Supporting Methods

Unless stated otherwise, reactions were performed in flame-dried glassware under a nitrogen atmosphere, using freshly distilled solvents. Diethyl ether (Et_2O) and tetrahydrofuran (THF) were distilled from sodium/benzophenone ketyl. Methylene chloride (CH_2Cl_2) and triethylamine (Et_3N) were distilled from calcium hydride. All other commercially obtained reagents were used as received.

Unless stated otherwise, all reactions were magnetically stirred and monitored by TLC using E. Merck silica gel 60 F_{254} precoated plates (0.25 mm). Column or flash chromatography was performed with the indicated solvents by using silica gel (230-400 mesh) purchased from Bodman Chemicals. In general, the chromatography guidelines reported by Still *et al.* (1) were followed.

All melting points were obtained on a Gallenkamp capillary melting point apparatus and are uncorrected. IR spectra were recorded on a Midac M1200 Fourier transform infrared. ^1H and ^{13}C NMR spectra were recorded on a Bruker AM-500, Bruker Avance DPX-500, or Bruker Avance DPX-400 spectrometer. Chemical shifts are reported relative to internal chloroform (^1H, δ 7.26 ppm; ^{13}C, δ 77.0 ppm). High-resolution mass spectra were performed at the University of Illinois Mass Spectrometry Center in Urbana. Single-crystal x-ray analyses were performed by Susan DeGala or Christopher Incarvito of Yale University. HPLC was performed on a Waters 510 solvent delivery system by using a Rainin Instruments Microsorb 80-199-C5 column or a Rainin Instruments Dynamax SD-200 solvent delivery system with a Rainin Instruments Microsorb 80-120-C5 column.

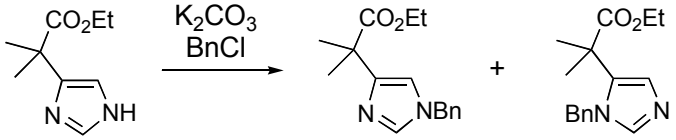
Preparation of Imidazole 8.

To a stirred solution of **10** (90 g, 568.9 mmol, 1.0 equiv.) in CCl_4 (200 ml) at 0°C was added Br_2 (26.4 ml, 512 mmol, 0.9 equiv.) in CCl_4 (75 ml) dropwise over 1 h. The mixture was stirred for and additional 2 h at 0°C and then concentrated *in vacuo*, maintaining the bath temperature below 30°C. Formamide (300 ml) was added and the

solution was heated at 180°C for 4 h. Excess formamide was removed by vacuum distillation (170°C, 3 mm Hg) until solid formation. After cooling to room temperature, the solid was dissolved in a minimum amount of H_2O and the solution was made basic by addition of solid K_2CO_3. The solution was refrigerated for 12 h, allowing crystallization of the product. The crystalline product was filtered and washed with Et_2O (2 × 100 ml) to afford nearly pure **8** (74.6g, 80% yield) as a white solid. Silica gel chromatography (100% EtOAc) provided an analytical sample of **8**.

Imidazole 8. m.p. 94-95°C; Fourier transform infrared (FTIR) (thin film/NaCl) 2988 (m), 2842 (m), 2628 (m), 1718 (s), 1466 (m), 1264 (m), 1173 (m), 1161 (m), 1138 (m), 982 (m), 631 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.59 (d, *J* = 1.0 Hz, 1H), 6.91 (d, *J* = 1.2Hz, 1H), 4.13 (q, *J* = 7.1 Hz, 2H), 1.60 (s, 6H), 1.21 (t, *J* = 7.1 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.2, 134.9, 60.9, 42.3, 25.7, 14.0; high-resolution MS (HRMS) (electron impact ionization) *m/z* 183.1133 [calculated for $C_9H_{14}N_2O_2$ (M^+) 183.1133].

Preparation of Benzyl Imidazoles 46 and 47



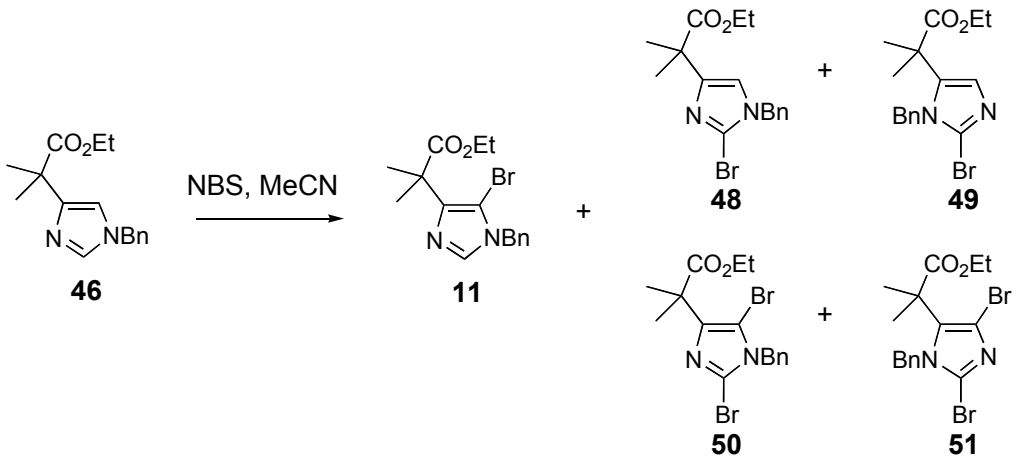
8 **46** **47**

To a stirred solution of **8** (500 mg, 2.74 mmol, 1.0 equiv.) in *N*,*N*,dimethylformamide (DMF) (25 ml) at room temperature was added K_2CO_3 (1.90 g, 13.72 mmol, 5.0 equiv.). The heterogeneous mixture was stirred vigorously for 30 min, at which time benzyl chloride (474 μl, 4.12 mmol, 1.5 equiv.) was added in one portion, and the mixture was heated at 55°C for 12 h. The reaction was filtered through a fritted funnel and the filtrates were washed with EtOAc (2 × 25 ml). The solution was reduced *in vacuo* and chromatographed on silica gel (70% EtOAc/Hexanes) to afford **46** (672 mg, 90% yield) and **47** (67 mg, 9% yield) as white solids.

Benzyl Imidazole 46. m.p. 72-73°C; FTIR (thin film/NaCl) 2978 (m), 2935 (w), 1725 (s), 1498 (m), 1455 (m), 1382 (w), 1361 (w), 1256 (m), 1213 (m), 1146 (s), 1113 (m), 1027 (m), 972 (w), 728 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.45 (d, *J* = 1.4 Hz, 1H) 7.37-7.28 (m, 3H), 7.16-7.13 (m, 2H), 6.75 (d, *J* = 1.4 Hz, 1H), 5.05 (s, 2H), 4.12 (q, *J* = 7.1 Hz, 2H), 1.55 (s, 6H), 1.19 (t, *J* = 7.1 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.1, 146.8, 136.4, 136.1, 128.8, 128.0, 127.2, 114.8, 77.3, 77.0, 76.8, 60.5, 50.7, 43.0, 25.4, 14.0; HRMS (EI) *m/z* 273.1602 [calculated for $C_{16}H_{20}N_2O_2$ (M^+) 273.1603].

Benzyl Imidazole 47. m.p. 90-91°C; FTIR (thin film/NaCl) 2981 (m), 2937 (w), 1725 (s), 1496 (m), 1453 (m), 1387 (w), 1363 (w), 1255 (m), 1147 (m), 1026 (w), 916 (w), 730 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.39-7.27 (m, 4H), 7.04 (d, *J* = 7.4Hz, 2H), 7.00 (s, 1H), 5.06 (s, 2H), 3.88 (q, *J* = 7.2 Hz, 2H), 1.58 (s, 6H), 1.14 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 175.4, 139.5, 136.3, 135.2, 128.8, 129.9, 126.7, 126.4, 61.1, 48.8, 41.2, 26.1, 13.9; HRMS (EI) *m/z* 273.1602 [calculated for $C_{16}H_{20}N_2O_2$ (M^+) 273.1603].

Preparation of Bromoimidazoles 11 and 48-51.



To a stirred solution of **46** (500 mg, 1.84 mmol, 1.0 equiv.) in CH_3CN (20 ml) at 0°C was added *N*-bromosuccinimide (NBS) (327 mg, 1.84 mmol, 1.0 equiv.) in five equal portions over 1 h. The solution was then allowed to warm to room temperature and stirred

for an additional 30 min. After removal of the solvent *in vacuo*, the mixture was dissolved in $CHCl_3$ (50 ml) and washed with water (3 × 20 ml). The organic layer was dried with $MgSO_4$, filtered, and chromatographed on silica gel (30% EtOAc/Hexanes) to afford **11** (498 mg, 77% yield), an inseparable mixture of **48** and **49** (50 mg, 8% yield), and an inseparable mixture of **50** and **51** (48 mg, 7% yield) as white solids.

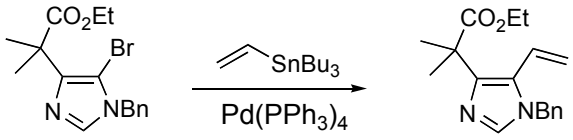
Bromoimidazole 11. m.p. 80-81°C; FTIR (thin film/NaCl) 2980 (m), 2934 (w), 1727 (s), 1486 (m), 1454 (m), 1299 (w), 1254 (m), 1227 (m), 1147 (m), 1028 (w), 996 (w), 733 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.53 (s, 1H), 7.38-7.30 (m, 3H), 7.11 (d, *J* = 7.2 Hz, 2H), 5.11 (s, 2H), 4.16 (q, *J* = 7.2 Hz, 2H), 1.62 (s, 6H), 1.20 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.3, 143.4, 136.4, 135.8, 129.3, 128.6, 127.4, 61.3, 50.0, 43.8, 25.7, 14.6; HRMS (EI) *m/z* 351.0706 [calculated for $C_{16}H_{19}BrN_2O_2$ (M^+) 351.0708].

Bromoimidazoles 48 and 49. m.p. 110-111°C; FTIR (thin film/NaCl) 3142 (w), 2975 (w), 1724 (s), 1473 (w), 1438 (w), 1376 (w), 1259 (m), 1222 (w), 1153 (m), 1108 (w), 1027 (w), 980 (w), 938 (w), 799 (w), 715 (w) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.36-7.30 (m, 6H), 7.18-7.13 (m, 4H), 6.81 (s, 1H), 6.75 (s, 1H), 5.06 (s, 2H), 5.05 (s, 2H), 4.12 (q, *J* = 7.2 Hz, 2H), 4.11 (q, *J* = 7.2 Hz, 2H), 1.52 (s, 6H), 1.51 (s, 6H), 1.20 (t, *J* = 7.2 Hz, 3H), 1.19 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 175.7, 147.2, 145.5, 135.5, 135.4, 128.9, 128.8, 128.2, 128.1, 127.2, 127.1, 118.7, 117.8, 116.6, 60.7, 51.2, 50.1, 43.2, 43.1, 25.3, 25.2, 14.0; HRMS (EI) *m/z* 351.0706 [calculated for $C_{16}H_{19}BrN_2O_2$ (M^+) 351.0708].

