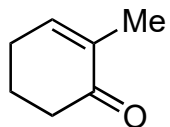


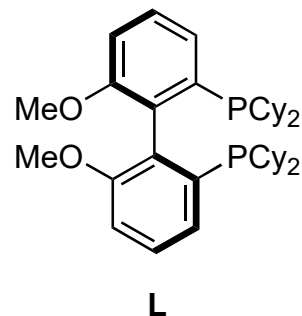
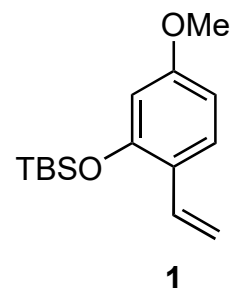
# Catalytic Asymmetric Total Synthesis of (-)-Garryine via an Enantioselective Heck Reaction

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- 1) LiHMDS, ClCO<sub>2</sub>Me; then Tf<sub>2</sub>O
- 2) **1**, 9-BBN, THF, 23 °C; then H<sub>2</sub>O; then **product of step 1**, Pd(PPh<sub>3</sub>)<sub>4</sub>, K<sub>3</sub>PO<sub>4</sub>, 60 °C
- 3) *p*-TsOH
- 4) Tf<sub>2</sub>O, Et<sub>3</sub>N
- 5) Pd<sub>2</sub>(dba)<sub>3</sub>, **L**, PMP, PhF, 80 °C



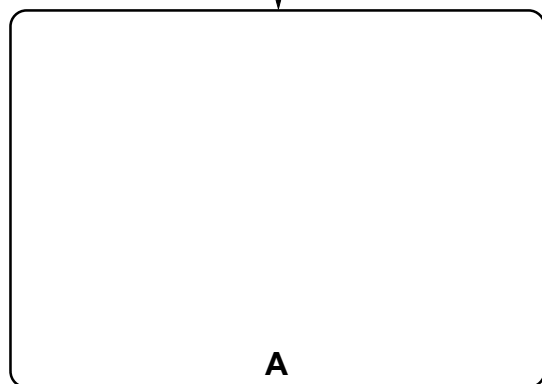
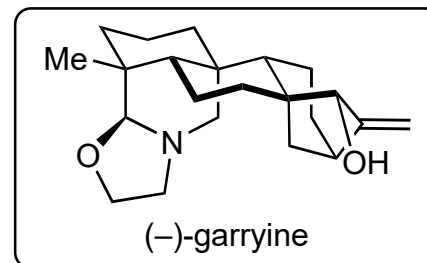
2) Name of the reaction?

5) Name of the reaction?

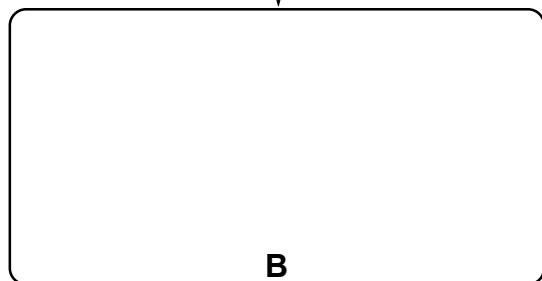
6) Name of the catalyst?

8) Name of the reaction?

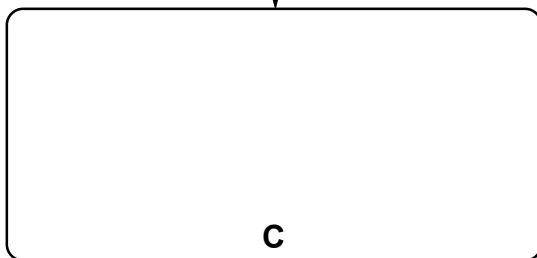
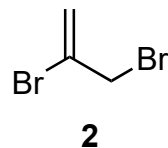
*Hint: Two reactions*



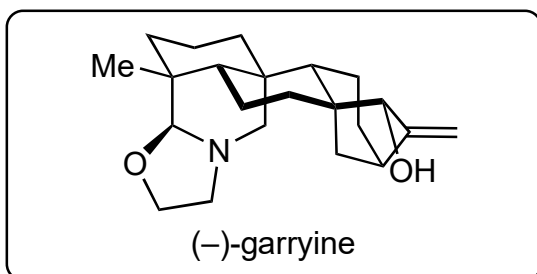
- 6) Pd(OH)<sub>2</sub>/C, H<sub>2</sub>
- 7) LDA, MeI
- 8) Li, NH<sub>3</sub> (liq.)



- 9) *m*-CPBA
- 10) Et<sub>3</sub>N
- 11) Sc(OTf)<sub>3</sub>
- 12) TBSCl
- 13) **2**, LiHMDS, HMPA
- 14) AIBN, *n*-Bu<sub>3</sub>SnH



- 15) OsO<sub>4</sub>, NaIO<sub>4</sub>
- 16) Lawesson's reagent
- 17) Raney-Ni; *then* Pd/C, H<sub>2</sub>
- 18) LiHMDS, MeI; *then* Comins reagent
- 19) Pd(OAc)<sub>2</sub>, PPh<sub>3</sub>, HCO<sub>2</sub>H
- 20) TPP, O<sub>2</sub>, *hv*; *then* Me<sub>3</sub>P
- 21) Ac<sub>2</sub>O
- 22) *p*-TsOH
- 23) PIDA, I<sub>2</sub>, *hv*; *then* ethanolamine
- 24) K<sub>2</sub>CO<sub>3</sub>, MeOH



- 11) *Hint: Elimination*
- 14) *Hint: Natural product like*

15) Name of the reaction?

16) *Hint: selective for the enone*

20) Name of the reaction?

23) Name of the reaction?

*Hint: Oxidation of the alcohol instead of ether formation after iodination*