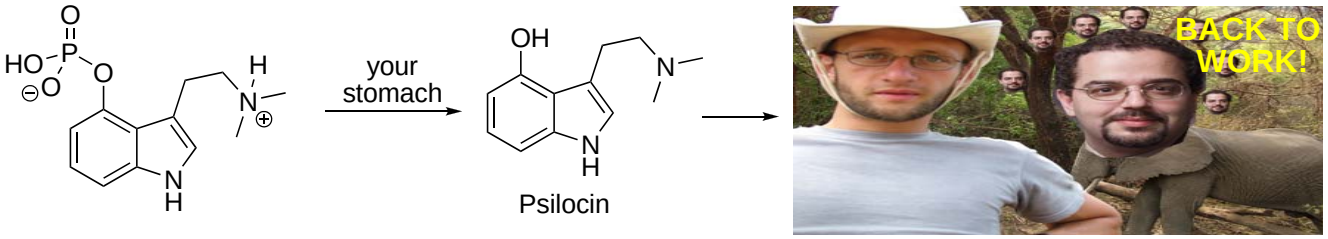
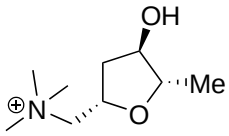
# Mushroom Chemistry, Toste Group Problem Set, 04/21/08

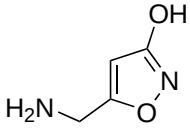
**1. Psychoactive**

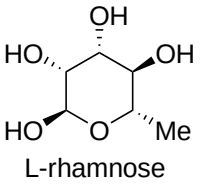
a. Psilocin and Psilocybin are the most well known mushroom derived halucinogens. Propose a synthesis of psilocin from chemicals available in the department.




b. The famous *Amanita muscaria* (aka fly agaric, red mushroom with white dots) is known to be quite toxic in addition to inducing a dreamlike state. Muscarine was long assumed to be the active compound, however, recent research has revealed that muscimol holds this honor. In any case, follow along on this protecting group free 1992 synthesis of muscarine.


Muscarin

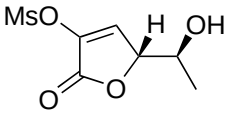

Muscimol


L-rhamnose

1. $Br_2$, $BaCO_3$, $H_2O$
2. TFA, $H_2O$

**A**

3. MsCl, py
4. $(CF_3CO)O_2$, $Et_3N$
then AcOH, MeOH



5. 10% Pd/C, $H_2$
6. $LiBH_4$, THF

**B**

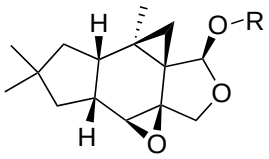
7. TsCl, py
8. $Me_3N$, MeOH

Muscarin

**2. Tasty or not.**

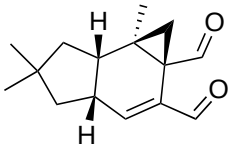
It has been proposed that several mushrooms in the Russulaceae family use the enzymatic degradation of velutinal to isovelleral as a chemical defense mechanism. Follow Heathcock's synthesis of isovelleral.

A Russulaceae

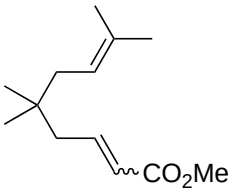



velutinal esters
mild tasting

tissue damage
[enzymes]



