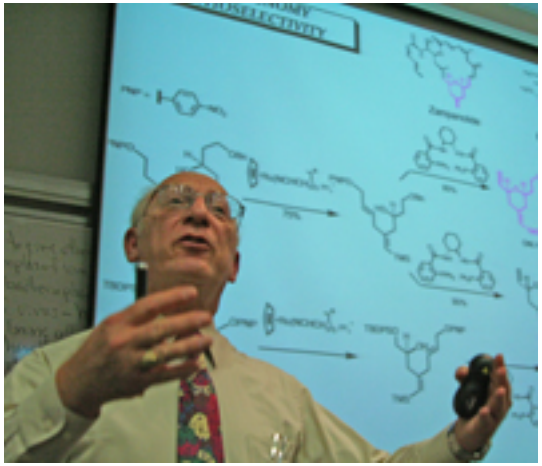
Barry M. Trost

Sebastian Krüger
Gaich-Group Seminar
15.10.12



There are two things: ...

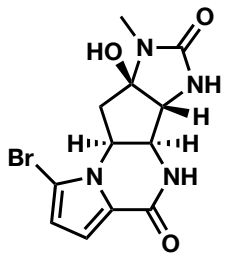
Life

- born June 13, 1941 in Philadephia
- B. A. at University of Pennsylvania in 1962
- Ph.D. Massachusetts Institute of Technology in 1965
- Professor at Wisconsin-Madison 1965-1987
- Tamaki Professor at Stanford Universit 1987 till present

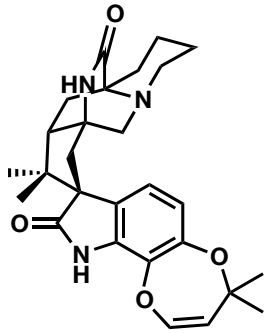
- Among the 50 most cited chemists
- Latest award: Arthur C. Cope award

- Former group mebers: Osman Achmatowicz, Dennis Curran, Andreas Gansäuer, Mike Krische, Tobias Ritter, Yian Shi, Yoshinao Tamaru

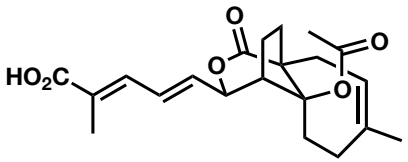
Synthesis & methods



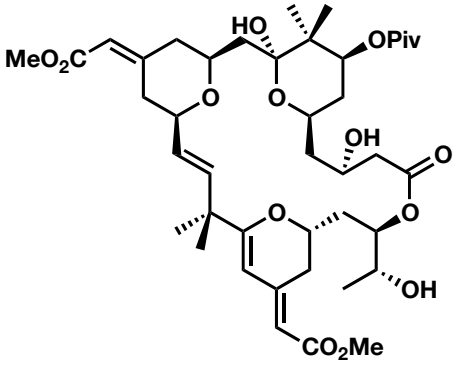
agelastatin A
key step: Pd-AAA



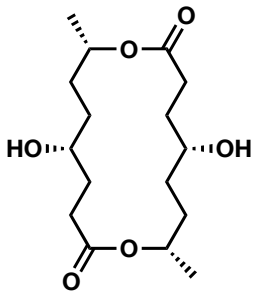
marcfortine B
key step: TMM



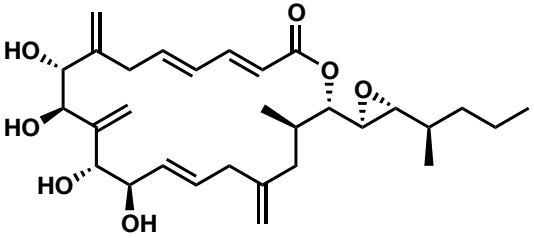
pseudolaric acid B
key step: Ru-[5+2]



