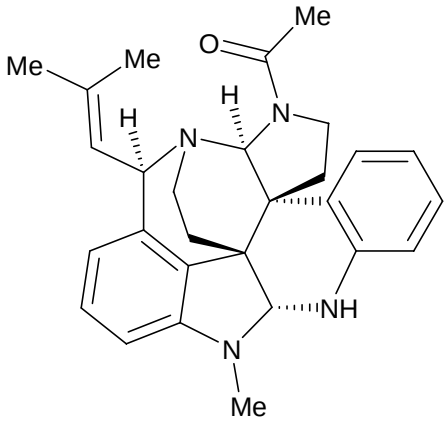
Total Synthesis of the Polycyclic Fungal Metabolite (±)-Communesin F

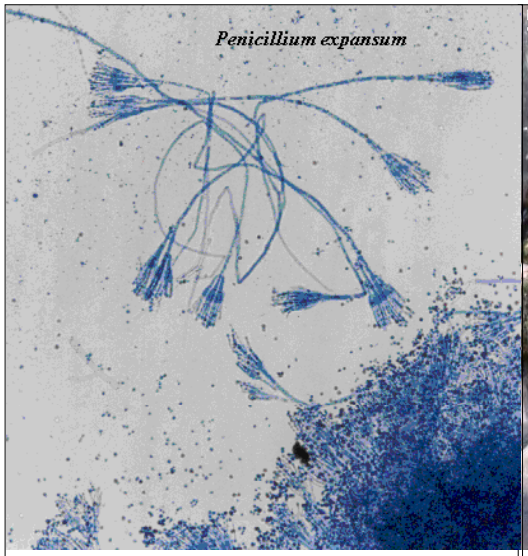
Liu, P.; Seo, J. H.; Weinreb, S. M. *Angew. Chem. Int. Ed*. **2010**, *49*, 2000–2003.



Current Literature Presentation
March 6th, 2010
Michael Yang

Isolation of Communesin F

- Isolated from *Penicillium* mold on marine algae



Penicillium expansum

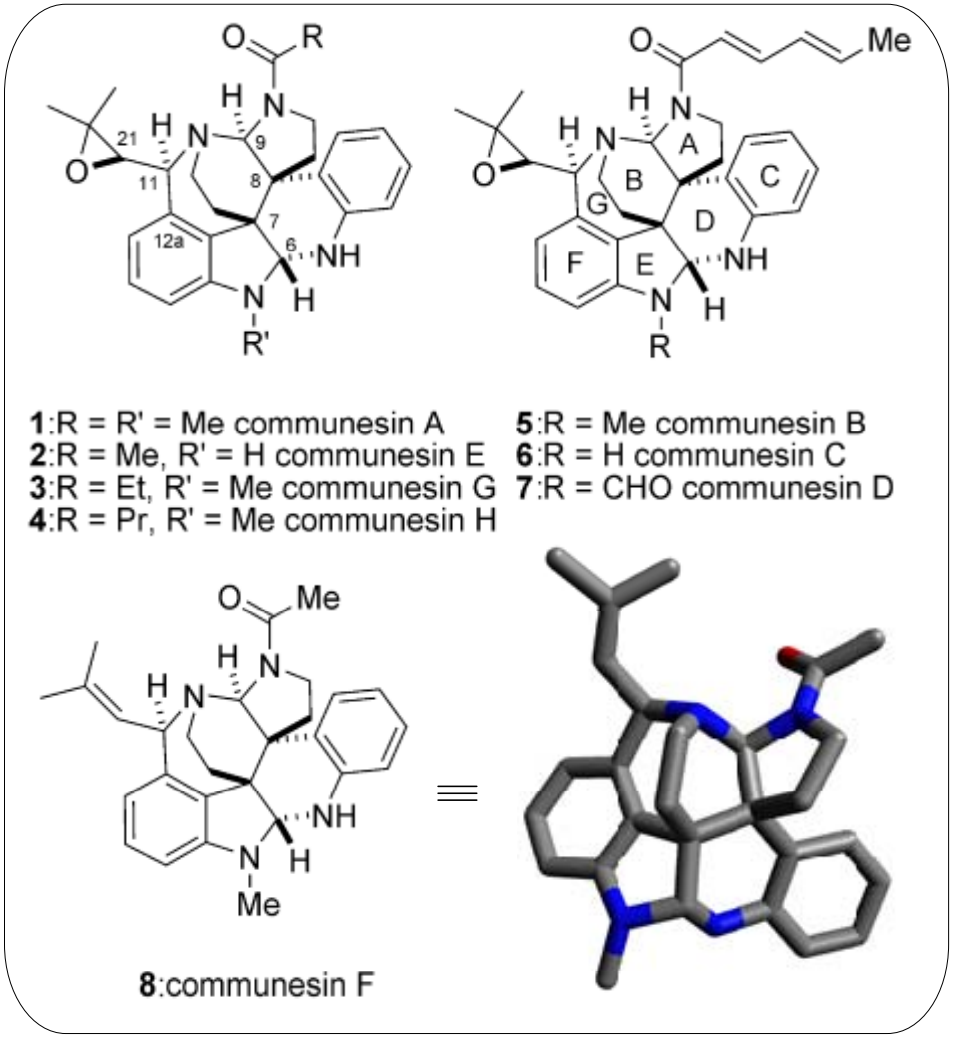
Enteromorpha interstinalis

Kerzaon, I.; Pouchus, Y. F.; Monteau, F.; Le Bizec, B.; Nourrisson, M. R. *Rapid Commun. Mass Spectrom.* **2009**, *23*, 3928.

