20. M. Sharafeldin, **R. Hein**, J. J. Davis<sup>\*</sup>, "Catalysed amplification of faradaic shotgun tagging in ultrasensitive electrochemical immunoassays", *Chem. Commun.*, **2022**, *58*, 9472-9475.
19. **R. Hein**, P. D. Beer<sup>\*</sup>, "Halogen Bonding and Chalcogen Bonding Mediated Sensing", *Chem. Sci.*, **2022**, *13*, 7098-7125.
18. **R. Hein**, A. Docker, J. J. Davis<sup>\*</sup>, P. D. Beer<sup>\*</sup>, "Redox-Switchable Chalcogen Bonding for Anion Recognition and Sensing", *J. Am. Chem. Soc.*, **2022**, *144*, 8827-8836.
17. F. N. Tehrani, K. I. Assaf<sup>\*</sup>, **R. Hein**, T. C. Nugent, W. M. Nau<sup>\*</sup>, "Supramolecular Catalysis of a Catalysis-Resistant Diels-Alder Reaction: Rapid Dimerization of Cyclopentadiene inside Cucurbit[7]uril", *ACS Cat.*, **2022**, *12*, 2261-2269.
16. **R. Hein**<sup>\*</sup>, P. D. Beer<sup>\*</sup>, "Organometallic receptors for charged and neutral guest species", in: *Comprehensive Organometallic Chemistry IV*, Elsevier, **2022**, *14*, 418-462. DOI: 10.1016/B978-0-12-820206-7.00132-3
15. S. C. Patrick<sup>†</sup>, **R. Hein**<sup>†\*</sup>, P. D. Beer<sup>\*</sup>, J. J. Davis<sup>\*</sup>, "Continuous and Polarisation-tuned Redox Capacitive Anion Sensing at Electroactive Interfaces", *J. Am. Chem. Soc.*, **2021**, *143*, 19199-19206. (Highlighted as Spotlight)
14. S. C. Patrick<sup>†</sup>, **R. Hein**<sup>†</sup>, M. Sharafeldin, X. Li, P. D. Beer, J. J. Davis<sup>\*</sup>, "Real-time Voltammetric Anion Sensing Under Flow", *Chem. Eur. J.*, **2021**, *27*, 17700-17706.
13. Y. C. Tse, **R. Hein**, E. J. Mitchell, Z. Zhang, P. D. Beer<sup>\*</sup>, "Halogen-Bonding Strapped Porphyrin BODIPY Rotaxanes for Dual Optical and Electrochemical Anion Sensing", *Chem. Eur. J.*, **2021**, *27*, 14550-14559. (HOT paper)

