CURRICULUM VITAE

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Education/Career

2010.3 **BS**
Graduate School of Pharmaceutical Sciences, The University of Tokyo
Under the supervision of Prof. Masakatsu Shibasaki

2012.3 **Master**
Graduate School of Pharmaceutical Sciences, The University of Tokyo
Under the supervision of Prof. Motomu Kanai

2015.3 **Ph.D.**
Graduate School of Pharmaceutical Sciences, The University of Tokyo
Under the supervision of Prof. Motomu Kanai

2015.4-2017.10 **Research Scientist**
Sumitomo Dainippon Pharma Co., Ltd.
Drug Development Chemistry Group I, Drug Development Research Laboratories

2017.10-2017.12 **Postdoctoral Fellows**
Graduate School of Pharmaceutical Sciences, The University of Tokyo
Under the supervision of Prof. Motomu Kanai

2018.1-present **Assistant Professor**
Graduate School of Pharmaceutical Sciences, The University of Tokyo
Under the supervision of Prof. Motomu Kanai

2022.10-present **JST PRESTO researcher** “Development of Basic Material Conversion Science for Global Environment”

2012.8-2012.12 **Visiting Scientist**
Department of Chemistry, University of California, Berkeley
Under the supervision of Prof. John F. Hartwig

Fellowship & Grant

2012.4-2015.3 Research Fellow of the Japan Society for the Promotion of Sciences (DC1) [fellowship]

2018.10-2020.9 JSPS Grant-in-Aid for Research Activity Start-up #18H05969, #19K21123 [research grant]

2020.10-2025.3 MEXT Grant-in-Aid for Scientific Research on Transformative Research Areas (A) #20H05843 [research grant]

2021.4-2023.3 JSPS Grant-in-Aid for Young Scientists #21K15220 [research grant]

2021.10-2023.9 Research Grant from ENEOS [research grant]

2022.4 薬学振興会 基礎的研究助成 [research grant]

2022.10-2026.3 JST PRESTO #JPMJPR2279

2023.4-2026.3 JSPS Scientific Research (C, General) # 23K06045 [research grant]

Award

2019 Teijin Pharmaceutical Award in Synthetic Organic Chemistry (SSOCJ, Japan)

2020 JISEDAI Symposium Lectureship Award (CSJ, Japan)

2024 The Pharmaceutical Society of Japan Award for Young Scientists (PSJ, Japan)

2025 The Chemical Society of Japan Lecture Award for Young Chemists (CSJ, Japan)

2025 Japan Association for International Chemical Information Award (JAICI, Japan)

2025 Chemist Award BCA 2025 (MSD life science foundation, Japan)

2025 Lectureship Award MBLA 2025 (MSD life science foundation, Japan)

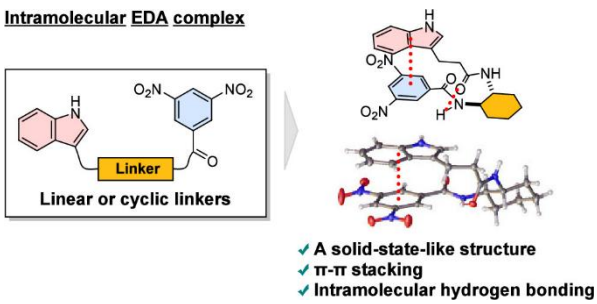
Publication

1. Electron Donor–Acceptor (EDA) Complex Formation via Spatial Control of Donor–Acceptor Interactions

   Toyobe, M.; Matsumoto, N.; Nishimura, K.; Yanai, N.; **Mitsunuma, H.***; Kanai, M.*

   J. Org. Chem. **2025**, *90*, 16923–16933.

   *Invited to Special issue “Chemistry and Biology of Peptides”, Featured article.



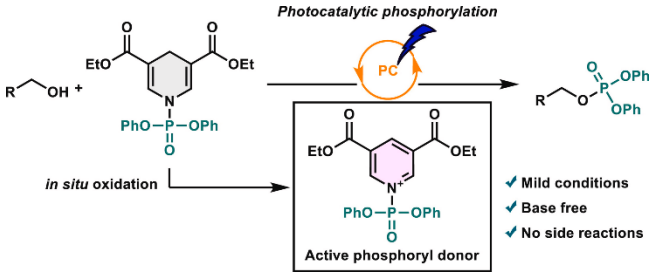
2. Photocatalytic phosphorylation of alcohols via oxidative activation of

1,4-dihydropyridine-N-phosphoramide

Fujiyoshi, K.; Arii, S.; Yamatsugu, K.; **Mitsunuma, H.**; Kanai, M.*

Tetrahedron **2026**, *189*, 135008.

*Special Issue on H-Atom Transfer Chemistry edited by M. Kanai and T. Ooi (Invited).

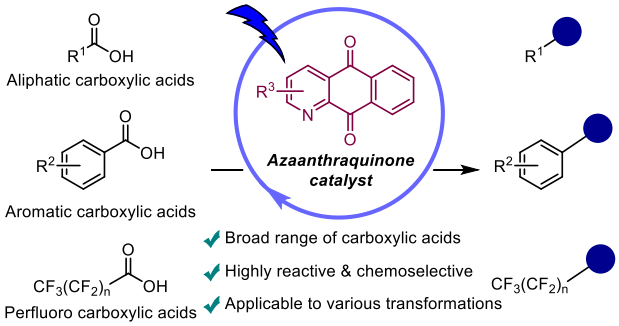


3. Azaanthraquinone PCET Catalysis Enables Chemoselective Decarboxylative Functionalization of Diverse Carboxylic Acids

Inoue, T.; Tomiya, D.; Fuki, M.; Kobori, Y.; Higashi, M.; Uesaka, K.; Yamakata, A.; Kawashima, S. A.; Yamatsugu, K.; **Mitsunuma, H.***; Kanai, M.*

J. Am. Chem. Soc. **2025**, *147*, 6349-6354.

*Highlighted by Department News Release and Chem-station.

