



JOC YEAR IN REVIEW

1972

ALEXANDROS ZOGRAFOS

THE BARAN GROUP MEETING

08/20/2003

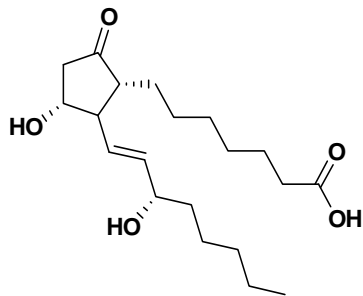
The difficult decision



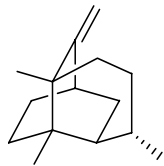
Some statistics

- Number of articles 1225!
- Full articles 480
- More than 25 total synthesis
- Isolation and characterization of 52 molecules
- Several novel methods

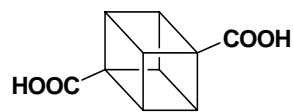
Total synthesis



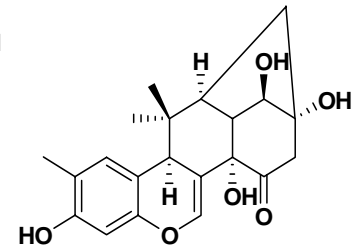
Prostaglandins



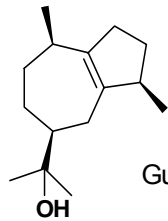
(-)-Seychellene



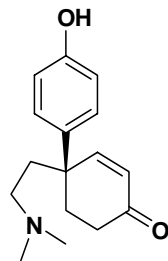
Cubane derivatives



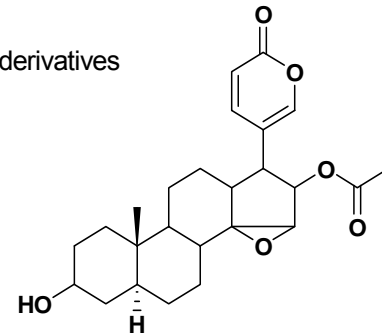
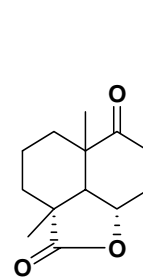
Mirestrol



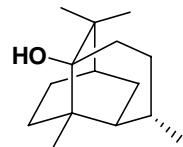
Guaiol



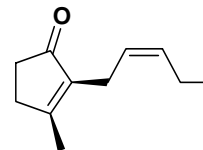
Dehydrojoubertiamine



Cinobufacin

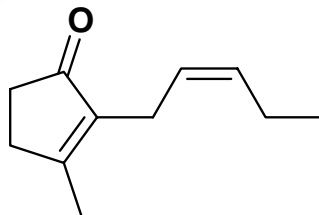


(-)-Patchouli alcohol



Jasmone

Total Synthesis of cis-Jasmone

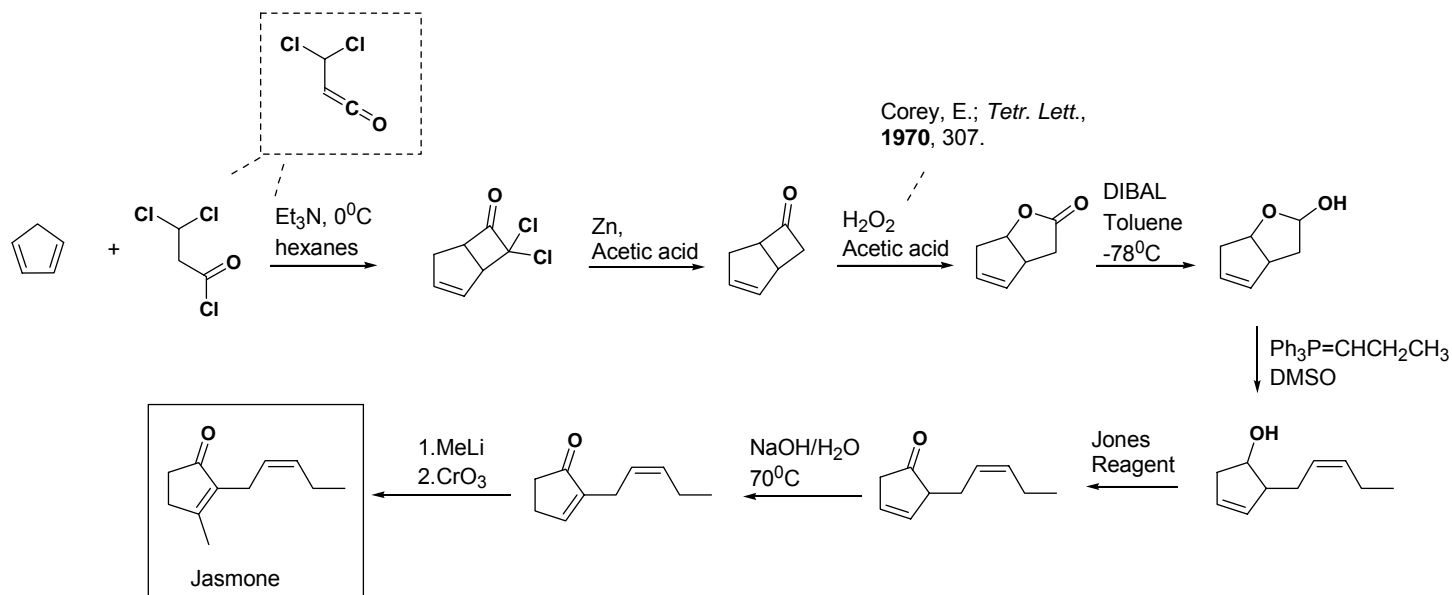


- Isolated from flower oils of *Jasminum*
- Indispensable in the reproduction of jasmine fragrance
- Several preparations have been reported
First synthesis at 1952 by Harper
- Two total synthesis in 1972.

