Supplementary Material (ESI) for Chemical Communications

Electronic Supplementary Information

Synthesis of Hyacinthacine B_3 and purported Hyacinthacine B_7

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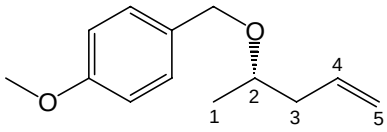
General Methods:

Unless otherwise indicated all ^{1}H (500 MHz) and ^{13}C NMR (125 MHz) spectra were recorded in $CDCl_3$ solutions. All signals were relative to TMS or $CDCl_3$, referenced at 0.00 ppm or 77.0 ppm. NMR assignments are based upon COSY, DEPT, HSQC and HMBC experiments. Petrol refers to the hydrocarbon fraction of bp 40-60 °C

Experimental for the Synthesis of hyacinthacine B_3

General Method for *O*-PMB Protection:

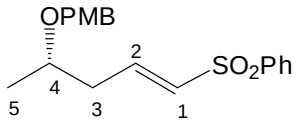


1-Methoxy-4-{[(2*S*)-pent-4-en-2-yloxy]methyl}benzene (5a). A solution of (*S*)-4-penten-2-ol **4a** (1.070 g, 12.423 mmol, $[\alpha]_D^{24}$ +5.0 (neat), > 98% ee, Aldrich), 4-methoxybenzyl chloride (3.15 mL, 23.220 mmol) and tetrabutylammonium iodide (0.369 g, 1.161 mmol) in anhydrous THF (40 mL) under a N_2 atmosphere was cooled to 0 ^{o}C, sodium hydride (50% dispersion in mineral oil, 0.836 g, 0.418 g NaH, 17.415 mmol) was then added, and the reaction mixture was allowed to warm to rt and stirred under nitrogen for 18 h. Quenching with H_2O (30 mL) gave a cloudy mixture, which was extracted with diethyl ether (30 mL). The aqueous layer was further extracted with diethyl ether (3 x 30 mL), and the combined ethereal extracts were washed with brine, dried ($MgSO_4$) and concentrated *in vacuo* to give a brown oil. Purification by flash column chromatography (increasing polarity from 0:100 to 5:95 Et_2O/petrol) gave the title compound as a colorless oil (2.309 g, 90%). R_f 0.43 (5:95 EtOAc/petrol). $[\alpha]_D^{24}$ +8.0 (*c* 1.00, $CHCl_3$). δ_H (500 MHz): 7.26 (2H, d, *J* = 8.8 Hz, ArH), 6.86 (2H, d, *J* = 8.8 Hz, ArH), 5.87-5.78 (2H, m, H4), 5.07 (1H, d, *J* = 17.3 Hz, $H5_{trans}$), 5.04 (1H, d, *J* = 10.7 Hz, $H5_{cis}$), (1H, d, *J* =

17.3 Hz, H5$_{trans}$), 4.48 (1H, d, *J* = 11.5 Hz, OC*H*HPMP), 4.27 (1H, d, *J* = 11.5 Hz, OC*H*HPMP), 3.77 (3H, s, OC*H*$_3$), 3.58-3.52 (1H, m, H2), 2.36 (1H, ddd, *J* = 5.9, 6.6, 13.7 Hz, H3$_A$), 2.21 (1H, ddd, *J* = 6.7, 7.1, 13.9 Hz, H3$_B$), 1.17 (3H, d, *J* = 6.1 Hz, H1)

δ_C (125 MHz): 159.0 (ArC), 135.0 (C4), 130.9 (ArC), 129.0 (ArC), 116.6 (C5), 113.6 (ArC), 74.0 (C2), 69.9 (O*C*H$_2$PMP), 55.1 (O*C*H$_3$), 40.8 (C3), 19.3 (C1).

