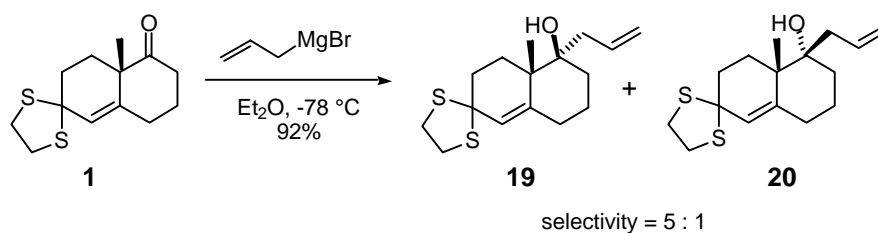


Transannular Macrocyclization Via Intramolecular *B*-Alkyl Suzuki Reaction  
Sherry R. Chemler and Samuel J. Danishefsky\*

Supporting Information

**General.** All commercial materials were used without further purification unless otherwise noted. THF, diethyl ether and methylene chloride used as reaction solvents were obtained from a dry solvent system (alumina) and used without further drying. All reactions were performed under a positive pressure of dry N<sub>2</sub> except the Suzuki reactions, which were performed under a dry Ar atmosphere. Solvents used in the Suzuki reactions were degassed by blowing Ar through them for ca. 10 min. <sup>1</sup>H and <sup>13</sup>C NMR spectra were recorded in CDCl<sub>3</sub> at 400 MHz and 100 MHz, respectively. Analytical thin-layer chromatography was performed on E. Merck silica gel (40-63 μm) or Sigma H-type gel (10-40 μm).

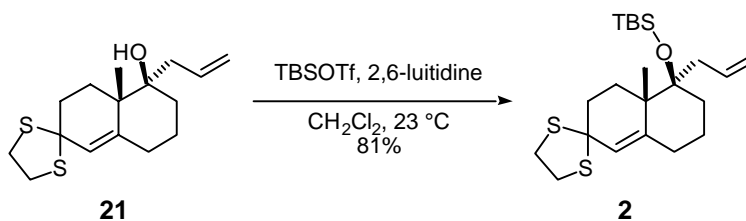


**Procedure for alcohol **19**:** A solution of ketone **1**<sup>1</sup> (4.0 g, 15.7 mmol) in Et<sub>2</sub>O (70 mL) and THF (70 mL) was treated at -78 °C with allylmagnesium bromide (28 mL of a 1 M solution in Et<sub>2</sub>O, 1.8 equiv). The reaction was stirred at -78 °C for 4 h, then was allowed to warm to 0 °C over 2 h and was quenched with sat. aqueous NH<sub>4</sub>Cl. The mixture was extracted with Et<sub>2</sub>O (2 x 100 mL), the combined organic layers were dried with MgSO<sub>4</sub>, filtered and concentrated *in vacuo*. Pure diastereomeric alcohols **19** and **20**

were obtained by chromatography on SiO<sub>2</sub> (10 - 30% Et<sub>2</sub>O/hexane gradient) where the minor alcohol **20**, (0.72 g, 15% yield, white solid) eluted first, followed by the major alcohol **19** (3.58 g, 77% yield, colorless oil).

Data for major alcohol **19**: <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 5.85 (m, 1 H), 5.64 (s, 1 H), 5.13-5.09 (m, 2 H), 3.39-3.35 (m, 3 H), 3.26 (m, 1 H), 2.37 (dd, J = 14.2, 6.7 Hz, 1 H), 2.27 (dd, J = 14.3, 7.9 Hz, 1 H), 2.30-2.10 (m, 4 H), 2.00 (dd, J = 14.5, 5.0 Hz, 1 H), 1.70 (ddd, J = 13.3, 13.3, 4.3 Hz, 1 H), 1.65-1.51 (m, 3 H), 1.42-1.28 (m, 2 H), 1.19 (s, 3 H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 143.1, 134.3, 127.3, 118.2, 76.4, 65.4, 42.8, 39.9, 39.6, 39.2, 38.3, 32.0, 30.6, 29.4, 21.9, 20.8; IR (neat) ν 3479.1, 2938.5, 1638.7, 1437.2, 1019.4 cm<sup>-1</sup>; HRMS (CI, NH<sub>3</sub>) calcd for [C<sub>16</sub>H<sub>24</sub>OS<sub>2</sub>]<sup>+</sup> 296.1268, found 296.1255 [M]<sup>+</sup>.

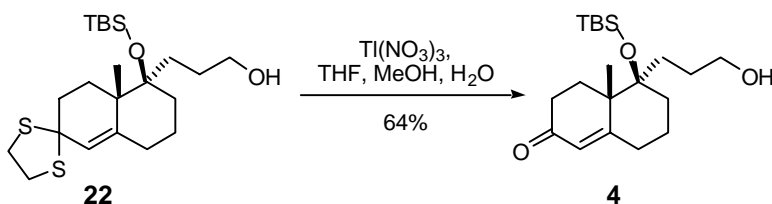
Data for minor alcohol **20**: mp = 113.7-115 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 5.92 (m, 1 H), 5.76 (d, J = 1.4 Hz, 1 H), 5.14-5.06 (m, 2 H), 3.45-3.30 (m, 3 H), 3.23 (m, 1 H), 2.40 (ddd, J = 13.6, 11.1, 3.4 Hz, 1 H), 2.37 (d, J = 13.8 Hz, 1 H), 2.28-2.07 (m, 4 H), 2.00 (m, 1 H), 1.68-1.43 (m, 6 H), 1.14 (s, 3 H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 142.2, 134.5, 129.2, 118.2, 75.7, 65.0, 42.7, 39.9, 39.7, 39.5, 37.8, 31.4, 31.2, 30.0, 21.8, 21.6; IR (neat) ν 3553.2, 2933.3, 1638.5, 1435.1 cm<sup>-1</sup>; HRMS (CI, NH<sub>3</sub>) calcd for [C<sub>16</sub>H<sub>24</sub>OS<sub>2</sub>]<sup>+</sup> 296.1268, found 296.1282 [M]<sup>+</sup>.



Procedure for silyl ether **2**: A solution of alcohol **21** (3.58 g, 12.0 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (25 mL) was treated with a solution of TBSOTf (6.1 mL, 26.6 mmol, 2.2 equiv) and 2,6-lutidine (6.2 mL, 53.1 mmol, 4.4 equiv) in CH<sub>2</sub>Cl<sub>2</sub> (25 mL). The reaction mixture was stirred 48 h at 23 °C, then was quenched with sat. aqueous NaHCO<sub>3</sub> (25

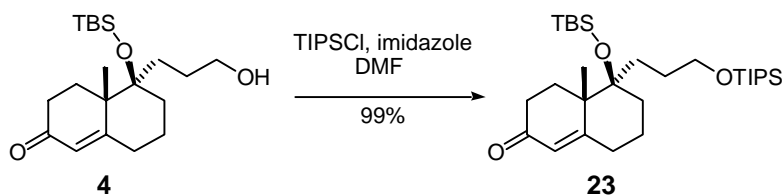


H), 1.84 (ddd,  $J = 13.4, 9.3, 4.4$  Hz, 1 H), 1.79-1.42 (m, 8 H), 1.28 (m, 1 H), 1.14 (s, 3 H), 0.86 (s, 9 H), 0.11 (s, 6 H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  143.9, 126.9, 80.3, 65.5, 63.6, 44.4, 39.7, 39.5, 38.3, 32.0, 31.7, 30.6, 29.7, 27.2, 26.0, 22.4, 21.7, 18.7, -1.2, -1.4; IR (neat) 3348.7, 2933.7, 2854.7, 1641.8, 1468.9, 1434.3, 1251.5, 1118.2, 1088.5, 1058.9  $\text{cm}^{-1}$ ; HRMS (DCI,  $\text{NH}_3$ ) calcd for  $[\text{C}_{22}\text{H}_{40}\text{O}_2\text{S}_2\text{Si}]^+$  428.2239, found 428.2223  $[\text{M}]^+$ .



