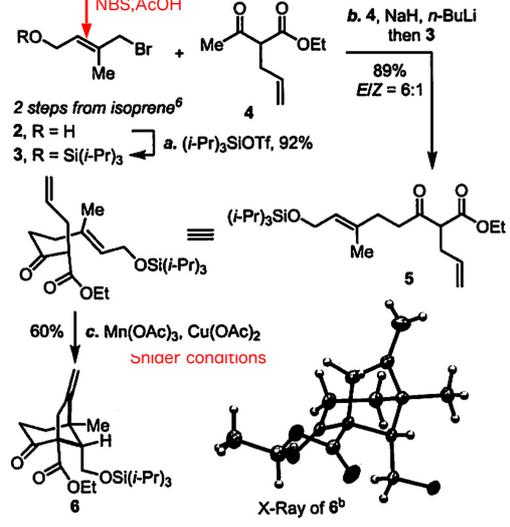
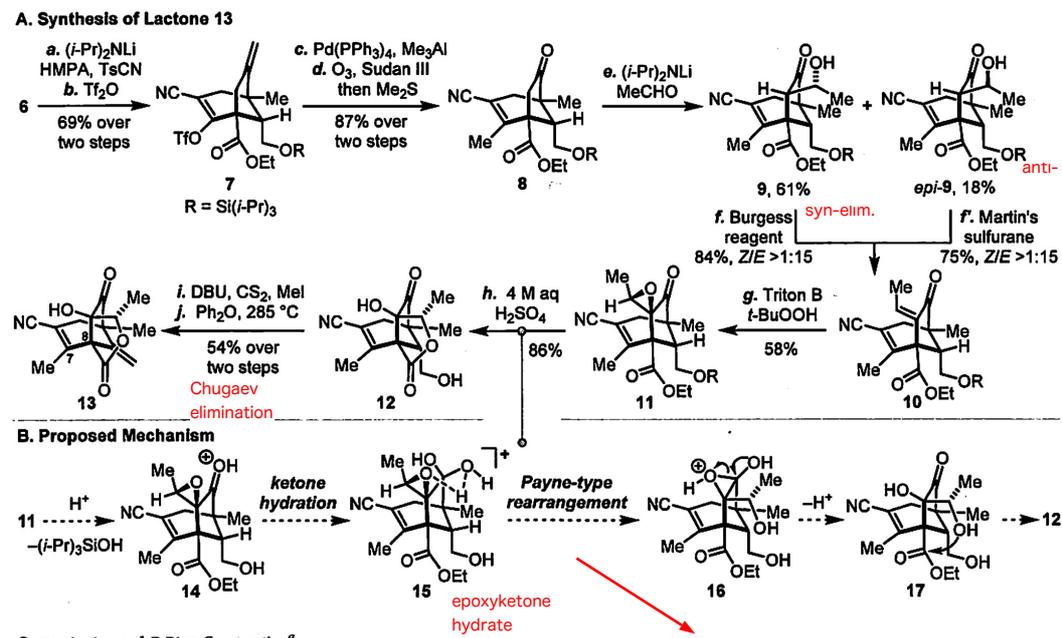


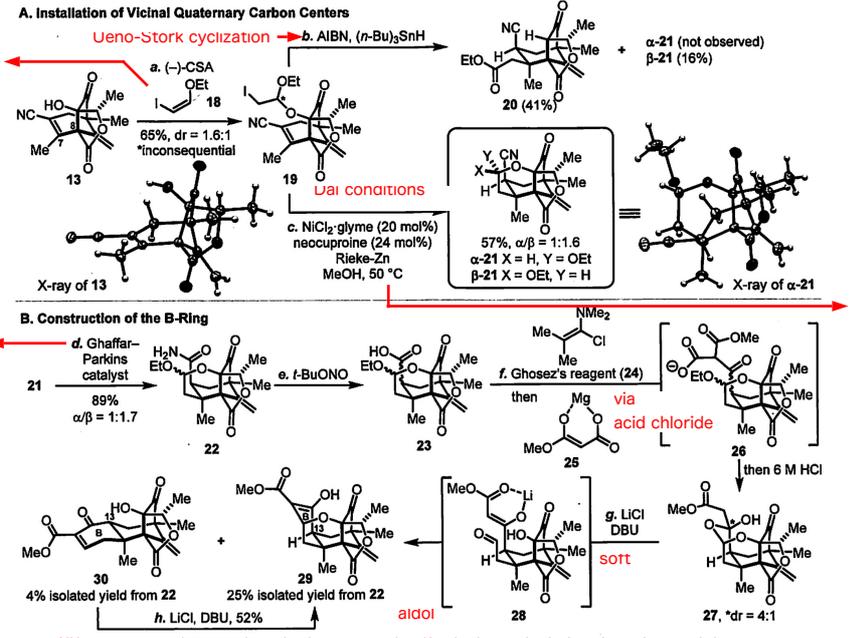
Scheme 3. Synthesis of Bicyclo[3.2.1]octane Core 6^a