12. S. C. Patrick, **R. Hein**, A. Docker, P. D. Beer\*, J. J. Davis\*, "Solvent Effects in Halogen and Hydrogen Bonding Mediated Electrochemical Anion Sensing in Aqueous Solution and at Interfaces", *Chem. Eur. J.*, **2021**, *27*, 10201-10209. (HOT paper)
11. **R. Hein**, X. Li, P. D. Beer\*, J. J. Davis\*, "Enhanced Interfacial Voltammetric Anion Sensing at Halogen and Hydrogen Bonding Ferrocenyl SAMs", *Chem. Sci.*, **2021**, *12*, 2433-2440.
10. C. Jiang, F. Hopfner, A. Katsikoudi, **R. Hein**, S. Evetts, Y. Huang, H. Wang, J. W. Ryder, G. Kuhlenbäumer, G. Deuschl, A. Padovani, D. Berg, B. Borroni, M. T. Hu, J. J. Davis, G. K. Tofaris\*, " $\alpha$ -Synuclein in serum neuronal exosomes precedes and predicts Parkinson's disease", *J. Neurol. Neurosurg. Psychiatry*, **2020**, *91*, 720-729.
9. C. Jiang<sup>†</sup>, G. Wang<sup>†</sup>, **R. Hein**<sup>†</sup>, N. Liu, X. Luo\*, J. J. Davis\*, "Antifouling Strategies for Selective In Vitro and In Vivo Sensing" *Chem. Rev.*, **2020**, *120*, 3852-3889. (5th Place in "YourFavoriteReview" poll)
8. A. Baradoke, **R. Hein**, X. Li, J. J. Davis\*, "Reagentless Redox Capacitive Assaying of C-Reactive Protein at a Polyaniline Interface", *Anal. Chem.*, **2020**, *92*, 3508-3511.
7. P. R. Bueno\*, **R. Hein**, A. Santos, J. J. Davis\*, "The Nanoscopic Principles of Capacitive Ion Sensing Interfaces", *Phys. Chem. Chem. Phys.*, **2020**, *22*, 3770-3774. (HOT paper)
6. **R. Hein**, P. D. Beer\*, J. J. Davis\*, "Electrochemical Anion Sensing: Supramolecular Approaches", *Chem. Rev.*, **2020**, *120*, 1888-1935.
5. **R. Hein**, A. Borissov, M. D. Smith, P. D. Beer\*, J. J. Davis\*, "A halogen-bonding foldamer molecular film for selective reagentless anion sensing in water", *Chem. Commun.*, **2019**, *55*, 4849-4852.
4. J. Piccoli, **R. Hein**, A. H. El-Sagheer, T. Brown, E. M. Cilli, P. R. Bueno\*, J. J. Davis\*, "Redox Capacitive Assaying of CRP at a Peptide Supported Aptamer Interface", *Anal. Chem.*, **2018**, *90*, 3005-3008.
3. M. J. Rowland, C. C. Parkins, J. H. McAbee, A. Kolb, **R. Hein**, X. J. Loh, O. A. Scherman\*, "An Adherent Tissue-inspired Hydrogel Delivery Vehicle Utilized in Primary Human Glioma Models", *Biomater.*, **2018**, *179*, 199-208.
2. M. A. Alnajjar, J. Bartelmeß, **R. Hein**, P. Ashokkumar, M. Nilam, W. M. Nau, K. Rurack, A. Hennig\*, "Rational design of boron-dipyromethene (BODIPY) reporter dyes for cucurbit[7]uril", *Beilstein J. Org. Chem.*, **2018**, *14*, 1961-1971.
1. **R. Hein**, C. Uzundal, A. Hennig\*, "Simple and rapid quantification of phospholipids for supramolecular membrane transport assays", *Org. Biomol. Chem.*, **2016**, *14*, 2182-2185.

## Patents

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2. P. D. Beer, **R. Hein**, 2024, "Sulphide sensing assembly", WO2024161140A1
1. P. D. Beer, J. J. Davis, **R. Hein**, S. C. Patrick, 2023, "Redox capacitance sensing of particles under flow", WO2023079269A1

## Lectures and Oral Presentations

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32. **NRW Return Fellows Workshop**, Münster, Germany, 08/2025, "Dynamic Redox Switching"
31. **University of Hamburg**, Hamburg, Germany, 07/2025, "Dynamic Redox Switching – From Sensors to Molecular Machines" (*Invited lecture*)
30. **IRCCS-ILR-IRTG Seminar**, Nagoya, Japan, 06/2025, "Dynamic Redox Switching"
29. **University of Osaka, Toyonaka**, Osaka, Japan, 06/2025, "Dynamic Redox Switching – From Sensors to Molecular Machines" (*Invited lecture*)
28. **University of Osaka, Suita**, Osaka, Japan, 06/2025, "Dynamic Redox Switching – From Sensors to Molecular Machines" (*Invited lecture*)
27. **University of Hiroshima**, Hiroshima, Japan, 06/2025, "Dynamic Redox Switching – From Sensors to Molecular Machines" (*Invited lecture*)
26. **University of Kyushu**, Fukuoka, Japan, 06/2025, "Dynamic Redox Switching – From Sensors to Molecular Machines" (*Invited lecture*)
25. **ISMSC 2025**, Kyoto, Japan, 05/2025, "Multi-State Redox- and Light-Driven Switching of Crown Ethers"