Bromoimidazoles 50 and 51. m.p. 89-90°C; FTIR (thin film/NaCl) 2990 (w), 2979 (m), 1729 (s), 1526 (w), 1454 (m), 1381 (m), 1249 (m), 1175 (m), 1138 (m), 1027 (w), 1009 (m), 716 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.37-7.28 (m, 6H), 7.14-7.08 (m, 4H), 5.20 (s, 2H), 5.17 (s, 2H), 4.16 (q, *J* = 7.2 Hz, 2H), 4.15 (q, *J* = 7.2 Hz, 2H), 1.61 (s, 6H), 1.60 (s, 6H), 1.21 (t, *J* = 7.2 Hz, 3H), 1.20 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.0, 144.6, 143.0, 135.3, 135.2, 129.3, 129.2, 128.5, 128.4, 127.1, 127.0,

118.0, 101.4, 100.4, 61.4, 50.4, 49.4, 44.0, 43.9, 25.7, 14.6; HRMS (EI) *m/z* 428.9814 [calculated for $C_{16}H_{18}Br_2N_2O_2$ (M^+) 428.9813].

Preparation of Vinyl Imidazole 52.



11 **52**

To a stirred solution of **11** (5.0 g, 14.23 mmol, 1.0 equiv.) in DMF (100 ml) was added vinyl(tributyl)tin (6.24 ml, 21.35 mmol, 1.5 equiv.) and tetrakis(triphenylphosphine)palladium(0) [$Pd(PPh_3)_4$] (822 mg, 0.71 mmol, 0.05 equiv.). The mixture was heated to 100°C for 4 h, at which time the solvent was removed *in vacuo*. The reaction was then chromatographed on silica gel (40% EtOAc/Hexanes) to afford **52** (4.2 g, 98% yield) as a colorless oil.

Vinylimidazole 52. FTIR (thin film/NaCl) 2980 (m), 2935 (w), 1725 (s), 1632 (w), 1497 (m), 1454 (m), 1381 (w), 1632 (w), 1255 (m), 1138 (m), 1028 (w), 734 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.40 (s, 1H), 7.33-7.23 (m, 3H), 7.00 (d, *J* = 7.2 Hz, 2H), 6.41 (dd, *J* = 12Hz, 18Hz, 1H), 5.21 (dd, *J* = 1 Hz, 12 Hz, 1H), 5.13 (dd, *J* = 1 Hz, 18 Hz, 1H), 5.12 (s, 2H), 4.09 (q, *J* = 7.2 Hz, 2H), 1.60 (s, 6H), 1.15 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.6, 143.5, 136.8, 136.3, 128.7, 127.7, 126.2, 124.9, 124.0, 117.7, 60.5, 48.9, 43.5, 26.1, 14.0; HRMS (EI) *m/z* 299.1759 [calculated for $C_{18}H_{22}N_2O_2$ (M^+) 299.1759].

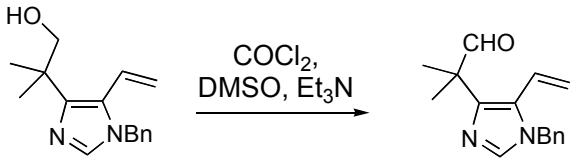
Preparation of Alcohol 12

To a stirred solution of $LiAlH_4$ (789 mg, 20.78 mmol, 2.0 equiv.) in Et_2O (100 ml) at 0°C was added dropwise **52** (3.10 g, 10.39 mmol, 1.0 equiv.) in Et_2O (20 ml). The solution was allowed to warm to room temperature and stirred for 1 h. H_2O (3.1 ml), NaOH (aq., 1N) (6.2 ml), and potassium fluoride (sat., aq.) (9.3 ml) were added dropwise

sequentially. The solution was decanted off and the solid precipitate was washed with EtOAc (5 × 20 ml). The organic layers were combined, dried with $MgSO_4$ and reduced *in vacuo*. The mixture was chromatographed on silica gel (80% EtOAc/Hexanes) to afford **12** (2.02 g, 76% yield) as a white solid.

Alcohol 12. m.p. 67-68°C; FTIR (thin film/NaCl) 3353 (s), 2961 (s), 2926 (m), 2867 (m), 1631 (m), 1497 (s), 1454 (s), 1359 (m), 1243 (m), 1153 (w), 1053 (s), 996 (m), 917 (w), 732 (s) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.37-7.27 (m, 4H), 7.04 (d, *J* = 7.2 Hz, 2H), 6.63 (dd, *J* = 11.7 Hz, 18.1 Hz, 1H), 5.36 (dd, *J* = 1.3 Hz, 11.7 Hz, 1H), 5.21 (dd, *J* = 1.3 Hz, 18.1 Hz, 1H), 5.12 (s, 2H), 4.67 (bs, 1H), 3.69 (s, 2H), 1.30 (s, 6H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 146.6, 136.4, 136.0, 128.8, 127.8, 126.5, 125.3, 125.1, 119.3, 73.1, 48.9, 37.4, 25.3; HRMS (EI) *m/z* 257.1654 [calculated for $C_{16}H_{20}N_2O$ (M^+) 257.1654].

Preparation of Aldehyde 53.



12 **53**

To a solution of oxalyl chloride (664 µl, 7.61 mmol, 1.3 equiv.) in CH_2Cl_2 (60 ml) at -78°C was added DMSO (830 µl, 11.70 mmol, 2.0 equiv.) dropwise. The solution was stirred for 10 min, followed by the addition of **12** (1.5 g, 5.85 mmol, 1.0 equiv.) in CH_2Cl_2 (10 ml) dropwise. Stirring of the solution for another 10 min, was followed by the addition of Et_3N (4.08 ml, 29.25 mmol, 5.0 equiv.). After being allowed to warm to room temperature, H_20 (50 ml) was added. The aqueous layer was extracted with CH_2Cl_2 (3 × 20 ml) and the organic layers were combined and dried with $MgSO_4$. Removed of the solvent *in vacuo* provided an oil that was chromatographed on silica gel (50% EtOAc/Hexanes) to afford **53** (1.40 g, 95% yield) as a colorless oil.

Aldehyde 53. FTIR (thin film/NaCl) 2976 (w), 2931 (w), 1721 (s), 1498 (s), 1454 (m), 1359 (m), 1235 (w), 1143 (w), 989 (w), 733 (s) cm^{-1}; ^{1}H NMR (500 MHz, $CDCl_3$) δ 9.52 (s, 1H), 7.48 (s, 1H), 7.36-7.27 (m, 3H), 7.04 (d, *J* = 7.2 Hz, 2H), 6.38 (dd, *J* = 11.8 Hz, 17.8 Hz, 1H), 5.31 (dd, *J* = 1.0 Hz, 11.8 Hz, 1H), 5.18 (dd, *J* = 1.0 Hz, 17.8 Hz, 1H), 5.14 (s, 2H), 1.48 (s, 6H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 201.9, 140.2, 137.5, 136.1, 129.0, 128.0, 126.7, 126.4, 123.8, 119.7, 49.1, 48.0, 22.0; HRMS (EI) *m/z* 255.1522 [calculated for $C_{16}H_{18}N_2O$ (M^+) 255.1497].

Preparation of Acetylene 13

To a stirred suspension of dry Mg turnings (260 mg, 10.62 mmol, 3.0 equiv.) in Et_2O (100 ml) at room temperature was added propargyl bromide (80 wt. % solution in toluene) (1.18 ml, 10.62 mmol, 3.0 equiv.) and $HgCl_2$ (144 mg, 0.53 mmol, 0.15 equiv.). The suspension was fitted with a reflux condenser and heated with a heat gun to the point of a self-sustaining reflux. After consumption of most of the Mg turnings, the solution was cannulated into a stirred solution of **53** (900 mg, 3.54 mmol, 1.0 equiv.) in Et_2O (35 ml). The reaction was stirred at room temperature for 15 min and then quenched by addition of H_20 (100 ml). The mixture was extracted with EtOAc (3 × 75 ml), washed with brine (50 ml), and dried with $MgSO_4$. The solvent was removed *in vacuo* and the resulting oil was chromatographed on silica gel (50% acetone/hexanes) to afford **13** (930 mg, 89% yield) as a colorless oil.

Acetylene 13. FTIR (thin film/NaCl) 3296 (s), 2970 (m), 2931 (m), 2116 (w), 1631 (w), 1497 (s), 1453 (m), 1359 (m), 1238 (m), 1156 (w), 1068 (s), 995 (m), 932 (w) cm^{-1}; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.40 (s, 1H), 7.38-7.28 (m, 3H), 7.03 (d, *J* = 7.2 Hz, 2H), 6.61 (dd, *J* = 11.4 Hz, 18.0 Hz, 1H), 5.42 (dd, *J* = 1.6 Hz, 11.5 Hz, 1H), 5.22 (dd, *J* = 1.6 Hz, 18.0 Hz, 1H), 5.10 (s, 2H), 3.81 (dd, *J* = 3.1 Hz, 9.2 Hz, 1H), 2.33 (ddd, *J* = 2.7, 9.2 Hz, 12.0 Hz, 1H), 2.30 (ddd, *J* = 2.7 Hz, 9.2 Hz, 12.0 Hz, 1H), 1.98 (t, *J* = 2.7 Hz, 1H), 1.40 (s, 3H), 1.33 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 144.7, 136.6, 136.3, 128.9, 127.9, 126.5, 125.9, 125.8, 120.9, 83.1, 78.9, 69.1, 48.7, 40.3, 26.8, 24.3, 23.0; HRMS (EI) *m/z* 295.1809 [calculated for $C_{19}H_{22}N_2O$ (M^+) 295.1810].

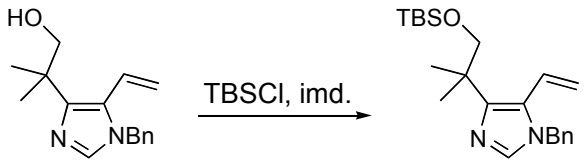
Preparation of Chloride 14 and Olefin 15.

To a stirred solution of **13** (1.0 g, 3.40 mmol, 1.0 equiv.) in CCl_4 (40 ml) and CH_3CN (10 ml) at 75°C was added tri-*n*-butylphosphine [P(*n*-Bu)$_3$] (1.69 ml, 6.60 mmol, 2.0 equiv.) dropwise. The reaction was refluxed for 10 min and cooled to room temperature, and the solvent was removed *in vacuo*. The mixture was chromatographed on silica gel (30% acetone/hexanes) to afford **14** (567 mg, 53% yield) and **15** (258 mg, 27% yield) as colorless oils.