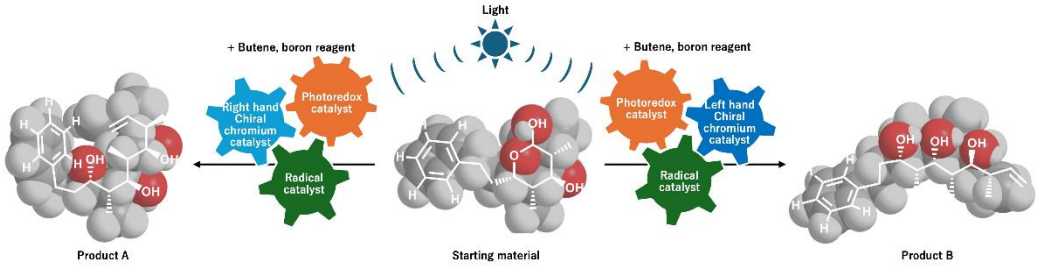


4. Visible light–driven stereodivergent allylation of cyclic hemiacetals with butene for polypropionate synthesis

Nakao, H.; Hassan, M. M. M.; Nakamura, Y.; Toyobe, M.; Higashi, M.; **Mitsunuma, H.***; Kanai, M.*

Science **2025**, *390*, 272-278.

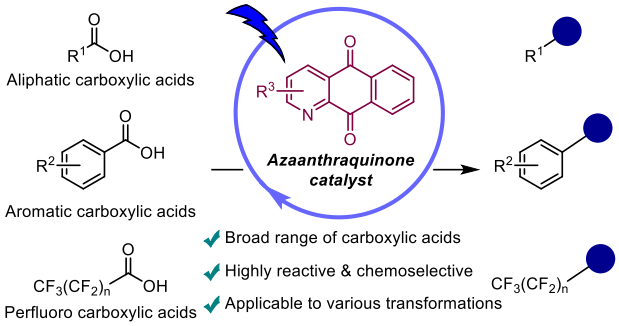
*Highlighted by Department News Release, UT Press Release, Chem-station and Synfacts.



5. Intracellular Catalytic Photooxygenation of α-Synuclein Amyloid

   Iwai, A.; Hwang, Y.; Umeda, H.; Sawazaki, T.; Tomizawa, I.; Ono, M.; Higuchi, M.; Sohma, Y.; Hori, Y.; Tomita, T.; **Mitsunuma, H.**; Kanai, M.*

   ChemistryEurope **2025**, *Early View,* DOI: 10.1002/ceur.202500192

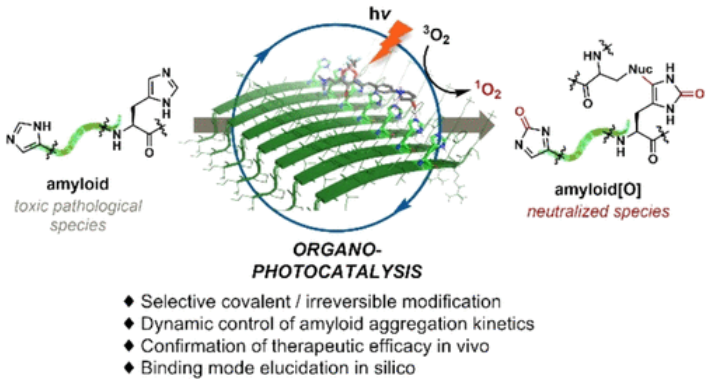


6. Catalytic Photooxygenation Demonstrates Therapeutic Efficacy in Transthyretin Amyloidosis

   Yamane, M.; Umeda, H.; Toyobe, M.; Iwai, A.; Ishihara, K.; Kudo, G.; **Mitsunuma, H.**; Hori, Y.; Tomita, T.; Mizuguchi, M.; Okada, M.; Ueda, M.; Ando, Y.; Kawashima, S. A.; Sohma, Y.; Kaji, H.; Hirokawa, T.; Yamanaka, K.*; Kanai, M.*

   J. Am. Chem. Soc. **2025**, *147*, 6349-6354.

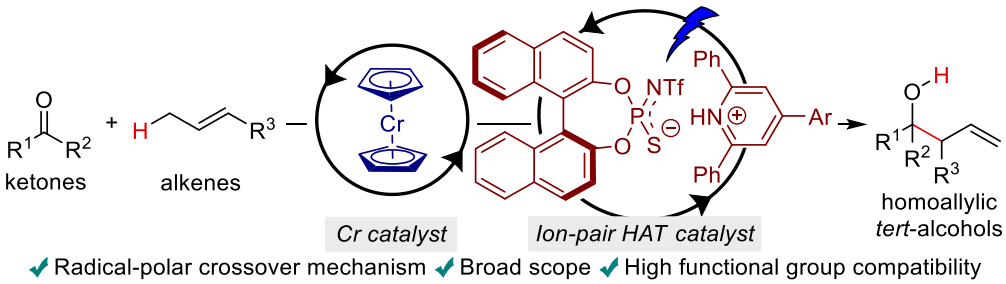
   *Highlighted by Department News Release, UT Press Release and Chem-Station.



7. Ion-Pair Hydrogen Atom Transfer Catalysis Enables Cr-Catalyzed Allylation of Ketones Using Hydrocarbon Alkenes

   Arii, S.; Yu, Z.; Chen, H.; **Mitsunuma, H.***; Kanai, M.*

   Angew. Chem. Int. Ed. **2025**, *64*, e202503249.

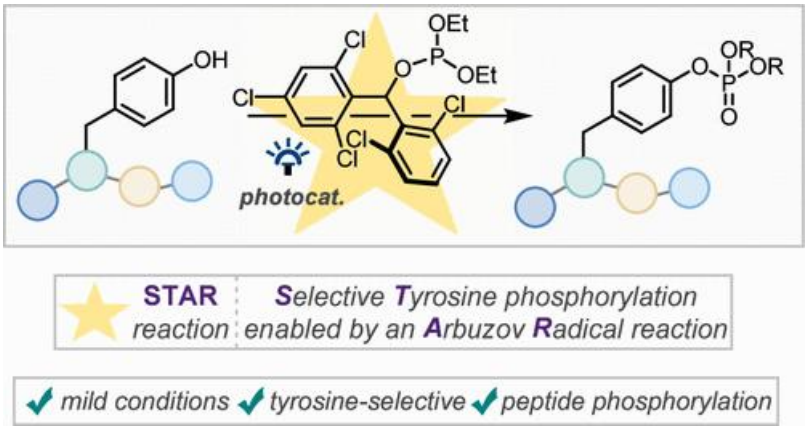


8. Catalytic Phosphorylation of Tyrosine via a Radical Arbuzov Reaction

   Shennan, B. D. A.; Fukuta, T.; Yamane, M.; Koyama, T.; **Mitsunuma, H.**; Kanai, M.*

   J. Am. Chem. Soc. **2025**, *147*, 6349-6354.

   *Highlighted by UT press release, 日本経済新聞.