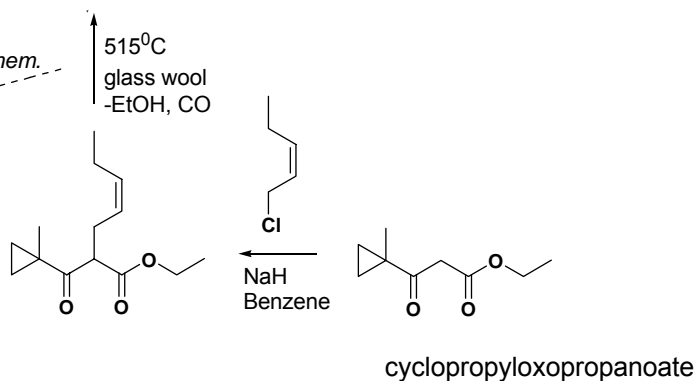
Crombie, L.; Harper, S.; *J. Chem Soc.*; **1952**, 869; Harper, S; Smith, J.; *J. Chem. Soc.*; **1955**, 1512; Buchi, G.; Egger, B.; *J. Org. Chem.*; **1971**, 36, 2021; Mc Murry, J.; Melton, J.; *J. Am. Chem. Soc.*; **1971**, 93, 5309.

Two Efficient Methods for the Construction of cis-Jasmone

Berkowitz, W.; *J. Org. Chem.*, **1972**, *37*, 341; Grieco, P.; *J. Org. Chem.*, **1972**, *37*, 2363.