Communesin Background

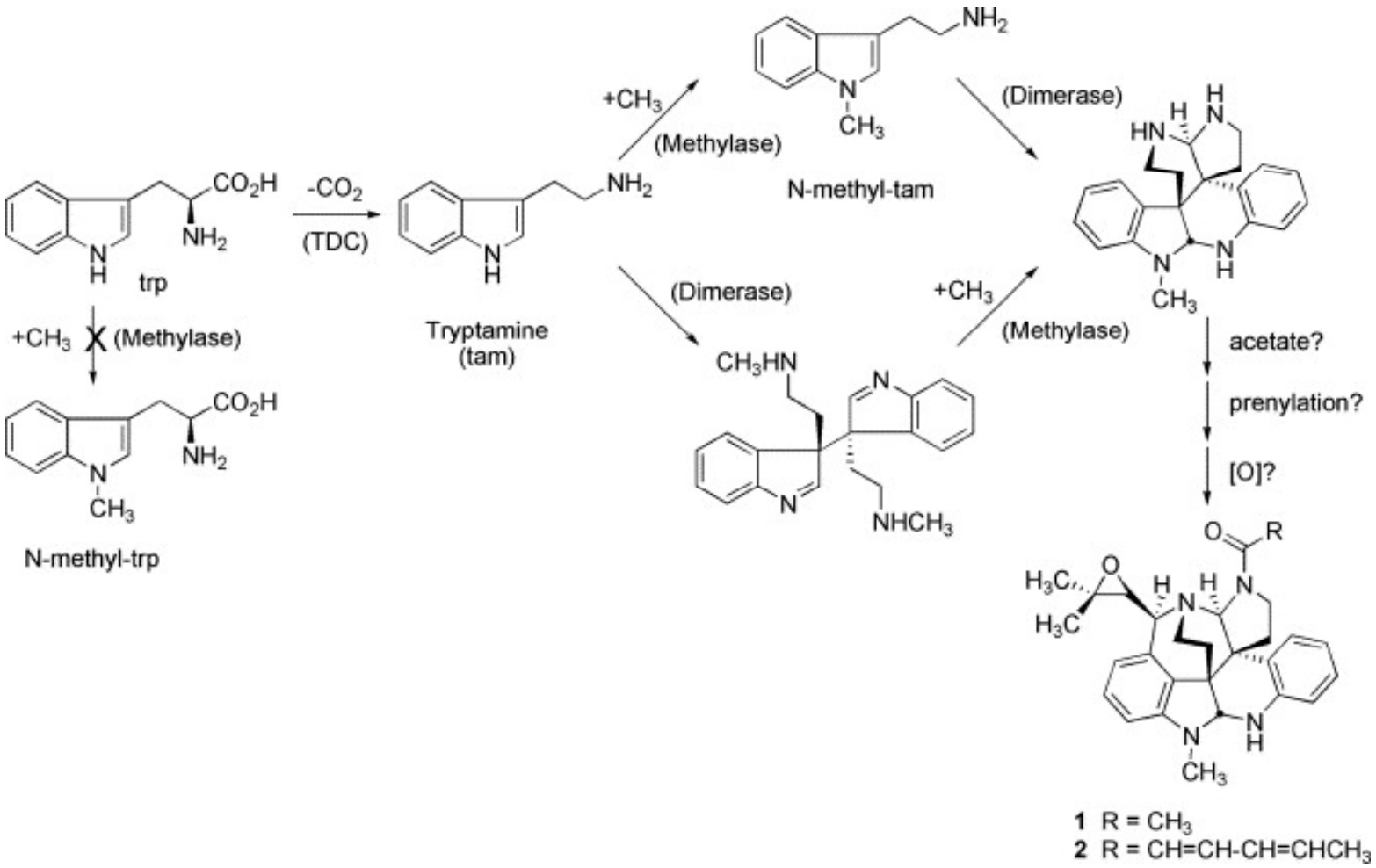
- Biological Activities:
  - Communesins A–D are active against various leukemia cell lines
  - Communesins D–F are insecticidal

- Key Structural Features
  - Two contiguous quaternary centers (C-7 and C-8)
  - Two aminals



Liu, P.; Seo, J. H.; Weinreb, S. M. *Angew. Chem. Int. Ed.* **2010**, early view.

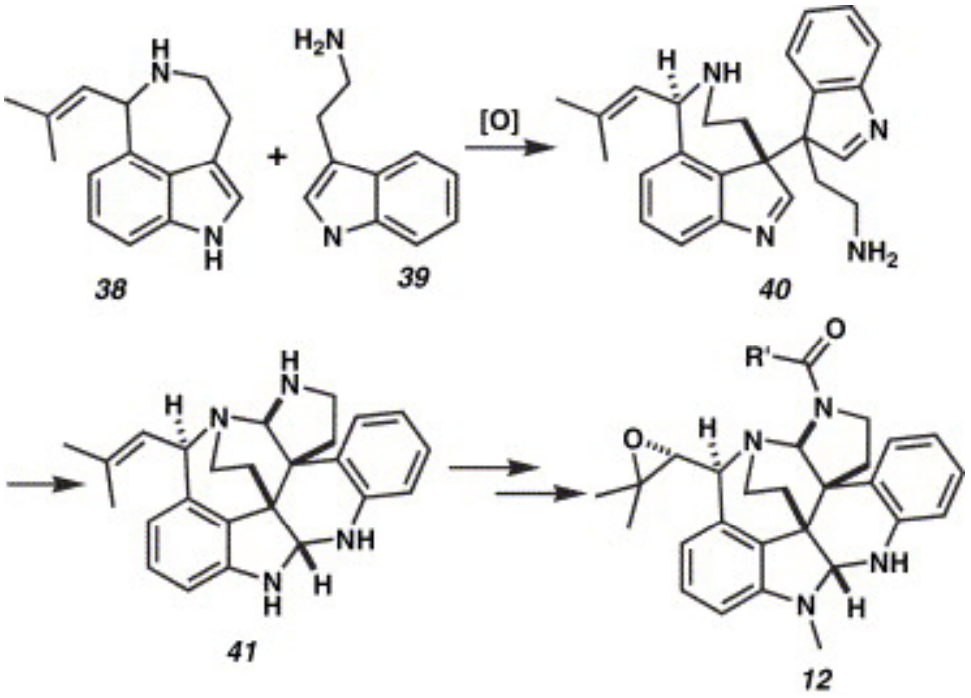
Biosynthetic Proposal 1: Oxidative Dimerization of Tryptamine



Wigley, L. J.; Mantle, P. G.; Perry, D. A. *Phytochemistry* **2006**, *67*, 561–569.

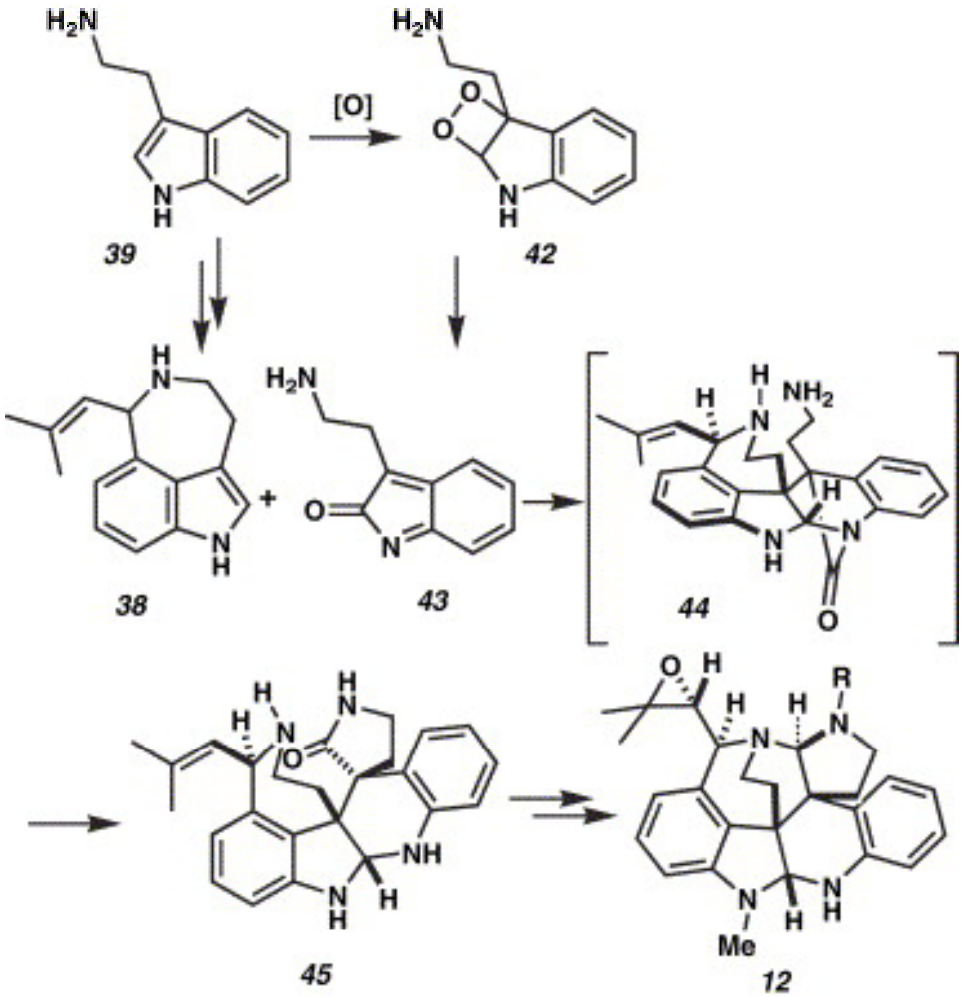
Biosynthetic Proposal 2: Dimerization of Tryptamine and Aurantioclavine

