Supporting Information

Synthesis of Flinderoles B and C by a Gold-Catalyzed Allene Hydroarylation.

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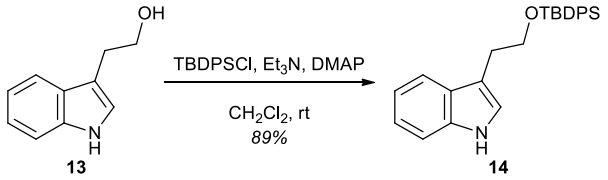
1. General Information

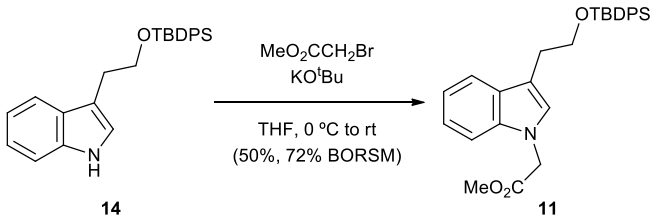
Unless otherwise noted, all reagents were obtained commercially and used without further purification. All reaction mixtures were stirred with a magnetic stir bar in flame-dried glassware under a nitrogen atmosphere. Tetrahydrofuran (THF), diethyl ether (Et_2O), dichloromethane (CH_2Cl_2), and triethylamine (Et_3N) were dried were obtained by passing commercially available predried, oxygen-free formulations through activated alumina columns. Diisopropylamine ($^iPr_2NH$) and acetonitrile (MeCN) were distilled over CaH_2.[1] Dry DMSO and methanol were obtained from Acros. Lithium chloride was dried overnight while stirring at 150˚C under vacuum. Extracts were dried over $MgSO_4$ or Na_2SO_4 and solvents were removed via a rotary evaporator. TLC analysis of reaction mixtures was performed on Merck silica gel 60 F254 TLC plates. Unless otherwise indicated, chromatography was carried out on ICN SiliTech 32-63 D 60 Å silica gel. ^1H, ^{13}C NMR and ^{31}P NMR spectra were recorded with Bruker AMX-300, AVQ-400, AVB-400, DRX-500, AV-500 and AV-600 spectrometers and referenced to $CDCl_3$, CD_3OD or D_6-DMSO. The order of citation in parentheses is a) multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, a = apparent), b) number of protons, and c) coupling constants calculated to two significant figures. Structures were confirmed using NOESY, COSY, ROESY and HSQC experiments. Mass spectra data were obtained at the Micro-Mass/Analytical Facility in the College of Chemistry, University of California, Berkeley.

[1] Alaimo P J, Peters D W, Arnold J, Bergman, R G (2001) Suggested modifications to a distillation-free solvent purification system. *J. Chem. Ed.* 78: 64.

2.1 Preparation of Western Fragment 8



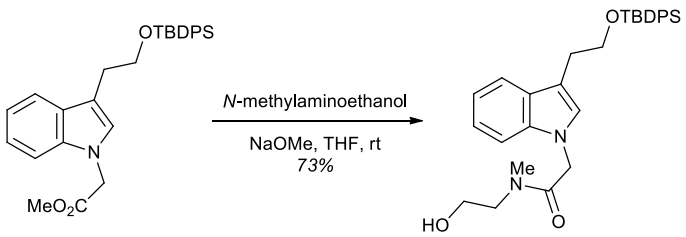
3-(2-(*tert*-butyldiphenylsiloxy)ethyl)indole (14). To a solution of tryptophol[2] (17.9 g, 111 mmol, 1.0 equiv) in CH_2Cl_2 (500 mL) was added first Et_3N (13.5 g, 133 mmol, 1.2 equiv), followed by dropwise addition of *tert*-butyldiphenylchlorosilane (TBDPSCl) (30.5 g, 111 mmol, 1.0 equiv)**.** Catalytic 4-dimethylaminopyridine (DMAP) (0.680 g, 5.55 mmol, 5 mol%) was then added in one portion. The reaction mixture stirred at room temperature for 18 h. The reaction mixture was then quenched with saturated $NaHCO_3$ (400 mL) and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 x 150 mL) and the combined organic layers were dried over $MgSO_4$ and concentrated *in vacuo*. The product was isolated as a pink oil (39.60 g, 89%) by flash chromatography (2% EtOAc in hexanes; 10% EtOAc in hexanes). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.90 (broad s, 1H), 7.66 (d, 4H, J = 7.5 Hz), 7.32-7.44 (m, 8H), 7.17 (t, 1H, J = 7.5 Hz), 7.05 (t, 1H, J = 7.5 Hz), 7.00 (d, 1H, J = 2.0 Hz), 3.94 (t, 2H, J = 7.5 Hz), 3.04 (t, 2H, J = 7.5 Hz), 1.09 (s, 9H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 136.1, 135.6, 134.0, 129.5, 127.7, 127.6, 122.2, 121.8, 119.2, 118.9, 113.1, 110.1, 64.5, 28.7, 26.9, 19.2. HRMS (ESI) calc'd for $[C_{26}H_{29}ONNaSi]^+$ 422.1911, found 422.1905.



3-(2-((tert-butyldiphenylsilyl)oxy)ethyl)-1H-indole (11). To a stirring solution of **14** (39.60 g, 98.8 mmol, 1.0 equiv) in THF (300 mL) at 0˚C was added dropwise by syringe potassium *tert*-butoxide (1.0 M in THF) (220 mL, 22.0 mmol, 2.2 equiv). As the base was added, the solution turned from yellow and clear to dark orange and cloudy. This mixture stirred at 0˚C for one hour, at which time methyl bromoacetate (3.34 g, 22.0 mmol, 2.2 equiv) was added slowly by syringe. The reaction was allowed to warm to room temperature, and further salt formation was observed immediately. The reaction stirred overnight at room temperature. The reaction was then submerged in an ice bath and quenched with water (200 mL). The resulting mixture was diluted with EtOAc (200 mL) and the layers were separated. The water layer was then extracted with EtOAc (3 x 200 mL), and the combined organic layers were washed with saturated aqueous $NaHCO_3$ (3 x 200 mL) and brine (1 x 200 mL). The organic layer was then dried over $MgSO_4$ and concentrated by rotary evaporator. Crude ^{1}H NMR analysis demonstrates a mixture of desired product and starting material. Flash chromatography (2% EtOAc in hexanes; 3% EtOAc in hexanes; 10% EtOAc in hexanes) was performed to separate the product from the starting material; 23.4 g (49.6 mmol, 50%; 72% BORSM) of product was isolated as a yellow oil, and 12.3 g (30.7 mmol, 31%) of starting material was recovered as a clear oil. ^{1}H NMR (500 MHz,

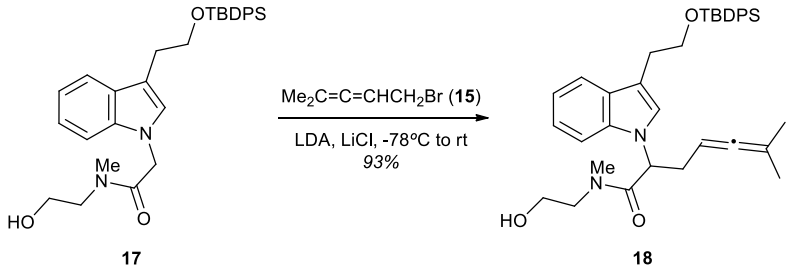
[2] While tryptophol is commercially available, it is also readily accessed by reduction of 3-indoleacetic acid with $LiAlH_4$. See R. F. Nystrom, W. G. Brown, *J. Am. Chem. Soc.* 1947, **69**, 1197.

$CDCl_3$) δ 7.64 (d, 4H, *J* = 7.0 Hz), 7.41 (t, 2H, *J* = 7.0 Hz), 7.32-7.37 (m, 5H), 7.18-7.19 (m, 2H), 7.04-7.07 (m, 1H), 6.87 (s, 1H), 4.77 (s, 2H), 3.93 (t, 2H, *J* = 7.5 Hz), 3.69 (s, 3H), 3.04 (t, 2H, *J* = 7.5 Hz), 1.08 (s, 9H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 169.2, 135.7, 134.0, 129.6, 128.4, 127.7, 126.5, 122.0, 119.3, 113.0, 108.8, 64.4, 52.5, 47.6, 28.6, 26.9, 19.2. HRMS (ESI) calc'd for $[C_{29}H_{34}O_3NSi]^+$ 472.2302, found 472.2292.



