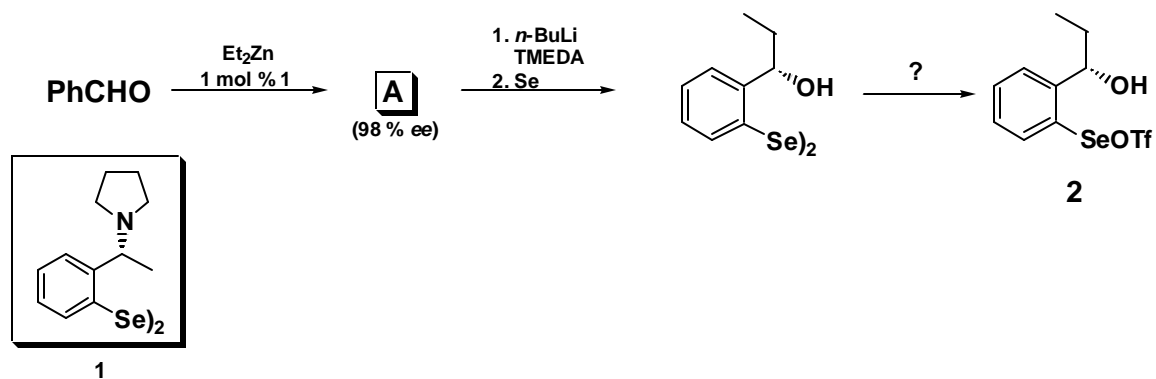


Chiral Selenium Compounds in Organic Synthesis

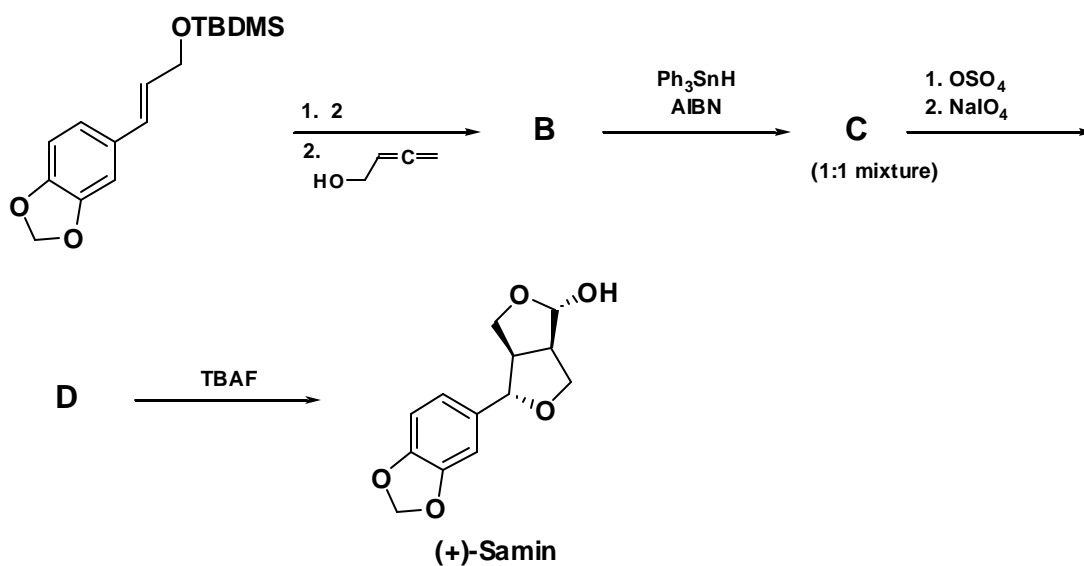
1. Chiral diselenides were instrumental in Wirth's total synthesis of (+)-Samin, a component of sesame oil.

a) Chiral selenium reagent **2** was a key player in his approach. What is the structure of compound **A**, and provide a catalytic cycle for its formation.

