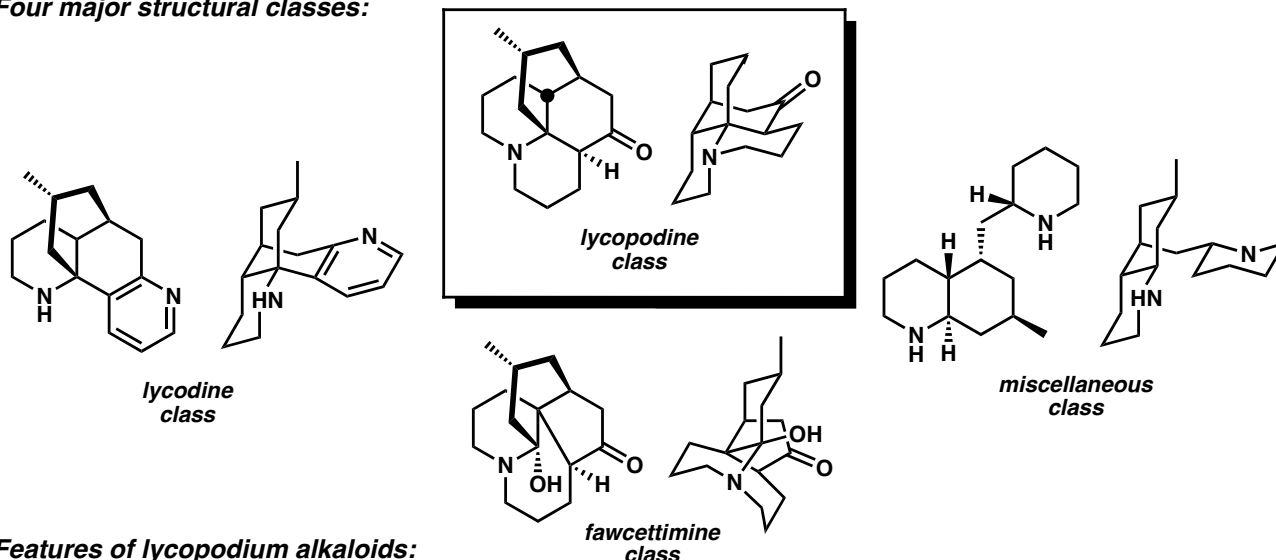


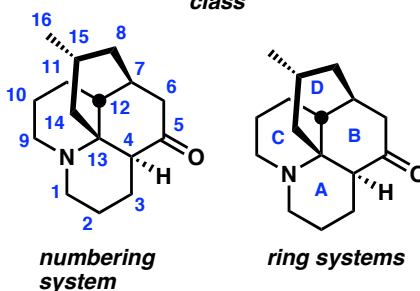
Lycopodine and the Lycopodium Alkaloids

Four major structural classes:



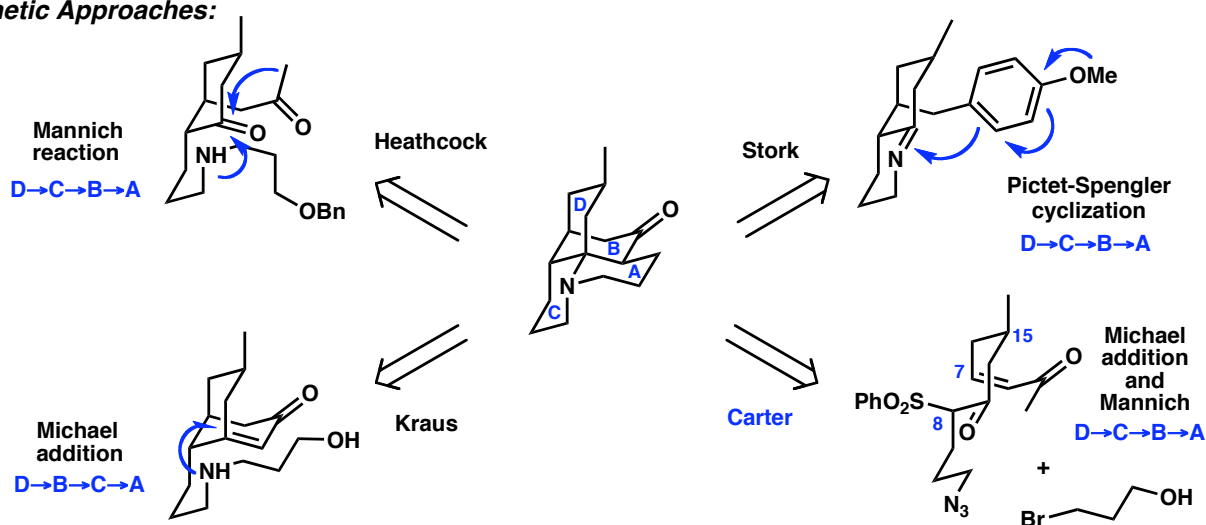
Features of lycopodium alkaloids:

- first isolated from clubmoss *lycopodium complanatum* (1881)
- over 200 lycopodium alkaloids have been identified
- members of this family are known to have cardiovascular and neuromuscular effects (Huperzine A is being studied as an Alzheimer's treatment)



- seven racemic total syntheses and two racemic formal syntheses to date
- synthetic challenges include poly-fused/bridged system and 4 contiguous stereocenters

Synthetic Approaches:



Today's Paper: Enantioselective Total Synthesis of Lycopodine
Yang, H.; Carter, R. G.; Zakharov, L. N. *JACS*, 2008, 230, 9238-9239.

References:

Isolation and Biology:

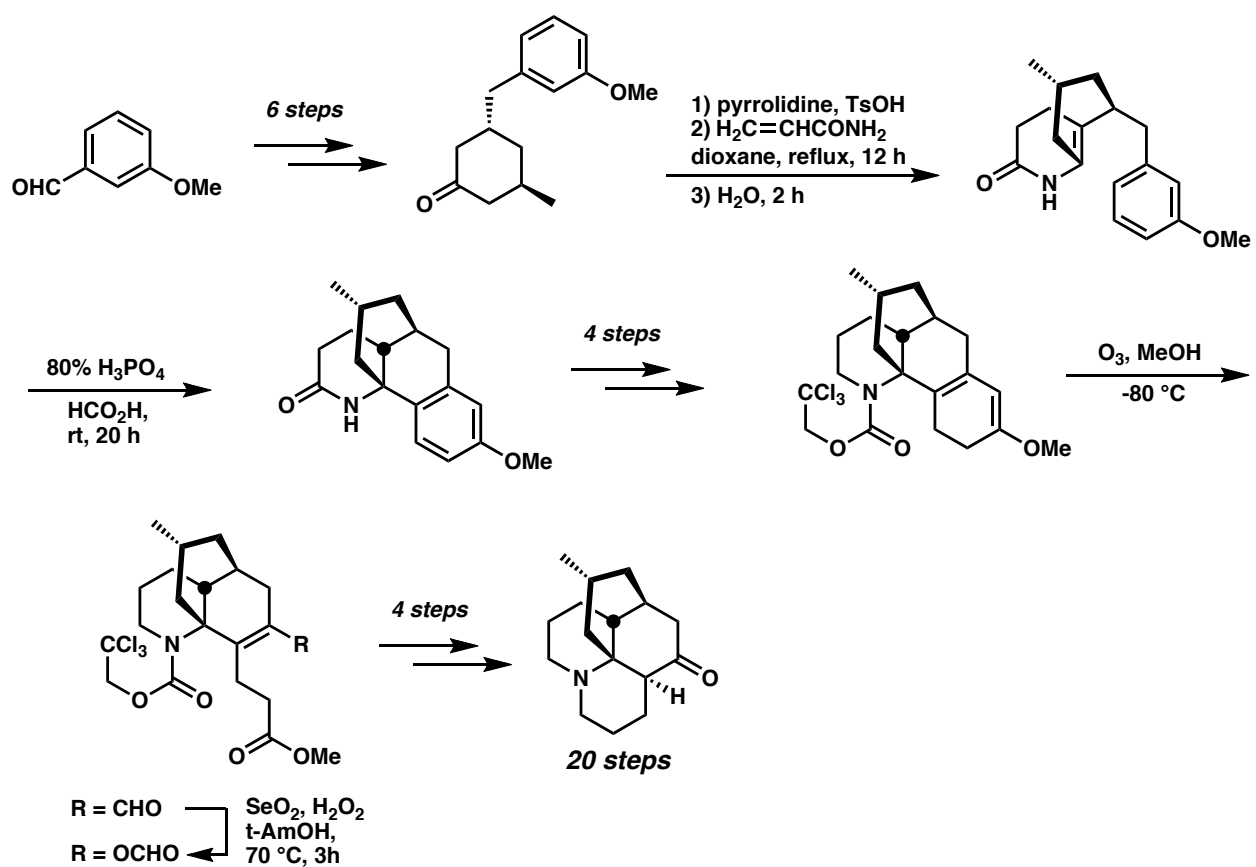
- (1) Ma, X., Gang, D. R., *Nat. Prod. Rep.*, 2004, 21, 752-772.
 - (2) Kobayashi, J.; Morita, H. *Alkaloids*. 2005, 61, 1-57.
- General Reference:**
- (3) Hudlicky, T.; Reed, J.W. *The Way of Synthesis*. Wiley-VCH: Weinheim, 2007, pp. 573-615.