General Method for Olefin Cross Metathesis using the Grubb's II Catalyst:



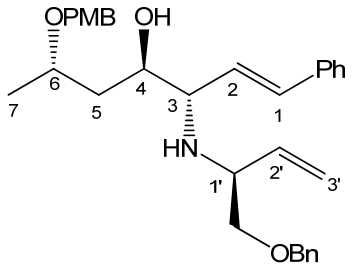
(1*E*,4*S*)-4-[(4-Methoxybenzyl)oxy]pent-1-en-1-yl phenyl sulfone (6a). To a nitrogen-flushed solution of **5a** (100 mg, 0.483 mmol) and phenyl vinyl sulfone (0.163 g, 0.966 mmol) in anhydrous CH_2Cl_2 (3 mL) was added the Grubbs II catalyst (21 mg, 0.0242 mmol). The reaction mixture was stirred and irradiated with microwaves in a CEM microwave reactor for 1 h at 90 ^oC using a maximum applied power of 200 W. After cooling the reaction mixture was concentrated *in vacuo* to give a black semi-solid. Purification by flash column chromatography (increasing polarity from 1:10:2 to 1:5:2 Et_2O/petrol/CH_2Cl_2 as eluent) gave the title compound (0.114g, 68%) as a pale yellow oil. R_f 0.52 (1:5:2 Et_2O/petrol/CH_2Cl_2). $[\alpha]_D^{22}$ -6.7 (*c* 2.90, $CHCl_3$). IR υ_{max} (cm^{-1}): 2965, 2909, 2832, 1613, 1511, 1444, 1305, 1246, 1144, 1085, 1031, 750. δ_H (300 MHz): 7.87-7.84 (2H, m, ArH), 7.60-7.48 (3H, m, ArH),7.20-7.17 (2H, m, ArH), 7.01 (1H, dt, *J* = 7.4, 15.0 Hz, H2), 6.86-6.83 (2H, m, ArH), 6.37 (1H, dt, *J* = 1.4, 15.0 Hz, H1), 4.48 (1H, d, *J* = 11.2 Hz, OC*H*HAr), 4.34 (1H, d, *J* = 11.2 Hz, OC*H*HAr), 3.80 (3H, s, OCH_3), 3.65 (1H, dq, *J* = 6.2, 12.4 Hz, H4), 2.46-2.39 (2H, m, H3), 1.20 (3H, d, *J* = 6.2 Hz, H5). δ_C (75 MHz): 159.1 (ArC), 143.6 (C2), 140.5 (ArC), 133.2 (ArC), 132.0 (C1), 130.2 (ArC),

129.2 (ArC), 127.5 (ArC), 113.8(ArC), 72.5 (C4), 70.1 (O-*C*H_2-Ar), 55.2 (OCH_3), 38.5 (C3), 19.6 (C5). ESIMS *m/z* 364 (100%) $[MNH_4]^+$, 369 (12%) $[MNa]^+$, HRESIMS found 369.1151, calc for $C_{19}H_{22}O_4NaS$, 369.1137 $[MNa]^+$.

General Method for the Sharpless Asymmetric Dihydroxylation using DHQD-IND:

To a solution of potassium ferric cyanide (0.322 g, 0.977 mmol), potassium carbonate (0.135 g, 0.977 mmol), methanesulfonamide (0.031 g, 0.326 mmol), potassium osmate dihydrate (1.4 mg, 0.0039 mmol) and DHQD-IND (2.3 mg, 0.0049 mmol) in H_2O (1.5 mL) was added a solution of **6a** (0.113 g, 0.326 mmol) in *tert*-butanol (1.5 mL). The reaction mixture was agitated with ultrasound waves in a sonicator fitted with a water bath for 6 h, stirred at rt for 12 h and then sonicated again for an additional 6 h. The mixture was diluted with H_2O (10 mL) and extracted with EtOAc (3 x 10 mL). The combined organic layers were dried and concentrated *in vacuo* to afford a yellow oil, which was used unpurified in the subsequent Petasis reaction.

