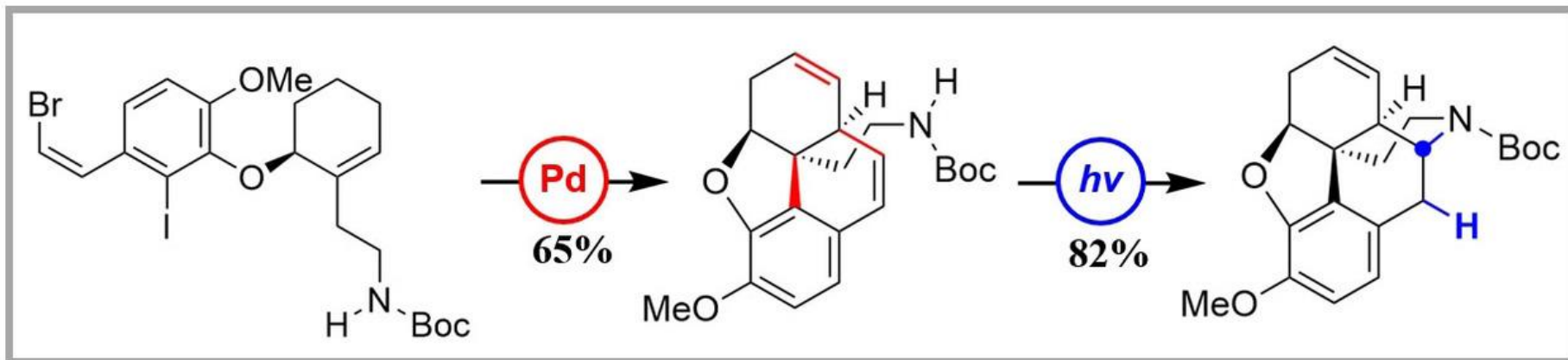
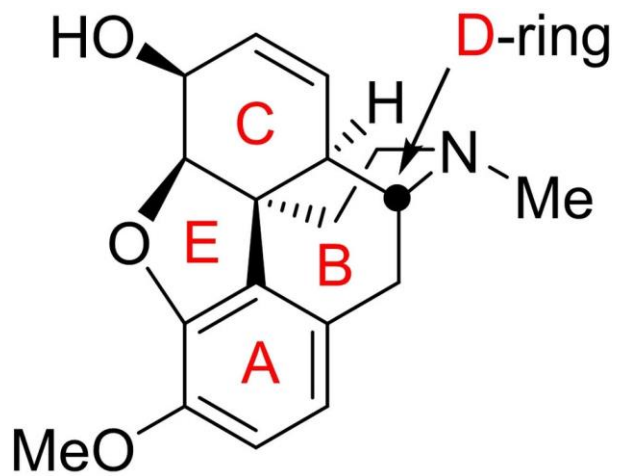


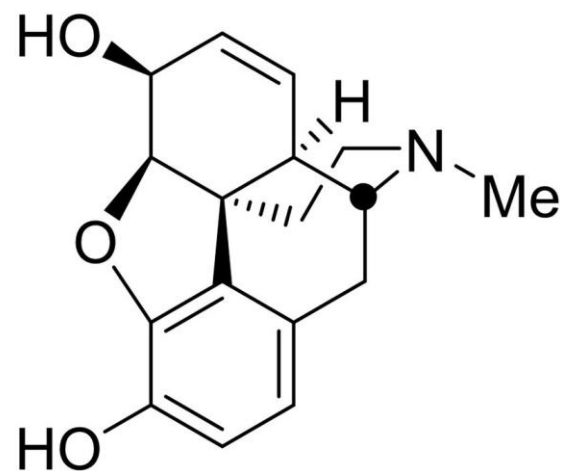
# Expeditious Access to Morphinans by Chemical Synthesis

