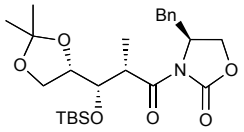
Supporting Materials and Methods

Except as otherwise indicated, reactions were carried out under an argon atmosphere in flame- or oven-dried glassware, and solvents were freshly distilled. Diethyl ether and tetrahydrofuran (THF) were distilled from sodium/benzophenone. Dichloromethane was distilled from calcium hydride. Triethylamine was distilled from calcium hydride and stored over potassium hydroxide. Reactions were monitored by TLC with 0.25-mm E. Merck precoated silica gel plates. Silica gel for flash chromatography (particle size 0.040–0.063 mm) was supplied by Bodman, Silicycle, and Sorbent Technologies. Yields refer to chromatographically and spectroscopically pure compounds unless otherwise noted. Melting points were determined on a Bristoline heated-stage microscope or a Thomas-Hoover apparatus and are corrected. ^{1}H and ^{13}C spectra were recorded on a Bruker AM-500 spectrometer. Chemical shifts are reported as δ values relative to internal chloroform (δ 7.24), benzene (δ 7.15), methanol (δ 3.34), or dimethylsulfoxide (δ 2.54) for ^{1}H and either chloroform (δ 77.0), benzene (δ 128.0), or methanol (δ 49.0) for ^{13}C. Infrared spectra were recorded on a Perkin–Elmer Model 283B, a Perkin–Elmer Model 1600 Fourier transform infrared (FTIR), or a Jasco FTIR-480plus spectrometer with polystyrene as external standard. Optical rotations were measured on a Perkin-Elmer model 241 polarimeter. High–resolution mass spectra were measured at the University of Pennsylvania Mass Spectrometry Center.

Preparation of Imide (+)-11



(+)-11

To a solution of *N*-acyloxazolidinone (+)-**10** (3.76 g, 16.1 mmol) in dichloromethane (15 ml) at 0˚C were added Bu_2BOTf (1.0 M in dichloromethane, 19.4 ml, 19.4 mmol)

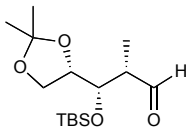
and Et_3N (2.9 ml, 21.0 mmol) dropwise so as not to exceed 3˚C. The resulting yellow reaction mixture was stirred for 15 min before cooling to -78˚C. Glyceraldehyde acetonide (–)-**9**[1,2] (2.31g, 17.7 mmol) was added via cannula as a solution in dichloromethane (10 + 5 ml) and the reaction stirred for 20 min, warmed to 0˚C, and stirred an additional 1 h. The reaction was quenched by the slow, consecutive addition of pH 7 buffer (18 ml), MeOH (54 ml), and MeOH:30% H_2O_2 (2:1, 54 ml) so as not to exceed 10˚C. The reaction mixture was concentrated in vacuo to remove any volatile materials and the residue was diluted with Et_2O (90 ml). The layers were separated and the aqueous phase was extracted with Et_2O (2 × 90 ml). The combined organic extracts were washed with $NaHCO_3$ (5% aq soln, 90 ml), brine (90 ml), dried over $MgSO_4$, filtered, and concentrated in vacuo. Purification via flash chromatography (30% ethyl acetate/hexanes) gave 4.80 g (82% yield) as an oil: $[\alpha]_D^{20}$ +52˚ (*c* 0.42, $CHCl_3$); IR ($CHCl_3$) 3680 (w), 3540 (br), 3020 (m), 1780 (s), 1690 (m), 1380 (m), 1230 (m), 1210 (m), 910 (m), 690 (w) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.32 (m, 5 H), 4.66 (dddd, *J* = 3.1, 3.1, 3.1, 6.9 Hz, 1 H), 4.22-4.11 (m, 3 H), 4.02 (dd, *J* = 6.7, 8.2 Hz, 1 H), 3.87-3.77 (m, 3 H), 3.25 (dd, *J* = 3.1, 13.4 Hz, 1 H), 2.76 (dd, *J* = 9.5, 13.4 Hz, 1 H), 2.46 (d, *J* = 6.6 Hz, 1 H), 1.41 (s, 3 H), 1.34 (s, 3 H), 1.31 (d, *J* = 6.9 Hz, 3 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 175.2, 152.9, 135.1, 129.4, 128.9, 127.4, 109.6, 76.8, 71.6, 66.18, 66.16, 55.3, 41.2, 37.7, 26.4, 25.3, 12.2; high resolution mass spectrum (CI, NH_3) *m/z* 364.1752 [$(M+H)^+$; calcd for $C_{19}H_{26}NO_6$: 364.1759].

Anal. Calcd for $C_{19}H_{25}NO_6$; C, 62.8; H, 6.93; N, 3.85. Found: C, 62.9; H, 7.20; N, 3.93.

To a solution of the resulting alcohol (1.67 g, 4.60 mmol) in dichloromethane (35 ml) at 0˚C were added 2,6-lutidine (1.82 ml, 15.6 mmol) and TBSOTf (1.80 ml, 7.82 mmol). The resulting solution was stirred for 45 min, after which time it was quenched by the addition of saturated aqueous $NaHCO_3$ (40 ml) and then poured onto

dichloromethane (50 ml). The layers were separated and the aqueous layer was extracted with dichloromethane (3 × 50 ml). The combined organic layers were then washed with brine, dried over $MgSO_4$, filtered, and concentrated in vacuo. Flash chromatography (10% ethyl acetate/hexanes) provided 2.00g (91% yield) as a colorless oil: $[\alpha]_D^{20}$ +37˚ (*c* 2.5, $CHCl_3$); IR ($CHCl_3$) 3020 (m), 1780 (s), 1700 (m), 1450 (w), 1380 (m), 1220 (m), 1110 (m), 830 (m), 690 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.32-7.18 (m, 5 H), 4.62 (dddd, *J* = 9.8, 5.5, 2.5, 2.5 Hz, 1 H), 4.34 (apparent t, *J* = 6.3 Hz, 1 H), 4.23-4.14 (m, 3 H), 3.97 (dd, *J* = 6.3, 8.4 Hz, 1 H), 3.86 (apparent t, *J* = 8.4 Hz, 1 H), 3.81 (apparent quint, *J* = 6.7 Hz, 1 H), 3.32 (dd, *J* = 3.1, 13.3 Hz, 1 H), 2.79 (dd, *J* = 9.6, 13.3 Hz, 1 H), 1.30 (s, 6 H), 1.21 (d, *J* = 6.9 Hz, 3 H), 0.87 (s, 9 H),, 0.08 (s, 3 H), 0.04 (s, 3 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 174.5, 153.0, 135.3, 129.4, 128.9, 127.3, 109.3, 77.6, 72.9, 66.0, 65.5, 55.7, 39.7, 37.7, 26.2, 25.7, 25.3, 18.1, 12.5, -4.2, -4.9; high resolution mass spectrum (CI, NH_3) *m/z* 478.2635 [$(M+H)^+$; calcd for $C_{25}H_{40}NO_6Si$: 478.2523].

Preparation of Aldehyde (+)-12



(+)-12

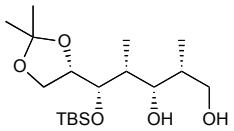
To a solution of ethanethiol (0.78 ml, 552 mg, 10.5 mmol) in THF (10 ml) at -78˚C was added *n*-butyllithium (1.6 M in hexane, 3.3 ml, 5.23 mmol). The mixture was warmed to 0˚C, at which time it became cloudy. A solution of oxazolidinone (+)-**11** (1.0 g, 2.09 mmol) in THF (5 ml + 5 ml rinse) was added via cannula. The mixture was stirred at 0˚C for 15 minutes then poured onto Et_2O (300 ml) and NaOH (1 N, 100 ml). The layers were separated and the organic layer was washed with brine (100 ml), dried over $MgSO_4$, filtered, and concentrated in vacuo. Flash column chromatography (5% ethyl acetate/hexanes) afforded 0.713 mg (94% yield) of the

thioester as a colorless oil: $[\alpha]_D^{20}$ -9.0° (*c* 2.7, $CHCl_3$); IR ($CHCl_3$) 2940 (s), 1680 (s), 1460 (m), 1380 (m), 1370 (m), 1250 (s), 1140 (s), 1060 (s), 1000 (w), 960 (s), 840 (s) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 4.19 (dd, *J* = 4.2, 6.9 Hz, 1 H), 4.04 (apparent dt, *J* = 6.8, 6.8, 6.8 Hz, 1 H), 3.90 (dd, *J* =6.4, 8.1 Hz, 1 H), 3.60 (apparent t, *J* = 8.1 Hz, 1 H), 2.82 (q, *J* = 7.4 Hz, 2 H), 2.54 (m, 1 H), 1.39 (s, 3 H), 1.29 (s, 3 H), 1.21 (app t, *J* = 7.4 Hz, 3 H), 1.18 (d, *J* = 7.0 Hz, 3 H), 0.83 (s, 9 H), 0.05 (s, 3 H), 0.02 (s, 3 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 201.3, 109.3, 78.1, 74.0, 65.7, 50.7, 26.4, 25.8, 25.2, 23.1, 18.2, 14.5, 11.8, -4.1, -4.9; high resolution mass spectrum *m/z* (CI, NH_3) 363.2027 [$(M+H)^+$; calcd for $C_{17}H_{35}O_4SSi$:363.2025].

Anal. Calcd. for $C_{17}H_{34}O_4SSi$; C, 56.31; H, 9.45. Found: C, 56.56; H, 9.68.

To a solution of the resulting thioester (1.97 g, 5.43 mmol) in dichloromethane (50 ml) were added 10% Pd/C (290 mg, 0.272 mmol) and triethylsilane (1.73 ml, 1.26 g, 10.8 mmol). After 20 minutes, TLC analysis indicated complete reaction. The reaction mixture was filtered through a pad of Celite and the filter cake washed with dichloromethane (3 × 20 ml) and the filtrate concentrated in vacuo. Flash chromatography (7% ethyl acetate/hexanes) provided 1.44 g (88% yield) of aldehyde (+)-**12** as a colorless oil: $[\alpha]_D^{20}$ +31° (*c* 1.4, benzene); IR (C_6H_6) 2940 (s), 2860 (s), 1730 (s), 1460 (m), 1380 (s), 1370 (s), 1260 (s), 1210 (m), 1150 (s), 1120 (s), 1060 (s), 940 (w), 830 (s), 780 (s) cm^{-1}; ^1H NMR (500 MHz, C_6D_6) δ 9.4 (s, 1 H), 3.91 (m, 2 H), 3.57 (dd, *J* = 6.0, 8.0 Hz, 1 H), 3.34 (apparent t, *J* = 7.3 Hz, 1 H), 1.73 (dq, *J* = 3.0, 7.0 Hz, 1 H), 1.35 (s, 3 H), 1.24 (s, 3 H), 0.93 (m, 12 H), 0.11 (s, 3 H), 0.05 (s, 3 H); ^{13}C NMR (125 MHz, C_6D_6) δ 201.5, 109.6, 77.8, 73.1, 65.7, 49.3, 26.5, 26.0, 25.5, 18.4, 8.1, -4.0, -4.8; high resolution mass spectrum (CI, NH_3) *m/z* 320.2251 [$(M+NH_4)^+$; calcd for $C_{15}H_{34}NO_4Si$:320.2257].

Preparation of diol (+)-13



(+)-13

To a solution of *N*-acyloxazolidinone (+)-**10** (1.18 g, 5.06 mmol) in dichloromethane (25 ml) at -78˚C was added Et_3N (0.83 ml, 5.96 mmol) followed by Bu_2BOTf (1.0 M dichloromethane, 4.80 ml, 4.80 mmol). The resulting yellow solution was stirred for 1 h, warmed to 0˚C, stirred 15 minutes further, and then recooled to -78˚C. Aldehyde (+)-**12** (900 mg, 2.98 mmol) in dichloromethane (4 ml + 2 ml rinse) was then added via cannula. The reaction mixture was stirred at -78˚C for 1 h, warmed to -10˚C, stirred for an additional hour, and then quenched consecutively with pH 7 buffer (5 ml), MeOH (10 ml), and MeOH:30% H_2O_2 (1:1, 5 ml). The resulting mixture was stirred for 35 minutes at 0˚C and then poured onto water (15 ml) and the layers separated. The aqueous layer was extracted with dichloromethane (2 × 40 ml) and the combined organic layers were dried over $MgSO_4$, filtered, concentrated in vacuo, and used without further purification for the next step. An analytical sample was obtained by flash chromatography (30% ethyl acetate/hexanes): $[\alpha]_D^{20}$ +23˚ (*c* 0.72, $CHCl_3$); IR ($CHCl_3$) 3580 (w), 3500 (br), 2980 (m), 1790 (s), 1690 (s), 1460 (m), 1380 (s), 1230 (s), 1150 (m), 1110 (s), 1080 (m), 1050 (m), 1020 (m), 980 (m), 840 (m), 690 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.37-7.22 (m, 5 H), 4.70 (m, 1 H), 4.20 (m, 2 H), 4.11 (ddd, *J* = 6.3, 6.3, 8.7 Hz, 1 H), 4.07 (dd, *J* = 2.0, 6.2 Hz, 1 H), 3.99 (dd, *J* = 6.1, 7.9 Hz, 1 H), 3.93 (m, 1 H), 3.73 (dd, *J* = 2.7, 6.6 Hz, 1 H), 3.61 (d, *J* = 2.0 Hz, 1 H), 3.54 (apparent t, *J* = 8.3 Hz, 1 H), 3.27 (dd, *J* = 3.3, 13.4 Hz, 1 H), 2.81 (dd, *J* = 9.5, 13.4 Hz, 1 H), 1.52 (m, 1 H), 1.45 (s, 3 H), 1.38 (s, 3 H), 1.32 (d, *J* = 7.0 Hz, 3 H), 1.04 (d, *J* = 6.8 Hz, 3 H), 0.88 (s, 9 H), 0.14 (s, 3 H), 0.13 (s, 3 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 177.4, 152.6, 135.0, 129.4, 128.9, 127.4, 109.3, 77.8, 75.3, 72.1,

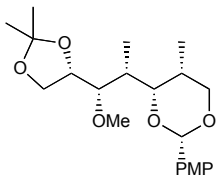
66.1, 66.0, 55.0, 39.5, 38.8, 37.7, 26.5, 25.8, 25.6, 18.4, 12.2, 9.3, -3.8, -5.2; high resolution mass spectrum *m/z* 536.3043 [$(M+H)^+$; calcd for $C_{28}H_{46}O_7NSi$:536.3043].

Anal. Calcd. for $C_{28}H_{45}O_7NSi \cdot H_2O$; C, 60.73; H, 8.55; N, 2.53. Found: C, 61.03; H, 8.23; N, 2.41.

To a solution of the resulting alcohol in THF (20 ml) at 0˚C was added MeOH (0.36 ml, 8.9 mmol) followed by the slow addition of $LiBH_4$ (2.0 M THF, 4.4 ml, 8.9 mmol), during which time gas evolution was observed. The reaction mixture was stirred at 0˚C for 10 minutes and then warmed to room temperature and stirred for an additional 40 minutes before being quenched with NaOH (1 N, 15 ml). The biphasic mixture was then poured onto water (30 ml) and Et_2O (100 ml) and the layers were separated. The aqueous layer was extracted with Et_2O (3 × 25 ml) and the combined organic layers were washed with brine. The aqueous washes were back extracted with Et_2O (25 ml) and the combined ethereal layers were dried over $MgSO_4$, filtered, and concentrated in vacuo. Flash chromatography (35% ethyl acetate/hexanes) afforded 765 mg (71% yield over the two steps) of diol (+)-**13** as a colorless oil: $[\alpha]_D^{20}$ +8.9˚ (*c* 1.3, $CHCl_3$); IR ($CHCl_3$) 3620 (w), 3540-2860 (br), 2940 (s), 1470 (m), 1380 (s), 1370 (s), 1260 (s), 1150 (s), 1110 (s), 1070 (s), 1050 (s), 1030 (s), 960 (m), 870 (m), 830 (s) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 4.09 (ddd, *J* = 5.5, 5.5, 7.8 Hz, 1 H), 3.93 (m, 2 H), 3.64 (m, 2 H), 3.57 (m, 2 H), 3.20 (d, *J* = 3.0 Hz, 1 H), 2.50 (br s, 1 H), 1.79 (m, 1 H), 1.60 (m, 1 H), 1.37 (s, 3 H), 1.32 (s, 3 H), 0.98 (d, *J* = 3.8 Hz, 3 H), 0.96 (d, *J* = 3.7 Hz, 3 H), 0.86 (s, 9 H), 0.06 (s, 3 H), 0.04 (s, 3 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 109.3, 76.7, 75.0, 73.7, 67.8, 66.1, 39.8, 37.6, 26.4, 25.9, 25.7, 18.2, 11.0, 9.7, -4.1, -4.6; high resolution mass spectrum (CI, NH_3) *m/z* 363.2569 [$(M+H)^+$; calcd for $C_{18}H_{39}O_5Si$:363.2566].

Anal. Calcd. for $C_{18}H_{38}O_5Si$; C, 59.63; H, 10.56. Found: C, 59.30; H, 10.17.

Preparation of Methyl Ether (+)-14



(+)-14

To a solution of diol (+)-**13** (7.4 g, 20.4 mmol) in DMF (120 ml) were added anisaldehyde dimethylacetal (7.00 ml, 40.8 mmol) and camphor sulphonic acid (474 mg, 2.04 mmol). After one hour at room temperature, the reaction mixture was poured into Et_2O:hexanes (2:1, 300 ml) and water (400 ml). The layers were separated and the aqueous phase was extracted with Et_2O:hexanes (2:1, 3 × 100 ml). The combined organic layers were washed with water (200 ml) and brine (200 ml) and the aqueous phases were further extracted with Et_2O:hexanes (2:1, 50 ml). The organic layers were dried over $MgSO_4$, filtered and concentrated in vacuo and used without further purification in the next reaction. An analytical sample was obtained by flash column chromatography (30% ethyl acetate/hexanes): $[\alpha]_D^{20}$ +21° (*c* 0.44, $CHCl_3$); IR ($CHCl_3$) 3520 (s), 1620 (m), 1520 (m), 1460 (m), 1370 (m), 1360 (m), 1250 (s), 1220 (s), 1160 (m), 1130 (m), 1050 (s), 930 (m), 910 (m), 780 (s), 730 (s), 660 (s) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.39 (d, *J* = 8.7 Hz, 2 H), 6.86 (d, *J* = 8.8 Hz, 2 H), 5.42 (s, 1 H), 4.06 (m, 1 H), 4.00 (m, 2 H), 3.94 (dd, *J* = 6.0, 8.0 Hz, 1 H), 3.78 (m, 1 H), 3.78 (s, 3 H), 3.67 (dd, *J* = 1.4, 8.0 Hz, 1 H), 3.41 (dd, *J* = 8.2, 8.6 Hz, 1 H), 1.69 (m, 1 H), 1.45 (m, 1 H), 1.39 (s, 3 H), 1.34 (s, 3 H), 1.14 (d, *J* = 6.8 Hz, 3 H), 1.00 (s, *J* = 6.5 Hz, 3 H), 0.90 (s, 9 H), 0.13 (s, 3 H), 0.08 (s, 3 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 159.8, 131.5, 127.2, 113.5, 109.1, 101.9, 81.3, 79.0, 73.5, 73.1, 66.0, 55.2, 37.4, 29.3, 26.7, 26.0, 25.7, 18.5, 11.4, 9.6, -3.5, -5.2; high resolution mass spectrum (CI, NH_3) *m/z* 481.2980 [$(M+H)^+$; calcd for $C_{28}H_{45}O_6Si$:481.2985].

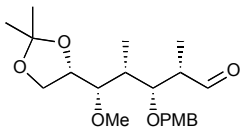
To a solution of acetal in THF (150 ml) was added TBAF (1.0 M in THF, 140 ml). The reaction mixture was stirred at ambient temperature for 24 h and then poured onto Et_2O (300 ml) and water (300 ml). The layers were separated, the aqueous phase was extracted with Et_2O (3 × 100 ml) and the combined ethereal extracts were washed with water (100 ml) and brine (100 ml). The aqueous washes were back-extracted with Et_2O (100 ml) and the combined organic layers were dried over $MgSO_4$, filtered, and concentrated in vacuo. Flash chromatography (25→35% ethyl acetate/hexanes) afforded 6.80 g (93% yield over two steps) as a colorless oil: $[\alpha]_D^{20}$ +11˚ (*c* 0.35, $CHCl_3$); IR ($CHCl_3$) 3680 (w), 3580 (m), 2980 (m), 1620 (m), 1520 (m), 1460 (m), 1380 (m), 1370 (m), 1330 (w), 1300 (w), 1250 (s), 1170 (s), 1100 (s), 1070 (s), 1030 (s), 1000 (s), 970 (m), 910 (w), 860 (w), 830 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.39 (dd, *J* = 1.8, 6.7 Hz, 2 H), 6.86 (dd, *J* = 2.0, 6.7 Hz, 2 H), 5.45 (s, 1 H), 4.14 (apparent q, *J* = 7.0 Hz, 1 H), 4.07 (dd, *J* = 2.3, 11.1 Hz, 1 H), 4.00 (m, 2 H), 3.86 (dd, *J* = 2.0, 9.8 Hz, 1 H), 3.77 (s, 3 H), 3.58 (m, 2 H), 2.22 (d, *J* = 2.9 Hz, 1 H), 1.82 (m, 1 H), 1.61 (m, 1 H), 1.42 (s, 3 H), 1.36 (s, 3 H), 1.15 (d, *J* = 6.9 Hz, 3 H), 1.03 (d, *J* = 6.7 Hz, 3 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 159.8, 131.5, 127.2, 113.5, 109.6, 101.9, 81.2, 77.9, 73.7, 71.1, 66.1, 55.2, 36.8, 29.5, 26.8, 25.5, 11.4, 9.3; high resolution mass spectrum (CI, NH_3) *m/z* 367.2125 $[(M+H)^+$; calcd for $C_{20}H_{31}O_6$:367.2120].