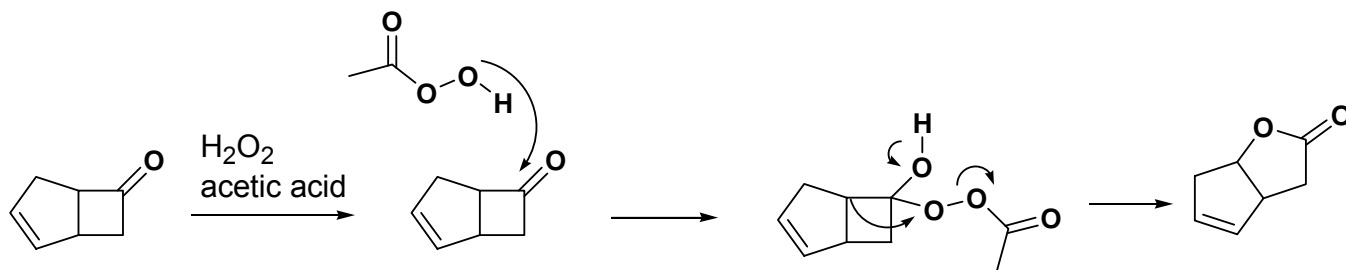


Berkowitz, W.; *J. Org. Chem.*
1971, *36*, 3787

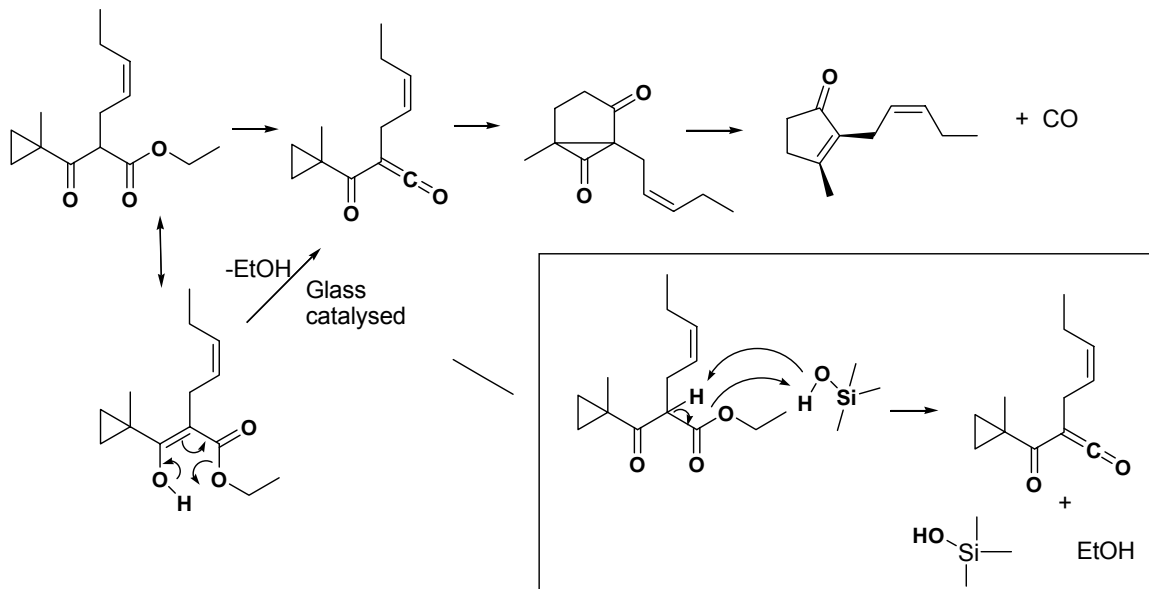


Highlights

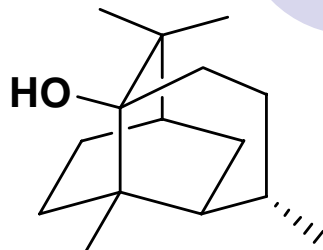
Baeyer-Villiger Ring Expansion



A Thermal Two Carbon Ring-Expansion



Total Synthesis of Patchouli Alcohol

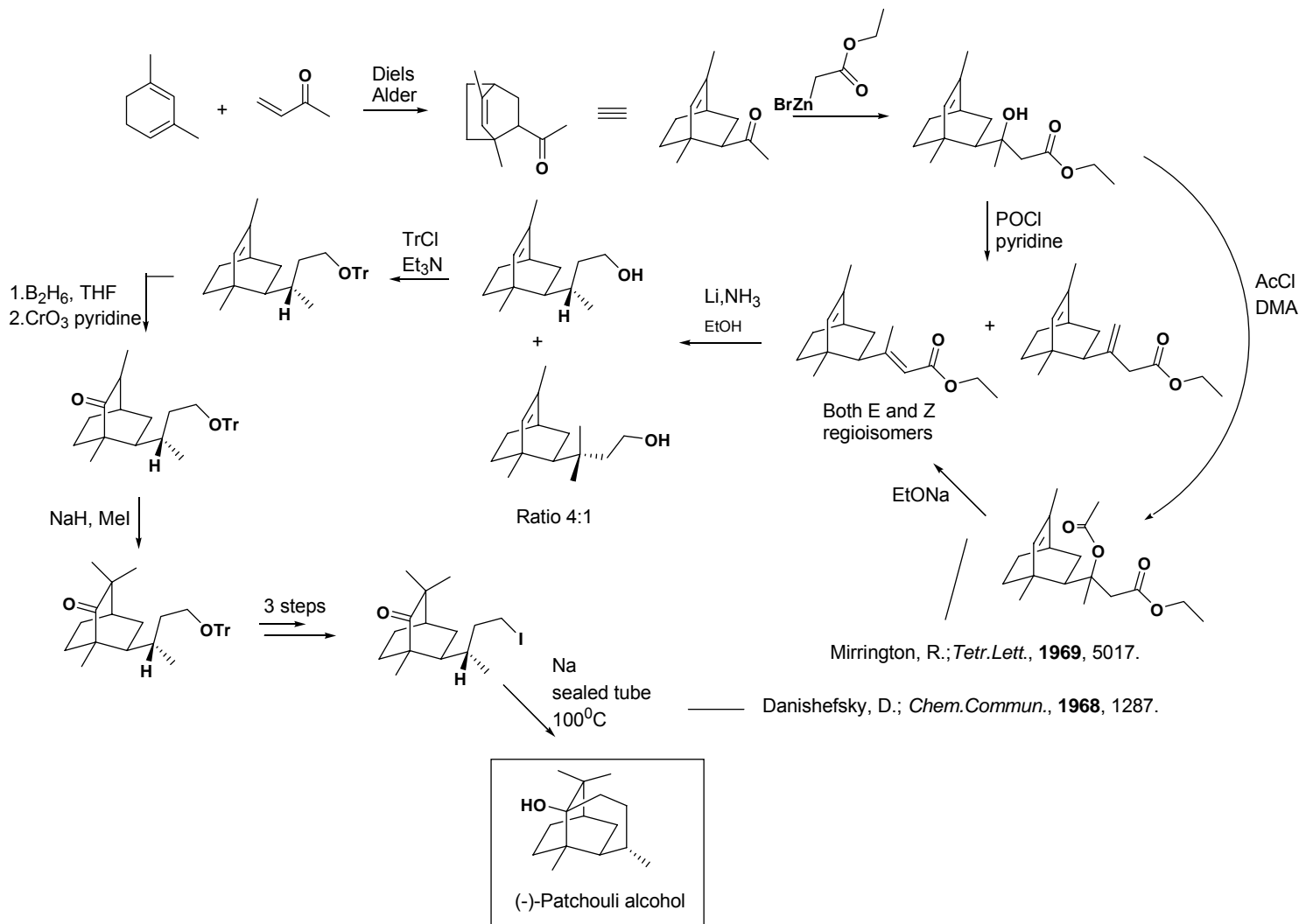


- A tricyclic sesquiterpene isolated from patchouli oil
- An important raw material for the composition of perfumes
- First total synthesis by Buchi at 1956

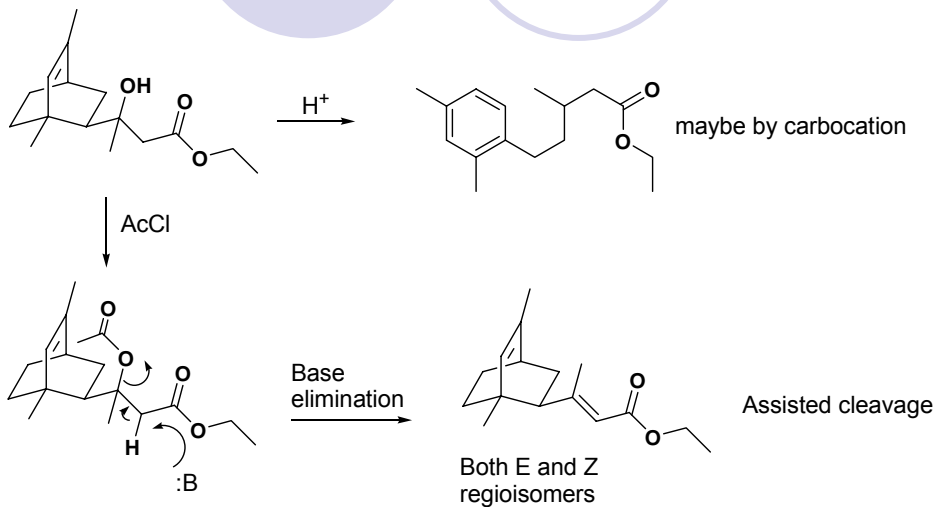
Buchi, G.; Erickson, R.; J. Am. Chem. Soc., 1956, 78, 1262; Buchi, G.; Erickson, R.; J. Am. Chem. Soc., 1961, 927; Buchi, G.; McLeod, W.; J. Am. Chem. Soc., 1962, 84, 3205; Buchi, G.; McLeod, W.; Padilla, O.; J. Am. Chem. Soc., 1964, 86, 4438.