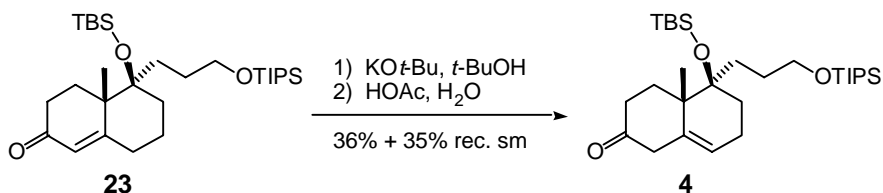
Procedure for ketone **4**:<sup>3</sup> A solution of dithioketal **22** (3.80 g, 8.86 mmol) in a 2:2:1 THF/MeOH/ $\text{H}_2\text{O}$  solvent mixture was treated with a solution of  $\text{Ti}(\text{NO}_3)_3$  in MeOH (50 mL). After being stirred 10 min, the reaction was diluted with  $\text{H}_2\text{O}$  (30 mL) and extracted with  $\text{Et}_2\text{O}$  (2 x 100 mL). The organic layer was dried with  $\text{MgSO}_4$ , filtered and concentrated *in vacuo*. Purification of the crude oil by chromatography on  $\text{SiO}_2$  (10-40%  $\text{EtOAc}$ /hexane gradient) yielded 2.00 g (64%) of ketone as clear, yellow crystals.

Data for ketone **4**: mp = 115-118  $^\circ\text{C}$ .  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  5.77 (d,  $J = 1.8$  Hz, 1 H), 3.67-3.56 (m, 2 H), 2.43-2.24 (m, 5 H), 1.96 (ddd,  $J = 17.4, 13.5, 4.0$  Hz, 1 H), 1.89-1.70 (m, 3 H), 1.70-1.35 (m, 6 H), 1.30 (s, 3 H), 0.88 (s, 9 H), 0.15 (s, 3 H), 0.14 (s, 3 H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  199.5, 169.5, 125.8, 80.2, 63.3, 46.2, 34.6, 32.7, 31.4, 31.0, 27.7, 26.8, 26.0, 21.6, 20.4, 18.7, -1.2, -1.3; IR (neat)  $\nu$  3426.1, 2955.3, 2859.0, 1669.9, 1252.6, 1054.7, 835.3  $\text{cm}^{-1}$ ; HRMS (DCI,  $\text{NH}_3$ ) calcd for  $[\text{C}_{20}\text{H}_{37}\text{O}_3\text{Si}]^+$  353.2512, found 353.2496  $[\text{M} + \text{H}]^+$ .



Procedure for silyl ether **23**: A solution of alcohol **4** (2.00 g, 5.68 mmol) in DMF (10 mL) was treated with imidazole (0.54 g, 7.95 mmol, 1.4 equiv) and TIPSCl (1.46 g, 6.82 mmol, 1.2 equiv) and was stirred for 3 h at 23 °C. The reaction was quenched with H<sub>2</sub>O (10 mL) and extracted with Et<sub>2</sub>O (2 x 50 mL). The combined organic extracts were dried over MgSO<sub>4</sub>, filtered and concentrated *in vacuo*. Pure ether **23** (2.88 g, 99% yield) was obtained after chromatography of the crude oil on SiO<sub>2</sub> (5-10% EtO<sub>2</sub>/hexane gradient).

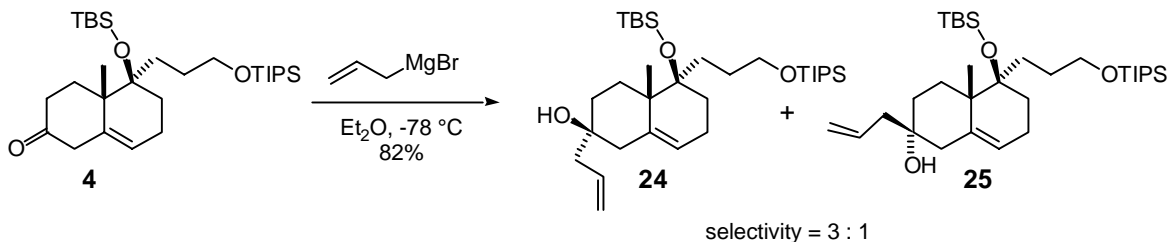
Data for **23**: <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 5.76 (d, J = 1.8 Hz, 1 H), 3.69-3.60 (m, 2 H), 2.49-2.35 (m, 3 H), 2.30 (ddd, J = 12.8, 12.8, 6.0 Hz, 1 H), 2.21 (dd, J = 15.4, 4.8 Hz, 1 H), 1.94 (ddd, J = 13.3, 13.3, 4.0 Hz, 1 H), 1.88-1.35 (m, 7 H), 1.29 (s, 3 H), 1.10-1.00 (m, 22 H), 0.88 (s, 9 H), 0.14 (s, 3 H), 0.13 (s, 3 H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 199.4, 169.6, 125.7, 80.2, 63.6, 46.2, 34.6, 32.9, 31.4, 31.1, 27.7, 27.2, 26.0, 21.5, 20.4, 18.7, 18.0, 17.7, 12.3, 11.9, -1.3, -1.4; IR (neat) ν 2944.6, 2859.0, 1675.2, 1616.4, 1461.2, 1252.6, 1108.2 cm<sup>-1</sup>; HRMS (DCI, NH<sub>3</sub>) calcd for [C<sub>29</sub>H<sub>57</sub>O<sub>3</sub>Si<sub>2</sub>]<sup>+</sup> 509.3846, found 509.3854 [M + H]<sup>+</sup>.



Procedure for ketone **4**:<sup>2</sup> Ketone **23** (2.88 g, 5.67 mmol) in *t*-BuOH (10 mL) was treated at 15 °C with KO*t*-Bu (5.10 g, 45.4 mmol), added in three portions. This mixture was stirred 45 min, when was quenched by the rapid addition of a 10% AcOH solution in

H<sub>2</sub>O. This mixture was extracted with Et<sub>2</sub>O (2 x 30 mL) and the combined organic extracts were dried over MgSO<sub>4</sub>, filtered and concentrated *in vacuo*. Purification of the crude reaction mixture by chromatography on SiO<sub>2</sub> (10-30% Et<sub>2</sub>O/hexane gradient) afforded starting enone **23** (1.00 g, 35%, eluting first) and 1.04 g (36%) of the desired de-conjugated ketone **4**.

Data for ketone **4**: <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 5.28 (s, 1 H), 3.72-3.60 (m, 2 H), 3.18 (dq, J = 17.5, 2.4 Hz, 1 H), 2.89 (d, J = 17.5 Hz, 1 H), 2.41 (ddd, J = 11.4, 8.2, 3.0 Hz, 1 H), 2.30 (ddd, J = 14.0, 8.7, 5.2 Hz, 1 H), 2.17 (ddd, J = 13.1, 8.5, 5.0 Hz, 1 H), 2.06-1.95 (m, 3 H), 1.79 (m, 1 H), 1.70 (m, 1 H), 1.66-1.52 (m, 4 H), 1.24 (s, 3 H), 1.10-1.00 (m, 21 H), 0.89 (s, 9 H), 0.16 (s, 3 H), 0.13 (s, 3 H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 211.2, 137.2, 121.9, 79.3, 63.8, 47.4, 43.3, 38.6, 31.5, 28.5, 28.2, 27.8, 26.1, 26.0, 24.5, 24.3, 18.7, 18.0, 12.0, -1.0, -1.3; IR (neat) 2944.6, 2859.0, 1723.4, 1664.5, 1461.2, 1252.6, 1102.8, 1054.7 cm<sup>-1</sup>; ESIMS calcd for [C<sub>29</sub>H<sub>56</sub>O<sub>3</sub>Si<sub>2</sub>Na]<sup>+</sup> 531.4, found 531.1 [M + Na]<sup>+</sup>.