Lorenzo V. White, Nan Hu, Yu-Tao He, Martin G. Banwell,\* and Ping Lan\*

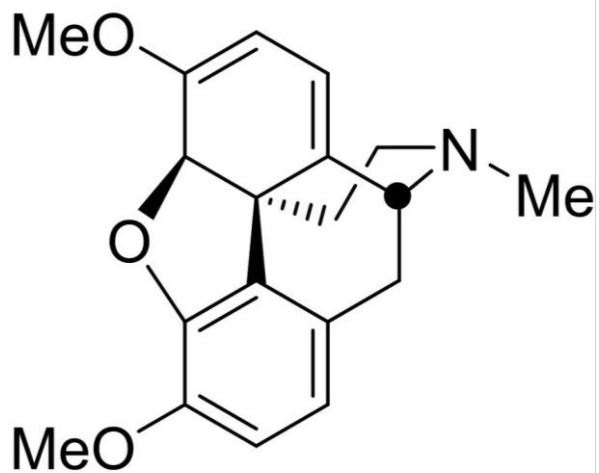




1

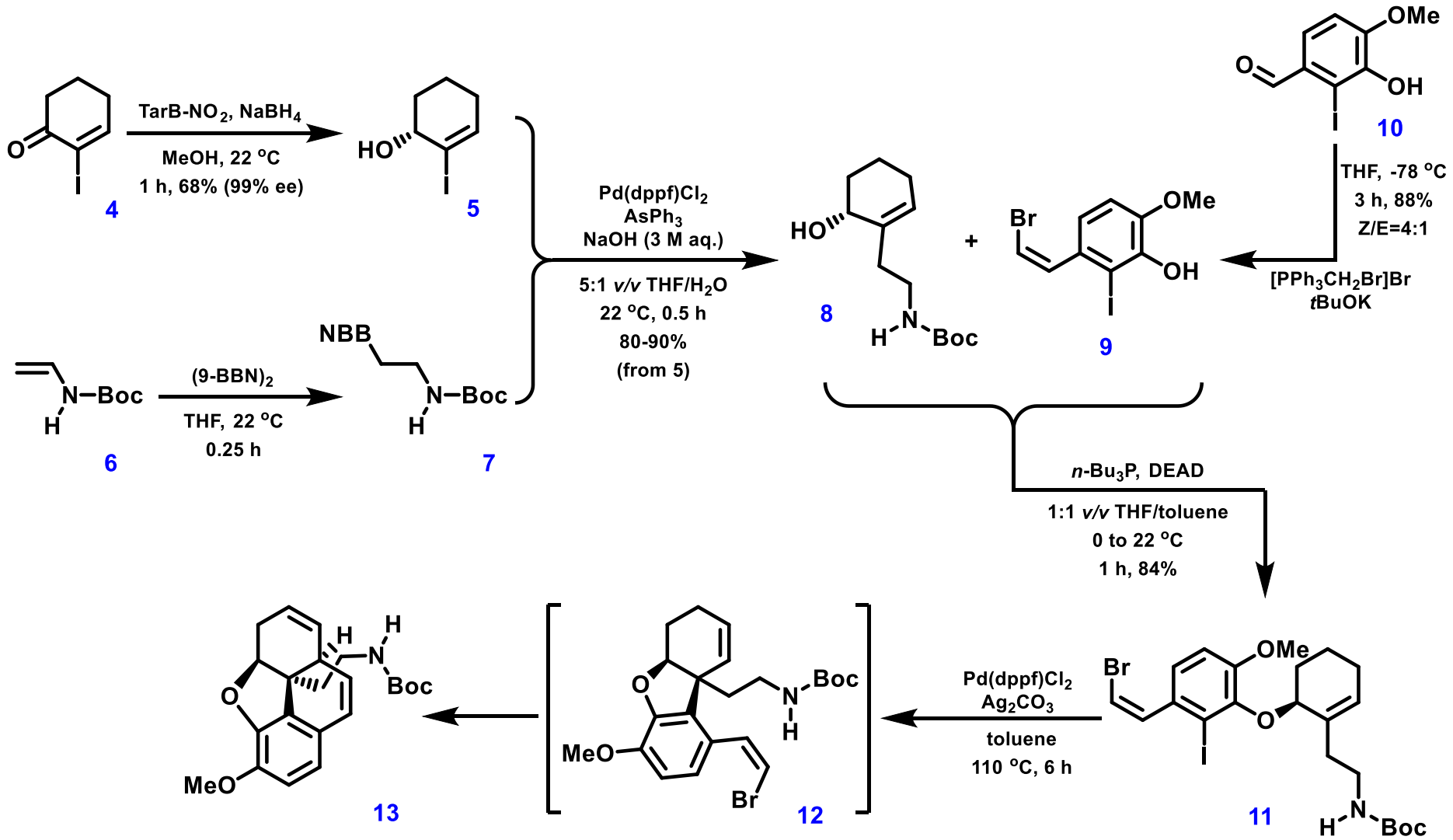


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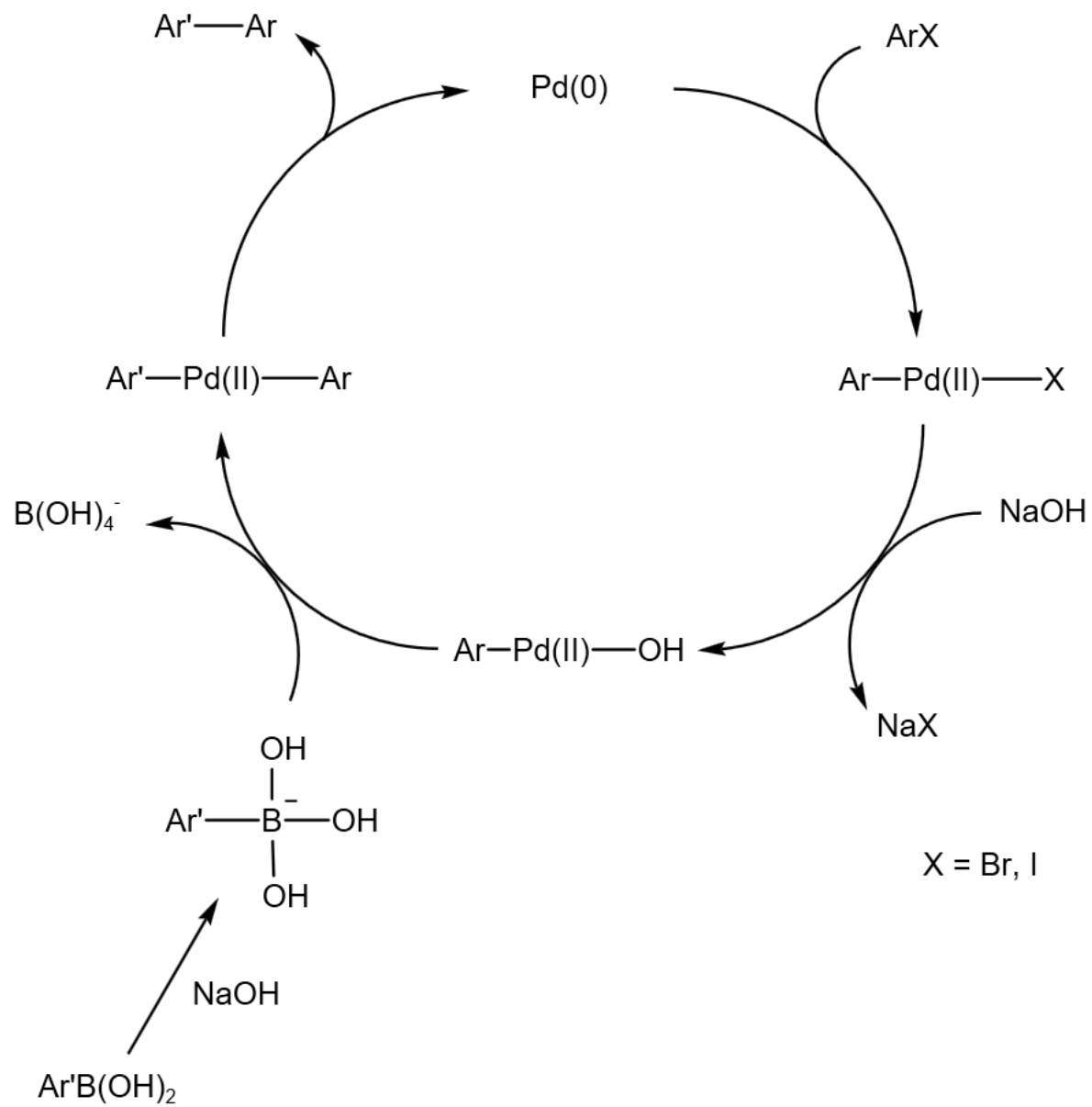


3

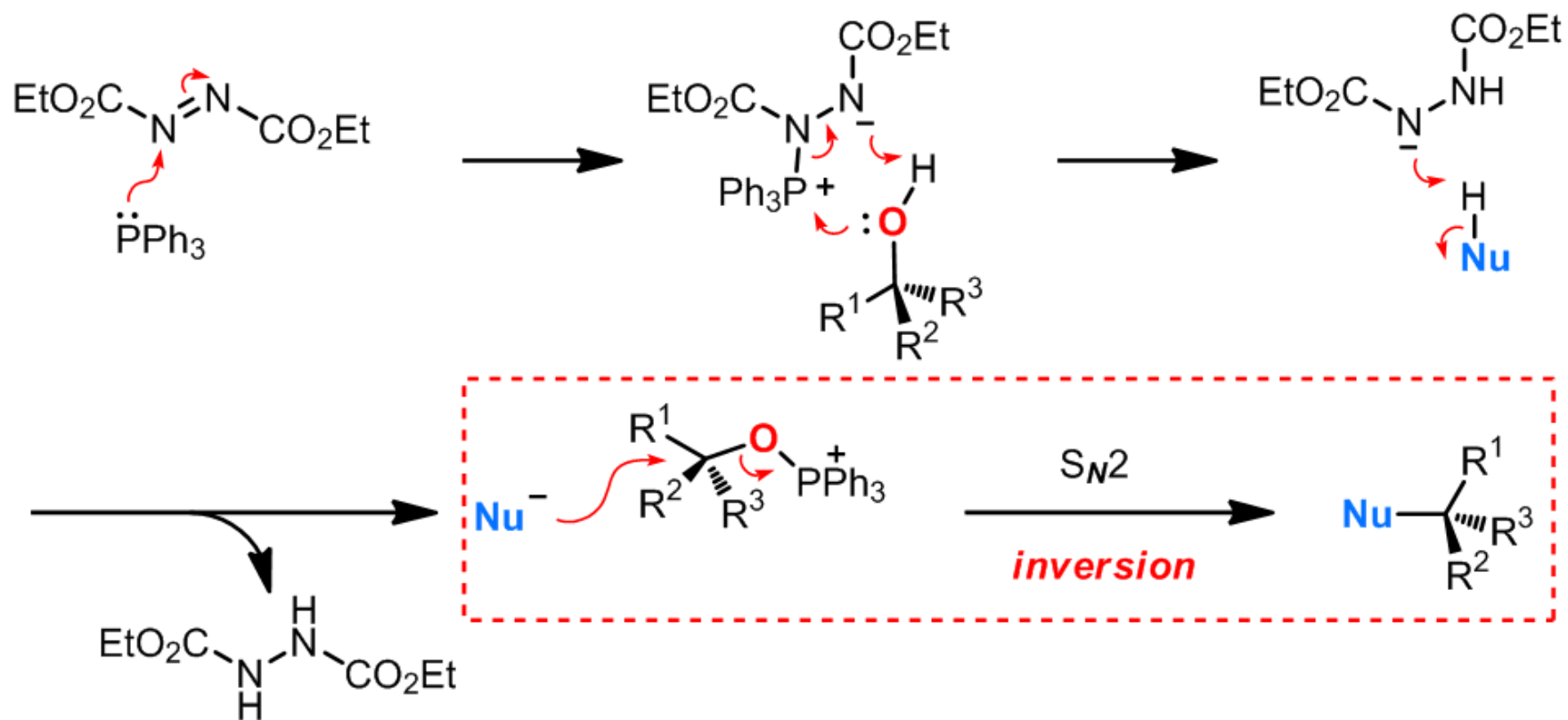
during the golden era of total synthesis of natural products, many other syntheses of morphine alkaloids followed. The effort continues to the present day. And yet, with almost 30 total syntheses on record, no truly practical preparation of this alkaloid, or the medicinal agents derived from it, has materialized.<sup>6</sup> A synthesis of morphine competitive in cost with its isolation should be no longer than five or six steps and originate from commodity chemicals. The latest figures on the annual *legal consumption* of morphine and codeine, Figure 1, demonstrate that the scale of



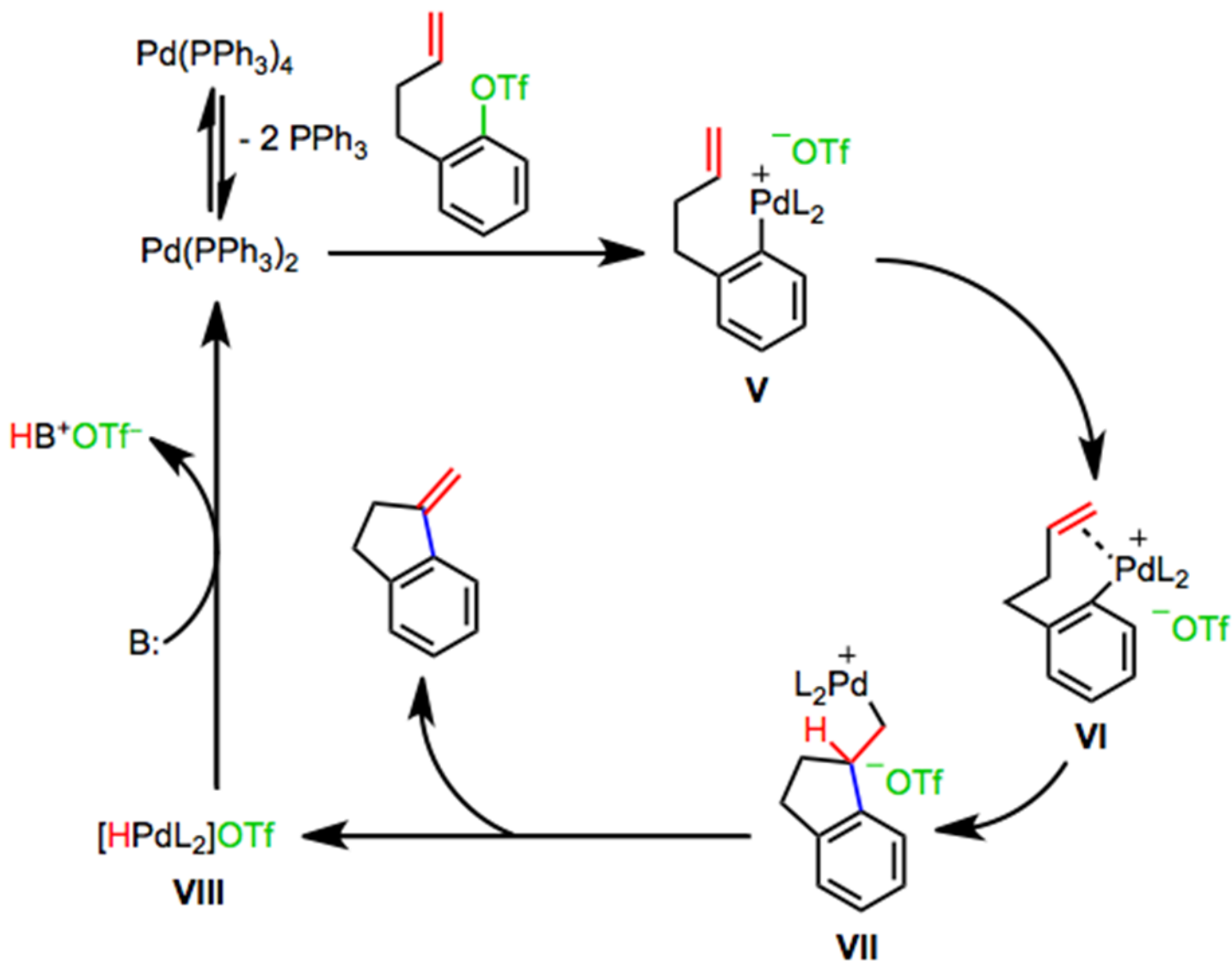
# Suzuki-Miyaura 反应

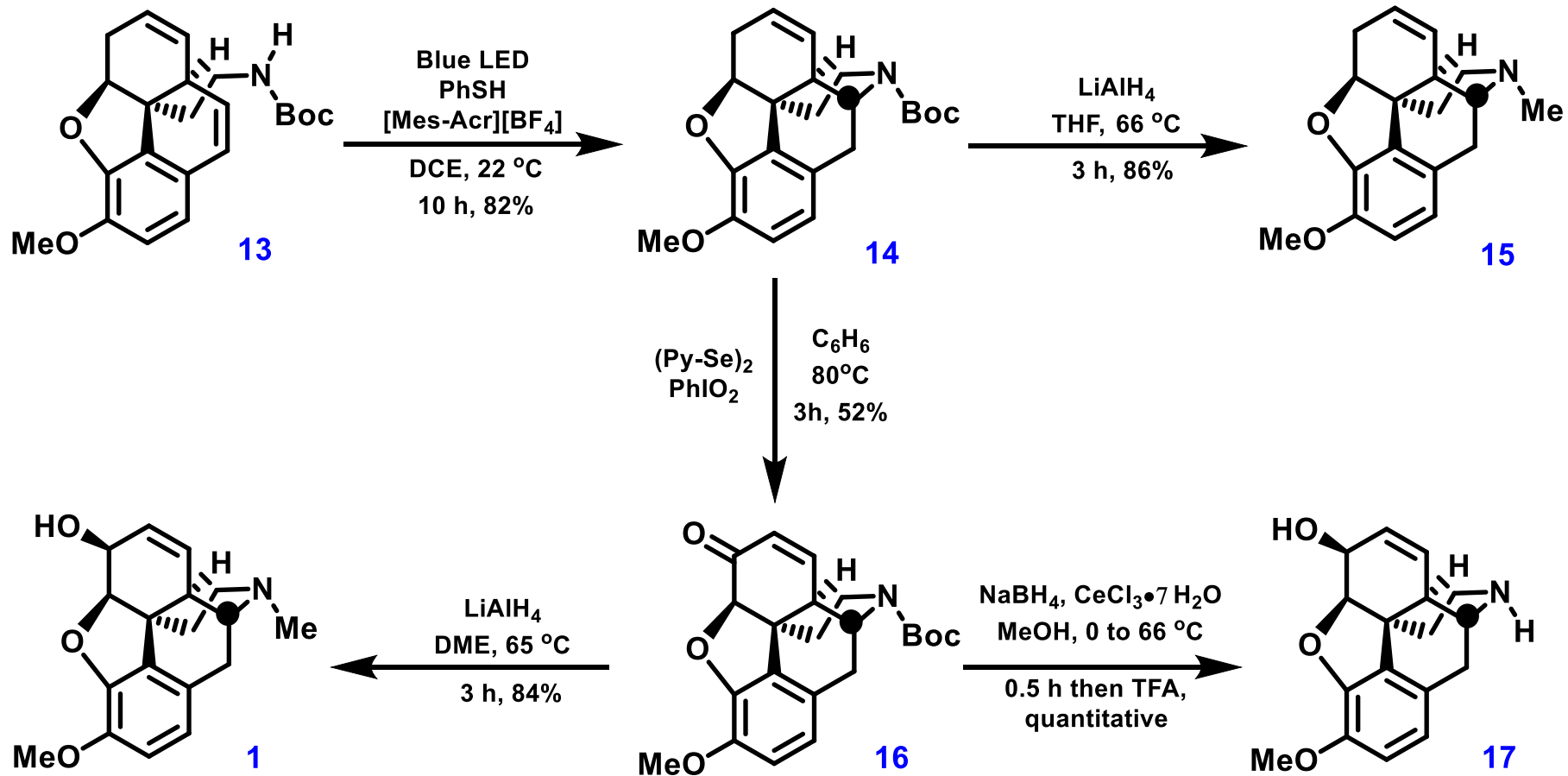


# Mitsunobu反应



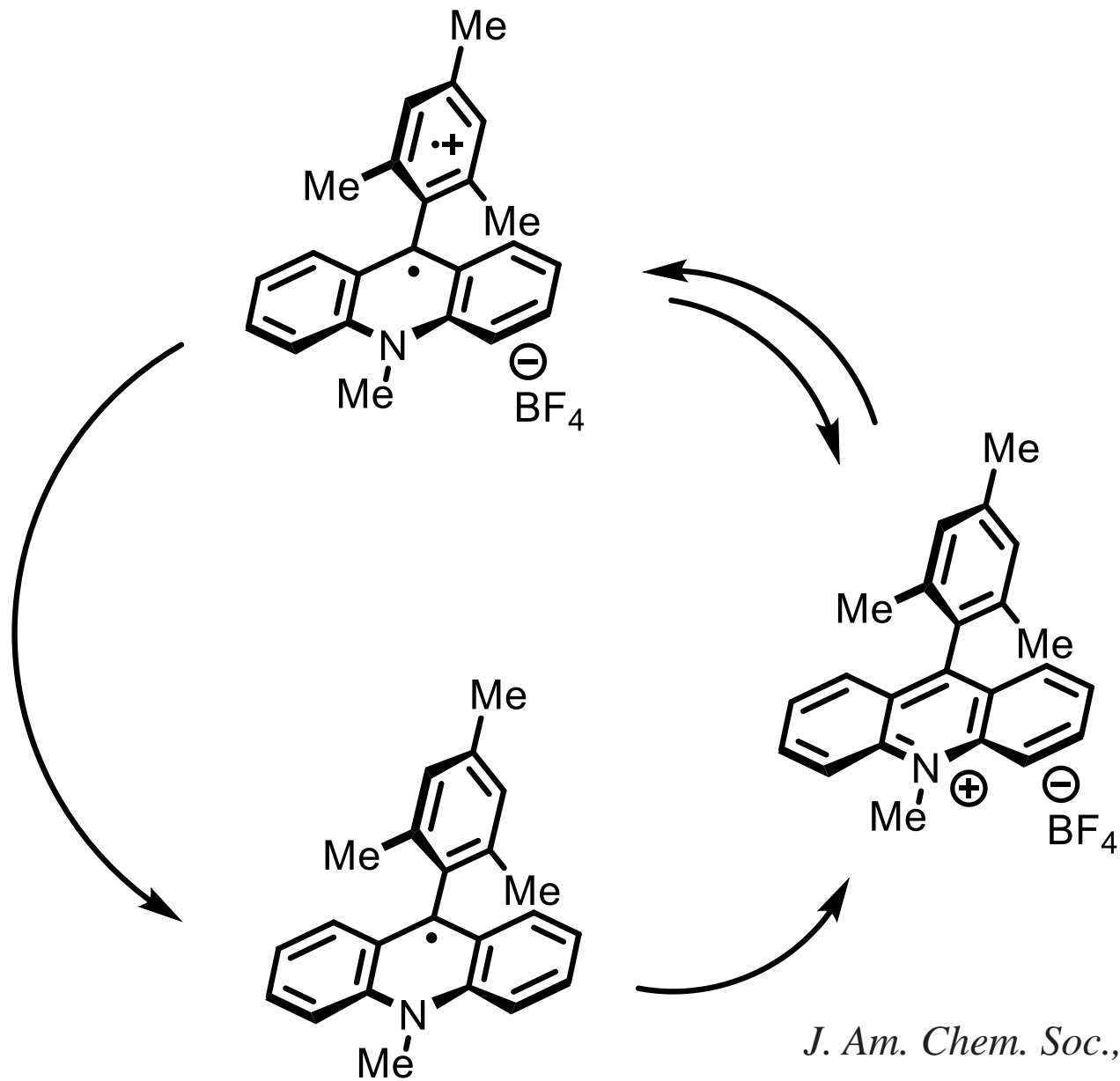
