

# Year in Review:

## Journal of the American Chemical Society 1974

**Number of papers:** 1939

**Most Prolific Authors:**

Olah, G. A. (23)	Kochi, J.K (9)
Paquette, L. A. (21)	Nelsen, S.F (9)
Dewar, M.J.S. (16)	Schleyer, P.V. (9)
Bruice, T.C (13)	Stork, G. (9)
Cotton, F.A. (13)	Zimmerman, H.E. (9)
Paul, I.C. (13)	Eliel, E.L. (8)
Gray, H.B (12)	Hawthorn, M.F. (8)
Ingold, K.U. (11)	Hehre, W.J (8)
Mislow, K. (11)	Jencks, W (8)
Turro, N.J. (11)	Nakanishi, K (8)
Ibers, J.A. (10)	Nozakai, H (8)
Whitesid, G.M. (10)	Reeves, L.W. (8)
Beaucham, J.L. (9)	
Cram, D.J. (9)	
Griller, D (9)	
Kirschne, S. (9)	

**Most Cited Papers:**

**721 citations - Pitzer (p 5701)** – Thermodynamics of electrolytes  
**712 citations – Muetterties (p 1748)** – Idealized polytopal forms  
**583 citations – Mukaiyama (p 7503)** - New cross-aldol reactions. Reactions of silyl enol ethers with carbonyl compounds activated by titanium tetrachloride

**Kristy Tran**  
**Leighton Group**  
**May 1, 2006**

# Year in Review:

## Journal of the American Chemical Society 1974

### Natural Products:

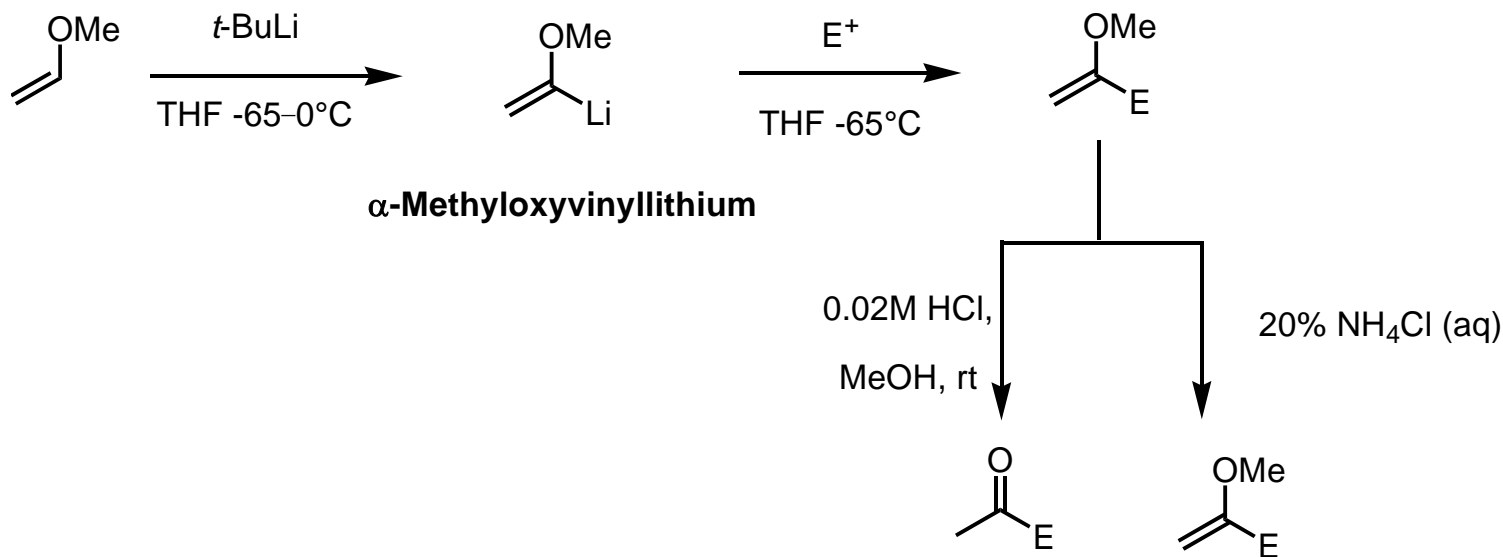
Haemanthidine – 7781  
Scopine – 3336  
Dendrobine – 4332  
Talatisamine – 4990  
(±)-Poranterine – 6516  
dl-erythro Juvabione – 1213  
Cembrene – 4724  
Isotelekin – 8102  
Strigol – 1976  
Serratendial – 7103  
Many examples of  
prosteglandins synthesis

### Notable Methodology:

Overman Rearrangement – 597  
Corey-Nicolaou Macrolactonization – 5614  
Danishefsky's Diene Diels-Alder – 7807  
Mukaiyama Aldol – 7503  
McMurry Coupling – 4708

# $\alpha$ -Methoxyvinyl lithium

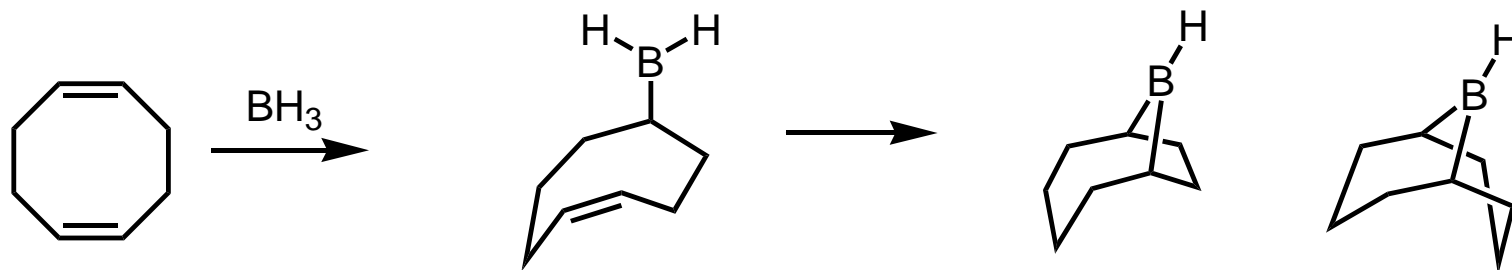
$\alpha$ -Methoxyvinyl lithium as Acyl Anion Equivalents - Baldwin - MIT - 7125 - (259 citations)



