Copper-Catalyzed Enantioselective Reduction of \( \alpha, \beta \)-Unsaturated Esters

**Significance:** Buchwald and co-workers reported the use of copper and chiral bisphosphine ligands for the enantioselective 1,4-reduction of \( \alpha, \beta \)-unsaturated esters. Polymethylhydroxiloxane (PMHS) was employed as a stoichiometric hydride source.

**Comment:** Novel methodologies have been developed since this seminal report on the enantioselective hydrofunctionalization of alkenes. Use of DTBM-SEGPHOS as the ligand and other hydride sources are now available for the asymmetric reduction of less activated alkenes.

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**Selected examples:**

- 84% yield, 90% ee
- 89% yield, 92% ee
- 98% yield, 91% ee
- 95% yield, 84% ee
- 93% yield, 80% ee from \( Z \) alkene
- 90% yield, 95% ee from \( E \) alkene
- 94% yield, 81% ee

**Proposed mechanism:**

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