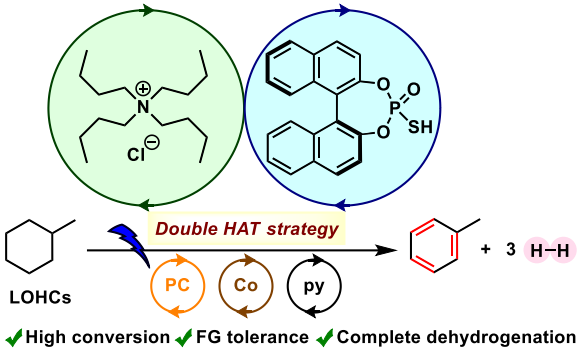


9. Catalytic Acceptorless Complete Dehydrogenation of Cycloalkanes

   Jagtap, R. A.; Nishioka, Y.; Geddis, S.; Irie, Y.; Takanashi, T.; Adachi, R.; Yamakata, A.; Masaaki, F.; Kobori, Y.; **Mitsunuma, H.***; Kanai, M.*

   Nat. Commun. **2025**, *16*, 428.

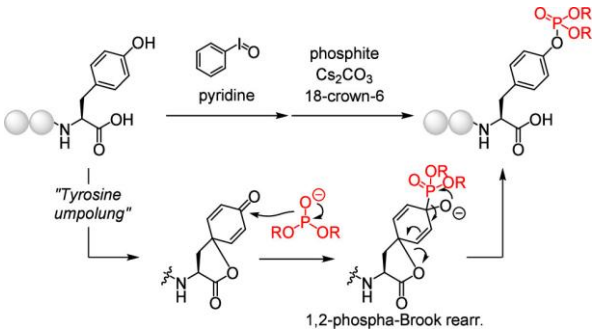
   *Highlighted by UT press release, 日本経済新聞.



10. Umpolung Phosphorylation of Tyrosine via 1,2-Phospha-Brook Rearrangement

    Fukuta, T.; Tatsumi, T.; Fujiyoshi, K.; Koyama, T.; Kawashima, S. A.; **Mitsunuma, H.**; Yamatsugu, K.*; Kanai, M.*

    Org. Lett. **2024**, *26*, 8827-8831.

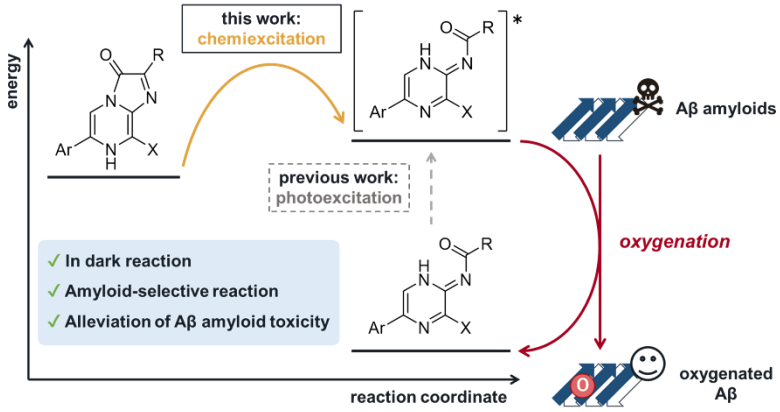


11. Unimolecular Chemiexcited Oxygenation of Pathogenic Amyloids

Umeda, H.; Suda, K.; Yokogawa, D.; Azumaya, Y.; Kitada, N.; Maki, S. A.; Kawashima, S. A.; **Mitsunuma, H.**; Yamanashi, Y.; Kanai, M.*

Angew. Chem. Int. Ed. **2024**, *63*, e202405605.

*Highlighted by Department News release, 化学.

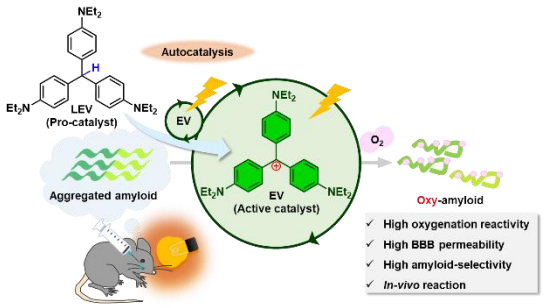


12. Leuco Ethyl Violet as Self-Activating Prodrug Photocatalyst for in vivo Amyloid-Selective Oxygenation

Furuta, M.; Arii, S.; Umeda, H.; Matsukawa, R.; Shizu, K.; Kaji, H.; Kawashima, S. A.; Hori, Y.; Tomita, T.; Sohma, Y.; **Mitsunuma, H.**; Kanai, M.*

Adv. Sci. **2024**, *11*, 2401346.

*Highlighted by UT press release, 日本経済新聞 and Chem-Station.

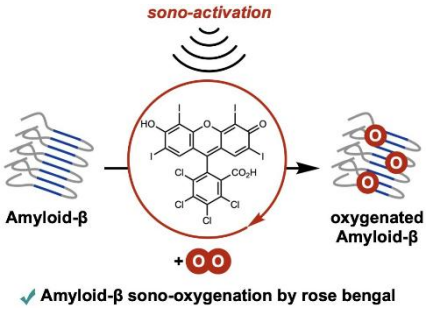


13. Rose Bengal Promoted Catalytic Amyloid-β Oxygenation via Sono-Activation

Atsumi, W.; Kawabata, K.; Yamane, M.; Oi, M.; **Mitsunuma, H.**; Sohma, Y.*; Hori, Y.*;

Tomita, T.*; Kanai, M.*

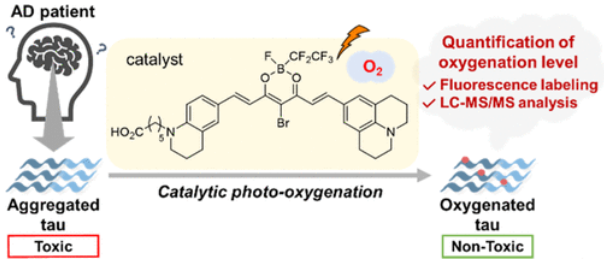
Synlett **2023**, *35*, 920-924.