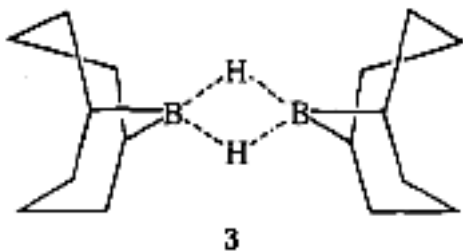
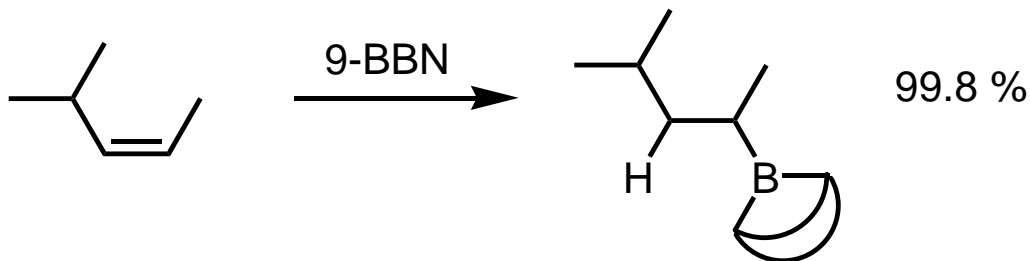
**Electrophiles include:** aldehyde, ketones, nitriles, halides, selective for 1,2 additions in  $\alpha,\beta$ -unsaturated carbonyls

# 9-BBN

9-BBN as a Reagent for Hydroboration - Brown (Purdue) - 7765 (229 citations)

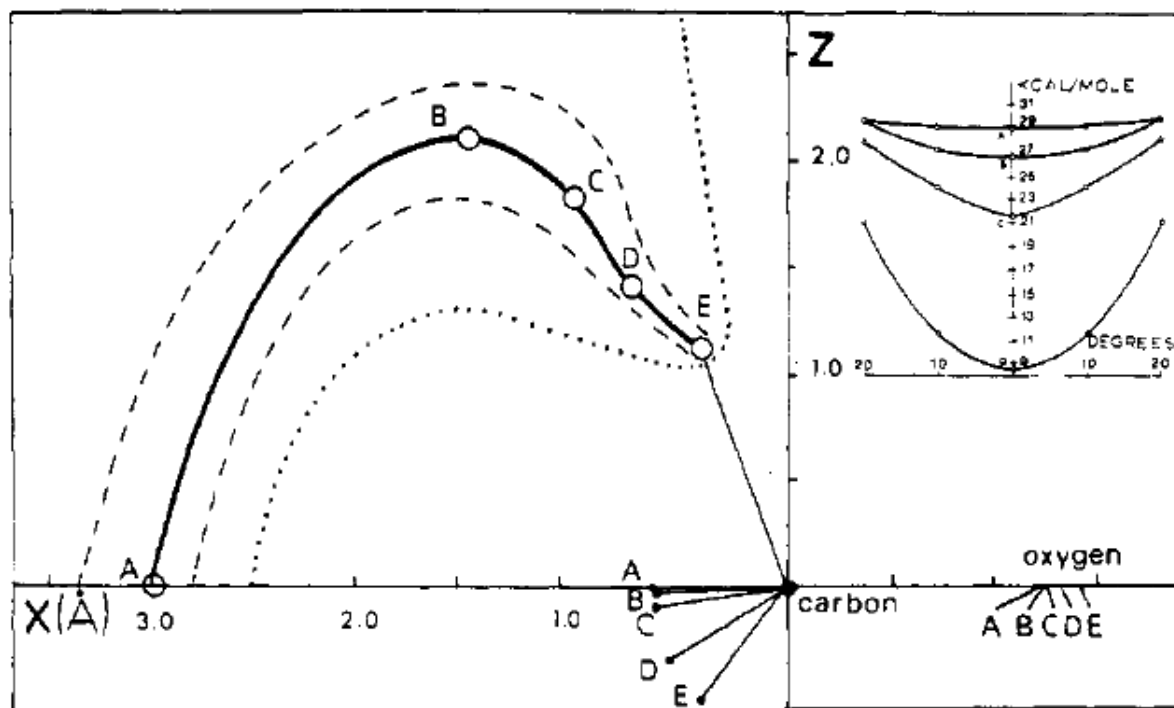


Regiospecific for the less hindered carbon



# Ab-Initio Studies – Bürgi-Dunitz Angle

An Ab-initio study of Nucleophilic Addition to a Carbonyl Group - Bürgi (ETH) - 1956  
(239 citations)