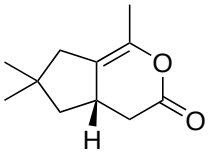

isovelleral
hot, pungent flavor
antimicrobial and antifungal



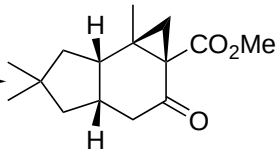

1. 235°C, 24 hrs, *93%*
2. KOH, MeOH, *100%*
3. $O_3$ then $Me_2S$, *100%*

**A**

$(COCl)_2$, Δ
*94%*




3 steps

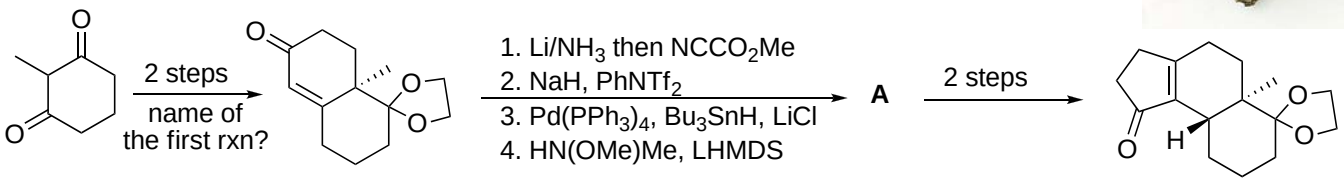


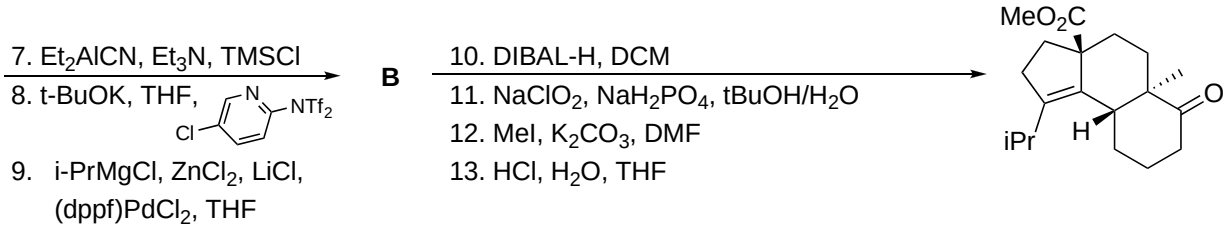

1. LDA then $PhNTf_2$
2. $Pd(OAc)_2$, $PPh_3$, MeOH, CO, $Et_3N$, DMF, rt, 2hrs
3. DIBAL-H
4. Swern

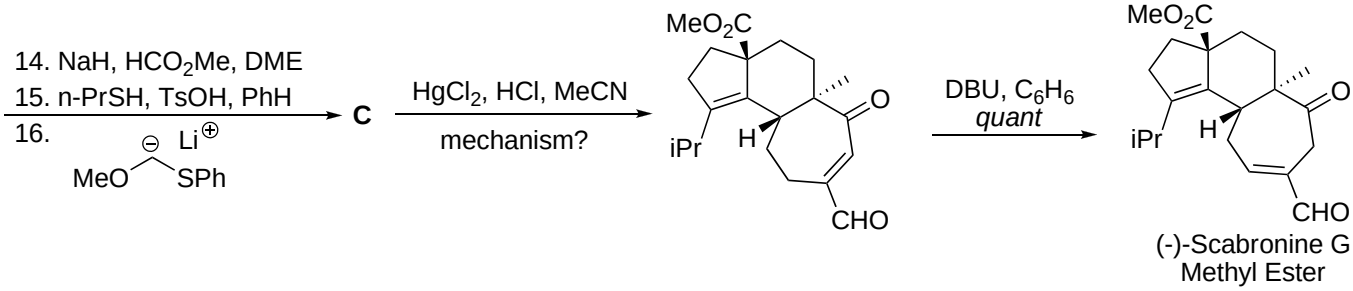
(±)-isovelleral

**3. I'm not 'bitter'**

The scabronine's were isolated from the 'bitter' mushroom *Sarcodon scabrosus* and induce neuronal differentiation of certain rat cells. Follow Danishefsky's synthesis of Scabronine G.



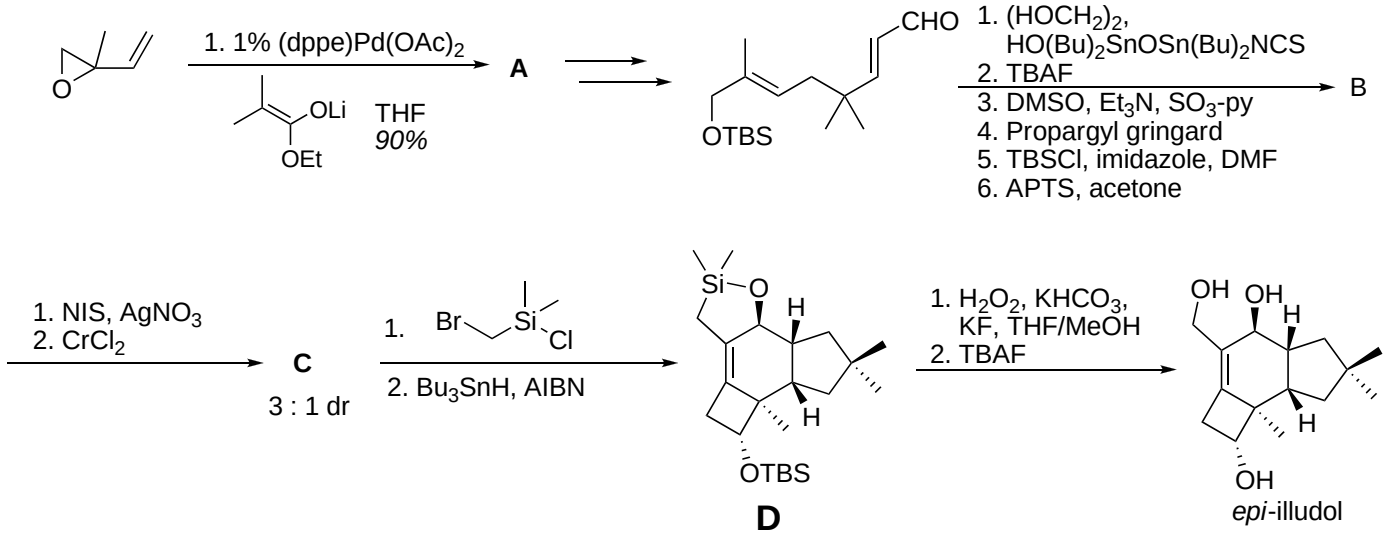




(-)-Scabronine G
Methyl Ester

**4. I Glow in the dark, no really.**

The poisonous *Clitocybe illudens*, more commonly known as the Jack o' Lantern mushroom, luminesces so brightly that one can read by its light. This 'shroom also produces illudol, which has been synthesized at least 4 times. Of particular note are Vollhardt's synthesis featuring a Co-catalyzed intramolcular [2+2+2] reaction and Malacria's, shown below. Follow along.




Also, note that **D** is formed as a single diastereomer. The authors propose that this selectivity partially results from the fact that minor diastereomer of **C** decomposes in the course of conversion to **D**. Explain why the major diastereomer of **C** proceeds to **D** with such high selectivity.