# Chemistry 514: Asymmetric Catalysis in Organic Synthesis

**Instructor:** Dr. Sherry R. Chemler
**Days and TImes**: Tuesday and Thursday, 9:30-10:50 AM
**Office Hours**: Tuesday and Thursday, 11-12 noon
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## Materials Needed:

Access to the internet to download journal articles (visit our fabulous science library), course notes from lecture. Extra helpful resources: Beilstein, Sci-Finder, Web of Science Search engines (available through the library).
Optional Books: 1) Catalytic Aysmmetric Synthesis, Ojima Ed., Wiley-VCH (available through Amazon.com); 2) Transition Metals in the Synthesis of Complex Organic Molecules, Hegedus Ed., University Science Books (available through Amazon.com).

## About the Course:

The 2001 Nobel prize in chemistry went to three chemists who pioneered the area of asymmetric catalysis. What's all the buzz about? In this course, methods for synthesizing enantioenriched organic compounds through asymmetric catalysis are described. Both transition metal and organocatalysis methods are covered. This course covers basic bond formation mechanisms, three-dimensional analysis of the stereochemistry-determining step, physical organic methods for determining what the stereochemistry-determing step is and the use of these reactions for the synthesis of biologically active organic compounds. The course is taught with an historical perspective designed to show the progression of scientific advancement from the early stages of asymmetric synthesis and catalysis to the current, cutting-edge research of today. The work of key scientist in this field such as Sharpless, Trost, Evans, Jacobsen, Miller, Fu, Overman, Hoveyda, Denmark, Noyori, Shibasaki, MacMillan, and Davies will be discussed, among others. By the end of this course, you should be able to develop and study a novel catalytic reaction.

**Homework:** 1) 2 Critical reviews of selected articles; 2) 4 Graded problem sets.

**Tests:** 4 Tests will be given that cover the material of the previous weeks (the tests are not cumulative).

**Independent Proposal**: Develop an independent research proposal (5 pages) that 1) develops a new catalytic asymmetric reaction, 2) probes a mechanistic question of an existing catalytic reaction in depth or 3) incorporates the use of asymmetric catalysis technology. For (3), you may synthesize a biologically active molecue using catalytic reaction, you may develop a library of potential medicinal agents, or you may apply asymmetric catalysis to the formation of novel functional materials. Be prepared to explain 1) the significance of your proposal, 2) the novelty of your approach to the

problem and 3) experimental details sufficient enough to persuade others of the feasibility of your approach. This is excellent practice for your fifth semester independent proposal. The more time you put into this project, the more you will get out of it. You may pass your initial idea by the instructor for an early opinion. The evaluation of a scientific proposal includes novelty (creativity), current or potential utility and technical competence. Communication (spelling, grammar, structure) are also important—don't make the reader work too hard. APPROPRIATELY CITE ALL RELEVENT PRECEDENTS IN THE FOOTNOTE (Endnote is a good program for citations). Use the NIH guidelines as a model. Proposals are due on the last day of class.

**Grading:** Tests (40%), Homework (30%), Proposal (30%).