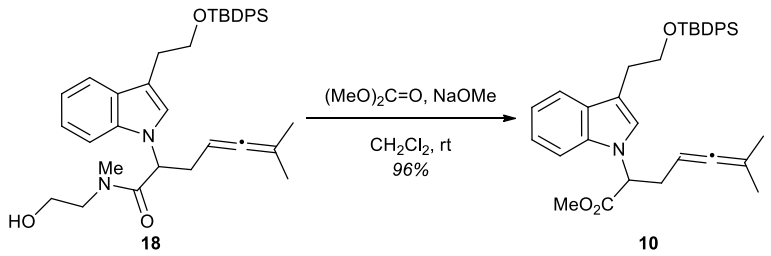
11 17

2-(3-(2-((tert-butyldiphenylsilyl)oxy)ethyl)-1H-indol-1-yl)-N-(2-hydroxyethyl)-N-methylacetamide (17). To a solution of **11** (11.61 g, 24.8 mmol, 1.0 equiv) and *N*-methylaminoethanol (3.70 mg, 49.2 mmol, 2.0 equiv) in THF (120 mL) was added dropwise by syringe NaOMe (30 wt% in MeOH) (2.22 g, 12.4 mmol, 0.50 equiv). The mixture stirred at room temperature for five hours. The reaction was then quenched with water (100 mL) and the resulting slurry was diluted with EtOAc (100 mL). The layers were separated, and the water layer was then washed with EtOAc (3 x 100 mL). The combined organic layers were washed with saturated aqueous $NaHCO_3$ (1 x 150 mL) and brine (1 x 150 mL), dried over $MgSO_4$ and concentrated by rotary evaporator. The product was isolated as a 2:1 mixture of rotamers by flash chromatography (2% methanol in CH_2Cl_2) as a iridescent solid (9.34 g, 18.1 mmol, 73%). ^{1}H NMR (500 MHz, $CDCl_3$; minor rotamer peaks are indicated with an asterisk where applicable) δ 7.68 (d, 4H, *J* = 6.5 Hz), 7.425 (t, 1H, *J* = 7.0 Hz), 7.33-7.38 (m, 6H), 7.12-7.22 (m, 2H), 7.01-7.05 (m, 1H), 6.85 (s, 1H), 4.88* (s, 2H), 4.76* (s, 2H), 3.94 (t, 2H, *J* = 7.5 Hz), 3.65 (t, 2H, *J* = 5.0 Hz), 3.43 (t, 2H, *J* = 5.0 Hz), 3.39-3.41* (m, 2H), 3.20-3.22* (m, 2H), 3.04 (t, 2H, *J* = 7.5 Hz), 2.92 (s, 3H), 2.76* (s, 3H), 1.08 (s, 9H). ^{13}C NMR (125 MHz, $CDCl_3$; minor rotamer peaks are indicated with an asterisk where applicable) δ 169.1, 136.8, 135.6, 134.0, 129.6, 128.4, 127.7, 126.8*, 126.5, 121.9, 121.7*, 119.3, 119.2, 119.1*, 118.9*, 112.6, 109.3*, 109.0, 64.6*, 64.5, 60.7*, 58.9, 51.5*, 51.1, 48.0, 35.8, 33.5, 28.7, 27.0, 19.3. HRMS (ESI) calc'd for $[C_{31}H_{39}O_3N_2Si]^+$ 515.2724, found 515.2716.

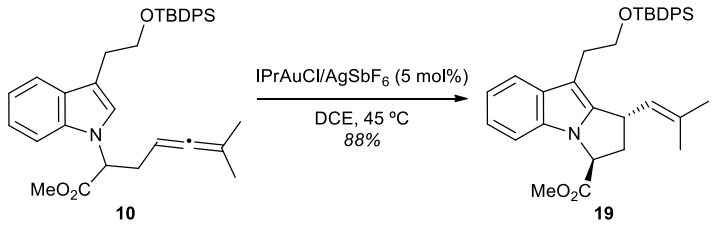


2-(3-(2-((tert-butyldiphenylsilyl)oxy)ethyl)-1H-indol-1-yl)-N-(2-hydroxyethyl)-N,6-dimethylhepta-4,5-dienamide (18).[3] To a stirred solution of DIPA (2.27 g, 22.5 mmol, 2.5 equiv) and LiCl (2.54 g, 60.0 mmol, 6.0 equiv) in THF (40 mL) at -78˚C was added dropwise by syringe nBuLi (2.05 M in hexanes) (10.1 mL, 20.8 mmol, 2.08 equiv). The temperature was raised to 0˚C and the solution stirred thirty minutes. The temperature was then lowered to -78˚C and a solution of **17** (5.15 g, 10.0 mmol, 1.0 equiv) in THF (40 mL) was added dropwise by syringe, gradually turning a bright yellow. This mixture stirred for one hour at -78˚C, followed by fifteen minutes at 0˚C and five minutes at room temperature. The reaction temperature was then lowered again to 0˚C and a solution of **15**[4] (1.96 g, 20.0 mmol, 2.0 equiv) in THF (10 mL) was added dropwise. This mixture stirred for one hour at room temperature. The reaction was quenched with 0.01 M $NaHSO_4$ (50 mL) and the resulting slurry was diluted with water (50 mL) and EtOAc (100 mL). The layers were separated and the aqueous layer was extracted with EtOAc (2 x 100 mL). The combined organic layers were washed with brine (1 x 150 mL), dried over $MgSO_4$ and concentrated by rotary evaporator. The product was isolated as a yellow foam (5.39 g, 9.27 mmol, 93%) by flash chromatography (1% methanol in CH_2Cl_2). ^{1}H NMR (500 MHz, $CDCl_3$; minor rotamer peaks are indicated with an asterisk where applicable) δ 7.65-7.67 (m, 4H), 7.42 (t, 2H, *J* = 7.0 Hz), 7.32-7.38 (m, 6H), 7.20 (t, 1H, *J* = 7.5 Hz), 7.04-7.10 (m, 2H), 5.41-5.43* (m, 1H), 5.19 (t, 1H, *J* = 7.0 Hz), 4.88-5.00 (m, 1H), 4.82-4.84* (m, 1H), 3.90-3.94 (m, 2H), 3.68-3.72 (m, 2H), 3.50-3.55* (m, 2H), 3.43-3.48 (m, 2H), 3.25-3.29* (m, 1H), 3.15-3.19* (m, 1H), 3.00-3.04 (m, 2H), 2.91* (s, 3H), 2.86 (s, 3H), 2.64-2.69* (m, 2H), 2.50-2.60 (m, 2H), 1.58 (d, 3H, *J* = 2.5 Hz), 1.54* (d, 3H, *J* = 2.5 Hz), 1.50 (d, 3H, *J* = 2.5 Hz), 1.41* (d, 3H, *J* = 2.5 Hz), 1.19 (s, 9H). ^{13}C NMR (125 MHz, $CDCl_3$; minor rotamer peaks are indicated with an asterisk where applicable) δ 202.7*, 202.5, 170.8, 136.1, 135.6, 134.0, 129.6, 128.5, 127.7, 124.0, 121.8, 121.7*, 119.5, 119.4, 119.3*, 119.1*, 113.1, 108.8, 96.4, 96.0*, 84.9, 84.7*, 64.3, 61.2, 59.7*, 55.8, 55.2*, 52.0, 51.4*, 36.6, 34.3*, 33.0*, 32.3, 28.8, 26.9, 20.5, 20.4*, 20.2*, 20.1, 19.3. HRMS (ESI) calc'd for $[C_{37}H_{47}O_3N_2Si]^+$ 595.3350, found 595.3352.

[3] A. G. Myers, B. H. Yang, H. Chen, J. L. Gleason, *J. Am. Chem. Soc.,* 1994, **116**, 9361.
[4] P. A. Wender, F. Glorius, C. O. Husfeld, E. Langkopf, J. A. Love. *J. Am. Chem. Soc.* 1999, **121**, 5348.

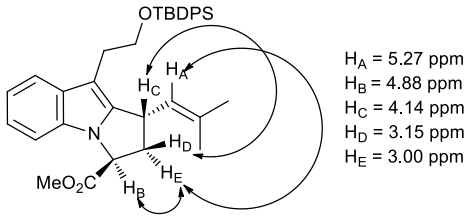


Methyl 2-(3-(2-((tert-butyldiphenylsilyl)oxy)ethyl)-1H-indol-1-yl)-6-methylhepta-4,5-dienoate (10).[5] To a stirred solution of **18** (1.60 g, 2.69 mmol, 1.0 equiv) in CH_2Cl_2 (54 mL) was added dropwise by syringe dimethyl carbonate (1.51 g, 16.7 mmol, 6.2 equiv), followed by NaOMe (30 wt% in methanol) (4.84 g, 26.9 mmol, 10.0 equiv). The reaction mixture stirred overnight at room temperature. The reaction mixture was then quenched with saturated aqueous $NaHCO_3$ (20 mL) and the layers were separated. The aqueous layer was extracted with CH_2Cl_2 (20 mL). The combined organic layers were washed with brine (2 x 40 mL), dried over $MgSO_4$ and concentrated. The product was isolated by flash chromatography (5% EtOAc in hexanes) to give the product as a yellow oil (1.42 g, 2.57 mmol, 96%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.68-7.71 (m, 4H), 7.42-7.45 (m, 2H), 7.35-7.39 (m, 5H), 7.33 (d, 1H, *J* = 8.5 Hz), 7.21 (t, 1H, *J* = 7.5 Hz), 7.12 (s, 1H), 7.07 (t, 1H, *J* = 7.5 Hz), 5.05 (dd, 1H, *J* = 8.5, 6.5 Hz), 4.88-4.90 (m, 1H), 3.96 (t, 2H, *J* = 7.0 Hz), 3.66 (s, 3H), 3.06 (t, 2H, *J* = 7.0 Hz), 2.91 (dt, 1H, *J* = 15.0, 6.5 Hz), 2.73 (ddd, 1H, *J* = 15.0, 8.5, 6.0 Hz), 1.52 (d, 3H, *J* = 3.0 Hz), 1.42 (d, 3H, *J* = 2.5 Hz), 1.10 (s, 9H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 202.6, 171.0, 136.7, 135.7, 134.0, 129.6, 128.4, 127.7, 123.4, 121.7, 119.2, 119.1, 112.9, 109.2, 83.9, 64.4, 57.7, 52.4, 31.5, 28.8, 27.0, 20.3, 20.2, 19.3. HRMS (ESI) calc'd for $[C_{35}H_{42}O_3NSi]^+$ 552.2928, found 552.2934.

