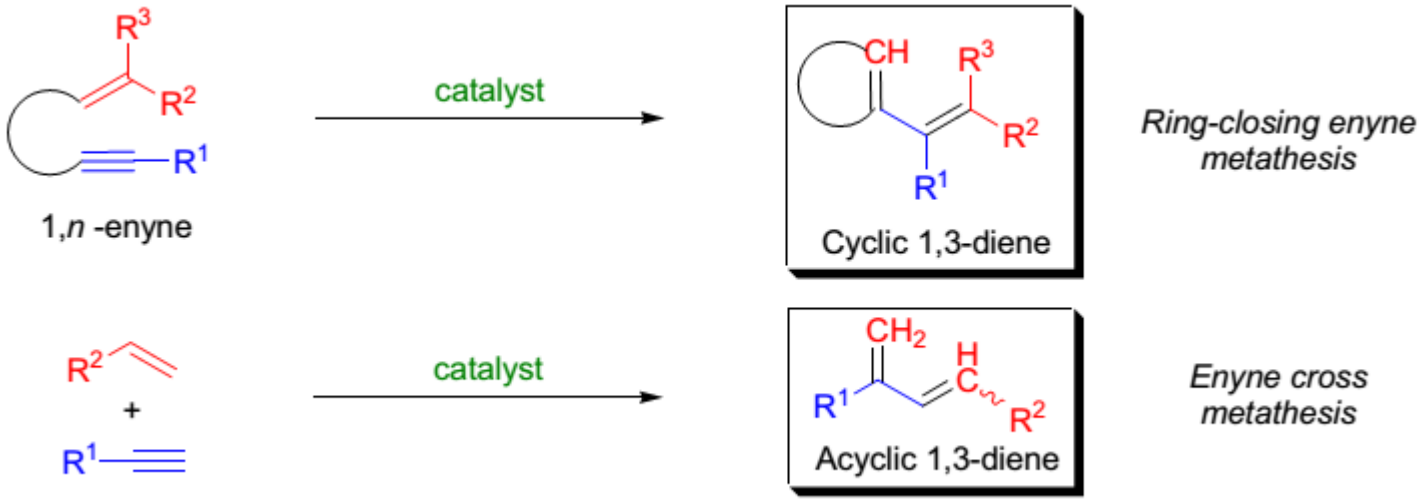
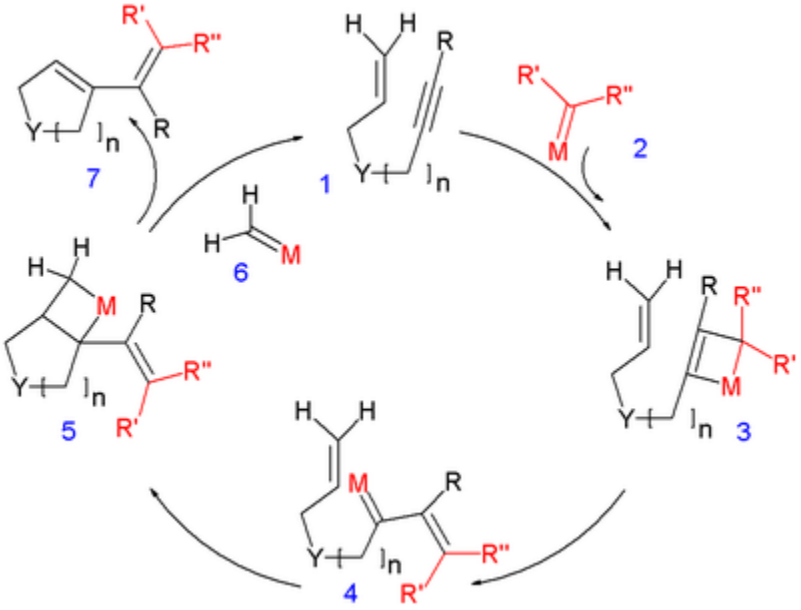
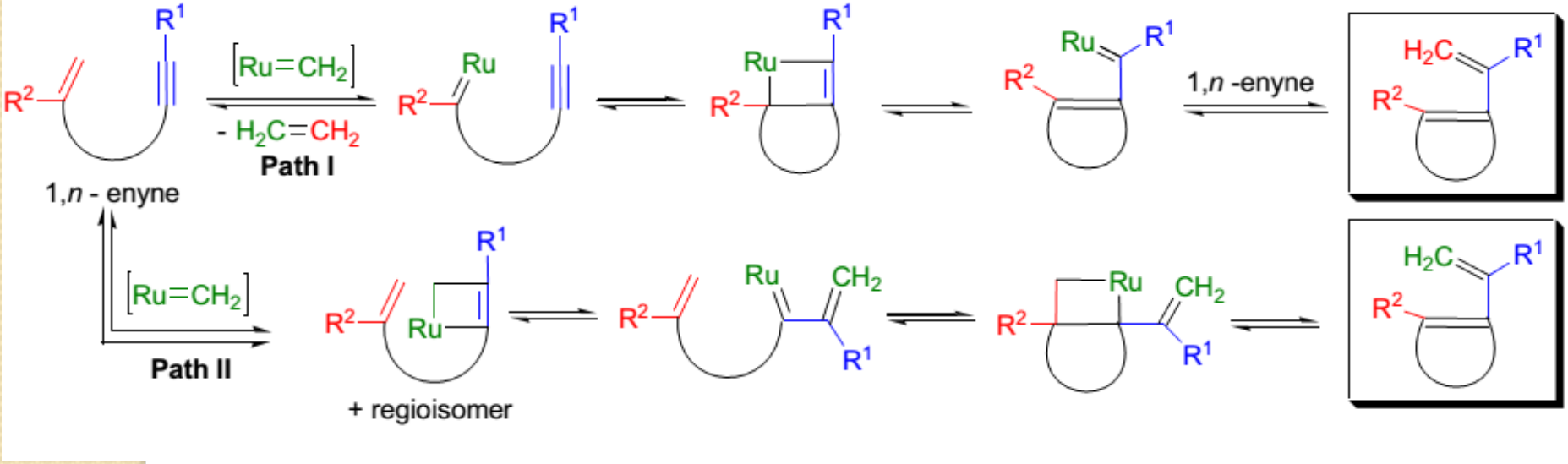
ENYNE METATHESIS