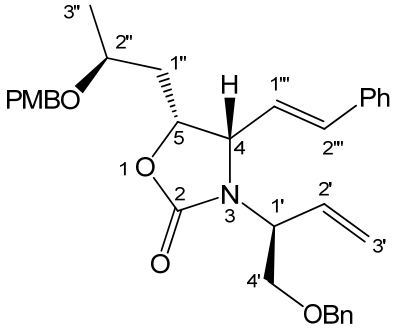
General Method for the Petasis Reaction



(3*S*,4*R*,6*S*,*E*)-3-((*S*)-1-(Benzyloxy)but-3-en-2-ylamino)-6-(4-methoxybenzyloxy)-1-phenylhept-1-en-4-ol (9a). To a stirred solution of the crude Sharpless ADH product in dry CH_2Cl_2 (2 mL) with stirring under a nitrogen atmosphere was added (*E*)-2-

phenylvinylboronic acid (0.058 g, 0.326 mmol) and (2*S*)-1-(benzyloxy)but-3-en-2-amine (0.048 g, 0.326 mmol). The reaction mixture was stirred at rt for 48 h, diluted with EtOAc (10 mL) and washed with 0.5 M aq NaOH (3 x 10 mL). The organic layer was dried ($MgSO_4$) and concentrated *in vacuo* to give a black oil. Purification by flash column chromatography (2.5:97.5 to 5:95 MeOH/CH_2Cl_2 as eluent) gave the title compound (0.087 g, 53%, over 2 steps) as a brown oil. R_f 0.25 (5:95 MeOH/CH_2Cl_2). $[\alpha]_D^{24}$ +18.2 (*c* 1.00, $CHCl_3$). IR υ_{max} (cm^{-1}): 3421, 3078, 3027, 2965, 2909, 2852, 1613, 1512, 1444, 1247, 1085, 1034. δ_H (500 MHz): 7.36-7.19 (12H, m, ArH), 6.85-6.79 (2H, m, ArH), 6.43 (1H, d, *J* = 16.0 Hz, H1), 6.09 (1H, dd, *J* = 8.5, 16.0 Hz, H2), 5.59 (1H, ddd, *J* = 7.7, 9.9, 17.4 Hz, H2'), 5.22-5.15 (2H, m, H3'), 4.55-4.36 (4H, m, OC*H*$_2$Ph and OC*H*$_2$PMP), 4.02 (td, *J* = 3.8, 6.3 Hz, H4), 3.88-3.78 (1H, m, H6), 3.77 (3H, s, OCH_3), 3.24 (1H, dd, *J* = 3.8, 8.5 Hz, H3), 3.50-3.40 (3H, m, H1' and H1''), 1.57 (2H, dd, *J* = 5.7, 6.3 Hz, H5), 1.21 (3H, d, *J* = 6.2 Hz, H7). δ_C (125 MHz): 159.1 (ArC), 138.1 (ArC), 137.8 (C2'), 136.9 (ArC), 135.3 (ArC), 132.9 (C1), 130.9 (ArC), 129.3 (ArC), 128.5 (ArC), 128.4 (ArC), 127.9 (C2), 127.6 (ArC), 127.4 (ArC), 126.4 (ArC), 118.0 (C3'), 113.8 (ArC), 73.3 (C1''), 73.0 (O*C*H$_2$PMP), 72.1 (C6), 70.4 (O*C*H$_2$Bn), 70.2 (C4), 62.3 (C3), 58.0 (C1'), 55.3 (OCH_3), 40.1 (C5), 19.7 (C7). ESIMS *m/z* 502 (100%) $[MH]^+$, HRESIMS found 502.2954, calc for $C_{32}H_{40}NO_4$, 502.2957 $[MH]^+$.