14. Quantitative Assays for Catalytic Photo-Oxygenation of Alzheimer Disease-Related Tau Proteins

Umeda, H.; Sawazaki, T.; Furuta, M.; Suzuki, T.; Kawashima, S. A.; **Mitsunuma, H.**; Hori, Y.; Tomita, T.; Sohma, Y.; Kanai, M.*

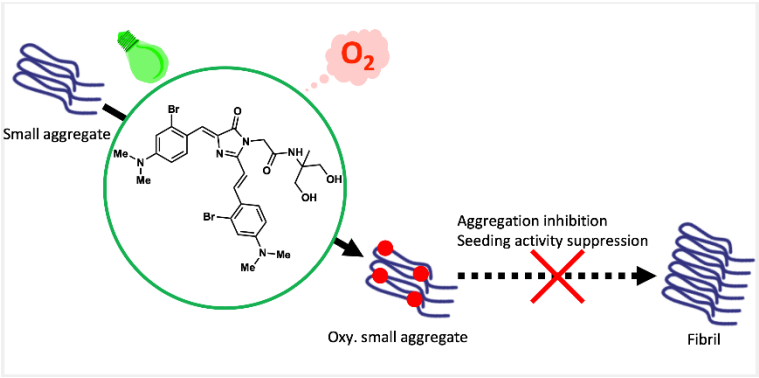
ACS Chem. Neurosci. **2023**, *14*, 2710–2716.



15. Attenuation of α-synuclein aggregation by catalytic photo-oxygenation

Iwai, A.; Nakamura, R.; Tomizawa, I.; **Mitsunuma, H.**; Hori, Y.; Tomita, T.; Sohma, Y.*; Kanai, M.*

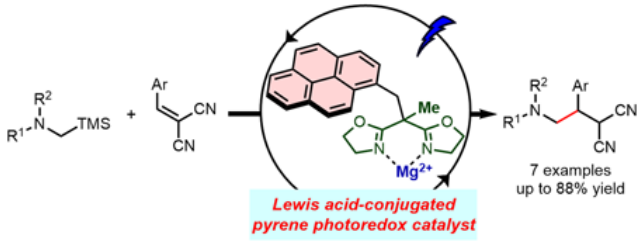
Chem. Commun. **2023**,*59*, 5745-5748.



16. Lewis Acid-Conjugated Pyrene Photoredox Catalyst Promoting the Addition Reaction of α-Silyl Amines with Benzalmalononitriles

Katayama, Y.; **Mitsunuma, H.***; Kanai, M.*

Chem. Pharm. Bull. **2022**, *70*, 765-768.

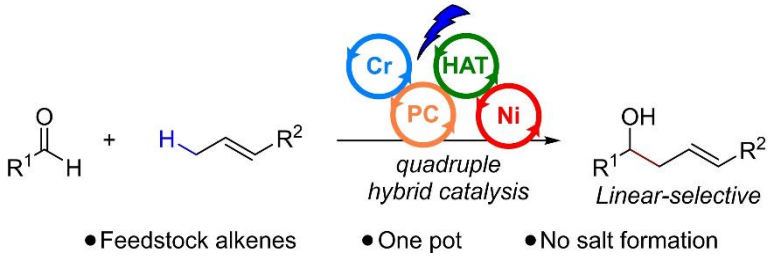


17. Linear-Selective Allylation of Aldehydes with Simple Alkenes Mediated by Quadruple Hybrid Catalysis

    Irie, Y.; Chen, H.; Fuse, H.; **Mitsunuma, H.***; Kanai, M.*

    Adv. Synth. Catal. **2022**, *364*, 3378-3383.

    *Special Issue: Dedicated to Andreas Pfaltz.



18. Site-Selective α-Alkylation of 1,3-Butanediol Using a Thiophosphoric Acid Hydrogen Atom Transfer Catalyst

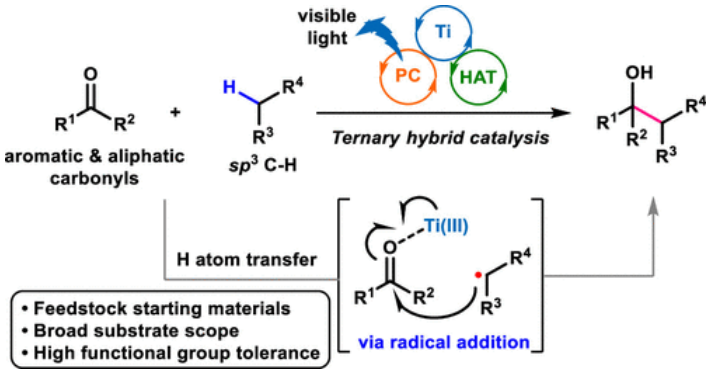
    Nakao, H.; **Mitsunuma, H.***; Kanai, M.*

    Chem. Pharm. Bull. **2022**, *70*, 540-543.

19. A Catalytic Alkylation of Ketones via sp^3 C–H Bond Activation

    Peng, X.; Hirao, Y.; Yabu, S.; Sato, H.; Higashi, M.; Akai, T.; Masaoka, S.; **Mitsunuma, H.***; Kanai, M.*

    J. Org. Chem. **2023**, *88*, 6333–6346.

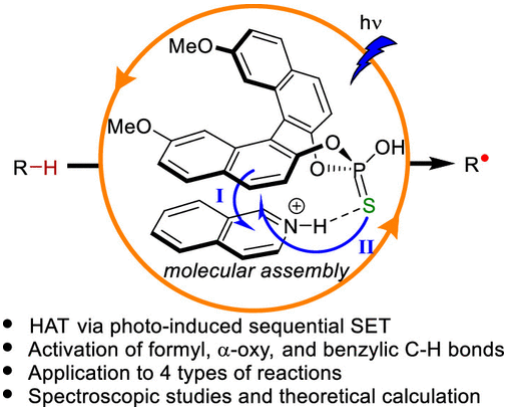


20. Identification of a Self-Photosensitizing Hydrogen Atom Transfer Organocatalyst System

    Fuse, H.; Irie, Y.; Fuki, M.; Kobori, Y.; Kato, K.; Yamakata, A.; Higashi, M.; **Mitsunuma, H.***; Kanai, M.*