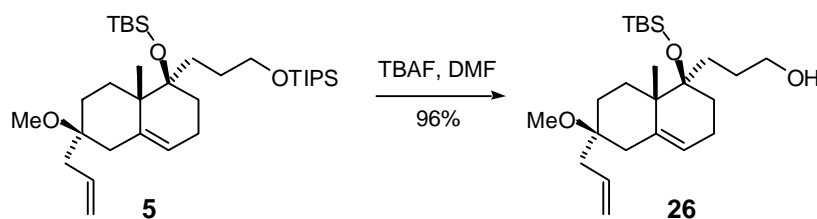
Procedure for alcohol **24**: A solution of ketone **4** (1.10 g, 2.16 mmol) in Et<sub>2</sub>O (20 mL) at -78 °C was treated with AlIMgBr (3.3 mL of a 1 M solution in Et<sub>2</sub>O, 1.5 equiv). The reaction was allowed to warm to -10 °C over 16 h, then was quenched with sat. NH<sub>4</sub>Cl (aq) (20 mL) and extracted with Et<sub>2</sub>O (2 x 50 mL). The combined organic extracts were dried over MgSO<sub>4</sub>, filtered and concentrated *in vacuo*. Purification of the crude reaction mixture on SiO<sub>2</sub> (10-30% Et<sub>2</sub>O/hexane eluent) afforded the minor alcohol

**25** (eluting first, 0.245 g, 21% yield) followed by the major alcohol **24** (0.72 g, 61% yield).

Data for minor alcohol **25**:  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  5.89 (m, 1 H), 5.28 (s, 1 H), 5.14-5.07 (m, 2 H), 3.70-3.62 (m, 2 H), 2.36 (dq,  $J = 14.8, 2.5$  Hz, 1 H), 2.21 (d,  $J = 7.4$  Hz, 2 H), 2.04-1.85 (m, 5 H), 1.79-1.50 (m, 7 H), 1.38 (dt,  $J = 13.3, 3.1$  Hz, 1 H), 1.26 (m, 1 H), 1.11 (s, 3 H), 1.10-1.02 (m, 21 H), 0.87 (s, 9 H), 0.14 (s, 3 H), 0.08 (s, 3 H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  139.2, 133.8, 122.3, 118.3, 79.3, 71.5, 64.2, 47.4, 43.9, 43.7, 32.8, 32.0, 31.6, 30.3, 28.9, 28.2, 26.1, 24.3, 21.0, 18.8, 18.0, 11.7, -1.0, -1.3; IR (neat) 3597.3, 3468.9, 2955.3, 2859.0, 1461.2, 1252.6, 1102.8, 1060.0  $\text{cm}^{-1}$ ; HRMS (DCI,  $\text{NH}_3$ ) calcd for  $[\text{C}_{32}\text{H}_{62}\text{O}_3\text{Si}_2]^+$  550.4237, found 550.4225  $[\text{M}]^+$ .

Procedure for methyl ether **5**:<sup>3</sup> A solution of NaH (0.156 g, 6.5 mmol, 5 equiv) in THF (4 mL) was treated with a solution of alcohol **24** (0.713 g, 1.30 mmol) in THF (4 mL) followed by MeI (4.4 mL, 52 mmol, 40 equiv) at 23 °C. After being stirred for 10

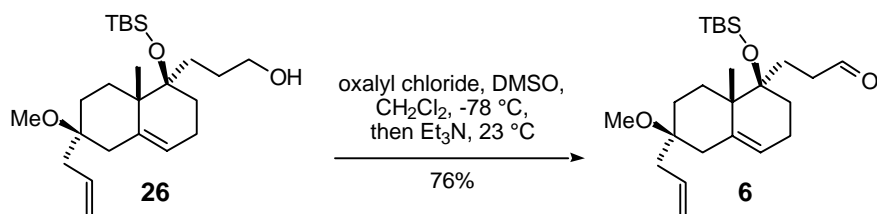
min, the solution was refluxed for 2 h, then was cooled to 23 °C and quenched with sat. aqueous NH<sub>4</sub>Cl (5 mL). The resulting mixture was extracted with Et<sub>2</sub>O (2 x 20 mL) and the combined organic layers were dried over MgSO<sub>4</sub>, filtered and concentrated *in vacuo*. Ether **5** (0.589 g, 80% yield) was obtained pure as a colorless oil by chromatography of the crude reaction mixture on SiO<sub>2</sub> (5-10% Et<sub>2</sub>O/hexane eluent).



Data for alcohol **26**:  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  5.79 (m, 1 H), 5.20 (d,  $J = 2.1$  Hz, 1 H), 5.04 (m, 2 H), 3.64-3.61 (m, 2 H), 3.22 (s, 3 H), 2.32 (dq,  $J = 13.6, 2.1$  Hz, 1



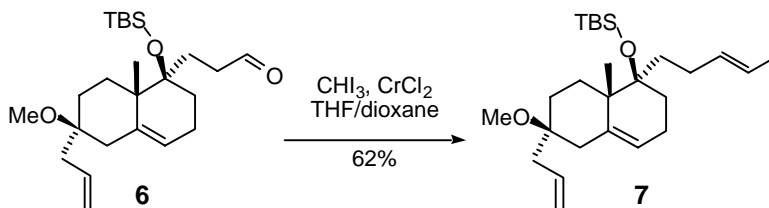
H), 2.24-2.12 (m, 3 H), 2.03-1.88 (m, 3 H), 1.79-1.39 (m, 10 H), 1.15 (s, 3 H), 0.87 (s, 9 H), 0.13 (s, 3 H), 0.09 (s, 3 H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  140.0, 133.7, 121.2, 117.3, 79.2, 63.8, 48.4, 43.8, 41.3, 36.1, 31.7, 30.0, 29.0, 27.9, 27.1, 26.1, 24.3, 22.3, 18.8, 17.7, -0.9, -1.3; IR (neat) 3392.5, 2953.8, 2857.5, 1637.0, 1471.1, 1251.8, 1064.6  $\text{cm}^{-1}$ ; HRMS (DCI,  $\text{NH}_3$ ) calcd for  $[\text{C}_{24}\text{H}_{45}\text{O}_3\text{Si}]^+$  409.3138, found 409.3132  $[\text{M} + \text{H}]^+$ .



Procedure for aldehyde **6**: A solution of DMSO (0.21 mL, 2.99 mmol, 3 equiv) in  $\text{CH}_2\text{Cl}_2$  (2 mL) at  $-78\text{ }^\circ\text{C}$  was treated with oxalyl chloride (1.1 mL of a 2 M solution in  $\text{CH}_2\text{Cl}_2$ , 2.25 mmol, 2.25 equiv). After 15 min, a solution of alcohol **26** (0.408 g, 0.998 mmol) in  $\text{CH}_2\text{Cl}_2$  (2 mL) was cannulated into the reaction mixture and the resulting solution was stirred for 15 min, then treated with  $\text{Et}_3\text{N}$  (0.63 mL, 4.49 mmol, 4.5 equiv) and warmed to  $23\text{ }^\circ\text{C}$ . After being stirred for 1 h, the reaction was quenched with sat. aqueous  $\text{NaHCO}_3$  and extracted with  $\text{Et}_2\text{O}$  (2 x 20 mL). The combined organic layers were dried over  $\text{MgSO}_4$ , filtered and concentrated *in vacuo*. The crude oil was chromatographed on  $\text{SiO}_2$  (5-15%  $\text{Et}_2\text{O}$ /hexane gradient), affording 0.307 g (76%) of aldehyde **6** as a colorless oil.

Data for aldehyde **6**:  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  9.81 (d,  $J = 2.9\text{ Hz}$ , 1 H), 5.77 (m, 1 H), 5.21 (s, 1 H), 5.09-5.00 (m, 2 H), 3.20 (s, 3 H), 2.62 (dddd,  $J = 17.1, 11.6, 4.3, 1.0\text{ Hz}$ , 1 H), 2.50 (dddd,  $J = 16.8, 11.5, 5.2, 1.9\text{ Hz}$ , 1 H), 2.32 (dq,  $J = 13.7, 2.3\text{ Hz}$ , 1 H), 2.25-2.12 (m, 3 H), 2.05-1.87 (m, 4 H), 1.80-1.50 (m, 5 H), 1.45 (m, 1 H), 1.16 (s, 3 H), 0.87 (s, 9 H), 0.13 (s, 3 H), 0.11 (s, 3 H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  202.4, 140.0, 133.5, 121.0, 117.4, 78.7, 76.6, 48.5, 44.0, 41.3, 40.0, 36.1, 30.0, 29.5, 27.3, 26.1,

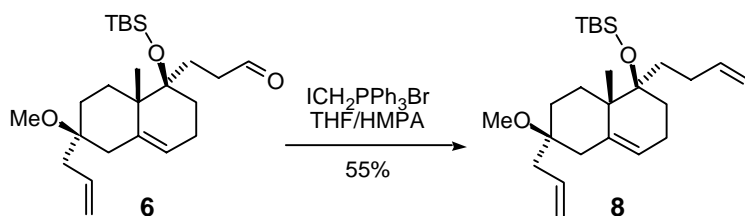
24.2, 22.2, 18.8, -0.90, -1.30; IR (neat) 2928.7, 1727.2, 1471.6, 1255.4, 1073.5  $\text{cm}^{-1}$ ; HRMS (DCI,  $\text{NH}_3$ ) calcd for  $[\text{C}_{24}\text{H}_{43}\text{O}_3\text{Si}]^+$  407.2981, found 407.2997  $[\text{M} + \text{H}]^+$ .