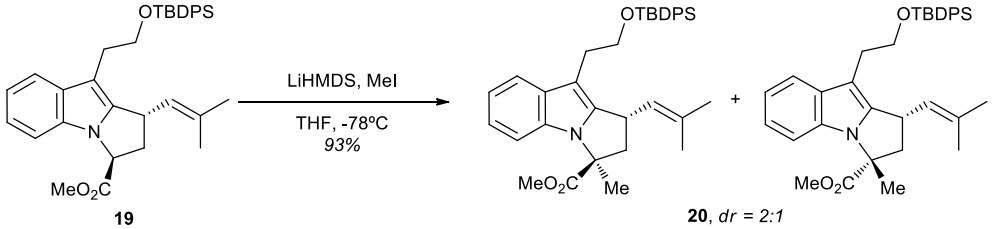


Methyl 9-(2-((tert-butyldiphenylsilyl)oxy)ethyl)-1-(2-methylprop-1-en-1-yl)-2,3-dihydro-1H-pyrrolo[1,2-a]indole-3-carboxylate (19). IPrAuCl[6] (28 mg, 0.0443 mmol, 5 mol%) and $AgSbF_6$ (15 mg, 0.0443 mmol, 5 mol%) in dichloroethane (2 mL) were mixed in the dark in a sealed vial. After five minutes, the catalyst mixture was passed through a glass wool filter in to a solution of **10** (489 mg, 0.886 mmol, 1.0 equiv) in dichloroethane (5 mL). The filter was washed with dichloroethane (2 x 0.5 mL) and then the reaction vessel was sealed and submerged in a 45˚C oil bath for four hours. The reaction mixture was then filtered over a silica gel plug and the filtrate was concentrated *in vacuo*. The product was isolated as a single diastereomer by flash chromatography (5% EtOAc in hexanes) as a white solid (432 mg, 0.783 mmol, 88%). Important nOe correlations are indicated below:

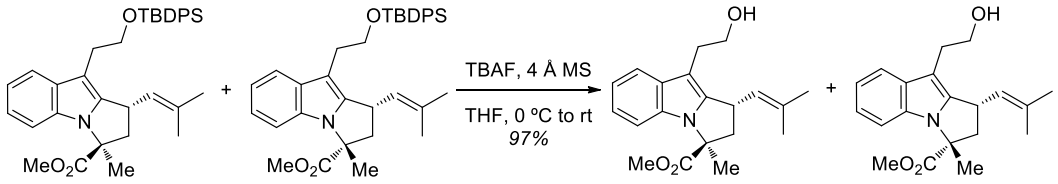
[5] J. Etxebarria, J. L. Vicario, D. Badia, L. Carrillo, *J. Org. Chem,* 2004, **69**, 2588.
[6] P. Mauleón, R. M. Zeldin A. Z. González, L. Riesgo, F. D. Toste, *J. Am. Chem. Soc.* 2009, **131**,6348



^{1}H NMR (500 MHz, $CDCl_3$) δ 7.69 (d, 2H, *J* = 6.5 Hz), 7.65 (d, 2H, *J* = 7.0 Hz), 7.45 (t, 2H, *J* = 7.0 Hz), 7.32-7.37 (m, 5H), 7.12-7.18 (m, 2H), 7.05 (t, 1H, *J* = 7.0 Hz), 5.27 (d, 1H, *J* = 9.5 Hz), 4.88 (dd, 1H, *J* = 8.5, 5.5 Hz), 4.14 (ddd, 1H, *J* = 9.5, 9.0, 5.5 Hz), 3.88 (t, 2H, *J* = 7.5 Hz), 3.73 (s, 3H), 3.15 (ddd, 1H, *J* = 13.0 Hz, 9.0 Hz, 8.5 Hz), 3.00 (t, 2H, *J* = 7.5 Hz), 2.45 (dt, 1H, *J* = 13.0 Hz, 5.5 Hz), 1.59 (s, 3H), 1.49 (s, 1H), 1.08 (s, 9H). ^{13}C NMR (125 MHz, $CDCl_3$): 171.8, 144.1, 135.6, 134.1, 134.0, 133.3, 132.8, 132.3, 129.5, 127.6, 125.0, 120.8, 119.2, 119.0, 109.7, 103.6, 64.5, 57.2, 52.6, 43.6, 40.9, 35.2, 27.7, 26.9, 25.7, 19.3, 18.1. HRMS (ESI) calc'd for $[C_{35}H_{42}O_3NSi]^+$ 552.2928, found 552.2937.

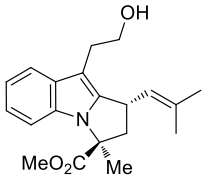


Methyl 9-(2-((tert-butyldiphenylsilyl)oxy)ethyl)-3-methyl-1-(2-methylprop-1-en-1-yl)-2,3-dihydro-1H-pyrrolo[1,2-a]indole-3-carboxylate (20). To a solution of the methyl ester (442 mg, 0.801 mmol, 1.0 equiv) in THF (8 mL) at -78˚C was added dropwise by syringe LiHMDS (1.0 M in THF) (0.88 mL, 0.88 mmol, 1.1 equiv). Upon addition of base, the reaction mixture turned bright yellow. The reaction mixture stirred at -78˚C for one hour, at which time methyl iodide (1.14 g, 8.01 mmol, 10 equiv) was added in one portion. The reaction mixture stirred for one hour at -78˚C, and the reaction mixture was then quenched with 0.01 M $NaHSO_4$ (8 mL). The resulting slurry was extracted with EtOAc (3 x 8 mL), and the combined organic layers were washed with brine (1 x 16 mL), dried over $MgSO_4$, and concentrated *in vacuo*. The product, a yellow oil, was isolated as an inseparable 2:1 mixture of *anti* and *syn* diastereomers (422 mg, 0.745 mmol, 93%) by flash chromatography (5% EtOAc in hexanes). The diastereochemistry of the two isomers was confirmed by silyl deprotection to afford the readily separable alcohols shown below. ^{1}H NMR (500 MHz, $CDCl_3$; minor diastereomer peaks are indicated with an asterisk when applicable): δ 7.68 (d, 2H, *J* = 6.5 Hz), 7.60 (d, 2H, *J* = 8.0 Hz), 7.28-7.45 (m, 8H), 7.19* (d, 1H, *J* = 8.0 Hz), 7.11 (t, 1H, *J* = 7.5 Hz), 7.01 (t, 1H, *J* = 7.5 Hz), 5.22 (at, 1H, *J* = 9.5 Hz), 4.22 (m, 1H), 4.20* (m, 1H), 3.85 (t, 2H, *J* = 7.5 Hz), 3.76* (s, 3H), 3.62 (s, 3H), 3.18 (dd, 1H, *J* = 13.0, 8.0 Hz), 2.93-3.02 (m, 2H), 2.69-2.72* (m, 2H), 2.19 (dd, 1H, *J* = 13.0, 8.5 Hz), 1.96 (s, 3H), 1.81 (s, 3H), 1.78 (s, 3H), 1.75* (s, 3H), 1.75* (s, 3H), 1.07 (s, 9H). ^{13}C NMR (125 MHz, $CDCl_3$; minor diastereomer peaks are indicated with an asterisk when applicable): δ 173.9*, 173.6, 143.8, 143.6*, 135.6, 134.1, 134.0*, 133.9, 133.5, 133.0*, 131.6, 131.3*, 129.5, 129.4, 127.6, 124.8, 120.6*, 120.5, 119.0*, 118.9, 109.9, 103.5, 103.4*, 65.0, 64.5, 64.4*, 52.8*, 52.7, 49.6, 49.1*, 35.3, 34.7*, 27.5*, 27.3, 26.9, 25.7, 23.8, 22.9*, 19.2, 18.3, 18.2*. HRMS (ESI) calc'd for $[C_{36}H_{44}O_3NSi]^+$ 566.3085, found 566.3090.

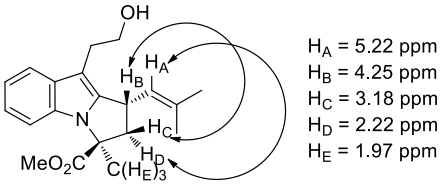


20, *dr = 2:1 anti/syn* 2 **26** : 1 3'-*epi*-**26**

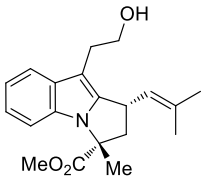
Methyl 9-(2-hydroxyethyl)-3-methyl-1-(2-methylprop-1-en-1-yl)-2,3-dihydro-1H-pyrrolo[1,2-a]indole-3-carboxylate (26). A solution of TBAF (1.0 M in THF, ca. 5% water) (5.0 mL, 5.0 mmol, 3.0 equiv) in THF (10 mL) was stirred at room temperature with 4 Å molecular sieves for twenty minutes. The temperature of this mixture was dropped to 0˚C, at which time a solution of the silyl ether (959 mg, 1.69 mmol, 1.0 equiv; 2:1 *d.r.*) in THF (5 mL) was added by cannula. The reaction temperature was increased to room temperature and the reaction was allowed to stir for 5 h. The reaction mixture was then quenched with saturated $NaHCO_3$ (10 mL). The resulting slurry was extracted with EtOAc (20 mL) and the layers were separated. The organic layer was washed with saturated $NaHCO_3$ (2 x 10 mL) and brine (1 x 10 mL), dried over $MgSO_4$ and concentrated *in vacuo*. The products were separated by flash chromatography (15% EtOAc in hexanes; 20% EtOAc in hexanes) to yield the *anti* alcohol (359 mg, 1.09 mmol) and *syn* diastereomer (180 mg, 0.551 mmol) in 97% yield as yellow oils.



Methyl 9-(2-hydroxyethyl)-3-methyl-1-(2-methylprop-1-en-1-yl)-2,3-dihydro-1H-pyrrolo[1,2-a]indole-3-carboxylate (26). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.56 (d, 1H, *J* = 7.0 Hz), 7.35 (d, 1H, *J* = 8.0 Hz), 7.14 (d, 1H, *J* = 7.0 Hz), 7.10 (d, 1H, *J* = 7.0 Hz), 5.22 (d, 1H, *J* = 9.5 Hz), 4.25 (dd, 1H, *J* = 9.0, 8.5 Hz), 3.80 (t, 2H, *J* = 6.5 Hz), 3.70 (s, 3H), 3.18 (dd, 1H, *J* = 13.5, 8.5 Hz), 2.87-2.97 (m, 2H), 2.22 (dd, 1H, *J* = 13.5, 9.0 Hz), 1.97 (s, 3H), 1.83 (s, 3H), 1.78 (s, 3H). Important nOe correlations are shown below:

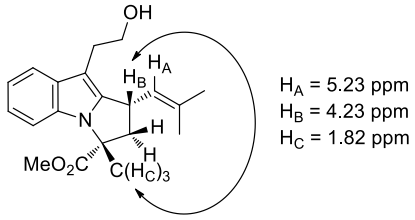


^{13}C NMR (125 MHz, $CDCl_3$): δ 173.4, 144.3, 134.2, 133.4, 131.8, 124.7, 120.9, 119.2, 118.8, 110.2, 103.0, 65.1, 63.2, 52.8, 49.5, 35.3, 27.3, 25.8, 23.7, 18.3. HRMS (ESI) calc'd for $[C_{20}H_{26}O_3N]^+$ 328.1907, found 328.1914.

