
Professor Thomas J. J. Müller

A tribute



This special issue of Arkivoc is dedicated to Professor Thomas J. J. Müller, in recognition of his outstanding contribution to organic chemistry

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Prof. Thomas J. J. Müller was born in 1964 in Würzburg, Germany, of a Franconian father, a lawyer, and a Finnish mother, a philologist, who moved as a young family to Aystetten, close to Augsburg, Bavaria, in 1965, where Thomas essentially grew up together with his two younger brothers, born in 1966 and 1967. After attending the local elementary school, Thomas received his school education at a grammar school in neighboring Neusäß, which was named after the famous German chemist, Justus von Liebig, in 1983, where Thomas also finished with his "abitur" certificate.

Already at elementary school he has been fascinated with natural sciences, nature, and certainly with space having seen rocket launches and the landing on the moon on tv as a kid. However, at the age of eleven, second grade in grammar school, Thomas' parents together with his grandparents had the brilliant idea to give him an experimental chemistry set as a Christmas present. The kids' playroom in the basement of the house was quickly "converted" into a "laboratory" and the kids' pet, a bunny, was anxiously watching what Thomas was doing with all his test tubes, chemicals and the stove on the old wooden desk. Very quickly, he became so fascinated by his chemistry set, including also the fundamental theory, that he decorated the playroom walls with self-drawn posters about the periodic table, functional groups, and mnemonics on all different aspects of chemistry. All this triggered his passion for chemistry and very quickly his desire to become a chemist by profession grew, long before he had it as a school subject. As a schooler, certainly he could not buy chemicals on his own. But his parents were always supportive and fulfilled all quests young chemists might have, including presenting highly desired books and chemistry set supplements over the years. During school years, he carried on experimenting at home, later also in school. In the last two school years, he had a challenging chemistry teacher at school who further encouraged him to follow his ambition to become a chemist after school. Only for a few "nanoseconds" during his military service, Thomas also considered that physics would also be a nice subject.

At the age of 20, Thomas was admitted to the Ludwig Maximilian University at Munich, Germany, where he studied chemistry for the diploma degree. During his main studies, his passion for organic chemistry constantly grew. Although, he also liked the other subjects (inorganic, physical and biochemistry) he always felt a stronger attraction to organic chemistry with its mechanistic based approach, sophisticated synthetic transformations, and the plethora of molecules and their properties. At the age of 25, he received his diploma after having completed his diploma thesis on model reactions for preparing conjugated cyanine polymers under the supervision of Professor Rudolf Gompper. He stayed with the Gompper group for his doctoral thesis working on functional chromophores (merocyanines and cyanines) that are switchable by electric current and upon photonic excitation. Two and a half years later, he graduated with "summa cum laude" and received the degree "doctor rerum naturalis" from the University of Munich.

After a few months of postdoctoral stay in the Gompper group, Thomas J. J. Müller received the prestigious Feodor Lynen scholarship by the Alexander von Humboldt foundation and he joined the group of Professor Barry M. Trost at Stanford University, U.S.A. Thematically, being postdoc with the Trost group was a huge step for Thomas, who had to familiarize himself with concepts of transition metal catalyzed processes, synthetic methodology and also natural product synthesis at Stanford. Still up to date, he considers his time in California with Barry and his group to be extremely stimulating and he enjoyed the academic spirit enormously. In his postdoctoral work, Thomas was committed to develop regioselectivity in the ruthenium catalyzed Alder ene addition, where he could develop a concise butenolide synthesis by reacting γ -hydroxy ethyl propiolates with terminal alkenes or allyl alcohols. After his postdoc, in autumn of 1994 he moved to the Technical University of Darmstadt, Germany, where he began his independent academic career mentored by Prof. Klaus Hafner and Prof. Herbert Mayr. In early 1997, he moved to Ludwig Maximilian University at Munich, Germany, where Prof. Mayr had just accepted the call to the chair of organic chemistry. Thereby, his

alma mater became also the university to work for his habilitation. In late summer 1999, Thomas submitted his habilitation thesis and defended in early February of 2000 to receive the *venia legendi* of organic chemistry. After a short time as a lecturer (*Privatdozent*), Thomas received in May 2001 the call to an associate professorship at Ruprecht Karl University at Heidelberg, Germany. From January 2002 to September 2006 he worked as a professor of organic chemistry at the Heidelberg institute, where his prime responsibility was the chemistry education of medicine and dentistry students. In late 2005, he received the call to a chaired professorship at Heinrich Heine University Düsseldorf, Germany.

