Felix Kaspar

CV

Is fascinated by how enzymes work and what they can contribute to the chemistry of tomorrow.

Personal Information

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Motivation

What motivates me to do science is a fundamental curiosity to discover, understand and apply new technologies and phenomena.

What brings me the most joy in my profession is the moment of scientific discovery. Having a data set come together to support a hypothesis or seeing a concept come to life for the first time are special moments. On a more daily basis, I enjoy working together with students and collaborators to add fresh perspectives on joint projects.

What keeps my job interesting is what I often call *curiosity-driven lateral exploration*: unexpected discoveries leading projects in different and unforeseeable directions and opening new opportunities.

What consistently amazes me about my research is the fact that enzymes actually work. "Loosely aggregated long chains of amino acids doing extremely precise chemistry" does sound rather unlikely. Nonetheless, that is what enables life on earth and almost all the diverse and fascinating chemistry in nature.

Academic Career

since 2025 ***Group leader***
Universität des Saarlandes, Saarbrücken, Germany
Research interests: Biocatalysis with phosphorylated intermediates, high-throughput enzymology, assay development, applied spectroscopy, chemoenzymatic synthesis

2024–2025 ***DAAD PRIME fellow***
University of Groningen, Groningen, Netherlands (with Prof. Mayer)
Core project: Engineering of prenylelongases for the assembly of non-natural terpenoids

2021–2024 ***Postdoctoral Researcher & Project Leader***
Technische Universität Braunschweig, Braunschweig, Germany (with Prof. Schallmey)
Core project, funded by an independent DFG Individual Research Grant: Archaeal ether synthases – Method development, synthetic and mechanistic studies

2019–2021 ***PhD*** (*summa cum laude*, with distinction)
Technische Universität Berlin, Berlin, Germany
Thesis: Analytical Methods and Thermodynamic Frameworks for Efficient Biocatalytic Nucleoside Synthesis via Nucleoside Phosphorylases (with Prof. Neubauer, thesis available at https://doi.org/10.14279/depositonce-11851)

2019–2021 Scientist at BioNukleo GmbH (Berlin, Germany)

2016–2019 ***Master Biochemistry / Chemical Biology*** (overall average grade: 1.1, with honors)
Technische Universität Braunschweig, Braunschweig, Germany
Thesis: Yield Prediction and Optimization via Thermodynamic Characterization of Enzymatic Nucleoside Phosphorylation Reactions with a UV-Spectroscopy-Based High-Throughput Assay (with Prof. Neubauer)

2017–2018 Research Internship in the group of Prof. Capon (University of Queensland, Brisbane, Australia)

2013–2016 ***Bachelor Biotechnology*** (overall average grade: 1.6)
Technische Universität Braunschweig, Braunschweig, Germany
Thesis: Investigations on the Secondary Metabolism of Nematode-Associated Fungi (with Prof. Stadler)

2016 DAAD Research Internship (RISE) in the group of Prof. Arduengo (University of Alabama, Tuscaloosa, USA)

2015 DAAD Research Internship (RISE) in the group of Prof. Jelinek (Charles Sturt University, Albury, Australia)

2005–2013 ***Abitur*** (overall average grade: 1.2)
König-Karlmann-Gymnasium, Altötting, Germany

2011 Otis-Bison High School, Otis, USA

Key Publications

*corresponding author, #joint first authors (see below for a comprehensive list)

[1] **Kaspar, F.***, Eilert, L., Staar, S., Oung, S.W., Wolter, M., Ganskow, C.S.G., Kemper, S., Klahn, P., Jacob, C.R., Blankenfeld, W., Schallmey, A.* Biocatalytic Ether Lipid Synthesis by an Archaeal Glycerolprenylase, *Angew. Chem. Int. Ed.* **2024**, e202412597, https://doi.org/10.1002/anie.202412597
This project marked our first foray into a largely unmapped family of enzymes. This was a long and fun project with a very unusual enzyme; and one that rewarded creative experimental designs and orthogonal experimentation.