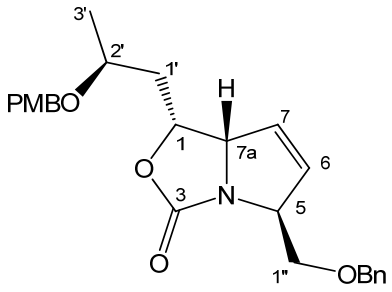
General Method for the Synthesis of Oxazolidinones



(4*S*,5*R*)-3-((*S*)-1-(Benzyloxy)but-3-en-2-yl)-5-((*S*)-2-(4-methoxybenzyloxy)propyl)-4-styryloxazolidin-2-one (10a). To solution of the 1,2-amino alcohol **9a** (0.020 g, 0.040 mmol) and triethylamine (11 μL, 0.080 mmol) in anhydrous CH_2Cl_2 (3 mL) at 0 ^oC was added triphosgene (6 mg, 0.020 mmol). The reaction mixture was allowed to warm to rt and was stirred for 18 h and then concentrated *in vacuo* to give a yellow solid. Purification by flash column chromatography using Et_2O/CH_2Cl_2 (1:30) as eluent gave the title compound (0.017 g, 81%) as a colorless oil. R_f 0.39 (1:3 EtOAc/petrol). $[\alpha]_D^{21}$ +3.6 (*c* 8.30, $CHCl_3$). IR υ_{max} (cm^{-1}): 2970, 2924, 2847, 1746, 1513, 1247, 1073. δ_H (300 MHz): 7.33-7.24 (12H, m, ArH), 6.88-6.85 (2H, m, ArH), 6.30 (1H, d, *J* = 16.2 Hz, H2’’’) 5.82 (1H, ddd, *J* = 7.2, 10.1, 17.6 Hz, H2’), 6.00 (1H, dd, *J* = 9.3, 15.9 Hz, H1’’’), 5.25 (1H, d, *J* = 17.2 Hz, H3’$_{trans}$), 5.18 (1H, dd, *J* = 10.4 Hz, H3’$_{cis}$), 4.86 (1H, ddd, *J* = 2.6, 8.1, 10.7 Hz, H5), 4.61 (1H, d, *J* = 11.7 Hz, OC*H*HPh), 4.52 (1H, d, *J* = 10.7 Hz, OC*H*HPMP), 4.48 (1H, d, *J* = 11.7 Hz, OC*H*HPh), 4.41-4.32 (1H, m, H4), 4.39-4.32 (1H, m, H1’), 4.34 (1H, d, *J* = 10.7 Hz, OC*H*HPMP), 3.90-3.76 (1H, m, H2’’), 3.90-3.76 (1H, m, H4’$_A$), 3.79 (3H, s, OCH_3), 3.61 (1H, dd, *J* = 5.4, 10.2 Hz, H4’$_B$), 1.74-1.55 (2H, m, H1’’), 1.19 (3H, d, *J* = 6.3 Hz, H3’’). δ_C (75 MHz): 159.2 (ArC), 157.4 (CO), 137.8 (ArC), 135.6 (ArC), 135.0 (C2’’’), 133.6 (C2’), 130.6 (ArC), 128.4 (ArC), 128.6 (ArC),

128.4 (ArC), 128.3 (ArC), 127.9 (ArC), 127.8 (ArC), 126. (ArC), 124.9 (C1'''), 118.4 (C3'), 113.8 (ArC), 74.6 (C5), 73.0 (O*C*H_2Ph), 71.3 (C2''), 70.9 (O*C*H_2PMP), 68.9 (C4'), 61.3 (C4), 56.2 (C1'), 55.3 (OCH_3), 38.7 (C1''), 20.1 (C3''). ESIMS *m/z* 550 (80%) $[MNa]^+$, 528 (18%) $[MH]^+$, HRESIMS found 528.2737, calc for $C_{33}H_{38}NO_5$, 528.2750 $[MH]^+$.

