

# STEPHAN C. HAMMER

Jun.-Prof. for Organic Chemistry and Biocatalysis  
Emmy Noether Research Group Leader

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## EDUCATION AND CAREER

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<b>Professor (W1 tt W2)</b>	since 12-2019
<ul style="list-style-type: none"><li>Bielefeld University, Faculty of Chemistry</li><li>Organic Chemistry and Biocatalysis</li></ul>	
<b>Emmy Noether Research Group Leader</b>	since 05-2019
<ul style="list-style-type: none"><li>Deutsche Forschungsgemeinschaft - Project number 420112577</li><li>New catalytic reaction development by directed enzyme evolution</li></ul>	
<b>Junior Research Group Leader</b>	2017-2019
<ul style="list-style-type: none"><li>University of Stuttgart, DE</li><li>Topic: Design and evolution of new enzyme function</li></ul>	
<b>Postdoctoral research with Prof. Dr. Frances H. Arnold</b>	2015-2017
<ul style="list-style-type: none"><li>California Institute of Technology, USA</li><li>Topic: Directed evolution of enzymes</li></ul>	
<b>PhD in Chemistry with Prof. Dr. Bernhard Hauer</b>	2010-2014
<ul style="list-style-type: none"><li>University of Stuttgart, DE (doctorate with honors)</li><li>Topic: Biocatalysis</li></ul>	
<b>Studies of Chemistry</b>	2005-2010
<ul style="list-style-type: none"><li>Philipps University of Marburg, DE</li><li>University of Cambridge, UK</li><li>Diploma (Philipps University of Marburg, 11.06.2010, grade 1.1)</li></ul>	
<b>Chemical Laboratory Assistant</b>	1997-2005
<ul style="list-style-type: none"><li>BASF SE, Ludwigshafen</li><li>Topic: Process development for new pesticides</li><li>Vocational training from 1997-2001 (chemical laboratory assistant)</li><li>Advanced training from 2001-2005 (state-certified technician for laboratory technology)</li></ul>	

## FELLOWSHIPS

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<ul style="list-style-type: none"><li>DFG Emmy Noether Fellowship</li></ul>	since 2019
<ul style="list-style-type: none"><li>DFG Research Fellowship</li></ul>	2016-2017
<ul style="list-style-type: none"><li>FCI Kekulé PhD Fellowship</li></ul>	2011-2014

**31. Directed Evolution Enables Dynamic Control of Transient Intermediates for Anti-Markovnikov Wacker-Tsuji-Type Oxidation of Unactivated Alkenes**

Klaus C, Soler J, Kubik G, Gumulya Y, Hui Y, Watkins-Dulaney EJ, Heitland M-L, Sommer M, Klein A, Kowal JL, Niemann HH, Arnold FH, Garcia-Borràs M, [Hammer SC](#)

[ChemRxiv 2024](#), doi:10.26434/chemrxiv-2024-j0229-v2. *This content is a preprint and has not been peer-reviewed.*

**30. A New Age of Biocatalysis by Generic Activation Modes**

Jain S, Ospina F, [Hammer SC](#)

[JACS Au 2024](#), 4, 2068-2080.

**29. Efficient Transferase Engineering for SAM Analog Synthesis from Iodoalkanes**

Schülke KH, Fröse J, Klein A, Garcia-Borràs M, [Hammer SC](#)

[ChemBioChem 2024](#), 25, e202400079.

Highlighted in *ChemistryViews*: Efficient Access to S-Adenosylmethionine Analogs.

**28. Efficient Molecular Basis for Chemoselectivity Control in Oxidations of Internal Aryl-Alkenes Catalyzed by Laboratory Evolved P450s**

Soler J, Gergel S, [Hammer SC](#), Garcia-Borràs M

[ChemBioChem 2024](#), 25, e202400066.

**27. Controlling Monoterpene Isomerization by Guiding Challenging Carbocation Rearrangement Reactions in Engineered Squalene-Hopene Cyclases**

Ludwig J, Curado-Carballada C, [Hammer SC](#), Schneider A, Diether S, Ruiz-Barragán S, Osuna S, Hauer B

[Angewandte Chemie International Edition 2024](#), 63, e202318913.

**26. Engineered P450 for direct arylalkene-to-ketone oxidation via highly reactive carbocation intermediates**

Gergel S, Soler J, Klein A, Schülke KH, Hauer B, Garcia-Borràs M, [Hammer SC](#)

[Nature Catalysis 2023](#), 6, 606-617.

News & Views by E. O'Reilly and M. Haarr, *Nature Catalysis* 2023, 6, 561-562.

Highlighted by L. Bara in *Nachrichten aus der Chemie*, 2023, 71(11), 48-51.

Highlighted by B. List and S. Brunen in *Synfacts* 2023, 19, 1030.

**25. Methylation of unactivated alkenes with engineered methyltransferases to generate non-natural terpenoids**

Aberle B, Kowalczyk D, Massini S, Egler-Kemmerer A, Gergel S, [Hammer SC](#), Hauer B

[Angewandte Chemie International Edition 2023](#), 62, e202301601.

