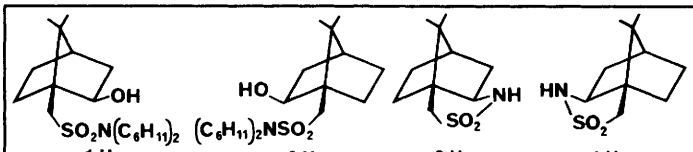
Oppolzer's Chiral Auxiliaries



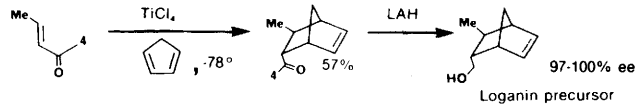
1-H 2-H 3-H 4-H

These chiral auxiliaries display excellent π-topological differentiation on reactions of their acryloyl (*e.g.*, Diels-Alder, conjugate addition, hydrogenation)[1-6] as well as their enolate derivatives.[5,7,9] Thus, chiral products are obtained in >90% diastereomeric excess (de) many of which can be purified to virtually 100% de by recrystallization. The auxiliaries are easily attached to the substrates[8] and nondestructively removed from the products (*e.g.*, by hydrolysis, transesterification and reduction) to give synthetically useful building blocks in high enantiomeric purity.

The following reaction schemes highlight a variety of recent asymmetric transformations which are directed by Oppolzer's auxiliaries.

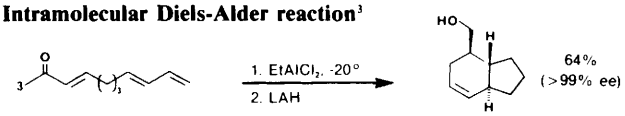
Intermolecular Diels-Alder reaction[1-4]

Preparation of a virtually pure chiral loganin precursor:[4]

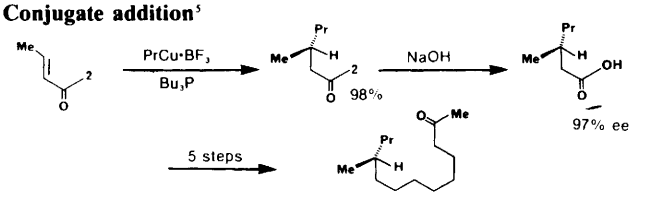


Loganin precursor

Intramolecular Diels-Alder reaction[3]

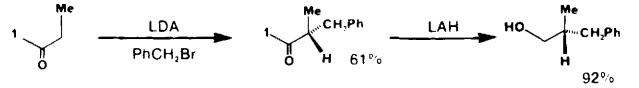


Conjugate addition[5]



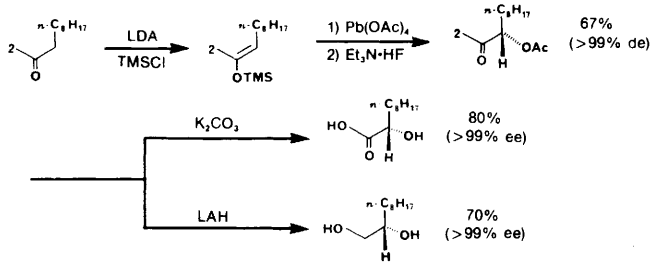
Southern corn rootworm pheromone

Enolate alkylation[5]



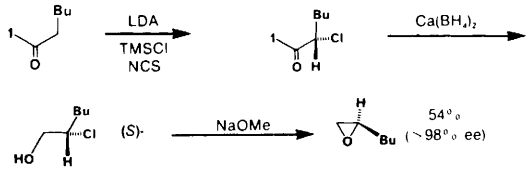
Asymmetric α-acetoxylation

Synthesis of chiral α-hydroxyacids and glycols:[7]

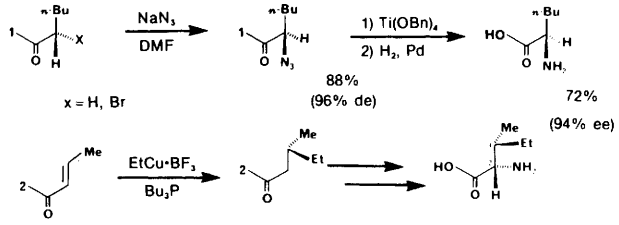


Asymmetric α-halogenation

Synthesis of chiral halohydrins and epoxides:[9]



α-Amino acid synthesis[10]

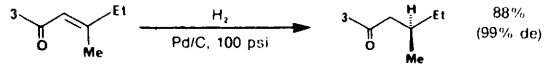


L-*allo*-isoleucine

Following this protocol, the combination of C(β)-alkylation (conjugate addition) with C(α)-halogenation provided the uncommon amino acid L-*allo*-isoleucine [(2*S*) - 99.3% ee, (3*R*) - 97.8% ee], an essential precursor in the synthesis of the psychotropic ergot peptide epicriptine.

Asymmetric hydrogenation[6]

A series of β,β-dialkylacrylamides prepared from auxiliary **3** gave reduced products of high diastereomeric excess on simple hydrogenation with H_2 and Pd/C.



References and notes:

1) Oppolzer, W. *Angew. Chem., Int. Ed. Engl.* **1984**, *23*, 876. 2) Oppolzer, W.; Chapuis, C., Bernardinelli, G. *Helv. Chim. Acta* **1984**,*67*, 1397. 3) Oppolzer, W.; Dupuis, D.; *Tetrahedron Lett.* **1985**, *26*, 5437. 4) Vanderwalle, M. *et al. Tetrahedron*, in press. 5) Oppolzer, W.; Dudfield, P.; Stevenson, T.; Godel, T. *Helv. Chim. Acta* **1985**, *68*, 212. 6) Oppolzer, W.; Mills, R.J.; Reglier, M. *Tetrahedron Lett.* **1986**, *27*, 183. 7) Oppolzer, W.; Dudfield, P. *Helv. Chim. Acta* **1985**, *68*, 216. 8) Acyl derivatives of auxiliaries **1** and **2** were prepared from the acid chloride with AgCN and those employing auxiliaries **3** and **4** were prepared with NaH and the acid chloride. 9) Oppolzer, W.; Dudfield, P. *Tetrahedron Lett.* **1985**, *26*, 5037. 10) Oppolzer, W.; Pedrosa, R.; Moretti, R. *ibid.* **1986**, *27*, 831.