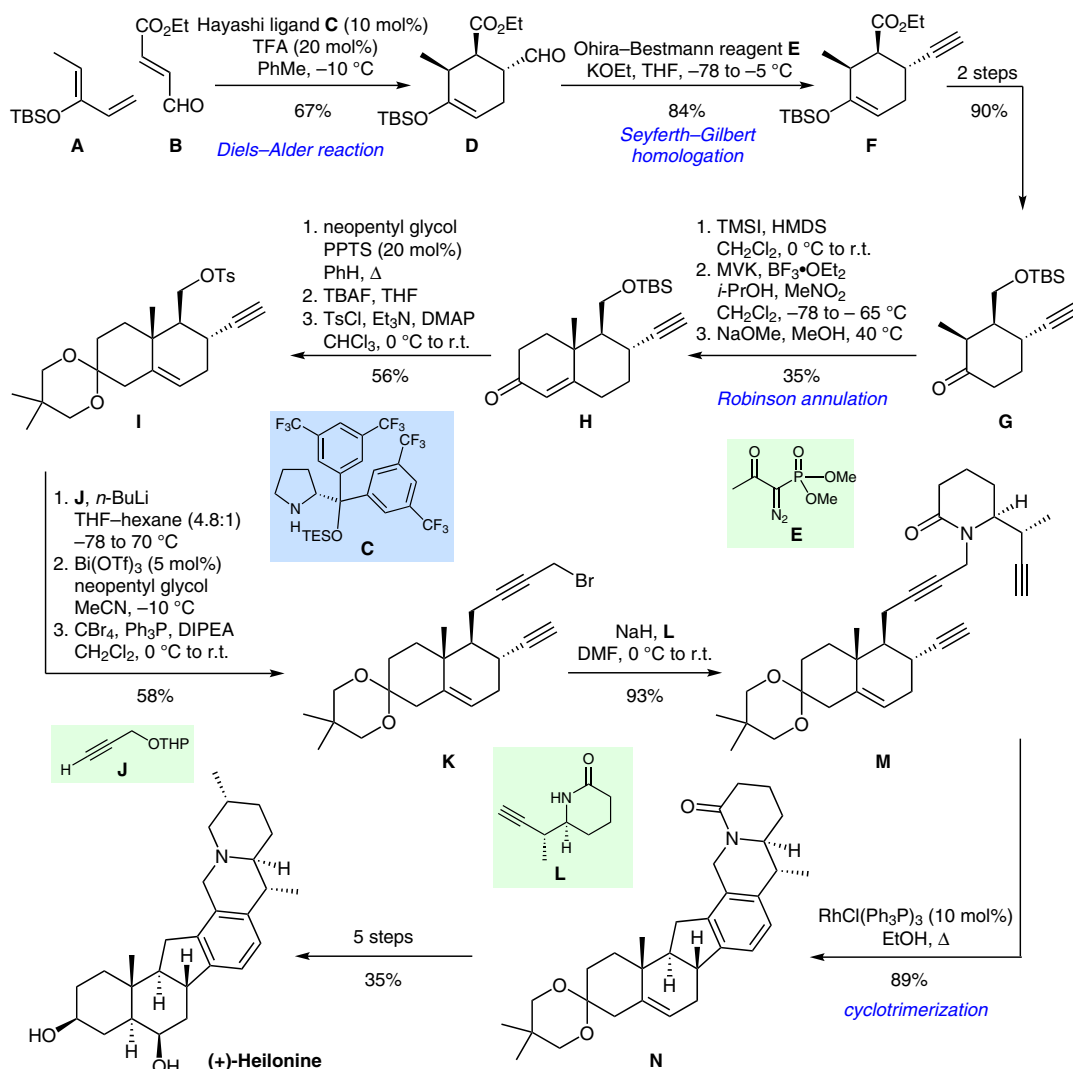


Total Synthesis of (+)-Heilonine



Significance: (+)-Heilonine is a steroidal alkaloid that was isolated in 1989 from *Fritillaria ussuriensis*-Maxim. It is a member of the cevanine alkaloids, of which only one has been synthesized prior to this work. (+)-Heilonine consists of a hexacyclic framework, including a quinolizidine.

Comment: Ester **D** is accessed in enantiomerically enriched form via an asymmetric Diels–Alder reaction, and rapidly elaborated into ketone **G**. Ketone **G** was subjected to a Robinson annulation, yielding enone **H**. Lactam **L**, accessible via an Evans-aldol strategy, was alkylated with propargyl bromide **K**, giving tryne **M**. The key rhodium-catalyzed cyclotrimerization of **M** yielded arene **N** with the scaffold of the natural product. Few steps remained to access the natural product (+)-heilonine.