To a solution of the resulting alcohol (5.9 g, 16.1 mmol) in THF:DMF (1:1, 150 ml) were added MeI (10 ml, 22.8 g, 0.161 mol) and NaH (1.61 g, 40.2 mmol), portion wise. The resulting mixture was allowed to stir at ambient temperature for 1.5 h, cooled to 0˚C, and slowly quenched with pH 7 buffer (160 ml). The biphasic mixture was then poured onto water (200 ml) and Et_2O:hexanes (2:1, 400 ml) and the layers separated. The aqueous layer was extracted with Et_2O:hexanes (2:1, 3 × 100 ml) and the combined organic layers were washed with brine (100 ml). The combined aqueous layers were back extracted with Et_2O:hexanes (2:1, 100 ml) and the

combined organic layers were then dried over $MgSO_4$, filtered, and concentrated in vacuo. Flash chromatography (15% ethyl acetate/hexanes) provided 5.7 g (93% yield) of (+)-**14** as a colorless oil: $[\alpha]_D^{20}$ +4.8˚ (*c* 1.6, $CHCl_3$); IR ($CHCl_3$) 2980 (m), 1620 (m), 1590 (w), 1520 (m), 1470 (m), 1370 (m), 1300 (m), 1250 (s), 1170 (s), 1120 (m), 1110 (m), 1080 (s), 1050 (s), 1000 (m), 970 (m), 930 (m), 870 (w), 830 (m), 620 (w) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.38 (dd, *J* = 1.9, 6.7 Hz, 2 H), 6.86 (dd, *J* = 1.9, 6.7 Hz, 2 H), 5.44 (s, 1 H), 4.25 (ddd, *J* = 6.0, 8.3, 8.3 Hz, 1 H), 4.07 (dd, *J* = 2.3, 11.2 Hz, 1 H), 4.01 (dd, *J* = 1.3, 11.2 Hz, 1 H), 3.97 (dd, *J* = 6.0, 8.1 Hz, 1 H), 3.82 (dd, *J* = 2.0, 9.7 Hz, 1 H), 3.77 (s, 3 H), 3.51 (s, 3 H), 3.46 (apparent t, *J* = 8.3 Hz, 1 H), 3.19 (dd, *J* = 1.8, 8.0 Hz, 1 H), 1.70 (m, 1 H), 1.55 (m, 1 H), 1.40 (s, 3 H), 1.36 (s, 3 H), 1.16 (d, *J* = 6.9 Hz, 3 H), 1.00 (d, *J* = 6.7 Hz, 3 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 159.8, 131.5, 127.1, 113.5, 109.4, 101.8, 81.2, 81.0, 79.4, 73.6, 66.2, 59.9, 55.2, 36.9, 30.0, 26.7, 25.8, 11.3, 10.1; high resolution mass spectrum (CI, NH_3) *m/z* 381.2271 [$(M+H)^+$; calcd for $C_{21}H_{33}O_6$:381.2277].

Anal. Calcd. for $C_{21}H_{32}O_6$; C, 66.28; H, 8.48. Found: C, 65.88; H, 8.58.

Preparation of Aldehyde (+)-6



(+)-6

A solution of methyl ether (+)-**14** (992 mg, 2.60 mmol) in dichloromethane (26 ml) at –78˚C was treated with DIBAL-H (1.40 ml, 7.80 mmol) and warmed to -10˚C. The reaction mixture was stirred for 15 minutes then immediately diluted with MeOH (5 ml) and saturated aqueous Rochelle's salt (30 ml). The resultant mixture was stirred vigorously until two clear layers were obtained (*ca*. 45 min). The layers were separated and the aqueous phase was extracted with Et_2O (3 × 50 ml). The combined

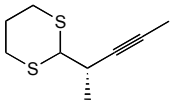
organic layers were washed with brine (75 ml), dried over Na_2SO_4, filtered, and concentrated in vacuo. Flash chromatography (20%→40% ethyl acetate/hexanes) provided 905 mg (91% yield) as a colorless oil: $[\alpha]_D^{20}$ -18° (*c* 0.42, $CHCl_3$); IR ($CHCl_3$) 3640 (w), 3500 (br), 3000 (m), 1610 (m), 1520 (m), 1460 (m), 1380 (m), 1370 (m), 1300 (w), 1250 (br), 1040 (s), 920 (w), 840 (w), 820 (w) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.24 (d, *J* = 8.5 Hz, 2 H), 6.85 (d, *J* = 8.5 Hz, 2 H), 4.52 (d, *J* = 10.8 Hz, 1 H), 4.49 (d, *J* = 10.8 Hz, 1 H), 4.21 (m, 1 H), 3.95 (dd, *J* = 6.2, 8.0 Hz, 1 H), 3.77 (s, 3 H), 3.58 (m, 3 H), 3.51 (m, 4 H), 2.91 (dd, *J* = 2.9, 7.1 Hz, 1 H), 2.00 (m, 1 H), 1.84 (apparent t, *J* = 5.1 Hz, 1 H), 1.71 (m, 1 H), 1.39 (s, 3 H), 1.35 (s, 3 H), 1.03 (d, *J* = 1.0 Hz, 3 H), 0.88 (d, *J* = 6.9, 3 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 159.2, 130.8, 129.3, 113.8, 109.2, 83.0, 80.6, 78.6, 74.2, 66.2, 66.1, 60.1, 55.2, 38.1, 37.9, 26.6, 25.8, 10.9, 10.8; high resolution mass spectrum *m/z* 383.2433 $[(M+H)^+$; calcd for $C_{21}H_{35}O_6$:383.2433].

Anal. Calcd for $C_{21}H_{34}O_6$; C, 65.89; H, 8.86. Found: C, 65.94; H, 8.96.

To a solution of the resulting alcohol (660 mg, 1.72 mmol) in DMSO (14 ml) were added Et_3N (2.8 ml, 20.7 mmol) and SO_3·pyr (1.64 g, 10.3 mmol) in portions. The reaction was stirred for 15 min, cooled to 0°C and quenched with water (5 ml). The reaction mixture was poured into Et_2O (40 ml) and water (30 ml) and the layers were separated. The aqueous layer was extracted with Et_2O (2 × 25 ml) and the organic extracts were washed with water (20 ml) and brine (20 ml). The aqueous washes were further extracted with Et_2O (20 ml) and the combined ethereal extracts were dried over $MgSO_4$, filtered, and concentrated in vacuo. Purification via flash chromatography (15→20% ethyl acetate/hexanes) provided 609 mg (93% yield) of (+)-**6** as an oil: $[\alpha]_D^{20}$ +23.6° (*c* 0.500, C_6H_6); IR (C_6H_6) 2980 (s), 2700 (w), 1730 (s), 1610 (m), 1510 (s), 1455 (m), 1380 (m), 1250 (s), 1040 (s), 730 (m) cm^{-1}; ^1H NMR (500 MHz, C_6D_6) δ 9.63 (s, 1 H), 7.15 (d, *J* = 8.1 Hz, 2 H), 6.76 (d, *J* = 8.6 Hz, 2 H),

4.29 (d, J = 10.7 Hz, 2 H), 4.17 (ddd, J = 6.3, 6.3, 8.5 Hz, 1 H), 3.93 (dd, J = 2.8, 7.7 Hz, 1 H), 3.70 (dd, J = 6.2, 8.0 Hz, 1 H), 3.39 (s, 3 H), 3.37 (apparent t, J = 8.2 Hz, 1 H), 3.27 (s, 3 H), 3.01 (dd, J = 2.6, 6.8 Hz, 1 H), 2.39 (dq, J = 2.8, 7.1 Hz, 1 H), 1.57 (m, 1 H), 1.38 (s, 3 H), 1.31 (s, 3 H), 1.05 (d, J = 7.0 Hz, 3 H), 0.99 (d, J = 6.9 Hz, 3 H); ^{13}C NMR (125 MHz, C_6D_6) δ 202.9, 159.8, 129.5, 128.1, 114.0, 109.4, 82.7, 79.5, 79.0, 73.6, 66.4, 59.5, 54.7, 49.4, 38.6, 26.8, 26.0, 11.3, 7.9; high resolution mass spectrum (CI, NH_3) *m/z* 398.2548 [$(M+NH_4)^+$; calcd for $C_{21}H_{36}NO_6$: 398.2542].

Preparation of Alkyne (–)-18



(–)-18

To a solution of oxalyl chloride (0.59 ml, 6.79 mmol) in dichloromethane (20 ml) at –78˚C was added DMSO (0.96 ml, 13.6 mmol). After stirring for 15 min, known alcohol (+)-**17**[3] (1.01g, 5.66 mmol) was added via cannula as a precooled solution (–78˚C) in dichloromethane (10 + 5 ml). After stirring for an additional 15 min, *i*-Pr_2EtN (3.35 ml, 19.2 mmol) was added and the reaction mixture was then warmed to –45˚C over 2h, after which time it was recooled to –78˚C and quenched with aq. HCl (0.5 N, 20 ml) and then warmed to room temperature. The mixture was poured into a separatory funnel and the layers were separated. The aqueous layer was extracted with Et_2O (3 × 15 ml) and the combined organic extracts were washed with brine (20 ml), dried over $MgSO_4$, filtered, and concentrated in vacuo. Flash chromatography (to remove baseline impurities) (20% ethyl acetate/hexanes) furnished 743 mg (74% yield) of the aldehyde as an oil, which was used without further purification.

To a solution of PPh_3 (3.75 g, 14.3 mmol) in dichloromethane (16 ml) at –10˚C was added CBr_4 (2.37 g, 7.14 mmol), portion wise. This mixture was stirred for 15 min before the aldehyde (0.631 mg, 3.57 mmol) was added as a solution in

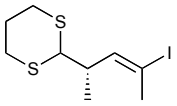
dichloromethane via cannula (10 + 5 ml). After stirring for 15 min, the reaction mixture was poured into stirring pentane (300 ml). The resulting slurry was filtered and the filtrate was concentrated in vacuo. Purification via flash chromatography (3% ethyl acetate/hexanes) furnished 1.09 g (92%) of dibromoolefin as an oil: $[\alpha]_D^{20}$ -20.9° (*c* 1.35, $CHCl_3$); IR ($CHCl_3$) 2980 (m), 1620 (w), 1450 (w), 1430 (w), 1380 (w), 1280 (w), 710 (w) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 6.43 (d, *J* = 9.4 Hz, 9.4 1H), 4.05 (d, *J* = 6.0 Hz, 1 H), 2.92-2.83 (m, 5 H), 2.11-2.05 (m, 1 H), 1.89-1.82 (m, 1 H), 1.18 (d, *J* = 6.8 Hz, 3 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 139.8, 89.8, 52.4, 43.1, 30.5, 30.3, 25.8, 16.6; high resolution mass spectrum (CI, NH_3) *m/z* 330.8782 $[(M+H)^+$; calcd for $C_8H_{13}Br_2S_2$: 330.8825].

To a solution of the dibromoolefin (1.24 g, 3.73 mmol) in THF (35 ml) at -78°C was added *n*-BuLi (2.5 M in hexanes, 2.98 ml, 7.46 mmol). The reaction mixture was stirred for 0.5 h, quenched with MeOH (3 ml), and poured onto Et_2O (40 ml) and water (40 ml). The layers were separated and the aqueous phase was extracted with Et_2O (2 × 30 ml). The ethereal extracts were washed with brine, dried over $MgSO_4$, filtered and concentrated in vacuo. Purification via flash chromatography (2.5% ethyl acetate/hexanes) gave 112 mg (64% yield) of the alkyne: $[\alpha]_D^{20}$ -4.08° (*c* 1.25, $CHCl_3$); IR ($CHCl_3$) 3310 (s), 2980 (s), 1450 (w), 1430 (m), 1380 (w), 1280 (m), 1230 (m), 1140 (w), 1110 (w), 910 (m), 640 (s) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 4.08 (d, *J* = 5.7 Hz, 1 H), 2.91-2.86 (m, 5 H), 2.21 (d, *J* = 2.4 Hz, 1 H), 2.11-2.05 (m, 1 H), 1.91-1.82 (m, 1 H), 1.36 (d, *J* = 7.0 Hz, 3 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 84.7, 71.0, 52.4, 31.7, 30.45, 30.42, 25.6, 18.7; high resolution mass spectrum (CI, NH_3) *m/z* 173.0454 $[(M+H)^+$; calcd for $C_8H_{13}S_2$: 173.0458].

To a solution of the terminal alkyne prepared above (355 mg, 2.06 mmol) in THF (19 ml) at -78°C was added *t*-BuLi (1.7 M in pentane, 1.2 ml, 2.06 mmol). The reaction was stirred for 20 min and then MeI was added (0.38 ml, 6.18 mmol). The reaction

was stirred for 10 min further then warmed to room temperature and stirred an additional 1 h. The reaction was poured onto Et_2O (35 ml) and water (35 ml) and the layers were separated. The aqueous layer was extracted with Et_2O (2 × 30 ml) and the organic extracts were combined, washed with brine (20 ml), dried over $MgSO_4$, filtered and concentrated in vacuo. Purification via flash chromatography (2.5% ethyl acetate/hexanes) gave 349 mg (91% yield) of (–)-**18**: $[\alpha]_D^{20}$ -12.6° (*c* 1.00, $CHCl_3$); IR ($CHCl_3$) 2900 (m), 2360 (w), 1450 (m), 1430 (m), 1380 (m), 1280 (m), 1250 (m), 1180 (m), 910 (w), 900 (w), 740 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 4.04 (d, *J* = 5.8 Hz, 1 H), 2.84 (m, 4 H), 2.07 (m, 2 H), 1.86 (m, 1 H), 1.80 (d, *J* = 2.3 Hz, 3 H), 1.3 (d, *J* = 6.9 Hz, 3 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 79.7, 78.6, 53.3, 32.0, 30.54, 30.51, 25.8, 19.2, 3.6; high resolution mass spectrum (CI, NH_3) *m/z* 187.0606 [$(M+H)^+$; calcd for $C_9H_{15}S_2$: 187.0615].

Preparation of Vinyl Iodide (–)-5



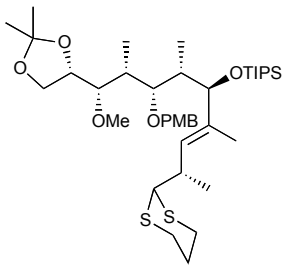
(–)-5

To a solution of methyl alkyne (–)-**18** (224 mg, 1.20 mmol) in dichloromethane (3.6 ml) was added $PdCl_2(PPh_3)_2$ (17 mg, 0.024 mmol) followed by the slow, dropwise addition of freshly distilled Bu_3SnH (0.97 ml, 3.61 mmol). After the addition of Bu_3SnH was complete, the reaction was stirred for 15 min further, concentrated in vacuo, and filtered through a pad of silica (20% ethyl acetate/hexanes) to remove any palladium salts. The filtrate was concentrated in vacuo, azeotroped with benzene (2 × 5 ml), and used immediately in the next reaction. An analytical sample was obtained via flash chromatography (hexanes): $[\alpha]_D^{20}$ –37° (*c* 1.8, CH_2Cl_2); IR (neat) 2954 (s), 2924 (s), 1607 (w), 1455 (w), 1372 (w), 1277 (m), 1176 (w), 1075 (w) cm^{-1}; ^1H NMR (500 MHz, C_6D_6) δ 5.83 (dd, *J* = 1.8, 9.1 Hz, 1 H), 3.96 (d, *J* = 6.4 Hz, 1 H),

3.17 (m, 1 H), 2.39 (m, 4 H), 1.95 (d, J = 1.8 Hz, 3 H), 1.64 (m, 7 H), 1.38 (m, 7 H), 1.28 (d, J = 6.8 Hz, 3 H), 1.01 (m, 6 H), 0.94 (m, 9 H); ^{13}C NMR (125 MHz, C_6D_6) δ 142.3, 137.8, 54.1, 36.7, 29.9, 29.6, 28.6 (d, J = 5 Hz), 26.8, 25.3, 18.6, 17.7, 13.0, 8.6; high resolution mass spectrum (ES+) *m/z* 501.1650 [$(M+Na)^+$; calcd for $C_{21}H_{42}S_2SnNa$: 501.1648].

To a solution of the vinyl stannane in dichloromethane (2 ml) at 0˚C was added a solution of I_2 in dichloromethane until the purple color persisted. The reaction was quenched with sat aq $Na_2S_2O_3$ (5 ml) and poured into Et_2O (20 ml) and water (20 ml). The layers were separated and the aqueous layer was extracted with Et_2O (3 × 20 ml) and then the combined organic extracts were washed with brine, dried over $MgSO_4$, filtered, and concentrated in vacuo. Crude NMR shows an 85:15 ratio of regioisomers. Purification via flash chromatography (0.5% Et_3N/1% ethyl acetate/hexanes→2% ethyl acetate/hexanes) gave 297 mg (79% yield) of (–)-**5** as a single isomer: $[\alpha]_D^{20}$ –30˚**C** (*c* 1.8 C_6H_6); IR (CCl_4) 2900 (s), 1630 (m), 1420 (m), 1380 (m), 1280 (m), 1180 (m), 1140 (m), 1090 (m), 1040 (m), 910 (m), 860 (m), 740 (m) cm^{-1}; ^{1}H NMR (500 MHz, C_6D_6) δ 6.27 (dq, J = 1.4, 2.9 Hz, 1 H), 3.60 (d, J = 6.7 Hz, 1 H), 2.62 (m, 1 H), 2.34-2.26 (m, 4 H), 2.13 (d, J = 1.5 Hz, 3 H), 1.50 (m, 1 H), 1.38 (m, 1 H), 1.01 (d, J = 6.8 Hz, 3 H); ^{13}C NMR (125 MHz, C_6D_6) δ 143.1, 95.2, 53.5, 40.7, 30.5, 30.3, 27.9, 26.0, 17.8; high resolution mass spectrum (CI, NH_3) *m/z* 314.9738 [$(M+H)^+$; calcd for $C_9H_{16}IS_2$: 314.9738].

Preparation of Dithiane (–)-4



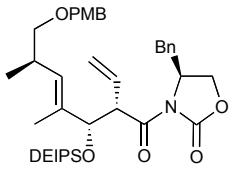
(–)-4

To a solution of vinyl iodide (–)-**5** (91 mg, 0.28 mmol) in a mixture of toluene/Et_2O (6:1, 2 ml) at –78˚C was added *t*-BuLi (1.5 M in pentane, 0.26 ml, 0.39 mmol). The mixture was stirred for 60 min and then added via cannula to a solution of (+)-**6** (55 mg, 0.14 mmol) in toluene/Et_2O (6:1, 2 ml) at –78˚C. The reaction mixture was stirred for 60 min before being quenched with sat aq NH_4Cl (10 ml). The layers were separated and the aqueous layer was extracted with Et_2O (2 × 10 ml) and the combined organic layers were dried over $MgSO_4$, filtered and concentrated. 500 MHz ^1H NMR indicated a 11.8:1 (β:α) mixture of diastereomers. Purification via flash chromatography (20% Et_2O/hexanes to 100%Et_2O) provided (–)-**4** (71 mg, 11.8:1 diastereomeric ratio, 87% yield): $[\alpha]_D^{20}$ -49˚ (*c* 0.90, $CHCl_3$); IR ($CHCl_3$) 3600 (w), 3560-3380 (w), 3000-2820 (s), 1610 (m), 1510 (m), 1460 (m), 1380 (m), 1370 (m), 1250 (s), 1110 (s), 1040 (s), 830 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.25 (d, *J* = 8.6 Hz, 2 H), 6.84 (d, *J* = 8.6 Hz, 2 H), 5.50 (d, *J* = 9.8 Hz, 1 H), 4.59 (ABq, J_{AB}= 10.8 Hz, $\Delta\upsilon_{AB}$= 35 Hz, 2 H), 4.22 (ddd, *J* = 6.3, 6.3, 7.4 Hz, 1 H), 4.17 (d, *J* = 4.7 Hz, 1 H), 4.03 (d, *J* = 6.5 Hz, 1 H), 3.95 (dd, *J* = 6.1, 8.0 Hz, 1 H), 3.77 (s, 3 H), 3.58 (dd, *J* = 2.7, 7.5 Hz, 1 H), 3.51 (s, 3 H), 3.46 (m, 1 H), 3.13 (dd, *J* = 2.7, 7.3 Hz, 1 H), 2.85-2.78 (m, 5 H), 2.41 (broad s, 1 H), 2.06 (m, 1 H), 1.90 (m, 1 H), 1.80 (m, 1 H), 1.68 (m, 1 H), 1.64 (s, 3 H), 1.39 (s, 3 H), 1.35 (s, 3 H), 1.14 (d, *J* = 6.7 Hz, 3 H), 1.04 (d, *J* = 6.9 Hz, 3 H), 0.90 (d, *J* = 6.9 Hz, 3 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 159.1, 136.5, 130.9, 129.0, 113.8, 109.3, 83.7, 82.8, 79.1, 74.3, 66.2, 60.0, 55.2,

54.8, 39.3, 38.0, 37.4, 30.6, 26.7, 26.1, 25.8, 18.4, 13.2, 10.6, 7.4; high resolution mass spectrum (ES+) *m/z* 591.2790 [$(M+Na)^+$; calcd for $C_{30}H_{48}O_6S_2Na$: 591.2790].