bryostatin 16
key feature: atom economy

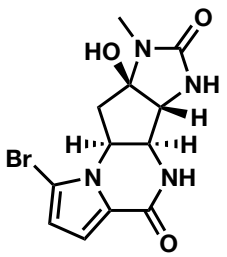


tetrahydro-pyreneophorol
key step: Prophenol



amphidinolide A
key step: alkene-alkyne coupling

AAA

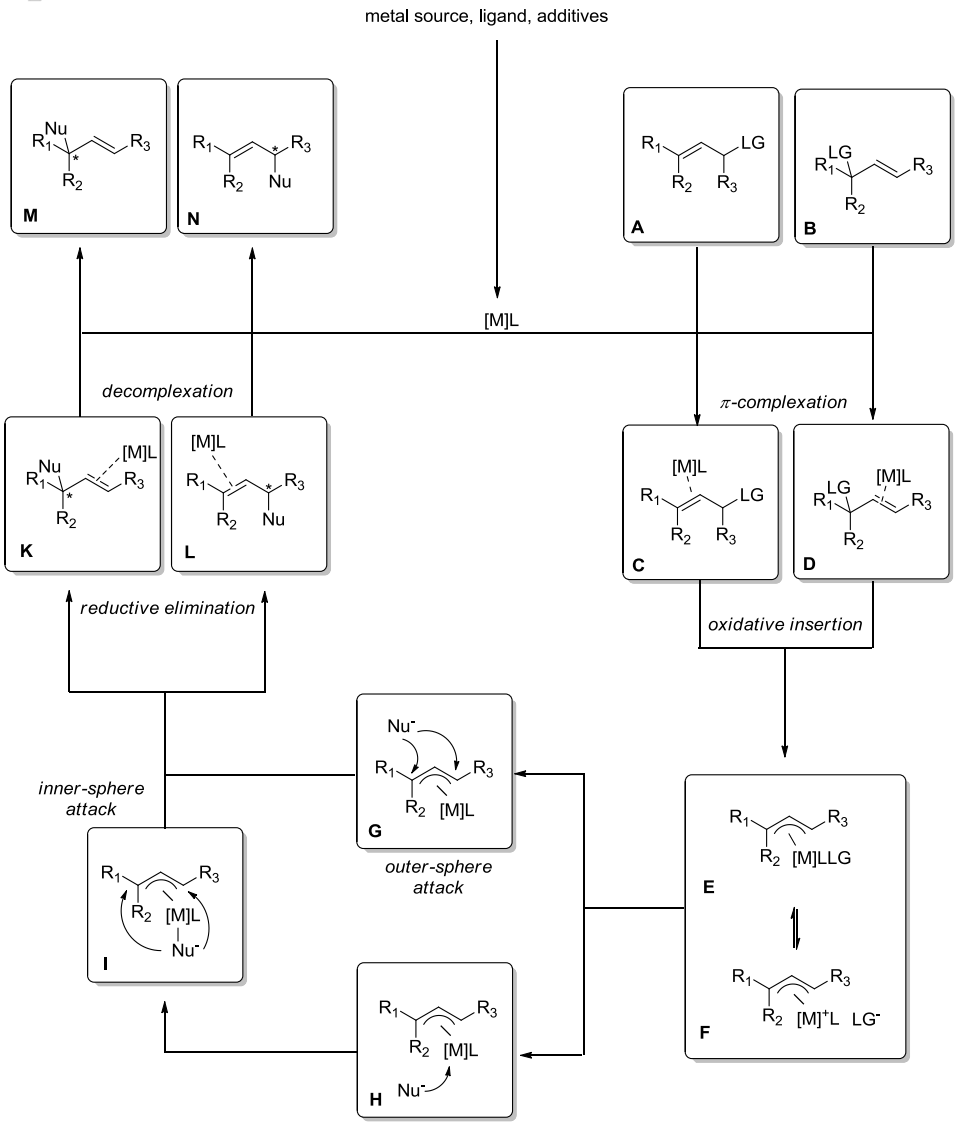


agelastatin A
key step: Pd-AAA

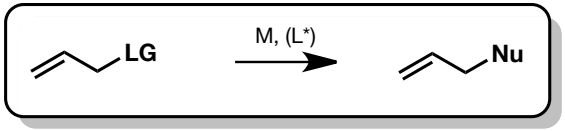
Asymmetric **a**llylic **a**lkylation reviews:

B. M. Trost, *JOC,* **2004**, *69*, 5813-5837
B. M. Trost, M. L. Crawley, *Chem. Rev.*, **2003**, *103*, 2921-2943
B. M. Trost, D. L. Van Vranken, *Chem. Rev.*, **1996**, *96*, 395-422

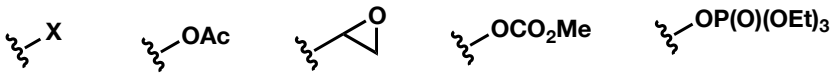
Mechanism


metal source, ligand, additives
[M]L
decomplexation
π-complexation
reductive elimination
oxidative insertion
inner-sphere attack
outer-sphere attack
M
N
A
B
K
L
C
D
G
I
E
F
H
[M]LLG
[M]+L LG-

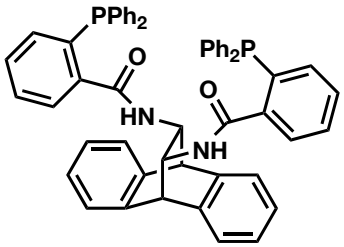
Basics I



leaving groups

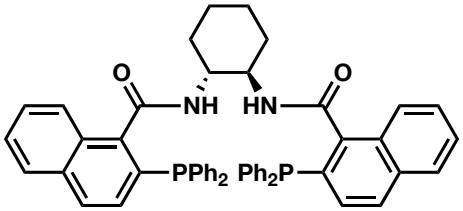


ligands



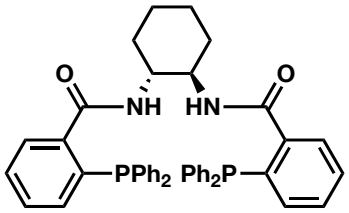
(*R,R*)-ANDEN-Phenyl Trost Ligand

500 mg 205 € (Aldrich)



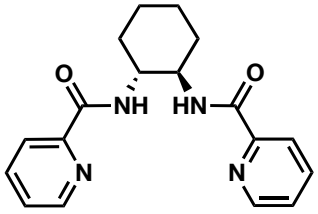
(*R,R*)-DACH-naphthyl Trost ligand

1g 230 € (Aldrich)



(*R,R*)-DACH-phenyl Trost ligand

1g 230 € (Aldrich)



(*R,R*)-DACH-pyridyl Trost ligand

1g 56 € (Aldrich)

metals

allylic alkylation is catalyzed by many transition metals (Pd, Mo, W, Ir, Ni, Pt...)