- Oxidative dimerization between tryptamine and aurantioclavine
  - Aurantioclavine – *Penicillium* fungal metabolite



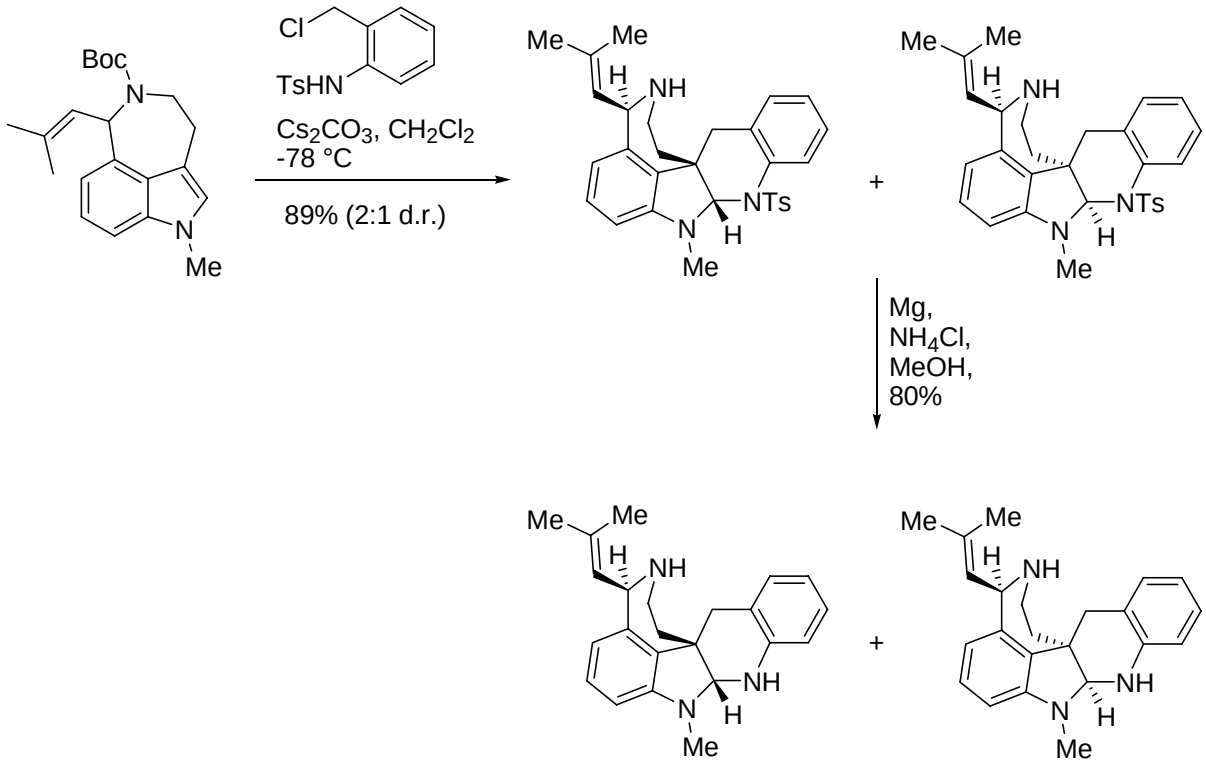
May, J. A.; Stoltz, B. *Tetrahedron* **2006**, *62*, 5262–5271.

Biosynthetic Proposal 3: Diels-Alder Reaction



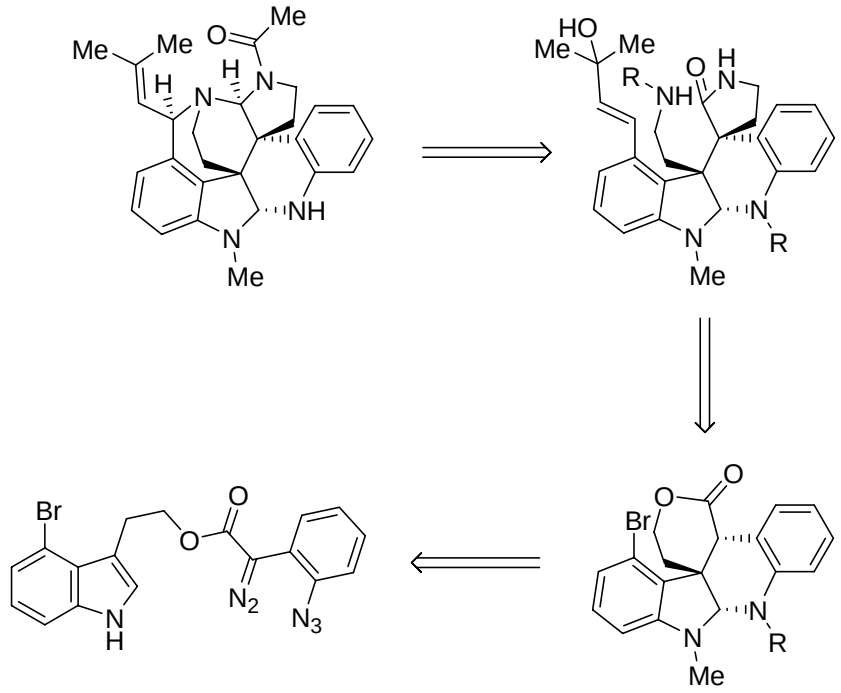
May, J. A.; Zeidan, R. K.; Stoltz, B. *Tetrahedron Lett.* **2003**, *44*, 1203–1205.
May, J. A.; Stoltz, B. *Tetrahedron* **2006**, *62*, 5262–5271.