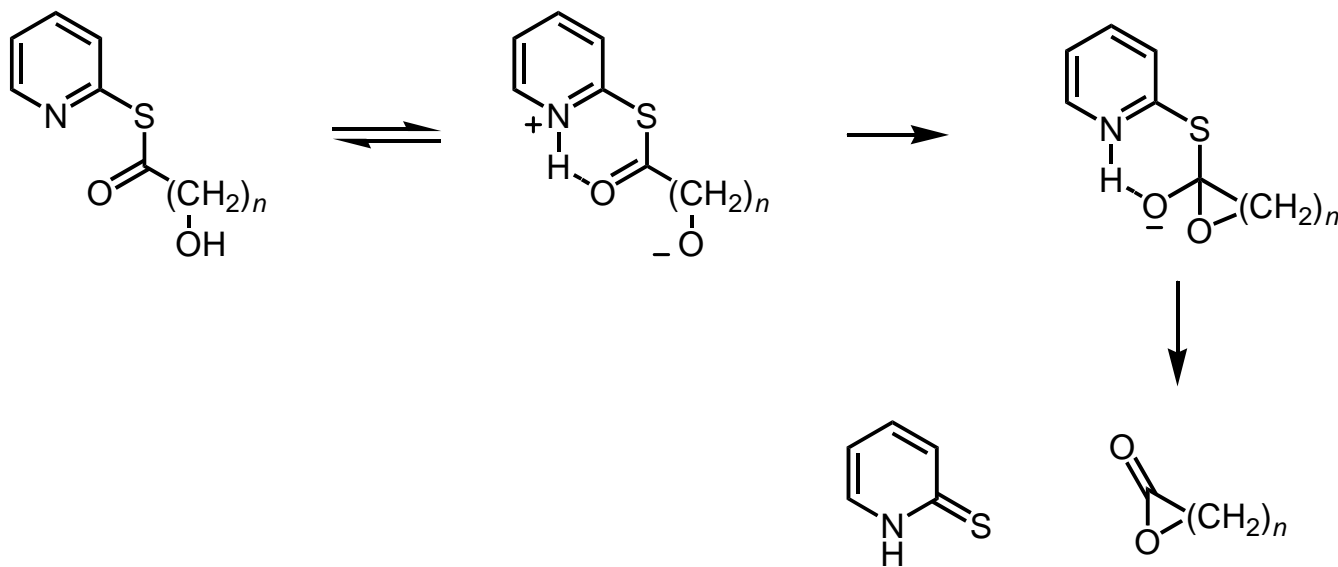


Calculated Values:  $105^\circ$

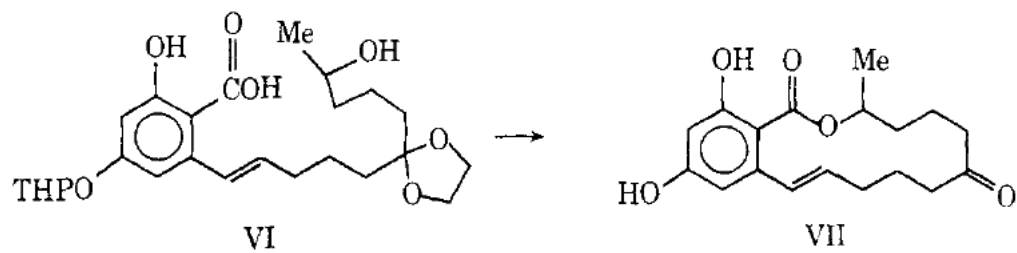
Experimental Values (in 1974):  $107^\circ \pm 5$

# Macrolactonization

A Mild Macrolactonization - Corey (Nicolaou) - Harvard - 5614 (392 citations)



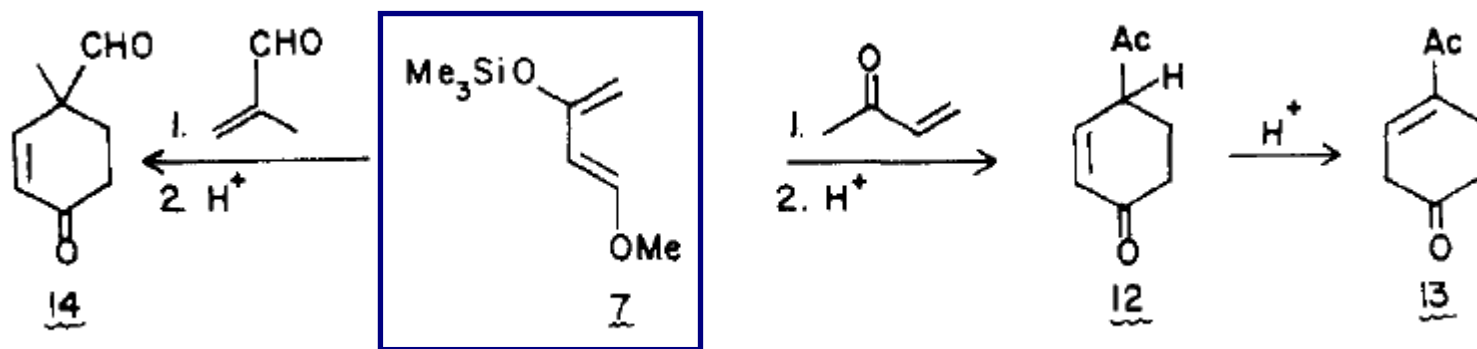
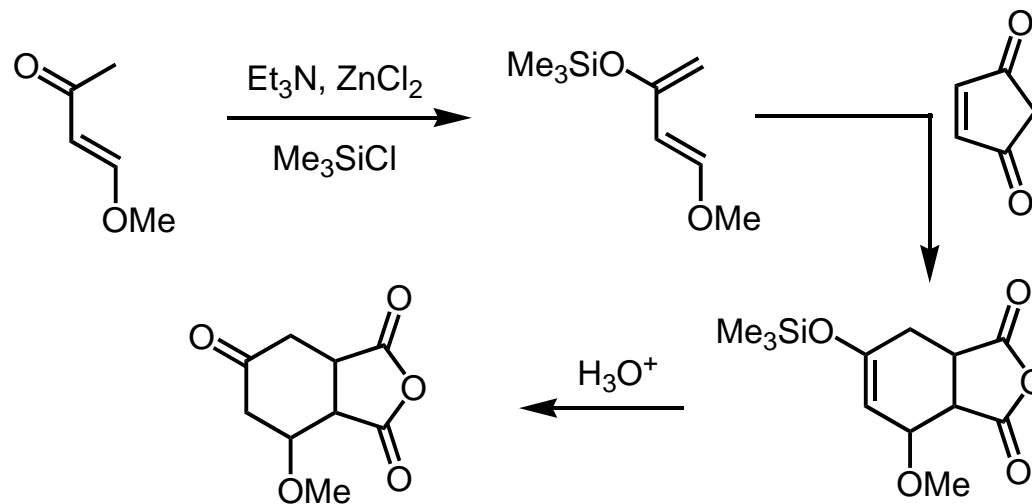
## (±)-Zearalenone