    J. Am. Chem. Soc. **2022**, *144*, 6566-6574.

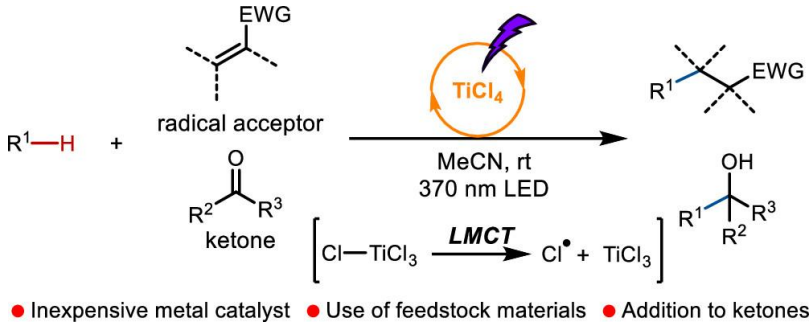
    * Highlighted by Department News release, JACS Spotlights.



21. Titanium(IV) Chloride-Catalyzed Photoalkylation via C(sp^3)–H Bond Activation of Alkanes

    Yamane, M.; Kanzaki, Y.; **Mitsunuma, H.***; Kanai, M.*

    Org. Lett. **2022**, *24*, 1486-1490.

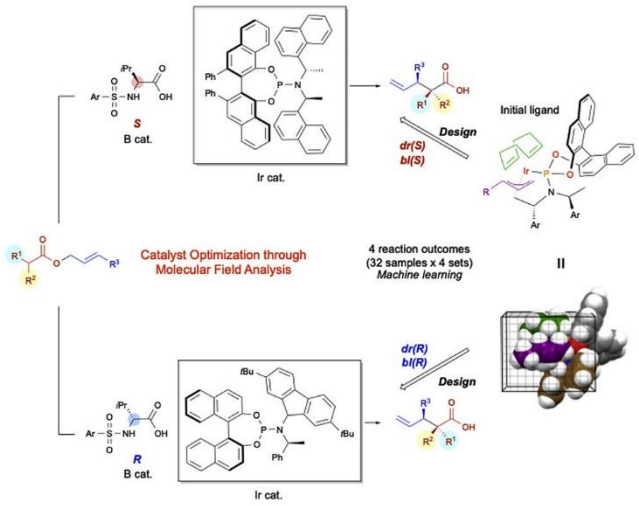


22. Data-driven catalyst optimization for stereodivergent asymmetric synthesis by iridium/boron hybrid catalysis

Chen, H.; Yamaguchi, S.*; Morita, Y.; Nakao, H.; Zhai, X.; Shimizu, Y.; **Mitsunuma, H.***; Kanai, M.*

Cell Rep. Phys. Sci. **2021**, *3*, 100679.

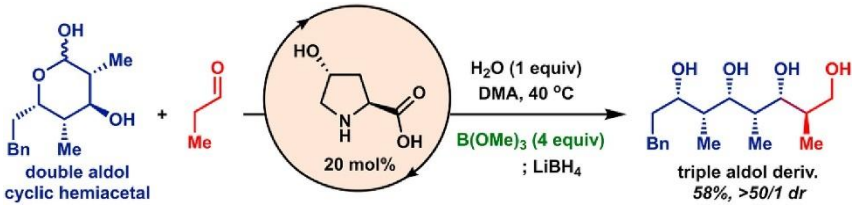
*Highlighted by Department News release, 日刊工業新聞, 化学工業日報, 日本経済新聞.



23. A 4-hydroxyproline/trimethyl borate system for asymmetric synthesis of triple aldols from double aldol cyclic hemiacetals

Hirao, Y.; Kanzaki, Y.; **Mitsunuma, H.***; Kanai, M.*

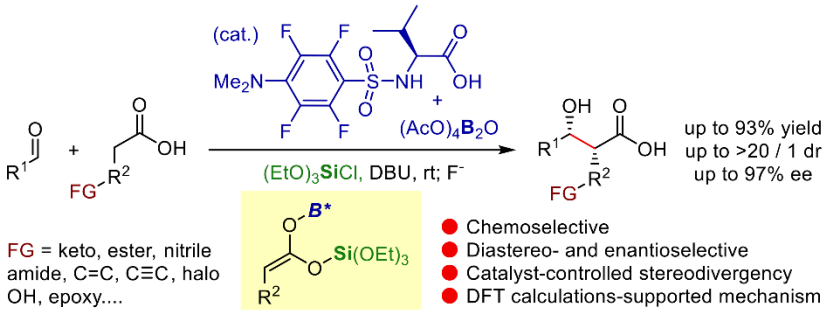
Tetrahedron **2021**, *98*, 132448.



24. Siloxy Esters as Traceless Activators of Carboxylic Acids: Boron-Catalyzed Chemoselective Asymmetric Aldol Reaction

Fujita, T.; Yamane, M.; Sameera, W. M. C.; **Mitsunuma, H.***; Kanai, M.*

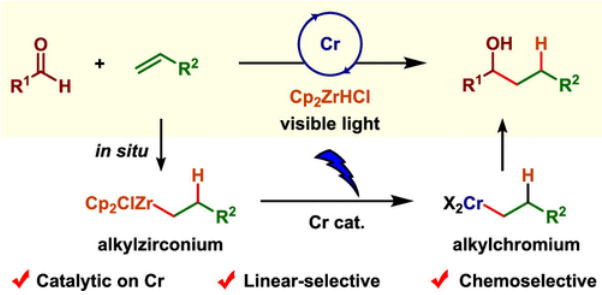
Angew. Chem. Int. Ed. **2021**, *60*, 24598-24604.



25. Chromium-Catalyzed Linear-Selective Alkylation of Aldehydes with Alkenes

Hirao, Y.; Katayama, Y.; **Mitsunuma, H.***; Kanai, M.*

Org. Lett. **2020**, *22*, 8584-8588.