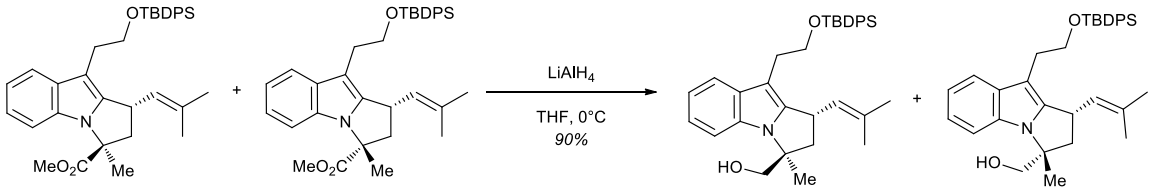


Methyl 9-(2-hydroxyethyl)-3-methyl-1-(2-methylprop-1-en-1-yl)-2,3-dihydro-1H-pyrrolo[1,2-a]indole-3-carboxylate (3'-*epi*-**26).** ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.55 (d, 1H, *J* =

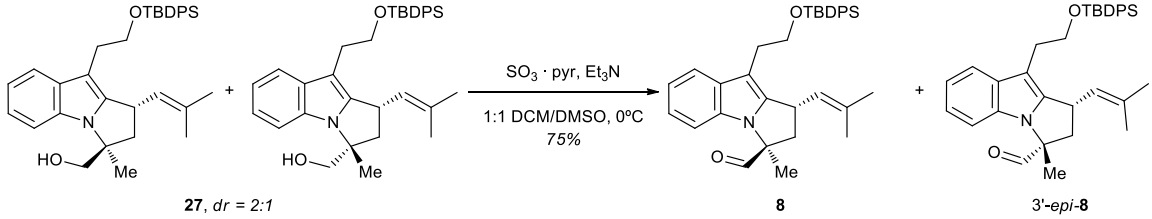
7.5 Hz), 7.20 (d, 1H, *J* = 7.5 Hz), 7.06-7.13 (m, 2H), 5.23 (d, 1H, *J* = 10.0 Hz), 4.23 (dd, 1H, *J* = 16.5, 8.5 Hz), 3.80 (t, 2H, *J* = 6.5 Hz), 3.76 (s, 3H), 2.85-2.96 (m, 2H), 2.67-2.78 (m, 2H), 1.82 (s, 3H), 1.76 (s, 6H). Important nOe correlations are shown below:



^{13}C NMR (125 MHz, $CDCl_3$): δ 173.4, 144.3, 134.2, 133.4, 131.8, 124.7, 120.9, 119.2, 118.8, 110.2, 103.0, 65.1, 63.2, 52.8, 49.5, 35.3, 27.3, 25.8, 23.7, 18.3. HRMS (ESI) calc'd for $[C_{20}H_{26}O_3N]^+$ 328.1907, found 328.1912.

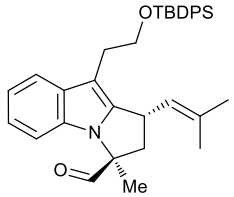


9-(2-((tert-butyldiphenylsilyl)oxy)ethyl)-3-methyl-1-(2-methylprop-1-en-1-yl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-3-yl)methanol (27). To a stirred suspension of $LiAlH_4$ (48 mg, 1.27 mmol, 1.2 equiv) in THF (5 mL) at 0˚C was added dropwise by cannula a solution of **20** (598 mg, 1.06 mmol, 1.0 equiv). The reaction stirred for 2 h at 0˚C. The reaction was then quenched with $Na_2SO_4 \cdot 10\ H_2O$, and the salts were allowed to digest overnight. The salts were then removed by gravity filtration, and the filtrate was concentrated. The product was isolated as an inseparable 2:1 mixture of diastereomers **2x** (515 mg, 0.958 mmol, 90%) by flash chromatography (10% EtOAc in hexanes). ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.66 (d, 2H, *J* = 6.5 Hz), 7.61 (d, 2H, *J* = 7.0 Hz), 7.28-7.45 (m, 8H), 7.08 (t, 1H, *J* = 7.5 Hz), 7.00 (t, 1H, *J* = 7.5 Hz), 5.27* (d, 1H, *J* = 10.5 Hz), 5.18 (d, 1H, *J* = 9.5 Hz), 4.19-4.24 (m, 1H), 3.95 (d, 1H, *J* = 6.5 Hz), 3.83 (t, 2H, *J* = 7.5 Hz), 3.73-3.80* (m, 2H), 3.69-3.73 (m, 1H), 2.93-3.02 (m, 2H), 2.86 (dd, 1H, *J* = 13.0 Hz, 8.5 Hz), 2.48* (d, 2H, *J* = 8.0 Hz), 2.07 (dd, 1H, *J* = 13.0 Hz, 8.5 Hz), 1.81* (s, 3H), 1.79 (s, 3H), 1.75 (s, 3H), 1.72* (s, 3H), 1.58* (s, 3H), 1.06 (s, 9H). ^{13}C NMR (125 MHz, $CDCl_3$; minor diastereomer peaks are indicated with an asterisk when applicable): δ 144.8, 144.7*, 135.7*, 135.6, 134.2, 134.1*, 133.7*, 133.5, 132.9, 132.6*, 131.2, 129.6, 129.5*, 127.6, 126.0*, 127.6*, 120.3*, 120.2, 119.1, 118.8*, 118.7, 109.7, 109.4*, 103.1*, 102.8, 68.8, 67.7*, 64.7, 64.6*, 64.5, 47.7, 46.0*, 35.4, 34.5*, 27.4*, 27.0, 25.7, 22.9, 22.1*, 19.3, 18.3. δ HRMS ($ESI^+ + H^+$): calculated for $C_{35}H_{44}O_2NSi$ 538.3136, found 538.3120.

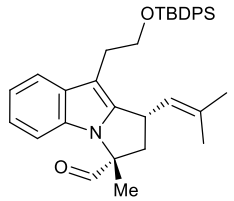


9-(2-((tert-butyldiphenylsilyl)oxy)ethyl)-3-methyl-1-(2-methylprop-1-en-1-yl)-2,3-dihydro-1H-pyrrolo[1,2-a]indole-3-carbaldehyde (8). **.** To a solution of the alcohol **27** (515 mg, 0.958,

1.0 equiv) in 1:1 CH_2Cl_2/DMSO (10 mL) at 0˚C was added Et_3N (970 mg, 9.58 mmol, 10 equiv) followed by sulfur trioxide pyridine complex (1.28 g, 7.95 mmol, 8.3 equiv). The reaction mixture stirred for 1 h at 0˚C. The reaction mixture was then quenched with 1:1 $NaHCO_3$:H_2O (10 mL) and the layers were separated. The organic layer was washed with water (3 x 5 mL) and brine (1 x 5 mL), dried over Na_2SO_4, and concentrated. The two diastereomers were separated by column chromatography (2 % EtOAc in hexanes; 10% EtOAc in hexanes) to yield the *anti* diastereomer *anti*-**8** (278.6 mg, 0.520 mmol) as a yellow oil and *syn* diastereomer *syn*-**8** (108.2 mg, 0.202 mmol) as a yellow oil in 75% total yield.

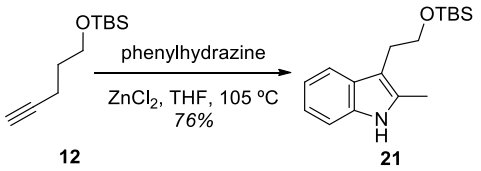


9-(2-((tert-butyldiphenylsilyl)oxy)ethyl)-3-methyl-1-(2-methylprop-1-en-1-yl)-2,3-dihydro-1H-pyrrolo[1,2-a]indole-3-carbaldehyde (8). ^{1}H NMR (500 MHz, $CDCl_3$) δ 9.62 (s, 1H), 7.50-7.70 (broad d, 1H), 7.23 (broad s, 1H), 7.10-7.20 (m, 2H), 5.27 (d, 1H, *J* = 9.0 Hz), 4.15-4.25 (m, 1H), 3.49-3.59 (m, 1H), 3.23-3.33 (m, 1H), 3.07 (dd, 1H, *J* = 13.0, 8.5 Hz), 2.75-2.95 (m, 5H), 2.17 (dd, 1H, *J* = 13.5 Hz, 7.5 Hz), 1.82 (s, 3H), 1.80 (s, 6H), 1.23-1.46 (m, 9H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 198.6, 159.6, 155.6, 143.5, 133.7, 131.6, 128.3, 125.1, 123.1, 122.9, 122.7, 121.1, 119.5, 114.3, 109.3, 104.9, 79.2, 68.6, 55.3, 52.6, 49.7, 46.0, 35.0, 28.3, 25.7, 19.7, 18.2. HRMS (ESI) calc'd for $[C_{25}H_{34}O_3N_2Na]^+$ 433.2462, found 433.2470.