[2] Eilert, L., Schallmey, A., **Kaspar, F.*** UV-Spectroscopic Detection of (Pyro-)Phosphate with the PUB module, *Anal. Chem.* **2022**, 94, 3432–3435, https://doi.org/10.1021/acs.analchem.1c05356
This enabling method for high-throughput detection of phosphate species proved exceptionally valuable for kinetic studies and screening purposes. Definitely among our most thorough papers to date.

[3] **Kaspar, F.***, Crameri, F.* Coloring Chemistry: How Mindful Color Choices Improve Chemical Communication, *Angew. Chem. Int. Ed.* **2022**, 61, e202114910, https://doi.org/10.1002/anie.202114910
This opinion piece outlines best practices for inclusive figure design, with a specific focus on an audience of life scientists.

[4] **Kaspar, F.***#, Brandt, F.#, Westarp, S., Eilert, L., Kemper, S., Kurreck, A., Neubauer, P., Jacob, C., Schallmey, A. Biased Borate Esterification during Nucleoside Phosphorylase-Catalyzed Reactions: Apparent Equilibrium Shifts and Kinetic Implications, *Angew. Chem. Int. Ed.* **2023**, 135, e202218492, https://doi.org/10.1002/anie.202218492
This project was sparked by a serendipitous discovery, which we pursued purely out of curiosity. Getting to the bottom of this one was a challenging process!

[5] **Kaspar, F.*** Quality Data from Messy Spectra – How Isometric Points Increase Information Content in Highly Overlapping Spectra, *ChemBioChem* **2023**, 24, e202200744, https://doi.org/10.1002/cbic.202200744
This somewhat unconventional tutorial outlines how isometric points (points in a spectrum where nothing happens) can be used to extract valuable information from spectroscopic data featuring high degrees of signal overlap.

[6] **Kaspar, F.***, Seeger, M., Westarp, S., Köllmann, C., Lehmann, A.P., Pausch, P., Kemper, S., Neubauer, P., Bange, G., Schallmey, A., Werz, D.B., Kurreck, A., Diversification of 4'-Methylated Nucleosides by Nucleoside Phosphorylases, *ACS Catalysis* **2021**, 11, 10830–10835, https://doi.org/10.1021/acscatal.1c02589 (**highlighted by the ESRF**: https://shorturl.at/xIM49)
This highly interdisciplinary study describes how biocatalysis and principles of thermodynamic control can be used to install different nucleobases on a modified sugar scaffold.

[7] Westarp, S., Brandt, F., Neumair, L., Betz, C., Dagane, A., Kemper, S., Jacob, C.R., Neubauer, P., Kurreck, A.*, **Kaspar, F.*** Nucleoside Phosphorylases Make *N*7-Xanthosine, *Nat. Commun.* **2024**, 15, 3625, https://doi.org/10.1038/s41467-024-47287-4
This paper is an excellent example of curiosity-driven lateral exploration. The enzymatic cascade we had envisioned did not yield the desired results. In working out why that was the case, we discovered an unprecedented reactivity of nucleoside phosphorylases which provided access to a "non-native" regioisomer with unusual physicochemical properties.

Awards and Honors

2025 Liebig fellowship

2024 DAAD PRIME fellowship

2024 Leopoldina Postdoc fellowship (declined)

2022–2024 Elected chairman of The Young Braunschweig Scientific Society (JBWG; member since 2021, vice chair since 2024)

2022 *ChemBioChem* ChemBioTalent

2022 Forschungspreis der Fakultät III für Nachwuchswissenschaftler*innen (TU Berlin) (PhD thesis award)

2020 *The Next Generation of Biocatalysis in Bern 2021* travel grant

2019 Freunde des Institutes für Organische Chemie e.V. (TU Braunschweig) award for an outstanding Master degree

2017–2018 Germany scholarship

2015 & 2016 DAAD RISE scholarships

Invited Talks

2025 Albert-Ludwigs-Universität Freiburg, Germany: Biocatalysis with Phosphorylated Intermediates – Profiling prenylelongases