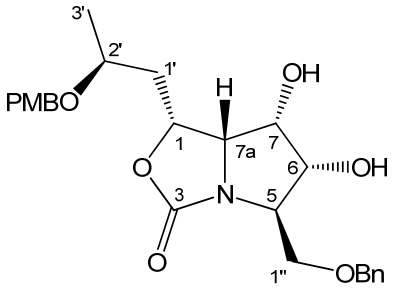
General Method for Ring-Closing Metathesis of Oxazolidinones



(1*R*,5*S*,7a*S*)-5-(Benzyloxymethyl)-1-((*S*)-2-(4-methoxybenzyloxy)propyl)-1,7a-dihydropyrrolo[1,2-*c*]oxazol-3(5*H*)-one (11a). To a nitrogen-flushed solution of the oxazolidinone **10a** (0.165 g, 0.313 mmol) in anhydrous CH_2Cl_2 (3 mL) was added Grubbs II catalyst (13 mg, 0.0157 mmol). The reaction mixture was stirred and irradiated with microwaves in a CEM microwave reactor for 1 h at 90 ^oC using a maximum applied power of 200 W. After cooling the reaction mixture was concentrated *in vacuo* to give a black semi-solid. Purification by flash column chromatography using EtOAc/petrol (3:7) as eluent gave the title compound (0.100 g, 76%) as a yellow oil. R_f 0.25 (1:3 EtOAc/petrol). $[\alpha]_D^{24}$ -32.4 (c 1.00, $CHCl_3$). IR υ_{max} (cm^{-1}): 2970, 2929, 2858, 1752, 1513, 1375, 1248, 1030. δ_H (500 MHz): 7.35-7.24 (7H, m, ArH), 6.92-6.86 (2H, m, ArH), 6.01 (1H, dd, *J* = 2.3, 6.0 Hz, H7), 5.91 (1H, dd, *J* = 1.1, 6.1 Hz, H6), 5.00 (1H, dt, *J* = 3.4, 8.9 Hz, H1), 4.82-4.77 (2H, m, H7a and H5), 4.58 (1H, d, *J* = 12.0 Hz, OC*H*HPMP), 4.56

(1H, d, *J* = 10.8 Hz, OC*H*HPh), 4.54 (1H, d, *J* = 12.0 Hz, OC*H*HPMP), 4.34 (1H, d, *J* = 10.8 Hz, OC*H*HPh), 3.81-3.76 (1H, m, H2'), 3.80 (3H, s, OCH_3), 3.54 (2H, dd, *J* = 2.1, 5.0 Hz, H1''), 1.73 (1H, ddd, *J* = 3.6, 10.3, 14.3 Hz, $H1'_A$), 1.62 (1H, ddd, *J* = 2.8, 9.7, 14.3 Hz, $H1'_B$), 1.22 (3H, d, *J* = 6.0 Hz, H3'). δ_C (125 MHz): 162.4 (ArC), 159.2 (C3), 137.9 (ArC), 132.8 (C7), 130.5 (ArC), 129.4 (ArC), 128.4 (ArC), 128.4 (C6), 127.6 (ArC), 127.5 (ArC), 113.9 (ArC), 76.3 (C1), 73.2 (OCH_2PMP), 71.3 (C1''), 71.1 (C2'), 70.8 (OCH_2Ph), 68.2 (C5), 66.8 (C7a), 55.1 (OCH_3), 40.0 (C1'), 19.9 (C3'). ESIMS *m/z* 446 (100%) $[MNa]^+$, HRESIMS found 446.1956 calc for $C_{25}H_{29}NO_5Na$, 424.2124 $[MNa]^+$.

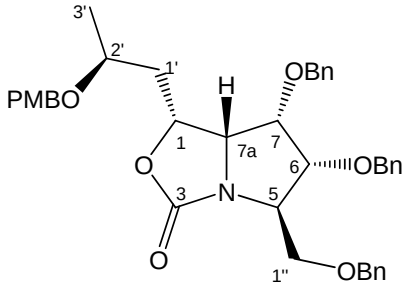
General Method for *Syn*-Dihydroxylation