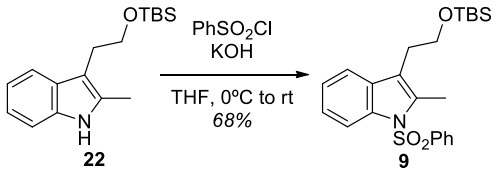


9-(2-((tert-butyldiphenylsilyl)oxy)ethyl)-3-methyl-1-(2-methylprop-1-en-1-yl)-2,3-dihydro-1H-pyrrolo[1,2-a]indole-3-carbaldehyde (3'-*epi* **-8).** ^{1}H NMR (500 MHz, $CDCl_3$) δ 9.64 (s, 1H), 7.50-7.70 (broad d, 1H), 7.10-7.20 (m, 3H), 5.24-5.30 (m, 1H), 4.25-4.35 (m, 1H), 3.49-3.59 (m, 1H), 3.50-3.60 (m, 1H), 3.20-3.30 (m, 1H), 2.75-2.95 (m, 5H), 2.52 (dd, 1H, *J* = 13.0, 8.0 Hz), 2.43 (dd, 1H, *J* = 13.0, 8.0 Hz), 1.83 (s, 3H), 1.79 (s, 3H), 1.59 (s, 3H), 1.23-1.46 (m, 9H). ^{13}C NMR (125 MHz, $CDCl_3$; minor diastereomer peaks are indicated with an asterisk when applicable): δ 144.8, 144.7*, 135.7*, 135.6, 134.2, 134.1*, 133.7*, 133.5, 132.9, 132.6*, 131.2, 129.6, 129.5*, 127.6, 126.0*, 127.6*, 120.3*, 120.2, 119.1, 118.8*, 118.7, 109.7, 109.4*, 103.1*, 102.8, 68.8, 67.7*, 64.7, 64.6*, 64.5, 47.7, 46.0*, 35.4, 34.5*, 27.4*, 27.0, 25.7, 22.9, 22.1*, 19.3, 18.3. HRMS (ESI) calc'd for $[C_{25}H_{34}O_3N_2Na]^+$ 433.2462, found 433.2469. HRMS ($ESI^+ + H^+$): calculated for $C_{35}H_{42}O_2NSi$ 536.2979, found 536.2972.

2.2 Preparation of Phosphonates 7a and 7b

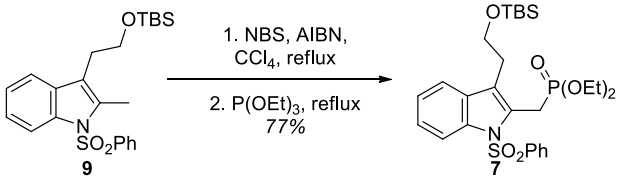


3-(2-((*tert*-butyldimethylsilyl)oxy)ethyl)-2-methyl-1*H*-indole (22).[7] A sealed flask was loaded with phenylhydrazine (1.62 g, 15 mmol, 1.5 equiv), pentyne **12** (1.98 g, 10 mmol, 1.0 equiv) and zinc(II) chloride (4.10 g, 30 mmol, 3.0 equiv) in THF (25 mL). The reaction mixture was heated to 110˚C over 18 h. The reaction mixture was then cooled and the zinc salts were removed by filtration. The product was isolated as an orange oil (2.20 g, 7.60 mmol, 76%) and used without further purification. ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.80 (s, 1H), 7.62 (d, 1H, *J* = 7.0 Hz), 7.31 (d, 1H, *J* = 8.5 Hz), 7.18-7.26 (m, 2H), 3.91 (t, 2H, *J* = 7.5 Hz), 3.06 (t, 2H, *J* = 7.5 Hz), 2.43 (s, 3H), 1.04 (s, 9H), 0.16 (s, 6H). ^{13}C NMR (125 MHz, $CDCl_3$): δ 135.3, 131.9, 129.0, 120.9, 119.2, 118.0, 110.4, 108.3, 63.8, 28.3, 26.2, 18.6, 12.7, -5.2.

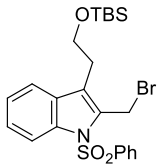


3-(2-((*tert*-butyldimethylsilyl)oxy)ethyl)-2-methyl-1-(phenylsulfonyl)-*1*H-indole (9). To a stirring solution of indole **22** (1.32 g, 4.56 mmol, 1.0 equiv) in THF (8 mL) at 0˚C was added powdered anhydrous potassium hydroxide (1.28 g, 22.8 mmol, 5.0 equiv). Benzenesulfonyl chloride (2.42 g, 13.7 mmol, 3.0 equiv) was then added dropwise. The reaction temperature was raised to room temperature and the reaction stirred overnight, turning heterogeneous. The reaction mixture was then quenched with water and the organic products were extracted with EtOAc (3 x 20 mL). The combined organic layers were washed with saturated $NaHCO_3$ (1 x 40 mL) and brine (1 x 40 mL), dried over $MgSO_4$ and concentrated by rotary evaporator. The product was purified from the resulting resin by serial silica gel chromatography (first 1% EtOAc in toluene; then 2.5% EtOAc in hexanes) to yield the product **9b** as an orange oil (1.32 g, 3.10 mmol, 68%). ^{1}H NMR (500 MHz, $CDCl_3$): δ 8.22 (d, 1H, *J* = 8.0 Hz), 7.77 (d, 2H, *J* = 8.0 Hz), 7.51 (dd, 1H, *J* = 7.5, 7.0 Hz), 7.42 (t, 3H, *J* = 8.0 Hz), 7.40 (d, 1H, *J* = 7.5 Hz), 7.28 (dd, 1H, *J* = 7.5 Hz, 7.0 Hz), 7.24 (dd, 1H, *J* = 7.5 Hz, 7.0 Hz), 3.72 (t, 2H, *J* = 7.0 Hz), 2.84 (t, 2H, *J* = 7.0 Hz), 2.56 (s, 3H), 0.82 (s, 9H), -0.23 (s, 6H). ^{13}C NMR (125 MHz, $CDCl_3$): δ 139.4, 136.4, 133.7, 133.5, 130.7, 129.3, 126.3, 124.0, 123.3, 118.5, 117.5, 114.5, 62.6, 28.0, 25.9, 18.3, 12.9, -5.5. HRMS ($ESI^+ + H^+$ - TBS): calculated for $C_{17}H_{17}O_3NS$ 315.0929, found 316.1003.

[7] K. Alex, A. Tillack, N. Schwarz, M. Beller, *Angew. Chem. Int. Ed.* 2008, **47**, 2304.

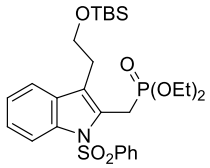


Diethyl ((3-(2-((*tert*-butyldimethylsilyl)oxy)ethyl)-1-(phenylsulfonyl)-*1*H-indol-2-yl)methyl)phosphonate (7). A stirred solution of 2-methylindole **9** (1.05 g, 2.43 mmol, 1.0 equiv), recrystallized *N*-bromosuccinimide (0.432 g, 2.43 mmol, 1.0 equiv) and catalytic AIBN (40 mg, 0.243 mmol, 10 mol%) in CCl_4 (12 mL) was refluxed at 75˚C for 6 h. The reaction temperature was then lowered to room temperature and the reaction mixture was quenched with water (10 mL); the product was then extracted in to CH_2Cl_2 (3 x 10 mL). The combined organic layers were washed with brine (1 x 15 mL), dried over $MgSO_4$ and concentrated.



^{1}H NMR (500 MHz, $CDCl_3$): δ 8.13 (d, 1H, *J* = 8.5 Hz), 7.91 (d, 2H, *J* = 7.5 Hz), 7.51 (d, 2H, *J* = 7.5 Hz), 7.40 (t, 2H, *J* = 7.5 Hz), 7.35 (dd, 1H, *J* = 8.0 Hz, 7.5 Hz), 7.26 (t, 1H, *J* = 7.5 Hz), 5.14 (s, 2H), 3.84 (t, 2H, *J* = 6.5 Hz), 2.97 (t, 2H, *J* = 6.5 Hz), 0.82 (s, 9H), -0.11 (s, 6H). ^{13}C NMR (125 MHz, $CDCl_3$): δ 138.7, 136.7, 133.9, 133.2, 129.9, 129.2, 126.9, 126.0, 123.8, 123.3, 119.8, 115.0, 61.9, 28.1, 25.9, 23.2, 18.3, -5.4.

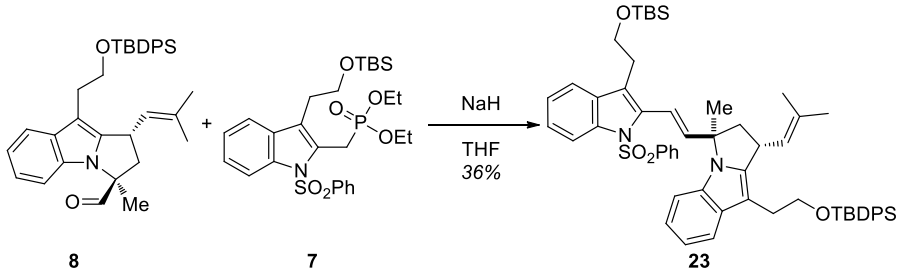
The resulting brown oil was suspended in triethylphosphite (3.5 mL) and this solution was stirred at 55˚C for 48 h. The excess triethylphosphite was removed by rotary evaporator, and the product was isolated by flash chromatography (1% methanol in CH_2Cl_2) to give an orange oil (0.843 g, 1.61 mmol, 77% over 2 steps).