Scheme 4. Synthesis of Lactone 13 and Proposed Mechanism for the Payne-Type Rearrangement^a



Scheme 5. Vicinal Carbon Quaternization and B-Ring Construction^a

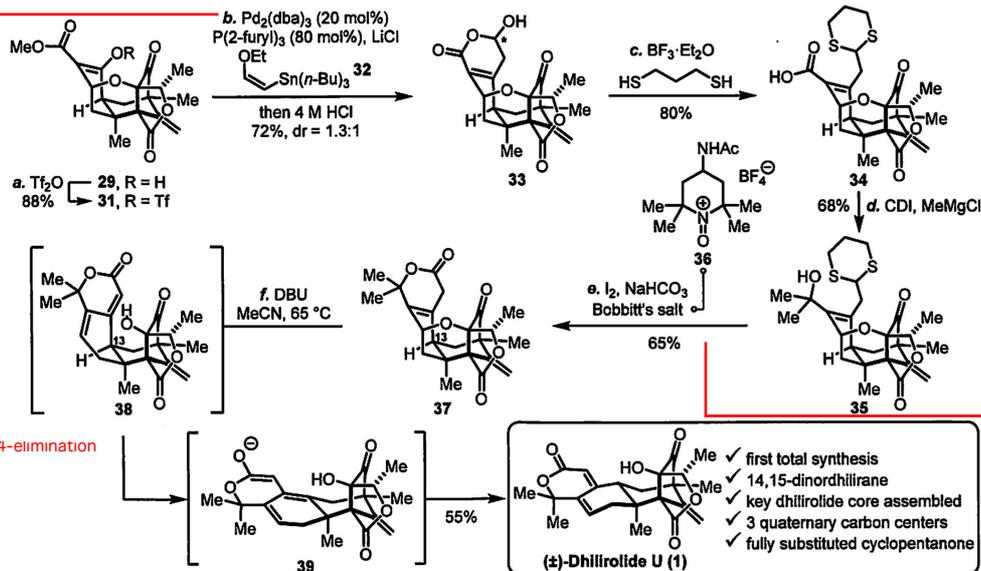


Entry	Selection of Investigated Conditions	Outcome
1	YKOTf, wet THF, reflux	5%
2	HClO ₄ (30 equiv), THF-H ₂ O (5:1), 95 °C (sealed flask)	27%
3	TFA-H ₂ O-THF (1:1:2), 95 °C (sealed flask)	2%
4	TFA-H ₂ O-THF (2:1:5), 95 °C (sealed flask)	41%
5	TFA-H ₂ O-THF (1:1:2), MW, 140 °C	decomposition
6	HCl (50 equiv), THF-H ₂ O (3:1), 65 °C	33%
7	H ₂ SO ₄ (10 equiv), 1,4-dioxane-H ₂ O (3:1), 95 °C	58%
8	H ₂ SO ₄ (10 equiv), 1,4-dioxane-H ₂ O (3:1), 95 °C	70%
9	H ₂ SO ₄ (10 equiv), 1,4-dioxane-H ₂ O (3:1), 85 °C	10 mg 83%, 29.4 g waste (isolated 80%)

