Enantioselective Synthesis of Iboga Alkaloids and Vinblastine Via Rearrangements of Quaternary Ammoniums

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1) C, THF, reflux
2) H₂, Pd/C (10% mol)
3) isobutyl chloroformate, NMO, then D, Et₃N
4) t-butylthiol, 270W sun lamp

5) Boc₂O
6) LDA, propargyl bromide
7) TFA
8) Me₂O⁺BF₄⁻, then NaBH₄
9) PPh₃AuNTf₂ (cat.), E, MsOH, AgOTf (cat.) then NaHCO₃ (aq.), Et₃N
10) t-BuOK, Ph₃PEtBr

Step 1: What is the name of the amino acid that the starting material comes from? Name the reaction.

Step 4: Name the reaction

Step 9: During the basic treatment a second reaction happens followed by a rearrangement. Name the rearrangement and provide a mechanism.

Step 10: Name the reaction

(+)–Dihydrocatharanthine
Step 11: Propose a mechanism for this step

11) H₂, PtO₂

12) F, FeCl₃, 0.1N HCl-CF₃CH₂OH
then Fe₂(ox)₃, O₂, NaBH₄

Step 12: Propose a mechanism for this step
Step 9: [1,2]-Stevens rearrangement. Proposed mechanism:

Note: radical mechanism also plausible

Step 12: Oxidative coupling to vinblastine. Proposed mechanism.