Chloride 14. FTIR (thin film/NaCl) 3296 (m), 2980 (m), 2930 (m), 1633 (w), 1496 (s), 1454 (m), 1385 (w), 1370 (m), 1275 (w), 1215 (m), 1144 (w), 1105 (m), 985 (w), 933 (w), 732 (s) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.4 (s, 1H), 7.36-7.27 (m, 3H), 7.00 (d, *J* = 7.3 Hz, 2H), 6.44 (dd, *J* = 11.7 Hz, 17.7 Hz, 1H), 5.52 (dd, *J* = 1.2 Hz, 17.7 Hz, 1H), 5.29 (dd, *J* = 1.2 Hz, 11.7 Hz, 1H), 5.20 (d, *J* = 16.3 Hz, 1H), 5.16 (d, *J* = 16.3 Hz, 1H), 3.50 (dd, *J* = 3.5 Hz, 11.1 Hz, 1H), 2.99 (m, 2H), 1.82 (t, *J* = 2.5 Hz, 1H), 1.74 (s, 3H), 1.49 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 139.1, 137.5, 136.5, 129.1, 128.9, 127.9, 126.1, 123.5, 118.0, 83.4, 73.9, 68.8, 49.3, 49.0, 32.1, 28.6, 20.7; HRMS (EI) *m/z* 313.1473 [calculated for $C_{19}H_{21}ClN_2$ (M^+) 313.1471].

Olefin 15. FTIR (thin film/NaCl) 3296 (s), 3067 (w), 3030 (w), 2969 (w), 2915 (w), 2116 (w), 1630 (m), 1496 (s), 1453 (m), 1372 (w), 1357 (w), 1301 (w), 1227 (m), 1076 (w), 1029 (w), 984 (w), 894 (s), 732 (s) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.46 (s, 1H), 7.36-7.27 (m, 3H), 7.04 (d, *J* = 7.0 Hz, 2H), 6.44 (dd, *J* = 11.7 Hz, 18.0 Hz, 1H), 5.39 (dd, *J* = 1.3 Hz, 18.0 Hz, 1H), 5.25 (dd, *J* = 1.3 Hz, 11.7 Hz, 1H), 5.15 (s, 2H), 4.94-4.90 (m, 2H), 3.70 (t, *J* = 7.6 Hz, 1H), 2.84 (dd, *J* = 2.5 Hz, 7.6 Hz, 2H), 1.92 (t, *J* = 2.5 Hz, 1H), 1.74 (s, 3H), ; ^{13}C NMR (125 MHz, $CDCl_3$) δ 145.9, 141.2, 137.3, 136.3, 128.9, 127.9, 126.7, 126.3, 123.3, 116.8, 111.6, 83.6, 68.8, 49.0, 44.4, 22.5, 20.6; HRMS (EI) *m/z* 277.1704 [calculated for $C_{19}H_{20}N_2$ (M^+) 277.1704].

Preparation of TBS-Ether 54.



12 **54**

To a stirred solution of alcohol **12** (3.85 g, 15.0 mmol, 1.0 equiv.) in DMF (30 ml) at room temperature was added imidazole (3.06 g, 45.0 mmol, 3.0 equiv.) and tert-butyldimethylsilyl chloride (4.50 g, 30.0 mmol, 1.5 equiv.). The mixture was stirred at room temperature, at which time it was diluted with Et_2O (100 ml) and washed with H_20 (2 × 100 ml). The organic layer was separated, washed with brine (100 ml), and dried with $MgSO_4$. Silica gel chromatography (30% EtOAc/hexanes) afforded **54** (5.46 g, 99% yield) as a pale yellow oil.

TBS-Alcohol 54. FTIR (thin film/NaCl) 3090 (w), 3066 (w), 3032 (w), 2955 (s), 2928 (s), 2896 (m), 2855 (s), 2737 (w), 2709 (w), 1948 (w), 1860 (w), 1808 (w), 1631 (m), 1497 (m), 1471 (m), 1455 (m), 1388 (m), 1360 (m), 1250 (s), 1092 (s), 1005 (m), 994 (m), 938 (m), 915 (m), 836 (s), 776 (s), 731 (m), 697 (m), 668 (w) cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 7.44 (s, 1H), 7.38-7.26 (m, 3H), 7.04 (d, J = 7.0 Hz, 2H), 6.73 (dd, J = 11.6 Hz, 17.9 Hz, 1H), 5.32 (dd, J = 1.4 Hz, 11.5 Hz, 1H), 5.15 (dd, J = 1.3 Hz, 17.9 Hz, 1H), 5.14 (s, 2H), 3.67 (s, 2H), 1.35 (s, 6H), 0.87 (s, 9H), 0.01 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 137.5, 137.0, 129.2, 128.1, 127.0, 126.8, 126.0, 119.0, 72.1, 49.1, 39.1, 26.3, 25.6, 18.7, -5.0; HRMS (EI) *m/z* 371.2518 [calculated for $C_{22}H_{35}N_2OSi$ (M^+) 371.2519].

Preparation of Iodide 16.

To a stirred solution of sodium acetate (NaOAc) (2.30 mg, 28.4 mmol, 3.5 equiv.) in CH_3CN (35 ml) at -20°C was added dropwise iodine monochloride as a 1.0 M solution in CH_2Cl_2 (16.2 ml, 2.0 equiv.). The reaction mixture was stirred at -20°C for 1.5 h at which time vinyl imidazole **54** (3.00 g, 8.10 mmol, 1.0 equiv.) was added. The reaction mixture

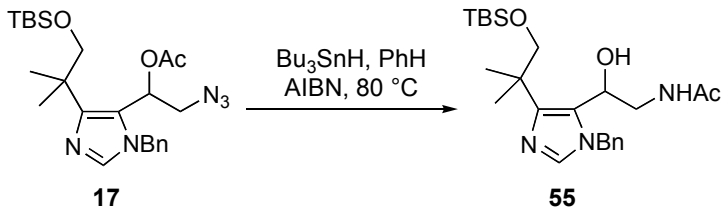
was then allowed to warm to room temperature and stirred for 2 h. The reaction mixture was then washed with $Na_2S_2O_4$ (sat., aq.) (50 ml) and brine (50 ml) and dried with $MgSO_4$. The solvent was removed *in vacuo*, and the resulting oil was chromatographed on silica gel (30% EtOAc/hexanes) to afford **16** (4.50 mg, 99% yield) as a pale yellow foam.

Preparation of Azide 17.

To a stirred solution of iodide **16** (4.50 g, 8.03 mmol, 1.0 equiv.) in DMF (40 ml) was added NaN_3 (5.2 g, 80.0 mmol, 10.0 equiv.). The mixture was stirred at 90°C for 4 h, then cooled to room temperature, diluted with Et_2O (100 ml), and washed with H_20 (2 × 100 ml). The organic layer was then dried with $MgSO_4$ and chromatographed on silica gel (30% EtOAc/hexanes) to afford **17** (3.33 g, 86% yield) as a white foam.

Azide 17. FTIR (thin film/NaCl) 3065 (w), 3032 (w), 2955 (m), 2929 (m), 2857 (m), 2101 (s), 1750 (s), 1662 (w), 1607 (w), 1558 (w), 1499 (m), 1472 (m), 1454 (m), 1371 (m), 1249 (s), 1221 (s), 1089 (s), 1036 (m), 1007 (m), 940 (m), 837 (s), 777 (m), 728 (m) cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 7.44 (s, 1H), 7.39-7.29 (m, 3H), 6.94 (d, J = 6.8 Hz, 2H), 6.58 (dd, J = 3.5 Hz, 9.5 Hz, 1H), 5.35 (q, J = 16.5 Hz, 2H), 3.74 (d, J = 9.5 Hz, 1H), 3.71 (d, J = 9.5 Hz, 1H), 3.53 (dd, J = 9.3 Hz, 13.1 Hz, 1H), 3.26 (dd, J = 3.3 Hz, 13.1 Hz, 1H), 1.70 (s, 3H), 1.40 (s, 3H), 0.88 (s, 9H), 0.05 (s, 3H), 0.03 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.8, 147.3, 138.8, 137.9, 129.4, 128.3, 126.1, 122.1, 72.5, 67.5, 54.4, 50.4, 39.4, 26.4, 26.1, 25.5, 20.6, 18.8, -4.9. -4.9; HRMS (EI) *m/z* 472.2742 [calculated for $C_{24}H_{38}N_5O_3Si$ (M^+) 472.2744].

Preparation of Amide 55.



17 **55**

To a stirred solution of azide **17** (1.40 g, 2.95 mmol, 1.0 equiv.) in PhH (1 ml) was added tributyltin hydride (Bu_3SnH) (1.60 ml, 5.90 mmol, 2.0 equiv.) and 2,2'-azobisisobutyronitrile (AIBN) (70 mg, 0.43 mmol, 0.15 equiv.). The reaction mixture was stirred at reflux for 24 h, at which time the solvent was removed *in vacuo*. Silica gel chromatography of the resulting oil afforded **55** (810 mg, 62% yield) as a white foam.

Amide 55. m.p. 53-55°C; FTIR (thin film/NaCl) 3269 (m), 3066 (w), 3033 (w), 2955 (m), 2928 (m), 2855 (m), 1653 (m), 1558 (m), 1506 (m), 1471 (m), 1456 (m), 1388 (w), 1372 (w), 1361 (m), 1289 (w), 1250 (m), 1156 (w), 1087 (m), 911 (w), 838 (s), 778 (m), 734 (m) cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 7.43 (s, 1H), 7.37-7.29 (m, 3H), 7.08 (d, J = 6.9 Hz, 2H), 5.96 (bt, 1H), 5.41 (d, J = 16.2 Hz, 1H), 5.28 (d, J = 16.4 Hz, 1H), 5.19 (dd, J = 3.5 Hz, 9.8 Hz, 1H), 3.63 (d, J = 9.5 Hz, 1H), 3.60 (d, J = 9.5 Hz, 1H), 3.48 (ddd, J = 3.5 Hz, 7.5 Hz, 14.0 Hz, 1H), 3.26 (ddd, J = 4.3 Hz, 9.8 Hz, 14.0 Hz, 1H), 1.98 (s, 3H), 1.44 (s, 3H), 1.38 (s, 3H), 0.86 (s. 9H), 0.03 (s, 3H), 0.02 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.3, 144.9, 137.5, 137.5, 129.3, 128.3, 127.1, 126.9, 73.2, 66.7, 49.9, 46.3, 38.9, 26.7, 26.4, 26.2, 23.6, 18.9, -5.0, -.5.1; HRMS (EI) *m/z* 446.2839 [calculated for $C_{24}H_{40}N_3O_3Si$ (M^+) 446.2839].