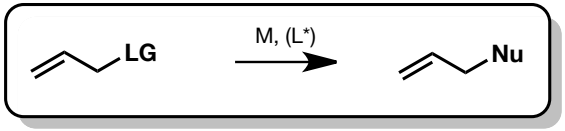
asymmetric variants for Pd, Mo (Trost) and Ir (not Trost) available

metal sources

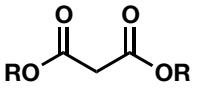
Pd_2dba_3 (1g 67 € (Aldrich)) , (η_3–$C_3H_5PdCl_2$) (1g 151 € (Aldrich))

$Mo(CO)_6$, $[Mo(C_7H_8)(CO)_3]$, $[Mo(CO)_3(MeCN)_3]$, $[Mo(NBD)(CO)_4]$

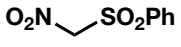
Basics II



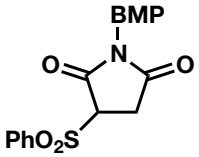
carbon nucleophiles



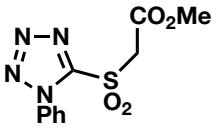
malonate type (also NHR)



sulfonylnitroalkanes

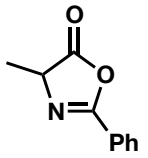


imidosulfones



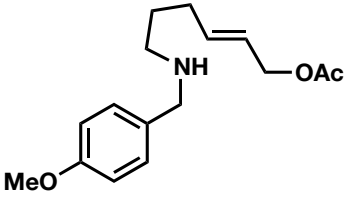
sulfone esters

nitro alkanes

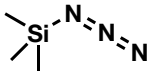


azlactones

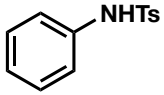
nitrogen nucleophiles



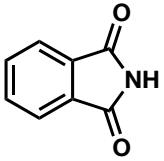
amines (challenging, best tethered secondary)