2024 Helmholtz Center for Infection Research, Germany: Effective Postdoc Fellowship Applications – A Retrosynthetic Perspective

Vrije Universiteit Amsterdam, Netherlands: Biocatalysis with Phosphorylated Intermediates – Methods to Mechanisms

Universität Augsburg, Germany: Biocatalysis with Phosphorylated Intermediates – Methods to Mechanisms

Albert-Ludwigs-Universität Freiburg, Germany: Biocatalysis with Phosphorylated Intermediates – Methods to Mechanisms

2023 University College Dublin, Ireland: Biocatalysis with Phosphorylated Intermediates

Otto-von-Guericke-Universität Magdeburg, Germany: Biocatalysis with Phosphorylated Intermediates

Technische Universität Dresden, Germany: Biocatalysis with Phosphorylated Intermediates

Rijksuniversiteit Groningen, Netherlands: Biocatalytic Diversification of Nucleosides

Technische Universität München, Germany: Biocatalytic Diversification of Nucleosides

University of Gothenburg, Sweden: Biocatalytic Diversification of Nucleosides

Teaching

since 2019 Supervision and co-supervision of (under)graduate students (1 Master and 3 Bachelor students as of July 2025)

2025 Conceptualization, design and presentation of a graduate student lecture in (Bio-)Chemistry (topic: Methods in chemical biology)

2022–2024 Conceptualization, design and presentation of a graduate student lecture in (Bio-)Chemistry (topic: "new-to-nature" reactions)

2022 Invited lecture on inclusive color design of publications and teaching materials (TU Braunschweig)

2021 Conceptualization, design and supervision of a graduate student lab course in Biochemistry (topic: activity-stability relationships in biocatalysis)

2019 Tutor for 'Biochemical Engineering 1'

2017 & 2018 Tutor for 'Mathematical Methods of Chemistry 2' and 'Thermodynamics and Transport Processes'

2016–2017 Mentor at the TU Braunschweig bureau for gender equality in science

2015 Assistant at the TU Braunschweig Language Center

2014–2015 Tutor for 'Mathematical Methods of Chemistry 1'

Conference Contributions

2025 Poster at the Biotrans2025 in Basel: *Engineering Prenylelongases for the Assembly of Non-Natural Terpenoids by High-Throughput Profiling*

Lecture at the NextGenBiocat Milan: *Biocatalytic Ether Lipid Synthesis by an Ultrastable Archaeal Glycerolprenylase*

2024 Lecture at the Biocat2024 Hamburg: *Biocatalytic Ether Lipid Synthesis by an Archaeal Glycerolprenylase*

2023 Poster at the Biotrans2023 in LaRochelle: *Bright and Flashy Figures of the Inclusive Kind*

2022 Poster at the NextGenBiocat in Delft: *A New dimension for Biocatalytic Nucleoside Synthesis: From Serendipity to Applications*

2021 Lecture at the virtual Biotrans2021 in Graz: *Diversification of Nucleoside Analogues by Nucleoside Phosphorylases*

Oral presentation at the virtual NGBiocat in Bern: *Ask what an equilibrium can do for you - Applications and perspectives from biocatalytic nucleoside synthesis*

Poster at the virtual EFB Conference (European Federation of Biotechnology): *Chemistry done by nature: Enzymatic diversification of nucleoside analogs*

Poster at the virtual BNCM2021 (Biocatalysis in Non-Conventional Media; Milan): *Making the Insoluble Possible: Nucleoside (Trans-)Glycosylations in Near-Boiling Cosolvent-Heavy Media*

Poster at the 2021 #RSCPoster Twitter Conference: *Get Quality data from messy UV spectra - Spectral unmixing for monitoring of reactions between species with highly overlapping UV absorption spectra* (highlighted by *Chemical Science* and @ErrantScience, archived at https://doi.org/10.5281/zenodo.4738900)