To a solution of the resulting alcohol (16 mg, 0.0281 mmol) in dichloromethane at 0˚C was added 2,6-lutidine (20 µl, 0.168 mmol) and TIPSOTf (23 µl, 0.0843 mmol). The reaction mixture was stirred for 20 min and then quenched with $NaHCO_3$ (sat. aq. 10 ml) and poured onto Et_2O (10 ml). The layers were separated and the aqueous phase was extracted with Et_2O (3 × 5 ml). The combined organic extracts were washed with brine (10 ml), dried over $MgSO_4$, filtered, and concentrated in vacuo. Purification via flash chromatography (5 → 13% ethyl acetate/hexanes) gave 18 mg (89% yield) of (–)-**4** as an oil: $[\alpha]_D^{20}$ –39˚ (*c* 1.3, $CHCl_3$); IR ($CHCl_3$) 2940 (s), 2840 (s), 1610 (w), 1510 (m), 1460 (m), 1370 (m), 1250 (s), 1050 (s) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.25 (d, *J* = 8.6 Hz, 2 H), 6.83 (d, *J* = 8.6 Hz, 2 H), 5.31 (d, *J* = 9.5 Hz, 1 H), 4.72 (d, *J* = 11.3 Hz, 1 H), 4.57 (d, *J* = 11,3 Hz, 1 H), 4.20 (m, 1 H), 4.18 (d, *J* = 9.8 Hz, 1 H), 4.03 (d, *J* = 5.7 Hz, 1 H), 3.94 (dd, *J* = 6.0, 8.0 Hz, 1 H), 3.78 (s, 3 H), 3.56 (apparent d, *J* = 8.0 Hz, 1 H), 3.50 (s, 3 H), 3.43 (apparent t, *J* = 8.4 Hz, 1 H), 3.13 (dd, *J* = 2.0, 7.7 Hz, 1 H), 2.86-2.80 (m, 5 H), 2.06 (m, 1 H), 1.86-1.80 (m, 2 H), 1.65 (s, 3 H), 1.55 (m, 1 H), 1.40 (s, 3 H), 1.34 (s, 3 H), 1.11 (d, *J* = 6.7 Hz, 3 H), 1.04 (m, 27 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 158.8, 138.2, 132.1, 131.3, 128.6, 113.6, 109.3, 82.7, 81.4, 80.3, 79.6, 74.2, 66.5, 59.9, 55.3, 40.2, 40.0, 37.6, 30.8, 30.6, 26.8, 26.2, 25.9, 18.5, 18.4, 18.3, 17.5, 12.8, 11.5, 11.2, 10.0; high resolution mass spectrum (ES+) *m/z* 747.4153 [$(M+Na)^+$; calcd for $C_{39}H_{68}O_6S_2SiNa$: 747.4124].

Preparation of Imide (+)-21



(+)-21

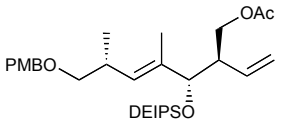
To a solution of DMSO (0.325 ml, 4.48 mmol) in dichloromethane (10 ml) at –78˚C was added oxalyl chloride (0.200 ml, 2.30 mmol) and the resulting solution was stirred for 15 min. To this solution was added alcohol (–)-**19**[4] (480 mg, 1.91 mmol) as a solution of dichloromethane via cannula (2 ml + 2 ml rinse). The reaction mixture was stirred for 15 min and then Et_3N (1.32 ml, 9.55 mmol) was added dropwise. The resulting mixture was stirred for 10 min at –78˚C and then warmed to –10˚C and stirred for an additional 15 min. The reaction was quenched by the addition of $NaHSO_4$ (1 N, 40 ml) and Et_2O (60 ml) and poured into a separatory funnel. The layers were separated and the aqueous phase was extracted with Et_2O (2 × 30 ml) and the combined organic extracts were washed with brine (30 ml), dried over $MgSO_4$, filtered and concentrated in vacuo. Purification via flash chromatography (15% ethyl acetate/hexanes) gave 450 mg (95% yield) of aldehyde as an oil: $[\alpha]_D^{20}$ –13˚ (*c* 1.4, CCl_4); IR (neat) 2925 (m), 2850 (m), 2710 (w), 1685 (s), 1638 (m), 1611 (m), 1512 (s), 1247 (s) cm^{-1}; ^1H NMR (500 MHz, C_6D_6) δ 9.28 (s, 1 H), 7.13 (d, *J* = 8.4 Hz, 2 H), 6.78 (d, *J* = 8.4 Hz, 2 H), 5.85 (dd, *J* = 1.3, 9.5 Hz, 1 H), 4.23 (s, 2 H), 3.29 (s, 3 H), 3.04 (dd, *J* = 6.1, 9.0 Hz, 1 H), 3.03 (dd, *J* = 6.5, 9.0 Hz, 1 H), 2.65 (m, 1 H), 1.65 (d, *J* = 1.3 Hz, 3 H), 0.78 (d, *J* = 6.8 Hz, 3 H); ^{13}C NMR (125 MHz, C_6D_6) δ 193.1, 158.8, 154.4, 138.5, 129.7, 128.3, 113.1, 72.6, 71.9, 53.8, 33.2, 15.3, 8.4; high resolution mass spectrum (ES+) *m/z* 249.1503 [$(M+H)^+$; calcd for $C_{15}H_{21}O_3$: 249.1491].

To a solution of *N*-acyl oxazolidinone (+)-**20** (3.75 g, 15.3 mmol) in dichloromethane (45 ml) at –78˚C were added Bu_2BOTf (1.0 M solution in dichloromethane, 14.4 ml, 14.4 mmol) and Et_3N (2.50 ml, 18.0 mmol). The reaction mixture was stirred for 1 h then warmed to 0˚C and stirred for an additional 15 min, at which time the solution turned bright yellow. The solution was then recooled to –78˚C and a solution of the aldehyde prepared above (2.24 g, 9.02 mmol) in dichloromethane (15 ml + 5 ml; precooled to –78˚C) was added dropwise via cannula. The reaction mixture was then stirred for 25 min. at –78˚C before warming to 0˚C and stirring for 30 min. The reaction mixture was quenched at 0˚C by addition of pH 7 buffer (25 ml) followed by MeOH:30% H_2O_2 (1:1, 50 ml). After stirring for 1 h at 0˚C, the mixture was poured into a separatory funnel, the layers separated, and the aqueous layer extracted with dichloromethane (2 × 20 ml). The organic extracts were washed with 10% $NaHCO_3$, dried over Na_2SO_4, filtered and concentrated in vacuo. Purification via flash chromatography (30% ethyl acetate/hexanes) gave 4.00 g (90% yield) as an oil: $[\alpha]_D^{20}$ +4.8˚ (*c* 2.0, $CHCl_3$); IR ($CHCl_3$) 3040 (br), 2980 (m), 2940 (m), 1780 (s), 1680 (s), 1610 (m), 1510 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.29-7.12 (m 7 H), 6.80 (dd, *J* = 2.7, 11.2 Hz, 2 H), 5.95 (ddd, *J* = 9.8, 10.0, 17.3 Hz, 1 H), 5.35 (d, *J* = 17.4 Hz, 1 H), 5.34 (d, *J* = 10.0 Hz, 1 H), 5.28 (d, *J* = 9.13 Hz, 1 H), 4.79 (dd, *J* = 6.4, 8.9 Hz, 1 H), 4.51 (m, 1 H), 4.35 (AB_q, *J* = 11.8 Hz, Δυ = 8.3 Hz, 2 H), 3.99 (dd, *J* = 2.6, 9.0 Hz, 1 H), 3.93 (apparent t, *J* = 7.9 Hz, 1 H), 3.76 (s, 3 H), 3.20 (m, 3 H), 3.14 (dd, *J* = 3.2, 13.4 Hz, 1 H), 2.69 (m, 2 H), 2.48 (d, *J* = 2.6 Hz, 1 H), 1.64 (s, 3 H), 0.93 (d, *J* = 6.7 Hz, 3 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 172.9, 159.1, 152.9, 135.1, 133.9, 132.4, 131.2, 130.6, 129.4, 129.1, 128.9, 127.3, 121.0, 113.8, 76.6, 75.0, 72.5, 65.9, 55.3, 55.2, 51.7, 37.5, 32.7, 17.4, 12.6; high resolution mass spectrum (ES+) *m/z* 516.2380 [$(M+Na)^+$; calcd for $C_{29}H_{35}NO_6Na$: 516.2362].

To a solution of the aldol adduct (1.17 g, 2.36 mmol) in dichloromethane (20 ml) at 0˚C were added 2,6-lutidine (1.10 ml, 9.44 mmol) and DEIPSOTf (1.13 ml, 4.72 mmol). The reaction mixture was stirred for 15 min before being poured onto Et_2O

(25 ml) and $NaHCO_3$ (25 ml). The layers were separated, the aqueous phase extracted with Et_2O (2 × 20 ml), and the combined ethereal extracts were washed with brine, dried over $MgSO_4$, filtered and concentrated. Purification via flash chromatography (15% ethyl acetate/hexanes) furnished 1.40 g (95% yield) of (+)-**21** as an oil: $[\alpha]_D^{20}$ +21.3˚ (*c* 1.45, $CHCl_3$); IR ($CHCl_3$) 2940 (m), 1760 (s), 1680 (s), 1610 (m), 1510 (m), 1450 (m), 1380 (m), 1360 (m), 1250 (m), 1080 (s), 900 (m), 880 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.28-7.10 (m, 7 H), 6.77 (d, *J* = 8.4 Hz, 2 H), 5.95 (ddd, *J* = 10.0, 10.0, 17.2 Hz, 1 H), 5.25 (d, *J* = 17.2 Hz, 1 H), 5.20 (d, *J* = 10.1 Hz, 1 H), 5.15 (d, *J* = 9.2 Hz, 1 H), 4.78 (apparent t, *J* = 8.6 Hz, 1 H), 4.41 (d, *J* = 8.4 Hz, 1 H), 4.37 (m, 1 H), 4.32 (ABq, J_{AB}= 11.9 Hz, $\Delta\upsilon_{AB}$ = 20.2 Hz, 2 H), 3.89 (dd, *J* = 1.8, 8.9 Hz, 1 H), 3.74 (s, 3 H), 3.74 (m, 1 H), 3.16 (m, 2 H), 3.08 (dd, *J* = 3.1, 13.4 Hz, 1 H), 2.65 (m, 2 H), 1.61 (s, 3 H), 0.99-0.83 (m, 15 H), 0.62-0.52 (m, 5 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 172.1, 159.1, 152.9, 135.7, 135.3, 134.3, 131.2, 130.5, 129.4, 129.0, 128.8, 127.2, 119.1, 113.7, 79.3, 75.1, 72.5, 65.6, 55.3, 55.2, 53.1, 37.5, 32.7, 17.2, 17.0, 12.9, 11.4, 7.08, 7.02, 3.8, 3.7; high resolution mass spectrum (ES+) *m/z* 644.3388 [$(M+Na)^+$; calcd for $C_{36}H_{51}NO_6SiNa$: 644.3383].

Preparation of Acetate (–)-22



(–)-22

To a solution of the imide (+)-**21** (76 g, 122 mmol) in THF (1 liter) and water (8.1 ml, 450 mmol) at 0°C was added $LiBH_4$ (9.8 g, 450 mmol) in 3 portions. The solution was warmed to room temperature and stirred for 12 h. The reaction was quenched by cautious addition of saturated aqueous NH_4Cl (400 ml) at 0°C. The solution was partially concentrated, re-dissolved in ether, and poured into a separatory funnel. The layers were separated and the aqueous layer was extracted with diethyl ether (3 × 200

ml). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered, and concentrated in vacuo. Column chromatography (10% ethyl acetate/hexanes, then 100% ethyl acetate) gave 36.9 g (67% yield) of the desired alcohol as an oil and 21.8 g (30% yield) of an amido alcohol resulting from reductive opening of the auxiliary, which could be recycled (*vide infra*) as an oil.

Alcohol: $[\alpha]_D^{20}$ +2.2° (*c* 1.5, $CHCl_3$); IR ($CHCl_3$) 3480 (br), 2940 (s), 1610 (m), 1510 (m), 1450 (m), 1240 (s), 1060 (s), 1010 (s), 870 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.22 (d, *J* = 8.5 Hz, 2 H), 6.85 (d, *J* = 8.5 Hz, 2 H), 5.69 (ddd, *J* = 8.8, 10.4, 17.2 Hz, 1 H), 5.09 (m, 3 H), 4.39 (ABq, J_{AB}= 11.8 Hz, $\Delta\upsilon_{AB}$= 11.4 Hz, 2 H), 3.95 (d, *J* = 7.3 Hz, 1 H), 3.78 (s, 3 H), 3.51 (m, 1 H), 3.40 (m, 1 H), 3.24 (dd, *J* = 6.3, 8.8 Hz, 1 H), 3.18 (apparent t, *J* = 8.8 Hz, 1 H), 2.71 (m, 1 H), 2.40 (m, 1 H), 2.25 (apparent t, *J* = 6.2 Hz, 1 H), 1.63 (s, 3 H), 0.95-0.90 (m, 15 H), 0.59-0.52 (m, 5 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 159.1, 137.6, 137.2, 130.4, 130.1, 129.2, 117.3, 113.7, 80.1, 74.9, 72.6, 63.5, 55.2, 51.5, 32.6, 17.3, 16.8, 12.9, 12.2, 7.1, 7.0, 3.9, 3.7; high resolution mass spectrum (ES+) *m/z* 471.2892 [$(M+Na)^+$; calcd for $C_{26}H_{44}O_4SiNa$: 471.2906].

Amido Alcohol: $[\alpha]_D^{20}$ -23.4° (*c* 1.0, $CHCl_3$); IR (film) 3414 (m), 3334 (m, br), 2955 (s), 2874 (s), 1651 (s), 1636 (s), 1513 (s), 1456 (m), 1248 (s), 1077 (s), 820 (w) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.20 (m, 5 H), 7.12 (d, *J* = 7.7 Hz, 2 H), 6.85 (d, *J* = 7.7 Hz, 2 H), 5.91 (m, 1 H), 5.74 (bd, *J* = 6.7 Hz, 1 H), 5.19 (d, *J* = 9.1 Hz, 1 H), 5.14 (dd, *J* = 10.3, 1.6 Hz, 1 H), 5.03 (dd, *J* = 17.3, 0.9 Hz, 1 H), 4.40 (app q, *J* = 6.3 Hz, 1 H), 4.36 (ABq, J_{AB}= 11.6 Hz, $\Delta\upsilon_{AB}$= 17.4 Hz, 2 H), 3.93 (m, 1 H), 3.78 (s, 3 H), 3.46 (m, 1 H), 3.31 (m, 1 H), 3.23 (d, *J* = 6.8 Hz, 2 H), 3.05 (bs, 1 H), 2.87 (dd, *J* = 8.9, 6.4 Hz, 1 H), 2.69 (m, 3 H), 1.58 (s, 3 H), 1.57 (d, *J* = 10.6, 1 H), 0.94 (m, 15 H), 0.61 (m, 4 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 172.3, 159.4, 137.7, 135.5, 134.5, 131.0, 130.5, 129.6, 129.5, 128.6, 126.7, 119.1, 113.9, 78.4, 75.4, 72.9, 63.9, 57.7,

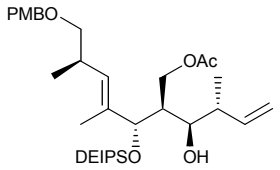
55.4, 53.2, 37.3, 32.9, 17.5, 17.3, 13.1, 12.3, 7.3, 7.2, 4.0, 3.8; high resolution mass spectrum (ES+) *m/z* 618.3564 [$(M+Na)^+$; calcd for $C_{35}H_{53}NO_5SiNa$: 618.3591].

To a solution of the resulting alcohol (1.95 g, 4.33 mmol) in dichloromethane (40 ml) were added Et_3N (1.81 ml, 13.0 mmol), Ac_2O (0.61 ml, 6.50 mmol), and DMAP (catalytic, *ca*. 10 mg) at 0˚C. The reaction mixture was warmed to room temperature and stirred for 17 h. The reaction mixture was quenched with $NaHCO_3$ (sat. aq., 25 ml), the layers were separated, and the aqueous layer was extracted with dichloromethane (2 × 20 ml). The combined organic extracts were dried over Na_2SO_4, filtered and concentrated in vacuo. Purification via flash chromatography (5% ethyl acetate/hexanes) yielded 2.04 g (96% yield) of (–)-**22** as an oil: $[\alpha]_D^{20}$ – 8.2˚ (*c* 2.5, $CHCl_3$); IR ($CHCl_3$) 2940 (s). 2860 (s), 1730 (s) 1610 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.23 (d, *J* = 8.5 Hz, 2 H), 6.86 (d, *J* = 8.5 Hz, 2 H), 5.70 (ddd, *J* = 8.7, 10.3, 17.2 Hz, 1 H), 5.13 (d, *J* = 9.4 Hz, 1 H), 5.07 (dd, *J* = 1.8, 10.3 Hz, 1 H), 5.03 (dd, *J* = 4.7, 17.1 Hz, 1 H), 4.40 (ABq, *J* = 11.6 Hz, Δυ = 20.4 Hz, 2 H), 4.01 (d, *J* = 6.1 Hz, 1 H), 3.97 (apparent d, *J* = 6.6 Hz, 2 H), 3.79 (s, 3 H), 3.26 (dd, *J* = 6.2, 9.0 Hz, 1 H), 3.21 (dd, *J* = 7.1, 8.9 Hz, 1 H), 2.70 (m, 1 H), 2.47 (m, 1 H), 2.00 (s, 3 H), 1.59 (s, 3 H), 0.99–0.87 (m, 15 H), 0.61–0.53 (m, 5 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.8, 159.0, 136.2, 135.9, 130.8, 129.9, 129.0, 117.4, 113.7, 77.7, 75.0, 72.6, 64.9, 55.2, 48.0, 32.7, 20.9, 17.3, 12.9, 12.3, 7.1, 7.0, 3.9, 3.6; high resolution mass spectrum (ES+) *m/z* 513.3012 [$(M+Na)^+$; calcd for $C_{28}H_{46}O_5SiNa$: 513.3012].

Recycling the amido alcohol: To a solution of carbonyldiimidazole (CDI) (90 mg, 0.55 mmol) and the above amido alcohol (132 mg, 0.22 mmol) in DMF (8 ml, 0°C) was added NaH (4 mg, 60% in oil). After 10 min, the reaction was poured into a separatory funnel containing water and diethyl ether. The aqueous layer was washed with diethyl ether (3 × 20 ml) and the combined organic layers were back-extracted with water (2 × 20 ml) then brine (20 ml). The organic layer was dried over $MgSO_4$, filtered and concentrated in vacuo. Column chromatography (10%→ 20% ethyl

acetate/hexanes) gave 125 mg (91%)of (+)-**21** as an oil with spectra and chirooptic properties identical to those already reported.

Preparation of Crotylation Adduct (–)-25



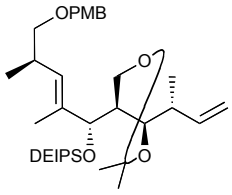
(–)-25

To a solution of acetate (–)-**22** (1.00 g, 2.04 mmol) in acetone:H_2O (8:1, 18 ml) were added NMO (958 mg, 4.48 mmol) and a few crystals of OsO_4. The reaction mixture was protected from light and stirred for 3 h at room temperature. After addition of Na_2SO_3 (sat. aq., 25 ml) and Et_2O (40 ml), the mixture was poured into a separatory funnel and the layers were separated. The aqueous layer was extracted with Et_2O (2 × 20 ml) and the combined organic extracts were washed with brine, dried over $MgSO_4$, filtered, concentrated in vacuo and the residue azeotroped with benzene (2 × 5 ml).