Model Study: Communesin via Diels-Alder



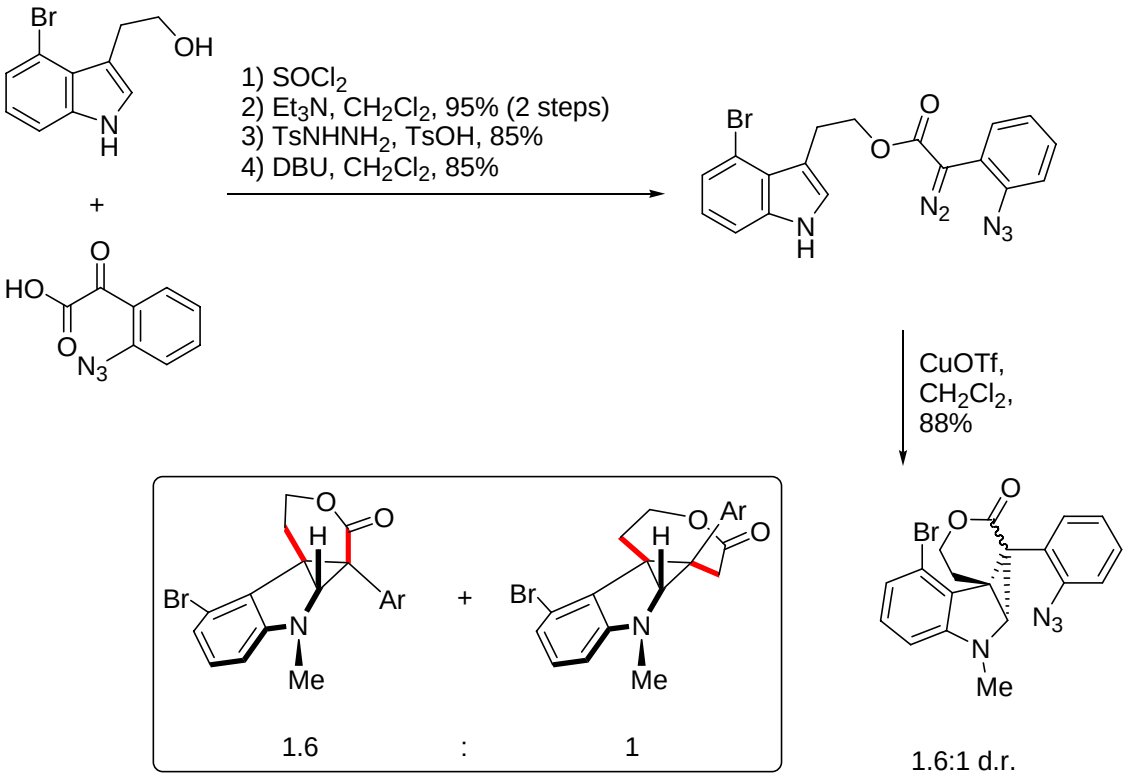
May, J. A.; Zeidan, R. K.; Stoltz, B. *Tetrahedron Lett.* **2003**, *44*, 1203–1205.
May, J. A.; Stoltz, B. *Tetrahedron* **2006**, *62*, 5262–5271.

Retrosynthetic Analysis - Qin



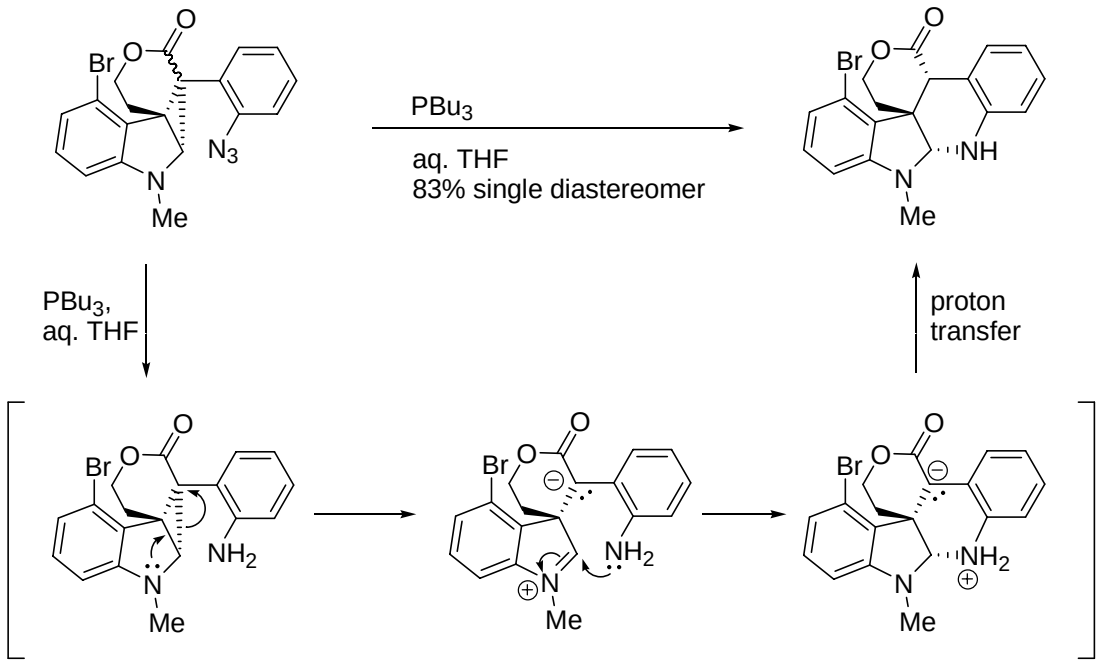
Yang, J.; Wu, H.; Shen, L.; Qin, Y. *J. Am. Chem. Soc.* **2007**, *129*, 13794–13795.

Diastereomers?



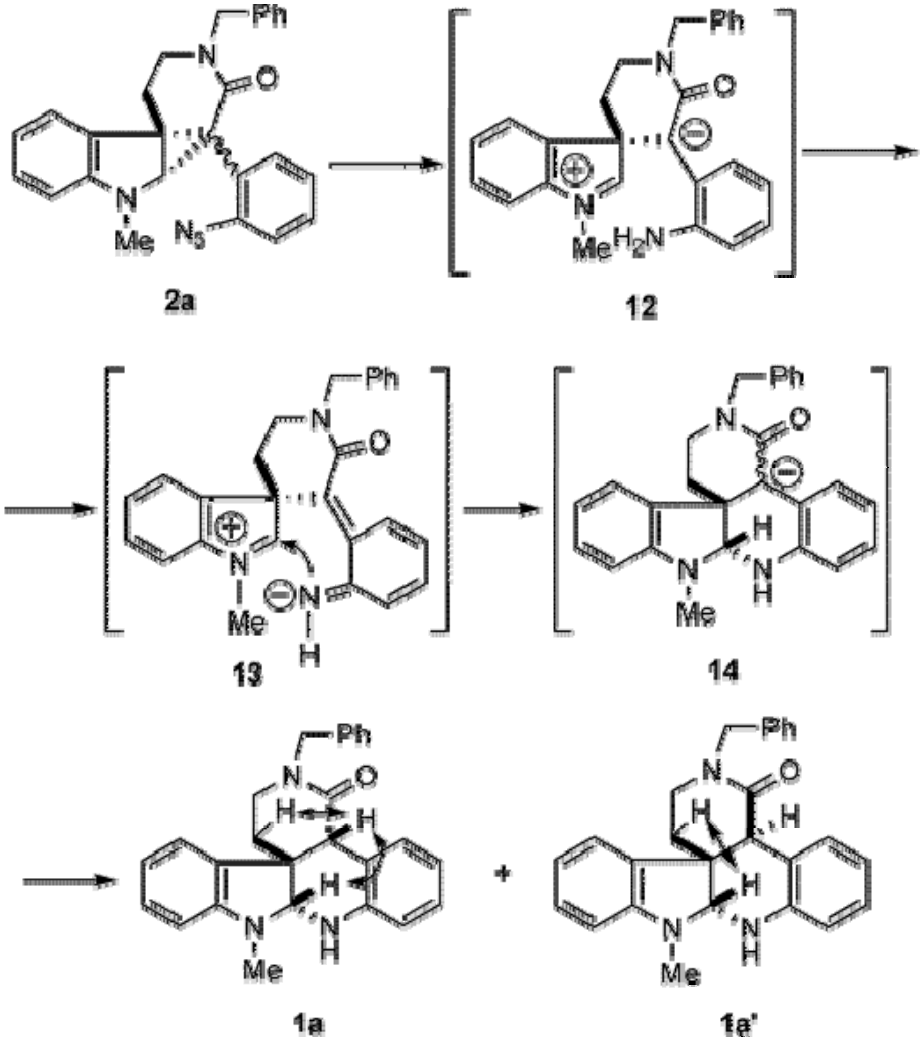
Yang, J.; Wu, H.; Shen, L.; Qin, Y. *J. Am. Chem. Soc.* **2007**, *129*, 13794–13795.