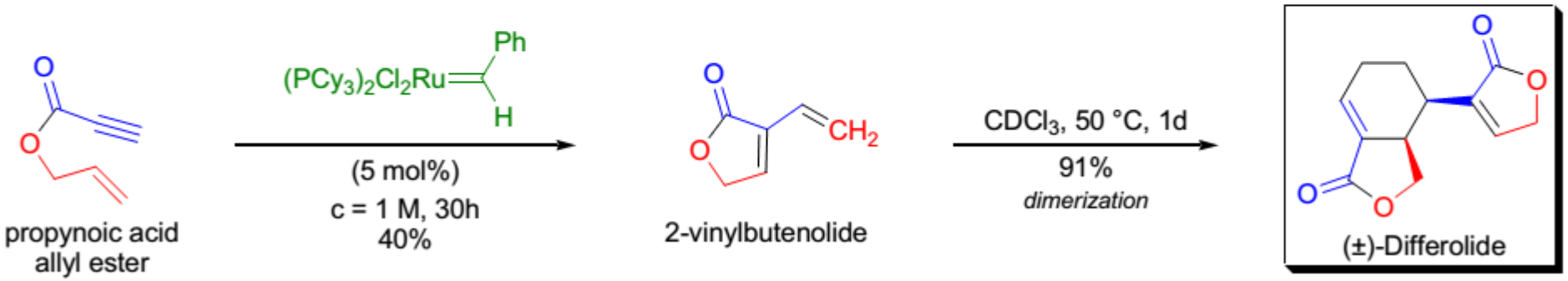


Mechanism:

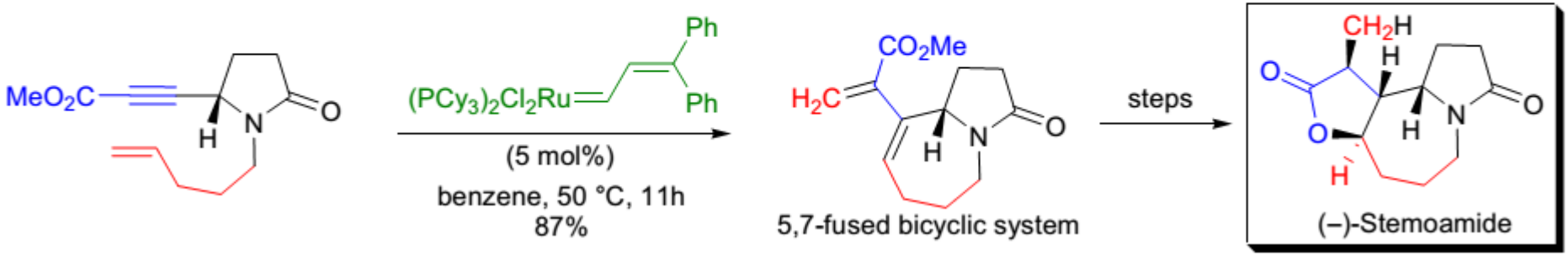

R'
R''
Y
In
R
7
1
2
M
H
6
5
3
4


R1
R2
[Ru=CH2]
- H2C=CH2
Path I
Ru
1,n - enyne
1,n -enyne
H2C
[Ru=CH2]
Path II
CH2
+ regioisomer