Poster at the virtual NextGenBiocat 2021 (Graz): *What an equilibrium can do for you - Why small energy differences can be a good thing, at least for nucleoside synthesis*

2020 Poster at the Online Nucleic Acids Forum 2020: *Just Add Sugar - employing enzyme catalysis to access nucleosides via selective glycosylation*

Poster at the LMB-UNIGE Graduate Life Sciences Symposium 2020: *Just Add Sugar - employing enzyme catalysis to access nucleosides via selective glycosylation* (awarded runner-up Best Poster Prize)

Poster at the 2020 #RSCPoster Twitter Conference: *Spectral Unmixing for Efficient Reaction Monitoring of Nucleoside Transformations*

Peer-Reviewed Publications

*corresponding author, #joint first authors

preprints **Kaspar, F.*** A Chemical Definition of Efficiency, **2020**, preprint at https://doi.org/10.26434/chemrxiv.13251344.v1

2025 [29] Staar, S., Estévez-Gay, M., **Kaspar, F.**, Osuna, S., Schallmey, A. Engineering of Conserved Sequence Motif 1 Residues in Halohydrin Dehalogenase HheC Simultaneously Enhances Activity, Stability and Enantioselectivity, *ACS Catal.* **2025**, 15, 5257, https://doi.org/10.1021/acscatal.5c00819

2024 [28] Motter, J., Westarp, S., Barsig, J., Betz, C., Dagane, A., **Kaspar, F.**, Neumair, L., Kemper, S., Neubauer, P., Kurreck, A.* A deamination-driven biocatalytic cascade for the synthesis of ribose-1-phosphate, *Green Chem.* **2024**, 26, 11600, https://doi.org/10.1039/D4GC02955K

[27] **Kaspar, F.***, Eilert, L., Staar, S., Oung, S.W., Wolter, M., Ganskow, C.S.G., Kemper, S., Klahn, P., Jacob, C.R., Blankenfeld, W., Schallmey, A.* Biocatalytic Ether Lipid Synthesis by an Archaeal Glycerolprenylase, *Angew. Chem. Int. Ed.* **2024**, e202412597, https://doi.org/10.1002/anie.202412597

[26] Westarp, S., Brandt, F., Neumair, L., Betz, C., Dagane, A., Kemper, S., Jacob, C.R., Neubauer, P., Kurreck, A.*, **Kaspar, F.*** Nucleoside Phosphorylases Make *N*7-Xanthosine, *Nat. Commun.* **2024**, 15, 3625, https://doi.org/10.1038/s41467-024-47287-4

2023 [25] **Kaspar, F.***#, Brandt, F.#, Westarp, S., Eilert, L., Kemper, S., Kurreck, A., Neubauer, P., Jacob, C., Schallmey, A. Biased Borate Esterification during Nucleoside Phosphorylase-Catalyzed Reactions: Apparent Equilibrium Shifts and Kinetic Implications, *Angew. Chem. Int. Ed.* **2023**, 135, e202218492, https://doi.org/10.1002/anie.202218492

[24] **Kaspar, F.*** Quality Data from Messy Spectra – How Isometric Points Increase Information Content in Highly Overlapping Spectra, *ChemBioChem* **2023**, 24, e202200744, https://doi.org/10.1002/cbic.202200744

2022 [23] Westarp, S.,# **Kaspar, F.***#, Neubauer, P., Kurreck, A.* Industrial potential of the enzymatic synthesis of nucleoside analogs: Existing challenges and perspectives, *Curr. Opin. Biotechnol.* **2022**, 78, 102829, https://doi.org/10.1016/j.copbio.2022.102829 (open access preprint at https://doi.org/10.26434/chemrxiv-2022-x5hm9)

[22] Solarczek, J.,# **Kaspar, F.**#, Bauer, P., Schallmey, A.* G-type Halohydrin Dehalogenases Catalyze Ring Opening Reactions of Cyclic Epoxides with Diverse Anionic Nucleophiles, *Chem. Eur. J.* **2022**, 28, e202202343, https://doi.org/10.1002/chem.202202343