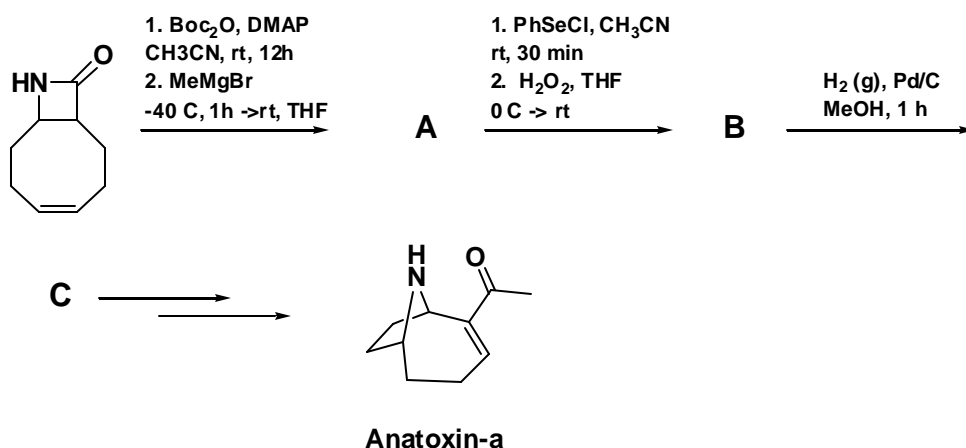


Also, how would you then make compound **2**?

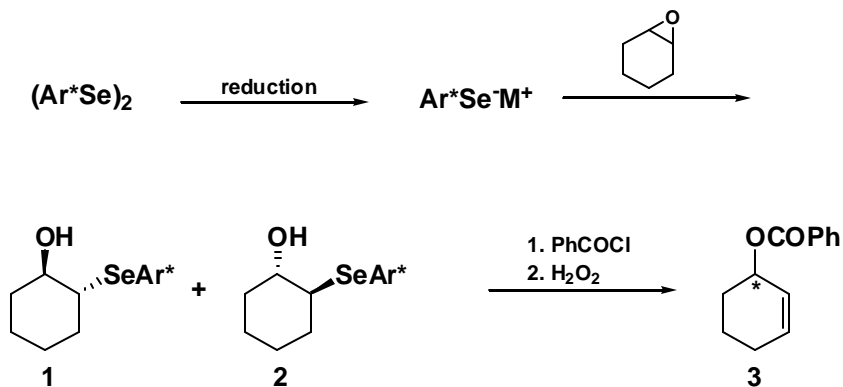
b) Now we're ready to make (+)-Samin. Provide the missing intermediates in his short synthesis.



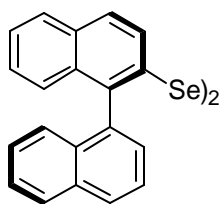
2. Anatoxin-a is a nicotinic acetylcholine receptor agonist. Provide the missing intermediates in this synthesis by Parsons and coworkers. What is the mechanism for the formation of compound **B**?



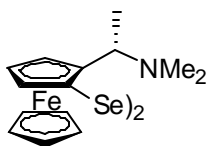
3. Different research groups have used chiral aryl selenoate reagents in the stereoselective ring opening of meso-epoxides, as shown below.



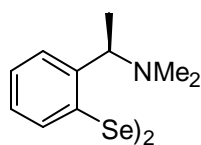
a) Which of the following diselenides investigated would you expect to give the greatest selectivity for compound **2** under equivalent reduction conditions?



a



b

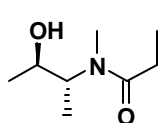


c

b) Why do you think the diastereomeric excess of compound **3** is so dependent on the reducing agent employed when the same diselenide is used?

diselenide	reducing agent, conditions	de (configuration of 3)
b	NaBH ₄ , EtOH, 25 C	2 % (<i>S</i>)
b	LiAlH ₄ , THF, 40 C	69 % (<i>S</i>)

4. Provide the missing intermediates in Carreira's synthesis of Leucascandrolide A.

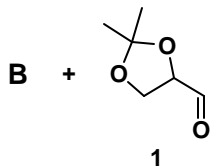


1. LDA, LiCl, allyl iodide, THF, -78 C -> 0 C, 2 h
 2. LDA, NH₃BH₃, THF, rt, 2 h
 3. TIPSCl, imidazole, DMAP, rt, 1h
 4. 9-BBN, THF, rt, 6 h