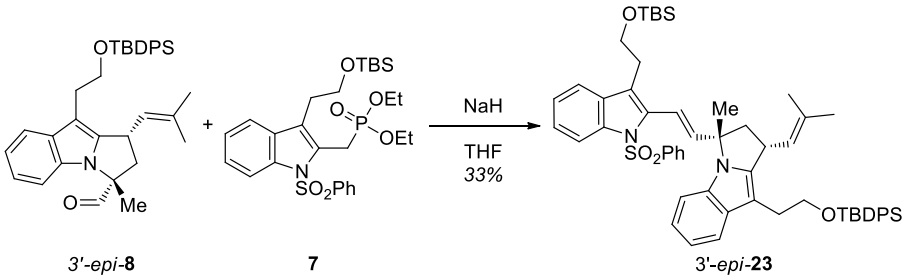
7

^{1}H NMR (500 MHz, $CDCl_3$): δ 8.05 (broad s, 1H), 7.40-7.60 (m, 1H), 7.20-7.26 (m, 2H), 4.00 (q, 4H, *J* = 7.0 Hz), 3.80-3.90 (m, 2H), 3.43 (broad s, 2H), 2.94 (broad s, 2H), 2.75-2.90 (m, 3H), 1.68 (s, 9H), 1.30-1.40 (m, 9H), 1.21 (t, 6H, *J* = 7.0 Hz). ^{13}C NMR (125 MHz, $CDCl_3$): δ 155.6, 150.5, 136.9, 129.3, 127.2, 124.1, 122.5, 118.1, 115.6, 84.2, 79.5, 62.1, 48.8, 28.5, 28.2, 26.1, 24.9, 16.4. HRMS ($ESI^+ + H^+$): calculated for $C_{27}H_{41}O_6NPSSi$ 566.2156, found 566.2164.

2.3 Preparation of flinderole B (2) and flinderole C (3)

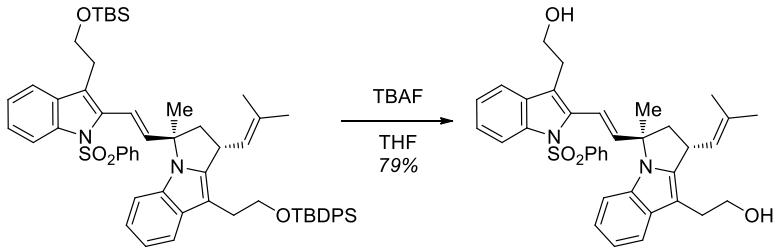


3-((*E*)-2-(3-(2-((*tert*-butyldimethylsilyl)oxy)ethyl)-1-(phenylsulfonyl)-1*H*-indol-2-yl)vinyl)-9-(2-((*tert*-butyldiphenylsilyl)oxy)ethyl)-3-methyl-1-(2-methylprop-1-en-1-yl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indole (23). To a stirred solution of aldehyde **8** (332 mg, 0.620 mmol, 1.0 equiv) and phosphonate **7** (526 mg, 0.930 mmol, 1.5 equiv) in THF (6 mL) was added in one portion NaH (60% in mineral oil) (45 mg, 1.12 mmol, 1.8 equiv). The reaction mixture stirred 1 h at which poinr the aldehyde had been consumed. The reaction mixture was quenched with saturated aqueous $NaHCO_3$ (10 mL) and the resulting biphasic mixture was extracted with EtOAc (3 x 10 mL). The combined organic layers were washed with brine (1 x 15 mL), dried over $MgSO_4$ and concentrated. The product *anti*-**23** was isolated as an iridescent foam (210 mg, 0.222 mmol, 36%) by silica gel chromatography (5% EtOAc in hexanes). ^{1}H NMR (500 MHz, $CDCl_3$): 8.18 (d, 1H, *J* = 8.0 Hz), 7.67 (d, 2H, *J* = 7.0 Hz), 7.64 (d, 2H, *J* = 7.0 Hz), 7.51 (d, 2H, *J* = 7.5 Hz), 7.36-7.41 (m, 4H), 7.33-7.35 (m, 5H), 7.28-7.30 (m, 3H), 7.21 (q, 2H, *J* = 7.5 Hz), 7.03 (t, 1H, *J* = 7.5 Hz), 6.99 (t, 1H, *J* = 7.5 Hz), 6.94 (d, 1H, *J* = 8.0 Hz), 6.93 (d, 1H, *J* = 7.5 Hz), 6.24 (d, 1H, *J* = 16.0 Hz), 6.17 (d, 1H, *J* = 16.0 Hz), 5.25 (d, 1H, *J* = 9.0 Hz), 4.35 (q, 1H, *J* = 8.0 Hz), 3.80-3.86 (m, 2H), 3.72-3.79 (m, 2H), 2.97-3.03 (m, 2H), 2.80-2.86 (m, 3H), 2.29 (dd, 1H, *J* = 13.5 Hz, 7.0 Hz), 1.99 (s, 3H), 1.80 (s, 3H), 1.76 (s, 3H), 1.04 (s, 9H), 0.75 (s, 9H), -0.24 (s, 6H). ^{13}C NMR (125 MHz, $CDCl_3$): δ 143.8, 138.9, 138.6, 136.2, 135.7, 135.6, 134.5, 134.3, 134.2, 133.9, 133.5, 133.4, 131.6, 131.0, 129.6, 128.9, 127.0, 126.5, 125.0, 124.9, 123.6, 120.4, 119.5, 119.4, 119.0, 118.7, 118.5, 114.9, 110.2, 103.1, 65.0, 63.9, 62.9, 51.3, 35.0, 28.7, 27.6, 27.0, 26.0, 25.8, 25.7, 19.4, 18.4, -5.4, -5.5. HRMS ($ESI^+ + H^+$ - TBS): calculated for $C_{52}H_{57}O_4N_2Ssi$ 833.3808, found 833.3800.



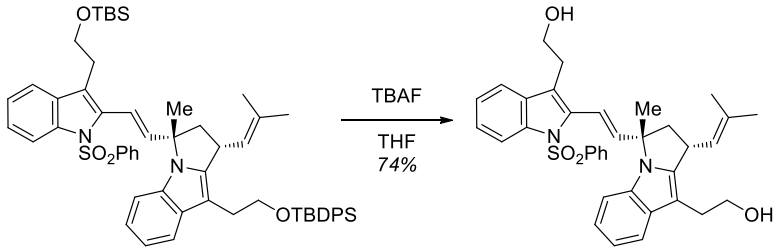
3-((*E*)-2-(3-(2-((*tert*-butyldimethylsilyl)oxy)ethyl)-1-(phenylsulfonyl)-1*H*-indol-2-yl)vinyl)-9-(2-((*tert*-butyldiphenylsilyl)oxy)ethyl)-3-methyl-1-(2-methylprop-1-en-1-yl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indole (3'-*epi*-**23).** Prepared analogously to **23** using aldehyde 3'-*epi*-**8** (136 mg, 0.254 mmol, 1.0 equiv) and phosphonate **7b** (216 mg, 0.381 mmol, 1.5 equiv) to give *syn*-**23** as an iridescent foam (76 mg, 0.084 mmol, 33%). ^{1}H NMR (500 MHz, $CDCl_3$): 8.19 (d, 1H, *J* = 8.5 Hz), 7.67 (d, 2H, *J* = 8.5 Hz), 7.65 (d, 2H, *J* = 8.5 Hz), 7.60 (d, 2H, *J* = 7.0 Hz), 7.34-7.46 (m, 8H), 7.29-7.32 (m, 3H), 7.21-7.24 (m, 3H), 6.96-7.00 (m, 2H), 6.37 (d, 1H, *J* = 17.0 Hz), 5.29 (d, 1H, *J* = 9.0 Hz), 4.25 (q, 1H, *J* = 8.5 Hz), 3.84 (t, 2H, *J* = 7.5 Hz), 3.75-3.80 (m, 2H), 2.96-3.01

(m, 2H), 2.88-2.93 (m, 2H), 2.72 (dd, 1H, J = 12.5 Hz, 8.0 Hz), 2.39 (dd, 1H, J = 12.5 Hz, 8.0 Hz), 1.81 (s, 3H), 1.78 (s, 3H), 1.75 (s, 3H), 1.05 (s, 9H), 0.68 (s, 9H), -0.29 (s, 3H), -0.32 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$): δ 143.2, 140.2, 138.4, 136.3, 135.6, 134.8, 134.2, 134.1, 133.4, 133.3, 133.0, 131.3, 131.2, 129.5, 129.4, 128.9, 127.6, 127.5, 126.6, 125.4, 125.0, 123.6, 120.4, 120.2, 119.7, 118.8, 118.6, 115.0, 110.0, 103.0, 64.7, 62.9, 62.8, 51.8, 35.2, 28.6, 27.5, 26.9, 25.8, 25.7, 23.0, 19.2, 18.2, 18.1, -5.6, -5.7. HRMS ($ESI^+ + H^+$ - TBS): calculated for $C_{52}H_{57}O_4N_2Ssi$ 833.3808, found 833.3804.