Cyclopropane Ring-opening



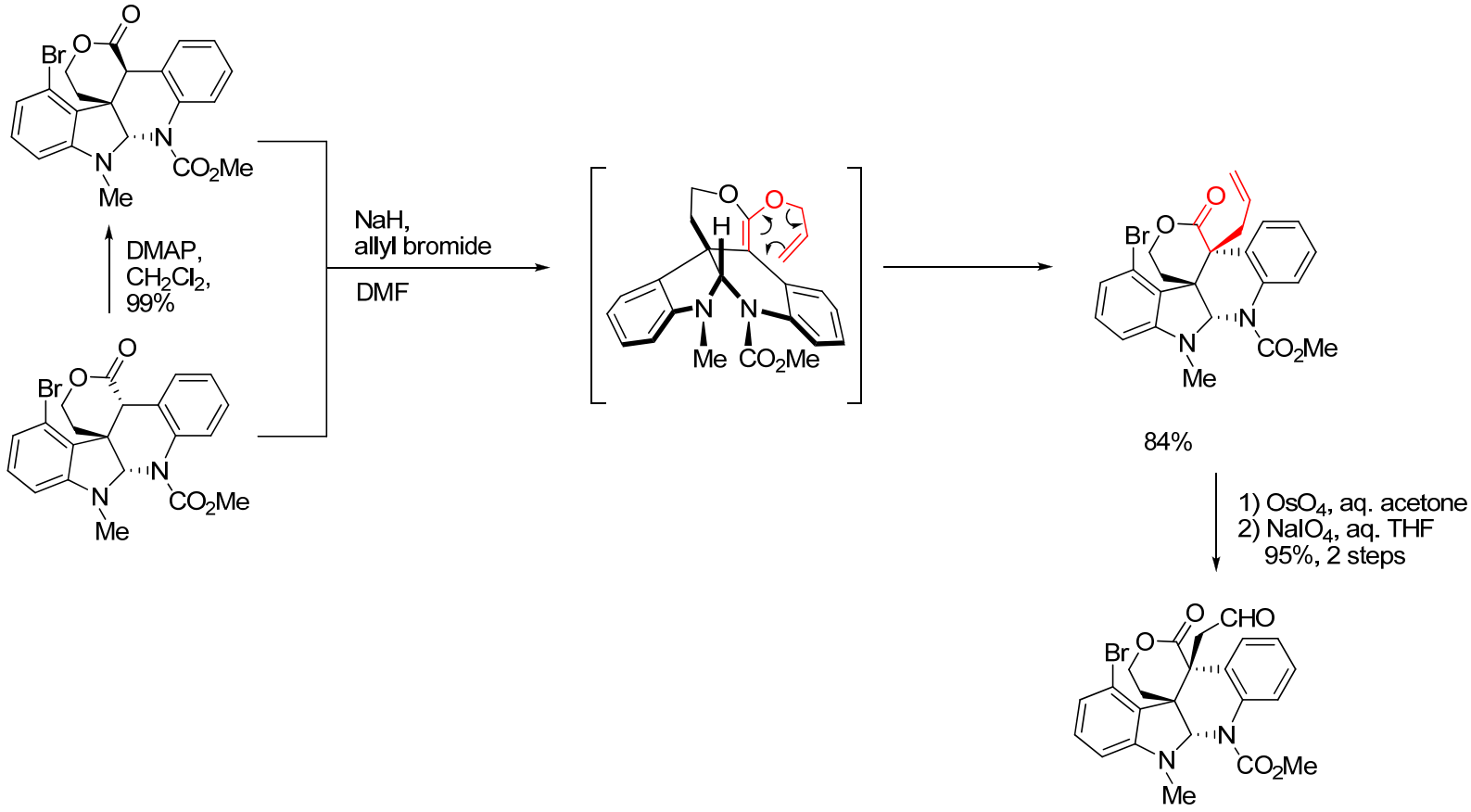
Yang, J.; Wu, H.; Shen, L.; Qin, Y. *J. Am. Chem. Soc.* **2007**, *129*, 13794–13795.