Several Syntheses:

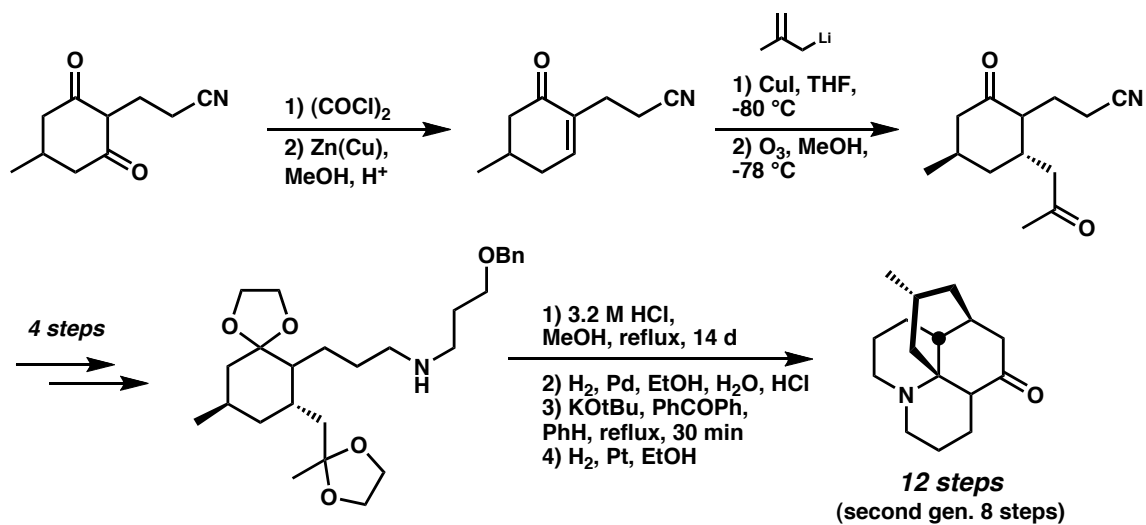
- (5) Wiesner, *Tetrahedron Lett.* 1967, 49, 4931-4936.
- (6) Stork, *JACS*. 1968, 90, 1647-1648.
- (7) Heathcock, *JACS*. 1978, 100, 8036-8037.; Heathcock, *JACS*. 1982, 104, 1054-1068.
- (8) Kraus, *JACS*. 1985, 107, 4341-4342.

Lycopodine and the Lycopodium Alkaloids

Stork Synthesis (1968):