24. **FoChIn Symposium 2025**, Münster, Germany, 05/2025, "Hein Lab Research: Electrifying Supramolecular Chemistry"
23. **Chemiedozententagung 2025**, Braunschweig, Germany, 03/2025, "Dynamic Redox Switches Based on Overcrowded Alkenes"
22. **Regionales Stipendiat:innentreffen, RUB**, Bochum, Germany, 01/2025, "Dynamic Redox Switching"
21. **São Paulo State University, UNESP**, Araraquara, Brazil, 10/2024, "Dynamic Redox Switching – From Sensors to Molecular Machines" (*Invited lecture*)
20. **University of São Paulo, USP**, Sao Carlos, Brazil, 10/2024, "Dynamic Redox Switching – From Sensors to Molecular Machines" (*Invited lecture*)
19. **Brazilian Materials Research Society Conference XXII**, Santos, Brazil 10/2024, "Dynamic Redox Switching – From Sensors to Molecular Machines" (*Invited lecture*)
18. **SupraSys Indo-German Workshop**, Goa, India, 09/2024, "Novel Redox Switches in Solution and at Interfaces"
17. **9th EuChemS Chemistry Congress**, Dublin, 07/2024, "Ion-Dependent Conformational Switching of Bisthiocanthylidenes"
16. **The 5th ERC Grantees Conference**, Edinburgh, 07/2023, "Redox-Switchable Chalcogen Bonding for Anion Recognition and Sensing"
15. **University of Ulm**, 05/2023, Ulm, Germany, "Supramolecular Electrochemistry: Novel Approaches for Sensing and Redox Switching" (*Invited lecture*)
14. **University of Münster**, 05/2023, Münster, Germany, "Supramolecular Electrochemistry: Novel Approaches for Sensing and Redox Switching" (*Invited lecture*)
13. **GDCh-Kolloquim, University of Osnabrück**, 01/2023, Osnabrück, Germany, "Supramolecular Electrochemistry: Novel Approaches for Sensing and Redox Switching" (*Invited lecture*)
12. **SupraChem 2022**, 07/2022, Mainz, Germany, "Redox-Switchable Chalcogen Bonding for Anion Recognition and Sensing"
11. **Matrafured - International Meeting on Chemical Sensors 2022**, 06/2022, Visegrad, Hungary, "Continuous and Polarisation-Tuned Redox Capacitive Ion Sensing at Electroactive Interfaces"
10. **Somerville JRF Symposium 2022**, 05/2022, Oxford, U.K., "Going with the Flow: Development of Sensing Devices for Water Monitoring"
9. **Analytical Research Forum 2021**, Online conference, "Electrochemical Anion Sensing: From Fundamentals to Applications"
8. **Seminar in Chemistry, Mahidol University**, 09/2020 (online), Bangkok, Thailand, "Supramolecular Electrochemistry: Anion Sensing and Fundamental Host-Guest Studies" (*Invited lecture*)
7. **MPLS Graduate Seminar, Lady Margaret Hall 2020**, Oxford, U.K. "Harnessing the Power of Electrochemistry: Sensors and Higher-order Structures"
6. **São Paulo State University, USP**, 08/2019, Araraquara, Brazil, "From Supramolecular Anion Recognition to Electrochemical Sensing"
5. **Oxford Electrochemical Society Chapter Symposium 2019**, Oxford, U.K., "Anion Sensing via non-Faradaic Capacitance Spectroscopy"
4. **Inorganic Graduate Symposium 2019**, Oxford, U.K., "Electrochemical Anion Sensing in Solution and at Receptive Interfaces"
3. **Mahidol University**, 02/2019, Bangkok, Thailand, "Electrochemical Anion Sensing" (*Invited lecture*)
2. **Pure and Applied Chemistry International Conference, PACCON 2019**, Bangkok, Thailand, "Non-Faradaic Capacitive Anion Sensing at Anion Receptive Interfaces"
1. **Macrocyclic and Supramolecular Chemistry Meeting 2018**, Lancaster, U.K., "A Halogen-bonding Foldamer Molecular Film for Selective Reagentless Anion Sensing in Water"