75% yield after the removal of protecting groups

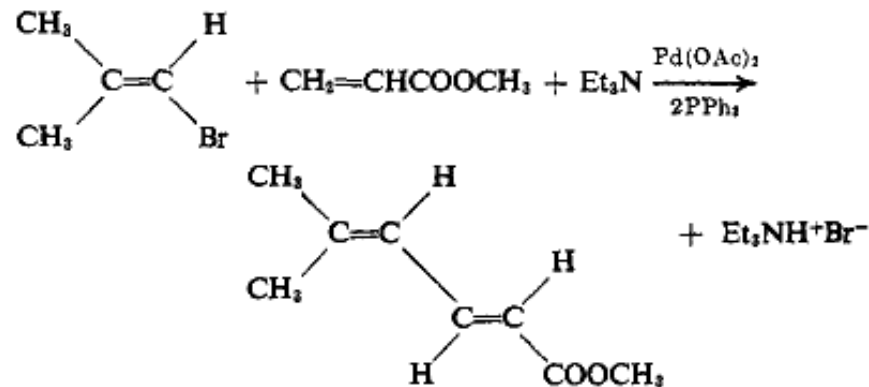
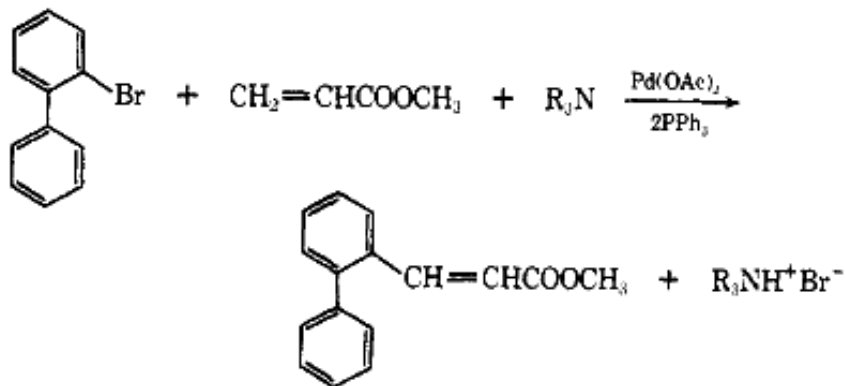
# The Danishefsky Diene

A Useful Diene for the Diels-Alder Reaction - Danishefsky (Pittsburg) - 7807 (382 citations)



# Improvements in the Heck Reaction

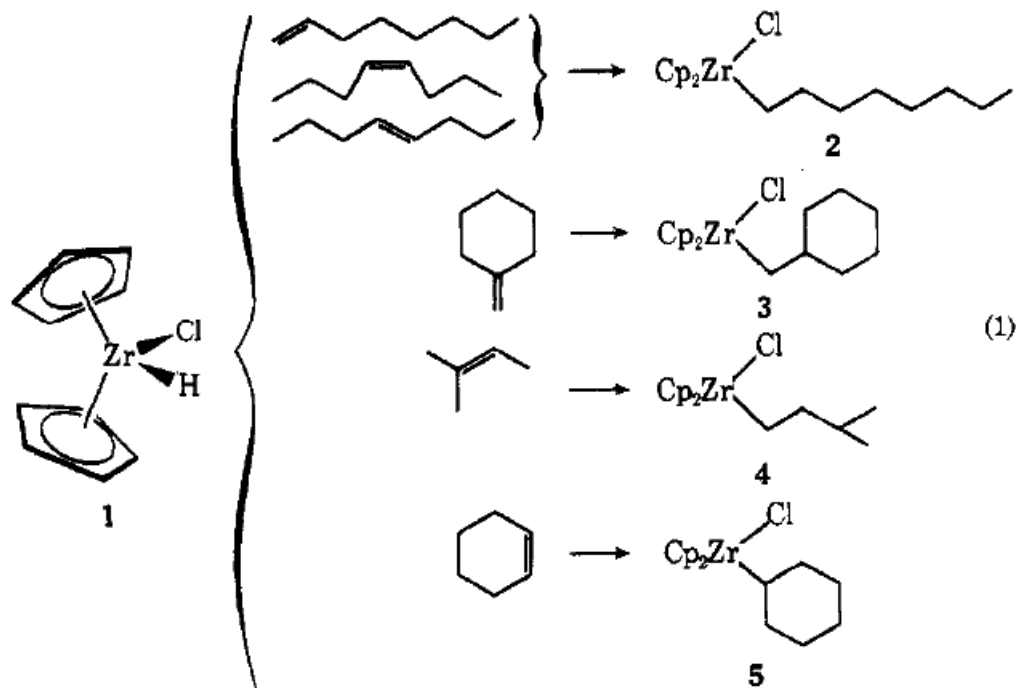
## Organophosphinepalladium complexes as Catalysts for Vinylic Hydrogen Substitution Reactions - Heck (Delaware) - 1133 (225 citations)



- Addressed the problem of requiring aryl and vinyl iodides (difficult to obtain) and the loss of stereospecificity of *cis* or *trans* olefins.
- Bromides react reasonably with  $Pd(OAc)_4$  in the presence of triphenylphosphine (optimal ratio 2:1). Iodides react without phosphine.
- Electron withdrawing substituent increased the reactivity of the bromides
- Phosphine reduces elimination of the allylic hydrogen by reducing the amount of palladium hydride re-addition

# An Alternative to Hydroboration

Hydrozirconation - Schwartz (Princeton) - 8115 (218 citations)

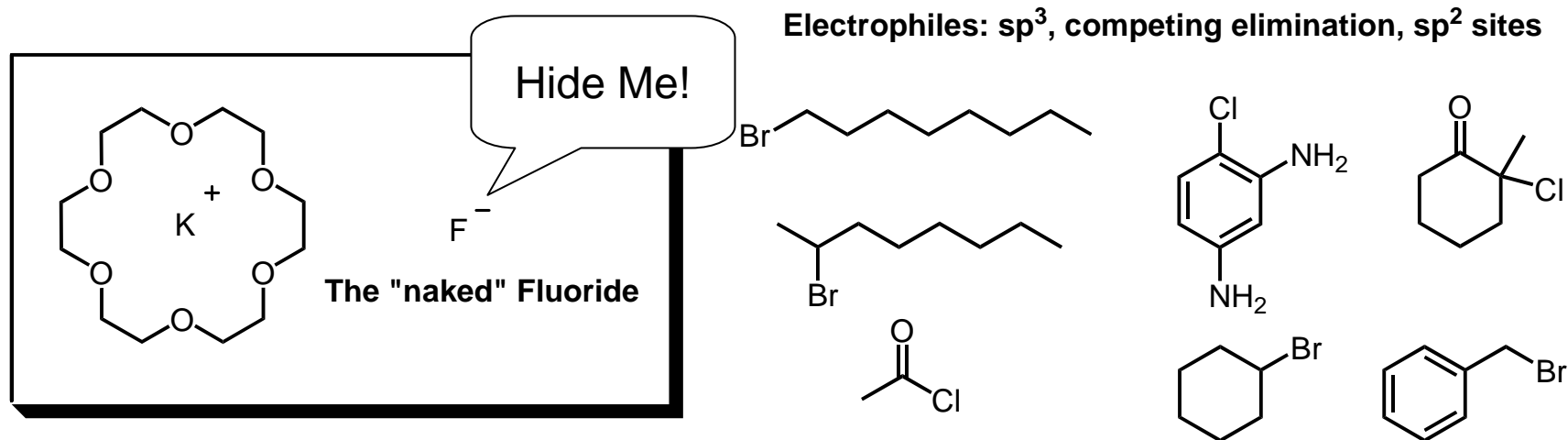


Functionalizations of less hindered terminus of alkene by “...regiospecific addition of Zr-H to a terminal olefin or addition to to an internal olefin followed by rapid rearrangement via Zr-H elimination and readdition to place metal in less hindered position”.

Electrophile:  $\text{H}^+$ ,  $\text{Br}_2$ ,  $\text{CH}_2\text{C}(\text{O})\text{Cl}$

# “Naked” Anions

The Chemistry of Naked Anions: 18-Crown-6 complex of Potassium Fluoride - Liotta (Georgia IT) - 2250 (380 citations)



Nucleophilic reactions with fluoride atypical. Encumbered by solvent.  
Crown ethers first used to solvate metal ions in 1967; used here to free fluoride.

Nucleophilicity of 18-crown-6 potassium fluoride tested at  $sp^3$  sites (primary, secondary, tertiary, benzylic), competing elimination reactions, and  $sp^2$  sites.

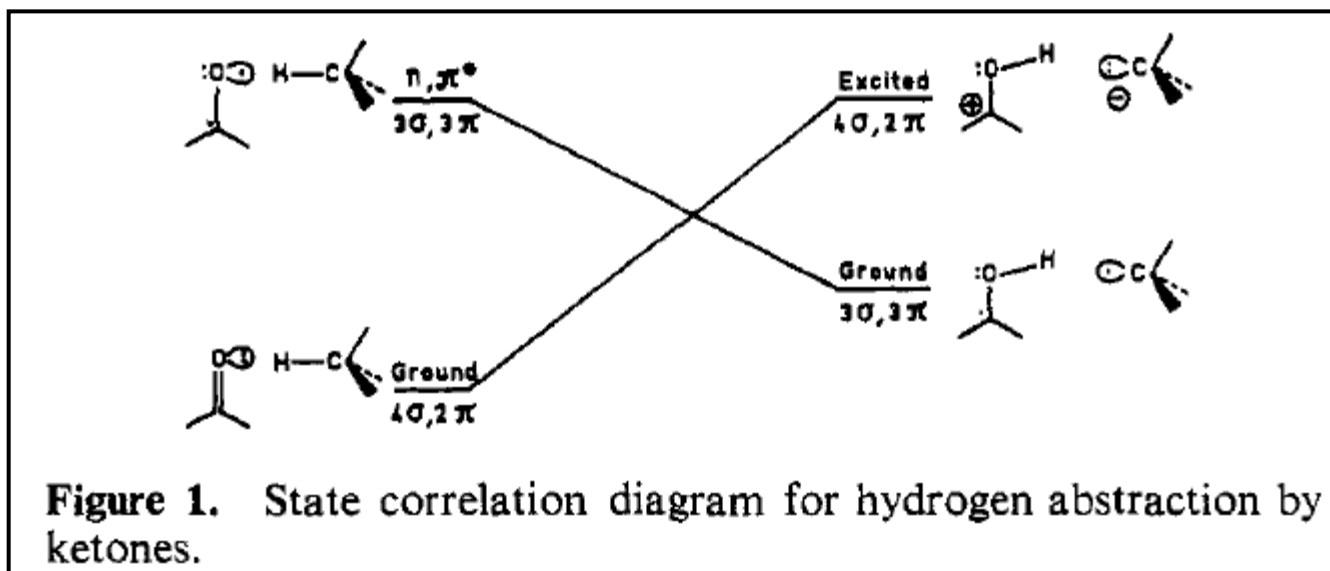
Quantitative conversion in all cases with expected mixture of products in competing reactions



# Realm of Multidimensionality

## Surface Crossing and Surface Touchings in Photochemistry - Salem (d'Orsay) - 3486 (273 citations)

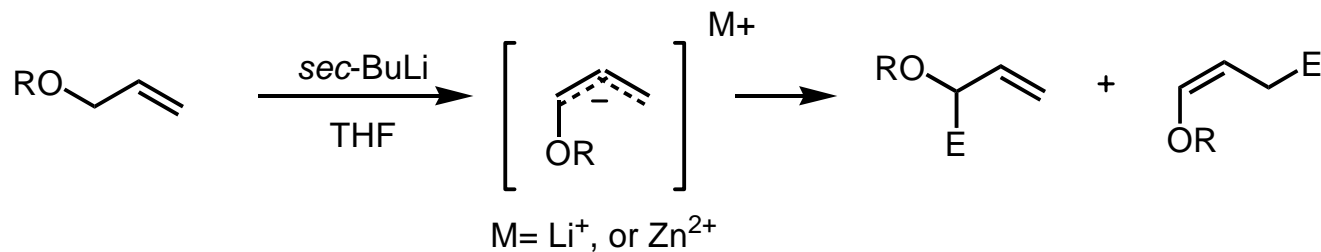
Studies (1) hydrogen abstraction by ketones, (2) photoreduction by aza aromatics, (3) hydrogen abstraction by carbenes, (4) addition of ketones to electron rich carbenes, (5)  $\alpha$ -cleavage of alkanones, (6)  $\alpha$ -cleavage of dienones (7) isomerization of furans to cyclopropenyl ketones (8) ring opening of aziridines



Photochemistry, more than any other field, brings man in close touch with the realm of multidimensionality. The freedom enjoyed by an excited molecule is associated with the many directions along which

# Umpolung Chemistry is Popular

Metalated Allylic Ethers as Homoenolate Anion Equivalents - Evans, D.A. (UCLA) - 5560 (232 citations)



<i>R</i>	<i>Electrophile</i>	<i>M</i> <sup>+</sup>	<i>α</i> substitution	<i>γ</i> substitution
THP	<i>n</i> -C <sub>6</sub> H <sub>13</sub> I	Li	54	46
Ph		Li	63	37
Et		Li	75	25
<i>t</i> -Bu		Li	89	11
Me	Cyclohexanone	Li	72	28
Me		Zn	0	100

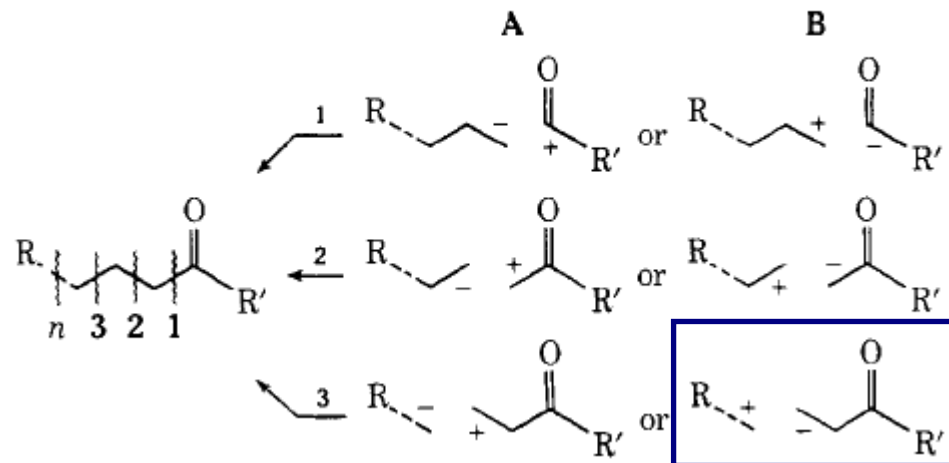
- For alkylations, substitution is dependent on the size of the ligand on oxygen
- For carbonyl electrophiles, substitution is counter ion dependent.

# Umpolung Chemistry is Really Popular

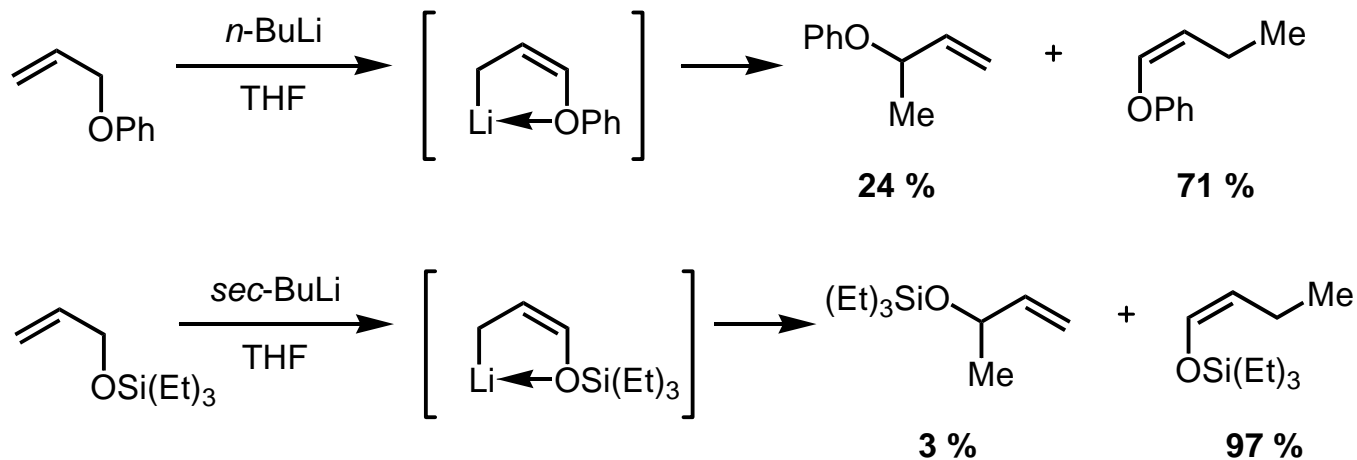
Allyloxy Carbanions.  $\beta$ -Acyl Anion Equivalents - Still (Columbia) - 5561 (197 citations)

Only equivalents of 3B are not well known.

Scheme I



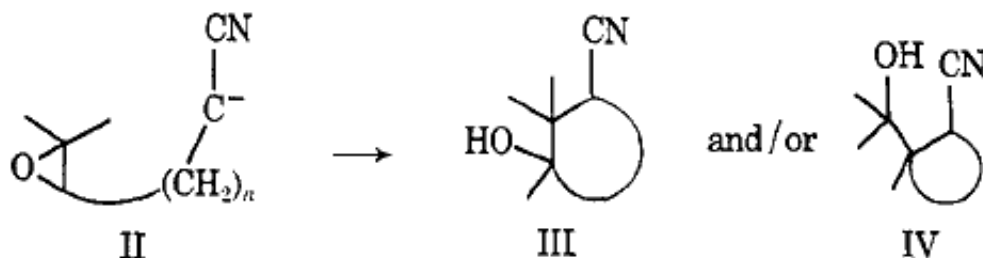
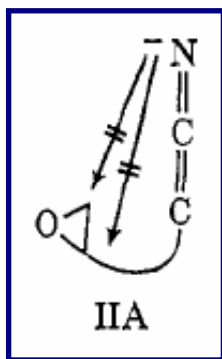
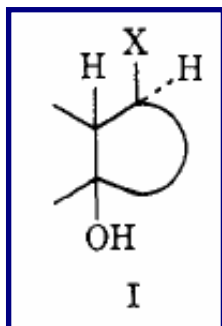
A  $\beta$ -acyl anion equivalent



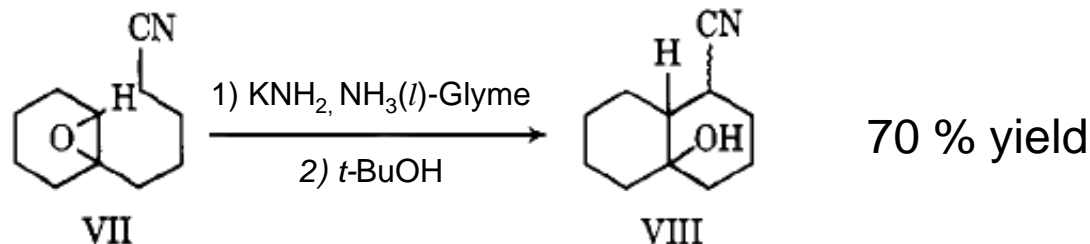
# Epoxynitrile Cyclization

Epoxynitrile Cyclization - Stork (Columbia) - 5268, 5270 (181 citations)

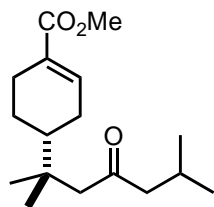
Target



- Low acidity of  $\alpha$  methylene of cyano group
- Cyano group delocalizes negative charge but Nitrogen anion will undergo nucleophilic attack (geometric constraints)

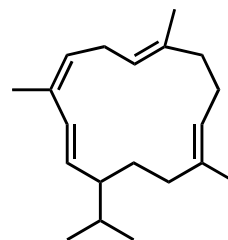


# Total Synthesis



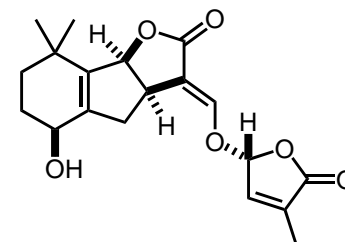
**dl-erythro Juvabione**

**Ficini** - University of Paris  
*JACS* **1974**, 96, 1213



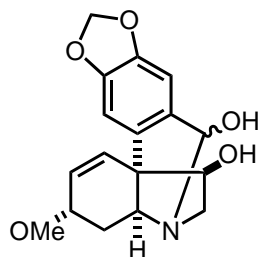
**Cembrane**

**Dauben** - UC, Berkeley  
*JACS* **1974**, 96, 4724



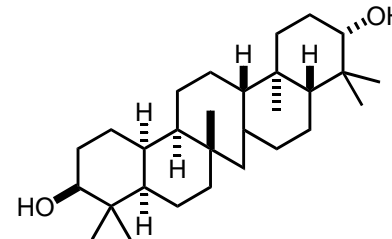
**Strigol**

**Sih** - University of Wisconsin  
*JACS* **1974**, 96, 1976



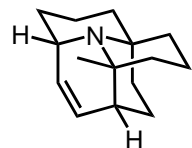
**Haemanthidine**

**Hendrickson** - Brandeis University  
*JACS* **1974**, 96, 7781



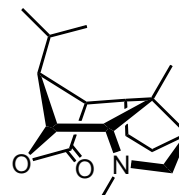
**dl-Serratendial**

**Johnson** - Stanford  
*JACS* **1974**, 96, 7103



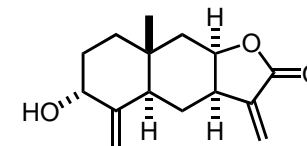
**Porantherine**

**Corey** - Harvard  
*JACS* **1974**, 96, 6516



**Dendrobine**

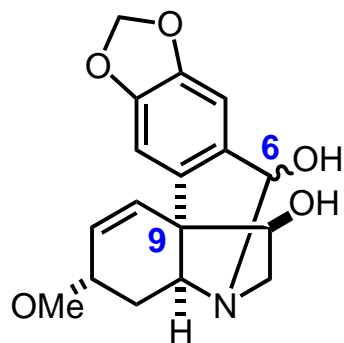
**Kende** - University of Rochester  
*JACS* **1974**, 96, 4332



**Isotelekin**

**Miller** - UC, Davis  
*JACS* **1974**, 96, 8102

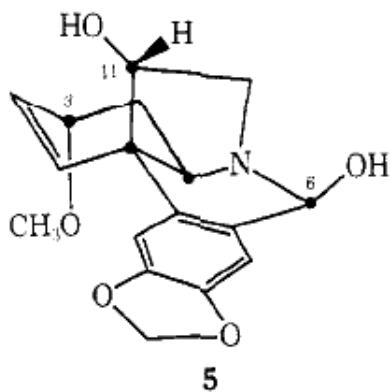
# Haemanthidine



Haemanthidine

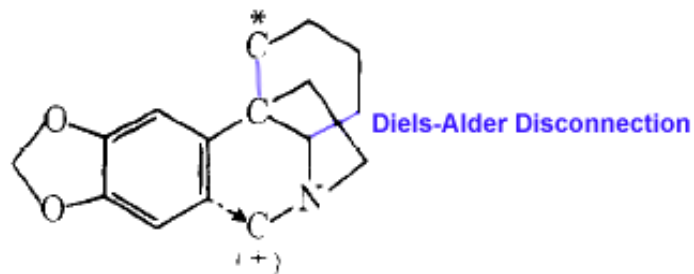
Hendrickson - Brandeis University  
*JACS* 1974, 96, 7781