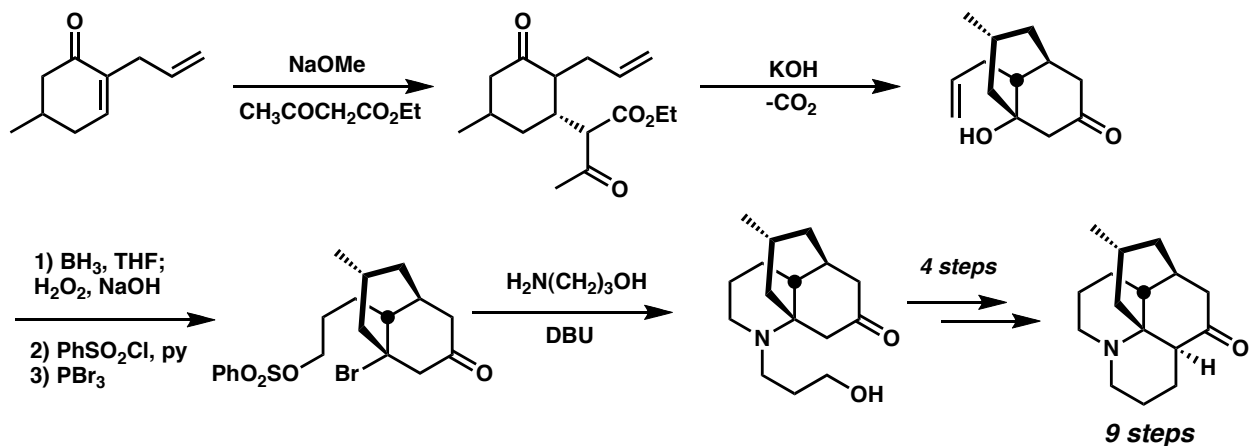


Heathcock Synthesis (1978):



Lycopodine and the Lycopodium Alkaloids

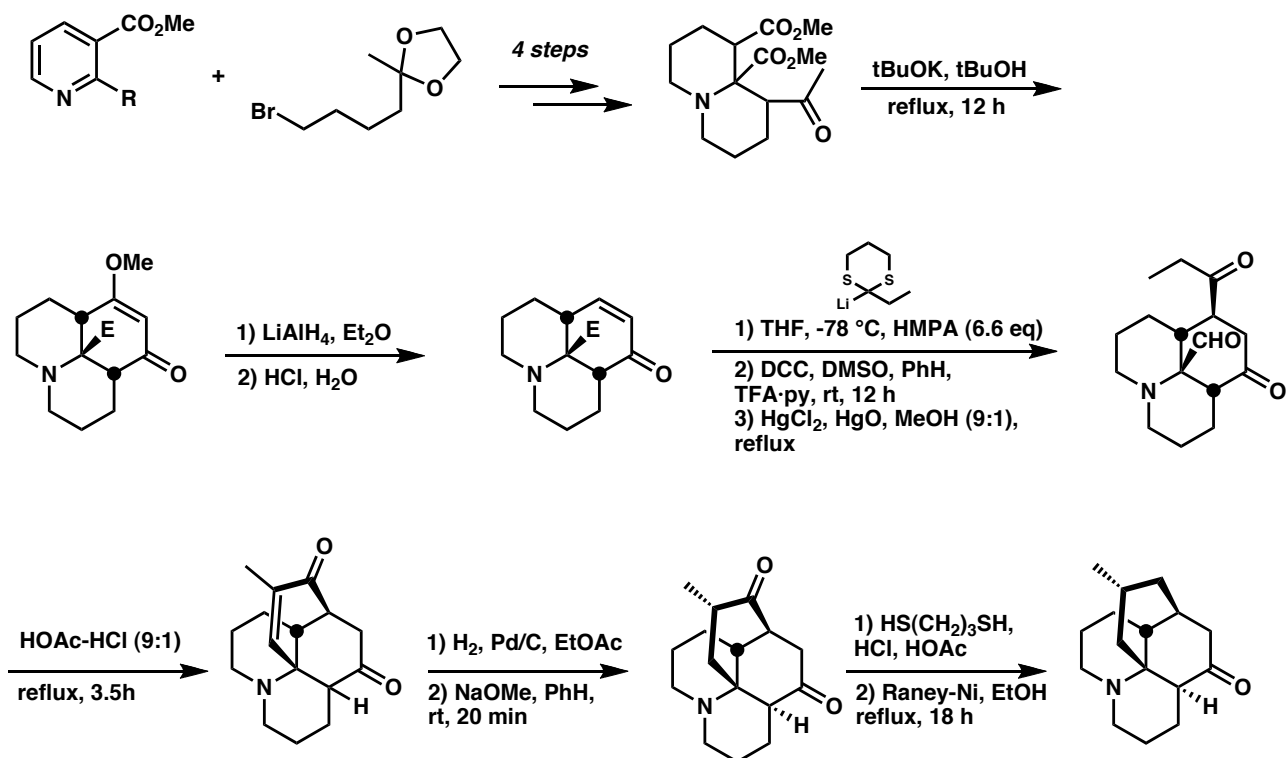
Kraus Synthesis (1985):