# Heck偶联—阳离子历程







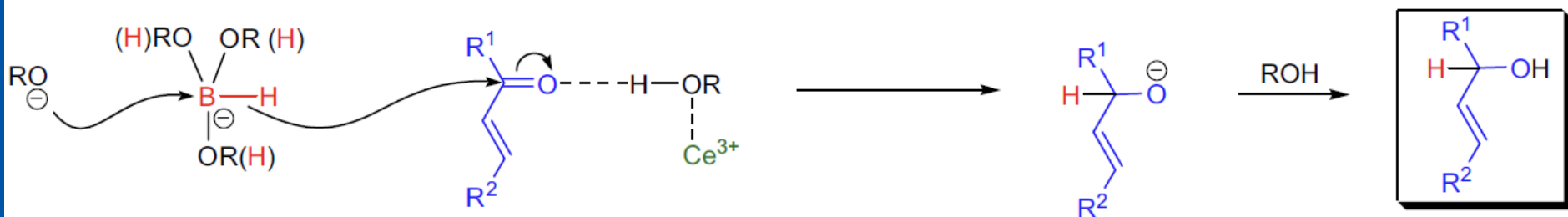
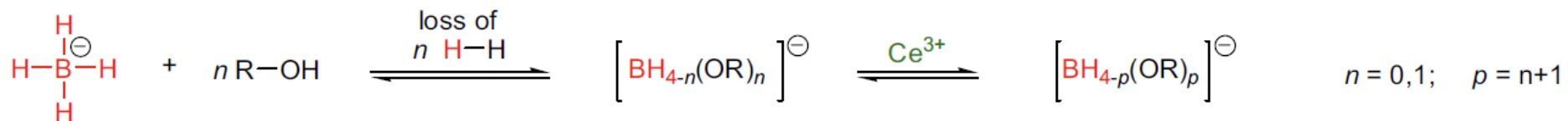
# 光氧化还原反应——Mes-Acr<sup>+</sup>