(1*R*,5*R*,6*R*,7*S*,7a*S*)-5-(Benzyloxymethyl)-6,7-dihydroxy-1-((*S*)-2-(4-methoxy-benzyloxy)propyl)tetrahydropyrrolo[1,2-*c*]oxazol-3(1*H*)-one (12a). To a solution of the alkene **11a** (0.600 g, 1.420 mmol) in 3:2 acetone/water (20 mL) was added *N*-morpholine-*N*-oxide (0.333 g, 2.840 mmol) and potassium osmate dihydrate (26 mg, 0.071 mmol). The reaction mixture was stirred at rt for 18 h, diluted with H_2O and extracted with EtOAc (3 x 20 mL). The combined organic layers were dried ($MgSO_4$) and concentrated *in vacuo* to afford a black oil. Purification by flash column chromatography (increasing polarity from 0:100 to 5:95 MeOH/CH_2Cl_2 as eluent) gave

the title compound (0.572 g, 88%) as a brown oil. R_f 0.26 (1:1 EtOAc/petrol). $[\alpha]_D^{24}$ +2.0 (*c* 1.00, $CHCl_3$). IR υ_{max} (cm^{-1}): 3421, 2934, 2909, 2863, 1727, 1513, 1247, 1123, 1061. δ_H (500 MHz): 7.36-7.21 (7H, m, ArH), 6.86 (2H, d, *J* = 8.5 Hz, ArH), 4.86 (1H, td, *J* = 3.9, 8.2 Hz, H1), 4.57 (2H, q, *J* = 11.1 Hz, OC*H*$_2$PMP), 4.54 (1H, d, *J* = 10.8 Hz, O*H*CHPh), 4.31 (1H, d, *J* = 10.8 Hz, O*H*CHPh), 4.30-4.27 (1H, m, H7), 3.97-3.95 (1H, m, H6), 3.80-3.77 (1H, m, H5), 3.78 (3H, s, OCH_3), 3.78-3.76 (1H, m, H2'), 3.74 (1H, dd, *J* = 3.8, 9.6 Hz, H1''$_A$), 3.67-3.65 (1H, m, H7a), 3.63 (1H, dd, *J* = 5.3, 9.6 Hz, H1''$_B$), 2.36 (1H, ddd, *J* = 2.4, 8.8, 14.6 Hz, H1'$_A$), 1.94 (1H, ddd, *J* = 4.0, 10.4, 14.6 Hz, H1'$_B$), 1.24 (3H, d, *J* = 6.0 Hz, H3'). δ_C (125 MHz): 162.7 (C3), 159.2 (ArC), 137.8 (ArC), 130.5 (ArC), 129.5 (ArC), 128.4 (ArC), 127.8 (ArC), 127.6 (ArC), 113.8 (ArC), 76.3 (C7), 73.9 (C1), 73.5 (C3''), 72.3 (C6), 72.1 (C2'), 70.7 (C5'), 70.4 (1''), 65.1 (C7a), 62.3 (C5), 55.3 (OCH_3), 37.5 (C1'), 19.9 (C3'). ESIMS *m/z* 480 (100%) $[MNa]^+$, 458 (10%) $[MH]^+$, HRESIMS found 458.2187, calc for $C_{25}H_{32}NO_7$, 458.2179 $[MH]^+$.

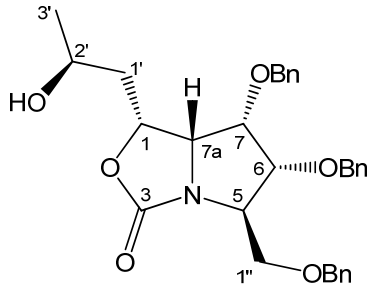
General Method for Bisbenzylation of Secondary Diols



(1*R*,5*R*,6*R*,7*S*,7a*R*)-6,7-Bis(benzyloxy)-5-(benzyloxymethyl)-1-((*S*)-2-(4-methoxybenzyloxy)propyl)tetrahydropyrrolo[1,2-*c*]oxazol-3(1*H*)-one (13a). A solution of the diol **12a** (0.018 g, 0.0391 mmol), benzyl bromide (0.020 mL, 0.157 mmol) and tetrabutylammonium iodide (1 mg, 0.004 mmol) in anhydrous THF (5 mL) was cooled to