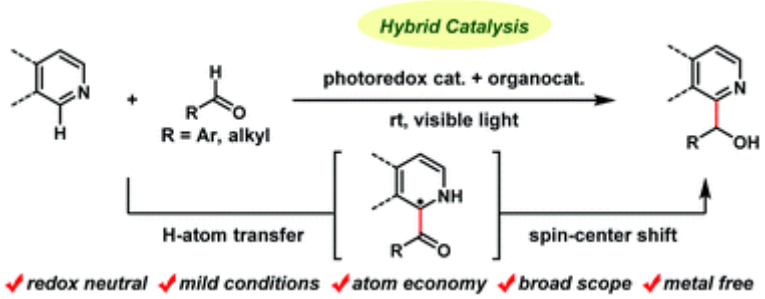


26. Photocatalytic redox-neutral hydroxyalkylation of N-heteroaromatics with aldehydes

Fuse, H.; Nakao, H.; Saga, Y.; Fukatsu, A.; Kondo, M.; Masaoka, S.: **Mitsunuma, H.***; Kanai, M.*

Chem. Sci. **2020**, *11*, 12206-12211.

*Highlighted by *Synfacts* **2021**, *17*, 0084.

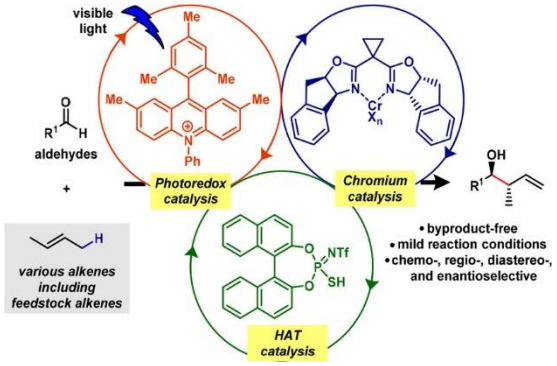


27. Catalytic Allylation of Aldehydes Using Unactivated Alkenes

Tanabe, S.; **Mitsunuma, H.***; Kanai, M.*

J. Am. Chem. Soc. **2020**, *142*, 12374-12381.

*Highlighted by Department News release.

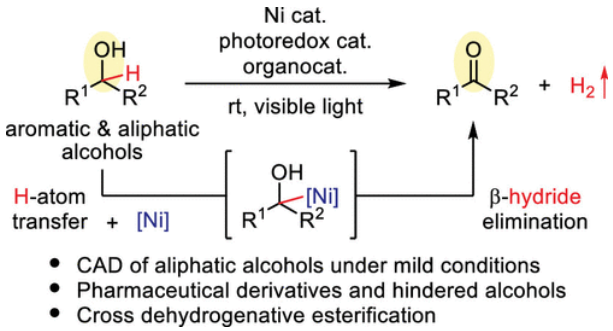


28. Catalytic Acceptorless Dehydrogenation of Aliphatic Alcohols.

    Fuse, H.; **Mitsunuma, H.***; Kanai, M.*

    J. Am. Chem. Soc. **2020**, *142*, 4493-4499.

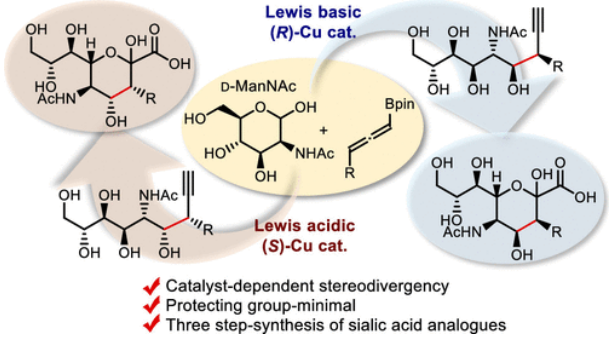
    *Highlighted by Department News release.



29. Copper(I)-Catalyzed Stereodivergent Propargylation of N-Acetyl Mannosamine for Protecting Group Minimal Synthesis of C3-Substituted Sialic Acids

    Ishizawa, K.; Majima, S.; Wei, X.-F.; **Mitsunuma, H.**; Shimizu, Y.; Kanai, M.

    J. Org. Chem. **2019**, *84*, 10615-10628.

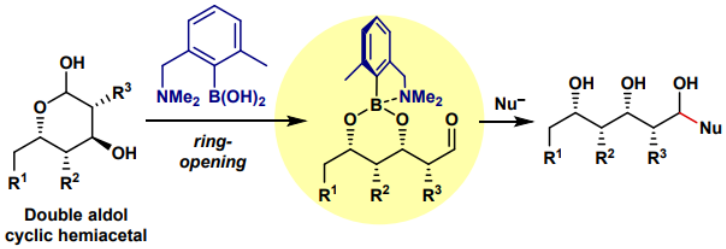


30. Amine-Tethered Phenylboronic Acid-Enabling Ring-Opening Strategy for Carbon Chain Elongation from Double Aldol Cyclic Hemiacetals

    Kanzaki, Y.; Hirao, Y.; **Mitsunuma, H.***; Kanai, M.*

    Org. Biomol. Chem. **2019**, *17*, 6562-6565.

    * Invited to Synthetic methodology in OBC and Trends in Organoboron Chemistry.



31. Catalytic Asymmetric Allylation of Aldehydes with Alkenes Mediated by Organophotoredox and Chiral Chromium Hybrid Catalysis

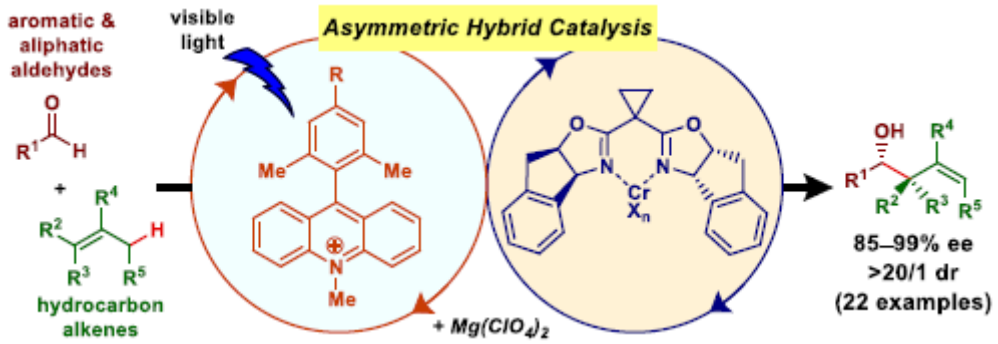
Mitsunuma, H.*; Tanabe, S.; Fuse, H.; Ohkubo, K.; Kanai, M.*

Chem. Sci. **2019**, *10*, 3459-3465.