Qin's Mechanistic Rationale



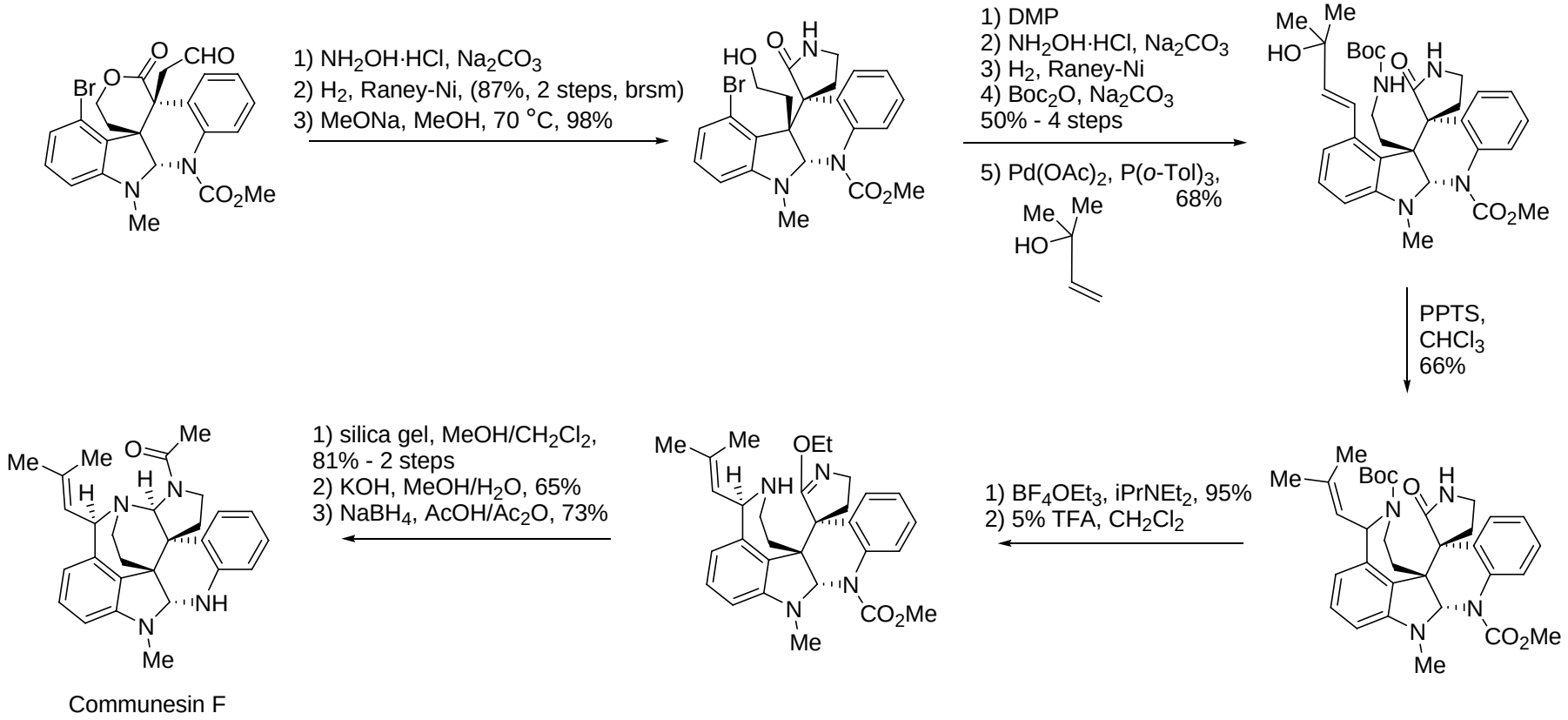
Yang, J.; Song, H.; Xiao, X.; Wang, J.; Qin, Y. *Org. Lett.* **2006**, *8*, 2187–2190.

Formation of the C-8 Quaternary Center: Claisen Rearrangement



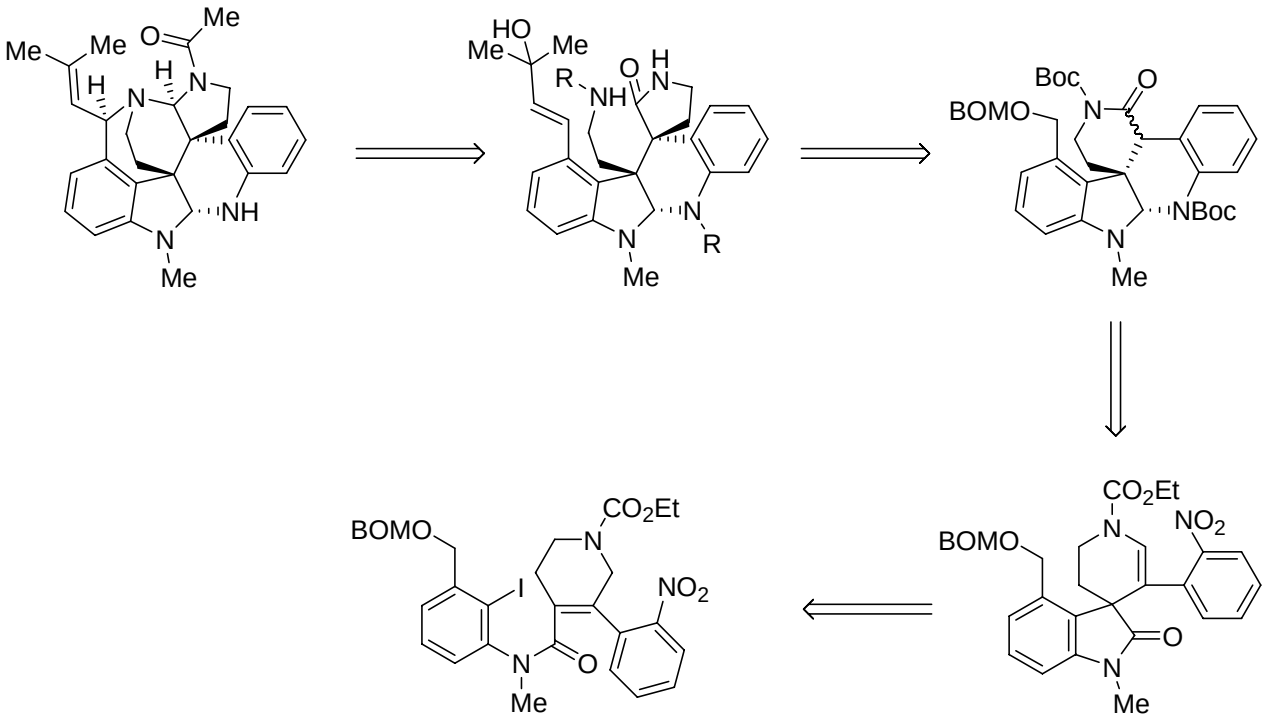
Yang, J.; Wu, H.; Shen, L.; Qin, Y. *J. Am. Chem. Soc.* **2007**, *129*, 13794–13795.

