

CHM 4220, Organic Synthesis, Dr. Laurie S. Starkey, Cal Poly Pomona

Asymmetric Synthesis Literature Assignment

The last two chapters of the textbook represent brief treatments of two BIG topics: stereochemistry and transition-metal mediated reactions that form new C–C bonds. This project enables you to dig more deeply into at least one of these topics, and possibly both. **Asymmetric synthetic methods** enable chemists to synthesize predominantly one enantiomer of a chiral compound. Such a strategy can also be described as an **enantioselective synthesis**. The other enantiomer is typically formed as a minor product, and the goal is to achieve a high **enantiomeric excess** (ee). A 100% ee indicates that the reaction produced exclusively a single enantiomer, a 90% ee means a 95:5 mixture of the two enantiomers was formed, and 0% ee means a 50:50 (racemic) mixture was formed. Many such methods have been developed, and asymmetric method development continues to be a hot topic of current research! For this assignment, you are going to explore a topic in the literature and prepare a very brief video presentation (~2-5 minutes) to be viewed during class in Week 15.

You have two options:

- A. Explore an **asymmetric synthetic method** and its various applications (over 2-3 journal articles). *Or*
- B. Explore a journal article that describes the **asymmetric synthesis of a natural product**.

Your source(s) should be full articles, rather than a brief communication, since we want to see all the experimental details of the multi-step synthesis. Search online databases through the CPP library website (try using SciFinder or Web of Science database) to find suitable articles. Prepare a video presentation using PowerPoint, Adobe Spark, or your preferred software. To simplify the project, you do not need to create any drawings from scratch – images can be taken from the journals as “screen grabs,” with proper citation.

Option A – Asymmetric Method Review

- 1) Find 2-3 journal articles focused on a particular asymmetric method (see list for ideas, and to sign up). Include the titles and complete literature references for the articles.
- 2) Discuss the origin of the enantioselectivity – what chiral auxiliary is used? How does it work? Include a diagram to illustrate the stereochemistry, if available.
- 3) Provide tables to illustrate the scope of the reaction. For example: what functional groups does it tolerate? What limitations does it have? How does it improve on previously known methods? If your topic is a chiral auxiliary, rather than a specific reaction, discuss the various reactions it has been applied to.
- 4) Find an application of the method to the total synthesis of an interesting target molecule. What makes the TM interesting?

Option B – Asymmetric Natural Product Synthesis

- 1) What article are you reviewing? Include the title and a complete literature reference.
- 2) What is the biological activity of the natural product TM? Provide a complete literature reference.
- 3) Identify the reactions in the synthetic scheme that form new C–C bonds (if it is a large synthesis, select three different reactions to discuss). Highlight the reaction and describe it. (Is it a Grignard? Aldol? Wittig? etc.) If the reaction is new to you, say so. It is **very** likely that there will be **many** unfamiliar reactions. The world of organic synthesis is a large one and we have only seen the tip of the iceberg in this class!
- 4) Identify the enantioselective reaction and describe it. What was the ee (or de)? Was there any optimization needed to improve the yield or selectivity?