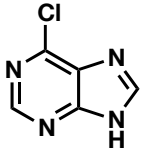
azides



sulfonamides

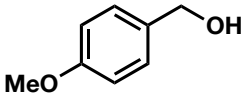


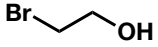
imidates



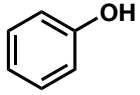
heterocycles

oxygen nucleophiles

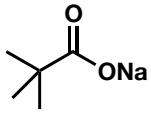




primary alcohols

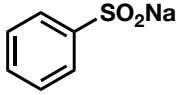


phenols



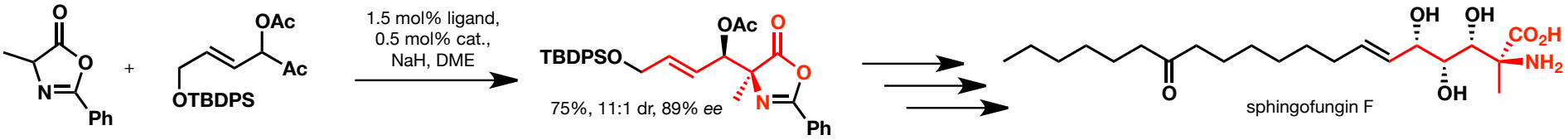
carboxylates

sulfur nucleophiles

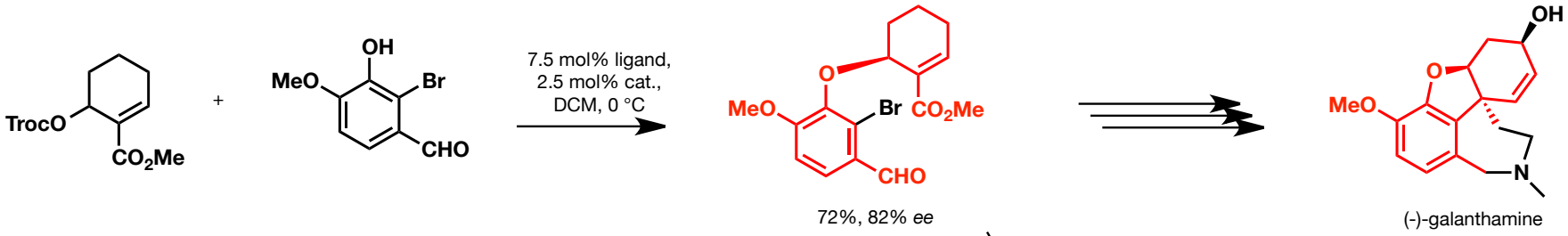


sulfones

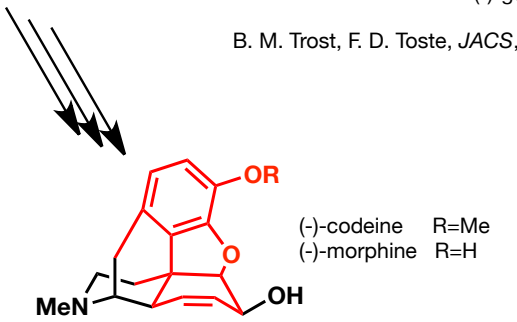
Examples



B. M. Trost, C. B. Lee, *JACS*, **2001**, *123*, 12191-12201

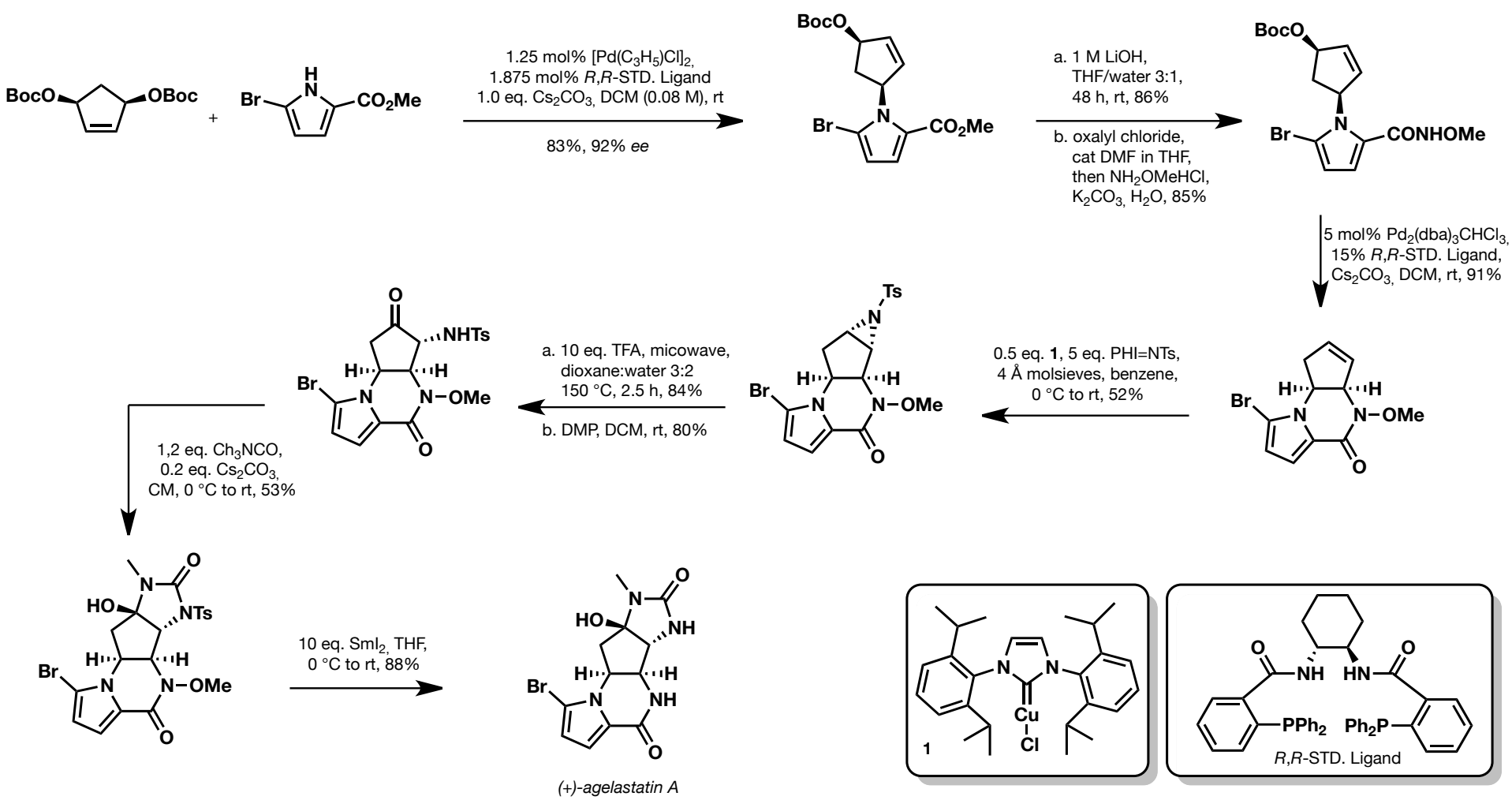


B. M. Trost, F. D. Toste, *JACS*, **2000**, *122*, 11262-11263



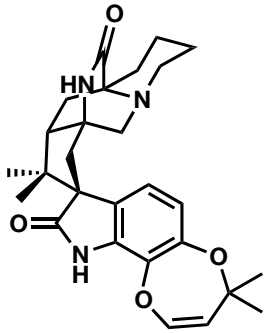
B. M. Trost, W. Tang, *JACS*, **2002**, *124*, 14542-14543