Entry	Selection of Investigated Conditions	Outcome
1	19 (X = I), AIBN (50 mol%), (n-Bu) ₃ SnH (5.0 equiv), PhMe, 110 °C, sealed flask	α-21 (not observed), β-21 (19%, isolated 16%), 20 (45%, isolated 41%) (messy reaction)
2	19 (X = I), AIBN (50 mol%), Ph ₃ SnH (5.0 equiv), PhMe, 110 °C, sealed flask	α-21 (11%), β-21 (13%), 20 (29%) (messy reaction)
3	19 (X = I), Et ₃ B (50 mol%), (n-Bu) ₃ SnH (5.0 equiv), PhMe, -78 °C	α-21 (7%), β-21 (17%) (messy reaction)
4	19 (X = I), Ir(dFCF ₃ ppy) ₃ (dtbbpy)PF ₆ (10 mol %), (i-Pr) ₃ NEt, H ₂ O (20 equiv), MeCN, rt, blue LED	α-21 (18%), β-21 (54%), 13 (4%)
5	19 (X = I), NiCl ₂ ·glyme (20 mol %), neocuproine (24 mol %), zinc dust, MeOH, reflux	α-21 (<5%), β-21 (<5%), 13 (11%)
6	19 (X = I), NiCl ₂ ·glyme (20 mol %), neocuproine (24 mol %), zinc dust, MeOH, reflux	α-21 (25%, isolated 22%), β-21 (41%, isolated 37%), 13 (11%)
7	19 (X = I), NiCl ₂ ·glyme (20 mol %), neocuproine (24 mol %), Rieke zinc in THF, MeOH, 50 °C to 60 °C	α-21 (7%), β-21 (22%), 13 (65%)
8	19 (X = I), NiCl ₂ ·glyme (20 mol %), neocuproine (24 mol %), Rieke zinc in THF, MeOH, 50 °C to 60 °C	α-21 (24%, isolated 22%), β-21 (38%, isolated 35%), 13 (31%, isolated 38%) on 5.26 mmol scale
9	SI-7 (X = Br), NiCl ₂ ·glyme (20 mol %), neocuproine (24 mol %), Rieke zinc, MeOH, reflux	α-21 (16%), β-21 (23%), 13 (42%)

The tetrahydropyran in 29 serves as a transient protecting group for the tertiary alcohol and masks an olefin

Scheme 6. Completion of the Synthesis^a



Entry	Conditions Investigated	Outcome
1	Pd(PPh ₃) ₄ (20 mol %), LiClO ₄ (50 equiv), 32 (1 equiv), THF, 65 °C	SI-8 (10%)
2	Pd(PPh ₃) ₄ (20 mol %), Ac ₂ O, THF, 65 °C	SI-8 (10%)
3	Pd(PPh ₃) ₄ (20 mol %), Ac ₂ O, THF, 65 °C	SI-8 (20%)
4	CuCl (10 equiv), Cu ₂ O (10 equiv), 1,4-dioxane, 95 °C	SI-8 (17%)
5	CuCl (10 equiv), Cu ₂ O (10 equiv), 1,4-dioxane, 95 °C	SI-8 (17%)
6	Pd(PPh ₃) ₄ (20 mol %), P(2-furyl) ₃ (80 mol %), Sn(n-Bu) ₃ (10 equiv), 4 M HCl, 72 °C	SI-8 (10%)
7	Pd(PPh ₃) ₄ (20 mol %), P(2-furyl) ₃ (80 mol %), Sn(n-Bu) ₃ (10 equiv), 4 M HCl, 72 °C	SI-8 (10%)
8	Pd(PPh ₃) ₄ (20 mol %), P(2-furyl) ₃ (80 mol %), Sn(n-Bu) ₃ (10 equiv), 4 M HCl, 72 °C	SI-8 (10%)
9	Pd(PPh ₃) ₄ (20 mol %), P(2-furyl) ₃ (80 mol %), Sn(n-Bu) ₃ (10 equiv), 4 M HCl, 72 °C	SI-8 (10%)
10	Pd(PPh ₃) ₄ (20 mol %), P(2-furyl) ₃ (80 mol %), Sn(n-Bu) ₃ (10 equiv), 4 M HCl, 72 °C	SI-8 (10%)

Entry	Conditions Investigated	Outcome
1	PhIOAc/CF ₃ CO ₂ Me, MeCN-H ₂ O, 0 °C	SI-9 (<5%)
2	NBS, AcOH, then TEMPO	SI-9 (11%)
3	Selenic acid, MeCN-H ₂ O (20:1), 0 °C	SI-9 (<5%)
4	DMP, MeCN-H ₂ O-CH ₂ Cl ₂ , 0 °C	SI-9 (21%), 37 (<5%)
5	DDQ, MeCN-H ₂ O (9:1), reflux	SI-9 (7%)
6	1,10 equiv NaBrO ₃ (10 equiv), acetone-H ₂ O (5:1), rt	SI-9 (61%), 37 (22%)
7	1,10 equiv NaBrO ₃ (10 equiv), acetone-H ₂ O (5:1), rt	SI-9 (61%), 37 (22%)
8	1,10 equiv NaBrO ₃ (10 equiv), acetone-H ₂ O (5:1), rt	SI-9 (61%), 37 (22%)
9	1,10 equiv NaBrO ₃ (10 equiv), acetone-H ₂ O (5:1), rt	SI-9 (61%), 37 (22%)
10	1,10 equiv NaBrO ₃ (10 equiv), acetone-H ₂ O (5:1), rt	SI-9 (61%), 37 (22%)
11	1,10 equiv NaBrO ₃ (10 equiv), MeCN-H ₂ O (9:1), rt	SI-9 (61%), 37 (22%)