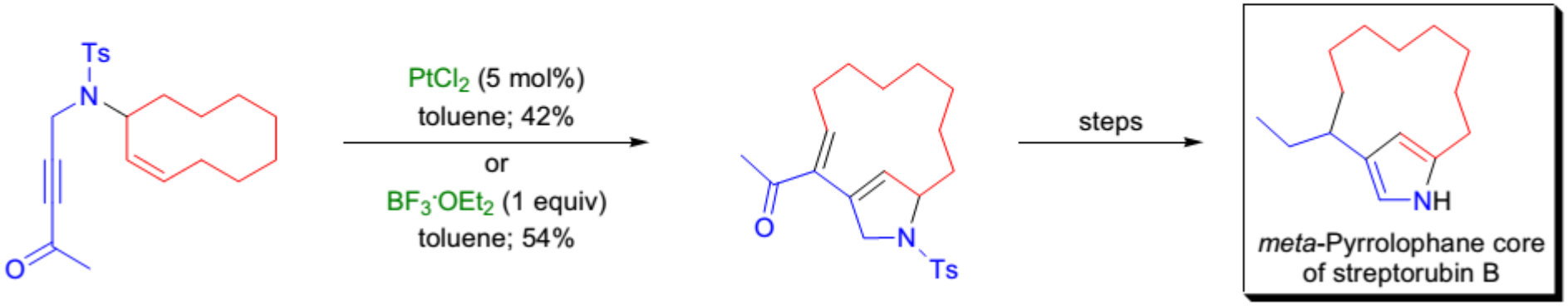
The short total synthesis of (±)-differolide based on a tandem *enyne metathesis* / [4+2] cycloaddition was accomplished by T.R. Hoye et al.[42] The *enyne metathesis* was carried out on allyl propynoate using Grubbs's first-generation metathesis catalyst. The catalyst was added to the substrate slowly to maintain high substrate and low ruthenium carbene concentrations. The initially formed 2-vinylbutenolide readily dimerized *via* a *Diels-Alder cycloaddition* in which the vinyl group participated as the dienophile to afford the natural product.

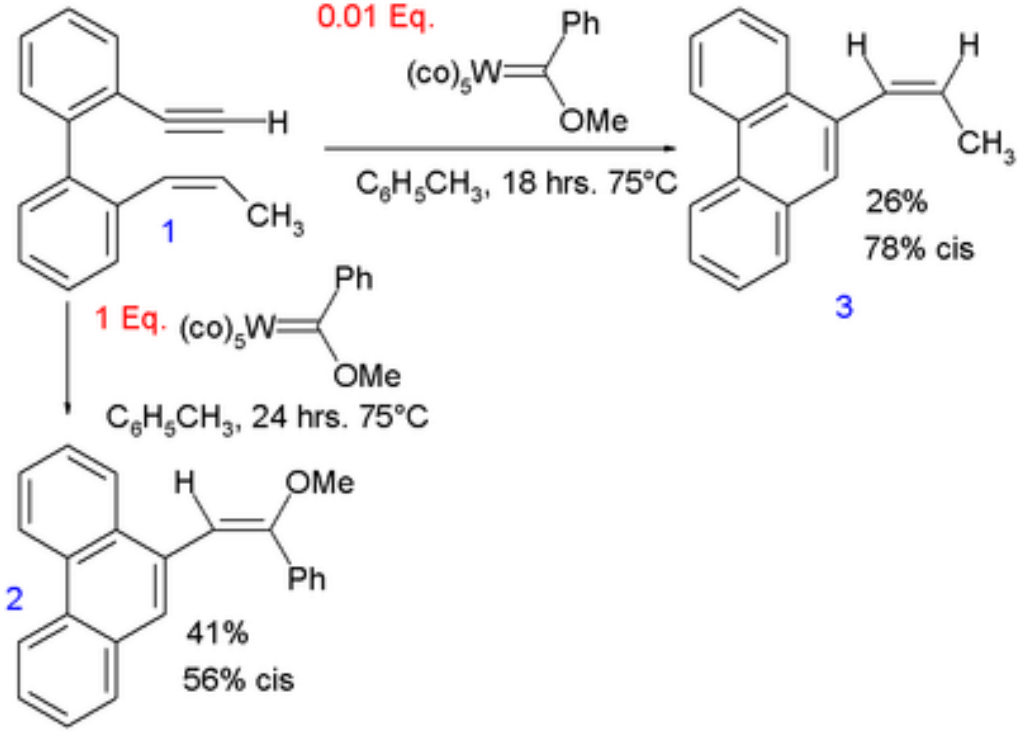


The total synthesis of polycyclic alkaloid (–)-stemoamide was achieved in the laboratory of M. Mori *via* a ruthenium carbene catalyzed *enyne metathesis*.[43] The cyclization was effected by 5 mol% of catalyst in benzene at 50 °C. After 11h of stirring under these conditions, 87% of the 5,7-fused bicyclic system was formed.



A platinum- and Lewis acid catalyzed *enyne metathesis* was used as the key step in the formal total synthesis of antibiotics streptorubin B and metacycloprodigiosin by A. Fürstner.[37] The electron-deficient enyne was cyclized with either a platinum halide or a hard Lewis acid (e.g., $BF_3{\cdot}OEt_2$) to the desired *meta*-pyrrolophane core of the target molecules. A few more steps completed the formal synthesis.





M. Shair and co-workers were the first to apply the *enyne metathesis* for macrocyclization during the biomimetic synthesis of (–)-longithorone A.[44] The two 16-membered paracyclophane building blocks, one diene and one dienophile component, were prepared using 50 mol% Grubbs's first-generation catalyst under 1 atm ethylene gas pressure. These components, after several additional steps, underwent two facile *Diels-Alder cycloaddition reactions* to afford the natural product.