Agelastatin A



B. M. Trost, G. Dong, *JACS*, **2006**, *128*, 6054-6055

TMM

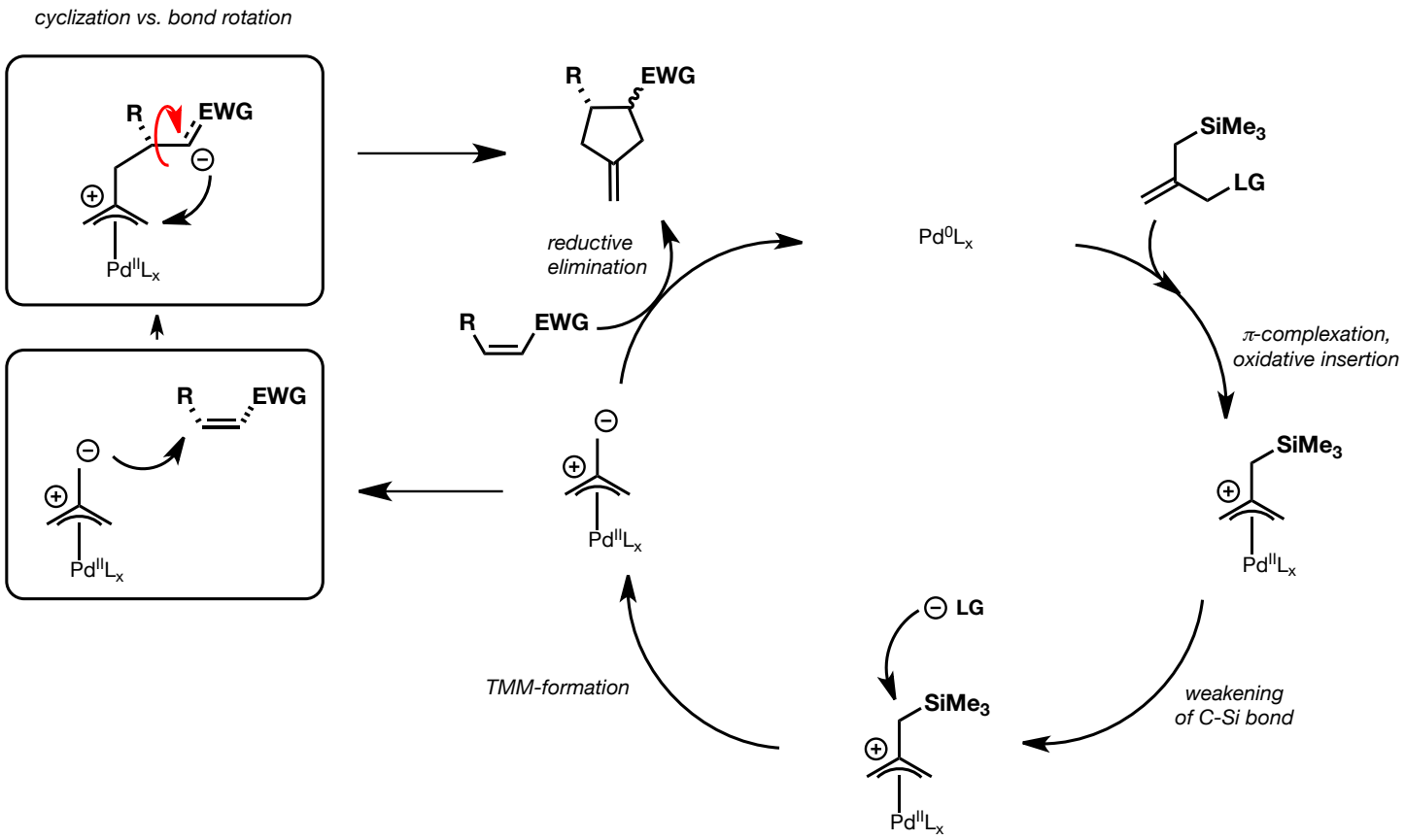


marcfortine B
key step: TMM

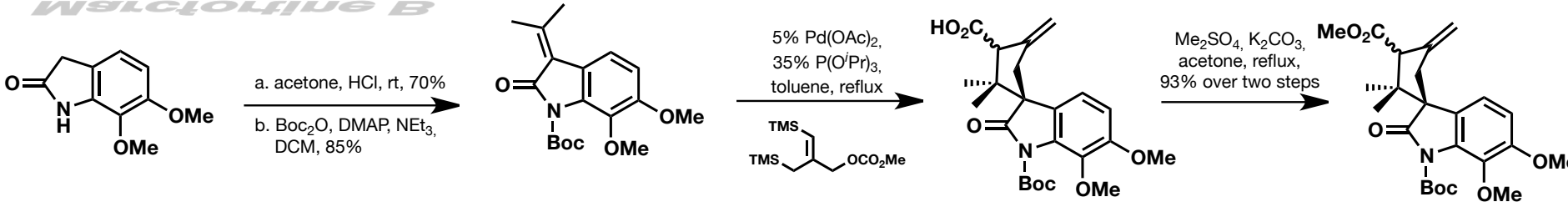
Tri**m**ethylene**m**ethane reviews:

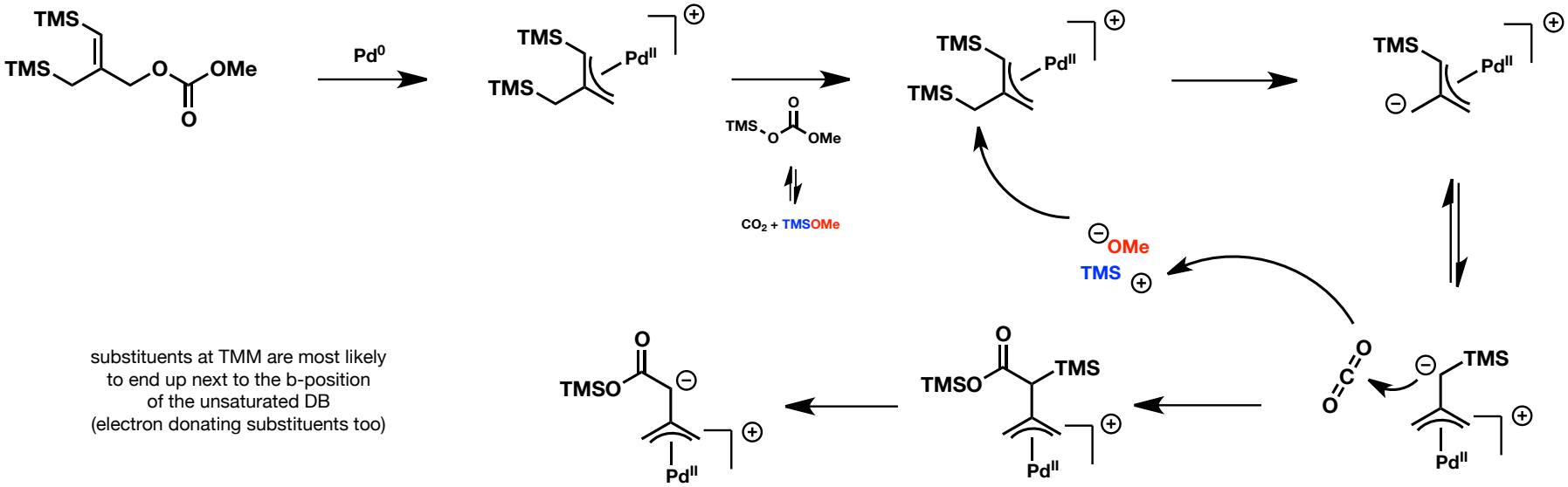
B. M. Trost, Angew. Chem. Int. Ed., 1986, 25, 1-20

Mechanism


cyclization vs. bond rotation
R
EWG
$Pd^{II}L_x$
reductive elimination
Pd^0L_x
SiMe3
LG
π-complexation, oxidative insertion
TMM-formation
weakening of C-Si bond

Marcfortine B

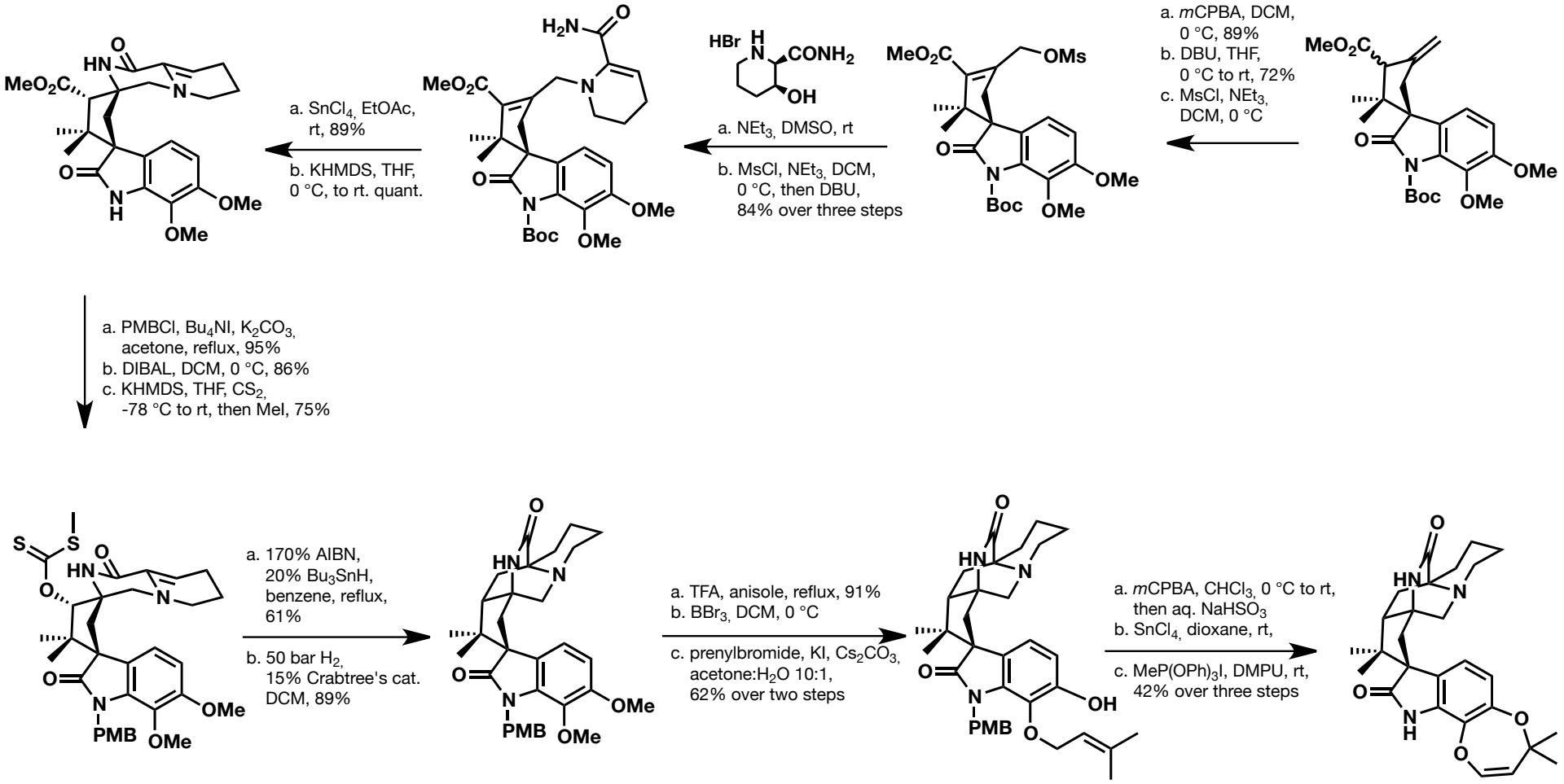




B. M. Trost, J. M. Mignani, T. Nanninga, *JACS*, **1986**, *108*, 6051-6053

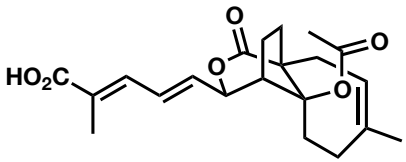
B. M. Trost, N. Cramer, H. Bernsmann, *JACS*, **2007**, *129*, 3086-3087,

Marcfortine B



B. M. Trost, N. Cramer, H. Bernsmann, *JACS*, **2007**, *129*, 3086-3087

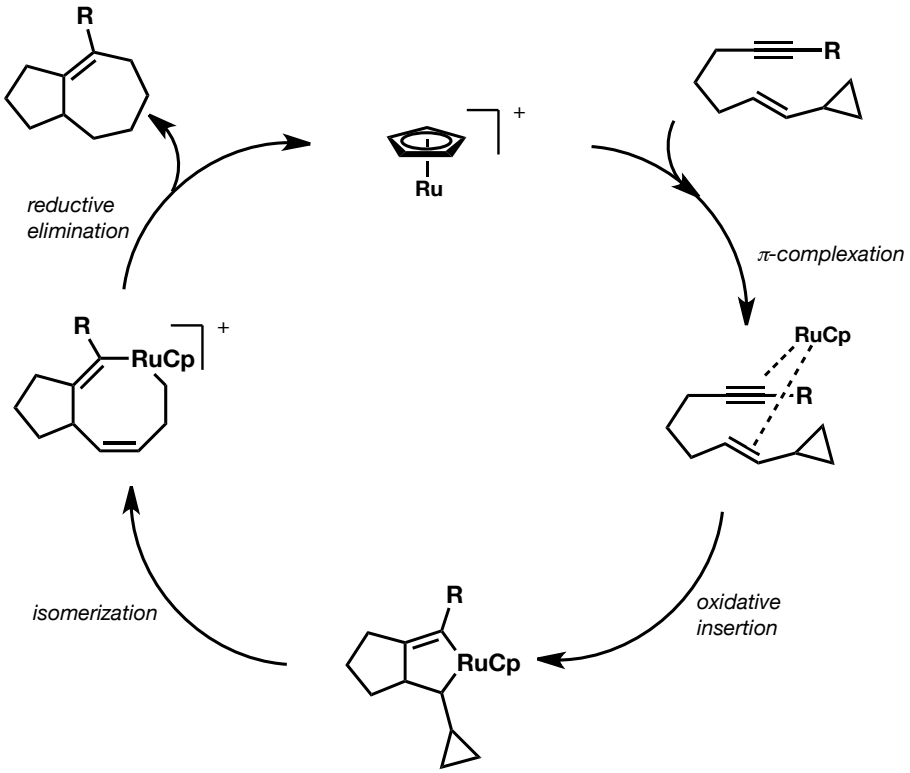
Ru-[5+2]