[21] **Kaspar, F.***, Schallmey, A.* Chemo-enzymatic Synthesis of Natural Products and their Analogues / Strategic Enzymatic Transformations in Modern Natural Product Synthesis, *Curr. Opin. Biotechnol.* **2022**, 77, 102759, https://doi.org/10.1016/j.copbio.2022.102759 (open access preprint at https://doi.org/10.26434/chemrxiv-2022-nvjkx)

[20] **Kaspar, F.***, Ganskow, C.S.G., Eilert, L., Klahn, P., Schallmey, A. Alternative Assay Reagents for UV-Spectroscopic Detection of (Pyro-)Phosphate with the PUB Module, *Anal. Chem.* **2022**, 94, 8132–8135, https://doi.org/10.1021/acs.analchem.2c01404

[19] **Kaspar, F.***, Crameri, F.* Coloring Chemistry: How Mindful Color Choices Improve Chemical Communication, *Angew. Chem. Int. Ed.* **2022**, 61, e202114910, https://doi.org/10.1002/anie.202114910

[18] Eilert, L., Schallmey, A., **Kaspar, F.*** UV-Spectroscopic Detection of (Pyro-)Phosphate with the PUB module, *Anal. Chem.* **2022**, 94, 3432–3435, https://doi.org/10.1021/acs.analchem.1c05356

2021 [17] Xiang, L., **Kaspar, F.**, Schallmey, A., Constantinou, I.* Two-Phase Biocatalysis in Microfluidic Droplets, *Biosensors* **2021**, 11, 407, https://doi.org/10.3390/bios11110407

[16] Kamel, S.#, Walczak, M.C.#, **Kaspar, F.**, Westarp, S., Neubauer, P., Kurreck, A.* Thermostable Adenosine 5'-Monophosphate Phosphorylase from *Thermococcus kodakarensis* forms catalytically active inclusion bodies, *Sci. Rep.* **2021**, 11, 16880, https://doi.org/10.1038/s41598-021-96073-5

[15] **Kaspar, F.***, Seeger, M., Westarp, S., Köllmann, C., Lehmann, A.P., Pausch, P., Kemper, S., Neubauer, P., Bange, G., Schallmey, A., Werz, D.B., Kurreck, A., Diversification of 4'-Methylated Nucleosides by Nucleoside Phosphorylases, *ACS Catal.* **2021**, 11, 10830–10835, https://doi.org/10.1021/acscatal.1c02589 (**highlighted by the ESRF**: https://shorturl.at/xIM49)

[14] **Kaspar, F.***, Wolff, D.S., Neubauer, P., Kurreck, A., Arcus, V. pH-Independent Heat Capacity Changes during Phosphorolysis Catalyzed by the Pyrimidine Nucleoside Phosphorylase from *Geobacillus thermoglucosidasius*, *Biochemistry* **2021**, 60, 1573–1577, https://doi.org/10.1021/acs.biochem.1c00156

[13] Hellendahl, K.F.#, **Kaspar, F.**#, Zhou, X., Huang, Z., Neubauer, P., Kurreck, A.* Optimized Biocatalytic Synthesis of 2-Seleno Pyrimidine Nucleosides via Transglycosylation, *ChemBioChem* **2021**, 22, 2002, https://doi.org/10.1002/cbic.202100067

[12] **Kaspar, F.***, Neubauer, P., Kurreck, A.* The Peculiar Case of the Hyperthermostable Pyrimidine Nucleoside Phosphorylase from *Thermus thermophilus*, *ChemBioChem* **2021**, 22, 1385, https://doi.org/10.1002/cbic.202000679

[11] **Kaspar, F.***, Neubauer, P., Kurreck, A.* Kinetic Analysis of the Hydrolysis of Pentose-1-Phosphates through Apparent Nucleoside Phosphorolysis Equilibrium Shifts, *ChemPhysChem* **2021**, 22, 283, https://doi.org/10.1002/cphc.202000901 (**invited for the front cover**)