*Highlighted by UT press release, Chem.Sci. Special Movie, 日経産業新聞

*Selected as 2019 Chemical Science HOT Article Collection and 2019 ChemSci Pick of the Week Collection

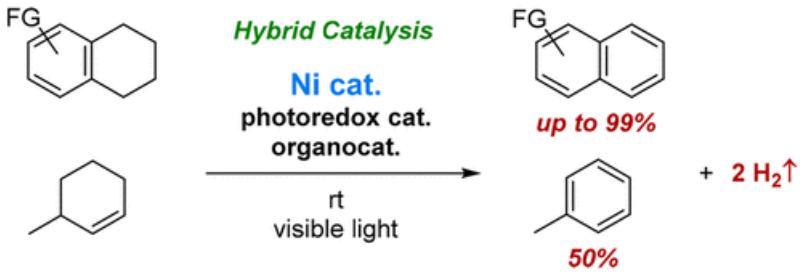
*Selected as Inside Front Cover



32. Acceptorless Dehydrogenation of Hydrocarbons by Noble-Metal-Free Hybrid Catalyst System

Fuse, H.; Kojima, M.; **Mitsunuma, H.**; Kanai, M.

Org. Lett. **2018**, *20*, 2042-2045.



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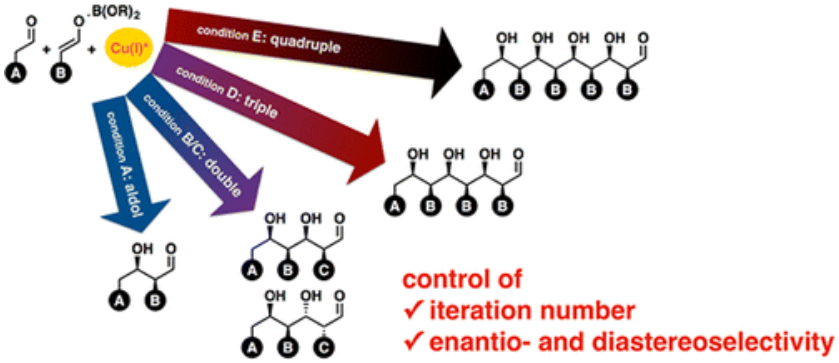

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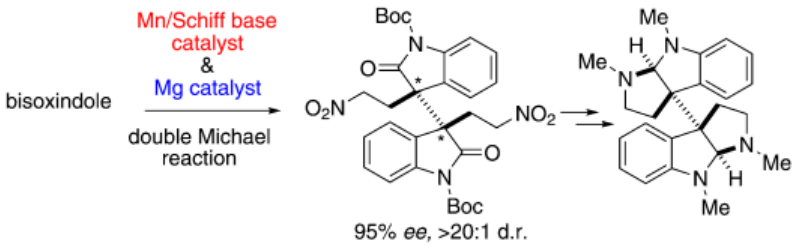

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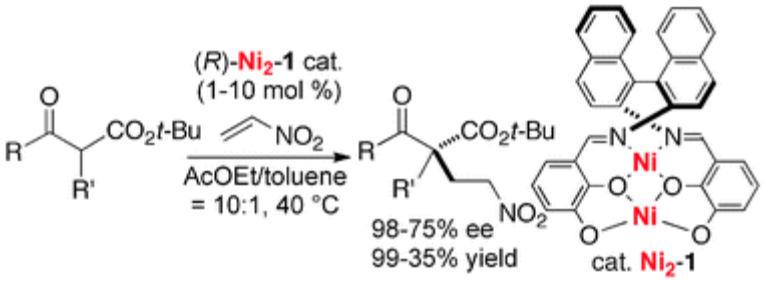

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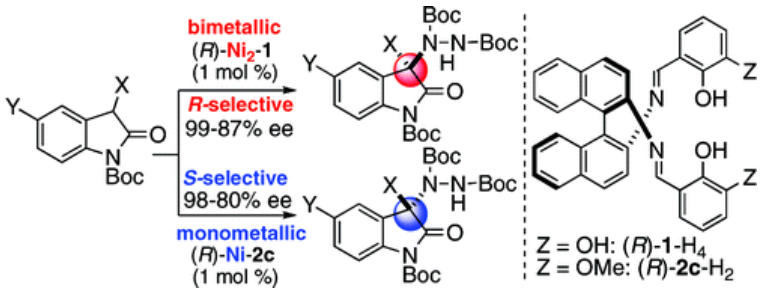

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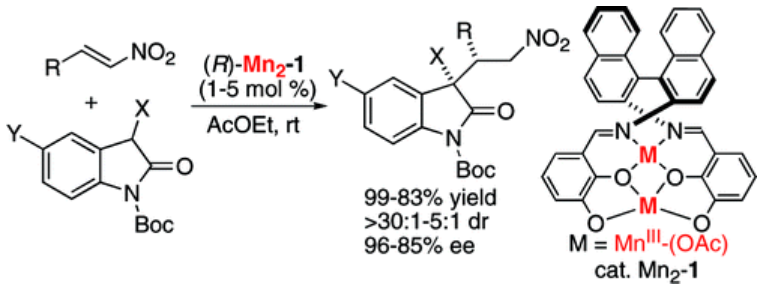

Review

1. Enhancing reaction efficiency in photochemical organic synthesis by controlling the dynamic effects of excitons
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Book, Essay

1. 「第 1 回，第 2 回次世代シンポレクチャーシップ賞受賞講演旅行報告」
三ツ沼治信、笹野裕介
ファルマシア **2024**, *60*, 336-337.
2. 「光触媒／ラジカル触媒／金属錯体触媒の三成分ハイブリッドによる炭化水素の水素放出反応および炭素―炭素結合形成反応」
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有機光反応の化学　光が誘起する電子移動・触媒系・有機合成（CSJ Current Review）
2022 年 3 月 15 章

3. 「光触媒を用いた C(sp^3)-H 結合活性化を経由する遷移金属触媒反応の動向」
   三ツ沼治信
   化学と工業 **2021**, *74-3*, 204-205.