pseudolaric acid B

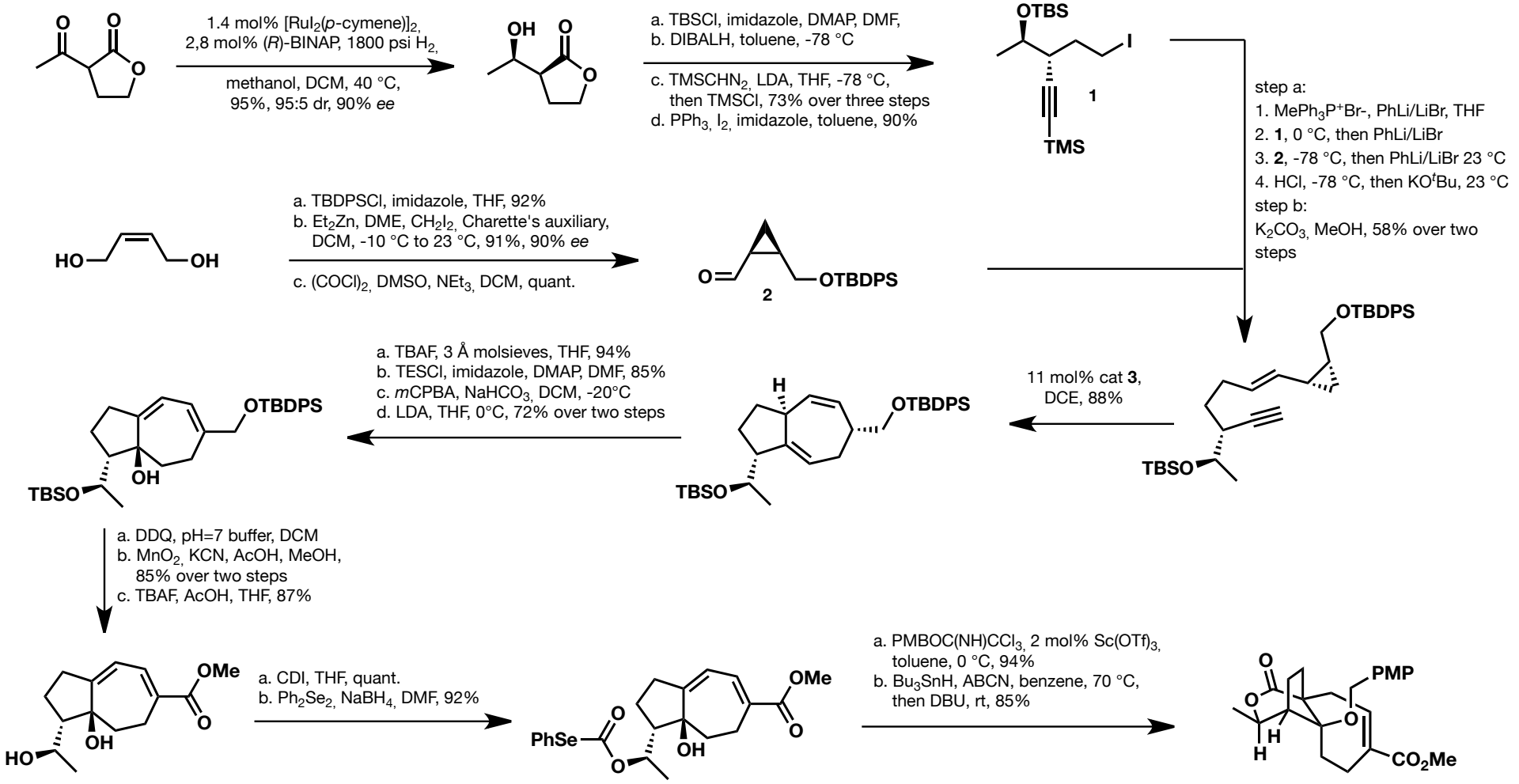
key step: Ru-[5+2]

Mechanism



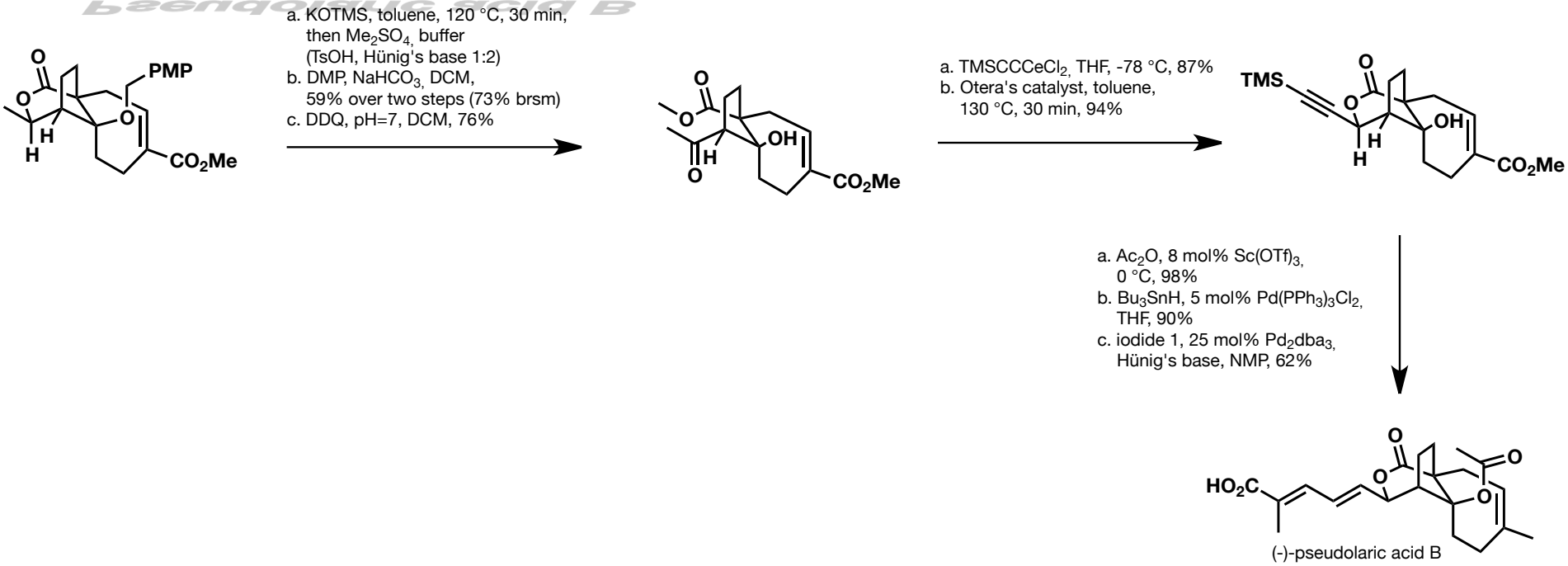
B. M. Trost, F. D. Toste, H. Sheng, *JACS*, **2000**, *122*, 2379-2380

Pseudolaric acid B



B. M. Trost, J. Waser, A. Meyer, *JACS*, **2007**, *129*, 14556-14557

Pseudolaric acid B



B. M. Trost, J. Waser, A. Meyer, *JACS*, **2007**, *129*, 14556-14557