Thomas then joined the Department of Chemistry at Heinrich Heine University Düsseldorf in October 2006, where he has been working since as a chaired professor and director of institute. In 2016, he received a call back to Ruprecht Karl University at Heidelberg as a chaired professor, which he declined. Since 2019, Thomas is the spokesperson of the Research Training Group RTG 2482 "ModISC – Modulation of Intersystem Crossing" at Heinrich Heine University Düsseldorf. In 2021, he was elected as a foreign member of the Ukrainian Academy of Sciences. Having started his doctoral research with π -electron system chemistry, over the years Thomas has broadened the scope to heterocyclic chemistry, development of catalytic one-pot methodologies for accessing functional molecules that are interesting both in life and material sciences.

Scientific achievements

Thomas graduated with his doctoral thesis "New Cyanine Systems for Optical Switches and Molecular Metals", a topic on functional organic chromophores with materials' science application, at Ludwig Maximilian University Munich under the supervision of Prof. Rudolf Gompper. Iminium salt-based condensation of amines and methylene active compounds formed the basis of the formation of conjugated oligomers and polymers, which revealed a considerable increase in electrical conductivity upon oxidation.¹⁻³ However, for his postdoctoral studies he decided to join the group of Prof. Barry M. Trost at Stanford University to work on the regioselectivity of propargyl alcohol substrates in ruthenium-catalyzed Alder ene reactions,⁴ which finally led to establishing a synthesis of butenolides that was employed in the concise total synthesis of *S,S*-ancepsenolide.⁵⁻⁶ After his return to Germany, his independent research on his habilitation – focused on the electronic amphiphilicity of tricarbonylchromium arene complexes in synthetic transformations and functional dyes – began with developing organic syntheses of conjugated side chains (alkynes, alkenes, allenes, propargyl derivatives), which should be able to convey the unusual feature of the chromium carbonyl arene complexes to stabilize both positive and negative charges in the sense of an electronic amphiphile. Methodologically, (dia)stereoselective propargylations and allenylations^{7,8} arose from these studies as well as the successful demonstration of nonlinear optical activity of both electron-donor and electron-acceptor substituted chromium complexes.⁹

Another interesting result of the peculiar arene tricarbonyl chromium chemistry was the discovery of the coupling-isomerization reaction as an unusual detour of the Sonogashira coupling of 1-(hetero)aryl propargyl alcohols in 1998/1999,¹⁰ which finally became the entry to consecutive multi-component reactions of heterocycles through the catalytic generation of Michael systems and catalytic entry into domino reactions.¹¹ The catalytic generation of enones under Sonogashira conditions was finally complemented by the catalytic generation of ynones from acid chlorides and via carbonylative alkynylation.¹² Particularly, relevant for the development of the research topic were the formation of solid-state¹³ and solution emissive spiroindolones¹³ and concise syntheses of meridianins, a class of indolyl-amino pyrimidine marine alkaloids, and their derivatives,¹⁴ which turned out to be highly potent kinase inhibitors¹⁵⁻¹⁶ and apoptosis inducers.¹⁷ The increasing relevance of syntheses in interdisciplinary collaborative research necessitated to expand the methodological concept of the catalytic generation of reactive intermediates for embedding into one-pot

methodologies. After the first successful implementation of the Masuda borylation in the catalytic formation of phenothiazinyl boronates,¹⁸ his group successfully adopted the scarcely known Masuda borylation-Suzuki coupling (MBSC)¹⁹ to the synthesis of bi(hetero)aryls,²⁰ omnipresent functional motifs for application, both in life sciences and materials sciences. Especially, for the concise synthesis of simple marine and plant alkaloids this elegant one-pot methodology proved to be excellent,²¹ and well-suited to be expanded to substance libraries of compounds with considerable biological and pharmaceutical interest, such as active agents against MRSA (methicillin-resistant staphylococcus aureus).²² Already prior to developing the MBSC sequence, the group has considerably advanced the one-pot concept of sequentially Pd-catalyzed processes,²³ which was then considerably advanced to one-pot syntheses of heterocyclic systems.²⁴⁻²⁵