0 ^{o}C. To the above solution was added sodium hydride (50% dispersion in mineral oil, 6 mg, 3 mg NaH, 0.117 mmol), and the reaction mixture was allowed to warm to rt and was stirred for 18 h. Quenching with H_2O gave a cloudy mixture, which was extracted with Et_2O (3 x 10 mL). The combined ethereal extracts were dried ($MgSO_4$) and concentrated *in vacuo* to give a pale yellow oil. Purification by flash column chromatography (increasing polarity from 1:9 to 1:4 EtOAc/petrol) gave the title compound (0.025 g, 100%) as a colorless oil. R_f 0.19 (1:10 EtOAc/petrol). $[\alpha]_D^{22}$ +9.3 (*c* 1.23, $CHCl_3$). IR υ_{max} (cm^{-1}): 2929, 2858, 1750, 1516, 1239, 1096, 1067, 1028, 906. δ_H (500 MHz): 7.35-7.19 (17H, m, ArH), 6.88-6.84 (2H, m, ArH), 5.01 (1H, d, *J* = 11.5 Hz, OC*H*HAr), 4.80 (1H, ddd, *J* = 4.8, 7.8, 8.0 Hz, H1), 4.63-4.50 (3H, m, 3 x OC*H*HAr), 4.55-4.50 (1H, m, OC*H*HAr), 4.43(1H, d, *J* = 16.3 Hz, OC*H*HAr), 4.41 (1H, d, *J* = 16.3 Hz, OC*H*HAr), 4.26 (1H, d, *J* = 10.6 Hz, OC*H*HAr), 4.18 (1H, dd, *J* = 2.7, 8.1 Hz, H6), 3.98 (1H, dt, *J* = 3.0, 8.1 Hz, H5), 3.94 (1H, t, *J* = 2.7 Hz, H7), 3.78 (3H, s, OCH_3), 3.78-3.75 (1H, m, H1''$_A$), 3.70-3.67 (1H, m, H2'), 3.65 (1H, dd, *J* = 2.7, 7.8 Hz, H7a), 3.59 (dd, *J* = 2.9, 10.3 Hz, H1''$_B$), 2.12 (1H, ddd, *J* = 2.7, 8.3, 14.7 Hz, H1'$_A$), 1.75 (1H, ddd, *J* = 4.7, 10.4, 14.7 Hz, H1'$_B$), 1.09 (3H, d, *J* = 6.1 Hz, H3'). δ_C (125 MHz): 162.0 (C3), 159.2 (ArC), 138.1 (ArC), 138.0 (ArC), 137.5 (ArC), 130.5 (ArC), 129.5 (ArC), 128.5 (ArC), 128.3 (ArC), 128.2 (ArC), 127.9 (ArC), 127.6 (ArC), 127.6 (ArC), 127.4 (ArC), 127.2 (ArC), 113.8 (ArC), 83.1 (C6), 77.1 (C7), 73.8 (C1), 73.3 (OBn), 73.2 (OBn), 72.8 (OBn), 72.2 (C2), 70.7 (OPMB), 69.2 (C1''), 64.2 (C7a), 60.9 (C5), 55.2 (OCH_3), 37.3 (C1'), 19.8 (C3'). ESIMS *m/z* 660 (70%) $[MNa]^+$, 638 (3%) $[MH]^+$, HRESIMS found 638.3093, calc for $C_{39}H_{44}NO_7$, 638.3118 $[MH]^+$.

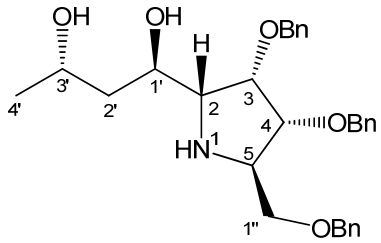
General Method for PMB Deprotection using DDQ.



