**Todd K. Hyster, Ph.D.**

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DOB: October 10, 1985 (Minneapolis, MN)

**Employment & Education**

Associate Professor of Chemistry and Chemical Biology, *Cornell University*

Assistant Professor of Chemistry, *Princeton University*

NIH-NRSA Postdoctoral Fellow, *California Institute of Technology*

Advisor: Frances H. Arnold

Marie Curie Fellow, *University of Basel*

Advisor: Thomas R. Ward

Doctor of Philosophy, *Colorado State University*

Advisor: Tomislav Rovis

Bachelor of Science in Chemistry, *University of Minnesota*

Advisor: Christopher Douglas

Jan. 2021 – Present

July 2015 – Dec. 2020

Aug. 2013 – June 2015

Jan. 2012 – April 2012

Aug. 2008 – June 2013

Sept. 2005 – May 2008

**Awards and Honors**

* Arthur C. Cope Early Career Scholar Award
* Amgen Young Investigator Award
* Junior BIOTRANs Award
* Eli Lilly Grantee Award
* NSF CAREER Award
* ACS PRF Doctoral New Investigator
* Alfred P. Sloan Foundation Research Fellow
* Searle Scholar Award
* Thieme Journal Award
* NIH NRSA Postdoctoral Fellow, *Caltech*
* Reaxys PHD Prize Finalist
* Aldrich Graduate Student Innovation Award
* Marie Curie Fellowship
* ADC Foundation Scholarship

2022

2021

2021

2021

2019-2024

2018-2020

2018-2020

2017-2020

2015

2013-2015

2014

2013

2012

2004-2008

**Independent Publications**

41. X. Gao, J. Turek-Herman, Y. J. Choi, R. Cohen, T. K. Hyster “Photoenzymatic Synthesis of a-Tertiary Amines by Engineered Flavin-Dependent ‘Ene’-Reductases” *In Review* 10.33744/chemrxiv-2021-955hf

40. B. T. Nicholls, D. G. Oblinsky, S. I. Kurtoic, D. Grosheva, Y. Ye, G. D. Scholes, T. K. Hyster “Engineering a Non-Natural Photoenzyme for Improved Photon Efficiency” *In Review* 10.33774/chemrxiv-2021.qgprm

39. D. Grosheva, T. K. Hyster “Light-Driven Flavin-Based Biocatalysis” *in Flavin-Based Catalysis: Principles and Applications*. **2021**, 291-313.

 \* Invited Contribution

38. H. Fu, H. Lam, M. A. Emmanuel, J. H. Kim, B. A. Sandoval, T. K. Hyster “Ground-State Electron Transfer as an Initiation Mechanism for Asymmetric Hydroalkylations in Radical Biocatalysis” *J. Am. Chem. Soc.* **2021**, 143, 9622-9629.

37. Y. Ye, H. Fu “Activation Modes in Biocatalytic Radical Cyclization Reactions” *J. Ind. Microbiol. Biotechnol.* **2021***,*https://doi.org/10.1093/jimb/kuab021

 \* Invited Contribution

36. B. A. Sandoval, P. D. Clayman, D. G. Oblinsky, S. Oh, Y. Nakano, M. J. Bird, G. D. Scholes, T. K. Hyster. “Biocatalytic Radical Hydrogenations Enabled by Direct Photoexcitation of Flavin-Dependent ‘Ene’-Reductases. *J. Am. Chem. Soc.* **2021**, *143*, 1735-1739.

 - Highlighted in Synfacts (2021, 17(04), 0441)

35. C. G. Page, S. J. Cooper, J. S. DeHovitz, D. G. Oblinsky, K. F. Biegasiewicz, A. H. Antropow, K. W. Armburst, J. M. Ellis, L. G. Hamann, E. J. Horn, K. M. Oberg, G. D. Scholes, T. K. Hyster. “Quaternary Charge-Transfer Complex Enables Photoenzymatic Intermolecular Hydroalkylation of Olefins. *J. Am. Chem. Soc.* **2021**, *143*, 97-102.

- Highlighted in Synfacts (2021, 17(04), 0439)

34. B. Kudisch, D. G. Oblinsky, M. J. Black, A. Zieleniewska, M. A. Emmanuel, G. Rumbles, T. K. Hyster, G. D. Scholes. “Large Reorganization Energies Customize the Photophysics within the Active Site of Photoenzymatic Old Yellow Enzymes” *J. Phys. Chem.* **2020**, *124*, 11236-11249.

33. P. J. Clayman, T. K. Hyster “Photoenzymatic Generation of Unstabilized Alkyl Radicals: An Asymmetric Reductive Cyclization” *J. Am. Chem. Soc.* **2020**, 142, 15673-15677.