23 **25**

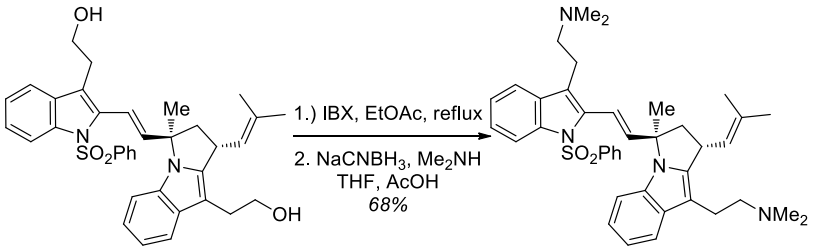
2-(3-((*E*)-2-(3-(2-hydroxyethyl)-1-(phenylsulfonyl)-1*H*-indol-2-yl)vinyl)-3-methyl-1-(2-methylprop-1-en-1-yl)-2,3-dihydro-1*H*-pyrrolo[1,2-a]indol-9-yl)ethanol (25). To a solution of bisindole **23** (209 mg, 0.221 mmol, 1.0 equiv) in THF (1.1 mL) was added TBAF (1.0 M in THF, ca. 5% water) (2.7 mL, 2.65 mmol, 12.0 equiv) in three aliquots over six hours. The reaction mixture was then quenched with saturated aqueous $NaHCO_3$ and the resulting slurry was extracted with EtOAc (3 x 2 mL). The combined organic layers were washed with brine (1 x 5 mL), dried over Na_2SO_4 and concentrated. The diol was isolated as a iridescent foam (104 mg, 0.175 mmol, 79%) by flash chromatography (40% EtOAc in hexanes). ^{1}H NMR (600 MHz, $CDCl_3$): 8.16 (d, 1H, J = 8.4 Hz), 7.61-7.65 (m, 1H), 7.44-7.48 (m, 1H), 7.39 (d, 2H, J = 7.8 Hz), 7.32-7.35 (m, 3H), 7.29 (t, 1H, J = 7.8 Hz), 7.20 (t, 1H, J = 7.8 Hz), 7.06 (t, 1H, J = 7.8 Hz), 6.22 (d, 1H, J = 15.6 Hz), 6.14 (d, 1H, J = 15.6 Hz), 5.31 (d, 1H, J = 9.6 Hz), 4.42 (q, 1H, J = 8.4 Hz), 3.81 (t, 2H, J = 6.0 Hz), 3.64-3.69 (m, 2H), 2.94-3.01 (m, 2H), 2.86 (dd, 1H, J = 12.6, 7.8 Hz), 2.82 (t, 2H, J = 6.0 Hz), 2.35 (dd, 1H, J = 12.0 Hz, 9.6 Hz), 2.06 (s, 3H), 1.83 (s, 3H), 1.82 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$): δ 144.3, 138.9, 138.0, 136.3, 134.7, 134.1, 133.5, 133.3, 133.0, 131.8, 130.8, 128.9, 126.3, 125.1, 124.5, 123.8, 120.6, 119.1, 119.0, 118.8, 118.1, 115.1, 110.3, 103.1, 64.0, 63.2, 62.0, 53.3, 51.0, 35.0, 28.3, 28.2, 27.3, 25.7, 25.5, 20.7, 18.2, 14.0. HRMS ($ESI^+ + H^+$): calculated for $C_{36}H_{39}O_4N_2S$ 595.2625, found 595.2624.



3'-*epi*-**23** 3'-*epi*-**25**

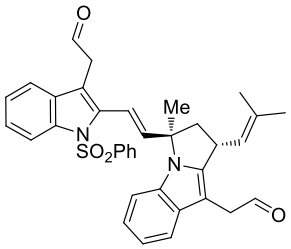
2-(3-((*E*)-2-(3-(2-hydroxyethyl)-1-(phenylsulfonyl)-1*H*-indol-2-yl)vinyl)-3-methyl-1-(2-methylprop-1-en-1-yl)-2,3-dihydro-1*H*-pyrrolo[1,2-a]indol-9-yl)ethanol (3'-*epi*-**25).** Prepared analogously to **25** using bisindole 3'-*epi*-**23** (76 mg, 0.080 mmol, 1.0 equiv) give the diol 3'-*epi*-**25** as an iridescent foam (35 mg, 0.059 mmol, 74%). ^{1}H NMR (600 MHz, $CDCl_3$): 8.20 (d, 1H, J = 8.4 Hz), 7.62 (d, 1H, J = 7.8 Hz), 7.58 (d, 1H, J = 7.8 Hz), 7.45 (d, 2H, J = 7.2 Hz), 7.43 (d,

1H, *J* = 7.2 Hz), 7.33 (t, 1H, *J* = 7.8 Hz), 7.21-7.27 (m, 4H), 7.07 (t, 1H, *J* = 7.8 Hz), 7.04 (t, 1H, *J* = 7.8 Hz) 6.95 (d, 1H, *J* = 16.2 Hz), 6.34 (d, 1H, *J* = 16.2 Hz), 5.35 (d, 1H, *J* = 9.6 Hz), 4.31 (q, 1H, *J* = 9.0 Hz), 3.79-3.86 (m, 2H), 3.72 (t, 2H, *J* = 7.2 Hz), 2.97-3.00 (m, 1H), 2.89-2.95 (m, 3H), 2.82 (dd, 1H, *J* = 12.6, 8.4 Hz), 2.44 (dd, 1H, *J* = 12.6, 7.2 Hz), 1.86 (s, 6H), 1.79 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$): δ 143.8, 140.2, 138.1, 136.5, 135.0, 133.6, 133.4, 133.3, 131.5, 130.9, 128.9, 126.5, 125.3, 123.9, 120.5, 119.6, 119.4, 119.0, 118.8, 115.2, 110.1, 102.6, 63.2, 62.2, 51.6, 35.2, 28.3, 27.5, 25.7, 23.2, 20.6, 18.2, 13.9. HRMS ($ESI^+ + H^+$): calculated for $C_{36}H_{39}O_4N_2S$ 595.2625, found 595.2624.



25 **28**

2-(3-((*E*)-2-(3-(2-(dimethylamino)ethyl)-1-(phenylsulfonyl)-1*H*-indol-2-yl)vinyl)-3-methyl-1-(2-methylprop-1-en-1-yl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)-*N*,*N*-dimethyethanamine (28).[8] A mixture of **25** (41 mg, 0.068 mmol, 1.0 equiv) and 2-iodoxybenzoic acid (114 mg, 0.409 mmol, 6.0 equiv) in EtOAc (4.5 mL) was heated to reflux (80˚C) for 1 h. The reaction mixture was then cooled to room temperature and poured over celite. The filtrate was washed with EtOAc (6 x 5 mL) and concentrated. The resulting dial was used without further purification.

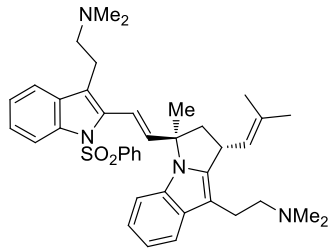


^{1}H NMR (600 MHz, $CDCl_3$): 9.64 (s, 1H), 9.57 (s, 1H), 8.19 (d, 1H, *J* = 8.4 Hz), 7.47-7.53 (m, 1H), 7.41-7.46 (m, 1H), 7.32-7.40 (m, 5H), 7.14-7.17, (m, 3H), 7.05 (t, 1H, *J* = 7.8 Hz) 6.17 (d, 1H, *J* = 15.6 Hz), 5.98 (d, 1H, *J* = 16.2 Hz), 5.25 (d, 1H, *J* = 9.6 Hz), 4.43 (dt, 1H, *J* = 9.6, 7.2 Hz), 3.66 (d, 2H, *J* = 1.8 Hz), 3.66 (d, 2H, *J* = 7.2 Hz), 2.85 (dd, 1H, *J* = 12.6 Hz, 7.2 Hz), 2.38 (dd, 1H, *J* = 12.6, 9.6 Hz), 2.05 (s, 3H), 1.82 (s, 6H), 1.80 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$): δ 200.0, 198.0, 145.1, 139.6, 138.1, 136.0, 135.6, 135.1, 133.7, 133.1, 131.7, 130.1, 129.6, 129.0, 127.7, 126.3, 125.6, 124.0, 123.7, 121.2, 119.5, 118.7, 118.4, 118.2, 114.9, 112.4, 96.7, 64.3, 51.0, 40.2, 38.9, 34.9, 29.7, 26.5, 25.7, 25.3, 18.3.

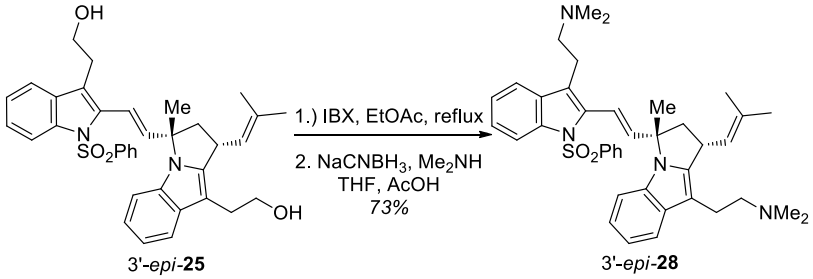
To a stirred solution of Me_2NH (2.0 M in THF) (0.27 mL, 0.545 mmol, 8.0 equiv) and $NaCNBH_3$ (17 mg, 0.272 mmol, 4.0 equiv) in 2.5% AcOH in anhydrous MeOH (2 mL) was added a solution of the dial (40 mg, 0.068 mmol, 1.0 equiv) in anhydrous MeOH (2 mL). The reaction stirred overnight at room temperature. The reaction mixture was the quenched with

[8] D. H. Dethe, R. D. Erande, A. Ranjan, *J. Am. Chem. Soc.* 2011, **133**, 2864.

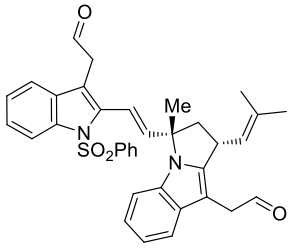
saturated aqueous $NaHCO_3$ (4 mL). The resulting slurry was extracted with EtOAc (3 x 4 mL), and the combined organic layers were washed with brine (1 x 4 mL), dried over Na_2SO_4 and concentrated. The resulting diamine was isolated by silica gel chromatography (10% MeOH in CH_2Cl_2; 20% MeOH in CH_2Cl_2) as a white solid (30 mg, 0.0462 mmol, 68%).