## Teaching and Mentoring

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07/2024 - to date	<b>Supervision as independent research group leader</b> Ongoing: 5 PhD students. 2 MSc research projects. Completed: 1 BSc Thesis
WiSe 2025/26	<b>Lecturer for "Grundlagen der Chemie (Nebenfach)", University of Münster</b> BSc Module (1.5 SWS)
SoSe 2025	<b>"Polymere und Nanostrukturen", University of Münster</b> MSc Module, design and implementation of practical/research lab courses (0.5 SWS)
WiSe 2024/25 and 2025/26	<b>Lecturer for "Aktuelle Aspekte der Organischen Chemie", University of Münster</b> MSc Module, Lecture "Molecular Nanotechnology" (1 SWS)
10/2023	<b>Lecturer for "Photochemistry and Photoredox Catalysis", University of Groningen</b> MSc Course, 2 lectures + 1 tutorial, substitute for Prof. B. L. Feringa
03/2023	<b>Lecturer at Second Dutch selection round for the International Chemistry Olympiad</b> Lecture: Physical-Organic Chemistry
10/2020 - 09/2021	<b>College Advisor, Kellogg College, University of Oxford, U.K.</b> Academic college advisor to nine postgraduate students
Michaelmas term 2017	<b>Lab Demonstrator, Physical and Theoretical Chemistry Lab, University of Oxford</b>
Spring term 2016	<b>Teaching Assistant, Jacobs University Bremen:</b> -Advanced Lab Course Physical Chemistry -Organic Chemistry II
Spring term 2015	<b>Teaching Assistant, Jacobs University Bremen:</b> -Advanced Lab Course Physical Chemistry -Organic Chemistry Lab
03/2014 - 2017, 2023	<b>Lecturer at Third German selection round for the International Chemistry Olympiad</b> Seminars: Organic Chemistry I-III, Physical-Organic Chemistry Lectures: Supramolecular Chemistry (2x), Dyes

## Peer-reviewed Funding

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**NRW Return Fellowship**, State of North Rhine-Westphalia, from 02/2025 (1.250.000 Eur)

**CRC1459 Project Leader**, project C07, DFG, from 01/2025 (279.000 Eur)

**Liebig-Fellowship**, Fonds der Chemischen Industrie, from 07/2024 (50k Eur + own position + 1 PhD position)

**Marie Skłodowska-Curie Postdoctoral Fellowship**, EU, 09/2022-07/2024 (187.600 Eur)

**Feodor-Lynen Fellowship**, Alexander von Humboldt Foundation, declined

## Awards and Prizes

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**Emerging Investigators Bursary**, The 5th ERC Grantees Conference, 07/2023

**Fulford Junior Research Fellowship**, Somerville College, University of Oxford, 10/2021 - 07/2022

**Postdoctoral Research Fellowship**, Christ Church, University of Oxford, 2021, declined

**Junior Research Fellowship**, Kellogg College, University of Oxford, 2021, declined

**Research Membership of Common Room**, Kellogg College, University of Oxford, 10/2020-09/2021

**Santander Academic Travel Award**, 2019, for research collaboration in Brazil

**One-year Residential Scholarship**, Lady Margaret Hall, 2016/17

**Fellowship of the Studienstiftung des Deutschen Volkes**, 03/2016 - 09/2017

**Entry on the President's List of Jacobs University Bremen**, 2013 - 2016, Cumulative GPA better than 1.50

**Merit-based scholarship, Jacobs University Bremen, 2013-2016**

**German selection contest for the International Chemistry Olympiad, 2012: Round 3, Place 26; 2013: Round 3 and 4, Place 5 and 8**

**German selection contest for the International Physics Olympiad, 2013: Round 3, Place 36**

**Primus-Prize of the city of Frankfurt (Oder), 2013, Prize for outstanding accomplishments in the natural sciences**

## **Professional Service and Extracurricular Activities**

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Reviewer	<b>Fulbright Poland (Senior Award), Electrochem. Commun., Mater. Horiz., J. Elecanal. Chem., J. Phys. Chem., J. Org. Chem., Chem, Macromol. Rapid Commun., Chem. Sci., J. Phys. Chem. Lett.</b>
08/2025	<b>Organizer of 1st NRW Return Fellows Workshop, Münster</b>
07/2019	<b>Mentor for the German National Team at the 51<sup>st</sup> International Chemistry Olympiad, Paris, France</b>
01/2018 - 12/2018	<b>MCR Social Secretary, Lady Margaret Hall, University of Oxford</b>
07/2016	<b>Scientific Observer for the German National Team at the 48<sup>th</sup> International Chemistry Olympiad, Tblisi, Georgia</b>
05/2014 - 06/2016	<b>Chemistry Society, Jacobs University Bremen, President (04/2015 - 05/2016)</b>
06/2012 - 06/2017	<b>Förderverein Chemie-Olympiade e.V. (Friends Of The Chemistry Olympiad e.V.) Organiser of the students chemistry competition "Chemie – die stimmt!" in the states of Lower Saxony and Bremen (03/2014 - 06/2017), Member of the advisory board (2013 - 2016)</b>