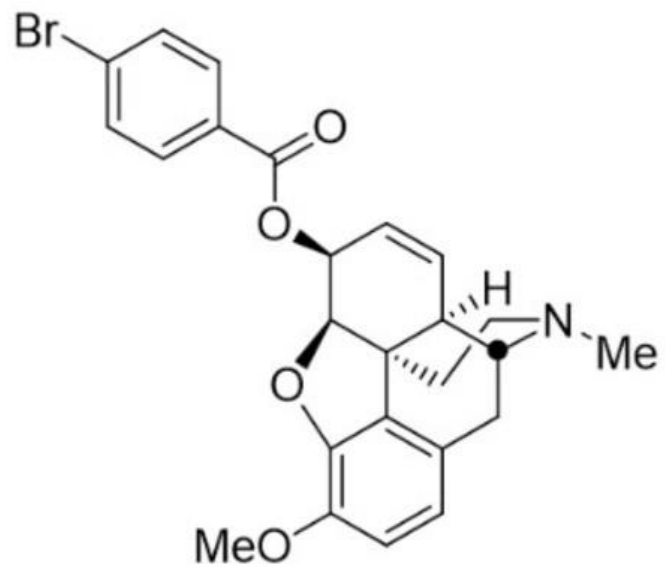


*J. Am. Chem. Soc.*, 2013, 9588.

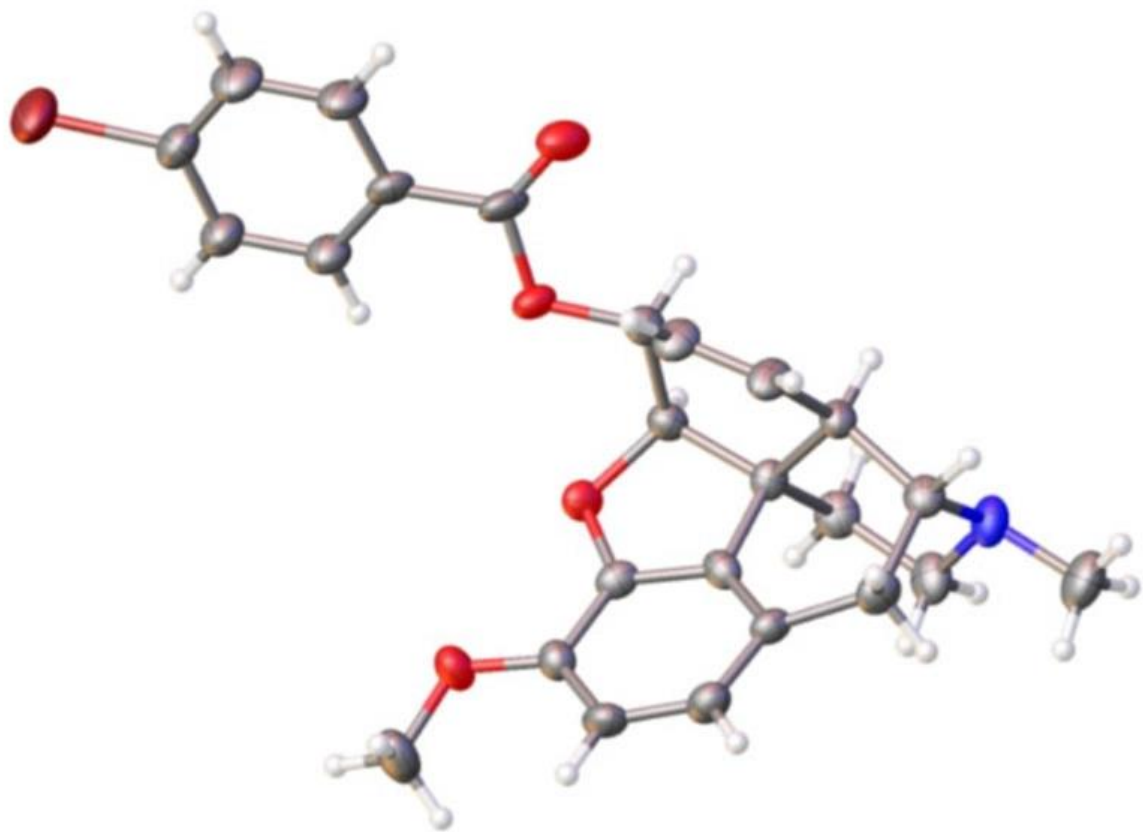
# Luche还原反应

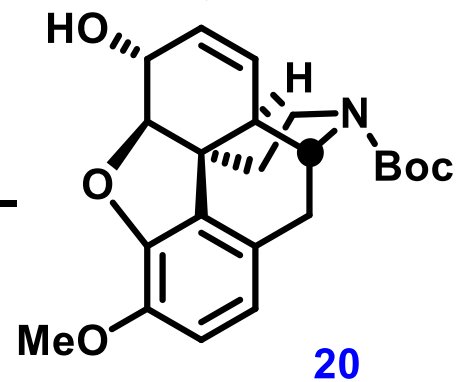
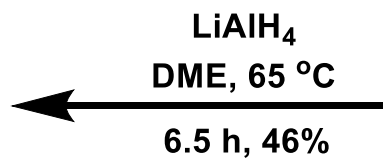
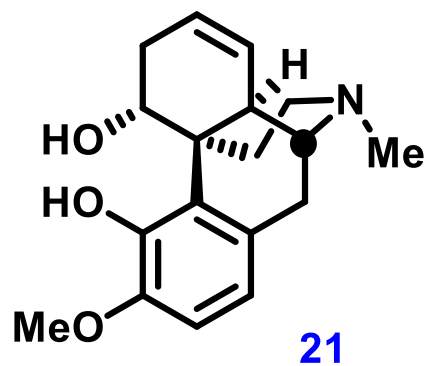
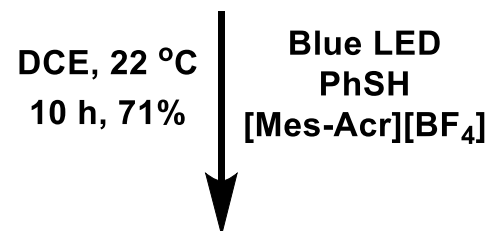
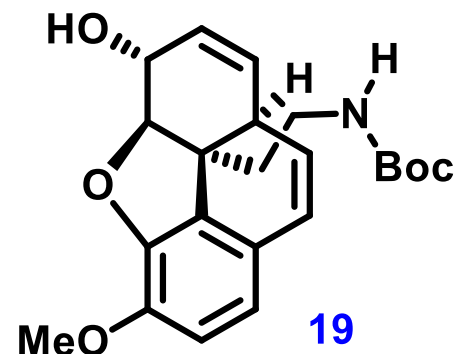
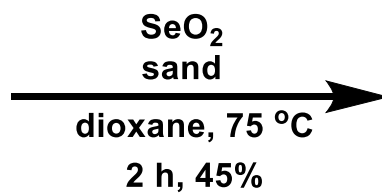
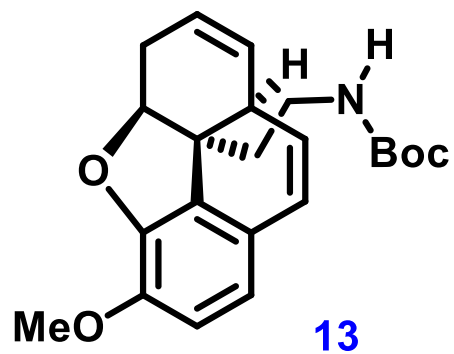
Formation of alkoxyborohydrides:





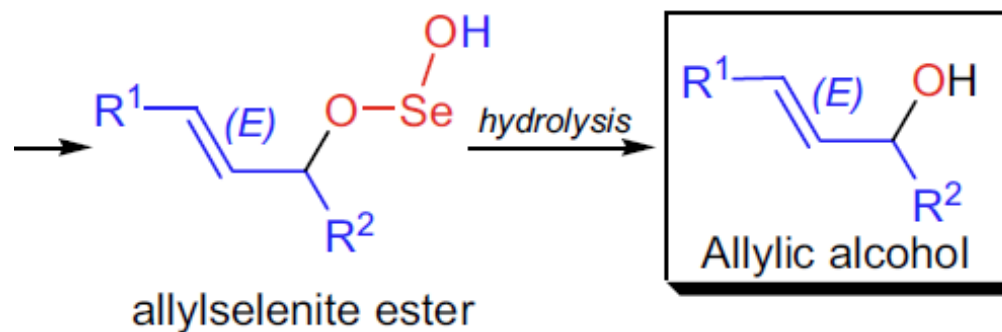
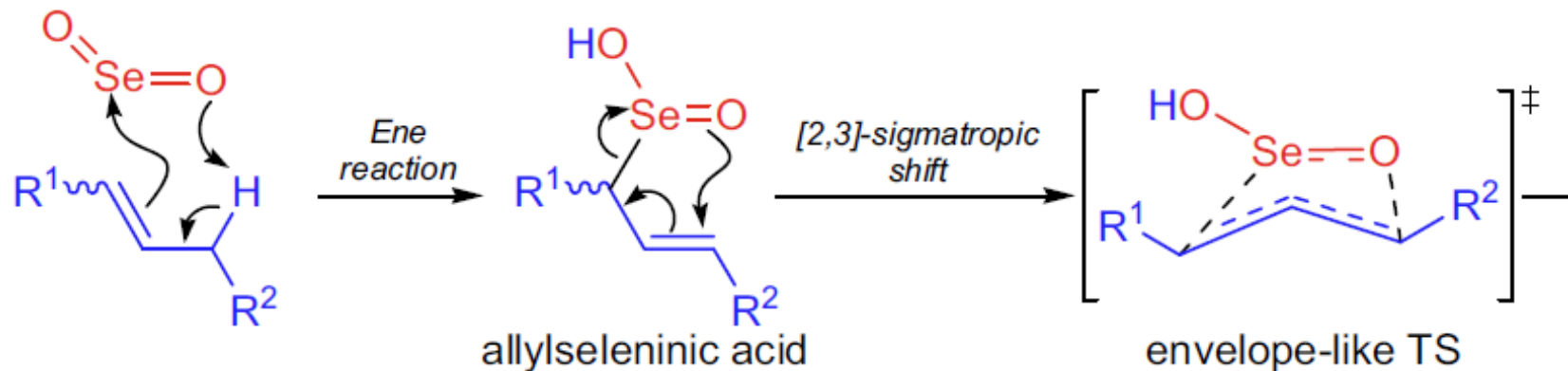
**18**





# Riley氧化反应

Oxidation of alkenes:



# A Possible Mechanism for the Conversion 20→21