^{1}H NMR (600 MHz, CD_3OD): 8.06 (d, 1H, *J* = 8.4 Hz), 7.61-7.62 (m, 1H), 7.50-7.52 (m, 1H), 7.46 (d, 1H, *J* = 7.8 Hz), 7.43 (t, 1H, *J* = 7.8 Hz), 7.39 (d, 2H, *J* = 7.8 Hz), 7.27 (t, 1H, *J* = 7.8 Hz), 7.22 (t, 1H, *J* = 7.8 Hz), 7.17 (t, 2H, *J* = 7.8 Hz), 7.09-7.11 (m, 2H), 6.20 (d, 1H, *J* = 16.2 Hz), 5.98 (d, 1H, *J* = 16.2 Hz), 5.37 (d, 1H, *J* = 9.6 Hz), 4.55 (dt, 1H, *J* = 9.6, 7.8 Hz), 3.12-3.18 (m, 2H), 3.01-3.10 (m, 3H), 2.87-2.95 (m, 4H), 2.73 (s, 6H), 2.40 (s, 6H), 2.07 (s, 3H), 1.85 (s, 3H), 1.84 (s, 3H). ^{13}C NMR (150 MHz, CD_3OD): δ 144.0, 138.4, 137.5, 136.2, 134.3, 134.0, 133.6, 132.5, 131.8, 130.4, 128.8, 126.0, 125.0, 124.3, 123.8, 120.6, 119.1, 118.9, 118.8, 118.3, 118.0, 114.7, 110.2, 100.9, 64.9, 64.2, 58.7, 57.7, 50.4, 43.3, 42.7, 34.9, 24.5, 24.4, 21.4, 19.6, 19.5, 17.1, 12.7. HRMS ($ESI^+ + H^+$): calculated for $C_{40}H_{49}O_2N_4S$ 649.3571, found`649.3564**.**

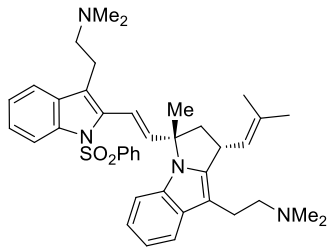


2-(3-((*E*)-2-(3-(2-(dimethylamino)ethyl)-1-(phenylsulfonyl)-1*H*-indol-2-yl)vinyl)-3-methyl-1-(2-methylprop-1-en-1-yl)-2,3-dihydro-1*H*-pyrrolo[1,2-*a*]indol-9-yl)-*N*,*N*-dimethyethanamine (3'-*epi*-**28).** Prepared analogously to the diamine shown above using alcohol *syn*-**25** (35 mg, 0.059 mmol, 1.0 equiv) to give the diamine as a white solid (28 mg, 0.043 mmol, 73%) over two steps.

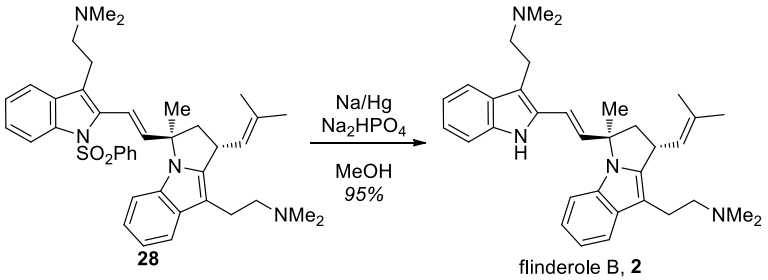


^{1}H NMR (600 MHz, $CDCl_3$): 9.661 (s, 1H), 9.603 (s, 1H), 8.190 (d, 1H, *J* = 8.4 Hz), 7.642 (d, 2H, *J* = 7.8 Hz), 7.43-7.48 (m, 2H), 7.33-7.39 (m, 3H), 7.26-7.29 (m, 3H), 7.02-7.16, (m, 4H), 6.134 (d, 1H, *J* = 16.2 Hz), 5.284 (d, 1H, *J* = 9.0 Hz), 4.313 (dt, 1H, *J* = 9.0, 7.8 Hz), 3.75-3.79

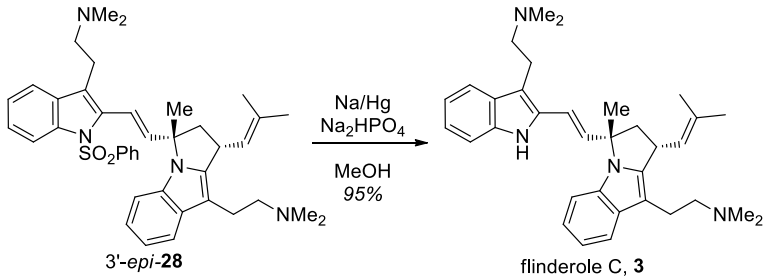
(m, 2H), 3.64-3.69 (m, 2H), 2.813 (dd, 1H, J = 12.6 Hz, 7.8 Hz), 2.435 (dd, 1H, J = 12.6, 7.8 Hz), 1.862 (s, 3H), 1.831 (s, 3H), 1.784 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$): δ 199.8, 197.8, 144.5, 140.7, 138.1, 136.2, 135.9, 134.3, 133.7, 133.1, 131.4, 130.3, 129.3, 128.1, 127.8, 126.5, 125.7, 124.4, 124.2, 121.0, 119.8, 119.5, 119.0, 118.4, 115.0, 113.3, 110.1, 96.7, 63.4, 51.5, 40.2, 39.0, 35.2, 29.7, 25.6, 25.1, 25.0, 18.2.



^{1}H NMR (500 MHz, CD_3OD): 8.15 (d, 1H, J = 8.0 Hz), 7.58-7.62 (m, 3H), 7.51-7.55 (m, 3H), 7.32-7.37 (m, 3H), 7.30 (t, 1H, J = 8.0 Hz), 7.03-7.10 (m, 2H), 6.95 (d, 1H, J = 16.0 Hz), 6.26 (d, 1H, J = 16.0 Hz), 5.52 (d, 1H, J = 10.0 Hz), 4.46 (dt, 1H, J = 9.5, 8.0 Hz), 2.90-3.10 (m, 7H), 2.92 (s, 6H), 2.58 (dd, 1H, J = 13.0 Hz, 7.5 Hz), 2.51 (s, 6H), 1.91 (s, 6H), 1.84 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$): δ 144.2, 140.2, 139.3, 137.3, 136.3, 135.0, 133.8, 132.4, 131.4, 129.9, 129.0, 127.4, 126.1, 125.4, 125.0, 124.1, 120.5, 119.4, 119.1, 118.9, 118.1, 114.8, 110.1, 99.3, 64.4, 63.2, 58.0, 56.3, 42.3, 41.9, 35.2, 34.0, 25.5, 24.5, 24.2, 21.8, 19.5, 19.3, 19.1, 17.0, 12.6, 12.5. HRMS ($ESI^+ + H^+$): calculated for $C_{40}H_{49}O_2N_4S$ 649.3571, found`649.3565**.**



Flinderole B (2). To a stirred solution of the diamine **28** (12 mg, 0.018 mmol, 1.0 equiv) in anhydrous MeOH (2 mL) was added Na/Hg (6%) (90 mg, 0.406 mmol, 20 equiv) and $Na_2HPO_4 \cdot 7\ H_2O$ (108 mg, 0.406 mmol, 20 equiv). The reaction stirred 3 hr at room temperature. The reaction was then quenched with water and the resulting solution was extracted with Et_2O (3 x 2 mL). The combined organic layers were washed with brine (1 x 4 mL), dried over Na_2SO_4 and concentrated. The product was isolated by silica gel chromatography (1:9:90 Et_3N/MeOH/CH_2Cl_2) to yield a white solid (9 mg, 0.018 mmol, 95%). Spectroscopic data matches that from ref. 8. ^{1}H NMR (500 MHz, d_6-DMSO): 10.93 (s, 1H), 7.43 (d, 1H, J = 7.2 Hz), 7.58-7.62 (m, 3H), 7.51-7.55 (m, 3H), 7.32-7.37 (m, 3H), 7.30 (t, 1H, J = 8.0 Hz), 7.03-7.10 (m, 2H), 6.95 (d, 1H, J = 16.0 Hz), 6.26 (d, 1H, J = 16.0 Hz), 5.52 (d, 1H, J = 10.0 Hz), 4.46 (dt, 1H, J = 9.5, 8.0 Hz), 2.90-3.10 (m, 7H), 2.92 (s, 6H), 2.58 (dd, 1H, J = 13.0 Hz, 7.5 Hz), 2.51 (s, 6H), 1.91 (s, 6H), 1.84 (s, 3H). ^{13}C NMR (150 MHz, d_6-DMSO): δ 143.1, 136.8, 132.9, 132.8, 132.0, 131.6, 131.3, 128.4, 125.5, 122.4, 120.4, 118.9, 118.7, 118.6, 113.1, 111.1, 110.5, 104.0, 64.0, 61.0, 60.7, 51.3, 45.5, 45.3, 34.8, 25.9, 25.8, 22.0, 21.8, 18.4. HRMS ($ESI^+ + H^+$): calculated for $C_{34}H_{45}N_4$ 509.3639, found 509.3634**.**



Flinderole C (3). Prepared analogously to flinderole B (**2**) using bisindole the 3'-*epi* diamine 3'-*epi*-**28** (35 mg, 0.059 mmol, 1.0 equi) to give flinderole C as a white solid (28 mg, .056 mmol, 95%). Spectroscopic data matches that from ref. 8. ^{1}H NMR (500 MHz, d_6-DMSO): 11.08 (s, 1H), 7.42 (d, 1H, J = 7.8 Hz), 7.41 (d, 1H, 8.4 Hz), 7.24 (d, 1H, J = 8.4 Hz), 7.22 (d, 1H, J = 7.2 Hz), 7.03 (dd, 1H, J = 7.8 Hz, 7.2 Hz), 6.89-6.93 (m, 3H), 6.58 (d, 1H, J = 16.0 Hz), 6.55 (d, 1H, J = 16.0 Hz), 5.24 (d, 1H, J = 9.6 Hz), 4.26 (dt, 1H, J = 9.6, 7.8 Hz), 2.66-2.76 (m, 6H), 2.27-2.33 (m, 4H) 2.18 (s, 6H), 2.11 (s, 6H), 1.80 (s, 3H), 1.71 (s, 3H), 1.69 (s, 3H). ^{13}C NMR (150 MHz, d_6-DMSO): δ 143.0, 136.9, 133.1, 132.8, 132.3, 132.2, 131.3, 129.9, 128.5, 126.5, 126.0, 122.5, 120.2, 118.9, 118.8, 118.7, 118.2, 113.4, 111.2, 110.3, 104.1, 63.3, 61.0, 51.5, 45.5, 45.4, 35.1, 26.0, 25.8, 23.6, 22.1, 18.4. HRMS ($ESI^+ + H^+$): calculated for $C_{34}H_{45}N_4$ 509.3639, found 509.3631**.**