 - Highlighted in Synfacts (2020, 16(12), 1469)

32. J. S. DeHovitz, Y. Y. Loh, J. A. Kautzky, K. Nagao, A. J. Meichan, M. Yamauchi, D. W. C. MacMillan, T. K. Hyster, “Inducing Dynamic Stereochemistry for Asymmetric Synthesis” *Science* **2020*,*** *369*, 1113-1118.

 - Highlighted in Synfacts (2020, 16(11), 1341)

31. J. Cao, T. K. Hyster, “Pyridoxal-Catalyzed Racemization of 𝛼-Aminoketones Enables the Stereodivergent Synthesis of 1,2-Amino Alcohols Using Ketoreductases.” *ACS Catalysis* **2020**, *10,* 6171*-*6175.

- Highlighted in Synfacts (2020, 16(08), 0961)

30. Y. Nakano, M. J. Black, A. J. Meichan, B. A. Sandoval, M. M. Chung, K. F. Biegasiewicz, T. Zhu, T. K. Hyster “Synergistic Photoenzymatic Hydrogenation of Heteroaromatic Olefins by ‘Ene’-Reductases.” *Angew. Chem. Int. Ed.* **2020**, *59*, 10484-10488.

29. B. A. Sandoval, T. K. Hyster “Emerging Strategies for Expanding the Toolbox of Enzymes in Biocatalysis. *Curr. Opin. Chem. Biol.* **2020**,*55*, 45-51.

 \*Invited Contribution

28. M. J. Black, A. J. Meichan, K. F. Biegasiewicz, B. Kudisch, D. G. Oblinsky, G. D. Scholes, T. K. Hyster\* “Asymmetric Radical Cyclization Enabled by Electron Transfer from Flavin in an ‘Ene’-Reductase” *Nat. Chem.* **2020**, *12*, 71-75.

- Highlighted in Synfacts (2020, 16(02), 0215)

27. K. F. Biegasiewicz, S. J. Cooper, X. Gao, D. G. Oblinsky, J. H. Kim, S. E. Garfinkle, L. A. Joyce, B. A. Sandoval, G. D. Scholes, T. K. Hyster\* “Photoexcitation of a Flavoenzyme Enables a Stereocontrolled Radical Cyclization” *Science* **2019**, *364*, 1166-1169.

 - Highlighted in Nature Chemical Biology (2019, 15, 847)

 - Highlighted in C&EN (2019, 97, 25)

 - Highlighted in Synfacts (2019, 15(10), 1177)

26. T. K. Hyster\* “Radical Biocatalysis: Using Non-Natural Single Electron Transfer Mechanisms to Access New Enzymatic Functions” *Synlett* **2020**, *31*, 248-254.

 \*Invited Contribution

25. B. A. Sandoval, S. I. Kurtoic, M. M. Chung, K. F. Biegasiewicz, T. K. Hyster\* “Photoenzymatic Catalysis Enables Radical-Mediated Ketone Reduction in ‘Ene’-Reductases” *Angew. Chem. Int. Ed.* **2019**, *58*, 8714-8718.

24. Y. Nakano, K. F. Biegasiewicz “Hydrogen Atom Transfer: an invigorating approach to free-radical reactions” *Curr. Opin. Chem. Biol.* **2019**, *49*, 16-24.

 \*Invited Contribution

23. K. F. Biegasiewicz, S. J. Cooper, M. A. Emmanuel, T. K. Hyster\* “Catalytic Promiscuity Enabled by Photoredox Catalysis in Nicotinamide Dependent Oxidoreductases” *Nat. Chem.* **2018**, *10*, 770-775.

 - Highlighted in Synfacts (2018, 14(09), 0981)

22. B. A. Sandoval, A. J. Meichan, T. K. Hyster\* “Enantioselective Hydrogen Atom Transfer: Discovery of Catalytic Promiscuity in Flavin-Dependent ‘Ene’-Reductases” *J. Am. Chem. Soc.* **2017**, *139*, 11313-11316.

 - *Highlighted in Synfacts* (2017, 13(11), 1200)

21. M. A. Emmanuel, N. R. Greenberg, D. G. Oblinsky, T. K. Hyster\* “Accessing Non-Natural Reactions by Irradiating Nicotinamide Dependent Ketoreductases With Light” *Nature* **2016**, *540*, 414-417.

 - *Highlighted in Synfacts* (2017, 13(03), 0309)

 - *Highlighted in Nature* (2016, 540, 345-346)

 - *Highlighted in Phys.org* (phys.org/news/2016-12-method-ketoreductase-enzyme-catalyze-non-natural.html)

20. T. K. Hyster\*, T. R. Ward\* Genetic Optimization of Metalloenzymes: Enhancing Enzymes for Non-Natural Reactions. *Angew. Chem. Int. Ed.* **2016**, *55*, 7344.

