Total Synthesis of (±)-Merrilactone A

Merrilactone A (1) is a structurally unique pentacyclic sesquiterpene dilactone isolated in 2000 by Fukuyama and coworkers from the *Illicium merrillianum*. It was identified as a potent nonpeptidal neurotrophic factor that promotes neurite outgrowth in the culture of fetal rat cortical neurons at a remarkably low concentration of 0.1 μmol/L. In addition to its promising bioactivity, the merrilactone A pentacycle is riddled with synthetic challenges. The molecule sports seven contiguous chiral centers, of which three are quaternary, and bears a highly substituted cyclopentane ring at its core.

1. Give reagents for step a).

2. What is the structure of 4? Draw a reaction mechanism for the formation of 4.

3. Give the reagents for step b) and c).

4. Draw the structures of 6 and 7.

5. What is the name of the reaction from 6 to 7? Propose a reaction mechanism. Comment on the stereochemistry.
6.) Draw the structure of 9 and the reaction mechanism of step 1).

7.) Give the reagents for step d).

8.) Draw the structure of 11. Give a mechanism for the formation of 12, both from 10 and from 11.

9.) Give the reagents for step e).

10.) What is the structure of 14a and b? What ratio do you expect?

11.) Give the structure of Dess-Martin periodinane. Draw the reaction mechanism for the formation of 13 out of 14b.

12.) Give reagents and mechanisms for steps f) and g).