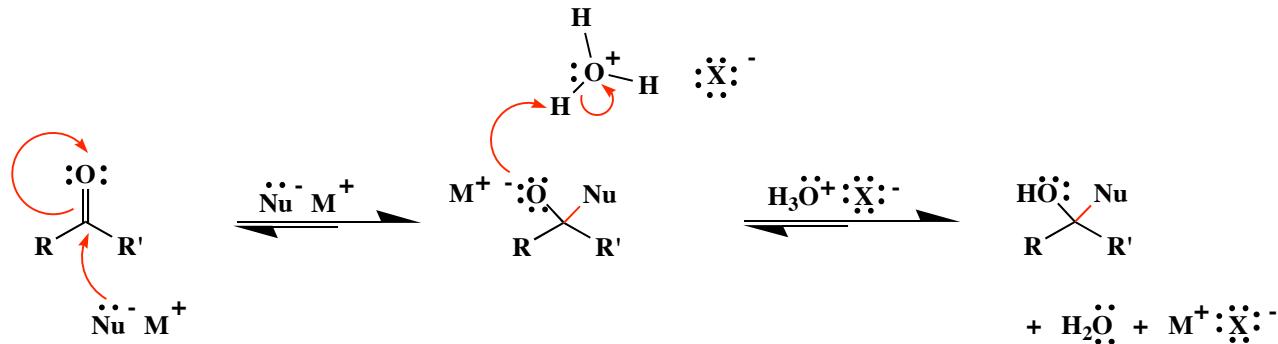
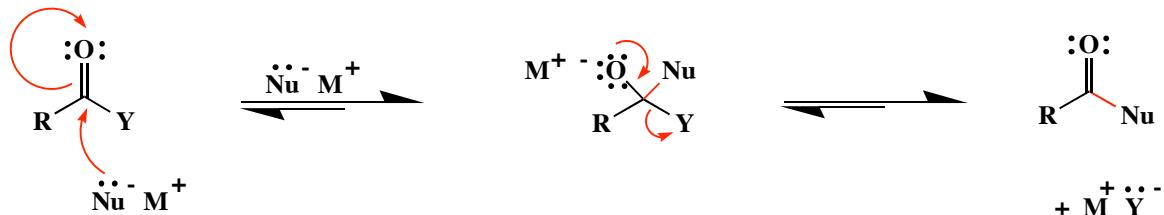


## Reactions of Carbonyl Compounds

### 1. Nucleophilic 1,2-Addition (ketones, aldehydes)



### 2. Nucleophilic Addition/Elimination (amides, esters, thioesters, acid anhydrides, acid halides)

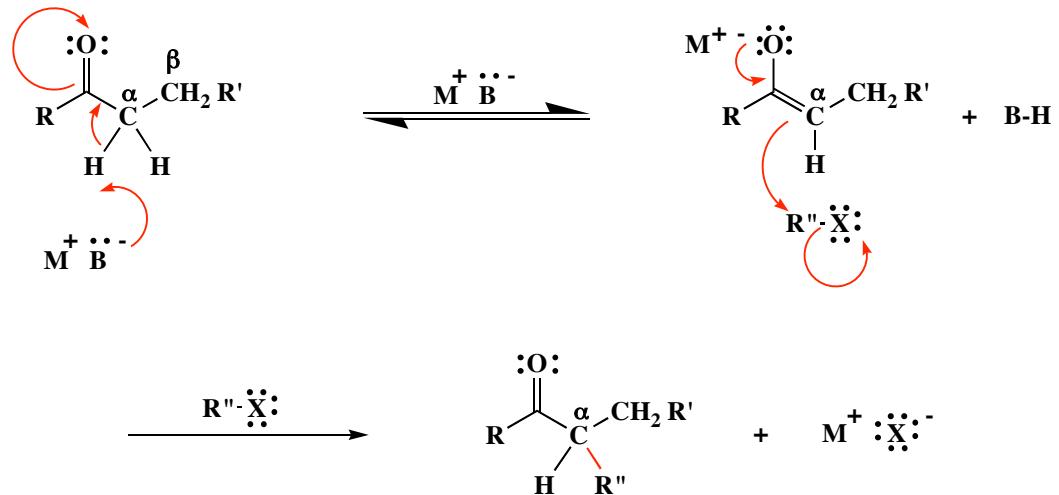


**Y = leaving group**

N.B. The reaction proceeds through a tetrahedral intermediate.  
The reaction is not an S<sub>N</sub>2 displacement.