Preparation of Imidazole 18.

To benzimidazole **55** (140 mg, 0.32 mmol, 1.0 equiv.) in a mixture of THF (3 ml) and MeOH (3 ml) was added palladium (10 wt. % on activated carbon) (180 mg). The reaction mixture was then stirred under an atmosphere of hydrogen and monitored by TLC. Upon consumption of the starting material (as indicated by TLC) the reaction mixture was filtered through a celite plug, which was then washed with 10% MeOH/CH_2Cl_2 (50 ml). Removal of the solvent *in vacuo* afforded **18** (110 mg, 98% yield) as a white solid.

Imidazole 18. m.p. 49-52°C; FTIR (thin film/NaCl) 3264 (s), 2955 (s), 2930 (s), 2885 (m), 2857 (s), 2241 (w), 1653 (s), 1559 (m), 1497 (m), 1472 (m), 1464 (m), 1373 (m),

1293 (w), 1256 (m), 1097 (s), 1006 (m), 911 (m), 838 (s), 778 (m), 734 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.70 (bs, 1H), 6.91 (bt, 1H), 5.08 (dd, *J* = 3.9 Hz, 7.6 Hz, 1H), 3.78 (ddd, *J* = 3.9 Hz, 7.1 Hz, 13.7 Hz, 1H), 3.64 (s, 2H), 3.46-3.37 (m, 1H), 2.00 (s, 3H), 1.38 (s, 3H), 1.36 (s, 3H), 0.93 (s, 9H), 0.11 (s, 3H), 0.10 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.6, 134.3, 133.9, 133.2, 73.0, 65.9, 46.6, 37.1, 26.3, 25.8, 25.5, 23.5, 18.6, -5.1, -5.1; HRMS (EI) *m/z* 356.2369 [calculated for $C_{17}H_{34}N_3O_3Si$ (M^+) 356.2369].

Preparation of Enamide 20.

To a stirred solution of amide **18** (10 mg, 0.028 mmol, 1.0 equiv.) in CH_2Cl_2 (2 ml) was added CBr_4 (28 mg, 0.085 mmol, 3.0 equiv.) and polymer-supported PPh_3 (3mmol/g) (20 mg, 2.0 equiv.). The reaction mixture was allowed to stir at room temperature and monitored by TLC. Upon consumption of the starting material (as indicated by TLC) 1,8-diazabicyclo[5.4.0]-undec-7-ene (DBU) (15 μl, 0.09 mmol, 3.0 equiv.) was added and the mixture was stirred an additional 3 h. The reaction was then allowed to cool to room temperature and filtered through a celite plug. The plug was subsequently washed with CH_2Cl_2 (10 ml) and the solvent was removed *in vacuo*. The resulting oil was chromatographed on silica gel (10% MeOH/CH_2Cl_2 + 1% Et_3N) to afford **20** (6 mg, 64% yield) as a colorless oil.

Enamide 20. FTIR (thin film/NaCl) 3232 (m), 3117 (m), 2955 (m), 2929 (m), 2896 (m), 2856 (m), 1652 (s), 1559 (m), 1541 (w), 1496 (m), 1489 (m), 1472 (m), 1436 (m), 1397 (m), 1363 (m), 1281 (m), 1257 (m), 1220 (w), 1096 (m), 1049 (w), 984 (w), 946 (w), 838 (m), 776 (m), 719 (w) cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 11.52 (d, *J* = 9.1 Hz, 1H), 10.07 (s, 1H), 7.50 (s, 1H), 6.93 (dd, *J* = 9.4 Hz, 10.2 Hz, 1H), 5.71 (d, *J* = 9.4 Hz, 1H), 3.64 (s, 2H), 2.16 (s, 3H), 1.35 (s, 6H), 0.95 (s, 9H), 0.12 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.1, 134.3, 132.7, 131.9, 121.2, 100.4, 73.3, 36.8, 26.3, 25.8, 24.2, 18.6, -5.1; HRMS (EI) *m/z* 338.2263 [calculated for $C_{17}H_{32}N_3O_2Si$ (M^+) 338.2264].

Preparation of Acetanilide 7.

To a solution of **13** (600 mg, 2.04 mmol, 1.0 equiv.) in DMF (10 ml) and Et_2NH (10 ml) was added 2-iodotrifluoroacetanilide (963 mg, 3.06 mmol, 1.5 equiv.), dichlorobis(triphenylphosphine)palladium(0) [$Pd(PPh_3)_2Cl_2$] (72 mg, 0.10 mmol, 0.05 equiv.), and CuI (19 mg, 0.10 mmol, 0.05 equiv.). The mixture was stirred at room temperature for 8 h at which time the solvent was removed *in vacuo*. The reaction was then chromatographed on silica gel (20% acetone/hexanes) to afford **7** (934 mg, 1.94 mmol, 95% yield) as a colorless oil.

Acetanilide 7. FTIR (thin film/NaCl) 3350 (m), 2970 (w), 2225 (w), 1730 (s), 1583 (m), 1541 (m), 1497 (m), 1453 (m), 1359 (w), 1286 (m), 1194 (m), 1153 (s), 1069 (w), 900 (w) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 9.10 (bs, 1H), 8.34 (d, *J* = 8.4 Hz, 1H), 7.43-7.31 (m, 6H), 7.13 (dt, *J* = 1.0 Hz, 7.6 Hz, 1H), 7.03 (d, *J* = 6.6 Hz, 1H), 6.61 (dd, *J* = 11.6 Hz, 17.9 Hz, 1H), 5.46 (dd, *J* = 1.3 Hz, 11.6 Hz, 1H), 5.25 (dd, *J* = 1.3 Hz, 17.9 Hz, 1H), 5.07 (q, *J* = 15.9 Hz, 23.8 Hz, 2H), 3.87 (dd, *J* = 3.4 Hz, 9.4 Hz, 1H), 2.72 (dd, *J* = 3.4 Hz, 17.0 Hz, 1H), 2.53 (dd, *J* = 9.4 Hz, 17.0 Hz, 1H), 1.45 (s, 3H), 1.37 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 154.9 (q, *J* = 37.6 Hz), 144.4, 136.8, 136.2, 136.1, 131.3, 129.0, 128.8, 128.0, 126.6, 126.0, 125.6, 125.1, 121.4, 119.6, 115.7 (q, *J* = 289.1 Hz), 114.3, 98.2, 78.9, 48.9, 40.2, 27.3, 24.1, 24.0; HRMS (EI) *m/z* 482.2057 [calculated for $C_{27}H_{26}F_3N_3O_2$ (M^+) 482.2057].

Preparation of Indole 24

To a stirred solution of **7** (10.4 g, 21.6 mmol, 1.0 equiv.) in DMF (75 ml) and ethylene glycol (30 ml) was added Et_2NH (15.0 ml, 205 mmol, 9.5 equiv.) and $Pd(PPh_3)_4$ (1.24 g, 1.08 mmol, 0.05 equiv.). The mixture was heated to 60°C for 12 h and then poured into Et_2O (500 ml). The reaction was washed with H_2O (3 × 200 ml) and brine (200 ml) and dried with $MgSO_4$. The solvent was removed *in vacuo* and the crude mixture was chromatographed on silica gel (40% EtOAc/hexanes) to afford **24** (6.1 g, 73% yield) as a yellow foam.

Indole 24. FTIR (thin film/NaCl) 3274 (s), 2972 (m), 2928 (m), 1723 (m), 1631 (w), 1584 (w), 1548 (w), 1497 (m), 1455 (s), 1358 (w), 1288 (m), 1198 (m), 1156 (s), 1063 (m), 932 (w), 780 (m), 735 (s) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 9.38 (bs, 1H), 7.51 (d *J* = 7.8 Hz, 1H), 7.41 (s, 1H). 7.40-7.29 (m, 5H), 7.10 (t, *J* = 7.2 Hz, 1H), 7.06-7.01 (m, 2H), 6.63 (dd, *J* = 11.6 Hz, 17.9 Hz, 1H), 6.20 (s, 1H), 5.46 (dd, *J* = 1.0 Hz, 11.6 Hz, 1H), 5.25 (dd, *J* = 1.0 Hz, 17.9 Hz, 1H), 5.11 (d, *J* = 16.3 Hz, 1H), 5.07 (d, *J* = 16.3 Hz, 1H), 3.93 (dd, *J* = 1.3 Hz, 10.2 Hz, 1H), 3.01 (dd, *J* = 1.3 Hz, 15.2 Hz, 1H), 2.69 (dd, *J* = 10.2 Hz, 15.2 Hz, 1H), 1.46 (s, 3H), 1.39 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 145.2, 139.1, 136.4, 136.1, 129.0, 128.3, 128.0, 126.6, 126.5, 125.8, 121.2, 120.6, 119.5, 119.1, 110.6, 99.5, 80.8, 50.8, 48.8, 40.15, 30.6, 27.2, 24.1; HRMS (EI) *m/z* 386.2232 [calculated for $C_{25}H_{27}N_3O$ (M^+) 386.2232].

Preparation of Esters 25 and 26 Using Ethyliodoacetate.

To a stirred solution of **24** (500 mg, 1.30 mmol, 1.0 equiv.) in THF (10 ml) at -78°C was added *n*-BuLi (1.6 M) (1.31 ml, 2.1 equiv.) dropwise. The reaction mixture was stirred at -78°C for 45 min at which time ethyl iodoacetate (154 μl, 1.30 mmol, 1 equiv.) was added dropwise. The reaction was warmed to 0°C and allowed to stir for 1 h and then quenched by addition of NH_4Cl (sat. aq.) (10 ml). H_2O (20 ml) was added and the reaction was extracted with EtOAc (3 × 25 ml). The organic layers were combined, washed with brine (50 ml), and dried with $MgSO_4$. Silica gel chromatography (30% EtOAc/hexanes) afforded an inseparable mixture of **25** (98 mg, 16% yield) and **26** (311 mg, 48% yield) as white foams.