Patent

1. トリアリールメタン骨格を有する光酸素化触媒、及びこれを含有する医薬組成物
   金井求、三ツ沼治信、古田将大、富田泰輔、堀由起子、相馬洋平
   特願 2023-032303
   出願者 : 国立大学法人東京大学、公立大学法人和歌山県立医科大学、公開日 : 2024/09/12
2. Substituted lactams showing serotonin 5-ht receptor activity
   Yoshinaga, H.; Ikuma, Y.; Ikeda, J.; Adachi, S.; **Mitsunuma, H.**; Aihara, Y.; Besnard, J.; Bell, A. S.
   Filed Patents: US20250084090A1; JP2024020396A; US12180213B2; PH12021550146A1; AU2019309130B2; SG11202100011VA; JP7387605B2; TWI860295B; CN112424195B; BR112020026014A8; EA202190316A1; US11466007B2; KR20210035247A; WO2020022237A1; MX2021000942A; CA3105428A1; EP3828182A4
   出願者：大日本住友株式会社、公開日(WO)：2019/07/22

Invited Lecture

1. Double Hydrogen Atom Transfer Strategy for Catalytic Acceptorless Dehydrogenation of Cycloalkanes
   Mitsunuma, H.; Jagtap, R.; Nishioka, Y.; Geddis, S.; Irie, Y.; Takanashi, T.; Adachi, R.; Yamakata, A.; Fuki, M.; Kobori, Y.; Kanai, M.
   247th Meeting of The Electrochemical Society、モントリオール、2025 年 5 月 22 日
2. 触媒システムを利用した新奇な sp3C-H 結合活性化反応の開発
   三ツ沼治信
   日本化学会第 105 回春季年会、関西大学千里山キャンパス、2025 年 3 月 28 日
3. sp^3 炭素－水素結合官能基化反応を実現する触媒システムの創製
   三ツ沼治信
   日本薬学会第 145 回年会、福岡国際会議場、2025 年 3 月 27 日
4. Grignard 反応の革新を目指して
   三ツ沼治信
   2024 若手研究者のためのセミナー、化学会館 5F（A+B）会議室、2024 年 7 月 29 日
5. Development of Leuco Ethyl Violet as Self-Activating Prodrug Photooxygenation Catalyst of Amyloid-β

Mitsunuma, H.; Furuta, M.; Matsukawa, R.; Shizu, K.; Kaji, H.; Kawashima, S. A.; Hori, Y.; Tomita, T.; Sohma, Y.; Kanai, M.
245th Meeting of The Electrochemical Society、サンフランシスコ、2024 年 5 月 26 日

6. Development of Grignard Reaction 2.0
Mitsunuma, H.
Basic & Clinical Research on Rare Diseases Conference、オンライン、2023 年 12 月 9 日
7. Grignard 反応の革新を目指して
三ツ沼治信
神戸大学有機反応化学研究会、神戸大六甲台キャンパス、2023 年 10 月 18 日
8. Grignard 反応の革新を目指して
三ツ沼治信
有機金属化学若手の会、阪大中ノ島キャンパス、2024 年 9 月 12 日
9. Development of sp3 C-H Bond Functionalization by Multiple Catalyst System
Mitsunuma, H.
JISEDAI symposium lectureship、The Hong Kong University of Science and Technology、2023 年 8 月 25 日
10. Development of sp3 C-H Bond Functionalization by Multiple Catalyst System
Mitsunuma, H.
JISEDAI symposium lectureship、City University of Hong Kong、2023 年 8 月 24 日
11. Development of sp3 C-H Bond Functionalization by Multiple Catalyst System
Mitsunuma, H.
JISEDAI symposium lectureship、The University of Hong Kong、2023 年 8 月 23 日
12. Development of sp3 C-H Bond Functionalization by Multiple Catalyst System
Mitsunuma, H.
JISEDAI symposium lectureship、The Chinese University of Hong Kong、2023 年 8 月 22 日
13. Identification of a Self-Photosensitizing Hydrogen Atom Transfer Organocatalyst System
Mitsunuma, H.; Fuse, H.; Irie, Y.; Fuki, M.; Kobori, Y.; Kato, K.; Yamakata, A.; Higashi, M.; Kanai, M.
245th Meeting of The Electrochemical Society、ボストン、2023 年 5 月 31 日
14. 電荷移動錯体を利用した光駆動型有機水素原子移動触媒の開発
三ツ沼治信、布施 拡、入江 優、婦木 正明、小堀 康博、加藤 康作、山方 啓、東 雅大、金井 求
日本化学会第 103 春季年会、東京理科大 野田キャンパス、2023 年 3 月 23 日
15. 電荷移動錯体を利用した光駆動型有機水素原子移動触媒の開発

三ツ沼治信、布施 拡、入江 優、婦木 正明、小堀 康博、加藤 康作、山方 啓、東 雅大、金井 求

2022 年光化学討論会、京都大学桂キャンパス、2022 年 9 月 15 日

16. Titanium-Catalyzed Intermolecular Radical Addition to Ketones via sp3 C-H Bond Activation

Mitsunuma, H.; Peng, X.; Hirao, Y.; Yabu, S.; Sato, H.; Higashi, M.; Kanai, M.

241st Meeting of The Electrochemical Society、バンクーバー、2022 年 5 月 31 日

17. 光増感分子触媒を利用した sp^3C-H 変換反応の開発

三ツ沼治信

第 15 回物性科学領域横断研究会、オンライン、2021 年 11 月 26 日

18. 光増感分子触媒を利用した C-H 変換反応の開発

三ツ沼治信

機能性色素部会第 104 回例会、オンライン、2021 年 11 月 9 日

19. Catalytic Allylation of Aldehydes Using Feedstock Alkenes

Mitsunuma, H.; Tanabe, S.; Kanai, M.

The International Conference on Flexible and Printed Electronics、オンライン、2021 年 10 月 1 日

20. Catalytic Allylation of Aldehydes Using Feedstock Alkenes

Mitsunuma, H.; Tanabe, S.; Kanai, M.

239th Meeting of The Electrochemical Society、オンライン、2021 年 6 月 3 日

References

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