Additional Syntheses

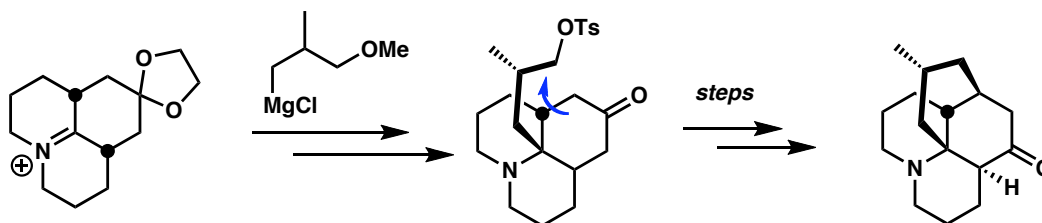
1. Wenkert, *J. Chem Soc., Chem Commun.* 1984, 714-715.
2. Ayer, *JACS.* 1968, 90, 1648-1650.
3. Padwa, *JOC.* 1997, 62, 78-87.
4. Grieco, *JACS*, 1998, 120, 5128-5122.

Wenkert Synthesis (1978):

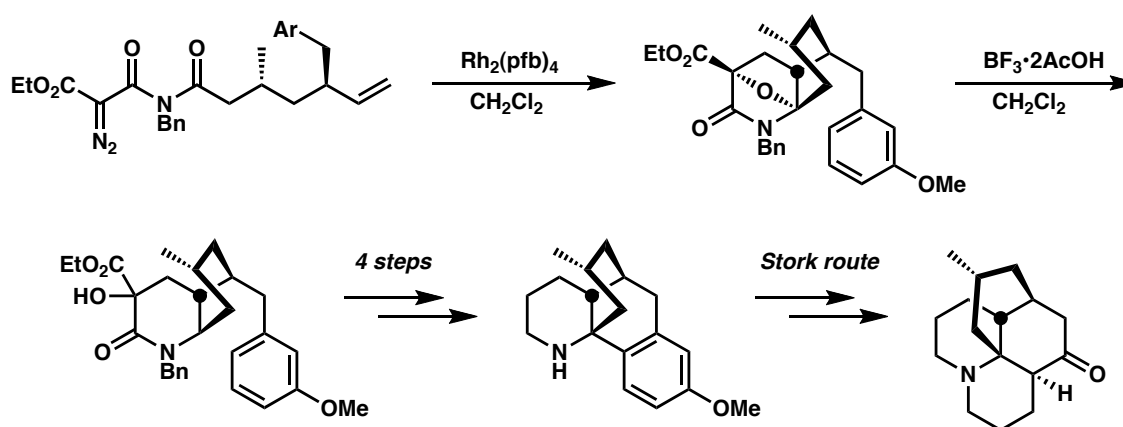


Lycopodine and the Lycopodium Alkaloids

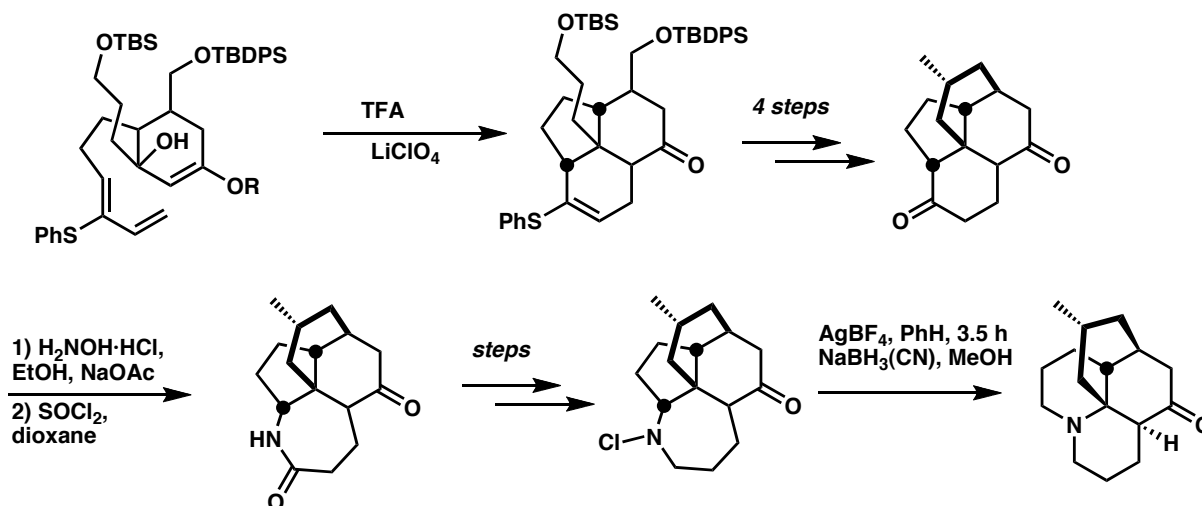
Ayer Synthesis (1968):