Ester 25. FTIR (thin film/NaCl) 3261 (s), 3111 (m), 3061 (m), 2976 (s), 2931 (s), 2873 (m), 2247 (w), 1731 (s), 1634 (m), 1498 (s), 1463 (s), 1359 (m), 1310 (m), 1241 (m), 1161 (s), 1103 (m), 1063 (m), 1031 (m), 996 (m), 910 (m), 736 (s), 697 (m), 648 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 9.46 (bs, 1H), 7.57 (d, *J* = 7.6 Hz, 1H), 7.44 (s, 1H), 7.42-7.27 (m, 4H), 7.19-7.08 (m, 2H), 7.06 (d, *J* = 7.6 Hz, 1H), 6.67 (dd, *J* = 11.4 Hz, 17.8 Hz, 1H), 5.48 (dd, *J* = 1.3 Hz, 11.7 Hz, 1H), 5.28 (dd, *J* = 1.6 Hz, 18.1 Hz, 1H), 5.11 (s, 2H), 4.12 (q, *J* = 7.0 Hz, 2H), 3.98 (d, *J* = 10.5 Hz, 1H), 3.71 (d, *J* = 15.4 Hz, 1H),

3.67 (d, J = 15.4 Hz, 1H), 3.11 (dd, J = 1.4 Hz, 15.4 Hz, 1H), 2.65 (dd, J = 10.5 Hz, 15.1 Hz, 1H), 1.49 (s, 3H), 1.44 (s, 3H), 1.23 (t, J = 7.3 Hz ,3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 172.7, 145.6, 137.0, 136.8, 135.6, 135.5, 129.4, 128.4, 127.0, 126.3, 126.1, 121.5, 121.4, 119.4, 118.4, 111.1, 104.2, 80.8, 61.1, 49.3, 40.6, 31.1, 31.0, 28.6, 27.2, 24.8, 14.7; HRMS (EI) *m/z* 472.2600 [calculated for $C_{29}H_{34}N_3O_3$ (M^+) 472.2600].

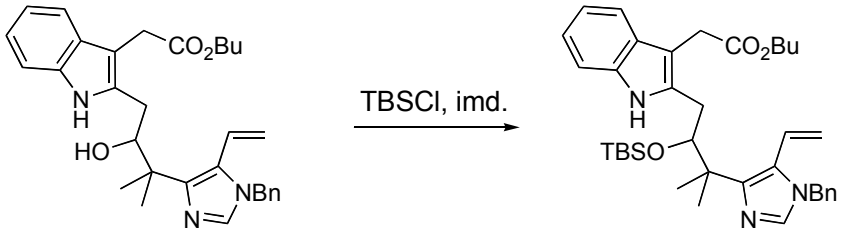
Ester 26. FTIR (thin film/NaCl) 3271 (s), 3058 (m), 2978 (s), 2929 (m), 1732 (s), 1663 (m), 1644 (m), 1550 (w), 1498 (m), 1457 (s), 1358 (w), 1302 (w), 1239 (w), 1184 (s), 1061 (m), 1030 (m), 946 (w), 853 (m), 780 (m), 736 (s) cm^{-1}; ^{1}H NMR (500 MHz, $CDCl_3$) δ 9.51 (bs, 1H), 9.45 (bs, 1H), 7.55 (d, J = 7.5 Hz, 1H), 7.52 (d, J = 7.9 Hz, 1H), 7.46 (s, 1H), 7.44 (s, 1H), 7.38-7.28 (m, 8H), 7.13-7.01 (m, 8H), 6.32 (d, J = 13.0 Hz, 1H), 6.29 (d, J = 13.0 Hz, 1H), 6.20 (s, 1H), 5.37 (d, J = 13.0 Hz, 1H), 5.35 (d, J = 13.0 Hz, 1H), 5.00 (s, 2H), 4.98 (s, 2H), 4.10 (q, J = 7.0 Hz, 2H), 3.92 (m, 2H), 3.80 (m, 4H), 3.70 (d, J = 15.3 Hz, 1H), 3.65 (d, J = 15.3 Hz, 1H), 3.09 (dd J = 1.5 Hz, 15.3 Hz, 1H), 3.00 (dd, J = 1.6 Hz, 15.1 Hz, 1H), 2.67 (dd, J = 10.3 Hz, 15.2 Hz, 1H), 2.61 (dd, J = 10.3 Hz, 15.2 Hz, 1H), 1.46 (s, 3H), 1.45 (s, 3H), 1.40 (s, 3H), 1.37 (s, 3H), 1.31 (t, J = 7.0 Hz, 3H), 1.30 (t, J = 7.0 Hz, 3H), 1.21 (t, J = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 172.2, 153.0, 152.9, 145.0, 144.9, 136.7, 136.6, 136.2, 136.1, 135.2, 135.1, 135.0, 128.9, 128.3, 128.0, 127.9, 126.7, 126.6, 122.9, 122.8, 120.9, 120.6, 119.4, 119.1, 118.9, 117.9, 110.7, 110.6, 103.7, 99.4, 92.4, 80.8, 80.5, 65.5, 65.4, 60.6, 48.4, 48.4, 40.1, 40.1, 30.6, 30.5, 28.2, 27.4, 27.1, 24.5, 24.3, 14.7, 14.2; HRMS (EI) *m/z* 472.2600 [calculated for $C_{29}H_{34}N_3O_3$ (M^+) 472.2600].

Preparation of Ester 26 Using Butyliodoacetate.

To a stirred solution of **24** (75 mg, .195 mmol, 1.0 equiv.) in THF (5 ml) at -78°C was added *n*-BuLi (1.6M) (250 µl, 2.05 equiv.) dropwise. The reaction mixture was stirred at -78°C for 45 min at which time *n*-butyl iodoacetate (28 µl, .195 mmol, 1.0 equiv.) was added dropwise. The reaction was warmed to 0°C and allowed to stir for 1 h and then quenched by addition of NH_4Cl (sat. aq.) (5 ml). H_2O (10 ml) was added and the reaction was extracted with EtOAc (3 × 25 ml). The organic layers were combined, washed with

brine (25 ml), and dried with $MgSO_4$. Silica gel chromatography (30% EtOAc/hexanes) afforded **26** (87 mg, 89% yield) as a white foam.

Preparation of TBS-Ether 56.



26 **56**

To a stirred solution of alcohol **26** (3.55 g, 6.50 mmol, 1.0 equiv.) in DMF (40 ml) at room temperature was added imidazole (1.60 g, 23.0 mmol, 3.5 equiv.) and TBSCl (1.50 g, 9.70 mmol, 1.5 equiv.). The mixture was stirred for 24 h, at which time it was diluted with Et_2O (100 ml) and washed with H_20 (2 × 100 ml). The organic layer was separated, washed with brine (100 ml), and dried with $MgSO_4$. Silica gel chromatography (50% EtOAc/hexanes) afforded **56** (3.94 g, 91% yield) as a colorless, viscous oil.

TBS-Ether 56. FTIR (thin film/NaCl) 3377 (m), 3197 (m), 3089 (m), 3059 (m). 3032 (m), 2957 (s), 2930 (s), 2895 (m), 2856 (m), 1731 (s), 1630 (s), 1497 (m), 1463 (s), 1382 (m), 1359 (m), 1306 (m), 1251 (s), 1160 (s), 1076 (s), 1040 (m), 1005 (m), 995 (m), 928 (m), 836 (s), 810 (m), 776 (s), 736 (s), 697 (m), 668 (m) cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 9.11 (s, 1H), 7.55 (d, *J* = 7.6 Hz, 1H), 7.47 (s, 1H), 7.36-7.24 (m, 4H), 7.15-7.01 (m, 4H), 6.70 (dd, *J* = 11.6 Hz, 17.9 Hz, 1H), 5.39 (dd, *J* = 1.5 Hz, 11.6 Hz, 1H), 5.19 (dd, *J* = 1.5 Hz, 17.9 Hz, 1H), 5.02 (s, 2H), 4.68 (dd, *J* = 4.0 Hz, 5.3 Hz, 1H), 4.08 (t, *J* = 6.7 Hz, 2H), 3.68 (d, *J* = 15.3 Hz, 1H), 3.58 (d, *J* = 15.3 Hz, 1H), 2.94 (dd, *J* = 4.0 Hz, 15.5 Hz, 1H), 2.87 (dd, *J* = 5.5 Hz, 15.5 Hz, 1H), 1.60 (q, *J* = 6.9 Hz, 2H), 1.42-1.29 (m, 2H), 1.40 (s, 3H), 1.36 (s, 3H), 0.99 (s, 9H), 0.91 (t, *J* = 7.4 Hz, 3H), 0.05 (s, 3H), -0.26 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 172.3, 146.6, 137.2, 137.0, 136.5, 135.8, 129.3, 128.9, 128.2, 127.1, 126.8, 126.4, 121.3, 120.0, 119.3, 118.7, 110.6, 105.1, 79.2,

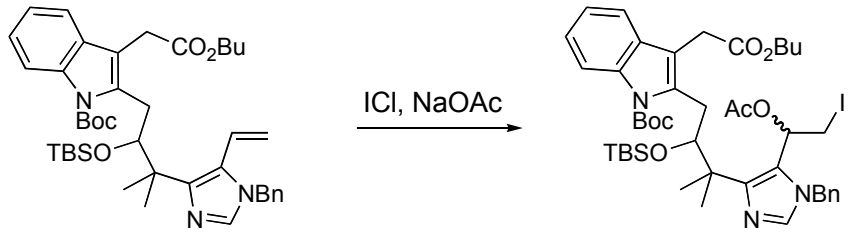
64.7, 49.2, 42.8, 31.9, 31.1, 28.9, 28.5, 21.3, 19.4, 18.5, 13.9, -4.1, -4.3; HRMS (EI) *m/z* 614.3780 [calculated for $C_{37}H_{53}N_3O_3Si$ (M^+) 614.3778].

Preparation of Boc-Indole 27.

To a stirred solution of **56** (3.94 g, 5.93 mmol, 1.0 equiv.) in CH_2Cl_2 (100 ml) at room temperature was added Et_3N (4.13 ml, 29.7 mmol, 5.0 equiv.) and 4-(dimethylamino)-pyridine (DMAP) (724 mg, 29.7 mmol, 5.0 equiv.) followed by di-*t*-butyl dicarbonate (6.48 g, 2.88 mmol, 10 equiv.). The solution was heated to reflux and stirred for 24 h, at which time the reaction was poured into H_2O (100 ml) and extracted with CH_2Cl_2 (3 × 50 ml). The organic layers were combined, washed with brine (100 ml), and dried with $MgSO_4$. The resulting oil was chromatographed on silica gel (30% EtOAc/Hexanes) to afford **27** (3.67 g, 85% yield) as a colorless oil.