A Synthetic Route to Racemic Patchouli Alcohol

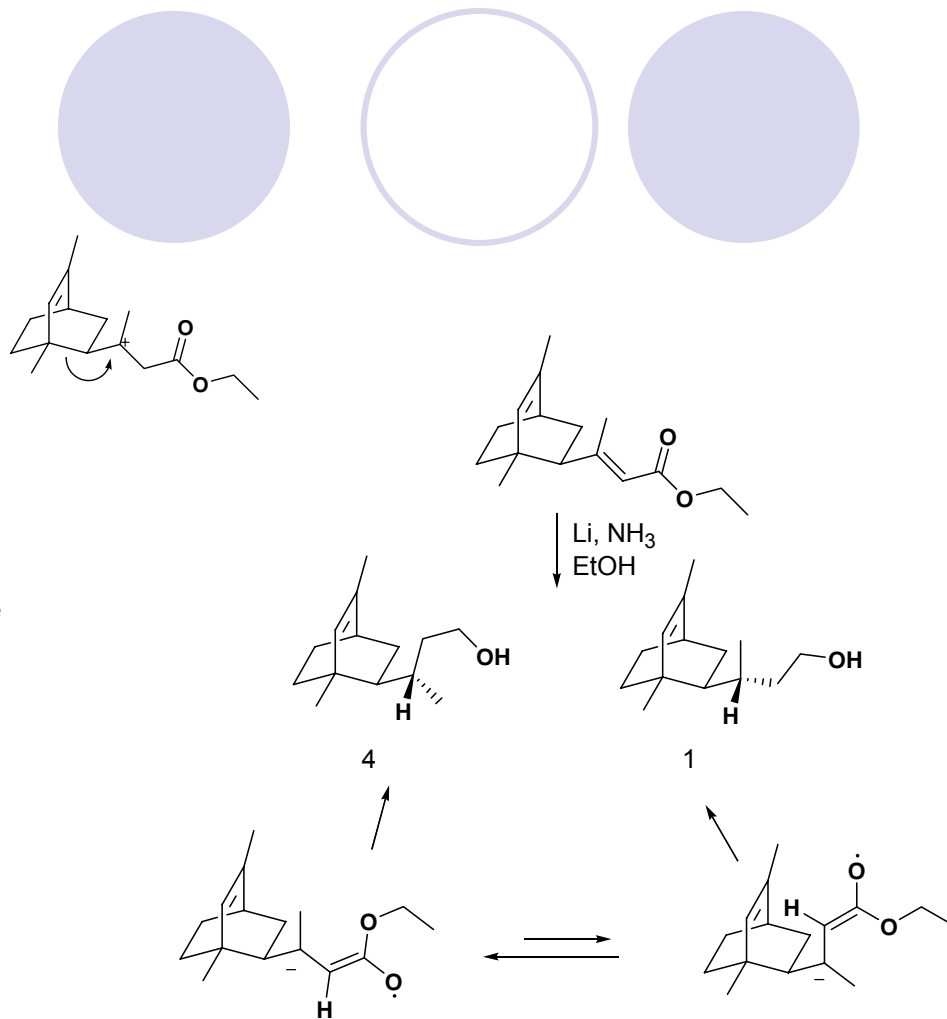
Mirrington, R.; Schmalzl, K.; *J. Org. Chem.*, **1972**, 37, 2871



Highlights



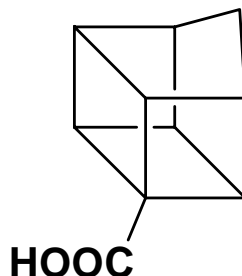
Selective dehydration



Proton attacks from the less hindered side

Stereochemistry of the reduction

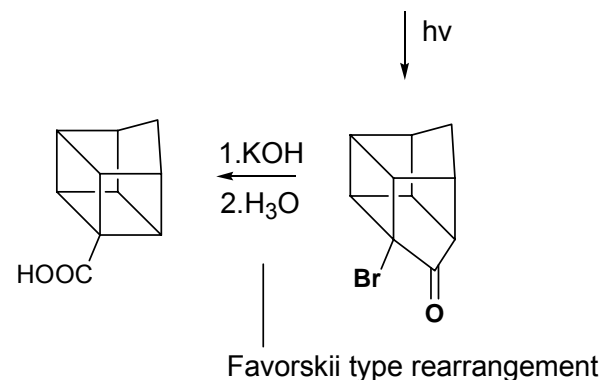
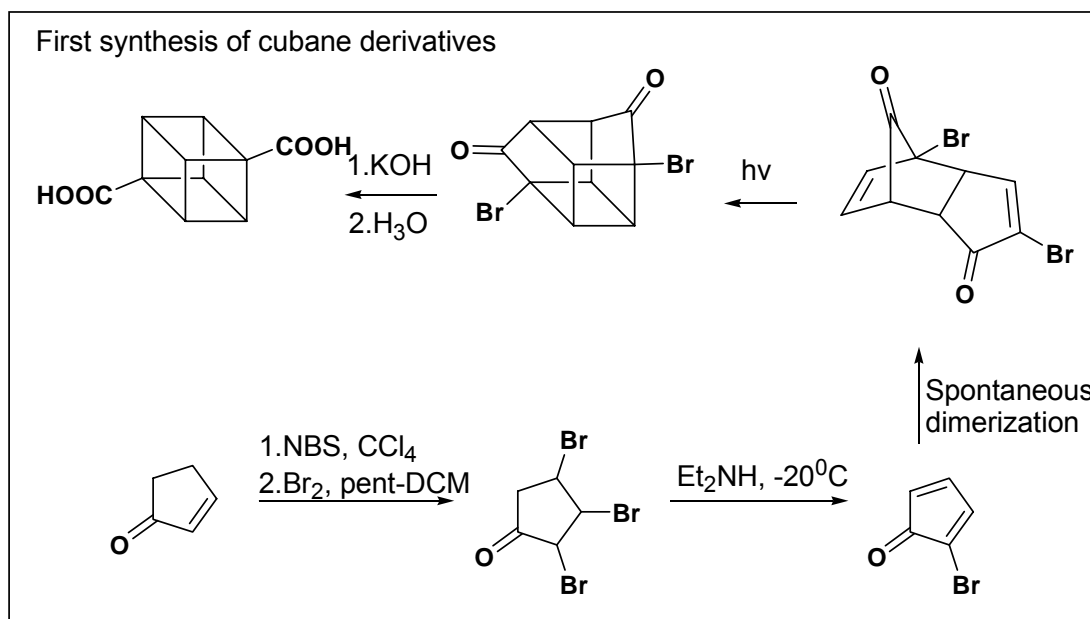
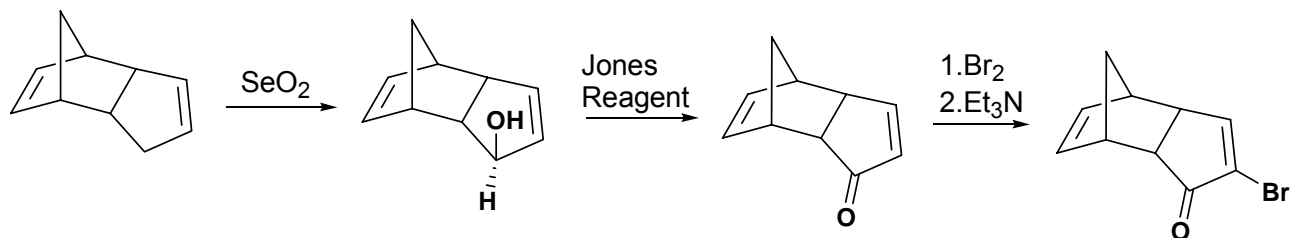
Synthesis Of Cubane Derivatives