Procedure for vinyl iodide **7**:<sup>4</sup> A solution of  $\text{CrCl}_2$  (0.644 g, 5.24 mmol, 10 equiv) in THF (1.3 mL) was treated at 23 °C with a solution of aldehyde **6** (0.213 g, 0.524 mmol) and iodoform (0.619 g, 1.57 mmol, 3 equiv) in dioxane (9 mL). After being stirred 20 h, the reaction was quenched with  $\text{H}_2\text{O}$  (10 mL) and the resulting mixture was extracted with  $\text{Et}_2\text{O}$  (2 x 25 mL). The combined organic layers were dried over  $\text{MgSO}_4$ , filtered and concentrated *in vacuo*. Purification of the crude oil by chromatography on  $\text{SiO}_2$  (5-15%  $\text{Et}_2\text{O}$ /hexane gradient) afforded 0.173 g (62% yield) of vinyl iodide **7** as an 11:1 mixture of *E*:*Z* vinyl iodide isomers **7** and **8**.

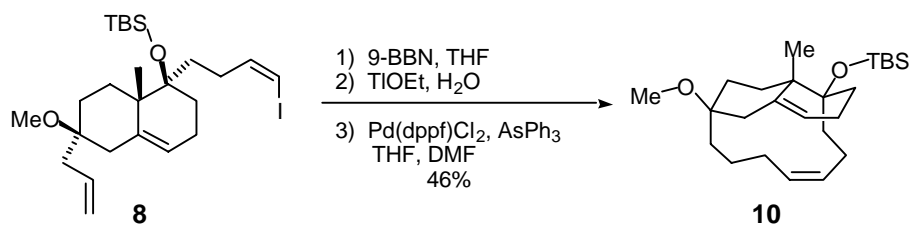
Data for vinyl iodide **7**:  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  6.53 (dt,  $J = 14.3, 7.2$  Hz, 1 H), 6.01 (dt,  $J = 14.3, 1.3$  Hz, 1 H), 5.80 (m, 1 H), 5.21 (d,  $J = 3.7$  Hz, 1 H), 5.12-5.01 (m, 2 H), 3.24 (s, 3 H), 2.32 (dq,  $J = 13.8, 2.1$  Hz, 1 H), 2.28-1.88 (m, 8 H), 1.79-1.40 (m, 7 H), 1.15 (s, 3 H), 0.87 (s, 9 H), 0.12 (s, 3 H), 0.10 (s, 3 H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  146.8, 140.0, 139.9, 133.6, 121.0, 117.4, 79.0, 74.3, 48.4, 43.8, 41.3, 36.2, 34.3, 31.6, 30.0, 28.9, 27.2, 26.1, 24.3, 22.2, 18.8, -0.90, -1.30; IR (neat) 2938.5, 2889.3, 1466.7, 1250.4, 1068.6  $\text{cm}^{-1}$ ; HRMS (DCM/NBA) calcd for  $[\text{C}_{25}\text{H}_{42}\text{IO}_2\text{Si}]^+$  529.2001, found 529.2022  $[\text{M} - \text{H}]^+$ .





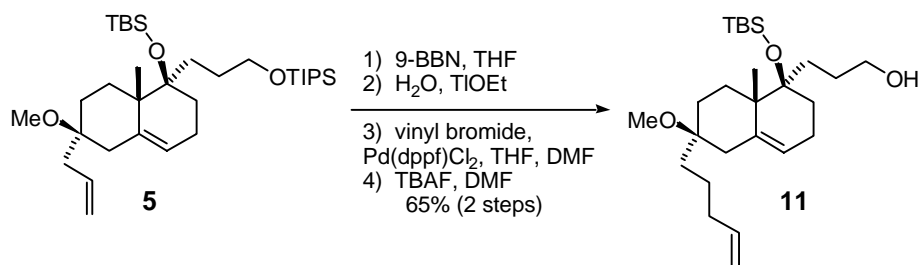
Procedure for vinyl iodide **8**: Iodomethyl triphenylphosphonium bromide<sup>5</sup> (0.547 g, 1.03 mmol, 3.0 equiv) in THF (3.4 mL) was treated with NaHMDS (0.83 mL of a 1.0 M solution in THF, 0.826 mmol, 2.4 equiv) at 23 °C, stirred for 5 min, then was cooled to -78 °C and treated with HMPA. Aldehyde **6** (0.140 g, 0.344 mmol) in 0.5 mL THF was transferred via cannula to this reaction mixture and the resulting mixture was stirred at -78 °C for 2 h. The reaction was warmed to 23 °C and quenched with sat. aqueous NH<sub>4</sub>Cl (5 mL). The resulting mixture was extracted with Et<sub>2</sub>O (2 x 20 mL) and the combined organic layers were dried over MgSO<sub>4</sub>, filtered and concentrated *in vacuo*. Purification of the crude oil by chromatography on SiO<sub>2</sub> (5-15% Et<sub>2</sub>O/hexane gradient) afforded vinyl iodide **8** (0.101 g, 55% yield) as a 13:1 mixture of *Z* : *E* vinyl iodide isomers **8** and **7**. A side product corresponding most closely to the terminal alkyne (0.044 g) was also isolated.

Data for vinyl iodide **8**: <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 6.22-6.15 (m, 2 H), 5.80 (m, 1 H), 5.22 (s, 1 H), 5.10-5.00 (m, 2 H), 3.20 (s, 3 H), 2.34-1.93 (m, 9 H), 1.76-1.55 (m, 6 H), 1.45 (m, 1 H), 1.17 (s, 3 H), 0.90 (s, 9 H), 0.21 (s, 3 H), 0.12 (s, 3 H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 141.5, 139.9, 133.7, 121.2, 117.3, 82.2, 79.1, 76.7, 48.5, 43.8, 41.3, 36.1, 33.5, 30.4, 30.0, 28.9, 27.1, 26.2, 24.5, 22.3, 18.8, -0.70, -1.20; IR (neat) 2953.8, 2932.4, 1471.1, 1251.8, 1069.9, 834.5, 770.3 cm<sup>-1</sup>; HRMS (FAB, DCM/NBA) calcd for [C<sub>25</sub>H<sub>42</sub>IO<sub>2</sub>Si]<sup>+</sup> 529.2001, found 529.1992 [M - H]<sup>+</sup>.



Procedure for macrocycle **10**: Vinyl iodide **8** (0.099 g, 0.187 mmol), neat, was treated with 0.5 mL of a 0.57 M solution of 9-BBN in THF (0.28 mmol, 1.5 equiv) at 23 °C. After being stirred 1.5 h, the reaction was quenched by addition of H<sub>2</sub>O (0.020 mL, 0.935 mmol, 5 equiv) and was then treated with TIOEt (0.040 mL, 0.561 mmol, 3 equiv) followed by dilution of the mixture with THF (4 mL). The resulting solution was added dropwise over 3 h (syringe-pump addition) to a solution of Pd(dppf)Cl<sub>2</sub> (0.0305 g, 0.0374 mmol, 0.2 equiv) and AsPh<sub>3</sub> (0.012 g, 0.038 mmol, 0.2 equiv) in THF (55 mL) and DMF (5 mL) under an Ar atmosphere. This mixture was stirred an additional 12 h, then was diluted with pH 7.2 phosphate buffer (12 mL) and treated with 30% H<sub>2</sub>O<sub>2</sub> (4 mL). After being stirred for 0.5 h, the reaction was extracted with a 1:1 Et<sub>2</sub>O/hexane solution (2 x 100 mL) and the combined organic layers were washed with H<sub>2</sub>O (20 mL), dried over MgSO<sub>4</sub>, filtered and concentrated *in vacuo*. Chromatography of the crude oil on SiO<sub>2</sub> (5-15% Et<sub>2</sub>O/hexane gradient) afforded 35 mg (46%) of intramolecular Suzuki adduct **10** as a colorless oil.

Data for macrocycle **10**: <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 5.66 (ddd, J = 11.2, 11.2, 4.5 Hz, 1 H), 5.17 (ddd, J = 11.5, 11.5, 5.2 Hz, 1 H), 5.09 (d, J = 2.3 Hz, 1 H), 3.18 (s, 3 H), 2.72 (m, 1 H), 2.40-2.25 (m, 3 H), 2.20-2.01 (m, 4 H), 2.01-1.80 (m, 4 H), 1.80-1.65 (m, 2 H), 1.60-1.30 (m, 6 H), 1.11 (s, 3 H), 0.90 (s, 9 H), 0.15 (s, 3 H), 0.10 (s, 3 H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 141.7, 132.8, 127.8, 120.8, 79.1, 78.7, 77.2, 48.5, 44.1, 42.2, 38.5, 34.7, 29.5, 29.3, 27.8, 26.2, 25.6, 24.1, 23.1, 20.5, 18.8, -1.5, -2.3; IR (neat) 2951.9, 2932.3, 1462.5, 1251.9, 1070.8 cm<sup>-1</sup>; HRMS (DEI) calcd for [C<sub>25</sub>H<sub>44</sub>O<sub>2</sub>Si]<sup>+</sup> 404.3110, found 4404.3098 [M]<sup>+</sup>.