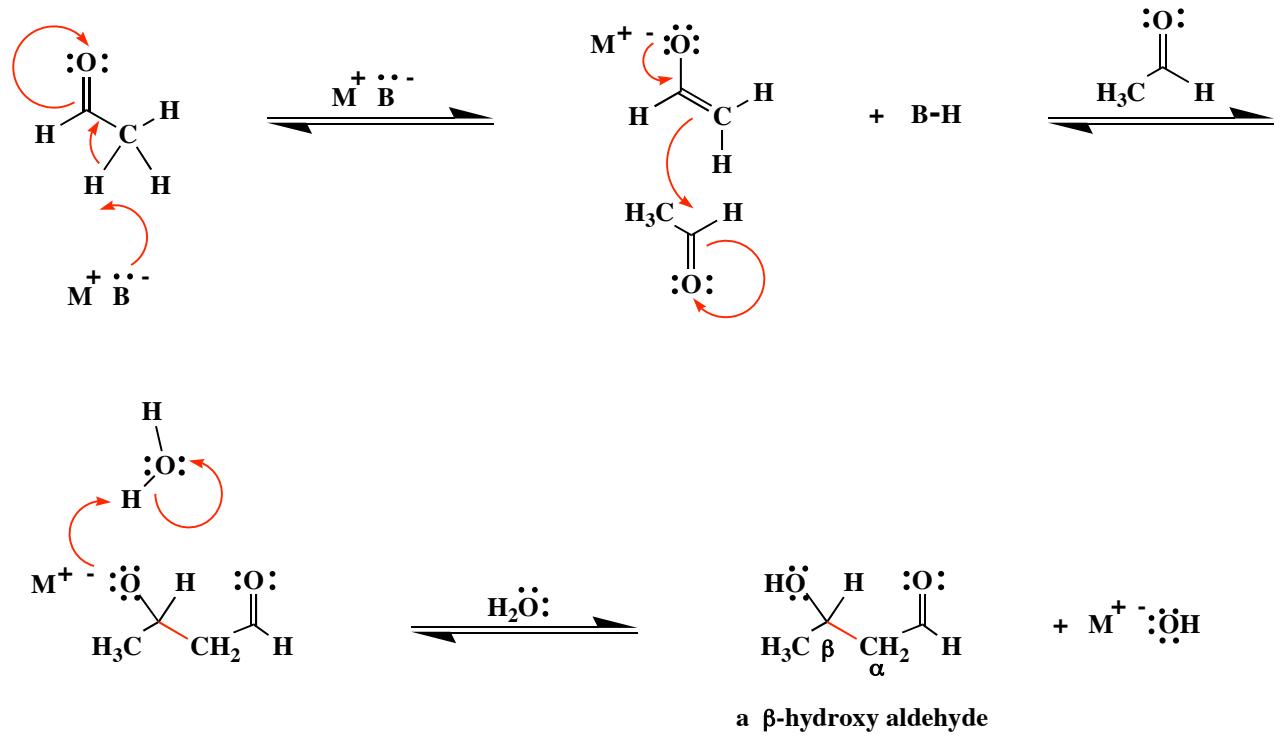
### 3. Alpha-Substitution

e.g., enolate alkylation



### 4. Condensation

e.g., aldol condensation



a  $\beta$ -hydroxy aldehyde

## 5. Nucleophilic 1,4-Addition