The residue from the above step was then dissolved in THF:H_2O (2:1, 18 ml) and cooled to 0˚C. Sodium periodate (1.31 g, 6.12 mmol) was added in portions and the reaction mixture was then stirred for 30 min. The reaction mixture was quenched with $NaHCO_3$ (sat. aq., 25 ml) and poured into Et_2O (30 ml). The layers were separated and the aqueous layer was extracted with Et_2O (2 × 25 ml). The combined organic extracts were dried over $MgSO_4$, filtered, and concentrated in vacuo. Expedient flash chromatography (15% ethyl acetate/hexanes) provided the unstable aldehyde [1.02 g (70% over two steps)] as an oil**.** To a solution of the aldehyde (12.0 g, 24.4 mmol) in toluene (98 ml) at 0°C was added 4 Å molecular sieves (12.0 g). The suspension was cooled to –78°C. The Roush reagent (**24**)[5] (*ca*. 0.85 M in toluene, 86.0 ml) was added to the suspension via cannula. The reaction mixture was stirred for 17 h at –78°C and then quenched with NaOH (1 N, 35 ml), warmed to 0°C, stirred for 20 min, then filtered through Celite, and the filter cake was washed with

diethyl ether (3 × 15 ml). The filtrate was transferred to a separatory funnel and diluted with 100 ml of 1N NaOH, the layers were separated, and the aqueous layer extracted with diethyl ether (4 × 50 ml). The organic extracts were washed with brine, dried over K_2CO_3, filtered, and concentrated in vacuo. Purification via flash chromatography (10 to 25% ethyl acetate/hexanes) provided 13.0 g (97% yield) of (–)-**25** as an oil: $[\alpha]_D^{20}$ –36˚ (*c* 0.90, $CHCl_3$); IR ($CHCl_3$) 3980 (br), 2940 (s), 2880 (s), 1730 (s), 1610 (m), 1510 (m), 1460 (m), 1360 (m), 1250 (s) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.23 (d, *J* = 6.7 Hz, 2 H), 6.86 (d, *J* = 6.7 Hz, 2 H), 5.76 (dddd, *J* = 1.9, 8.1, 10.1, 17.2 Hz, 1 H), 5.36 (d, *J* = 9.4 Hz, 1 H), 5.07 (d, *J* = 17.2 Hz, 1 H), 5.03 (d, *J* = 10.2 Hz, 1 H), 4.44-4.33 (m, 4 H), 4.11 (m, 1 H), 3.78 (s, 3 H), 3.69 (apparent d, *J* = 9.3 Hz, 1 H), 3.30–3.22 (m, 2 H), 3.08 (s, 1 H), 2.74 (m, 1 H), 2.35 (m, 1 H), 2.03 (s, 3 H), 1.90 (m, 1 H), 1.55 (s, 3 H), 1.09–0.85 (m, 18 H), 0.67–0.59 (m, 5 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.8, 159.1, 142.2, 134.6, 130.7, 129.7, 129.0, 114.7, 113.7, 77.3, 75.0, 72.7, 72.6, 61.9, 55.2, 41.6, 41.3, 32.9, 21.0, 17.5, 17.35, 17.34, 16.8, 13.6, 12.7, 7.02, 7.00, 3.7, 3.4; high resolution mass spectrum (ES+) *m/z* 571.3429 [$(M+Na)^+$; calcd for $C_{31}H_{52}O_6SiNa$: 571.3430].

Preparation of Acetonide (–)-26



(–)-26

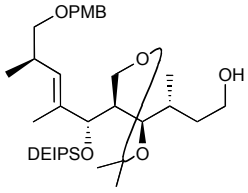
To a solution of acetate (–)-**25** (147 mg, 0.268 mmol) in MeOH (2 ml) at 0˚C was added K_2CO_3 (56 mg, 0.402 mmol). The reaction mixture was stirred for 1 h at 0˚C, quenched with H_2O (15 ml), poured onto Et_2O (30 ml), and the layers separated. The aqueous layer was extracted with Et_2O (2 × 15 ml) and the combined organic extracts were washed with brine (15 ml), dried over $MgSO_4$, filtered, and concentrated in

vacuo. Purification via flash chromatography (17% ethyl acetate/hexanes) furnished 122 mg (90% yield) as an oil: $[\alpha]_D^{20}$ –10.7˚ (*c* 1.8, $CHCl_3$); IR (neat) 3426(br), 2947 (s), 2873 (s), 1612 (w), 1511 (s), 1457 (m), 1372 (w). 1298 (w). 1245 (s), 1170 (w), 1058 (s), 883 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.21 (d, *J* = 8.5 Hz, 2 H), 6.85 (d, *J* = 8.6 Hz, 2 H), 5.75 (ddd, *J* = 8.5, 10.1, 17.2 Hz, 1 H), 5.25 (d, *J* = 9.5 Hz, 1 H), 5.12 (ddd, *J* = 0.86, 1.7, 17.2 Hz, 1 H), 5.09 (ddd, *J* = 0.46, 1.7, 11.4 Hz, 1 H), 4.39 (m, 3 H), 3.78 (s, 3 H), 3.71 (m, 2 H), 3.63 (m, 1 H), 3.27 (dd, *J* = 6.1, 8.8 Hz, 1 H), 3.18 (apparent t, *J* = 8.7 Hz, 1 H), 2.81 (dd, *J* = 4.4, 7.2 Hz, 1 H), 2.74 (m, 1 H), 2.49 (d, *J* = 3.0 Hz, 1 H), 2.38 (m, 1 H), 1.71 (m, 1 H), 1.61 (d, *J* = 1.0 Hz, 3 H), 0.98–0.86 (m, 18 H), 0.66–0.56 (m, 5 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 159.1, 142.1, 136.9, 130.4, 130.3, 129.3, 115.8, 113.7, 77.7, 74.9, 73.6, 72.6, 59.9, 55.2, 45.1, 42.6, 32.7, 17.3, 16.9, 16.8, 12.9, 12.0, 7.1, 7.0, 3.8, 3.6; high resolution mass spectrum (ES+) *m/z* 529.3315 [$(M+Na)^+$; calcd for $C_{29}H_{50}O_5SiNa$: 529.3325].

To a solution of the resulting diol (437 mg, 0.862 mmol) in 2,2-dimethoxypropane:acetone (7:1, 8 ml) was added PPTS (*ca*. 10 mg, catalytic). The reaction mixture was stirred for 3 h at room temperature and then quenched with $NaHCO_3$ (sat. aq., 25 ml) and poured into dichloromethane (30 ml). The layers were separated and the aqueous phase was extracted with dichloromethane (2 × 15 ml). The combined organic extracts were dried over Na_2SO_4, filtered, and concentrated in vacuo. Purification via flash chromatography (3% ethyl acetate/hexanes) afforded 405 mg (86% yield) of (–)-**26** as an oil: $[\alpha]_D^{20}$ –14˚ (*c* 2.5, $CHCl_3$); IR (neat) 2920 (s), 2867 (s), 1611 (w), 1509 (m), 1461 (m), 1370 (m), 1247 (s), 1226 (s) 1173 (m) 1055 (s) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.21 (dd, *J* = 2.1, 6.6 Hz, 2 H), 6.84 (dd, *J* = 2.1, 6.6 Hz, 2 H), 5.89 (ddd, *J* = 9.0, 10.3, 17.1 Hz, 1 H), 5.11 (dd, *J* = 0.88, 9.3 Hz, 1 H), 5.03 (d, *J* = 10.2 Hz, 1 H), 5.00 (d, *J* = 17.1 Hz, 1 H), 4.38 (ABq, *J* = 11.6 Hz, Δυ = 16.6 Hz, 2 H), 4.10 (d, *J* = 8.8 Hz, 1 H), 3.78 (s, 3 H), 3.58 (dd, *J* = 2.1, 8.5 Hz, 1 H), 3.52 (dd, *J* = 5.3, 11.7 Hz, 1 H), 3.37 (dd, *J* = 4.2, 11.7 Hz, 1 H),

3.23 (dd, *J* = 6.5, 9.0 Hz, 1 H), 3.20 (dd, *J* = 7.1, 9.0 Hz, 1 H), 2.69 (dddq, *J* = 6.7, 6.7, 6.7, 9.3 Hz, 1 H), 2.59 (m, 1 H), 1.90 (dddd, *J* = 4.4, 4.4, 8.8, 8.8 Hz, 1 H), 1.54 (d, *J* = 1.3 Hz, 3 H), 1.30 (s, 3 H), 1.27 (s, 3 H), 1.03 (d, *J* = 6.9 Hz, 3 H), 0.98–0.97 (m, 15 H), 0.62–0.54 (m, 5 H), ; ^{13}C NMR (125 MHz, $CDCl_3$) δ 159.0, 140.4, 136.1, 131.3, 130.7, 129.0, 115.3, 113.7, 98.8, 79.6, 74.9, 74.1, 72.6, 59.4, 55.2, 42.0, 41.6, 32.8, 26.3, 21.9, 18.2, 17.39, 17.36, 16.9, 12.9, 11.5, 7.18, 7.13, 3.9, 3.8; high resolution mass spectrum (ES+) *m/z* 369.3629 [$(M+Na)^+$; calcd for $C_{32}H_{54}O_5SiNa$: 569.3638].

Preparation of Alcohol (–)-27

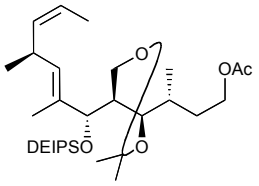


(–)-27

To a solution of diene (–)-**26** (190 mg, 0.347 mmol) in Et_2O (2.5 ml) at 0˚C was added 9-BBN (0.5 M in THF, 1.40 ml, 0.700 mmol). The cooling bath was removed and the reaction mixture was stirred for 4 h at ambient temperature, after which time it was recooled to 0˚C and quenched with NaOH (1 N, 2 ml) and 30% H_2O_2 (4 ml) and stirred for an additional 15 min. The mixture was then poured onto $NaHCO_3$ (sat. aq., 15 ml) and dichloromethane (30 ml) and the phases were separated. The aqueous layer was extracted with dichloromethane (2 × 15 ml) and the combined organic extracts were dried over Na_2SO_4, filtered, and concentrated in vacuo. Purification via flash chromatography (20% ethyl acetate/hexanes) gave 182 mg (93% yield) of (–)-**27** as an oil: $[\alpha]_D^{20}$ –1.0˚ (*c* 2.5, $CHCl_3$); IR (neat) 3422 (br), 2942 (s), 2874 (s), 1612 (w), 1513 (m), 1458 (m), 1247 (s), 1227 (m), 1171 (m), 1059 (s), 1 cm^{-1}; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.20 (dd, *J* = 2.0, 6.6 Hz, 2 H), 6.84 (dd, *J* = 2.0, 6.6 Hz, 2 H), 5.12 (d, *J* = 9.3 Hz, 1 H), 4.38 (ABq, *J* = 11.6 Hz, Δυ = 14.1 Hz, 2 H), 4.06 (d, *J* = 8.6

Hz, 1 H), 3.72 (s, 3 H), 3.70 (m, 1 H), 3.63 (dd, J = 2.4, 8.7 Hz, 1 H), 3.55 (m, 2 H), 3.41 (dd, J = 4.7, 11.8 Hz, 1 H), 3.21 (ddd, J = 6.7, 9.0, 11.7 Hz, 2 H), 2.69 (m, 2 H), 2.15 (m, 1 H), 1.96 (m, 1 H), 1.67 (m, 2 H), 1.55 (d, J = 1.1 Hz, 3 H), 1.32 (s, 3 H), 1.30 (s, 3 H), 0.97–0.87 (m, 18 H), 0.62–0.54 (m, 5 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 159.0, 135.8, 131.6, 130.6, 129.0, 113.72, 99.1, 79.7, 75.3, 74.8, 72.6, 59.98, 59.93, 55.2, 41.0, 33.3, 32.8, 26.3, 21.7, 17.39, 17.36, 16.92, 16.90, 12.9, 11.5, 7.16, 7.11, 3.9, 3.8; high resolution mass spectrum (ES+) *m/z* 587.3735 [$(M+Na)^+$; calcd for $C_{32}H_{56}O_6SiNa$: 587.3743].

Preparation of Acetate (+)-28



(+)-28

To a solution of alcohol (–)-**27** (310 mg, 0.567 mmol) in dichloromethane (5 ml) at 0˚C were added Et_3N (0.47 ml, 3.40 mmol), Ac_2O (0.13 ml, 1.42 mmol), and DMAP (*ca*. 15 mg, catalytic). The reaction mixture was stirred at 0 → 10˚C for 2 h and then quenched with $NaHCO_3$ (sat. aq., 20 ml) and poured onto dichloromethane (20 ml). The layers were separated, the aqueous layer was extracted with dichloromethane (2 × 15 ml), and the combined organic extracts were dried over Na_2SO_4, filtered, and concentrated in vacuo. Purification via flash chromatography (7% ethyl acetate/hexanes) provided 326 mg (95% yield) as an oil: $[\alpha]_D^{20}$ +5.5˚ (*c* 1.7, $CHCl_3$); IR (neat) 2954 (s), 2872 (s), 1736 (s), 1613 (w) cm^{-1}; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.21 (d, J = 8.5 Hz, 2 H), 6.84 (d, J = 8.6 Hz, 2 H), 5.12 (d, J = 9.3 Hz, 1 H), 4.38 (ABq, J = 11.6 Hz, Δυ = 15.1 Hz, 2 H), 4.16 (m, 1 H), 4.11 (d, J = 9.0 Hz, 1 H), 4.03 (ddd, J = 7.9, 7.9, 10.8 Hz, 1 H), 3.78 (s, 3 H), 3.58 (dd, J = 1.9, 8.1 Hz, 1 H), 3.53 (dd, J = 5.0, 11.7 Hz, 1 H), 3.37 (dd, J = 3.7, 11.1 Hz, 1 H), 3.22 (dd, J = 9.1, 12.2

Hz, 2 H), 2.69 (dddq, J = 6.7, 6.7, 6.7, 9.2 Hz, 1 H), 2.01 (s, 3 H), 1.97 (m, 1 H), 1.84 (m, 2 H), 1.54 (s, 3 H), 1.51 (m, 1 H), 1.29 (s, 3 H), 1.26 (s, 3 H), 0.99–0.85 (m, 18 H), 0.62–0.53 (m, 5 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 171.0, 159.0, 135.9, 131.5, 130.6, 129.0, 113.6, 98.9, 79.8, 75.0, 74.8, 72.5, 63.5, 59.4, 55.1, 41.4, 33.2, 32.8, 28.4, 26.2, 22.1, 20.9, 17.32, 17.3, 17.0, 16.8, 12.8, 11.3, 7.1, 7.0, 3.9, 3.8; high resolution mass spectrum (ES+) *m/z* 629.3831 [$(M+Na)^+$; calcd for $C_{34}H_{58}O_7SiNa$: 629.3849].

To a solution of the resulting acetate (323 mg, 0.532 mmol) in dichloromethane (5 ml) was added H_2O (0.1 ml). The solution was cooled to 0˚C, DDQ (242 mg, 1.06 mmol) was added, and the reaction mixture was stirred for 3 h and then quenched with $NaHCO_3$ (sat. aq., 10 ml). The reaction mixture was then poured onto dichloromethane (15 ml), the layers separated, and the aqueous layer extracted with dichloromethane (2 × 15 ml). The combined organic extracts were dried over Na_2SO_4, filtered, and concentrated in vacuo. Purification via flash chromatography (25% ethyl acetate/hexanes) gave 219 mg (85% yield) as an oil: $[\alpha]_D^{20}$ +18.6˚ (*c* 2.8, $CHCl_3$); IR (neat) 3441 (br), 2959 (s), 2877 (s), 1739 (s), 1457 (w), 1369 (m), 1228 (s), 1051 (s) cm^{-1}; ^{1}H NMR (500 MHz, $CDCl_3$) δ 5.13 (d, J = 9.6 Hz, 1 H), 4.15 (m, 1 H), 4.14 (d, J = 8.8 Hz, 1 H), 4.03 (ddd, J = 7.5, 8.0, 10.8 Hz, 1 H), 3.60 (dd, J = 5.0, 9.2 Hz, 1 H), 3.58 (d, J = 5.3 Hz, 1 H), 3.46–3.34 (m, 3 H), 2.60 (dddq, J = 6.8, 6.8, 6.8, 9.4 Hz, 1 H), 2.01 (s, 3 H), 1.96 (m, 1 H), 1.85 (m, 2 H), 1.58 (d, J = 1.2 Hz, 3 H), 1.53–1.45 (m, 2 H), 1.30 (s, 3 H), 1.25 (s, 3 H), 0.97–0.84 (m, 18 H), 0.62–0.54 (m, 5 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 171.1, 137.3, 131.2, 99.1, 79.9, 75.1, 67.6, 63.5, 59.5, 41.5, 35.2, 33.3, 28.5, 26.1, 22.3, 20.9, 17.37, 17.35, 17.1, 16.2, 12.9, 11.6, 7.17, 7.11, 3.98, 3.91; high resolution mass spectrum (ES+) *m/z* 471.3131 [$(M–Me)^+$; calcd for $C_{25}H_{47}O_6Si$: 471.3141].

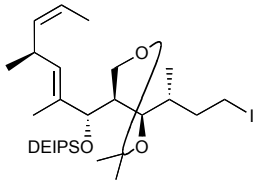
To a solution of the resulting alcohol (84 mg, 0.172 mmol) in dichloromethane (1 ml) at 0˚C were added pyridine (0.13 ml, 1.55 mmol) and the Dess-Martin periodinane

(219 mg, 0.518 mmol). The reaction mixture was stirred at 0˚C for 2 h and then quenched with $NaHCO_3$ (sat. aq., 1 ml) and $Na_2S_2O_3$ (sat. aq., 1 ml). The resulting mixture was stirred for 10 min, poured onto dichloromethane (10 ml) and $NaHCO_3$ (10 ml), and the layers separated. The aqueous layer was extracted with dichloromethane (2 × 10 ml) and the combined organic extracts were dried over Na_2SO_4, filtered, and concentrated in vacuo. The residue was azeotroped with benzene (3 × 5 ml) and used without any further purification.

To a solution of dried Wittig salt (ethyltriphenylphosphonium iodide) (210 mg, 0.567 mmol) in THF (0.5 ml) at –78˚C was added *n*-BuLi (2.5 M in hexanes, 0.21 ml, 0.516 mmol). The cooling bath was removed and the bright orange reaction mixture was allowed to stir at ambient temperature for 25 min before being recooled to –78˚C. In a separate flask, the previously prepared aldehyde was dissolved in THF (0.5 ml) and cooled to –78˚C. The orange ylide was then added to the aldehyde via cannula and the resulting mixture stirred for 3 min before being placed in a room temperature bath. After 5 min, the reaction was quenched with $NaHCO_3$ (sat. aq., 10 ml) and poured onto dichloromethane (10 ml). The layers were separated, the aqueous layer extracted with dichloromethane (2 × 10 ml), and the combined organic extracts were dried over Na_2SO_4, filtered, and concentrated in vacuo. Purification via flash chromatography (3% ethyl acetate/hexanes) gave 52 mg (61% yield over two steps) of (+)-**28** as an oil: $[\alpha]_D^{20}$ +62˚ (*c* 1.4, $CHCl_3$); IR (neat) 2952 (s), 2878 (m), 1742 (s), 1458 (w), 1368 (m), 1227 (s), 1172 (w), 1034 (s), 1013 (s), 879 (w), 720 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 5.29 (dq, *J* = 6.7, 10.7 Hz, 1 H), 5.18 (m, 2 H), 4.16 (m, 1 H), 4.08 (d, *J* = 8.8 Hz, 1 H), 4.04 (ddd, *J* = 7.5, 7.5, 10.8 Hz, 1 H), 3.56 (m, 2 H), 3.34 (m, 2 H), 2.01 (s, 3 H), 1.98 (m, 1 H), 1.85 (m, 2 H), 1.59 (dd, *J* = 1.7, 6.7 Hz, 3 H), 1.56 (d, *J* = 1.1 Hz, 3 H), 1.42 (m, 1 H), 1.29 (s, 3 H), 1.25 (s, 3 H), 1.00–0.86 (m, 18 H), 0.62–0.54 (m, 5 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 171.1, 134.8, 133.5, 133.4, 121.9, 98.9, 79.6, 75.0, 63.6, 69.5, 41.6, 33.1, 30.4, 28.5, 26.3, 22.0, 20.9, 20.7, 17.39, 17.37, 17.14, 12.97, 12.94, 11.3, 7.18, 7.13, 3.97, 3.90; high

resolution mass spectrum (ES+) *m/z* 519.3471 [$(M+Na)^+$; calcd for $C_{28}H_{52}O_5SiNa$: 519.3481].