2020 [10] **Kaspar, F.***, Stone, M.R.L., Neubauer, P., Kurreck, A. Route Efficiency Assessment and Review of the Synthesis of β-Nucleosides via *N*-Glycosylation of Nucleobases, *Green Chem.* **2021**, 23, 35–50, https://doi.org/10.1039/D0GC02665D (selected as **2020 Green Chemistry Hot Article**)

[9] Fehlau, M., **Kaspar, F.**, Hellendahl, K.F., Schollmeyer, J., Neubauer, P., Kurreck, A.* Modular enzymatic cascade synthesis of nucleotides using a (d)ATP regeneration system, *Front. Bioeng. Biotechnol.* **2020**, 8, 854, https://doi.org/10.3389/fbioe.2020.00854

[8] **Kaspar, F.***, Giessmann, R.T., Westarp, S., Hellendahl, K.F., Krausch, N., Thiele, I., Walczak, M.C., Neubauer, P., Kurreck, A.* Spectral Unmixing-Based Reaction Monitoring of Transformations Between Nucleosides and Nucleobases, *ChemBioChem* **2020**, 21, 2604, https://doi.org/10.1002/cbic.202000204 (**featured on the front cover**, https://doi.org/10.1002/cbic.202000569)

[7] Yehia, H.#, Westarp, S.#, Röhrs, V., **Kaspar, F.**, Giessmann, R.T., Klare, H.F.T., Paulick, K., Neubauer, P., Kurreck, J., Kurreck, A.* Efficient Biocatalytic Synthesis of Dihalogenated Purine Nucleoside Analogs Applying Thermodynamic Calculations, *Molecules* **2020**, 25, 934, https://doi.org/10.3390/molecules25040934

[6] **Kaspar, F.***#, Giessmann, R.T.#, Hellendahl, K., Neubauer, P., Kurreck, A.*, Gimpel, M. General Principles of Yield Optimization of Nucleoside Phosphorylase-Catalyzed Transglycosylations, *ChemBioChem* **2020**, 21, 1428–1432, https://doi.org/10.1002/cbic.201900740

[5] **Kaspar**, F.#, Giessmann, R.T.#, Neubauer, P., Kurreck, A.*, Gimpel, M. Thermodynamic Reaction Control of Nucleoside Phosphorolysis, *Adv. Synth. Catal.* **2020**, 362, 867-876, https://doi.org/10.1002/adsc.201901230

2019 [4] **Kaspar, F.#**, Giessmann, R. T.#, Krausch, N., Neubauer, P., Kurreck, A.*, Gimpel, M. A UV/Vis Spectroscopy-Based Assay for Monitoring of Transformations Between Nucleosides and Nucleobases, *Methods Protoc.* **2019**, 2, 60, https://doi.org/10.3390/mps2030060

[3] Giessmann, R. T.*#, Krausch, N.#, **Kaspar F.**, Cruz Bournazou, M. N., Wanger, A., Neubauer, P., Gimpel, M. Dynamic Modelling of Phosphorolytic Cleavage Catalyzed by Pyrimidine-Nucleoside Phosphorylase, *Processes* **2019**, 7, 380, https://doi.org/10.3390/pr7060380

[2] **Kaspar, F.***, Neubauer, P., Gimpel, M. Bioactive Secondary Metabolites from *Bacillus subtilis*: A Comprehensive Review, *J. Nat. Prod.* **2019**, 82, 7, 2038–2053, https://doi.org/10.1021/acs.jnatprod.9b00110

2016 [1] **Kaspar, F.**, Jelinek, H. F.*, Perkins, S., Al-Aubaidy, H. A., deJong, B. and Butkowski, E. Acute-Phase Inflammatory Response to Single-Bout HIIT and Endurance Training: A Comparative Study, *Mediators of Inflammation* **2016**, vol. 2016, https://doi.org/10.1155/2016/5474837