Selected as VIP Paper and HOT Topic in Biocatalysis by *Angewandte Chemie*.

Highlighted by B. List and L.M. Debie in *Synfacts* 2023, 19, z0709 and selected by the editors as "Synfact of the Month".

**24. Chiral alcohols from alkenes and water: Directed evolution of a styrene hydratase**

Gajdoš M, Wagner J, Ospina S, Köhler A, Engqvist MKM, [Hammer SC](#)

[Angewandte Chemie International Edition 2023](#), 62, e202215093.

Highlighted by J. Andexer and P. Germer in "Trendbericht Organische Chemie 2024", *Nachrichten aus der Chemie*, 2024, 72(3), 44-67.

**23. Engineering cytochrome P450s for selective alkene to carbonyl oxidation**

Klaus C, [Hammer SC](#)

[Methods in Enzymology 2023](#), 693, 111-131.

**22. A Career in Catalysis: Bernhard Hauer**

Nebel BA, Breuer M, Schneider S, Aberle B, [Hammer SC](#), Syrén PO, Weissenborn MJ, Nestl BM

[ACS Catalysis 2023](#), 13, 8861-8889.

**21. Comparative S-adenosyl-L-methionine analogue generation for biocatalytic Friedel-Crafts alkylation**

Hoffmann A, Schülke KH, [Hammer SC](#), Rentmeister A, Cornelissen NV

[Chemical Communication](#) **2023**, *59*, 5463-5466.

**20. Selective biocatalytic N-methylation of unsaturated heterocycles**

Ospina S, Schülke KS, Klein A, Prosenc B, Garcia-Borràs M, [Hammer SC](#)

[Angewandte Chemie International Edition](#) **2022**, *61*, e202213056.

Selected as VIP Paper and HOT Topic in Biocatalysis by *Angewandte Chemie*.

Highlighted by B. List and M. Turberg in *Synfacts* **2023**, *19*, 0080.

**19. Enzymatic control over reactive intermediates enables direct oxidation of alkenes to carbonyls by a P450 iron-oxo species**

Soler J, Gergel S, Klaus C, [Hammer SC](#), Garcia-Borràs M

[Journal of the American Chemical Society](#) **2022**, *144*, 15954-15968.

**18. New catalytic reactions by enzyme engineering**

Klaus C, [Hammer SC](#)

[Trends in Chemistry](#) **2022**, *4*, 363-366.

**17. Substrate profiling of anion methyltransferases for promiscuous synthesis of S-adenosylmethionine analogs from haloalkanes**

Schülke KH, Ospina F, Hörnschemeyer K, Gergel S, [Hammer SC](#)

[ChemBioChem](#) **2022**, *23*, e202100632.

Selected as VIP Paper by *ChemBioChem* and highlighted in the ChemBioTalents 2022/23 collection.

**16. Biocatalytic alkylation chemistry: Building molecular complexity with high selectivity**

Ospina F, Schülke KH, [Hammer SC](#)

[ChemPlusChem](#) **2022**, *87*, e202100454.

Selected as VIP Paper by *ChemPlusChem*.

**15. Engineered enzymes enable selective N-alkylation of pyrazoles with simple haloalkanes**

Bengel LL, Aberle B, Egler-Kemmerer A, Hauer B, [Hammer SC](#)

[Angewandte Chemie International Edition](#) **2021**, *60*, 5554-5560.

Selected as VIP Paper by *Angewandte Chemie*.

Highlighted by B. List and J.L. Kennemur in *Synfacts* **2021**, *17*, 0322.

**14. Asymmetric enzymatic hydration of unactivated, aliphatic alkenes**

Demming RM, [Hammer SC](#), Nestl BM, Gergel S, Fademrecht S, Pleiss J, Hauer B

[Angewandte Chemie International Edition](#) **2019**, *58*, 173-177.

Highlighted by B. List and J.L. Kennemur in *Synfacts* **2018**, *14*, 1300.

**13. Anti-Markovnikov alkene oxidation by metal-oxo-mediated enzyme catalysis**

[Hammer SC](#), Kubik G, Watkins E, Huang S, Minges H, Arnold FH

[Science](#) **2017**, *358*, 215-218.

Highlighted by S. Bormann in C&EN.

Highlighted by B. List and G.A. Shevchenko in *Synfacts* **2018**, *14*, 0083.

Highlighted by ACS in "Chemistry Research of the year 2017".

**12. Design and evolution of enzymes for non-natural chemistry**

[Hammer SC](#), Knight AM, Arnold FH

[Current Opinion in Green and Sustainable Chemistry](#). **2017**, *7*, 23-30.

### 11. Selectivity in the cyclization of citronellal introduced by squalene hopene cyclase variants

Bastian SA, [Hammer SC](#), Kreß N, Nestl BM, Hauer B

[ChemCatChem](#) **2017**, *9*, 4364-4368.

### 10. Substrate Pre-Folding and Water Molecule Organization Matters for Terpene Cyclase Catalyzed Conversion of Unnatural Substrates

[Hammer SC](#), Syrén PO, Hauer B

[ChemistrySelect](#) **2016**, *1*, 3589-3593.