Preparation of Iodide (+)-8

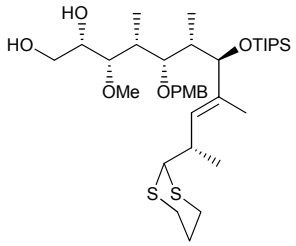


(+)-8

To a solution of acetate (+)-**28** (78 mg, 0.157 mmol) in MeOH (1 ml) at 0˚C was added K_2CO_3 (33 mg, 0.235 mmol). The reaction mixture was warmed to room temperature stirred for 3 h and then poured onto dichloromethane (10 ml) and H_2O (10 ml). The layers were separated and the aqueous layer was extracted with dichloromethane (2 × 10 ml). The combined organic extracts were dried over Na_2SO_4, filtered, and concentrated in vacuo. Purification via flash chromatography (10% ethyl acetate/hexanes) afforded 64 mg (90% yield) as an oil: $[\alpha]_D^{20}$ +57˚ (*c* 1.4, $CHCl_3$); IR (neat) 3426 (br), 2958 (s), 2873 (m), 1457 (w), 1372 (w), 1223 (m), 1170 (w), 1053 (s), 1011 (m), 878 (w), 713 (s) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 5.30 (dq, *J* = 6.7, 11.4 Hz, 1 H), 5.17 (m, 2 H), 4.03 (d, *J* = 8.5 Hz, 1 H), 3.69 (m, 1 H), 3.62 (dd, *J* = 2.4, 8.8 Hz, 1 H), 3.55 (m, 2 H), 3.38 (dd, *J* = 5.0, 11.8 Hz, 1 H), 3.35 (m, 1 H), 2.71 (m, 1 H), 2.16 (m, 1 H), 1.99 (ddd, *J* = 5.0, 8.7, 13.7 Hz, 1 H), 1.68 (m, 2 H), 1.59 (dd, *J* = 1.7, 6.7 Hz, 3 H), 1.57 (d, *J* = 1.2 Hz, 3 H), 1.32 (s, 3 H), 1.29 (s, 3 H), 1.00–0.84 (m, 18 H), 0.62–0.54 (m, 5 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 134.7, 133.46, 133.41, 122.0, 99.1, 79.5, 75.3, 59.9, 41.1, 33.1, 32.8, 30.3, 26.4, 21.6, 20.7, 17.4, 17.3, 16.8, 12.98, 12.95, 11.5, 7.17, 7.11, 3.9, 3.8; high resolution mass spectrum (ES+) *m/z* 477.3379 [$(M+Na)^+$; calcd for $C_{26}H_{50}O_4SiNa$: 477.3376].

To a solution of the resulting alcohol (209 mg, 0.46 mmol) and diisopropylethylamine (0.16 ml, 0.90 mmol) in THF (5 ml, 0°C) was added $(PhO)_3P(CH_3)I$ (400 mg, 0.88 mmol). After 15 min, another portion of $(PhO)_3P(CH_3)I$ (200 mg, 0.44 mmol) was added and stirring was continued for 10 min. The reaction was quenched by addition of MeOH (0.5 ml) followed by dilution with ether. The solution was stirred for 5 min, treated with silica gel, and concentrated. The solid was directly loaded onto a silica gel column and eluted with 2% ethyl acetate/hexanes to give the iodide (+)-**8** (239 mg, 92%) as an oil: $[\alpha]_D^{20}$ +43° (*c* 1.4, CCl_4); IR (neat) 2922 (s), 1457 (w), 1375 (w), 1222 (w), 1064 (w), 884 (w), 846 (w) cm^{-1}; ^1H NMR (500 MHz, C_6D_6) δ 5.34-5.21 (m, 3 H), 4.30 (d, *J* = 8.6 Hz, 1 H), 3.74 (dd, *J* = 1.7, 8.2 Hz, 1 H), 3.62 (dd, *J* = 5.0, 11.7 Hz, 1 H), 3.54 (dd, *J* = 3.7, 11.7 Hz, 1 H), 3.36 (m, 1 H), 3.14 (m, 1 H), 2.91 (ddd, *J* = 6.8, 9.6, 9.6 Hz, 1 H), 2.11 (m, 2 H), 1.95 (ddd, *J* = 3.9, 8.5, 12.3 Hz, 1 H), 1.75 (m, 1 H), 1.63 (d, *J* = 1.1 Hz, 3 H), 1.53 (dd, *J* = 1.6, 6.7 Hz, 3 H), 1.35 (s, 3 H), 1.32 (s, 3 H), 1.11-0.91 (m, 18 H), 0.72-0.65 (m, 5 H); ^{13}C NMR (125 MHz, C_6D_6) δ 134.2, 133.1, 132.8, 126.6, 99.0, 78.9, 74.2, 58.4, 41.6, 36.3, 33.2, 29.8, 29.2, 25.4, 21.4, 19.9, 16.8, 16.7, 15.6, 12.4, 10.8, 6.5, 6.5, 5.9, 3.4; high resolution mass spectrum (ES+) *m/z* 438.2884 $[(M+H-I)^+$; calcd for $C_{26}H_{50}O_3Si$: 438.2574].

Dithiane Diol (–)-29

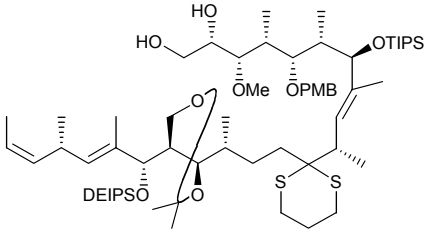


(–)-29

To a solution of acetonide (–)-**4** (50 mg, 0.0689 mmol) in MeOH (1 ml) at room temperature was added PPTs (3 mg). The reaction mixture was stirred for 48 h and quenched with $NaHCO_3$ (10 ml) and poured into dichloromethane (10 ml). The

layers were separated and the aqueous phase was extracted with dichloromethane (2 × 10 ml). The combined organic extracts were dried over Na_2SO_4, filtered, and concentrated in vacuo. Purification via flash chromatography (40% ethyl acetate/hexanes) yielded 41 mg (86% yield) of (+)-**24** as an oil: $[\alpha]_D^{20}$ –33.6° (*c* 1.1, $CHCl_3$); IR (neat) 3414 (br), 2933 (s), 2869 (s), 1612 (w), 1513 (m), 1463 (m), 1246 (s), 1039 (s), 883 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.26 (d, *J* = 8.6 Hz, 2 H), 6.84 (d, *J* = 8.6 Hz, 2 H), 5.33 (d, *J* = 9.6 Hz, 1 H), 4.58 (AB_q, *J* = 11.1 Hz, Δυ = 45.7 Hz, 2 H), 4.16 (d, *J* = 9.7 Hz, 1 H), 4.07 (d, *J* = 5.8 Hz, 1 H), 3.78 (s, 3 H), 3.75 (m, 1 H), 3.63 (dd, *J* = 1.3, 5.7 Hz, 1 H), 3.61-3.55 (m, 2 H), 3.43 (s, 3 H), 3.11 (app t, *J* = 4.8 Hz, 1 H), 2.88-2.79 (m, 5 H), 2.64 (d, *J* = 5.6 Hz, 1 H), 2.09-2.02 (m, 2 H), 1.97 (m, 1 H), 1.85-1.66 (m, 2 H), 1.63 (d, *J* = 0.73 Hz, 3 H), 1.12 (d, *J* = 6.8 Hz, 3 H), 1.08 (d, *J* = 6.8 Hz, 3 H), 1.02 (m, 24 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 158.9, 138.2, 131.7, 131.1, 128.7, 113.7, 82.9, 82.3, 79.0, 73.4, 72.4, 64.6, 60.6, 55.3, 55.0, 41.6, 40.3, 37.6, 30.8, 30.7, 26.2, 18.4, 18.3, 17.7, 12.8, 11.6, 11.4, 10.9; high resolution mass spectrum (ES+) *m/z* 685.3991 $[(M+H)^+$; calcd for $C_{36}H_{65}O_6S_2Si$: 685.3991].

Preparation of Coupled Fragment (–)-30

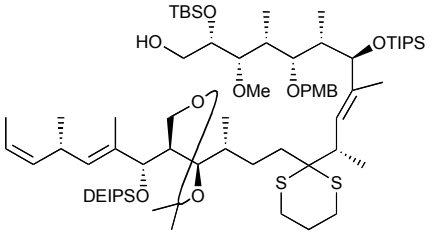


(–)-30

To a solution of dithiane (–)-**29** (168 mg, 0.25 mmol) in 10% HMPA/THF (1.5 ml) at -78°C was added *t*-BuLi (1.7 M in hexanes, 0.43 ml, 0.74 mmol) dropwise. The resulting yellow solution was treated with iodide (+)-**8** (133 mg, 0.16 mmol) via cannula. The reaction was stirred for 10 min at –78°C, diluted with diethyl ether (5

ml), and treated with saturated aqueous $NaHCO_3$ (1 ml). After warming to room temperature, the mixture was diluted with saturated aqueous $NaHCO_3$ (10 ml), extracted with diethyl ether (3 × 10 ml), and the combined organic layers were washed with brine (5 ml), dried over $MgSO_4$, filtered, and concentrated in vacuo. Column chromatography (10%→50% ethyl acetate/hexanes) gave the product (179 mg, 68% yield, 86% borsm), recovered iodide (28 mg, 18%), and recovered dithiane (22 mg, 7%). $[\alpha]_D^{20}$ -9.3° (*c* 1.0, $CHCl_3$); IR (film) 3448 (br), 2940 (s), 1612 (w), 1514 (m), 1460 (m), 1371 (m), 1247 (s), 1046 (s), 882 (m) 825 (w) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.30 (d, *J* = 8.5 Hz, 2 H), 6.84 (d, *J* = 8.5 Hz, 2 H), 5.76 (d, *J* = 9.6 Hz, 1 H), 5.30 (m, 1 H), 5.19 (m, 2 H), 4.84 (d, *J* = 11.0 Hz, 1 H), 4.65 (d, *J* = 11.0 Hz, 1 H), 4.24 (d, *J* = 9.6 Hz, 1 H), 4.09 (d, *J* = 8.7 Hz, 1 H), 3.78 (s, 3 H), 3.77 (m, 2 H), 3.59 (m, 4 H), 3.43 (s, 3 H), 3.37 (m, 2 H), 3.15 (t, *J* = 4.8 Hz, 1 H), 2.97 (m, 1 H), 2.84 (m, 2 H), 2.67 (d, *J* = 5.2 Hz, 1 H), 2.58 (m, 2 H), 2.02 (m, 8 H), 1.68 (m, 5 H), 1.63 (s, 3 H), 1.60 (dd, *J* = 6.7, 1.5 Hz, 3 H), 1.56 (s, 3 H), 1.30 (s, 3 H), 1.29 (m, 2 H), 1.28 (s, 3 H), 1.04 (m, 45 H), 0.61 (m, 4 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 159.1, 137.5, 135.1, 133.8, 133.7, 132.2, 131.1, 129.0, 122.2, 113.9, 99.1, 82.9, 82.5, 79.9, 79.6, 75.4, 73.9, 72.9, 64.7, 60.8, 59.8, 59.4, 55.5, 41.8, 41.4, 40.4, 38.7, 36.9, 34.2, 30.6, 26.7, 26.2, 25.8, 25.7, 24.9, 22.3, 21.0, 18.7, 18.6, 17.8, 17.7, 17.6, 14.3, 13.24, 13.17, 13.1, 11.90, 11.86, 11.5, 11.0, 7.5, 7.4, 4.22, 4.17; high resolution mass spectrum (ES+) *m/z* 1143.7170 [$(M+Na)^+$; calcd for $C_{62}H_{112}O_9S_2Si_2Na$: 1143.7184].

Preparation of TBS Ether (–)-31



(–)-31

To a solution of diol (–)-**30** (105 mg, 94 μmol) in CH_2Cl_2 (0.75 ml, –78°C) was added pyridine (25 μl, 0.28 mmol) and trimethylacetyl chloride (20 μl, 0.16 mmol). The reaction was stirred 30 min and quenched by the addition of saturated aqueous $NaHCO_3$ (250 μl). The mixture was allowed to warm to ambient temperature, diluted with diethyl ether (5 ml), and poured into water (3 ml). The layers were separated and the aqueous layer was extracted with diethyl ether (2 × 5 ml). The combined organic layers were washed with 1 N $NaHSO_4$ (7 ml), dried over $MgSO_4$, filtered, and concentrated. Column chromatography (10%→ 20% ethyl acetate/hexanes) gave the ester (106 mg, 94%) as an oil: $[\alpha]_D^{20}$ –12.6° (*c* 1.0, $CHCl_3$); IR (film) 3470 (br), 2942 (s), 2867 (s), 1732 (m), 1463 (m), 1247 (m), 1155 (m), 1050 (s), 883 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.30 (d, *J* = 8.5 Hz, 2 H), 6.83 (d, *J* = 8.5 Hz, 2 H), 5.74 (d, *J* = 9.6 Hz, 1 H), 5.30 (m, 1 H), 5.18 (m, 2 H), 4.83 (d, *J* = 11.0 Hz, 1 H), 4.65 (d, *J* = 11.0 Hz, 1 H), 4.23 (d, *J* = 9.5 Hz, 1 H), 4.11 (m, 3 H), 3.98 (m, 1 H), 3.77 (s, 3 H), 3.76 (m, 1 H), 3.59 (m, 2 H), 3.45 (s, 3 H), 3.38 (dd, *J* = 11.8, 4.0 Hz, 1 H), 3.35 (m, 1 H), 3.20 (t, *J* = 4.4 Hz, 1 H), 2.97 (m, 1 H), 2.84 (m, 2 H), 2.59 (m, 2 H), 2.48 (d, *J* = 5.9 Hz, 1 H), 2.10 (m, 3 H), 1.90 (m, 4 H), 1.69 (m, 2 H), 1.63 (s, 3 H), 1.60 (dd, *J* = 6.7, 1.1 Hz, 3 H), 1.56 (s, 3 H), 1.30 (s, 3 H), 1.28 (s, 3 H), 1.18 (s, 9 H), 1.02 (m, 50 H), 0.6 (m, 4 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 178.6, 159.0, 137.4, 135.1, 133.8, 133.7, 132.2, 131.1, 129.0, 122.2, 113.8, 99.1, 82.5, 82.2, 79.9, 79.7, 75.3, 73.7, 70.7, 65.8, 61.0, 59.7, 59.3, 55.4, 41.8, 40.9, 39.9, 38.7, 36.9, 34.2, 30.6, 27.4, 26.7, 26.2, 25.8, 25.7, 24.8, 22.3, 21.0, 18.6, 17.8, 17.7, 17.6, 14.3, 13.2, 13.2, 13.1, 12.2, 11.9, 11.6, 11.1, 7.5, 7.4, 4.2, 4.2; high resolution mass spectrum (ES+) *m/z* 1227.7745 [$(M+Na)^+$; calcd for $C_{67}H_{120}O_{10}S_2Si_2Na$: 1227.7759].

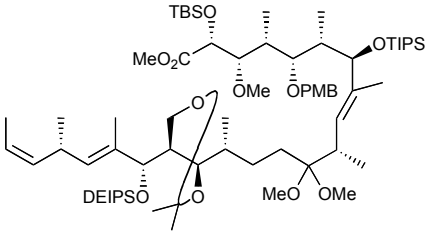
To a solution of the alcohol prepared above (49 mg, 41 μmol) and 2,6-lutidine (50 μl, 0.43 mmol) in CH_2Cl_2 (1 ml) at –78°C was added TBSOTf (48 μl, 0.20 mmol). The reaction was stirred for 1 h, warmed slowly to 0°C, diluted with diethyl ether (5 ml), and treated with water (3 ml). The mixture was extracted with diethyl ether (3 × 2 ml). The combined organic layers were washed with 1 N $NaHSO_4$ (5 ml), then water

(2 ml), then brine (2 ml), dried over $MgSO_4$, filtered and concentrated *in vacuo*. Column chromatography (2.5% → 5% ethyl acetate/hexanes) gave the silyl ether (51 mg, 95%) as an oil: $[\alpha]_D^{20}$ –17.7° (*c* 1.0, $CHCl_3$); IR (film) 2957, (s) 1732 (m), 1514 (w), 1463 (m), 1370 (w), 1248 (m), 1154 (m), 1059 (s), 882 (w), 831 (w), 777 (w) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.31 (d, *J* = 8.6 Hz, 2 H), 6.83 (d, *J* = 8.6 Hz, 2 H), 5.78 (d, *J* = 9.5 Hz, 1 H), 5.30 (m, 1 H), 5.19 (m, 2 H), 4.97 (d, *J* = 11.3 Hz, 1 H), 4.66 (d, *J* = 11.3 Hz, 1 H), 4.26 (m, 2 H), 4.09 (d, *J* = 8.8 Hz, 1 H), 3.94 (m, 2 H), 3.78 (s, 3 H), 3.64 (d, *J* = 9.1 Hz, 1 H), 3.58 (m, 2 H), 3.44 (s, 3 H), 3.36 (m, 2 H), 3.18 (d, *J* = 6.3 Hz, 1 H), 2.97 (m, 1 H), 2.83 (m, 2 H), 2.55 (m, 2 H), 2.18 (m, 1 H), 1.95 (m, 6 H), 1.70 (m, 3 H), 1.66 (s, 3 H), 1.60 (dd, *J* = 6.7, 1.6 Hz, 3 H), 1.56 (s, 3 H), 1.30 (s, 3 H), 1.28 (s, 3 H), 1.23 (m, 2 H), 1.20 (s, 9 H), 1.00 (m, 47 H), 0.87 (s, 9 H), 0.61 (m, 4 H), 0.09 (s, 6 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 178.6, 158.8, 137.4, 135.1, 133.8, 133.7, 132.7, 131.2, 128.9, 122.2, 113.7, 99.0, 82.22, 82.17, 80.5, 79.9, 75.4, 74.5, 72.5, 66.3, 60.9, 59.7, 59.2, 55.5, 41.8, 40.9, 38.6, 38.3, 37.0, 34.3, 30.6, 27.5, 26.7, 26.2, 26.1, 25.7, 25.6, 24.8, 22.3, 21.0, 18.6, 18.6, 17.8, 17.7, 17.6, 14.1, 13.2, 13.1, 12.0, 11.5, 11.3, 10.4, 7.5, 7.4, 4.2, 4.2, -4.3, -4.5; high resolution mass spectrum (ES+) *m/z* 1341.8695 [$(M+Na)^+$; calcd for $C_{73}H_{134}O_{10}S_2Si_3Na$: 1341.8624].

To a solution of the resulting ester (101 mg, 77 μmol) in CH_2Cl_2 (3 ml) at –78°C was added DIBAL-H (35 μl, 0.19 mmol). After 20 min, the reaction was quenched by addition of MeOH (2 drops), followed by dilution with diethyl ether (10 ml), and treatment with saturated aqueous Na/K tartrate (5 ml). The mixture was warmed to ambient temperature, stirred vigorously for 30 min, and extracted with diethyl ether (2 × 5 ml). The combined organic layers were washed with brine (5 ml), dried over $MgSO_4$, filtered, and concentrated. Column chromatography (5% →15% ethyl acetate/hexanes) gave alcohol (–)-**31** (86 mg, 92%) as an oil: $[\alpha]_D^{20}$ –17.1° (*c* 2.0, $CHCl_3$); IR (film) 3478 (br), 2934 (s), 1514 (w), 1463 (m), 1371 (w), 1247 (m), 1044 (s), 836 (w) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.34 (d, *J* = 8.5 Hz, 2 H), 6.86 (d, *J* = 8.5 Hz, 2 H), 5.79 (d, *J* = 9.6 Hz, 1 H), 5.32 (m, 1 H), 5.21 (m, 2 H), 4.98 (d, *J* =

11.3 Hz, 1 H), 4.69 (d, *J* = 11.3 Hz, 1 H), 4.28 (d, *J* = 10.0 Hz, 1 H), 4.11 (d, *J* = 8.8 Hz, 1 H), 3.90 (m, 1 H), 3.80 (s, 3 H), 3.68 (m, 2 H), 3.59 (m, 3 H), 3.44 (s, 3 H), 3.40 (dd, *J* = 11.8, 4.2 Hz, 1 H), 3.38 (m, 1 H), 3.20 (d, *J* = 6.5 Hz, 1 H), 2.99 (m, 1 H), 2.86 (m, 2 H), 2.59 (m, 2 H), 2.03 (m, 8 H), 1.68 (m, 3 H), 1.67 (s, 3 H), 1.62 (dd, *J* = 6.7, 1.6 Hz, 3 H), 1.58 (d, *J* = 1.0 Hz, 3 H), 1.32 (s, 3 H), 1.31 (m, 2 H), 1.30 (s, 3 H), 1.03 (m, 47 H), 0.92 (s, 9 H), 0.63 (m, 4 H), 0.12 (s, 3 H), 0.11 (s, 3 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 158.9, 137.4, 135.1, 133.8, 133.7, 132.7, 131.1, 128.9, 122.2, 113.8, 99.1, 82.9, 82.1, 80.8, 79.9, 75.4, 74.5, 73.5, 64.6, 60.6, 59.7, 59.3, 55.5, 41.8, 40.9, 38.6, 38.1, 37.0, 34.3, 30.6, 26.7, 26.2, 25.8, 25.6, 24.8, 22.3, 21.0, 18.6, 18.4, 17.8, 17.7, 17.6, 14.1, 13.2, 13.1, 12.0, 11.5, 11.4, 10.3, 7.5, 7.4, 4.2, -4.2, -4.5; high resolution mass spectrum (ES+) *m/z* 1257.8058 [$(M+Na)^+$; calcd for $C_{68}H_{126}O_9S_2Si_3Na$: 1257.8049].