- Interesting molecular structure
- Original work by Eaton et al. at 1964 reporting several derivatives of cubane skeleton
- First synthesis of homocubane from 2-cyclopentanone in less than 10% yield

A Facile Synthesis of Homocubane

Paquette, L.; Ward, J.; *J. Org. Chem.*, **1972**, 37, 3569

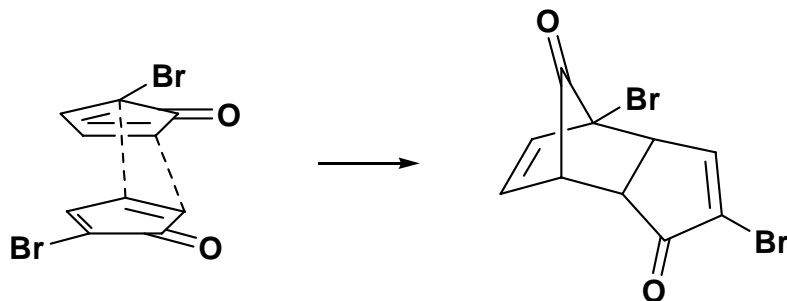


Eaton, P.; Cole, T.; *J. Am. Chem. Soc.*, **1964**, 86, 962

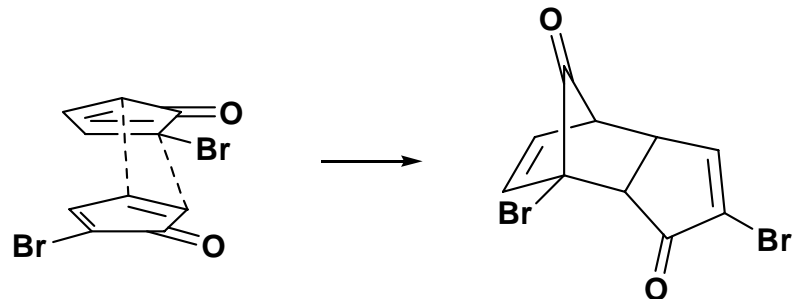
Highlights

Spontaneous cyclization of bromo-cyclopentanones

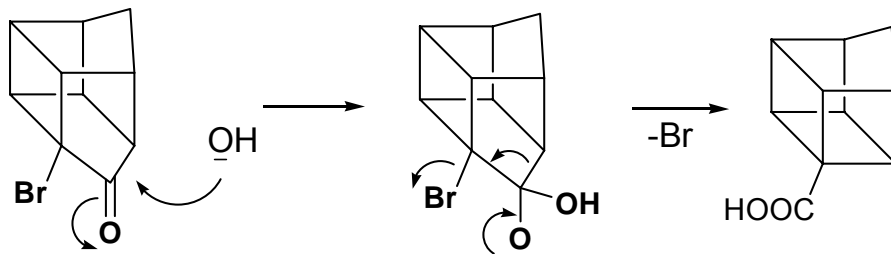
An intermolecular Diels-Alder Reaction



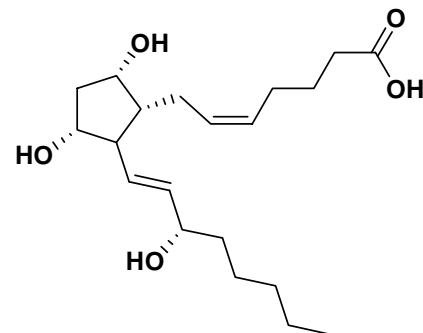
Favorable intermediate



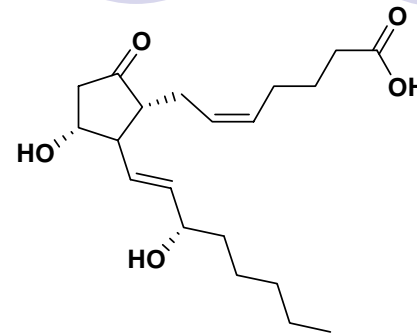
Favorskii type rearrangement



Total Synthesis of Prostaglandins F_{1a} and E₁



Prostaglandin F_{1a}

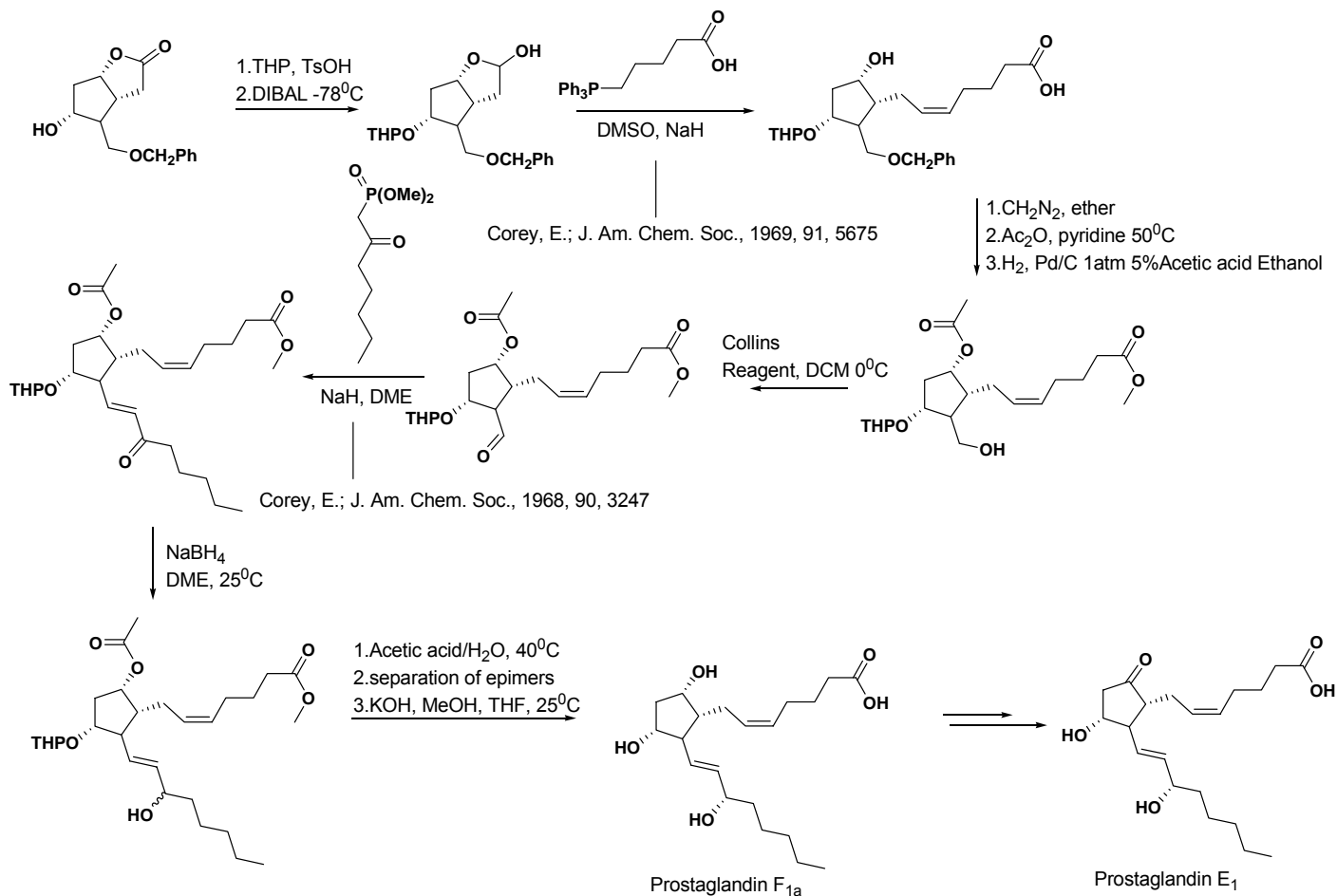


Prostaglandin E₁

- Prostaglandins are discovered by von Euler in 1932
- Carbocyclic oxygenated C-20 molecules are hormones that elicit an unusually diverse array of physiological response
- Several preparations have been reported

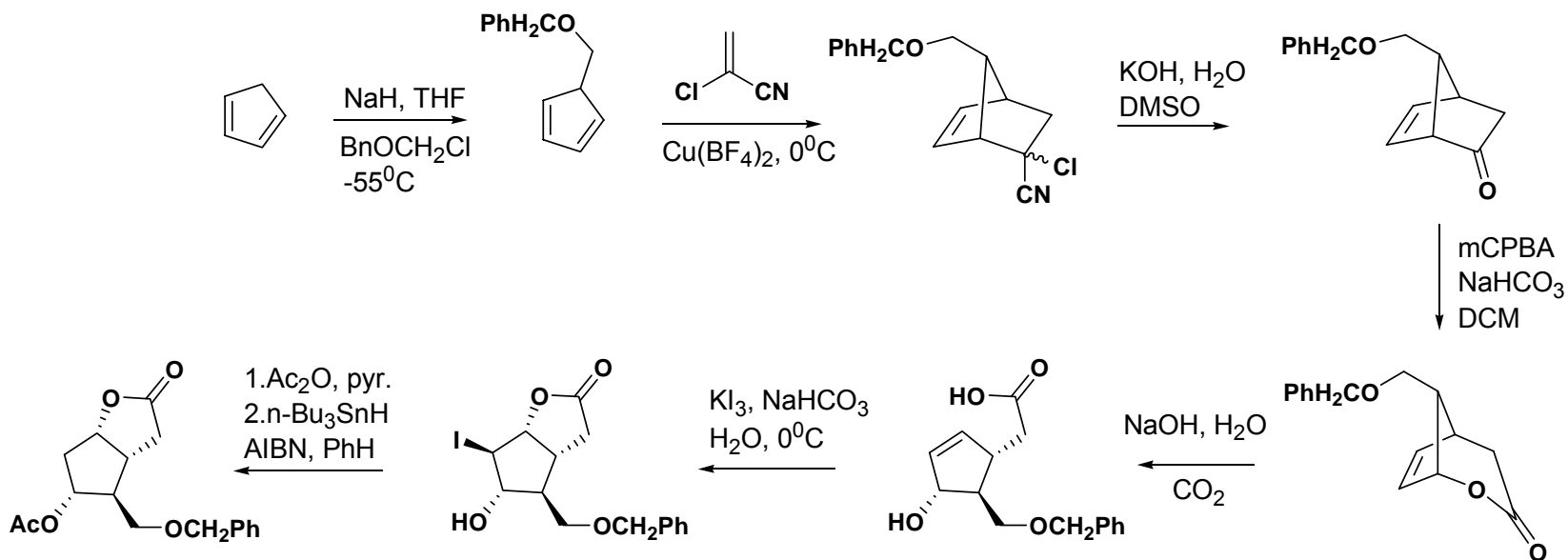
A New Method for the Preparation of Prostaglandins

Schaaf, T.; Corey, E.; *J. Org. Chem.*, 1972, 37, 2921



Highlights

Synthesis of Corey's lactone



Novel Methods

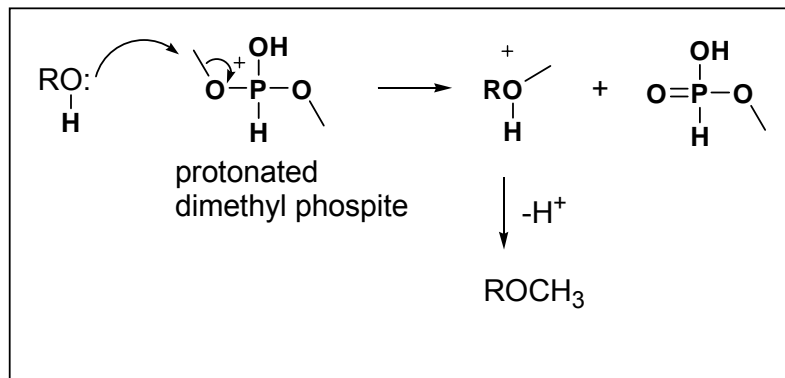
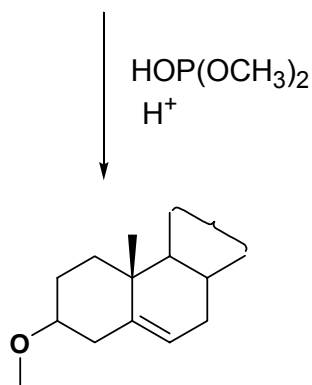
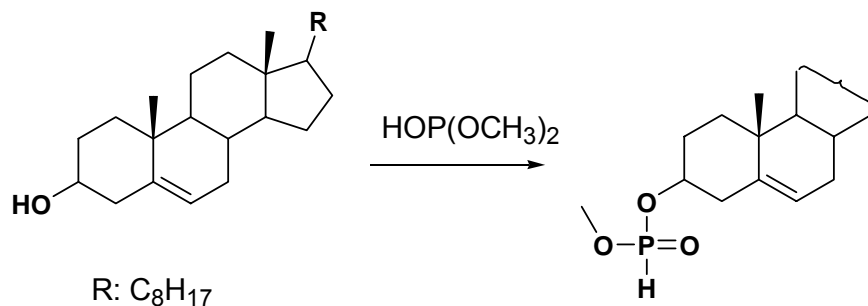


- Thallium chemistry in organic synthesis
- Novel etherification of alcohols
- Palladium-Catalyzed Vinylic Hydrogen Substitution (Heck reaction)

Novel Etherification of Alcohols

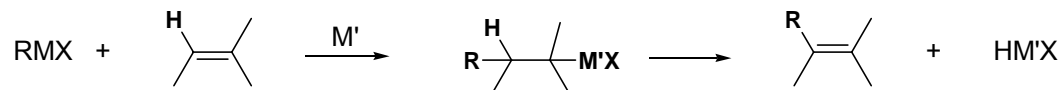
Kashman Y.; *J. Org. Chem.*, 1972, 37, 912

Dialkyl phosphites react with alcohols to give the corresponding ether in the presence of catalytic amount of acid

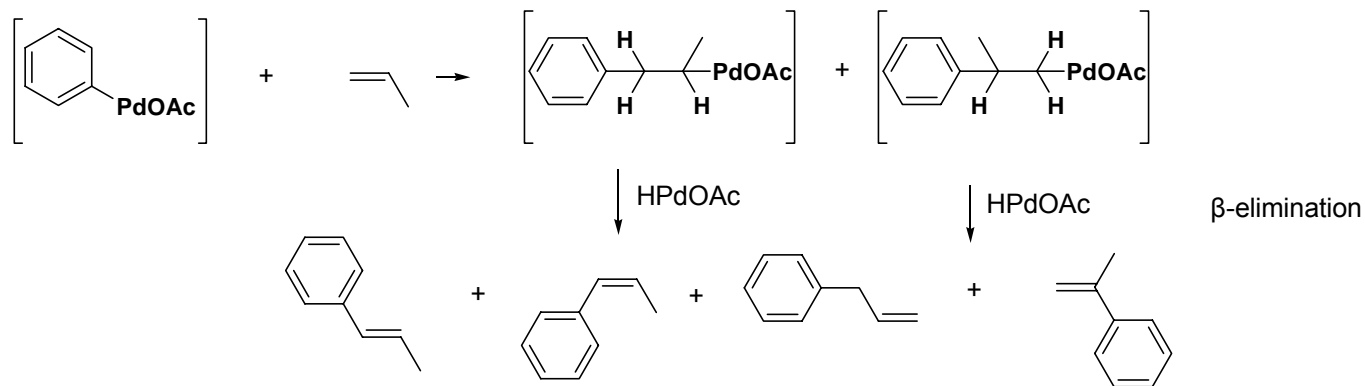
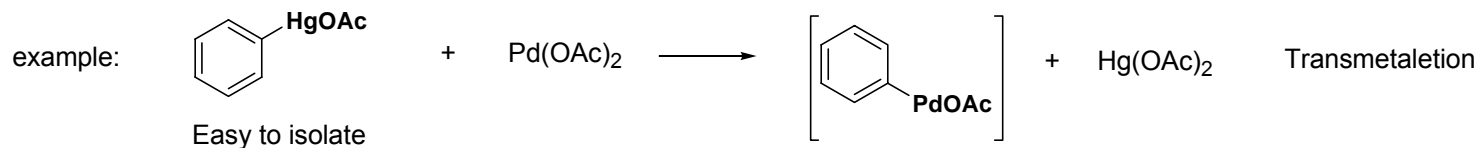


Paladium-catalyzed Vinylic Hydrogen Substitution

Background before the discovery of Heck Reaction



M: Hg, Sn, etc



Disadvantages

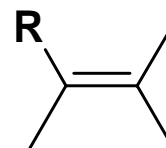
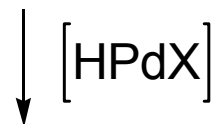
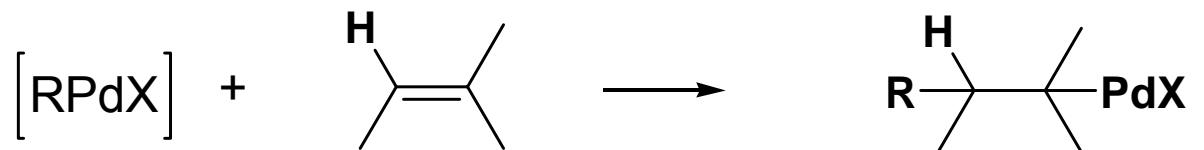
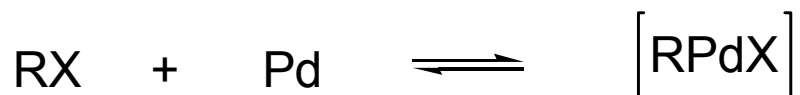


- There is often a problem obtaining the organomercury, lead or tin compounds
- Thick slurries of salts difficult to manipulate if the reaction is carried out catalytically in palladium

A New Method for the Arylation and Benzylation of Vinylic Hydrogen

Heck R.; Nolley, J.; *J. Org. Chem.*, **1972**, 37, 2320

Mechanism of Heck Reaction



- Use of a base is essential in order to neutralize the hydrogen halide from the reaction
- Tolerate a number of functional groups
- Iodides react rapidly. Benzyl halides are less reactive
- Loss of stereochemistry. Both cis and trans products

Thalium Chemistry in Organic Synthesis

Background

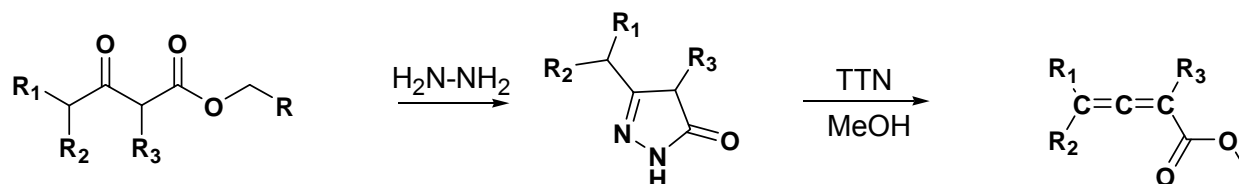
- Thalium acetate was first described at 1903 by Meyer and Goldschmidt
- Among its applications are oxidative cleavage of cyclopropanes, the conversion of chalcones into isoflavones and the hydration of acetylenes

Year 1972

- Direct synthesis of allenic esters from β -ketoesters
- Oxidation of cyclohexanones to adipoins

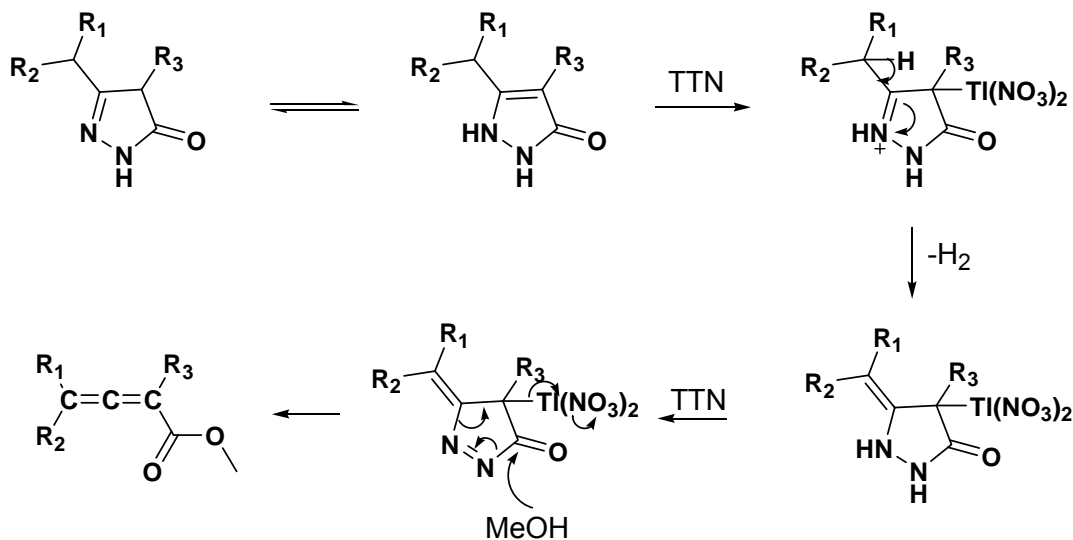
A New Synthesis of Allenic Esters

Taylor, E.; Robey, R.; McKillop, A.; J. Org. Chem., 1972, 37, 2797



$\text{R}_1, \text{R}_2, \text{R}_3 = \text{alkyl}$

Mechanism



Oxidation of Cyclohexane to Adipic Acids

McKillop, A.; Hund, J.; *J. Org. Chem.*, **1972**, 37, 3381

McKillop, A. et al. *J. Am. Chem. Soc.*, **1971**, 93, 4919