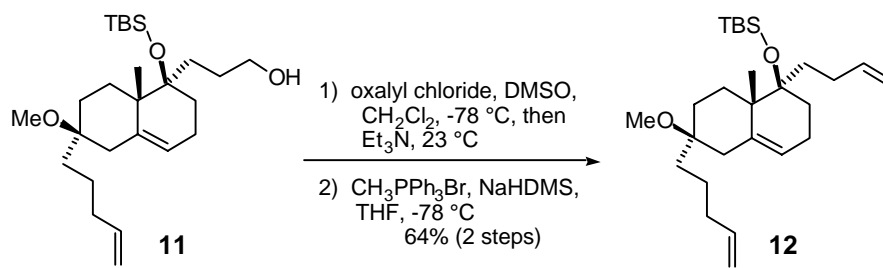


Procedure for alcohol **11**: A solution of olefin **5** (0.165 g, 0.292 mmol) in THF (0.6 mL) was treated with solid 9-BBN dimer (0.054 g, 0.440 mmol w/r to monomer, 1.5 equiv) at 23 °C. After being stirred 2 h, the reaction was quenched by the addition of H<sub>2</sub>O (0.030 mL, 1.46 mmol, 5 equiv) and then was treated with TIOEt (0.062 mL, 0.876 mmol, 3 equiv). This mixture was transferred via cannula to a solution of vinyl bromide (1.5 mL of a 1 M THF solution, 1.46 mmol, 5 equiv), Pd(dppf)Cl<sub>2</sub> (0.048 g, 0.058 mmol, 0.2 equiv) and AsPh<sub>3</sub> (0.018 g, 0.058 mmol, 0.2 equiv) in THF (1 mL) and DMF (0.5 mL) under an Ar atmosphere. After 2 h, the reaction was quenched by the addition of 3 mL of pH 7.2 phosphate buffer and 1 mL 30% H<sub>2</sub>O<sub>2</sub>. After 0.5 h, the mixture was extracted with a solution of 1:1 Et<sub>2</sub>O/hexane (2 x 20 mL), the combined organic layers were washed with H<sub>2</sub>O (10 mL), dried over MgSO<sub>4</sub>, filtered and concentrated *in vacuo*. Chromatography of the crude reaction mixture on SiO<sub>2</sub> (5-15% Et<sub>2</sub>O/hexanes gradient) afforded 0.233 g of the desired product, contaminated with AsPh<sub>3</sub>.

This mixture was dissolved in DMF (1 mL) and treated with TBAF (1 mL of a 1 M solution in THF). After 0.5 h, the reaction mixture was diluted with H<sub>2</sub>O (5 mL) and extracted with Et<sub>2</sub>O (2 x 20 mL). The combined organic layers were dried over MgSO<sub>4</sub>, filtered and concentrated *in vacuo*. Chromatography of the crude oil on SiO<sub>2</sub> (10-30% EtOAc/hexane) afforded 0.084 g (65% over two steps) of alcohol **11**.

Data for alcohol **11**: <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 5.72 (m, 1 H), 5.19 (d, J = 2.1 Hz, 1 H), 5.04-4.93 (m, 2 H), 3.64-3.62 (m, 2 H), 3.17 (s, 3 H), 2.31 (dd, J = 13.6, 2.1 Hz, 1 H), 2.13 (dd, J = 13.6, 2.3 Hz, 1 H), 2.03-1.92 (m, 5 H), 1.80-1.20 (m, 14 H), 1.16 (s, 3 H), 0.88 (s, 9 H), 0.13 (s, 3 H), 0.07 (s, 3 H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 140.3,

138.9, 120.8, 114.5, 79.2, 76.9, 63.9, 48.3, 43.9, 41.7, 33.9, 31.6, 30.5, 30.1, 29.0, 28.0, 27.4, 26.1, 24.3, 22.4, 21.2, 18.8, -0.90, -1.30; IR (neat) 3372.2, 2959.1, 2861.3, 1463.1, 1256.5, 1060.8  $\text{cm}^{-1}$ ; ESIMS calcd for  $[\text{C}_{26}\text{H}_{48}\text{O}_3\text{SiNa}]^+$  459.3, found 458.9  $[\text{M} + \text{Na}]^+$ .

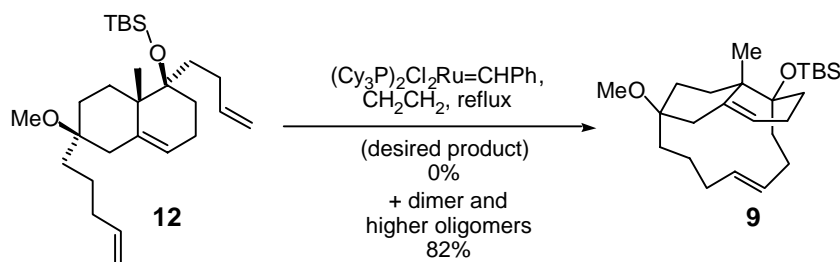


Procedure for olefin **12**: A solution of DMSO (0.040 mL, 0.57 mmol, 3 equiv) in  $\text{CH}_2\text{Cl}_2$  (0.5 mL) at  $-78\text{ }^\circ\text{C}$  was treated with oxalyl chloride (0.21 mL of a 2 M solution in  $\text{CH}_2\text{Cl}_2$ , 0.428 mmol, 2.25 equiv). After 15 min, this solution was treated with a solution of alcohol **11** in  $\text{CH}_2\text{Cl}_2$  (0.5 mL), stirred an additional 0.5 h, then was treated with  $\text{Et}_3\text{N}$  and warmed to  $23\text{ }^\circ\text{C}$ . After 1 h, the reaction mixture was quenched with sat. aqueous  $\text{NaHCO}_3$  (5 mL) and extracted with  $\text{Et}_2\text{O}$  (20 mL). The organic layer was washed with sat. aqueous  $\text{NaHSO}_4$  (5 mL), dried over  $\text{MgSO}_4$ , filtered and concentrated *in vacuo*. The resulting aldehyde was used crude in the next reaction after drying *in vacuo* (ca. 0.05 mm Hg) for 2 h.

A suspension of methyl triphenylphosphonium bromide (0.081 g, 0.228 mmol, 1.2 equiv) in THF (0.5 mL) was treated with NaHMDS (0.22 mL of a 1 M solution in THF, 0.219 mmol, 1.15 equiv) at  $0\text{ }^\circ\text{C}$ . After 5 min, the mixture was cooled to  $-78\text{ }^\circ\text{C}$  and was treated with a solution of the freshly prepared aldehyde in THF (0.5 mL). This mixture was stirred at  $-78\text{ }^\circ\text{C}$  for 1 h, warmed to  $0\text{ }^\circ\text{C}$  for 15 min, then was quenched with sat. aqueous  $\text{NH}_4\text{Cl}$  (10 mL) and extracted with  $\text{Et}_2\text{O}$  (2 x 20 mL). The combined organic

layers were dried over  $\text{MgSO}_4$ , filtered and concentrated *in vacuo*. Chromatography of the crude oil on  $\text{SiO}_2$  (5-20%  $\text{Et}_2\text{O}$ /hexane gradient) afforded 0.53 g (64% over 2 steps) of olefin **12**.

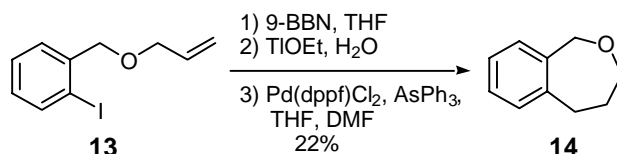
Data for olefin **12**:  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  5.89-5.73 (m, 2 H), 5.19 (d,  $J$  = 2.2 Hz, 1 H), 5.05-4.93 (m, 4 H), 3.17 (s, 3 H), 2.33-1.88 (m, 9 H), 1.74-1.51 (m, 6 H), 1.49-1.28 (m, 5 H), 1.16 (s, 3 H), 0.88 (s, 9 H), 0.14 (s, 3 H), 0.10 (s, 3 H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  140.3, 139.5, 138.8, 120.9, 114.6, 114.0, 79.3, 76.7, 48.3, 43.9, 41.7, 34.9, 33.9, 30.4, 30.1, 29.0, 28.9, 27.3, 26.1, 24.3, 22.4, 21.3, 18.8, -1.0, -1.3; IR (neat)  $\nu$  3075.8, 2928.2, 2854.4, 1641.9, 1473.2, 1257.1, 1072.6  $\text{cm}^{-1}$ ; HRMS (DCI,  $\text{NH}_3$ ) calcd for  $[\text{C}_{27}\text{H}_{48}\text{O}_2\text{Si}]^+$  432.3424, found 432.3420  $[\text{M}]^+$ .