Preparation of Methyl Ester (+)-32



(+)-32

To a solution of dithiane (–)-**31** (85 mg, 69 μmol) in MeOH (3 ml) at 0°C was added $PhI(O_2CCF_3)_2$ (85 mg, 0.19 mmol) in 2 portions over 15 min. The reaction was stirred for 15 min after the second addition of reagent, treated with saturated aqueous $NaHCO_3$ (ca. 25 mg), and poured into a separatory funnel containing water (7 ml) and diethyl ether (15 ml). The aqueous layer was extracted with diethyl ether (3 × 5 ml). The combined organic layers were washed with water (5 ml), then brine (5 ml), dried over $MgSO_4$, filtered, and concentrated. Column chromatography gave the ketal (76 mg, 93%) as an oil: $[\alpha]_D^{20}$ +22.4° (*c* 1.0, MeOH); IR (film) 3449 (br), 2938 (s), 1714 (m), 1461 (m), 1379 (w), 1252 (m), 1059 (s), 835 (w) cm^{-1}; ^{1}H NMR (500 MHz,

C_6D_6) δ 7.54 (d, *J* = 8.6 Hz, 2 H), 6.92 (d, *J* = 8.6 Hz, 2 H), 5.83 (d, *J* = 9.4 Hz, 1 H), 5.25 (m, 3 H), 4.97 (d, *J* = 11.3 Hz, 1 H), 4.86 (d, *J* = 11.3 Hz, 1 H), 4.56 (d, *J* = 9.9 Hz, 1 H), 4.30 (d, *J* = 8.7 Hz, 1 H), 3.90 (m, 1 H), 3.80 (dd, *J* = 8.0, 2.2 Hz, 1 H), 3.72 (dd, *J* = 11.7, 5.1 Hz, 1 H), 3.64 (m, 2 H), 3.58 (dd, *J* = 11.8, 3.4 Hz, 1 H), 3.52 (m, 1 H), 3.49 (s, 3 H), 3.36 (s, 3 H), 3.35 (m, 2 H), 3.21 (s, 3 H), 3.20 (s, 3 H), 3.11 (m, 1 H), 2.10 (m, 6 H), 1.84 (d, *J* = 0.9 Hz, 3 H), 1.84 (m, 1 H), 1.68 (m, 2 H), 1.65 (d, *J* = 1.0 Hz, 3 H), 1.55 (dd, *J* = 6.7, 1.6 Hz, 3 H), 1.49 (d, *J* = 6.8 Hz, 3 H), 1.38 (s, 3 H), 1.33 (s, 3 H), 1.20 (m, 30 H), 1.04 (m, 25 H), 0.69 (m, 4 H), 0.18 (s, 3 H), 0.10 (s, 3 H); ^{13}C NMR (125 MHz, C_6D_6) δ 159.4, 137.1, 135.1, 134.1, 133.8, 132.7, 131.4, 128.6, 122.1, 114.0, 104.5, 99.3, 82.9, 82.8, 81.6, 80.3, 75.4, 74.7, 74.2, 64.7, 60.4, 59.4, 54.8, 48.8, 48.2, 42.7, 41.6, 38.7, 38.3, 37.8, 32.3, 30.7, 26.3, 26.2, 24.9, 22.6, 20.9, 18.8, 18.7, 18.4, 17.8, 17.7, 15.6, 13.4, 13.3, 13.0, 11.6, 11.6, 11.3, 10.6, 7.5, 7.5, 4.4, 4.3, -4.3, -4.5; high resolution mass spectrum (ES+) *m/z* 1213.8461 [$(M+Na)^+$; calcd for $C_{67}H_{126}O_{11}Si_3Na$: 1213.8506].

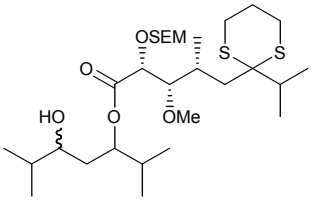
To a solution of the alcohol prepared above (15 mg, 13 μmol), NMO (15 mg, 0.13 mmol), and molecular sieves (4Å, powdered) in CH_2Cl_2 (1 ml) at 0°C was added a catalytic amount of TPAP. The reaction was stirred 20 min at 0°C, warmed to ambient temperature and stirred 30 min. The reaction was then filtered through a plug of silica gel, rinsing with 25% ethyl acetate/hexanes. After concentration, column chromatography (7.5%→10% ethyl acetate/hexanes) afforded the aldehyde (15 mg, 100%) as an oil: $[\alpha]_D^{20}$ +25.3° (*c* 1.5, $CHCl_3$); IR (film) 2937 (s), 1735 (w) 1716 (m), 1514 (m), 1462 (m), 1371 (m), 1248 (s), 1050 (s), 882 (w), 837 (w) cm^{-1}; ^{1}H NMR (500 MHz, C_6D_6) δ 9.71 (d, *J* = 1.5 Hz, 1 H), 7.50 (d, *J* = 8.6 Hz, 2 H), 6.91 (d, *J* = 8.6 Hz, 2 H), 5.80 (d, *J* = 9.5 Hz, 1 H), 5.26 (m, 3 H), 4.91 (d, *J* = 11.3 Hz, 1 H), 4.82 (d, *J* = 11.3 Hz, 1 H), 4.52 (d, *J* = 9.8 Hz, 1 H), 4.30 (d, *J* = 8.7 Hz, 1 H), 4.25 (dd, *J* = 6.3, 1.5 Hz, 1 H), 3.80 (dd, *J* = 8.0, 2.1 Hz, 1 H), 3.72 (dd, *J* = 11.7, 5.1 Hz, 1 H), 3.65 (d, *J* = 8.2 Hz, 1 H), 3.58 (m, 2 H), 3.40 (s, 3 H), 3.38 (m, 1 H), 3.36 (s, 3 H), 3.20 (s, 3 H), 3.19 (s, 3 H), 3.11 (m, 1 H), 2.41 (m, 1 H), 2.07 (m, 5 H), 1.82

(m, 1 H), 1.81 (s, 3 H), 1.66 (m, 1 H), 1.65 (d, *J* = 1.0 Hz, 3 H), 1.55 (dd, *J* = 6.7, 1.6 Hz, 3 H), 1.44 (d, *J* = 6.8 Hz, 3 H), 1.38 (s, 3 H), 1.34 (s, 3 H), 1.26 (d, *J* = 7.2 Hz, 3 H), 1.23 (d, *J* = 7.0 Hz, 3 H), 1.10 (m, 43 H), 0.96 (s, 9 H), 0.69 (m, 4 H), 0.09 (s, 3 H), 0.06 (s, 3 H); ^{13}C NMR (125 MHz, C_6D_6) δ 200.9, 159.5, 137.0, 135.1, 134.1, 133.8, 132.5, 131.5, 128.7, 122.2, 114.0, 104.5, 99.3, 82.9, 82.9, 81.2, 80.3, 78.6, 75.4, 74.1, 59.5, 59.4, 54.8, 48.8, 48.8, 48.2, 42.7, 41.2, 38.4, 38.2, 37.8, 32.3, 30.8, 26.3, 26.0, 24.9, 22.6, 20.9, 18.8, 18.7, 18.5, 17.8, 17.7, 17.7, 15.7, 13.4, 13.3, 13.0, 11.5, 11.5, 10.5, 7.5, 7.5, 4.4, 4.3, -4.4, -5.0; high resolution mass spectrum (ES+) *m/z* 1211.8335 [$(M+Na)^+$; calcd for $C_{67}H_{124}O_{11}Si_3Na$: 1211.8349].

A stock solution of oxidant was made by combining $NaClO_2$ (61 mg, 0.67 mmol), NaH_2PO_4 (43 mg, 0.36 mmol), and water (1 ml). Separately, the aldehyde prepared above (12 mg, 10μmol) was dissolved in *t*-BuOH (0.6 ml), treated with 2-methyl-2-butene (2 M in THF, 0.3 ml, 0.60 mmol), and cooled to 0°C. The stock solution was added dropwise until TLC showed complete consumption of starting material. Upon completion, the reaction mixture was poured into water (5 ml) and extracted with diethyl ether (3 × 10 ml). The combined organic layers were dried over $MgSO_4$, filtered, and concentrated. The acid was re-dissolved in diethyl ether (1 ml), and treated with excess CH_2N_2 (alcohol-free, in diethyl ether). The excess CH_2N_2 was removed by bubbling argon through the reaction mixture until the solution was colorless. The reaction was concentrated and purified by column chromatography (5%→10% ethyl acetate/hexanes) to give 5.7 mg (46% over 2 steps) of (+)-**32** as an oil: $[\alpha]_D^{20}$ +17.1° (*c* 0.4, C_6H_6); IR (film) 2955 (s), 1742 (m), 1514 (m), 1461 (m), 1371 (m), 1249 (s), 1048 (s), 882 (m), 838 (m) cm^{-1}; ^{1}H NMR (500 MHz, C_6D_6) δ 7.52 (d, *J* = 8.6 Hz, 2 H), 6.91 (d, *J* = 8.6 Hz, 2 H), 5.82 (d, *J* = 8.9 Hz, 1 H), 5.28 (m, 3 H), 4.98 (d, *J* = 11.2 Hz, 1 H), 4.87 (d, *J* = 11.2 Hz, 1 H), 4.59 (d, *J* = 7.2 Hz, 1 H), 4.55 (d, J = 9.9 Hz, 1 H), 4.30 (d, J = 8.7 Hz, 1 H), 3.80 (dd, J = 8.0, 2.2 Hz, 1 H), 3.72 (m, 3 H), 3.62 (s, 3 H), 3.58 (dd, J = 11.7, 3.3 Hz, 1 H), 3.37 (m, 3 H), 3.35 (s, 3 H), 3.22 (s, 3 H), 3.11 (dd, J = 9.4, 7.3 Hz, 1 H), 2.11 (m, 6 H), 1.86 (m, 1 H), 1.79 (d,

J = 0.7 Hz, 3 H), 1.67 (d, J = 1.0 Hz, 3 H), 1.55 (d, J = 5.1 Hz, 3 H), 1.45 (d, J = 6.7 Hz, 3 H), 1.37 (m, 12 H), 1.09 (m, 54 H), 0.70 (m, 4 H), 0.16 (s, 3 H), 0.14 (s, 3 H); ^{13}C NMR (125 MHz, C_6D_6) δ 172.1, 159.4, 137.2, 135.1, 134.1, 133.8, 131.4, 128.7, 122.2, 114.0, 104.5, 99.3, 83.5, 82.6, 81.3, 80.3, 76.1, 75.4, 74.3, 60.9, 59.3, 54.7, 51.3, 48.8, 48.2, 42.7, 41.1, 39.3, 38.4, 37.8, 32.3, 30.7, 26.3, 26.0, 24.9, 22.6, 20.9, 18.7, 17.8, 17.8, 17.7, 15.6, 13.4, 13.3, 13.2, 13.0, 11.6, 11.5, 11.1, 10.3, 7.5, 7.5, 4.4, 4.3, -4.9, -5.0; high resolution mass spectrum (ES+) m/z 1241.8511 [(M+Na)+; calcd for $C_{68}H_{126}O_{12}Si_3Na$: 1241.8455].

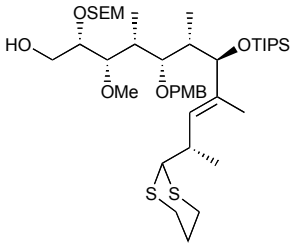
Preparation of Ester 35



35

A solution of the β-hydroxy ketone (21 mg, 0.133 mmol)[6] in THF (600 µl) was added to aldehyde (+)-**33**[7] (neat, 91 mg, 0.208 mmol). The reaction was cooled to –10°C and shielded from light, at which time SmI_2 (0.1 M in THF, 315 µl) was added. After 1 h the reaction was diluted with saturated aqueous $NaHCO_3$ (5 ml) and diethyl ether (15 ml). The layers were separated and the aqueous layer was extracted with diethyl ether (2 × 5 ml). The combined organic layers were dried over $MgSO_4$, filtered, and concentrated in vacuo. Purification via flash chromatography (5→20% ethyl acetate/hexanes) afforded recovered aldehyde (21 mg) and the desired ester (76 mg, 96% yield) as a mixture of diastereomers: high resolution mass spectrum (ES+) *m/z* 617.3351 [$(M+Na)^+$; calcd for $C_{29}H_{58}O_6S_2SiNa$: 617.3342].

Preparation of Dithiane (–)-36



(–)-36

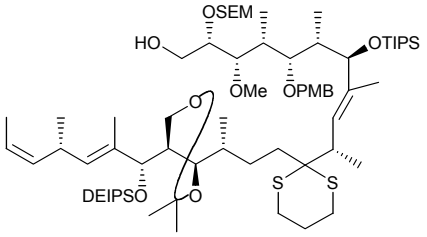
To a solution of diol (–)-**29** (1.5 g, 2.27 mmol) in CH_2Cl_2 (45 ml) at –78°C was added 2,4,6-collidine (2.5 ml, 18.8 mmol), and acetyl chloride (420 µl, 5.9 mmol). After 25 minutes of stirring the reaction was quenched by the addition of wet diethyl ether (15 ml) and warmed to room temperature at which time saturated aqueous $NaHCO_3$ (15 ml) was added. The reaction was stirred for 5 minutes, diluted with diethyl ether (80 ml) and saturated aqueous $NaHCO_3$ (40 ml). The layers were separated and the combined aqueous layers were extracted with diethyl ether (2 × 40 ml). The combined organic layers were washed with 1 M $NaHSO_4$ (100 ml) and brine (100 ml), dried over $MgSO_4$, filtered and concentrated in vacuo to afford the acetate (ca. 1.65 g, quantitative yield) as an oil, which was used without further purification: $[\alpha]_D^{20}$ –38.0° (*c* 1.0 $CHCl_3$); IR (film) 3471 (br), 2942 (s), 2865 (s), 1742 (s), 1613 (w), 1514 (s), 1464 (m), 1247 (s), 1039 (s) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.25 (d, *J* = 8.6 Hz, 2 H), 6.84 (d, *J* = 8.6 Hz, 2 H), 5.31 (d, *J* = 9.7 Hz, 1 H), 4.61 (d, *J* = 11.1 Hz, 1 H), 4.53 (d, *J* = 11.1 Hz, 1 H), 4.14 (d, *J* = 9.6 Hz, 1 H), 4.07 (m, 3 H), 3.95 (m, 1 H), 3.78 (s, 3 H), 3.63 (d, *J* = 5.3 Hz, 1 H), 3.45 (s, 3 H), 3.14 (ddd, *J* = 0, 5.5, 3.8 Hz, 1 H), 2.84 (m, 5 H), 2.58 (d, *J* = 6.2 Hz, 1 H), 2.04 (m, 2 H), 2.03 (s, 3 H), 1.80 (m, 2 H), 1.62 (s, 3 H), 1.12 (d, *J* = 6.8 Hz, 3 H), 1.08 (d, *J* = 6.8 Hz, 3 H), 1.01 (m, 24 H); ^{13}C NMR (125 MHz, C_6D_6) δ 170.9, 158.8, 138.1, 131.7, 131.2, 128.74, 128.69, 113.7, 82.4, 78.9, 73.2, 70.0, 66.2, 60.8, 55.3, 55.0, 41.2, 40.1, 37.6, 30.8, 30.7, 26.2, 20.9, 18.4, 18.3, 17.7, 12.8, 11.6, 11.5, 11.0; high resolution mass spectrum (ES+) *m/z* 749.3949 [$(M+Na)^+$; calcd for $C_{38}H_{66}O_7S_2SiNa$: 749.3917].

To a solution of the resulting acetate (1.65 g, 2.27 mmol) in CH_2Cl_2 (40 ml) was added diisopropylethylamine (3.6 ml, 20.4 mmol), TBAI (5.9 g, 15.9 mmol) and 2-(trimethylsilyl)ethoxymethyl chloride [(SEMCl) 2.6 ml,14.8 mmol]. After 16 h an additional 0.25 ml of SEMCl was added. After one hour the reaction was diluted with diethyl ether (60 ml) and poured into 1 M $NaHSO_4$ (80 ml). The layers were separated and the aqueous layer was extracted with diethyl ether (30 ml). The combined organic layers were washed with brine (50 ml), dried over $MgSO_4$, filtered, and concentrated in vacuo. Purification via flash chromatography (10→15% ethyl acetate/hexanes) gave the SEM ether (1.80 g, 95% yield over 2 steps) as an oil: $[\alpha]_D^{20}$ –100.0° (*c* 0.5 C_6H_6); IR (film) 2945 (s), 2866 (s), 1745 (s), 1613 (w), 1513 (m), 1463 (w), 1247 (s), 1038 (s), 836 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ□ □ □ (d, *J* = 8.5 Hz, 2 H), 6.84 (d, *J* = 8.3 Hz, 2 H), 5.29 (d, *J* = 9.6 Hz, 1 H), 4.78 (d, *J* = 7.0 Hz, 1 H), 4.75 (d, *J* = 7.0 Hz, 1 H), 4.69 (d, *J* = 11.4 Hz, 1 H), 4.59 (d, *J* = 11.4 Hz, 1 H), 4.30 (dd, *J* = 2.9, 12.0 Hz, 1 H), 4.16 (d, *J* = 9.9 Hz, 1 H), 4.06 (dd, *J* = 4.7, 12.0 Hz, 1 H), 4.01 (d, *J* = 6.0 Hz, 1 H), 3.90 (m, 1 H), 3.78 (s, 3 H), 3.68 (m, 1 H), 3.57 (m, 1 H), 3.53 (d, *J* = 8.0 Hz, 1 H), 3.48 (s, 3 H), 3.35 (dd, *J* = 1.5, 6.7 Hz, 1 H), 2.81 (m, 5 H), 2.06 (m, 1 H), 2.05 (s, 3 H), 1.93 (m, 1 H),1.80 (m, 2 H), 1.65 (s, 3 H), 1.11 (d, *J* = 6.7 Hz, 3 H), 1.01 (m, 26 H), 0.91 (m, 3 H) –0.01 (s, 9 H); ^{13}C NMR (125 MHz, C_6D_6) δ 170.8, 159.7, 138.1, 132.1, 131.2, 128.5, 113.6, 95.0, 81.6, 80.8, 80.6, 77.6, 73.7, 65.5, 64.7, 60.8, 55.3, 55.2, 40.5, 38.4, 37.6, 30.8, 30.7, 26.2, 20.9, 18.4, 18.3, 18.0, 17.7, 12.8, 11.6, 11.0, 10.0, -1.5; high resolution mass spectrum (ES+) *m/z* 879.4718 [$(M+Na)^+$; calcd for $C_{44}H_{80}O_8S_2Si_2Na$: 879.4731].

To a solution of the resulting acetate (835 mg, 0.975 mmol) in MeOH (20 ml), at 0°C was added K_2CO_3 (674 mg, 4.9 mmol). The reaction was then placed at room temperature for 45 minutes, at which time the reaction was diluted with H_2O (30 ml) and CH_2Cl_2 (50 ml). The layers were separated and the aqueous layers were extracted with CH_2Cl_2 (3 × 25 ml) and ethyl acetate (1 × 15 ml). The combined organic layers were dried over $MgSO_4$, filtered, and concentrated in vacuo. Purification via column

chromatography gave (–)-**36** (738 mg, 93 % yield) as an oil: $[\alpha]_D^{20}$ –58.7° (*c* 0.6, $CHCl_3$); IR (film) 3465 (br), 2945 (s), 2866 (s), 1613 (w), 1514 (m), 1464 (m), 1248 (s), 1039 (s), 836 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.26 (d, *J* = 6.7 Hz, 2 H), 6.84 (d, *J* = 6.6 Hz, 2 H), 5.28 (d, *J* = 9.6 Hz, 1 H), 4.82 (d, *J* = 7.0 Hz, 1 H), 4.69 (d, *J* = 6.9 Hz, 1 H), 4.67 (d, *J* = 11.2 Hz, 1 H), 4.57 (d, *J* = 11.3 Hz, 1 H), 4.16 (d, *J* = 9.8 Hz, 1 H), 4.00 (d, *J* = 6.0 Hz, 1 H), 3.79 (m, 1 H), 3.78 (s, 3 H), 3.72 (m, 1 H), 3.66 (m, 1 H), 3.55 (m, 3 H), 3.45 (s, 3 H), 3.31 (dd, *J* = 3.7, 8.9 Hz, 1 H), 3.24 (ddd, *J* = 0, 3.1, 5.9 Hz, 1 H), 2.80 (m, 5 H), 2.06 (m, 1 H), 1.95 (ddd, *J* = 3.0, 7.1, 7.1 Hz, 1 H), 1.79 (m, 2 H), 1.63 (s, 3 H), 1.10 (d, *J* = 6.8 Hz, 3 H), 1.05 (d, *J* = 6.8 Hz, 3 H), 1.01 (m, 23 H), 0.93 (m, 3 H), 0.00 (s, 9 H); ^{13}C NMR (125 MHz, C_6D_6) δ 159.5, 138.6, 132.8, 131.6, 129.6, 114.1, 95.9, 83.6, 82.3, 82.0, 90.9, 74.0, 65.8, 63.2, 60.2, 55.6, 54.8, 41.2, 39.0, 38.0, 30.70, 30.68, 26.4, 18.7, 18.6, 18.3, 18.1, 13.2, 11.8, 11.5, 10.5, –1.4; high resolution mass spectrum (ES+) *m/z* 837.4623 $[(M+Na)^+$; calcd for $C_{42}H_{78}O_7S_2Si_2Na$: 837.4625].