A

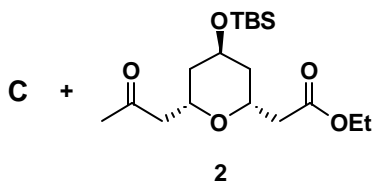
1. aq NaClO, TEMPO (2 mol %), KBr (10 mol %), DCM, pH 8.6 carbonate buffer, 0 C, 15 min
 2. (MeO)₂P(O)CN₂CO₂CH₃, K₂CO₃, MeOH, 16 h, rt

B



1. B, Zn(OTf)₂, (-)-N-methyl epinephrine, Et₃N, PhCH₃, then 1, rt, 2 days
 2. LiAlH₄, THF, rt, 5 h
 3. BzCl, Et₃N, DMAP, DCM, rt 15 h
 4. nBu₄NF, THF, 0 C -> rt, 24 h
 5. 4 A MS, NMO, DCM, then TPAP, rt, 30 min

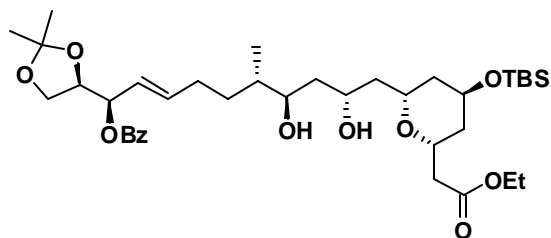
C



1. 2, Bu₂BOTf, Et₃N, Et₂O, -78 C, then C, 5 h

D

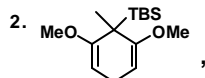
1. TABH, AcOH, CH₃CN, -40 C, 70 h



1. K₂CO₃, MeOH, rt, 40 h

E

1. 2,6-di-tert-butyl-4-methylpyridine, DCM, -78 C, then slow addition of TIPPSeBr



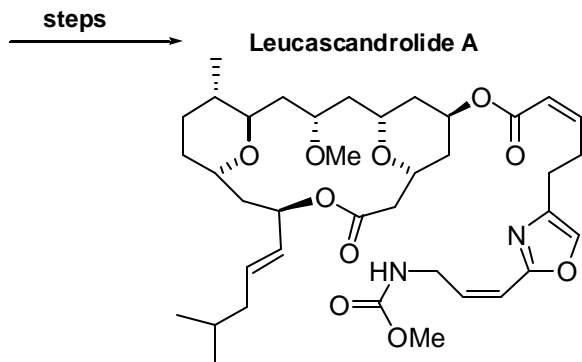
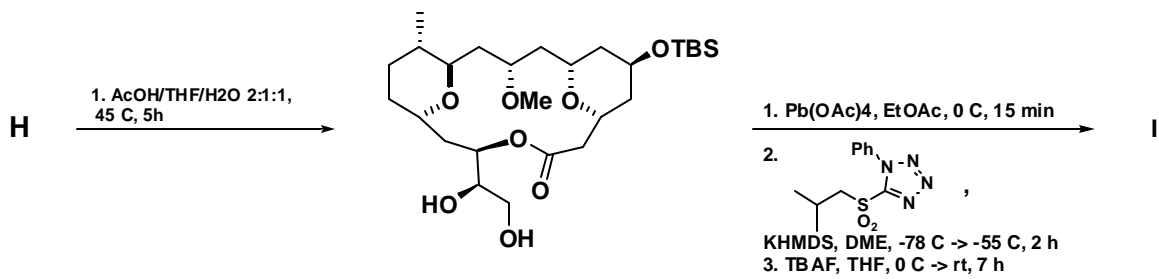
AIBN, hexane, reflux, 2 h

F

1. TMSOK, Et₂O, rt, 24 h
 2. 2,4,6-trichlorobenzoyl chloride, Et₃N, rt, 1 h, then dilution with DMF and slow addition to DMAP in DMF

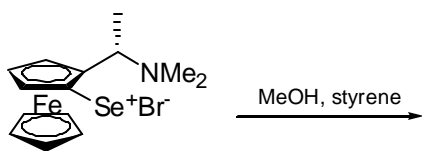
G

1. Me₃OBf₄, Proton Sponge, 4 A MS, rt, 30 min



5.

a) Predict the product for the following transformation. What is the origin of the selectivity?



b) Give the product.