**Publications from Postdoctoral, Graduate, and Undergraduate Work**

19. C. K. Prier, T. K. Hyster, C. C. Farwell, A. Huang, F. H. Arnold\* Asymmetric Enzymatic Synthesis of Allylic Amines: A Sigmatropic Rearrangement Strategy. *Angew. Chem. Int. Ed.* **2016**, *55*, 4711.

18. C. C. Farwell, R. K. Zhang, J. A. McIntosh, T. K. Hyster, F. H. Arnold\* Enantioselective Enzyme-Catalyzed Aziridination Enabled by Active-Site Evolution of a Cytochrome P450. *ACS Cent. Sci.* **2015**, *1*, 89.

17. T. K. Hyster High-Valent Ni(II)- and Co(III)-Catalyzed C–H Activation *Catal. Lett.* **2015**, *145*, 458.

 \* Invited Contribution

16. T. K. Hyster, C. C. Farwell, A. R. Buller, J. A. McIntosh, F. H. Arnold\* Enzyme-Controlled Nitrogen-atom Transfer Enables Regioselective C–H Amination *J. Am. Chem. Soc.* **2014**, *136*, 15505.

1. T. K. Hyster “Di-tert-Butylcyclopentadiene” Electronic Encyclopedia of Reagents for Organic Synthesis, **2014**.
2. T. K. Hyster, D. M. Dalton, T. Rovis\* Ligand Design for Rh(III)-Catalyzed C–H activation: An Unsymmetrical Cyclopentadienyl Group Enables a Regioselective Synthesis of Dihydroisoquinolones. *Chem. Sci.* **2015**, 5, 254.
3. T. K. Hyster, F. H. Arnold, F. H.\* P450BM3-Axial Mutations: A Gateway to Non-Natural Reactivity *Isr. J. Chem*. **2015**, *55*, 14.

 \* Invited Contribution

1. C. C. Farwell, J. A. McIntosh, T. K. Hyster, Z. J. Wang, F. H. Arnold\* Enantioselective Imidation of Sulfides via Enzyme-Catalyzed Intermolecular Nitrogen-Atom Transfer. *J. Am. Chem. Soc.* **2014**, *136*, 8766.
2. T. A. Davis, T. K. Hyster, T. Rovis\* Rh(III)-Catalyzed Intramolecular Hydroarylations, Amidoarylations, and Allylations: Three Pathways Determined by Amide Directing Group. *Angew. Chem. Int. Ed.* **2013**, *52*, 14181.
3. T. K. Hyster, L. Knörr, T. Rovis\*, T. R. Ward\* Biotinylated Rh(III) Complex in Engineered Streptavidin for Rate Enhanced Asymmetric C-H Activation “Practical Methods in Biocatalysis and Biotransformations, **2015.**
4. T. K. Hyster, T. Rovis\* Rh(III)-Catalyzed C–H Activation Mediated Synthesis of Isoquinolones from Amides and Cyclopropanes. *SynLett* **2013**, *24*, 1842.
5. T. K. Hyster, K. E. Ruhl, T. Rovis\* A Coupling of Benzamides and Donor/Acceptor Diazo Compounds To Form γ-Lactams via Rh(III)-Catalyzed C–H Activation. *J. Am. Chem. Soc.* **2013**, *135*, 5364.
6. T. K. Hyster, L. Knörr, T. R. Ward\*, T. Rovis\* Biotinylated Rh(III) Complex in Engineered Streptavidin for Rate Enhanced Asymmetric C-H Activation. *Science* **2012**, *338*, 500.
7. T. K. Hyster “Ferrocenium Salts” Electronic Encyclopedia of Reagents for Organic Synthesis, **2012**.
8. Y. Du, T. K. Hyster, T. Rovis\* Rhodium(III)-Catalyzed Oxidative Carbonylation of Benzamides with Carbon Monoxide. *Chem. Commun.* **2011**, *47*, 12074.
9. T. K. Hyster, T. Rovis\* Pyridine Synthesis from Oximes and Alkynes via Rhodium (III) Catalysis: Cp\* and Cpt Provide Complementary Selectivity. *Chem. Commun.* **2011**, *47*, 11846.
10. T. K. Hyster, T. Rovis\* An Improved Catalyst Architecture for Rhodium (III) Catalyzed C−H Activation and its Application to Pyridone Syntheses. *Chem. Sci.* **2011**, *2*, 1606.
11. T. K. Hyster, T. Rovis\* Rhodium-Catalyzed Oxidative Cycloaddition of Benzamides and Alkynes via C−H/N−H Activation. *J. Am. Chem. Soc.* **2010**, *132*, 10565.
12. M. T. Wentzel, V. J. Reddy, T. K. Hyster, C. J. Douglas\* Chemoselectivity in Catalytic C−C and C−H Bond Activation: Controlling Intermolecular Carboacylation and Hydroarylation of Alkenes. *Angew. Chem. Int. Ed.* **2009**, *48*, 6121.