Preparation of Coupled Fragment (–)-37

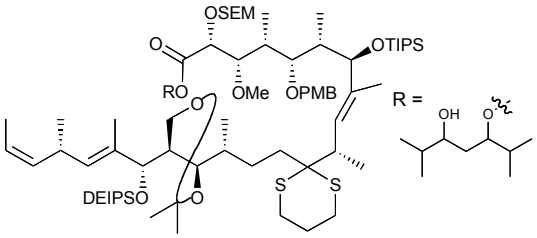


(–)-37

To a solution of dithiane (–)-**36** (1.03 g, 1.27 mmol) in 10% HMPA/THF (8.1 ml) at –78°C was added *t*-BuLi (1.5 M, 1.7 ml) dropwise. The orange colored solution was stirred for 4 minutes at which time iodide (+)-**8** (824 mg, 1.46 mmol) in THF [3.4 ml (2.9 ml and 0.5 ml washes)] was added via cannula. The reaction was allowed to stir for 10 minutes and then quenched with saturated aqueous NH_4Cl (2 ml). The reaction mixture was diluted with H_2O (35 ml) and diethyl ether (40 ml), the layers were separated and the aqueous layer was extracted with diethyl ether (2 × 25 ml). The

combined organic layers were washed with brine (20 ml), dried over $MgSO_4$, filtered and concentrated in vacuo. Purification via flash chromatography (10→25% ethyl acetate/hexanes) gave the alcohol (1.19 g, 75% yield) as a foam: $[\alpha]_D^{20}$ –23.4° (*c* 0.5, C_6D_6); IR (film) 3368 (br), 2950 (s), 2867 (s), 1514 (w), 1464 (w), 1370 (w), 1248 (m), 1057 (s), 883 (w), 836 (w) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.30 (d, *J* = 8.6 Hz, 2 H), 6.83 (d, *J* = 8.6 Hz, 2 H), 5.72 (d, *J* = 9.4 Hz, 1 H), 5.27 (m, 1 H), 5.19 (m, 2 H), 4.92 (d, *J* = 11.2 Hz, 1 H), 4.80 (d, *J* = 7.0 Hz, 1 H), 4.68 (d, *J* = 7.0 Hz, 1 H), 4.66 (d, *J* = 11.3 Hz, 1 H), 4.25 (d, *J* = 9.8 Hz, 1 H), 4.08 (d, *J* = 8.8 Hz, 1 H), 3.78 (m, 1 H), 3.77 (s, 3 H), 3.69 (m, 3 H), 3.56 (m, 4 H), 3.43 (s, 3 H), 3.35 (m, 3 H), 3.26 (dd, *J* = 2.7, 5.9 Hz, 1 H), 2.96 (app t, *J* = 13.0 Hz, 1 H), 2.83 (m, 2 H), 2.57 (m, 2 H), 2.16 (m, 1 H), 2.04 (m, 1 H), 1.92 (m, 5 H), 1.68 (m, 2 H), 1.63 (s, 3 H), 1.60 (d, *J* = 6.7 Hz, 3 H), 1.23 (app d, *J* = 12.0 Hz, 8 H), 1.05-0.91 (m, 53 H), 0.59 (m, 4 H), –0.01 (s, 9 H); ^{13}C NMR (125 MHz, $CHCl_3$) δ 158.6, 137.2, 134.8, 133.6, 133.5, 132.3, 130.8, 128.6, 121.9, 113.5, 98.8, 96.1, 84.7, 81.8, 81.6, 80.3, 79.6, 75.1, 73.9, 65.9, 63.4, 60.5, 59.5, 59.1, 55.2, 41.5, 40.3, 38.8, 38.4, 36.7, 34.0, 30.4, 26.5, 25.9, 25.5, 25.4, 24.5, 22.1, 20.8, 18.4, 18.3, 18.1, 17.6, 17.44, 17.38, 14.0, 13.0, 12.9, 12.8, 11.6, 11.31, 11.29, 10.1, 7.2, 7.2, 4.0, 3.9 –1.51; high resolution mass spectrum (ES+) *m/z* 1273.7981 [$(M+Na)^+$; calcd for $C_{68}H_{126}O_{10}S_2Si_3Na$: 1273.7998].

Preparation of Ester 38



(–)-38

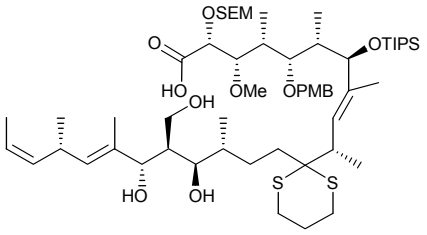
To a solution of alcohol (–)-**37** (601 mg, 0.48 mmol) in CH_2Cl_2 (6.4 ml) at –15°C was added DMSO (1.02 ml, 14.4 mmol), and diisopropylethylamine (670 µl, 3.84 mmol). Over the course of 30 minutes, 3 aliquots of SO_3•pyr were added [190 mg, 1.19 mmol

(total)]. The reaction was allowed to stir for 15 minutes, quenched by the addition of saturated aqueous $NaHCO_3$ (20 ml), and diluted with 40% ethyl acetate/heptane (30 ml). The layers were separated and the aqueous layer was extracted with 40% ethyl acetate/heptane (3 × 20 ml). The combined organic layers were washed with H_2O (10 ml) and brine (10 ml), dried over Na_2SO_4, filtered, and concentrated in vacuo to afford the unstable aldehyde, which was used directly in the next reaction. An analytically pure sample was available via careful flash chromatography (6→7.5% ethyl acetate/hexanes): $[\alpha]_D^{20}$ –11.2° (*c* 0.78, C_6H_6); IR (film) 2951 (s), 1733 (m), 1514 (m), 1464 (m), 1372 (m), 1248 (s), 1057 (s) cm^{-1}; ^1H NMR (500 MHz, C_6D_6) δ 9.85 (d, *J*, = 1.9 Hz, 1 H), 7.62 (d, *J* = 8.6 Hz, 2 H), 6.92 (d, *J* = 8.6 Hz, 2 H), 6.11 (d, *J* = 10.5 Hz, 1 H), 5.34 (m, 1 H), 5.25 (m, 3 H), 5.05 (d, *J* = 11.2 Hz, 1 H), 4.67 (app d, *J* = 6.8 Hz, 2 H), 4.63 (app d, *J* = 6.8 Hz, 2 H), 4.58 (d, *J* = 9.9 Hz, 1 H), 4.34 (d, *J* = 8.7 Hz, 1 H), 4.28 (dd, *J* = 1.9, 5.6 Hz, 1 H), 4.07 (d, *J* = 7.1 Hz, 1 H), 3.86 (dd, *J* = 2.8, 8.2 Hz, 1 H), 3.82 (ddd, *J*= 0, 5.6, 3.4 Hz, 1 H), 3.74 (dd, *J* = 5.2, 11.9 Hz, 1 H), 3.69 (ddd, *J*= 6.3, 9.7, 9.7 Hz, 1 H), 3.59 (m, 2 H) 3.39 (m, 1 H), 3.37 (s, 3 H), 3.34 (s, 3 H), 3.13 (m, 1 H), 2.77 (m, 2 H), 2.42 (m, 5 H), 2.15 (m 4 H), 1.82 (m, 1 H), 1.80 (s 3 H), 1.69 (s, 3 H), 1.57 (d, *J* = 1.6 Hz, 3 H), 1.55 (d, *J* = 1.6 Hz, 3 H), 1.45 (d, *J* = 6.8 Hz, 3 H), 1.41 (s, 3 H), 1.34 (m, 10 H), 1.22 (d, *J* = 6.9 Hz, 3 H), 1.10 (m, 32 H), 0.9 (m, 3 H), 0.7 (m, 4 H), -0.02 (s, 9 H); ^{13}C NMR (125 MHz, $CHCl_3$) δ 201.6, 159.5, 137.8, 135.1, 134.1, 133.9, 132.8, 129.0, 128.5, 122.2, 114.1, 99.4, 95.7, 83.5, 82.7, 82.1, 80.4, 80.3, 75.4, 74.2, 66.0, 59.62, 59.6, 59.3, 57.8, 42.8, 41.0, 39.03, 39.00, 37.49, 37.47, 30.8, 26.3, 26.2, 25.7, 25.6, 25.3, 22.8, 21.0, 18.8, 18.7, 18.1, 18.0, 17.8, 17.7, 14.5, 13.4, 13.3, 13.1, 12.0, 11.8, 11.6, 10.6, 7.6, 7.5, 4.44, 4.37, -1.4; high resolution mass spectrum (ES+) *m/z* 1271.7821 $[(M+Na)^+$; calcd for $C_{68}H_{124}O_{10}S_2Si_3Na$: 1271.7842].

To the aldehyde prepared above (600 mg, 0.48 mmol) was added a solution of hydroxy ketone **34**[6] (76 mg, 0.48) in THF (9.0 ml) via cannula. The solution was placed at –10°C, shielded from light, and charged with SmI_2 (0.1M in THF 1.85 ml).

The reaction was allowed to gradually warm to approximately 0°C over 90 minutes at which time the reaction was quenched with saturated aqueous $NaHCO_3$ (2 ml), poured into diethyl ether (45 ml) and diluted with H_2O (15 ml). The layers were separated and the aqueous layer was extracted with diethyl ether (2 × 25 ml). The combined organic layers were dried over $MgSO_4$ filtered, and concentrated in vacuo. Purification via flash chromatography (5→11% ethyl acetate/hexanes) gave the desired diastereomeric mixture of esters (510 mg, 75% yield over 2 steps) as an oil. High resolution mass spectrum (ES+) *m/z* 1429.9151 [$(M+Na)^+$; calcd for $C_{77}H_{142}O_{12}S_2Si_3Na$: 1429.9148].

Preparation of Carboxylic Acid (–)-39

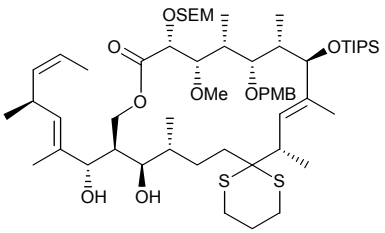


(–)-39

A stock solution of PPTs (33 mg) in anhydrous MeOH (45.5 ml) was prepared. To the diastereomeric esters [**38** (62 mg, 0.044 mmol)] was added the stock solution (4.55 ml). After 23 h the reaction was poured into saturated aqueous $NaHCO_3$ (10 ml) and ethyl acetate (20 ml). The layers were separated and the aqueous layer was extracted with ethyl acetate (3 × 10 ml). The combined organic layers were dried over $MgSO_4$, filtered, and concentrated in vacuo. Purification via flash chromatography (10→50% ethyl acetate/ hexanes) gave recovered starting material (28 mg) and the desired diastereomeric mixture of tetrols (26 mg, 85% yield BORSM): high resolution mass spectrum (ES+) *m/z* 1261.7758 [$(M+Na)^+$; calcd for $C_{67}H_{122}O_{12}S_2Si_2Na$: 1261.7814].

To a sealable pressure tube containing a solution of the resulting tetrols (245 mg, 0.1976 mmol) in degassed THF (5.7 ml), was added deionized H_2O (4.25 ml) and LiOH (237 mg, 9.90 mmol). The solution was degassed, the tube was sealed and placed at 70°C for 48 h. The reaction was brought to room temperature, diluted with THF (10 ml), pH 2 buffer [(pH 7 buffer potassium phosphate mono basic-NaOH buffer acidified with 1N $NaHSO_4$ until pH 2), 10 ml], and 1 M $NaHSO_4$ until the solution had reached pH 2. The solution was then diluted with ethyl acetate (40 ml). The layers were separated and the aqueous layer was extracted with ethyl acetate (3 × 20 ml). The combined organic layers were dried over $MgSO_4$, filtered, and concentrated in vacuo. Purification via preparative TLC (three 1 mm plates, 0.4% AcOH in 70% ethyl acetate/hexanes) afforded recovered starting material (130 mg) and the carboxylic acid (75 mg, 74% yield BORSM) as a foam: $[\alpha]_D^{20}$ –11.6° (*c* 0.5, CH_2Cl_2); IR (film) 3429 (br), 2926 (s), 1733 (m), 1514 (m), 1460 (w), 1248 (s), 1040 (s), 836 (w) cm^{-1}; ^1H NMR (500 MHz, CD_2Cl_2) 7.33 (d, *J* = 8.6 Hz, 2 H), 6.86 (d, *J* = 8.6 Hz, 2 H), 5.69 (d, *J* = 9.6 Hz, 1 H), 5.46 (d, *J* = 9.0 Hz, 1 H), 5.34 (m, 1 H), 5.29 (m, 1 H), 4.85 (d, *J* = 10.9 Hz, 1 H), 4.72 (app s, 2 H), 4.67 (d, *J* = 10.9 Hz, 1 H), 4.46 (d, *J* = 5.0 Hz, 1 H), 4.27 (m, 2 H), 3.99 (dd, *J* = 5.2, 11.3 Hz, 1 H), 3.80 (s, 3 H), 3.67 (m, 6 H), 3.46 (m, 1 H), 3.44 (s, 3 H), 2.96 (m, 3 H), 2.68 (m, 2 H), 2.10 (m, 2 H), 2.09 (app s 3, H), 1.97 (m, 2 H) 1.88 (m, 1 H), 1.75 (m, 1 H), 1.68 (s, 3 H), 1.67 (d, *J* = 1.5 Hz, 3 H), 1.66 (d, *J* = 1.5 Hz, 3 H), 1.62 (s, 3 H), 1.28 (m, 1 H), 1.08 (m, 32 H), 0.93 (m, 3 H), 0.84 (d, *J* = 6.7 Hz, 3 H), 0.02 (s, 9 H); ^{13}C NMR (125 MHz, CD_2Cl_2) δ 172.9, 137.9, 135.6, 134.0, 132.3, 131.4, 131.2, 129.1, 128.7, 122.2, 113.9, 95.5, 83.6, 82.7, 80.3, 78.9, 76.9, 75.2, 73.9, 66.8, 61.6, 60.9, 59.5, 55.6, 42.6, 41.8, 40.4, 38.9, 37.3, 33.4, 30.8, 28.3, 26.3, 26.1, 25.8, 21.8, 18.7, 18.6, 18.4, 16.5, 14.7, 13.3, 13.2, 12.1, 12.0, 11.4, 10.9, -1.4; high resolution mass spectrum (ES+) *m/z* 1119.6436 [$(M+Na)^+$; calcd for $C_{58}H_{104}O_{11}S_2Si_2Na$: 1119.6456].

Preparation of Macrolactone (+)-40:

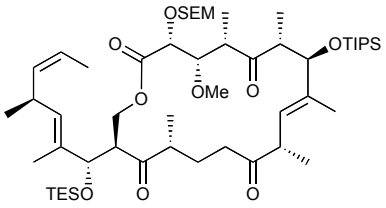


(+)-40

Macrolactone (+)-280. To a solution of acid (–)-**39** (102 mg, 0.093 mmol) in THF (6.6 ml) was added diisopropylethylamine (50 µl, 0.287 mmol) and trichlorobenzoyl chloride (40 µl, 0.256 mmol). The reaction was allowed to stir for 14 h, at which time the reaction was cooled to 0°C, and charged with toluene (5 ml) and a solution of DMAP (0.233 M in toluene, 1.6 ml). After 25 minutes the cloudy reaction mixture was quenched by the addition of saturated aqueous NH_4Cl (20 ml). The layers were separated and the aqueous layer was extracted with ethyl acetate (3 × 10 ml). The combined organic layers were dried over $MgSO_4$, filtered and concentrated. Purification via flash chromatography (7→20% ethyl acetate/hexanes gave the macrolactone (64 mg, 64% yield) as an oil: $[\alpha]_D^{20}$ +12.3° (*c* 0.7, $CHCl_3$); IR (film) 3492 (br), 2946 (s), 2866 (s), 1734 (m), 1514 (m), 1464 (m), 1248 (s), 1059 (s), 836 (s) cm^{-1}; ^1H NMR (500 MHz, C_6D_6 at 340K) δ 7.49 (d, *J* = 8.7 Hz, 2 H), 6.86 (d, *J* = 8.7 Hz, 2 H), 5.78 (d, *J* = 10.2 Hz, 1 H), 5.36 (m, 3 H), 5.02 (d, *J* = 10.7 Hz, 1 H), 4.81 (d, *J* = 6.6 Hz, 1 H), 4.76 (d, *J* = 6.6 Hz, 1 H), 4.71 (d, *J* = 10.7 Hz, 1 H), 4.60 (dd, *J* = 8.9, 11.2 Hz, 1 H), 4.54 (d, *J* = 7.8 Hz, 1 H), 4.45 (d, *J* = 8.9 Hz, 1 H), 4.19 (dd, *J* = 3.0, 11.9 Hz, 1 H), 3.91 (m, 1 H), 3.82 (dd, *J* = 2.4, 7.8 Hz, 1 H), 3.73 (m, 5 H), 3.71 (s, 3 H), 3.38 (s, 3 H), 3.13 (dddd, 10.1, 6.3, 6.3, 6.3 Hz, 1 H), 2.67 (m, 3 H), 2.47 (m, 2 H), 2.36 (m, 2 H), 2.23 (m, 1 H), 2.17 (m, 1 H), 2.09 (m, 1 H), 1.96 (m, 2 H), 1.88 (s, 3 H), 1.581 (d, *J* = 6.7 Hz, 3 H), 1.58 (d, *J* = 1.5 Hz, 3 H), 1.57 (d, *J* = 1.6 Hz, 3 H), 1.54 (s, 3 H), 1.37 (d, *J* = 7.1 Hz, 3 H), 1.31 (d, *J* = 7.0 Hz, 3 H), 1.13 (m, 21 H), 1.08 (d, *J* = 6.5 Hz, 3 H), 1.02 (d, *J* = 6.8 Hz, 3 H), 0.96 (ddd, *J* = 7.0, 9.1, 2.2 Hz, 3 H), 0.02 (s, 9 H); ^{13}C NMR (125 MHz, C_6D_6 at 340K) δ 170.7, 159.7, 140.0,

135.3, 133.9, 132.6, 132.0, 129.5, 129.1, 122.5, 114.2, 95.3, 85.4, 82.5, 81.7, 80.0, 77.7, 74.1, 73.6, 66.0, 64.5, 60.9, 60.2, 54.9, 45.5, 41.1, 40.8, 40.4, 38.1, 37.8, 30.9, 28.7, 26.4, 25.8, 25.6, 21.5, 18.8, 18.6, 18.3, 17.0, 16.7, 13.3, 13.1, 13.0, 11.8, 10.2, 9.9, –1.3; high resolution mass spectrum (ES+) *m/z* 1101.6278 [$(M+Na)^+$; calcd for $C_{58}H_{102}O_{10}S_2Si_2Na$: 1101.6351].

Preparation of Triketone (+)-41



(+)-41

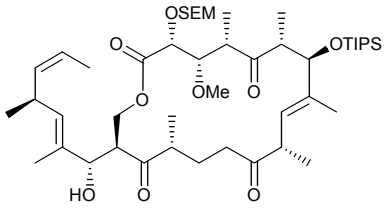
To a solution of diol (+)-**40** (150 mg, 0.139 mmol) in DMF (7.7 ml) at –15°C was added imidazole (95 mg, 1.39 mmol) and chlorotriethylsilane [(TESCl) 45 µl, 0.27 mmol]. After 20 minutes additional TESCl (135 µl) was added. After 1 h the reaction was quenched with saturated aqueous $NaHCO_3$ (10 ml), diluted with diethyl ether (30 ml) and H_2O (10 ml). The layers were separated and the aqueous layer was extracted with diethyl ether (2 × 20 ml). The combined organic layers were dried over $MgSO_4$, filtered, and concentrated. Purification via flash chromatography gave the silyl ether (158 mg, 95% yield) as an oil: $[\alpha]_D^{20}$ +4.0° (*c* 0.1, C_6H_6); IR (film) 3512 (w br), 2954 (s), 2873 (s), 1739 (m), 1514 (m), 1464 (m), 1248 (s), 1063 (s), 836 (w) cm^{-1}; ^1H NMR (500 MHz, C_6D_6 at 340K) δ 7.49 (d, *J* = 8.6 Hz, 2 H), 6.86 (d, *J* = 8.6 Hz, 2 H), 5.79 (d, *J* = 9.5 Hz, 1 H), 5.44 (d, *J* = 9.1 Hz 1 H), 5.34 (m, 2 H), 5.02 (d, *J* = 10.8 Hz, 1 H), 4.85 (d, *J* = 6.6 Hz, 1 H), 4.78 (d, *J* = 6.6 Hz, 1 H), 4.73 (d, *J* = 10.8 Hz, 1 H), 4.60 (m, 1 H), 4.58 (d, *J* = 7.5 Hz, 1 H), 4.45 (d, *J* = 8.8 Hz, 1 H), 4.30 (m, 1 H), 4.26 (dd, *J* = 2.9, 11.5 Hz, 1 H), 3.86 (m, 2 H), 3.78 (m, 1 H), 3.72 (s, 3 H), 3.715 (m, 1 H), 3.40 (m, 1 H), 3.38 (s, 3 H), 3.15 (dddd, 10.1, 6.7, 6.7, 6.7 Hz, 1 H), 2.68 (m, 5 H), 2.34 (m, 3 H), 2.21 (m, 1 H), 2.13 (ddd, *J* = 4.1, 13.4, 13.4 Hz, 1 H),

2.00 (m, 2 H), 1.90 (s, 3 H), 1.63 (s, 3 H), 1.58 (m, 6 H), 1.55 (m, 1 H), 1.38 (d, J = 7.1 Hz, 3 H), 1.37 (m, 1 H), 1.31 (d, J = 7.0 Hz, 3 H), 1.11 (m, 28 H), 1.04 (d, J = 6.7 Hz, 3 H), 0.98 (app t, J =8 Hz, 9 H), 0.62 (app q, J = 7.9 Hz, 6 H), 0.02 (s, 9 H); ^{13}C NMR (125 MHz, C_6D_6 at 340K) δ 170.8, 159.7, 140.0, 135.1, 133.5, 132.7, 132.6, 129.4, 129.3, 122.7, 114.2, 95.3, 85.3, 82.5, 81.8, 79.1, 74.2, 73.6, 66.1, 64.4, 60.8, 60.3, 54.9, 45.4, 42.3, 40.8, 40.4, 38.4, 37.9, 30.9, 28.9, 26.4, 25.8, 25.6, 21.2, 18.7, 18.6, 18.4, 16.9, 16.8, 13.3, 13.0, 12.7, 11.7, 10.2, 10.0, 7.0, 5.3, -1.30; high resolution mass spectrum (ES+) *m/z* 1215.7261 [$(M+Na)^+$; calcd for $C_{64}H_{116}O_{10}S_2Si_3Na$: 1215.7216].