Procedure for attempted ring closing metathesis (RCM) of **12**: A solution of olefin **12** (0.0486 g, 0.112 mmol) in  $\text{CH}_2\text{Cl}_2$  (0.002 M) was treated with the Grubbs' catalyst<sup>6</sup>  $(\text{Cy}_3\text{P})_2\text{Cl}_2\text{Ru}=\text{CHPh}$  (0.006 g, 0.007 mmol, 0.06 equiv) and was refluxed under Ar for 2 h. An additional 0.008 g of catalyst was added to the reaction mixture and refluxing was continued for 46 h. The solution was cooled to 23  $^\circ\text{C}$  and the solvent removed *in vacuo*. Chromatography of the crude oil yielded 0.0216 g of a solid white material which, by  $^1\text{H}$  NMR analysis, contained several (3-4) compounds in roughly equivalent amounts which resembled macrocycle **9**. However, mass spectroscopy of this mixture led to the identification of one of these compounds as a dimeric species (ESIMS



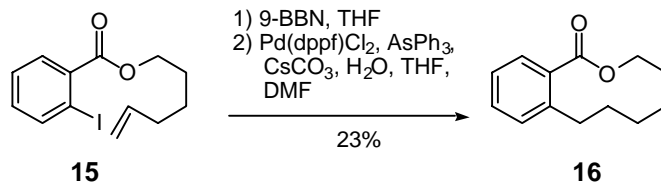
calc for  $[\text{C}_{50}\text{H}_{89}\text{O}_4\text{Si}_2\text{Na}]^+$  831.6, found 831.5 [dimer + Na] $^+$ ). A later eluting mixture of compounds (0.0154 g) was also obtained, also somewhat resembling by  $^1\text{H}$  NMR analysis, macrocycle **9**. The combined mass of these isolated products accounts for 84% of the material.



Procedure for ether **14**: Aryl iodide **13**<sup>7</sup> (0.102 g, 0.397 mmol) in THF (0.8 mL) at 23 °C was treated with solid 9-BBN dimer (0.073 g, 0.595 mmol w/r monomer, 1.5 equiv) and the resulting mixture was stirred for 1 h. This mixture was then diluted with THF (4 mL) and treated with H<sub>2</sub>O (0.021 mL, 1.19 mmol, 3 equiv) and then TIOEt (0.084 mL, 1.19 mmol, 3 equiv). This solution was added dropwise over 4 h (syringe pump) to a solution of Pd(dppf)Cl<sub>2</sub> (0.065 g, 0.079 mmol, 0.2 equiv) and AsPh<sub>3</sub> (0.024 g, 0.079 mmol, 0.2 equiv) in THF (120 mL) and DMF (12 mL) under an Ar atmosphere. After 9 h, the reaction mixture was treated with pH 7.2 phosphate buffer (10 mL) and 30% H<sub>2</sub>O<sub>2</sub> (3 mL) and stirred at 23 °C for 1 h. This mixture was extracted with hexanes (2 x 30 mL) and the combined organic layers were washed with H<sub>2</sub>O (10 mL), dried over MgSO<sub>4</sub>, filtered and concentrated *in vacuo* (avoiding high vacuum as the product is volatile). Chromatography on SiO<sub>2</sub> (2-5% Et<sub>2</sub>O/hexane gradient) afforded 0.013 g (22%) of cyclic ether **14**.

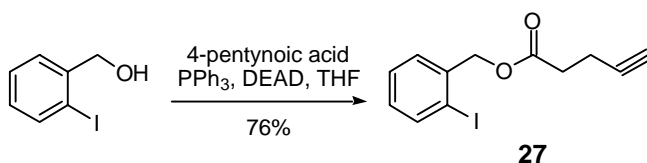
Data for ether **14** (the  $^1\text{H}$  NMR spectrum of this compound compares favorably to the spectrum of this compound taken in  $\text{CHClF}_2$ )<sup>8</sup>:  $^1\text{H}$  NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  7.22-7.13 (m, 4 H), 4.67 (s, 2 H), 4.06 (t, J = 5.1 Hz, 2 H), 3.01 (t, J = 5.7 Hz, 2 H), 1.85 (m, 2 H);  $^{13}\text{C}$  NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  142.7, 140.0, 129.1, 128.5, 127.8, 126.1, 75.7, 75.0,

35.5, 30.3; IR (neat)  $\nu$  2933.8, 2843.6, 1725.4, 1459.9, 1094.1, 753.4  $\text{cm}^{-1}$ ; HRMS (DEI) calcd for  $[\text{C}_{10}\text{H}_{13}\text{O}]^+$  148.0888, found 148.0884  $[\text{M}]^+$ .



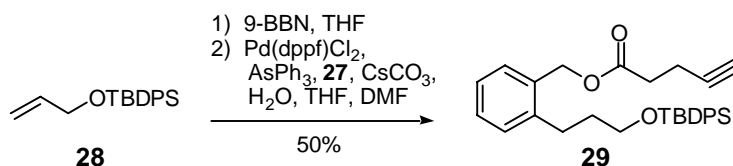
Procedure for lactone **16**: Aryl iodide **15**<sup>9</sup> (0.083 g, 0.261 mmol) in THF (1.3 mL) at 23 °C was treated with solid 9-BBN dimer (0.073 g, 0.595 mmol w/r monomer, 2.3 equiv) and the resulting mixture was stirred for 2 h. This solution was added dropwise over 2.5 h to a solution of Pd(dppf)Cl<sub>2</sub> (0.042 g, 0.052 mmol, 0.2 equiv) and AsPh<sub>3</sub> (0.016 g, 0.052 mmol, 0.2 equiv) in THF (34 mL) and DMF (17 mL) under an Ar atmosphere. After 16 h, the reaction mixture was diluted with H<sub>2</sub>O (20 mL) and extracted with a 1:1 Et<sub>2</sub>O/hexane solvent mixture. The combined organic layers were washed with H<sub>2</sub>O (10 mL), dried over MgSO<sub>4</sub>, filtered and concentrated *in vacuo*. Chromatography on SiO<sub>2</sub> (2-10% Et<sub>2</sub>O/hexane gradient) afforded 0.012 g (23%) of lactone **16**.

Data for lactone **16**: <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  7.79 (dd, *J* = 7.6, 1.3 Hz, 1 H), 7.37 (ddd, *J* = 7.4, 7.4, 1.4 Hz, 1 H), 7.26 (dd, *J* = 7.6, 1.1 Hz, 1 H), 7.22 (d, *J* = 7.7 Hz, 1 H), 4.44 (t, *J* = 5.4 Hz, 2 H), 2.86 (t, *J* = 7.5 Hz, 2 H), 1.83-1.72 (m, 4 H), 1.71-1.64 (m, 2 H), 1.53-1.47 (m, 2 H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  169.0, 144.1, 131.6, 130.8, 130.4, 126.0, 65.9, 32.3, 29.0, 27.6, 26.1, 22.4; IR (neat)  $\nu$  2931.5, 1714.5, 1281.5  $\text{cm}^{-1}$ ; HRMS (EI) calcd for  $[\text{C}_{13}\text{H}_{16}\text{O}_2]^+$  204.1150, found 204.1150  $[\text{M}]^+$ .



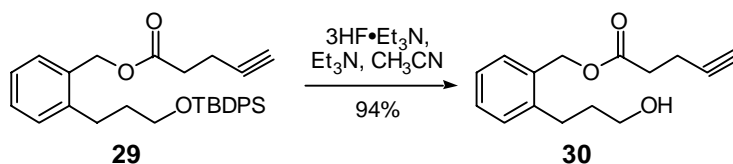
Procedure for ester **27**: A solution of 2-iodobenzyl alcohol (5.75 g, 24.6 mmol, 1.1 equiv) and 4-pentynoic acid (2.19 g, 22.3 mmol) in THF (20 mL) at 23 °C was treated with PPh<sub>3</sub> (8.2 g, 31.2 mmol, 1.4 equiv) and diethyl azodicarboxylate (4.6 mL, 29.0 mmol, 1.3 mmol). After 1 h, the reaction was diluted with sat. aqueous NaHCO<sub>3</sub> and the resulting mixture was extracted with Et<sub>2</sub>O (2 x 50 mL). The combined organic layers were dried over MgSO<sub>4</sub>, filtered and concentrated *in vacuo*. Chromatography of the crude residue on SiO<sub>2</sub> (5-15% Et<sub>2</sub>O/hexane) afforded 5.9 g (76%) of ester **27**.