Boc-Indole 27. FTIR (thin film/NaCl) 2958 (m), 2931 (m), 2855 (m), 1733 (s), 1628 (w), 1607 (w), 1577 (w), 1497 (w), 1456 (m), 1359 (m), 1324 (m), 1253 (m), 1157 (m), 1136 (m), 1117 (m), 1077 (m), 1005 (w), 990 (w), 913 (w), 837 (m), 807 (w), 774 (m), 732 (m), 696 (w) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.98-7.93 (m, 1H), 7.46-7.41 (m, 6H), 7.34-7.16 (m, 6H), 7.02 (d, *J* = 7.6 Hz, 2H), 6.80 (dd, *J* = 11.7 Hz, 17.7 Hz, 1H), 5.29 (d, *J* = 11.7 Hz, 1H), 5.12 (d, *J* = 17.7 Hz, 1H), 4.86-4.70 (m, 2H), 4.65 (dd, *J* = 4.6 Hz, 8.1 Hz, 1H), 4.08 (t, *J* = 6.6 Hz, 2H), 3.73 (d, *J* = 16.2 Hz, 1H), 3.68 (d, *J* = 16.2 Hz, 1H), 3.38 (dd, *J* = 8.1 Hz, 14.7 Hz, 1H), 3.17 (dd, *J* = 5.1 Hz, 14.7 Hz, 1H), 1.72 (s, 9H), 1.63-1.56 (m, 2H), 1.53 (s, 3H), 1.46 (s, 3H), 1.39-1.31 (m, 2H), 0.91 (t, *J* = 7.1 Hz, 3H), 0.86 (s, 9H), -0.04 (s, 3H), -0.52 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 171.6, 150.8, 146.8, 137.9, 136.8, 136.0, 130.4, 129.1, 128.0, 127.1, 127.0, 125.7, 123.5, 122.6, 118.4, 117.8, 115.8, 114.1, 83.7, 78.0, 64.9, 49.0, 42.5, 31.4, 31.1, 31.0, 28.7, 27.8, 26.7, 22.1, 19.4, 18.5, 13.8, -4.3; HRMS (EI) *m/z* 714.4303 [calculated for $C_{42}H_{60}N_3O_5Si$ (M^+) 714.4302].

Preparation of Iodide 57.



27 **57**

To a stirred solution of sodium acetate (NaOAc) (385 mg, 4.68 mmol, 3.0 equiv.) in CH_3CN (15 ml) at -20°C was added dropwise iodine monochloride as a 1.0 M solution in CH_2Cl_2 (2.75 ml, 1.75 equiv.). The reaction mixture was stirred at -20°C for 1.5 h at which time vinyl imidazole **27** (1.07 g, 1.56 mmol, 1.0 equiv.) was added. The reaction mixture was then allowed to warm to room temperature and stirred for 2 h. The reaction mixture was then washed with $Na_2S_2O_4$ (sat., aq.) (25 ml) and brine (25 ml) and dried with $MgSO_4$. The solvent was removed *in vacuo* and the resulting oil was chromatographed on silica gel (50% EtOAc/hexanes) to afford **57** (1.30 g, 93% yield) as a white foam.

Iodide 57. FTIR (thin film/NaCl) 3583 (w), 2957 (m), 2930 (m), 2855 (w), 1734 (s), 1456 (m), 1369 (m), 1324 (w), 1229 (m), 1157 (m), 1137 (w), 1116 (w), 1078 (w), 947 (w), 920 (w), 837 (m), 807 (w), 775 (w), 729 (w) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.98 (d, J = 7.7 Hz, 1H), 7.45 (d, J = 7.2 Hz, 1H), 7.41-7.26 (m, 5H), 7.24-7.16 (m, 2H), 7.08-7.00 (m, 2H), 6.73 (dd, J = 3.3 Hz, 10.5 Hz, 0.3H), 6.68 (dd, J = 3.3 Hz, 10.5 Hz, 0.7H), 5.30-5.17 (m, 2H), 4.72 (d, J = 10.5 Hz, 0.7H), 4.66 (d, J = 10.5 Hz, 0.3H), 4.17-4.02 (m, 2H), 3.85-3.70 (m, 2H), 3.61-3.37 (m, 2H), 3.31 (dd, J = 4.4 Hz, 11.1 Hz, 1H), 3.03-2.92 (m, 1H), 1.88 (s, 2H), 1.82 (s, 1H), 1.73 (s, 9H), 1.65-1.55 (m, 5H), 1.54-1.45 (m, 3H), 1.39-1.30 (m, 2H), 0.91 (t, J = 7.2 Hz, 3H), 0.83 (s, 9H), -0.01 (s, 1H), -0.02 (s, 2H), -0.71 (s, 2H), -0.74 (s, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 171.5, 169.3, 169.1, 150.9, 150.8, 148.2, 147.9, 138.6, 138.6, 137.9, 137.7, 137.5, 137.3, 136.4, 136.2, 130.4, 130.2, 129.4, 129.4, 129.4, 128.3, 128.2, 126.7, 126.6, 123.6, 123.1, 123.0, 122.6, 122.5, 118.4, 115.8, 115.7, 114.7, 114.2, 83.9, 83.9, 78.8, 78.6, 68.3, 68.0, 64.8, 50.3, 43.3, 43.1, 31.1, 31.1, 31.0, 31.0, 30.3, 30.3, 28.8, 28.8, 28.7, 28.4, 28.3, 26.8 26.7, 26.6, 21.5, 20.6,

20.5, 19.4, 18.6, 18.5, 13.8, 5.8, 5.3, -3.9, -3.9, -4.6, -4.6; HRMS (EI) *m/z* 900.3477 [calculated for $C_{47}H_{61}N_6O_4I$ (M^+) 900.3799].

Preparation of Azide 28

To a stirred solution of iodide **57** (4.23 mg, 4.70 mmol, 1.0 equiv.) in DMF (80 ml) was added NaN_3 (3.4 g, 50.0 mmol, 10.0 equiv.). The mixture was stirred at 90°C for 4 h, then cooled to room temperature, diluted with Et_2O (200 ml), and washed with H_20 (2 × 200 ml). The organic layer was then dried with $MgSO_4$ and chromatographed on silica gel (50% EtOAc/hexanes) to afford **28** (3.77 g, 98% yield) as a colorless oil.

Azides 28. FTIR (thin film/NaCl) 2959 (s), 2931 (s), 2885 (m) ,2856 (m), 2101 (s), 1735 (s), 1499 (m), 1456 (s), 1369 (s), 1325 (s), 1252 (s), 1227 (s), 1158 (s), 1137 (s), 1117 (s), 1080 (s), 1030 (m), 981 (m), 940 (m), 838 (s), 807 (m), 756 (s), 695 (w), 667 (w), 632 (w) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 8.0-7.95 (m, 1H), 7.48-7.43 (m, 1H), 7.42 (s, 1H), 7.39-7.26 (m, 4H), 7.25-7.17 (m, 2H), 7.08-7.01 (m, 2H), 6.75-6.66 (m, 1H), 5.39-5.23 (m, 3H), 4.69 (dd, *J* = 3.9 Hz, 10.5 Hz, 1H), 4.14-4.03 (m, 2H), 3.85-3.70 (m, 2H), 3.63-3.46 (m, 2H), 3.38 (dd, *J* = 3.9 Hz, 13.2 Hz, 1H), 3.03-2.94 (m, 1H), 1.85 (s, 2H), 1.81 (s, 1H), 1.72 (s, 9H), 1.65-1.54 (m, 5H), 1.50 (s, 3H), 1.39-1.31 (m, 2H), 0.91 (t, *J* = 7.2 Hz, 3H), 0.83 (s, 9H), -0.02 (s, 2H), -0.03 (s, 1H), -0.71 (s, 2H), -0.73 (s, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 171.5, 169.4, 169.2, 150.9, 150.8, 148.1, 138.9, 138.8, 137.9, 137.7, 137.7, 137.7, 136.4, 136.2, 130.4, 130.2, 129.4, 129.4, 128.3, 128.2, 126.7, 126.6, 126.6, 123.6, 123.6, 122.6, 122.6, 122.2, 118.4, 118.4, 115.8, 115.7, 114.7, 114.3, 83.7, 83.6, 78.8, 78.5, 67.2, 64.8, 54.5, 50.5, 43.3, 43.1, 31.1, 31.0, 31.0, 30.4, 30.3, 28.8, 28.7, 28.6, 26.8, 26.7, 21.8, 20.6, 20.5, 19.4, 18.6, 18.5, 13.8, -4.0, -4.0, -4.6; HRMS (EI) *m/z* 815.4530 [calculated for $C_{44}H_{63}N_6O_7Si$ (M^+) 815.44].

Preparation of Acid 29.

To a solution of **28** (550 mg, 0.675 mmol, 1.0 equiv.) in THF (15 ml) and H_2O (15 ml) was added LiOH (800 mg, 19.0 mmol, 28 equiv.). The reaction mixture was heated and

stirred at reflux. After 3 days the reaction was cooled, diluted with THF (50 ml), washed with NH_4Cl (sat. aq.) (50 ml) and brine (50 ml), and dried with $MgSO_4$. Removal of the solvent *in vacuo* afforded **29** (410 mg, 99% yield) as a pale yellow solid that was used crude in all further reactions.

Preparation of Lactone 30.

To a solution of acid **29** (700 mg, 0.95 mmol, 1.0 equiv.) in THF (15 ml) and Et_3N (415 ml, 3.0 mmol, 3.0 equiv.) at 0°C was added trichloro acetylchloride (238 ml, 1.50 mmol, 1.5 equiv.). The reaction mixture was allowed to stir at 0°C for 1 h at which time the ice bath was removed ,and the reaction mixture was cannulated into a solution of DMAP (50 mg, 0.41 mmol, 0.4 equiv.) in refluxing PhH (10 ml). After 1 h of heating the reaction was cooled to room temperature and the solvent was removed *in vacuo*. The resulting oil was diluted with Et_2O (50 ml), washed with NH_4Cl (25 ml), $NaHCO_3$ (25 ml), and brine (25 ml), and dried with $MgSO_4$. The solvent was removed *in vacuo* once again and the resulting oil was chromatographed on silica gel to afford **217** (500 mg, 74% yield) as a clear solid.

Lactone 30. m.p. 193-196°C; FTIR (thin film/NaCl) 3438 (s), 3059 (w), 3029 (w), 2954 (m), 2930 (m), 2898 (m), 2857 (m), 2102 (s), 1731 (s), 1620 (w), 1582 (w), 1562 (w), 1530 (w), 1463 (m), 1255 (m), 1228 (m), 1175 (m), 1063 (m), 1000 (m), 935 (m), 917 (w), 864 (w), 832 (m), 778 (m), 736 (m) cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 9.62 (s, 1H), 7.64 (s, 1H), 7.47 (d, J = 7.5 Hz, 1H), 7.45-7.33 (m, 3H), 7.30 (d, J = 7.5 Hz, 1H), 7.22-7.08 (m, 4H), 5.83 (dd, J = 3.1 Hz, 10.3 Hz, 1H), 5.37 (s, 2H), 4.42 (d, J = 5.6 Hz, 1H), 4.05 (d, J = 17.8 Hz, 1H), 3.63-3.52 (m, 2H), 2.81 (dd, J = 5.9 Hz, 16.3 Hz, 1H), 1.43 (s, 3H), 1.17 (s, 9H), 0.97 (s, 3H), 0.37 (s, 3H), 0.26 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 172.9, 137.2, 136.2, 135.9, 135.1, 129.7, 129.1, 128.0, 127.6, 123.5, 121.5, 119.6, 117.5, 110.8, 103.8, 79.7, 67.6, 52.8, 50.5, 43.8, 30.7, 30.6, 28.2, 26.7, 20.4, 18.8, -3.3, -4.2; HRMS (EI) *m/z* 599.3166 [calculated for $C_{33}H_{43}N_6O_3Si$ (M^+) 599.3166].