Over the years and decades, the group became famous for employing transition metal catalysis to consecutive multi-component syntheses of heterocycles.²⁶ As a consequence of the functional nature of heterocycles in various fields of applications, such as biology, pharmacy, medicine, organic materials, this concise and highly modular concept led the group besides many methodological synthetic endeavors and achievements increasingly into developing the concept of functional chromophores and electrophores by one-pot (often multi-component) processes.²⁷⁻²⁹ As a consequence, Thomas and his group became well-known players in the field of multi-component reactions and related processes and Thomas has guest edited several special issues. In addition, anellated 1,4-thiazines, namely phenothiazines and dithienothiazines, have become a red thread in the heterocyclic chemistry research of Thomas. Surprisingly, before the group started to enter phenothiazine around 2000, cross-coupling of phenothiazine was essentially unknown. As an electron-rich π -system, phenothiazines as well as their dithienothiazine congeners are highly interesting redox active luminophores.³⁰ Another hot topic in the world of heterocycles in Thomas' lab are short dipole-axis merocyanines, certainly accessible by consecutive multi-component reactions, which are weakly or non-emissive in solution and which turn on emission upon induced aggregation, aka aggregation-induced emission (AIE), or in the solid-state.³¹

Functional chromophores guide through Thomas' research as a glowing emissive red thread, enriched by novel synthetic and catalytic methodology, and the impetus to gain a deeper understanding of structure-property relationship of heterocyclic molecules. To date, he has graduated 76 individuals to the PhD degree, 148 persons to BSc degree, and 115 people to MSc or diploma degree. His scientific oeuvre to date encompasses more than 350 publications in peer review journals. In autumn 2023, Thomas was elected to the decision panel of molecular chemistry of the German Science Foundation (DFG), where he serves as a panel member since spring 2024.

Outside the laboratory

Thomas met his wife Marion Kemmerling, a grade school teacher, at the end of his diploma studies. After their studies, Thomas' doctorate and postdoctorate, and after Marion finished her preparatory service period, they have been married for 27 years now. Actually, both are highly dedicated hobby musicians. That was also how they met. Marion plays the saxophone and Thomas plays the trombone. Both are playing jointly and separately in different groups and ensembles, as a nice compensation for their professional work. Both are also dedicated cooks at home, Thomas is an expert in cooking stews and hearty Southern-German dishes, whereas Marion knows all degrees of sophistication to prepare excellent meals and bake marvelous cakes. They have three children, who are now all grown up and either study or work after university. The eldest, Lukas is a chemist, Laura is a speech therapist and Felix, the youngest, studies mathematics. All family is musically active, a heritage the parents have received from their parents and have passed it on to the next generation.

Prof. Thomas J. J. Müller also enjoys very much listening to music in concerts, opera performances, and on Spotify. From his youth, he still has a strong affection to hard rock music, which he listens to in evenings, when he is alone in his office. He enjoys reading thrillers and good fiction, but he is also interested in history, geopolitics, politics and philosophy.

I personally know Thomas already for several years. He is not only an excellent scientist with outstanding reputation, but he has also a very agreeable personality. He is a reliable and modest person with a friendly and warm character. Thomas is broadly interested and has a great knowledge in many fields of chemistry and outside chemistry. A few times he spent the night together with his family in our house in Rostock when he was on the way from Düsseldorf to Finland for vacation. Scientifically it is for me very impressive that Prof. Thomas J. J. Müller, already for many years, combines the development of synthetic methods with a deep analysis and understanding of the physical properties of the heterocyclic compounds prepared in his group (physical organic chemistry). During the process of the establishment of the new study programs B.Sc and M.Sc Wirtschaftschemie (industrial chemistry) at the University of Rostock, Prof. Thomas J. J. Müller gave to me many valuable suggestions and greatly supported the process.

Peter Langer
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Selected publications

1. R. Gompper, T. J. J. Müller, K. Polborn, Polymeric malondialdehyde dianils - a novel type of electrically conducting polymers. *J. Mat. Chem* **1998**, 2011-2018.
<https://doi.org/10.1039/a801654b>
2. H. Naarmann, R. Gompper, T. Müller, "Polyanils", German Patent DE 42 18 766; US Patent 5530087, WO 9325603, **1993**.
3. H. Naarmann, R. Gompper, T. Müller, New polypyridino-anil derivs. from aromatic-diamine - useful, esp. after doping, as electrically conducting materials, German Patent DE 4241869A1, **1992**.
4. B. M. Trost, A. Indolese, T. J. J. Müller, B. Treptow, A Ru Catalyzed Addition of Alkenes to Alkynes. *J. Am. Chem. Soc.* **1995**, *117*, 615-623.
<https://doi.org/10.1021/ja00107a005>
5. B. M. Trost, T. J. J. Müller, A Butenolide Synthesis Based Upon A Contra-Electronic Addition of An Alkene to An Ynoate. Synthesis and Absolute Configuration of (+) Ancepsenolide. *J. Am. Chem. Soc.* **1994**, *116*, 4985-4986.
<https://doi.org/10.1021/ja00112a004>
6. B. M. Trost, T. J. J. Müller, J. A. Martinez, Ruthenium Catalyzed Synthesis of Butenolides and Pentenolides via Contra-Electronic π -Alkylation of Hydroxyalkynoates. *J. Am. Chem. Soc.* **1995**, *117*, 1888-1899.
<https://doi.org/10.1021/ja00112a004>
7. A. Netz, K. Polborn, T. J. J. Müller, Diastereoselective Propargylations With Planar Chiral Chromiumcarbonyl Arene Complex Substituted Propargyl Cations. *J. Am. Chem. Soc.* **2001**, *123*, 3441-3453.
<https://doi.org/10.1021/ja0037116>
8. Stereoselective Propargylations With Transition Metal Stabilized Propargyl Cations. T. J. J. Müller, *Eur. J. Org. Chem.* **2001**, 2021-2033.

