5.37 Introduction to Organic Synthesis Laboratory

Spring 2009

Massachusetts Institute of Technology

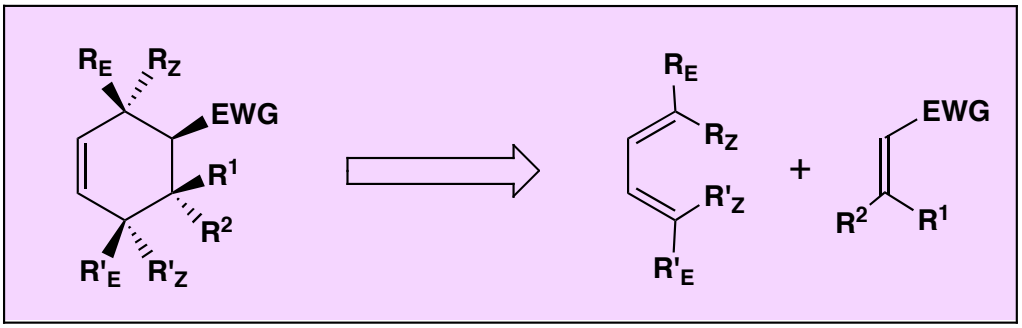
Organic Chemistry 5.37

April 23, 2008
Prof. Rick L. Danheiser

Lecture 3

Introduction to Organic Synthesis

The Diels–Alder Reaction, Part III



The Diels–Alder Reaction

If one chemical reaction had to be selected from all those in the repertoire of synthetic organic chemists as the most useful and powerful synthetic construction, it was clear by 1970 that the Diels-Alder reaction would be the logical choice. Its application not only leads to a strong increase in molecular complexity (molecular size, topology, stereochemistry, functionality, and appendages), but also can result in structures that lend themselves to additional amplification of complexity by the use of other powerful synthetic reactions.

E. J. Corey *Angew. Chem. Int. Ed.* **2002**, *41*, 1650

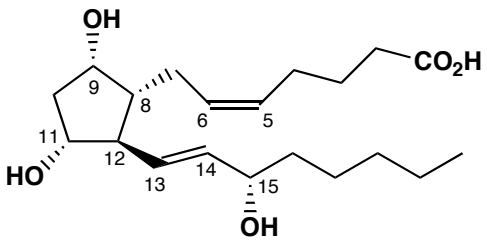
Intrinsic Stereoselectivity

- ★ Suprafacial with respect to the diene
- ★ Suprafacial with respect to the dienophile
- ★ Alder endo rule

Asymmetric Induction

- ★ Substrate control by chiral dienophiles
- ★ Substrate control by chiral dienes
- ★ Stereocontrol via chiral auxiliaries

Catalytic Asymmetric Cycloadditions

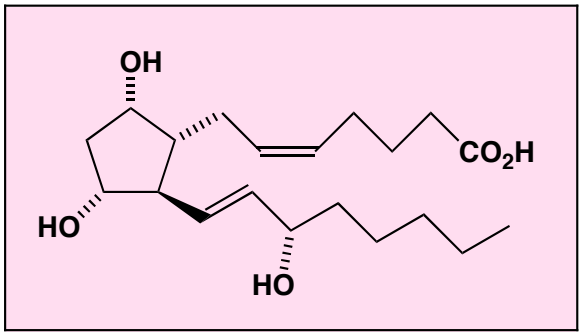


Prostaglandin $F_{2\alpha}$

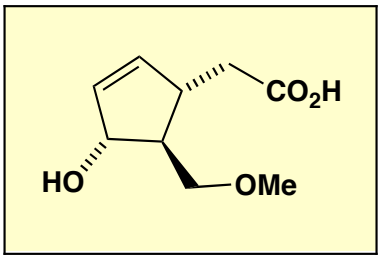
Case Study

Total Synthesis of Prostaglandins

Corey, E. J.; Weinshenker, N. M.; Schaaf, T. K.; Huber, W. *J. Am. Chem. Soc.* **1969**, *91*, 5675



Prostaglandin $F_{2\alpha}$



Key Subtarget

What is the mechanism of this hydrolysis? See C. S. Shiner et al. *Tetrahedron Lett.* **1983**, *24*, 5687