From the Crinine  
family of natural  
products

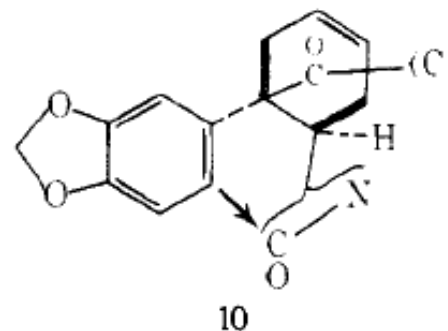


3D view

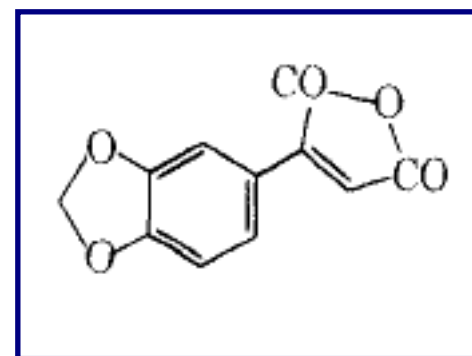
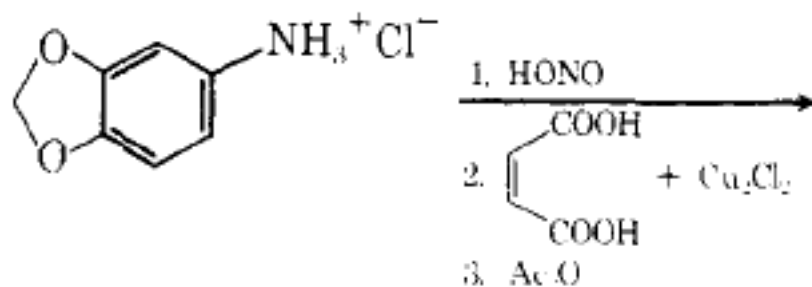
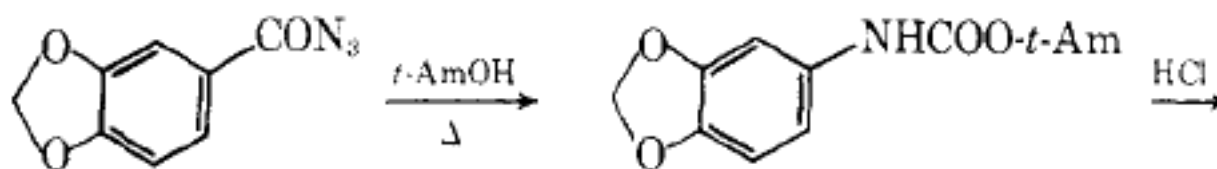
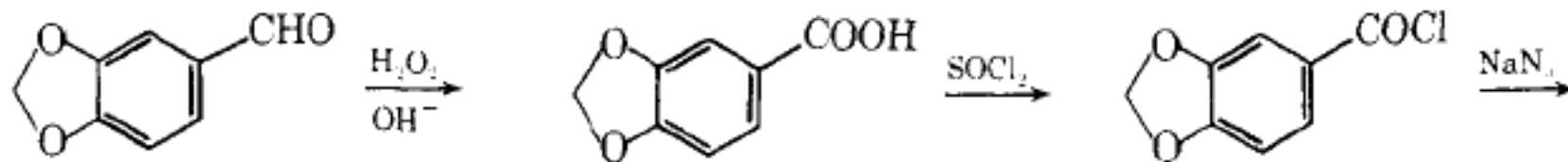
## Disconnections



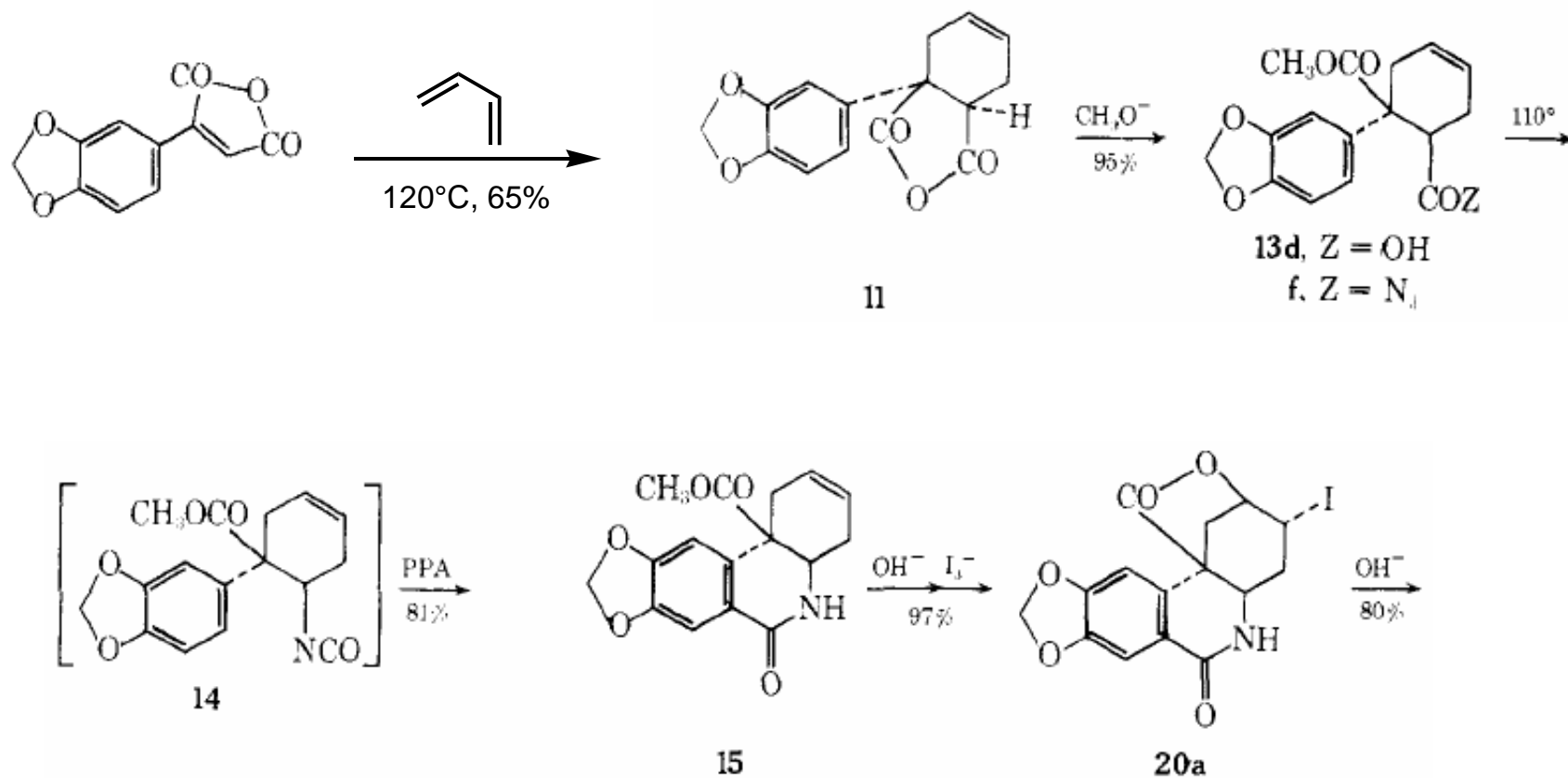
Focus of synthesis is the formation of C9 quaternary center. Key step: Diels-Alder. Formed cyclohexene also provides a functional handle for remainder of synthesis.



# Synthesis of Requisite Maleic Anhydride



# Synthesis of Haemanthidine



# Synthesis of Haemanthidine