- [https://doi.org/10.1002/1099-0690\(200106\)2001:11<2021::AID-EJOC2021>3.0.CO;2-G](https://doi.org/10.1002/1099-0690(200106)2001:11<2021::AID-EJOC2021>3.0.CO;2-G)
9. T. J. J. Müller, A. Netz, M. Ansorge, E. Schmäzlin, C. Bräuchle, K. Meerholz, Syntheses and NLO-Properties of Chromiumcarbonyl Arene Complexes with Conjugated Sidechains – The Amphoteric Nature of Chromiumcarbonyl Complexation in Push-Pull Chromophores. *Organometallics* **1999**, *18*, 5066-5074.
<https://doi.org/10.1021/om9904551>
 10. T. J. J. Müller, M. Ansorge, D. Aktah, An Unexpected Coupling - Isomerization Sequence as an Entry to Novel Three-Component-Pyrazoline Syntheses. *Angew. Chem. Int. Ed.* **2000**, *39*, 1253-1256.
[https://doi.org/10.1002/\(SICI\)1521-3773\(20000403\)39:7<1253::AID-ANIE1253>3.0.CO;2-X](https://doi.org/10.1002/(SICI)1521-3773(20000403)39:7<1253::AID-ANIE1253>3.0.CO;2-X)
 11. T. J. J. Müller, Synthesis of Carbo- and Heterocycles via Coupling-Isomerization Reactions. *Synthesis* **2012**, *44*, 159-174.
<https://doi.org/10.1055/s-0031-1289636>
 12. C. F. Gers-Panther, T. J. J. Müller Multicomponent Syntheses of Heterocycles Initiated by Catalytic Generation of Ynones and Ynediones. In *Advances in Heterocyclic Chemistry: Heterocyclic Chemistry in the 21st Century: A Tribute to Alan Katritzky*, E. F. V. Scriven, C. A. Ramsden, eds., **2016**, *120*, 67-98.
<https://doi.org/10.1016/bs.aihch.2016.04.007>
 13. D. M. D'Souza, F. Rominger, T. J. J. Müller, A Domino Sequence Consisting of Insertion, Coupling, Isomerization, and Diels–Alder Steps Yields Highly Fluorescent Spirocycles. *Angew. Chem. Int. Ed.* **2005**, *44*, 153-158.
<https://doi.org/10.1002/anie.200461489>
 14. A. S. Karpov, E. Merkul, F. Rominger, T. J. J. Müller, Concise Syntheses of Meridianins via Carbonylative Alkynylation and A Novel Four-Component Pyrimidine Synthesis. *Angew. Chem. Int. Ed.* **2005**, *44*, 6951-6956.
<https://doi.org/10.1002/anie.200501703>
 15. E. Merkul, F. Klukas, D. Dorsch, U. Grädler, H. E. Greiner, T. J. J. Müller, Rapid preparation of triazolyl substituted NH-heterocyclic kinase inhibitors via one-pot Sonogashira coupling–TMS-deprotection–CuAAC sequence. *Org. Biomol. Chem.* **2011**, *9*, 5129-5136.
<https://doi.org/10.1039/c1ob05586k>
 16. M. Wucherer-Plietker, E. Merkul, T. J. J. Müller, C. Esdar, T. Knöchel, T. Heinrich, H.-P. Buchstaller, H. Greiner, D. Dorsch, D. Finsinger, M. Calderini, D. Bruge, Discovery of Novel 7-Azaindoles as PDK1 Inhibitors. *Bioorg. Med. Chem. Lett.* **2016**, *26*, 3073-3080.
<https://doi.org/10.1016/j.bmcl.2016.05.005>
 17. D. Drießen, F. Stuhldreier, A. Frank, H. Stark, S. Wesselborg, B. Stork, T. J. J. Müller, Novel meriolin derivatives as rapid apoptosis inducers. *Bioorg. Med. Chem.* **2019**, *27*, 3463-3468.
<https://doi.org/10.1016/j.bmc.2019.06.029>
 18. C. S. Krämer, T. J. Zimmermann, M. Sailer, T. J. J. Müller, Syntheses of Phenothiazinyl Boronic Acid Derivatives - Suitable Starting Points for the Construction of Redox Active Materials. *Synthesis* **2002**, 1163-1170.
<https://doi.org/10.1055/s-2002-32527>
 19. M. Kruppa, T. J. J. Müller, Masuda Borylation–Suzuki Coupling (MBSC) Sequence: A One-Pot Process to Access Complex (hetero)Biaryls. *Catalysts* **2023**, *13*, 350.
<https://doi.org/10.3390/catal13020350>
 20. E. Merkul, E. Schäfer, T. J. J. Müller, Rapid synthesis of bis(hetero)aryls by one-pot Masuda borylation – Suzuki coupling sequence and its application to concise total syntheses of meridianins A and G. *Org. Biomol. Chem.* **2011**, *9*, 3139-3141.