Preparation of Alcohol 31.

To a stirred solution of lactone **30** (150 mg, .25 mmol, 1.0 equiv.) in THF (5 ml) at 0°C was added tetrabutylammonium fluoride (TBAF) (1.0 M) (315 µl, 1.25 equiv.). The reaction mixture was allowed to stir at 0°C and monitored by TLC. Upon consumption of the starting material (as indicated by TLC) the solvent was removed *in vacuo*. The resulting oil was then chromatographed on silica gel to afford **31** (89 mg, 73% yield) as a white solid.

Alcohol 31. FTIR (thin film/NaCl) 3412 (m), 3059 (w), 3030 (w), 2973 (m), 2932 (m), 2103 (s), 1729 (s), 1506 (m), 1498 (m), 1483 (m), 1463 (m), 1393 (w), 1354 (m), 1341 (m), 1260 (m), 1226 (m), 1175 (m), 1131 (m), 1064 (m), 1042 (m), 997 (m), 947 (w), 909 (m), 832 (w), 736 (s), 648 (m) cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.63 (s, 1H), 7.66 (s, 1H), 7.48 (d, *J* = 7.7 Hz, 1H), 7.45-7.32 (m, 4H), 7.24-7.08 (m, 4H), 5.85 (dd, *J* = 2.5 Hz, 10.2, Hz, 1H), 5.37 (s, 2H), 4.44 (bs, 1H), 4.07 (d, *J* = 17.5 Hz, 1H), 3.60 (d, *J* = 17.5 Hz, 1H), 3.58 (d, *J* = 10.2 Hz, 1H), 3.34 (bs, 1H), 2.95 (dd, *J* = 5.7 Hz, 16.1 Hz, 1H), 2.35 (d, *J* = 12.3 Hz, 1H), 2.28 (d, *J* = 15.9 Hz, 1H), 1.51 (s, 3H), 1.03 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 172.9, 137.2, 135.9, 135.7, 135.2, 129.7, 129.2, 128.0, 127.7, 123.6, 121.5, 119.5, 117.4, 111.1, 103.5, 78.8, 67.6, 52.9, 50.6, 43.1, 30.9, 29.7, 27.7, 19.9; HRMS (EI) *m/z* 485.2303 [calculated for $C_{27}H_{29}N_6O_3$ (M^+) 485.2301].

Preparation of Diol 32.

To a stirred solution of azide **31** (35 mg, 0.074 mmol, 1.0 equiv.) in PhH (1 ml) was added tributyltin hydride (Bu_3SnH) (45 ml, 0.17 mmol, 2.25 equiv.) and 2,2'-azobisisobutyronitrile (AIBN) (10 mg, 0.061 mmol, 0.82 equiv.). The reaction mixture was stirred at reflux for 24 h, at which time the solvent was removed *in vacuo*. Silica gel chromatography of the resulting oil afforded **32** (18 mg, 55% yield) as a white foam.

Lactam 32. FTIR (thin film/NaCl) 3408 (w), 2726 (w), 1541 (w), 1461 (s), 1308 (w), 1270 (w), 1154 (w), 1075 (w), 1043 (w), 722 (w) cm^{-1}; ^{1}H NMR (400 MHz, CD_3OD) δ 8.13 (d, *J* = 10.0 Hz, 1H), 7.45-7.34 (m, 5H), 7.35 (d, *J* = 7.7 Hz, 1H), 7.30 (d, *J* = 7.7

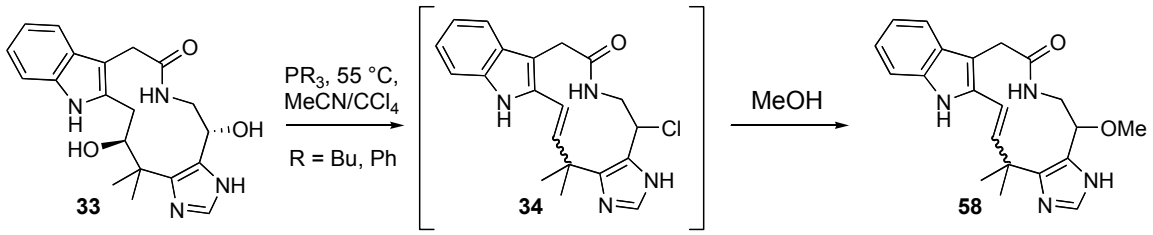
Hz, 1H), 7.15 (s, 1H), 7.06 (dt, *J* = 1.0 Hz, 7.1 Hz, 1H), 7.00 (dt, *J* = 1.0 Hz, 7.1 Hz, 1H), 5.91 (dd, *J* = 6.4 Hz, 11.2 Hz, 1H), 5.72 (d, *J* = 14.2 Hz, 1H), 5.35 (d, *J* = 14.2 Hz, 1H), 4.45-4.34 (m, 1H), 4.14 (dd, *J* = 5.8 Hz, 10.3 Hz, 1H), 3.62 (d, *J* = 18.2 Hz, 1H), 3.33 (quint., *J* = 1.6 Hz, 1H), 3.14 (d, *J* = 18.2 Hz, 1H), 3.09 (dd, *J* = 6.5 Hz, 13.0 Hz, 1H), 2.99 (dd, *J* = 6.0 Hz, 14.6 Hz, 1H), 2.40 (dd, *J* = 10.1 Hz, 14.6 Hz, 1H), 1.48 (s, 3H), 1.46 (s, 3H); ^{13}C NMR (125 MHz, CD_3OD) δ 172.9, 143.3, 137.0, 136.6, 136.5, 136.3, 129.0, 128.9, 128.5, 128.5, 128.2, 121.0, 118.9, 116.9, 110.6, 104.5, 76.0, 63.7, 50.5, 42.8, 42.6, 31.0, 28.3, 26.4; HRMS (EI) *m/z* 459.2395 [calculated for $C_{27}H_{31}N_4O_3$ (M^+) 459.2396].

Preparation of Imidazole 33

To benzimidazole **32** (56 mg, 0.12 mmol, 1.0 equiv.) in a mixture of THF (2 ml) and MeOH (2 ml) was added palladium (10 wt. % on activated carbon) (100 mg). The reaction mixture was then stirred under an atmosphere of hydrogen and monitored by TLC. Upon consumption of the starting material (as indicated by TLC) the reaction mixture was filtered through a celite plug, which was then washed with 10% MeOH/CH_2Cl_2 (50 ml). Removal of the solvent *in vacuo*, afforded **33** (35 mg, 77% yield) as a white solid.

Imidazole 33. FTIR (thin film/NaCl) 3397 (w), 3261 (w), 2922 (w), 1632 (m), 1544 (m), 1462 (m), 1345 (w), 1290 (w), 1259 (w), 1077 (w), 1016 (w), 923 (w), 759 (w) cm^{-1}; ^{1}H NMR (400 MHz, CD_3OD) δ 7.95 (s, 1H), 7.34 (d, *J* = 7.9 Hz, 1H), 7.30 (d, *J* = 7.9 Hz, 1H), 7.05 (t, *J* = 7.5 Hz, 1H), 6.98 (t, *J* = 7.5 Hz, 1H), 5.62 (dd, *J* = 5.3 Hz, 10.6 Hz, 1H), 4.14 (dd, *J* = 5.3 Hz, 10.1 Hz, 1H), 4.07 (t, *J* = 11.9 Hz, 1H), 3.57 (d, *J* = 18.1 Hz, 1H), 3.33 (quint., *J* = 1.7 Hz, 1H), 3.16 (dd, *J* = 5.6 Hz, 12.5 Hz, 1H), 3.15 (d, *J* = 18.1 Hz, 1H), 2.99 (dd, *J* = 5.6 Hz, 14.7 Hz, 1H), 2.30 (dd, *J* = 10.3 Hz, 14.7 Hz, 1H), 1.52 (s, 3H), 1.44 (s, 3H); ^{13}C NMR (125 MHz, CD_3OD) δ 171.4, 135.6, 134.9, 133.9, 132.1, 130.1, 126.9, 119.4, 117.3, 115.4, 108.9, 103.0, 74.3, 61.9, 42.6, 40.2, 29.4, 26.8, 24.7, 23.6; HRMS (EI) *m/z* 369.1926 [calculated for $C_{20}H_{25}N_4O_3$ (M^+) 369.1927].

Preparation of Imidazole 58.



To a stirred solution of amide **33** (32 mg, 0.028 mmol, 1.0 equiv.) in CCl_4 (2 ml) and MeCN (2 ml) polymer supported PPh_3 (3mmol/g) (130 mg, 3.0 equiv.). The reaction mixture was allowed to stir at reflux and monitored by TLC. Upon consumption of the starting material (as indicated by TLC), the reaction was allowed to cool to room temperature and filtered through a celite plug. The plug was subsequently washed with 10% MeOH/CH_2Cl_2 (10 ml) and the solvent was removed *in vacuo*. The resulting oil was chromatographed on silica gel (10% MeOH/CH_2Cl_2) to afford **58** (21 mg, 68% yield) as a white solid.

Methyl Ether 58. FTIR (thin film/NaCl) 3446 (m), 2954 (m), 2929 (m), 2856 (m), 1653 (s), 1559 (m), 1540 (m), 1258 (w), 1199 (w), 1108 (m), 1101 (w), 921 (w), 835 (m), 780 (w), 744 (w) cm^{-1}; ^1H NMR (500 MHz, CD_3OD) δ 8.05 (bt, 1H), 7.61 (s, 1H), 7.35 (d, *J* = 8.1 Hz, 1H), 7.17 (d, *J* = 8.1 Hz, 1H), 6.96 (dt, *J* = 1.0 Hz, 8.1 Hz, 1H), 6.88 (dt, 0.9 Hz, 7.9 Hz, 1H), 6.31 (d, *J* = 16.1 Hz, 1H), 6.10 (d, *J* = 16.1 Hz, 1H), 4.44 (dd, *J* = 4.2 Hz, 10.5 Hz, 1H), 3.93-3.86 (m, 1H), 3.60 (d, *J* = 15.7 Hz, 1H), 3.43-3.33 (m, 2H), 3.26-3.08 (m, 5H), 1.49 (s, 3H), 1.45 (s, 3H); ^{13}C NMR (125 MHz, CD_3OD) δ 174.4, 140.8, 136.3, 134.1, 133.2, 129.6, 121.7, 119.0, 118.0, 117.5, 110.7, 106.9, 72.6, 55.5, 42.6, 38.1, 31.4, 29.7, 29.0, 28.7; HRMS (EI) *m/z* 365.1977 [calculated for $C_{21}H_{25}N_4O_2$ (M^+) 365.1978].