Padwa Synthesis (1997):

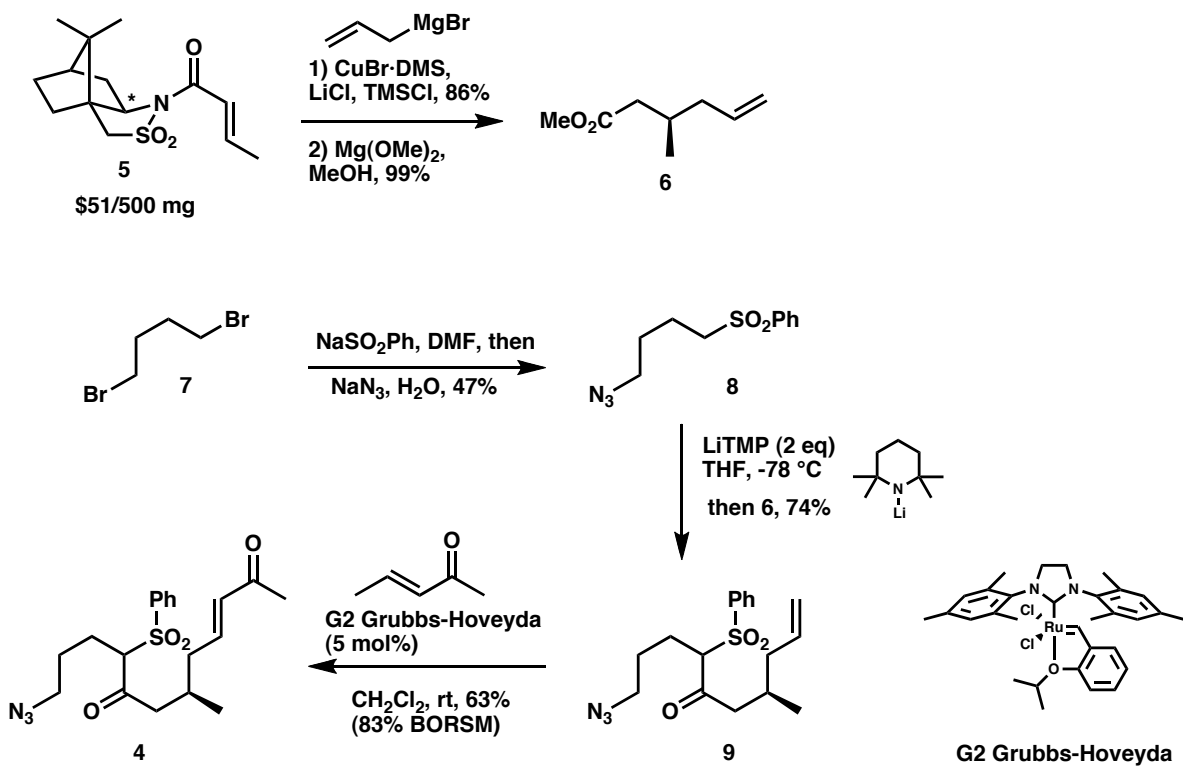


Grieco Synthesis (1998):



Carter's Synthesis of Lycopodine

Synthesis of Linear Precursor:



Cyclization Sequence:

