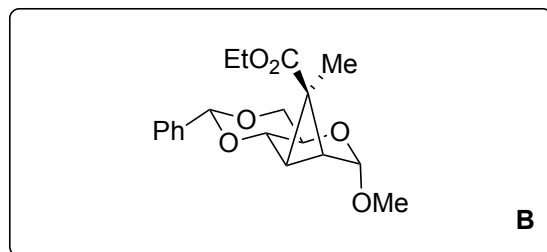
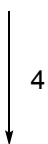
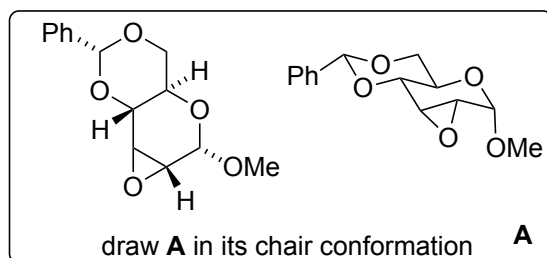
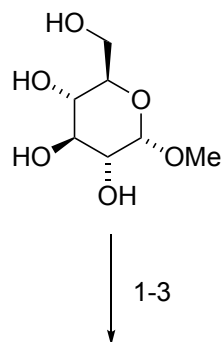


## An Enantiospecific Route to (+)- and (-)-Chrysanthemum Dicarboxylic Acids

B. J. Fitzsimmons and B. Fraser-Reid

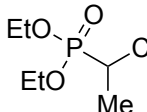
*Tetrahedron* **1984**, *40*, 1279-1287



1. *p*-TsOH, (MeO)<sub>2</sub>CHPh
2. TsCl (excess), pyridine
3. NaOMe, MeOH/CH<sub>2</sub>Cl<sub>2</sub>

Preparation of **A**:

*Can. J. Chem.* **1982**, *60*, 327.

4. NaH, , then **A**

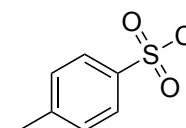
What is the name of the sugar starting material?

*methyl glucopyranoside (glucose)*

1. What is the name of the protecting group that is installed?

*benzylidene*

2. What is the structure of TsCl?



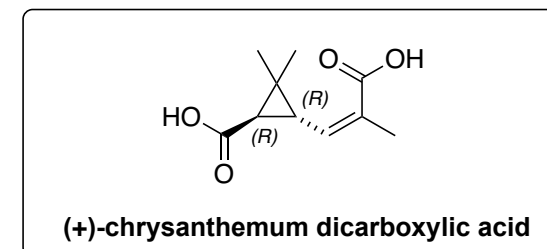
4. What is the name of this reaction?

*Wadsworth-Emmons Cyclopropanation*

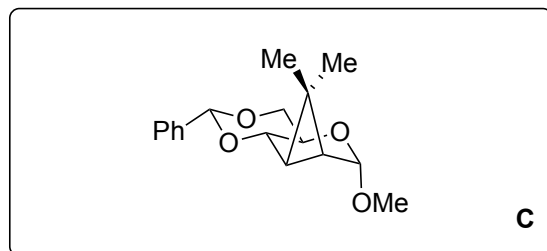
*J. Am. Chem. Soc.* **1962**, *84*, 3944.

Only one product is formed. Provide a mechanism and rationale for the formation of the product.

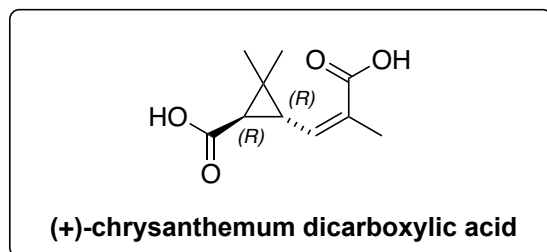
(Hint: think about orbitals) Ethoxide is not a leaving group.



5-7

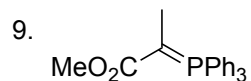


8-13



5.  $\text{LiAlH}_4$
6.  $\text{MeSO}_2\text{Cl}$
7.  $\text{LiAlH}_4$

8.  $\text{H}_2\text{O}/\text{dioxane}$ , reflux



10. *p*-TsOH, MeOH
11.  $\text{NaIO}_4$
12. NaOMe
13.  $\text{Ag}_2\text{O}/\text{NaOH}$

8. How would you confirm the stereochemistry of the cyclopropane ring after this step?

*The authors treated the resulting aldehyde with NaOMe to epimerize and compared the NMR signals of the aldehydic proton. The cis cyclopropane had  $\delta = 9.45$  ppm and the trans cyclopropane had  $\delta = 9.32$  ppm.*

12. Hint: an epimerization occurs.
13. Hint: Ester is also hydrolyzed during this step.

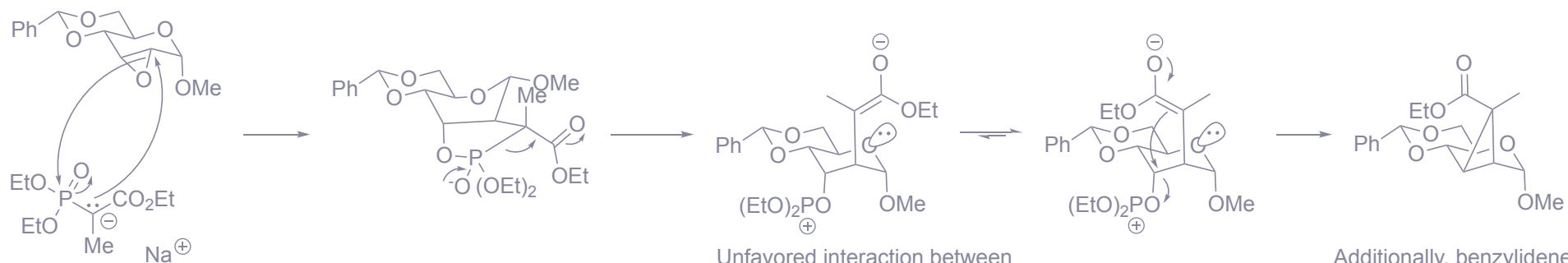
What is the name of this reagent?

*Tollens Reagent*

If you wanted to access the (–)-enantiomer, how would you do it from an intermediate in this synthesis?

*Epimerize product after step 8 using NaOMe then follow steps 9-13, skipping step 12.*

Step 4:



Unfavored interaction between enolate  $\pi$  electrons and p-orbital of ring Oxygen

Additionally, benzylidene restricts the flexibility of the system so only one product is formed