### 9. Squalene hopene cyclases are protonases for stereoselective Brønsted acid catalysis

[Hammer SC](#), Marjanovic A, Dominicus JM, Nestl BM, Hauer B

[Nature Chemical Biology](#) **2015**, *11*, 121-126.

### 8. Imine reductase-catalyzed intermolecular reductive amination of aldehydes and ketones

Scheller PM, Lenz M, [Hammer SC](#), Hauer B, Nestl BM

[ChemCatChem](#) **2015**, *7*, 3239-3242.

### 7. Emerging Enzymes

Faber K, Glueck SM, [Hammer SC](#), Hauer B, Nestl BM

[Science of Synthesis - Biocatalysis in Organic Synthesis](#) **2015**, *3*, 547-578.

### 6. Entropy is key to the formation of pentacyclic terpenoids by enzyme-catalyzed polycyclization

Syrén PO, [Hammer SC](#), Claasen B, Hauer B

[Angewandte Chemie International Edition](#) **2014**, *53*, 4845-4849.

### 5. New generation of biocatalysts for organic synthesis

Nestl BM, [Hammer SC](#), Nebel BA, Hauer B

[Angewandte Chemie International Edition](#) **2014**, *53*, 3070-3095.

### 4. Biokatalysatoren für die organische Synthese - die neue Generation

Nestl BM, [Hammer SC](#), Nebel BA, Hauer B

[Angewandte Chemie](#) **2014**, *126*, 3132-3158.

### 3. Schlummerndes Synthesepotenzial in Enzymen: Wie können wir es wecken?

[Hammer SC](#), Nestl BM, Hauer B

[BIOspektrum](#) **2013**, *19*, 574-576.

### 2. Squalene hopene cyclases: highly promiscuous and evolvable catalysts for stereoselective CC and CX bond formation

[Hammer SC](#), Syrén PO, Seitz M, Nestl BM, Hauer B

[Current opinion in chemical biology](#) **2013**, *17*, 293-300.

### 1. Stereoselective Friedel–Crafts alkylation catalyzed by squalene hopene cyclases

[Hammer SC](#), Dominicus JM, Syrén PO, Nestl BM, Hauer B

[Tetrahedron](#) **2012**, *68*, 7624-7629.

## LECTURES AND INVITATIONS (SELECTED HIGHLIGHTS)

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Nov 2024	Metabolic and Protein Engineering for Biosynthesis, Frankfurt, DE
May 2024	4 <sup>th</sup> NextGenBiocat, Heraklion, GR
Feb. 2024	36 <sup>th</sup> Irsee Natural Product Symposium, Irsee, DE
Jan. 2024	Universität Konstanz, <i>GDCh colloquium</i> , Konstanz, DE
Sep. 2023	Osaka University, Department of Applied Chemistry, Osaka, JP
Jun. 2023	Swedish Symposium on Enzyme Engineering, Stockholm, SE
Mar. 2023	Chemiedozententagung 2023, Dresden, DE
Oct. 2022	RWTH Aachen, <i>Organic chemistry colloquium</i> , Aachen, DE
Sep. 2022	Albert-Ludwigs-Universität Freiburg, <i>RTG1976 Retreat</i> , Freiburg, DE
Jun. 2022	Girona Seminar: Biocatalysis, Girona, ES
Apr. 2022	University of California Santa Barbara, <i>Organic Chemistry Seminar</i> , Santa Barbara, US
Oct. 2021	Leibniz Institute for Catalysis, <i>Catalysis Across Borders</i> , Rostock, DE
Jul. 2021	Universität Münster, <i>Organic chemistry colloquium</i> , Münster, DE
Mar. 2021	National Academy of Engineering & Alexander von Humboldt Foundation – 2021 German-American Frontiers of Engineering
Oct. 2020	Bayer AG, Leverkusen, DE
Jul. 2020	Technical University Munich, <i>TUM-JST symposium “Catalysis Science – Quo Vadis”</i> , Munich, DE
Jan. 2020	Universität Greifswald, <i>GDCh colloquium</i> , Greifswald, DE
Mar. 2019	52. Jahrestreffen Deutscher Katalytiker, Weimar, DE
Apr. 2018	Universität Regensburg, Center for Biochemistry, Regensburg, DE
Apr. 2017	Max-Planck-Institute for terrestrial Microbiology, Marburg, DE
Mar. 2016	Bridging Chemistry and Biology, Schwarzenberg, AT
Jul. 2014	Gordon Research Conference – Biocatalysis Seminar, Smithfield, US

## FUNCTIONS AND MEMBERSHIPS IN SCIENTIFIC SOCIETIES

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since 01-2024	Appointed member of the selection committee for the GDCh Prize for Biocatalysis
since 2024	American Chemical Society (ACS)
since 2015	Gesellschaft für Chemische Technik und Biotechnologie (DECHEMA)
since 2015	Gesellschaft für Biochemie und Molekularbiologie (GBM)
since 2006	Gesellschaft Deutscher Chemiker (GDCh)