To a solution of the resulting PMB ether (34 mg, 0.0285 mmol) in CH_2Cl_2 (2.8 ml) at 0°C was added pH 7 buffer (25 µl) and DDQ (11.6 mg, 0.0513 mmol). After 20 minutes the reaction was diluted with saturated aqueous $NaHCO_3$ (15 ml) and CH_2Cl_2 (15 ml). The layers were separated and the aqueous layer was extracted with CH_2Cl_2 (2 × 10 ml). The combined organic layers were dried over Na_2SO_4, filtered, and concentrated in vacuo. Purification via flash chromatography furnished the desired diol (28.5 mg, 93% yield) as an unstable oil: high resolution mass spectrum (ES+) *m/z* 1095.6592 [$(M+Na)^+$; calcd for $C_{56}H_{108}O_9S_2Si_3Na$: 1095.6640]. To a solution of the diol (14.3 mg, 0.0133 mmol) in MeCN/H_2O (9:1, 2.2 ml) at –5 to 0°C was added 2,6-di-*t*-butyl-4-methylpyridine (24 mg, 0.117 mmol) and $PhI(O_2CCF_3)_2$ (10 mg, 0.023 mmol). After 15 minutes additional $PhI(O_2CCF_3)_2$ (10 mg, 0.023 mmol) was added. After an additional 30 minutes a third portion of $PhI(O_2CCF_3)_2$ (5 mg, 0.012 mmol) was added. The reaction was allowed to stir 25 minutes longer and then was quenched with saturated aqueous $NaHCO_3$ (10 ml) and diluted with diethyl ether (15 ml). The layers were separated and the aqueous layer was extracted with diethyl ether (3 × 10 ml). The combined organic layers were dried over $MgSO_4$, filtered and concentrated in vacuo. Purification via flash chromatography (5→15% ethyl acetate hexanes) gave a semi-pure interconverting mixture of the ketone and hemiketal as an oil, which was taken on directly to the next step. To a solution of this mixture (ca. 10 mg, 0.01 mmol) in CH_2Cl_2 (2.2 ml) at 0°C was added $NaHCO_3$ (29 mg, 0.35 mmol)

and Dess-Martin periodinane (DMP) (14 mg, 0.033 mmol). The reaction was then placed at room temperature, and after 15 minutes additional DMP (14 mg, 0.033 mmol) was added. The reaction was allowed to stir for 45 minutes, at which time saturated aqueous $NaHCO_3$ (1 ml) and saturated aqueous $Na_2S_2O_3$ (100 µl) were added and allowed to stir for 5 minutes. The reaction mixture was then diluted with diethyl ether (15 ml) and H_2O (7 ml) and the layers were separated. The aqueous layer was extracted with diethyl ether (2 × 10 ml) and the combined organic layers were dried over $MgSO_4$, filtered, and concentrated in vacuo. Purification via flash chromatography (3.5→8% ethyl acetate/hexanes) gave the tri-ketone (7.5 mg, 58% yield over 2 steps) as an oil: $[\alpha]_D^{20}$ +90.9° (*c* 0.35, CH_2Cl_2); IR (film) 2954 (s), 2867 (s), 1762 (m), 1717 (s), 1460 (w), 1251 (w), 1063 (s), 989 (m) cm^{-1}; ^1H NMR (500 MHz, C_6D_6) δ 5.37 (m, 2 H) 5.22 (m, 1 H), 5.12 (d, *J* = 9.0 Hz, 1 H), 4.84 (d, *J* = 6.8 Hz, 1 H), 4.78 (d, *J* = 6.8 Hz, 1 H), 4.53 (d, *J* = 8.9 Hz, 1 H), 4.35 (d, *J* = 9.8 Hz, 1 H), 4.29 (d, *J* = 4.0 Hz, 1 H), 4.19 (m, 3 H), 3.79 (ddd, *J* = 9.3, 9.3, 6.7 Hz, 1 H), 3.62 (ddd, *J* = 9.7, 9.7, 7.1 Hz, 1 H), 3.41 (s, 3 H), 3.37 (ddd, *J* = 4.1, 10.4 10.4 Hz, 1 H), 3.30 (m, 1 H), 3.14 (m, 2 H), 3.03 (m, 1 H), 2.77 (m, 1 H), 2.40 (m, 3 H), 1.75 (s, 3 H), 1.74 (m, 1 H), 1.63 (s, 3 H), 1.57 (app dd, *J* = 1.9, 7.1 Hz, 3 H), 1.35 (m, 12 H), 1.17 (d, *J* = 7.2 Hz, 3 H), 1.09 (m, 20 H), 0.98 (m, 12 H), 0.59 (app q, *J* = 7.8 Hz, 6 H), 0.03 (s, 9 H); ^{13}C NMR (125 MHz, C_6D_6) δ 213.6, 212.9, 209.3, 169.7, 138.3, 134.5, 134.4, 132.9, 129.4, 123.1, 95.2, 80.8, 80.4, 78.9, 78.6, 66.5, 65.2, 59.9, 53.1, 50.7, 48.6, 48.4, 45.8, 38.3, 30.6, 25.9, 20.7, 18.50, 18.46, 18.3, 15.6, 15.5, 15.3, 13.2, 13.03, 12.96, 11.4, 10.6, 7.1, 5.2, -1.33. high resolution mass spectrum (ES+) *m/z* 1001.6334 [$(M+Na)^+$; calcd for $C_{53}H_{98}O_{10}Si_3Na$: 1001.6366].

Preparation of Alcohol (+)-42

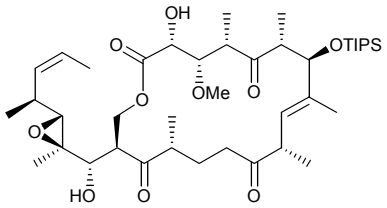


(+)-42

To a Teflon vial containing a solution of TES ether (+)-**41** (4.8 mg, 4.89 μmol) in THF (780 μl) was added a solution of HF•pyr, pyridine (1.2 M, 60 μl) [The HF•pyr, pyridine solution was made by the addition of 7 ml of pyridine to 10 ml of THF, followed by the addition of 1.48 ml of HF•pyr at 0°C]. The reaction was allowed to stir for 15.25 h, and then poured directly into a separatory funnel containing saturated aqueous $NaHCO_3$ (5 ml) and diethyl ether (10 ml). The layers were separated and the aqueous layer was extracted with diethyl ether (2 × 5 ml). The combined organic layers were diluted with heptane (5 ml), dried over $MgSO_4$, filtered, and concentrated in vacuo. Purification via flash chromatography (8→20% ethyl acetate/hexanes) furnished (+)-**42** (4.0 mg, 95% yield) as an oil: $[\alpha]_D^{20}$ +96.9° (*c* 0.13, CH_2Cl_2); IR (film) 3497 (w br), 2946 (s), 2871 (s), 1759 (m), 1712 (s), 1457 (m), 1369 (w), 1250 (m), 1063 (s), 984 (m) cm^{-1}; ^1H NMR (500 MHz, C_6D_6) δ 5.35 (m, 2 H) 5.22 (m, 1 H), 5.09 (d, *J* = 9.0 Hz, 1 H), 4.81 (d, *J* = 6.8 Hz, 1 H), 4.77 (d, *J* = 6.8 Hz, 1 H), 4.54 (d, *J* = 8.7 Hz, 1 H), 4.30 (m, 1 H), 4.20 (app t, *J* = 5.2 Hz, 1 H), 4.16 (dd, *J* = 3.7, 10.4 Hz, 1 H), 4.07 (dd, *J* = 3.4, 8.9 Hz, 1 H), 3.78 (m, 1 H), 3.62 (m, 1 H), 3.40 (s, 3 H), 3.27 (m, 2 H), 3.14 (m, 2 H), 3.00 (m, 1 H), 2.76 (dddd, *J* = 14.1, 7.1, 7.1, 7.1 Hz, 1 H), 2.36 (m, 3 H), 1.76 (s, 3 H), 1.67 (m, 1 H), 1.55 (s, 3 H), 1.54 (d, *J* = 1.9 Hz, 3 H), 1.35 (d, *J* = 4.1 Hz, 3 H), 1.33 (d, *J* = 4.1 Hz, 3 H), 1.29 (d, *J* = 4.1 Hz, 3 H), 1.11 (m, 25 H), 0.97 (m, 6 H), 0.03 (s, 9 H); ^{13}C NMR (125 MHz, C_6D_6) δ 214.0, 213.5, 209.4, 169.7, 138.5, 134.6, 134.3, 132.9, 127.5, 122.8, 95.2, 80.8, 80.3, 78.5, 77.5, 66.4, 65.2, 59.8, 52.3, 50.7, 48.5, 48.0, 45.9, 38.1, 30.6, 26.0, 21.2, 18.50, 18.46, 18.3,

15.6, 15.5, 15.4, 13.1, 13.0, 12.9, 11.5, 10.8, -1.33; high resolution mass spectrum (ES+) *m/z* 887.5474 [$(M+Na)^+$; calcd for $C_{47}H_{84}O_{10}Si_2Na$: 887.5501].

Preparation of Epoxide (+)-44



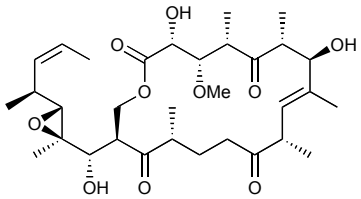
(+)-44

A stock solution of $MgBr_2$ in $Et_2O/MeNO_2$ was created by adding diethyl ether (5.1 ml) to $MgBr_2$ (69 mg). After stirring for 5 to 10 minutes $MeNO_2$ (130 µl) was added. \To a solution of alcohol (+)-**42** (9.7 mg, 0.0112 mmol) in diethyl ether (2.7 ml) was added the stock solution (2.15 ml, 0.157 mmol of $MgBr_2$). The reaction was allowed to stir for 6 h at which time it was diluted with saturated aqueous $NaHCO_3$ (8 ml). The layers were separated and the aqueous layer was extracted with diethyl ether (2 × 10 ml). The combined organic layers were dried over $MgSO_4$, filtered, and concentrated in vacuo. Purification via flash chromatography (15→23% ethyl acetate/hexanes) gave the diol (7.2 mg, 88% yield) as an oil: $[\alpha]_D^{20}$ +58.7° (*c* 0.37, CH_2Cl_2); IR (film) 3499 (br), 2942 (s), 2865 (s), 1747 (m), 1708 (s), 1548 (w), 1372 (w), 1263 (w), 1084 (m), 998 (w), 877 (w) cm^{-1}; ^1H NMR (500 MHz, C_6D_6) δ 5.66 (d, *J* = 9.7 Hz, 1 H) 5.33 (m, 1 H), 5.20 (m, 1 H), 5.00 (d, *J* = 9.0 Hz, 1 H), 4.43 (m, 2 H), 4.04 (dd, *J* = 4.1, 10.8 Hz, 1 H), 3.95 (m, 2 H), 3.78 (dd, *J* = 1.7, 9.3 Hz, 1 H), 3.34 (m, 1 H), 3.26 (m, 1 H) 3.15 (s, 3 H), 3.02 (m, 3 H), 2.80 (m, 1 H), 2.68 (d, *J* = 9.3 Hz, 1 H), 2.30 (m, 3 H), 1.84 (m, 1 H), 1.60 (s, 3 H), 1.54 (s, 3 H), 1.52 (d, *J* = 1.7 Hz, 3 H), 1.26 (d, *J* = 7.1 Hz, 3 H), 1.18 (d, *J* = 4.1 Hz, 1 H), 1.08 (m, 30 H), 0.94 (d, *J* = 6.8 Hz, 3 H); ^{13}C NMR (125 MHz, CD_2Cl_2) δ 215.7, 215.1, 211.4, 172.6, 137.4, 134.85, 134.79, 132.9, 129.1, 122.9, 83.7, 80.5, 77.7, 71.7, 66.1, 61.0, 51.5, 51.4, 48.7, 48.3, 45.4, 37.8, 30.8, 25.2, 21.2, 18.50, 18.46, 16.0, 15.9, 15.4, 14.8, 13.2 (2

carbons), 11.1, 10.7; high resolution mass spectrum (ES+) *m/z* 757.4669 [$(M+Na)^+$; calcd for $C_{41}H_{70}O_9SiNa$: 757.4687].

To a solution of the resulting diol (5.5 mg, 7.48 μmol) in CH_2Cl_2 (2.6 ml) at –30°C was added solid $NaHCO_3$ (35 mg, 0.42 mmol) and *m*-CPBA (0.18 M in CH_2Cl_2, 50 μl). The reaction was allowed to warm to room temperature over 6 h and then stirred at room temperature for 11 h. At this time the reaction mixture was placed at –10°C and an additional aliquot of the *m*-CPBA solution (50 μl) was added. The reaction was brought to room temperature and allowed to stir for 2 h at which time it was quenched by the addition of saturated aqueous $NaHCO_3$ (1 ml) and saturated aqueous Na_2SO_3 (50 μl). The reaction was poured into a separatory funnel containing diethyl ether (15 ml) and saturated aqueous $NaHCO_3$ (8 ml). The layers were separated and the aqueous layer was extracted with diethyl ether (2 × 5 ml). The combined organic layers were dried over $MgSO_4$, filtered, and concentrated in vacuo. Flash chromatography using silica pre-washed [(2% Et_3N/15% ethyl acetate/hexanes for washing) 18→32% ethyl acetate/hexanes] furnished (+)-**44** (2.7 mg, 48% yield) as a white film: $[\alpha]_D^{20}$ +23.5° (*c* 0.17, CH_2Cl_2); IR (film) 3446 (br), 2940 (s), 2867 (m), 1751 (m), 1717 (s), 1456 (m), 1373 (w), 1248 (w), 1085 (m), 883 (w) cm^{-1}; ^1H NMR (500 MHz, CD_3OD) δ 5.47 (m, 1 H) 5.30 (m, 2 H), 4.28 (d, *J* = 9.7 Hz, 1 H), 4.22 (dd, *J* = 4.2, 10.4 Hz, 1 H), 4.00 (app t, *J* =10.4 1 H), 3.68 (d, *J* = 2.0 Hz, 1 H), 3.61 (dd, *J* = 2.0, 9.4 Hz, 1 H), 3.38 (m, 2 H), 3.30 (s, 3 H), 3.15 (d, *J* = 10.1 Hz, 1 H), 3.11 (m, 2 H), 2.81 (m, 1 H), 2.60 (d, *J* = 9.7 Hz, 1 H), 2.47 (m, 1 H), 2.30 (m, 2 H), 1.94 (m, 1 H), 1.65 (d, *J* = 1.2 Hz, 3 H), 1.62 (dd, *J* = 1.8, 6.8 Hz, 3 H), 1.60 (m, 1 H), 1.35 (s, 3 H), 1.29 (d, *J* = 7.1 Hz, 3 H), 1.22 (d, *J* = 7.1 Hz, 3 H), 1.11 (d, *J* = 2.6 Hz, 3 H), 1.09 (d, *J* = 1.5 Hz, 3 H), 1.07 (m, 21 H), 1.01 (d, *J* = 7.1 Hz, 3 H); ^{13}C NMR (125 MHz, CD_3OD) δ 217.4, 215.7, 213.6, 173.5, 138.4, 131.8, 130.1, 126.0, 84.9, 81.7, 77.9, 72.7, 67.5, 65.6, 64.1, 61.2, 53.3, 52.3, 49.5, 49.3, 46.2, 38.6, 32.4, 25.9, 18.81, 18.79, 18.72, 16.2, 16.1, 15.4, 15.0, 14.0, 13.5, 11.4, 11.1; high resolution mass spectrum (ES+) *m/z* 773.4636 [$(M+Na)^+$; calcd for $C_{41}H_{70}O_{10}SiNa$: 773.4636].

Preparation of Synthetic (+)-13-Deoxytedanolide (2)



(+)-13-Deoxytedanolide (2)

(+)-13-Deoxytedanolide (2). To a solution of TIPS protected-13-deoxytedanolide, (+)-**44**, (2.3 mg, 3.06 μmmol) in DMPU [1.25 ml (Acros)] at 0°C was added TBAF (1.0 M in THF, 10 μl, 10μmol) in two portions over 20 minutes. The reaction was then warmed to ambient temperature. After 50 minutes the reaction was quenched with saturated aqueous $NaHCO_3$ (1 ml) and diluted with diethyl ether (15 ml) and H_2O (7 ml). The layers were separated and the aqueous layer extracted with diethyl ether (3 × 10 ml). The combined organic layers were washed with brine (5 ml), dried over $MgSO_4$, filtered, and concentrated. Flash chromatography (20→50% ethyl acetate/hexanes) afforded semi-pure 13-deoxytedanoilide (0.7 mg, 38% yield). Further purification *via* HPLC (45% ethyl acetate/hexanes) afforded (+)-13-deoxytedanolide as a white powder: $[\alpha]_D^{20}$ +46.7° (*c* 0.09, $CHCl_3$), Lit value: +84.4° (*c* 0.26, $CHCl_3$), Authentic Sample +50.0° (*c* 0.11, $CHCl_3$); λ□□□ 289.9; ^{1}H NMR (500 MHz, CD_3OD) δ 5.47 (dq, *J* = 10.9, 6.7 Hz, 1 H), 5.31 (m, 1 H), 5.27 (dq, *J* = 9.7, 1.2 Hz, 1 H), 4.20 (dd, *J* = 10.4, 4.2 Hz, 1 H), 4.02 (dd, *J* = 11.9, 10.6 Hz, 1 H), 3.96 (d, *J* = 10.1 Hz, 1 H); 3.68 (d, *J* = 1.9 Hz, 1 H), 3.61 (dd, *J* = 9.5, 1.9 Hz, 1 H), 3.41 (m, 1 H), 3.35 (m, 1 H), 3.34 (s, 3 H), 3.16 (d, *J* = 10.2 Hz, 1 H), 3.11 (m, 2 H), 2.78 (m, 1 H), 2.60 (d, *J* = 9.3 Hz, 1 H), 2.47 (m, 1 H), 2.30 (m, 2 H), 1.96 (m, 1 H), 1.63 (d, *J* = 1.2 Hz, 3 H) 1.62 (dd, *J* = 6.8, 1.7 Hz, 3 H), 1.58 (m, 1 H), 1.35 (s, 3 H), 1.27 (d, *J* = 7.0 Hz, 3 H), 1.22 (d, *J* = 7.1 Hz, 3 H), 1.12 (d, *J* = 7.1 Hz, 3 H), 1.10 (d, *J* = 6.5 Hz, 3 H), 1.02 (d, *J* = 6.9 Hz, 3 H); ^{13}C NMR (125 MHz, CD_3OD) δ 217.3, 215.6, 213.8, 173.5, 138.4, 131.8, 130.1, 126.0, 85.0, 80.3, 77.7, 72.5, 67.5, 65.7, 64.0, 61.1, 53.3, 51.1, 49.5, 49.3, 46.2, 38.7, 32.4, 26.0, 18.7, 16.2, 15.64, 15.6, 15.0,

13.5, 11.4, 10.5; high resolution mass spectrum (ES+) *m/z* 617.3302 [$(M+Na)^+$; calcd for $C_{32}H_{50}O_{10}Na$: 617.3311].

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