- <https://doi.org/10.1039/c1ob05310h>
21. M. Kruppa, G. A. Sommer, T. J. J. Müller, Concise syntheses of marine (bis)indole alkaloids meridianin C, D, F, and G and scalaridine A via one-pot Masuda borylation-Suzuki coupling sequence. *Molecules* **2022**, *27*, 2233.
<https://doi.org/10.3390/molecules27072233>
22. N. Rehberg, G. A. Sommer, D. Drießen, M. Kruppa, S. Chen, E. T. Adeniyi, L. Wang, K. Wolf, B. O. A. Tasch, T. R. Ioerger, K. Zhu, T. J. J. Müller, R. Kalscheuer, Nature-inspired (Di)Azine-bridged Bisindole Alkaloids with Potent Antibacterial *In Vitro* and *In Vivo* Efficacy Against Methicillin-resistant *Staphylococcus aureus*. *J. Med. Chem.* **2020**, *63*, 12623-12641.
<https://doi.org/10.1021/acs.jmedchem.0c00826>
23. T. J. J. Müller, Sequentially Palladium-Catalyzed Processes. In "Metal Catalyzed Cascade Reactions", T. J. J. Müller, ed., Springer Berlin/Heidelberg. *Top. Organomet. Chem.* **2006**, *19*, 149-205.
https://doi.org/10.1007/3418_012
24. T. Lessing, T. J. J. Müller, Sequentially Palladium-Catalyzed Processes in One-pot Syntheses of Heterocycles. *Appl. Sci.* **2015**, *5*, 1803-1836.
<https://doi.org/10.3390/app5041803>
25. M. M. Kornet, T. J. J. Müller, Recent Advances in sequentially Pd-catalyzed one-pot syntheses of heterocycles. *Molecules* **2024**, *29*, 5265.
<https://doi.org/10.3390/molecules29225265>
26. D. M. D'Souza, T. J. J. Müller, Multi-Component Syntheses of Heterocycles by Transition Metal Catalysis. *Chem. Soc. Rev.* **2007**, *36*, 1095-1108.
<https://doi.org/10.1039/B608235C>
27. T. J. J. Müller, D. M. D'Souza, Diversity Oriented Syntheses of Functional π -Systems by Multi-component and Domino Reactions. *Pure Appl. Chem.* **2008**, *80*, 609-620.
<https://doi.org/10.1351/pac200880030609>
28. L. Levi, T. J. J. Müller, Multicomponent syntheses of functional chromophores. *Chem. Soc. Rev.* **2016**, *45*, 2825-2846.
<https://doi.org/10.1039/C5CS00805K>
29. L. Brandner, T. J. J. Müller, Multicomponent Synthesis of Chromophores – The One-pot Approach to Functional π -Systems. *Front. Chem.* **2023**, *11*, 1124209.
<https://doi.org/10.3389/fchem.2023.1124209>
30. L. May, T. J. J. Müller, Dithieno[1,4]thiazines and Bis[1]benzothieno[1,4]thiazines – Organometallic Synthesis and Functionalization of Electron Density Enriched Congeners of Phenothiazine. *Molecules* **2020**, *25*, 2180.
<https://doi.org/10.3390/molecules25092180>
31. F. K. Merkt, T. J. J. Müller, Solid State and Aggregation Induced Emissive Chromophores by Multi-component Syntheses. *Isr. J. Chem.* **2018**, *58*, 889-900.
<https://doi.org/10.1002/ijch.201800058>

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