Data for ester **27**: <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 7.86 (d, J = 7.9 Hz, 1 H), 7.40-7.33 (m, 2 H), 7.03 (td, J = 7.8, 1.9 Hz, 1 H), 5.17 (s, 2 H), 2.68-2.64 (m, 2 H), 2.58-2.50 (m, 2 H), 1.99 (t, J = 2.5 Hz, 1 H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 171.3, 139.5, 138.1, 129.9, 129.5, 128.3, 98.3, 82.3, 70.2, 69.2, 33.3, 14.3; IR (neat) ν 3296.2, 3060.8, 2921.7, 1738.6, 1160.9 cm<sup>-1</sup>; HRMS (DEI) calcd for [C<sub>12</sub>H<sub>11</sub>O<sub>2</sub>]<sup>+</sup> 313.9806, found 313.9807 [M]<sup>+</sup>.



MgSO<sub>4</sub>, filtered and concentrated *in vacuo*. Silyl ether **29** (0.344 g, 50% yield) was isolated from the crude oil by chromatography on SiO<sub>2</sub> (5-15% Et<sub>2</sub>O/hexane gradient).

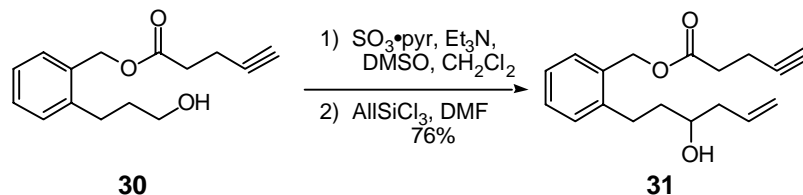
Data for silyl ether **29**: <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 7.71-7.69 (m, 4 H), 7.46-7.28 (m, 7 H), 7.26-7.20 (m, 3 H), 5.19 (s, 2 H), 3.74 (t, J = 6.1 Hz, 2 H), 2.79 (dd, J = 9.9, 7.8 Hz, 2 H), 2.59-2.55 (m, 2 H), 2.52-2.48 (m, 2 H), 1.95 (t, J = 2.4 Hz, 1 H), 1.85 (m, 2 H), 1.09 (s, 9 H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 171.5, 141.2, 135.6, 133.9, 133.3, 129.8, 129.6, 129.5, 128.7, 127.6, 126.1, 82.4, 69.1, 64.5, 63.2, 33.9, 33.3, 28.7, 26.9, 19.2, 14.3; IR (neat) ν 3296.7, 3067.1, 2931.5, 2858.5, 1740.6, 1427.6, 1161.5, 1109.4 cm<sup>-1</sup>; ESIMS calcd for [C<sub>31</sub>H<sub>36</sub>O<sub>3</sub>SiNa]<sup>+</sup> 507.2, found 507.2 [M + Na]<sup>+</sup>.



Procedure for alcohol **30**: Silyl ether **29** (0.34 g, 0.70 mmol) in CH<sub>3</sub>CN (2 mL) was treated with Et<sub>3</sub>N (0.6 mL, 4.2 mmol, 6 equiv) and 3HF·Et<sub>3</sub>N (0.34 mL, 2.1 mmol, 3 equiv) at 23 °C. After being stirred for 5 h, the reaction was quenched with H<sub>2</sub>O (10 mL) and extracted with Et<sub>2</sub>O (2 x 20 mL). The combined organic layers were washed with sat. aqueous NaHCO<sub>3</sub> (10 mL), dried over MgSO<sub>4</sub>, filtered and concentrated *in vacuo*. The crude oil was chromatographed on SiO<sub>2</sub> (10-30% EtOAc/hexanes gradient), affording 0.163 g (94% yield) of alcohol **30** as a colorless oil.

Data for alcohol **30**: <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 7.36-7.19 (m, 4 H), 5.21 (s, 2 H), 3.69 (t, J = 6.2 Hz, 2 H), 2.77 (dd, J = 9.5, 7.7 Hz, 2 H), 2.62-2.58 (m, 2 H), 2.54-2.49 (m, 2 H), 1.98 (t, J = 2.4 Hz, 1 H), 1.91-1.84 (m, 2 H), 1.64 (bs, 1 H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 171.6, 140.8, 133.3, 129.9, 129.5, 128.8, 126.2, 82.4, 69.1, 64.5, 62.1, 33.9, 33.3, 28.5, 14.3; IR (neat) ν 3416.3, 3296.0, 3025.3, 2935.0, 2874.9, 2122.9,

1730.6, 1384.6, 1159.0, 1058.8 cm<sup>-1</sup>; ESIMS calcd for [C<sub>15</sub>H<sub>18</sub>O<sub>3</sub>Na]<sup>+</sup> 269.1, found 268.6 [M + Na]<sup>+</sup>.

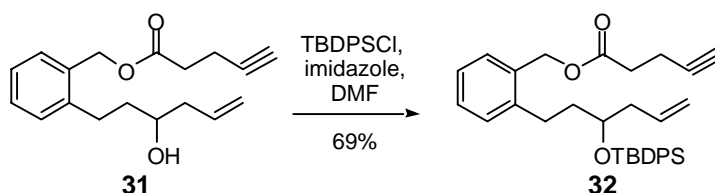


Procedure for alcohol **31**:<sup>10</sup> Alcohol **30** (0.147 g, 0.598 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (4 mL) and DMSO (1 mL) was treated at 23 °C with Et<sub>3</sub>N (0.430 mL, 3.11 mmol, 5.2 equiv) followed by SO<sub>3</sub>•py (0.381 g, 2.39 mmol, 4 equiv). After being stirred 12 h, the reaction mixture was diluted with NaHCO<sub>3</sub> (5 mL) and extracted with Et<sub>2</sub>O (2 x 20 mL). The combined organic layers were washed with sat. aqueous NaHSO<sub>4</sub> (5 mL), dried over MgSO<sub>4</sub>, filtered and concentrated *in vacuo*. The crude aldehyde was dried *in vacuo* (ca. 0.1 mm Hg) for 2 h.

Data for the aldehyde intermediate: <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 9.84 (s, 1 H), 7.37-7.21 (m, 4 H), 5.20 (s, 2 H), 3.01 (t, J = 7.4 Hz, 2 H), 2.80 (t, J = 7.8 Hz, 2 H), 2.59 (m, 2 H), 2.54-2.50 (m, 2 H), 1.97 (t, J = 2.4 Hz, 1 H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 201.0, 171.5, 139.5, 133.3, 130.3, 129.3, 129.1, 126.7, 82.3, 69.2, 64.6, 44.9, 33.3, 24.5, 14.3; IR (neat) ν 3284.8, 2922.5, 1726.8, 1154.0 cm<sup>-1</sup>; HRMS (DCI, NH<sub>3</sub>) calcd for [C<sub>15</sub>H<sub>20</sub>NO<sub>3</sub>]<sup>+</sup> 262.1443, found 262.1447 [M + NH<sub>4</sub>]<sup>+</sup>.

The freshly prepared aldehyde was dissolved in DMF (2 mL) and was treated at 23 °C with allyltrichlorosilane (0.260 mL, 1.79 mmol, 3 equiv).<sup>11</sup> After 3 h, the reaction was quenched with sat. aqueous NaHCO<sub>3</sub> (5 mL) and extracted with Et<sub>2</sub>O (2 x 20 mL). The combined organic layers were dried over MgSO<sub>4</sub>, filtered and concentrated *in vacuo*. Chromatography on SiO<sub>2</sub> (10-30% Et<sub>2</sub>O/hexane gradient) afforded 0.130 g (76%) of alcohol **31** as a colorless oil.