Synthesis of Communesin F - Qin



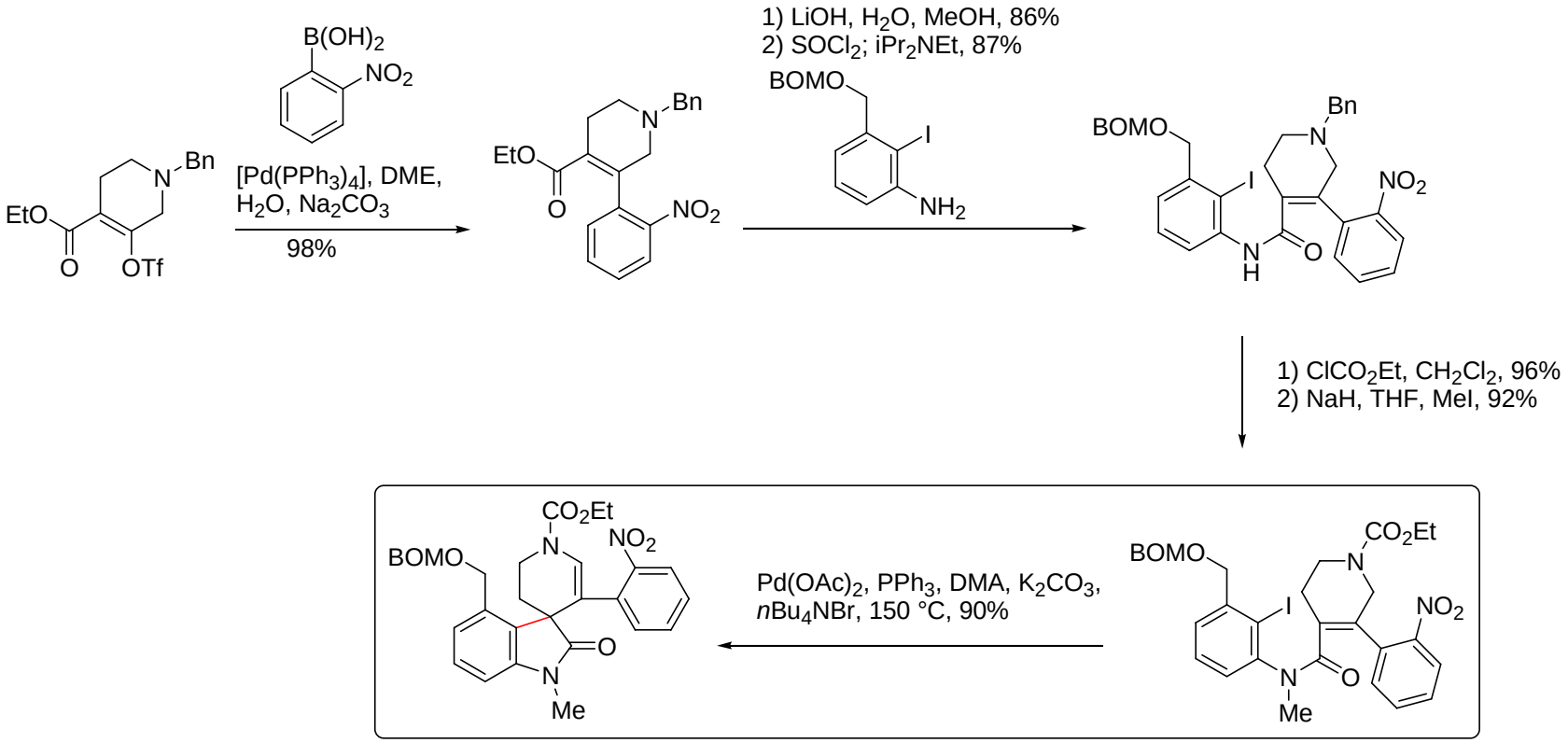
Yang, J.; Wu, H.; Shen, L.; Qin, Y. *J. Am. Chem. Soc.* **2007**, *129*, 13794–13795.

Retrosynthetic Analysis - Weinreb



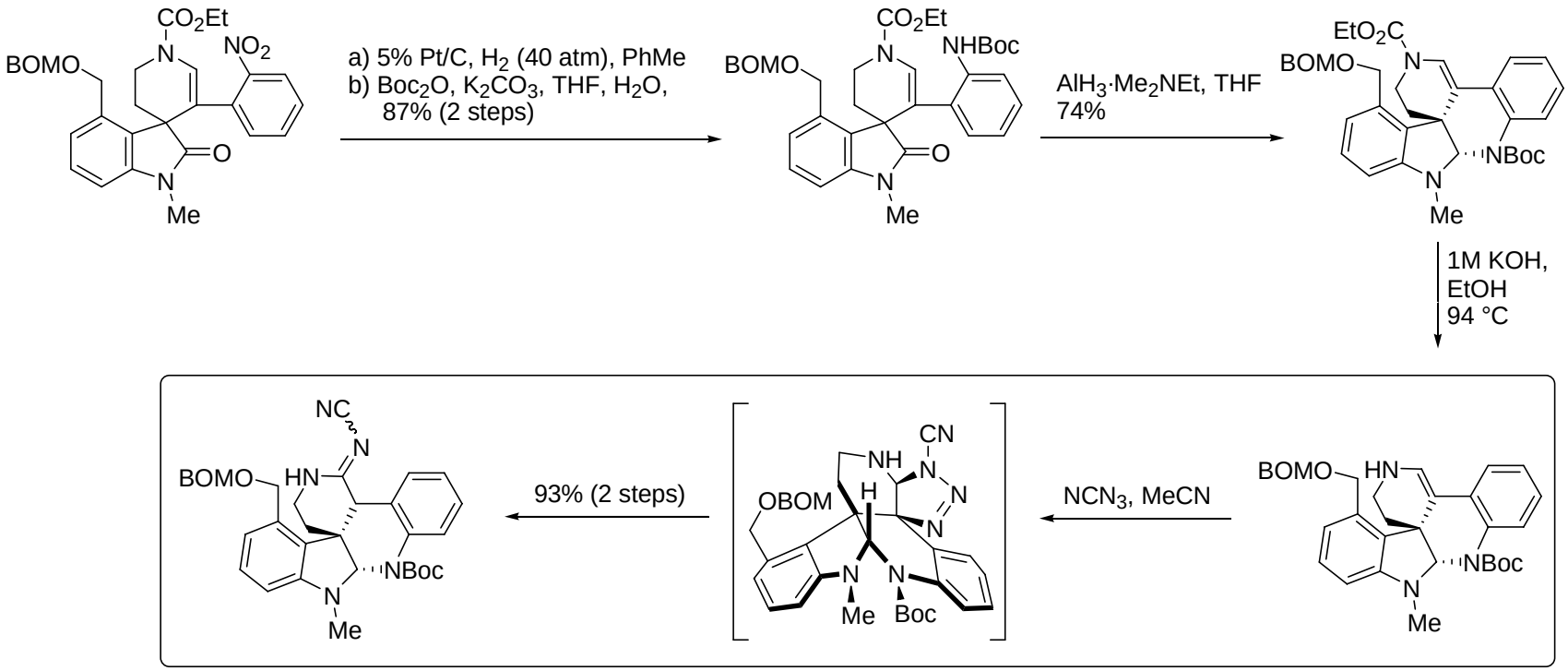
Liu, P.; Seo, J. H.; Weinreb, S. M. *Angew. Chem. Int. Ed.* **2010**, *49*, 2000–2003.