Preparation of Chloride 39.

To a stirred solution of **37** (see refs. 2 and 3) (1.0 g, 3.40 mmol, 1.0 equiv.) in CCl_4 (40 ml) was added triphenylphosphine (PPh_3) (1.69 ml, 6.60 mmol, 2.0 equiv.). The reaction was heated to 75°C and monitored by TLC. Upon consumption of starting material (as

indicated by TLC) the reaction was cooled to room temperature and the solvent was removed *in vacuo*. The mixture was chromatographed on silica gel (4% MeOH/CH_2Cl_2) to afford **39** (567 mg, 53% yield) as a colorless oil.

Chloride 39. FTIR (thin film/NaCl) 3154 (m), 3109 (m), 3062 (m), 3034 (m), 2965 (s), 2929 (s), 2870 (m), 2247 (w), 1588 (w), 1497 (m), 1460 (s), 1363 (m), 1319 (w), 1298 (m), 1245 (w), 1206 (m), 1155 (w), 1127 (s), 1059 (s), 1029 (s), 972 (w), 910 (m), 870 (w), 734 (s), 663 (m), 648 (m) cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 8.84 (bs, 1H), 7.68 (s, 1H), 7.59 (d, *J* = 7.6 Hz, 1H), 7.38-7.27 (m, 4H), 7.24-7.11 (m, 4H), 5.44, (s, 1H), 5.24 (d, *J* = 15.5 Hz, 1H), 5.19 (d, *J* = 15.5 Hz, 1H), 3.88-3.76 (m, 2H), 3.81 (s, 2H), 3.74-3.66 (m, 3H), 2.95 (dd, *J* = 10.4 Hz, 15.1 Hz, 1H), 3.09 (dd, *J* = 1.4 Hz, 15.1 Hz, 1H), 1.45 (s, 3H), 1.38 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 146.6, 138.0, 135.6, 135.5, 134.7, 129.5, 128.9, 127.8, 127.3, 122.6, 121.8, 120.5, 118.5, 118.0, 111.3, 101.0, 95.9, 83.1, 67.4, 50.4, 43.6, 36.9, 26.2, 23.6, 22.6, 13.4; HRMS (EI) *m/z* 489.2056 [calculated for $C_{28}H_{30}ClN_4O_2$ (M^+) 489.2057].

Preparation of Chloride 40.

To a stirred solution of **38** (see refs. 2 and 3) (200 mg, 0.43 mmol, 1.0 equiv.) in CCl_4 (4 ml) and CH_3CN (1 ml) at 75°C was added P(*n*-Bu)$_3$ (213 μl, 0.85 mmol, 2.0 equiv.). The reaction was refluxed for 10 min and then cooled to room temperature. The solvent was removed *in vacuo*, and the mixture was chromatographed on silica gel (15–20% acetone/hexanes) to afford **40** (145 mg, 69% yield) as a colorless oil.

Chloride 40. FTIR (thin film/NaCl) 2978 (m), 2931 (w), 2247 (w), 1659 (s), 1496 (m), 1455 (s), 1370 (w), 1183 (s), 1106 (m), 1029 (w), 934 (w), 806 (w), 740 (s) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 8.10 (bs, 1H), 7.56 (m, 2H), 7.29-7.10 (m, 6H), 6.91-6.86 (m, 2H), 5.16 (d, *J* = 12.7 Hz, 1H), 4.98 (d, *J* = 16.0 Hz, 1H), 4.96 (d, *J* = 12.7 Hz, 1H), 4.90 (d, *J* = 16.0 Hz, 1H), 3.63-3.09 (m, 7H), 1.90 (s, 3H), 1.48 (s, 3H), 0.97 (t, *J* = 7.1 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 152.9, 136.3, 136.2, 136.1, 135.9, 135.0, 128.9, 127.9, 126.9, 126.4, 122.0, 120.0, 118.0, 117.8, 110.7, 100.9, 90.6, 77.2, 75.2, 66.4, 51.1,

48.7, 32.2, 28.3, 27.5, 14.5, 12.8; HRMS (EI) *m/z* 487.2263 [calculated for $C_{29}H_{31}ClN_4O$ (M^+) 487.2265].

Preparation of Prenyl Indole 42.

To a mixture of acetanilide **7** (250 mg, 0.519 mmol, 1.0 equiv.) in THF (15 ml) was added prenyl methyl carbonate (82 mg, 0.571 mmol, 1.1 equiv.) and tetrakis(triphenylphosphine)palladium(0) [$Pd(PPh_3)_4$] (30 mg, 0.026 mmol, 0.05 equiv.). The reaction was heated at 60°C for 3 h at which time K_2CO_3 (360 mg, 2.60 mmol, 5.0 equiv.) and MeOH (1.0 ml) were added and the temperature was increased to 80°C. After 2 h the solvent was removed *in vacuo* and the mixture was chromatographed on silica gel (25% EtOAc/hexanes) to afford **42** (153 mg, 65%yield) and **24** (41 mg, 20% yield) as waxy solids oils.

Prenyl Indole 42. FTIR (thin film/NaCl) 3288 (s), 3110 (m), 3060 (m), 2974 (s), 2924 (m), 2860 (m), 2748 (s), 1631 (w), 1497 (m), 1460 (s), 1356 (m), 1243 (m), 1124 (w), 1062 (m), 994 (m), 737 (s) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 9.25 (bs, 1H), 7.51 (d, *J* = 7.7 Hz, 1H), 7.42 (s, 1H), 7.39-7.28 (m, 4H), 7.13-7.03 (m, 4H), 6.66 (dd, *J* = 11.4 Hz, 17.9 Hz, 1H), 6.00 (bs, 1H), 5.47 (dd, *J* = 1.3 Hz, 11.4 Hz, 1H), 5.30 (tt, *J* = 1.4 Hz, 6.9 Hz, 1H), 5.27 (dd, *J* = 1.3 Hz, 17.9 Hz, 1H), 5.11 (s, 2H), 3.91 (d, *J* = 10.3 Hz, 1H), 3.40 (d, *J* = 6.9 Hz, 2H), 3.08 (dd, *J* = 1.6 Hz, 15.1 Hz, 1H), 2.56 (dd, *J* = 10.3 Hz, 15.1 Hz, 1H), 1.81 (s, 3H), 1.70 (s, 3H), 1.48 (s, 3H), 1.41 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 145.4, 136.5, 136.2, 135.4, 134.6, 130.0, 129.0, 128.1, 128.0, 126.5, 125.8, 125.7, 124.5, 121.0, 120.6, 118.5, 118.0, 110.5, 110.4, 80.8, 48.8, 40.3, 27.9, 27.1, 25.7, 24.1, 23.2, 17.8; HRMS (EI) *m/z* 454.2856 [calculated for $C_{30}H_{25}N_3O$ (M^+) 454.2858].

Preparation of Prenyl Indole 43.

To a mixture of **41** (see refs. 2 and 3) (600 mg, 1.14 mmol, 1.0 equiv.) in THF (30 ml) was added prenyl methyl carbonate (180 mg, 1.37 mmol, 1.2 equiv.) and $Pd(PPh_3)_4$ (80 mg, 0.07 mmol, 0.05 equiv.). The reaction was heated to 60°C for 3 h, at which time

K_2CO_3 (790 mg, 5.70 mmol, 5.0 equiv.) and MeOH (200 µl) were added and the temperature was increased to 80°C. After 1 h the solvent was removed *in vacuo* and the crude reaction was chromatographed on silica gel (50% EtOAc/hexanes) to afford **43** (475 mg, 83% yield) as a waxy solid.

Prenyl Indole 43. FTIR (thin film/NaCl) 3287 (s), 2977 (s), 2926 (m), 1660 (w), 1643 (m), 1499 (m), 1461 (s), 1378 (w), 1241 (w), 1185 (s), 1123 (w), 1061 (m), 1009 (w), 865 (w), 738 (m) cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 9.27 (bs, 1H), 7.49 (d, *J* = 7.9 Hz, 1H), 7.45 (s, 1H), 7.38-7.27 (m, 4H), 7.12-7.01 (m, 4H), 6.29 (d, *J* = 13.1 Hz, 1H), 6.16 (bs, 1H), 5.37 (d, *J* = 13.1, 1H), 5.27 (t, *J* = 7.0 Hz, 1H), 5.02 (s, 2H), 3.85 (d, *J* = 9.4 Hz, 1H), 3.79 (q, *J* = 7.0 Hz, 2H), 3.38 (m, 2H), 3.05 (dd, *J* = 1.3 Hz, 15.2 Hz, 1H), 2.51 (dd, *J* = 10.3 Hz, 15.2 Hz, 1H), 1.80 (s, 3H), 1.68 (s, 3H), 1.45 (s, 3H), 1.37 (s, 3H), 1.30 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 152.9, 145.3, 136.8, 135.3, 135.2, 134.8, 130.0, 128.9, 128.1, 127.9, 126.7, 126.6, 124.5, 122.7, 120.5, 118.4, 118.0, 110.5, 110.3, 92.5, 80.9, 65.4, 48.4, 40.0, 27.9, 27.4, 25.7, 24.3, 23.2, 17.8, 14.7; HRMS (EI) *m/z* 498.3123 [calculated for $C_{32}H_{39}N_3O_2$ (M^+) 498.3121].

Preparation of Bromide 45.

To a stirred solution of **44** (50 mg, 0.103 mmol) in CH_3CN (0.5 ml) and MeOH (5 ml) at 0°C was added *N*-bromosuccinimide (NBS) (29 mg, 0.103 mmol, 1.0 eq.). The reaction was stirred at 0°C and monitored by TLC. Upon consumption of starting material the solvent was removed *in vacuo*. Silica gel chromatography of the resulting oil afforded **45** (40 mg, 71% yield) as a white solid.

Bromoimidazole 45. ^1H NMR (400 MHz, d^6-Acetone) δ 8.05 (bs, 1H), 7.55 (d, J = 7.3 Hz, 1H), 7.40 (bs, 1H), 7.33-7.18 (m, 3H), 5.15 (dd, J = 4.5 Hz, 10.6 Hz, 1H), 4.99 (dd, J = 1.6 Hz, 6.9 Hz, 1H), 3.44 (bs, 1H), 3.38-3.18 (m, 4H), 3.13-3.00 (m, 2H), 1.55 (s, 6H), 0.96 (s, 9H), 0.21 (s, 3H), 0.08 (s, 3H); (HRMS (EI) *m/z* 191.15 [calculated for $C_{12}H_{18}N_2$ (M^+) 191.15].

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