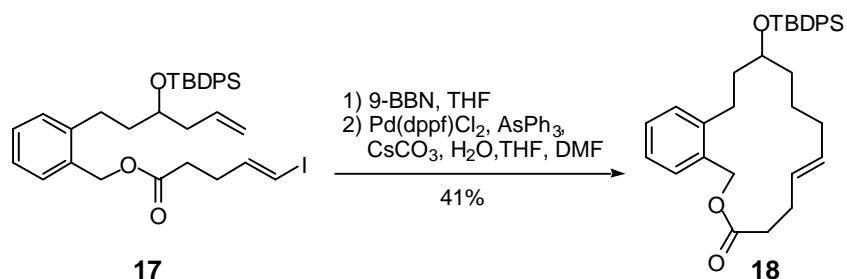
Data for alcohol **31**:  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  7.36-7.19 (m, 4 H), 5.83 (m, 1 H), 5.25-5.13 (m, 4 H), 3.61 (m, 1 H), 2.88 (ddd,  $J = 14.0, 9.9, 5.6$  Hz, 1 H), 2.73 (ddd,  $J = 13.9, 9.7, 6.9$  Hz, 1 H), 2.62-2.58 (m, 2 H), 2.54-2.49 (m, 2 H), 2.31 (m, 1 H), 2.20 (dt,  $J = 15.3, 7.8$  Hz, 1 H), 1.98 (t,  $J = 2.4$  Hz, 1 H), 1.89 (bs, 1 H), 1.83-1.68 (m, 2 H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  172.0, 141.6, 134.9, 133.7, 130.4, 130.0, 129.2, 126.6, 118.8, 82.8, 70.3, 69.6, 65.0, 42.6, 38.6, 33.8, 28.9, 14.8; IR (neat)  $\nu$  3461.1, 3294.6, 2922.5, 1736.6, 1163.8  $\text{cm}^{-1}$ ; HRMS (DEI) calcd for  $[\text{C}_{18}\text{H}_{23}\text{O}_3]^+$  287.1647, found 287.1645  $[\text{M} + \text{H}]^+$ .



Procedure for **32**: A solution of alcohol **31** (0.150 g, 0.524 mmol) in DMF (1 mL) was treated at 23 °C with imidazole (0.050 g, 0.734 mmol, 1.4 equiv) and TBDPSCl (0.164 mL, 0.629 mmol, 1.2 equiv). After being stirred for 16 h, the reaction mixture was diluted with  $\text{H}_2\text{O}$  (5 mL) and extracted with  $\text{Et}_2\text{O}$  (2 x 20 mL). The combined organic layers were dried over  $\text{MgSO}_4$ , filtered and concentrated *in vacuo*. Chromatography on  $\text{SiO}_2$  (5-10%  $\text{Et}_2\text{O}$ /hexane gradient) afforded 0.191 g (69%) of silyl ether **32** as a colorless oil.

Data for silyl ether **32**:  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  7.73-7.70 (m, 4 H), 7.47-7.37 (m, 6 H), 7.31 (dd,  $J = 7.4, 1.0$  Hz, 1 H), 7.25-7.15 (m, 2 H), 7.05 (d,  $J = 7.5$  Hz, 1 H), 5.76 (m, 1 H), 5.11 (s, 2 H), 5.08-4.96 (m, 2 H), 3.90 (m, 1 H), 2.70 (ddd,  $J = 11.2, 7.9, 5.5$  Hz, 1 H), 2.59-2.47 (m, 5 H), 2.35-2.24 (m, 2 H), 1.96 (t,  $J = 2.4$  Hz, 1 H), 1.78-1.66 (m, 2 H), 1.10 (s, 9 H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  171.4, 135.9, 135.9, 134.5, 134.3, 134.2, 133.2, 129.8, 129.6, 129.6, 129.3, 128.7, 127.6, 127.5, 126.0, 117.2, 82.4, 72.5, 69.1, 64.4, 41.1, 37.5, 33.3, 28.0, 27.1, 19.4, 14.3; IR (neat)  $\nu$  3301.8, 3066.6,





Procedure for macrocycle **18**: A solution of vinyl iodide **17** (0.106 g, 0.162 mmol) in THF (0.8 mL) was treated with solid 9-BBN dimer (0.030 g, 0.244 mmol w/r to monomer, 1.5 equiv) at 23 °C. After being stirred for 1.5 h, the solution was added dropwise over 1 h to a solution of Pd(dppf)Cl<sub>2</sub> (0.027 g, 0.032 mmol, 0.2 equiv), AsPh<sub>3</sub> (0.010 g, 0.032 mmol, 0.2 equiv) in THF (26 mL) and DMF (13 mL) under an Ar atmosphere. This mixture was stirred an additional 3 h, then was diluted with H<sub>2</sub>O (20 mL) and extracted with a 1:1 mixture of Et<sub>2</sub>O/hexane (2 x 40 mL). The combined organic layers were washed with H<sub>2</sub>O (10 mL) and dried over MgSO<sub>4</sub>, filtered and concentrated *in vacuo*. Chromatography of the crude oil on SiO<sub>2</sub> (5-15% Et<sub>2</sub>O/hexane gradient) afforded 35 mg (41%) of macrocycle **18** as a colorless oil.

Data for macrocycle **18**: <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 7.73-7.70 (m, 4 H), 7.47-7.37 (m, 6 H), 7.25-7.14 (m, 3 H), 6.92 (d, J = 7.3 Hz, 1 H), 5.39 (dt, J = 15.1, 7.3 Hz, 1 H), 5.28 (m, 1 H), 5.10 (A of ABq, J = 11.7 Hz, 1 H), 4.96 (B of ABq, J = 11.7 Hz, 1 H), 3.81 (m, 1 H), 2.55 (ddd, J = 15.4, 11.7, 5.1 Hz, 1 H), 2.44-2.28 (m, 5 H), 1.95 (m, 1 H), 1.81-1.70 (m, 3 H), 1.57-1.39 (m, 4 H), 1.09 (s, 9 H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 173.2, 142.0, 135.9, 134.7, 134.4, 132.8, 131.9, 131.2, 129.5, 129.5, 129.3, 128.3, 127.5, 127.5, 125.9, 71.8, 65.5, 36.4, 34.1, 33.3, 30.7, 27.5, 27.1, 26.7, 23.2, 19.4; IR (neat) 2968.1, 2928.8, 1732.6, 1619.1, 1599.5, 1476.6, 1205.4, 1179.9, 1031.0 cm<sup>-1</sup>; HRMS (DCI, NH<sub>3</sub>) calcd for [C<sub>34</sub>H<sub>43</sub>O<sub>3</sub>Si]<sup>+</sup> 527.2981, found 527.2963 [M + H]<sup>+</sup>.



---

## References

- <sup>1</sup> (a) Bosch, M. P.; Camps, F.; Coll, J.; Guerrero, A.; Tatsuoka, T.; Meinwald, J. *J. Org. Chem.* **1986**, *51*, 773. (b) Golinski, M.; Brock, C. P.; Watt, D. S. *J. Org. Chem.* **1993**, *58*, 159.
- <sup>2</sup> Moss, R. A.; Chen, E. Y. *J. Org. Chem.* **1981**, *46*, 1466.
- <sup>3</sup> Posner, G. H.; Babiak, K. A.; Loomis, G. L.; Frazee, W. J.; Mittal, R. D.; Karle, I. L. *J. Am. Chem. Soc.* **1980**, *102*, 7498.
- <sup>4</sup> (a) Takai, K.; Nitta, K.; Utimo, K. *J. Am. Chem. Soc.* **1986**, *108*, 7408. (b) Evans, D. A.; Black, W. C. *J. Am. Chem. Soc.* **1993**, *115*, 4497.
- <sup>5</sup> (a) Stork, G. and Zhao, K. *Tetrahedron Lett.* **1989**, *30*, 2173.
- <sup>6</sup> Schwab, P.; France, M. B.; Ziller, J. W.; Grubbs, R. H. *Angew. Chem. Int. Ed.* **1995**, *34*, 2039.
- <sup>7</sup> Beckwith, A. L. J.; Gara, W. B. *J. Chem. Soc. Perkin Trans. 2*, **1975**, 795.
- <sup>8</sup> Desilets, S. and St-Jacques, M. *J. Am. Chem. Soc.* **1987**, *109*, 1641.
- <sup>9</sup> Curran, D. P. and Liu, H. *J. Chem. Soc. Perkin Trans. I* **1994**, 1377.
- <sup>10</sup> Parikh, J. R.; Doering, W. von E. *J. Am. Chem. Soc.* **1967**, *89*, 5505.
- <sup>11</sup> Kobayashi, S.; Nishio, K. *J. Org. Chem.* **1994**, *59*, 6620.
- <sup>12</sup> Hart, D. W.; Blackburn, T. F.; Schwartz, J. *J. Am. Chem. Soc.* **1975**, *97*, 679.