Intramolecular Heck - Weinreb



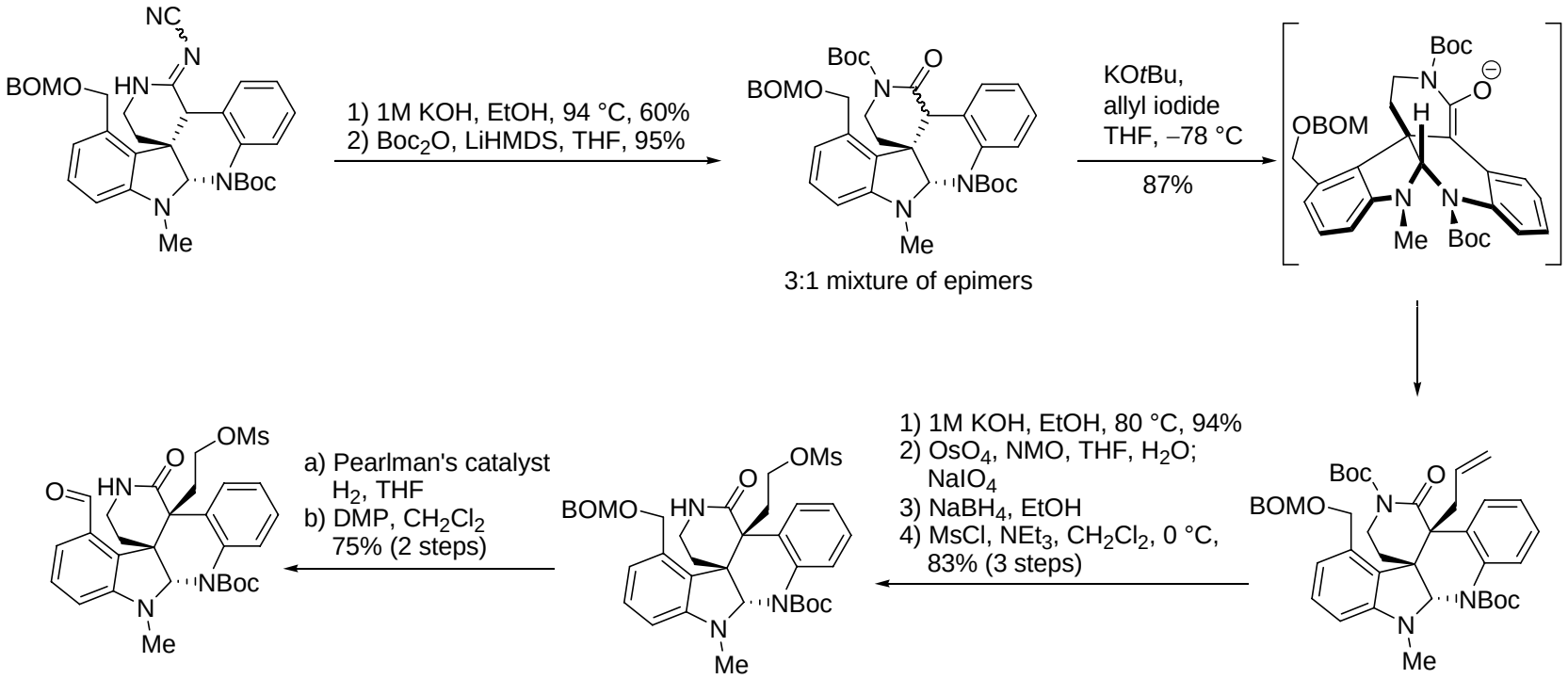
Liu, P.; Seo, J. H.; Weinreb, S. M. *Angew. Chem. Int. Ed.* **2010**, *49*, 2000–2003.

1,3 Dipolar Cycloaddition - Weinreb



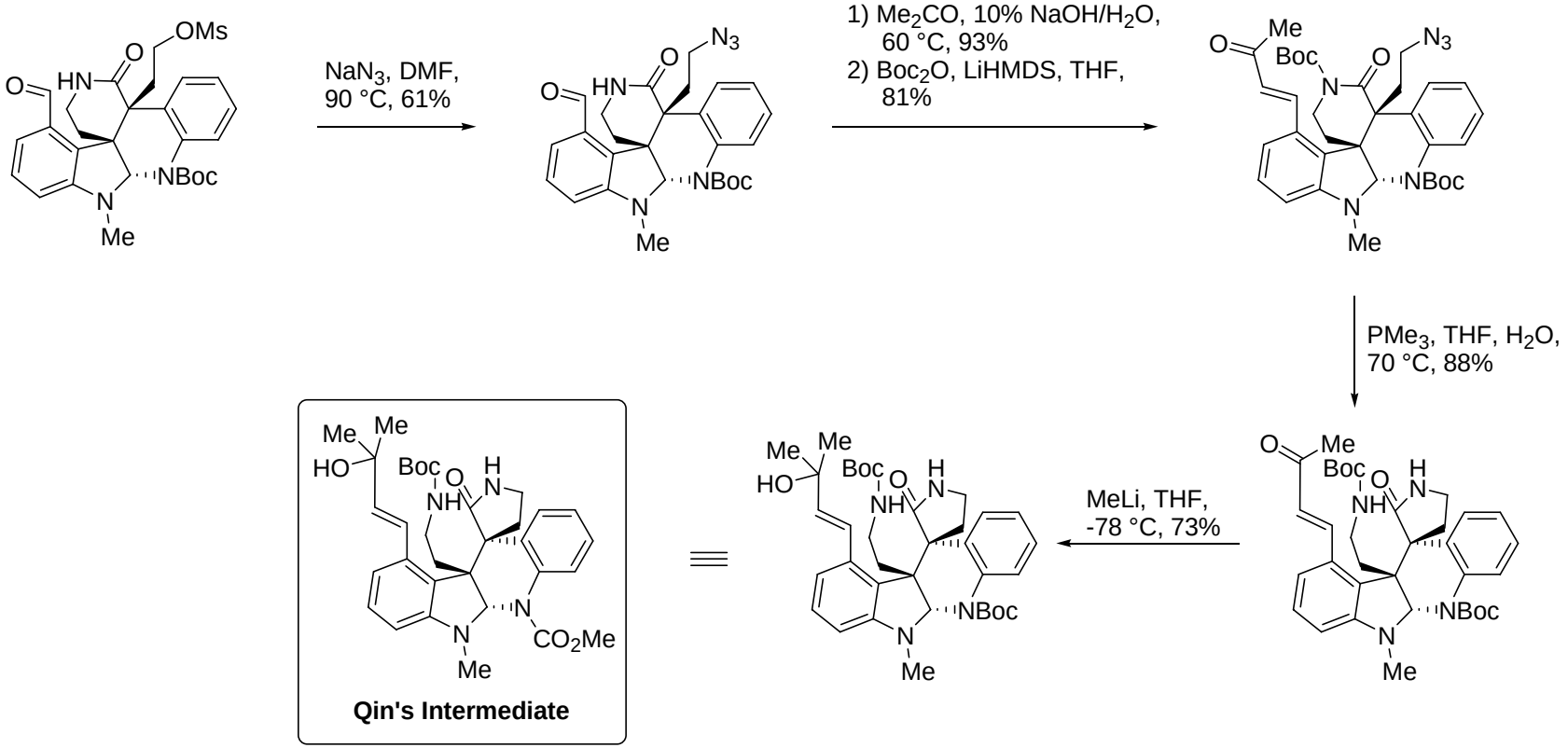
Liu, P.; Seo, J. H.; Weinreb, S. M. *Angew. Chem. Int. Ed.* **2010**, *49*, 2000–2003.

Formation of C-8 Quaternary Center



Liu, P.; Seo, J. H.; Weinreb, S. M. *Angew. Chem. Int. Ed.* **2010**, *49*, 2000–2003.

Qin's Intermediate



Liu, P.; Seo, J. H.; Weinreb, S. M. *Angew. Chem. Int. Ed.* **2010**, *49*, 2000–2003.

Summary

	Qin	Weinreb
C-7 Quaternary Center	Cyclopropanation	Heck
C-8 Quaternary Center	Claisen rearrangement	Enolate alkylation
Overall yield	3%	1%
Steps	23	30