(1*R*,5*R*,6*R*,7*S*,7a*R*)-6,7-Bis(benzyloxy)-5-(benzyloxymethyl)-1-((*S*)-2-hydroxypropyl)-tetrahydropyrrolo[1,2-*c*]oxazol-3(1*H*)-one (14a). To a solution of **13a** (0.131 g, 0.206 mmol) in 8:1 CH_2Cl_2/H_2O (9 mL) was added 2,3-dichloro-5,6-dicyanobenzoquinone (DDQ) (0.103 g, 0.453 mmol). The reaction mixture was stirred at rt for 4 h, when TLC analysis (EtOAc/petrol (1:1)) showed complete consumption of **13a**. Purification by flash column chromatography (increasing polarity from 1:1 to 4:1 EtOAc/petrol as eluent) gave the title compound (0.094 g, 89%) as a yellow oil. R_f 0.16 (1:1 EtOAc/petrol). $[\alpha]_D^{24}$ +19.8 (*c* 1.31, $CHCl_3$). IR υ_{max} (cm^{-1}): 3436, 3057, 3021, 2924, 2863, 1747, 1454, 1357, 1203. δ_H (500 MHz): 7.37-7.19 (15H, m, ArH), 5.04 (1H, d, *J* = 11.6 Hz, OC*H*HPh), 4.79 (1H, td, *J* = 4.8, 8.0 Hz, H1), 4.65 (1H, d, *J* = 11.9 Hz, OC*H*HPh), 4.56 (1H, d, *J* = 11.5 Hz, OC*H*HPh), 4.54 (1H, d, *J* = 14.0 Hz, OC*H*HPh), 4.51 (1H, d, *J* = 14.0 Hz, OC*H*HPh), 4.41 (1H, d, *J* = 11.9 Hz, OC*H*HPh), 4.29 (1H, dd, *J* = 2.1, 7.9 Hz, H6), 4.05-4.02 (1H, m, H7), 4.00 (1H, dt, *J* = 3.1, 8.0 Hz, H5), 3.92 (1H, ddd, *J* = 3.1, 6.3, 9.5 Hz, H2'), 3.76 (1H, dd, *J* = 3.2, 10.3 Hz, H1''$_A$), 3.73 (1H, dd, *J* = 2.6, 7.6 Hz, H7a), 3.60 (1H, dd, *J* = 3.0, 10.3 Hz, H1''$_B$), 2.10 (1H, ddd, *J* = 2.9, 8.5, 14.5 Hz, H1'$_A$), 1.64 (1H, ddd, *J* = 4.7, 9.9, 14.5 Hz, H1'$_B$), 1.08 (3H, d, *J* = 6.2 Hz, H3'). δ_C (125 MHz): 162.0 (C3), 138.1 (ArC), 137.9 (ArC), 137.5 (ArC), 128.5 (ArC), 128.3 (ArC), 128.3 (ArC), 127.8 (ArC), 127.6 (ArC), 127.4 (ArC), 127.3 (ArC), 83.2 (C6), 77.0

(C7), 73.8 (C1), 73.3 (O*C*H_2Ph), 73.2 (O*C*H_2Ph), 72.9 (O*C*H_2Ph), 69.3 (C1''), 65.1 (CH), 64.2 (C7a), 61.0 (C5), 38.1 (C1'), 24.4 (C3'). ESIMS *m/z* 540 (100%) $[MNa]^+$, 518 (48%) $[MH]^+$, HRESIMS found 518.2523, calc for $C_{31}H_{36}NO_6$, 518.2543 $[MH]^+$.

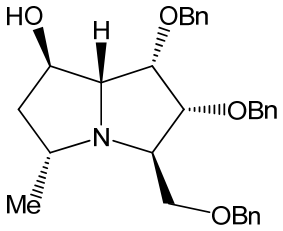
General Method for Hydrolysis of Oxazolidinones



(1*R*,3*S*)-1-((2*R*,3*S*,4*R*,5*R*)-3,4-Bis(benzyloxy)-5-(benzyloxymethyl)pyrrolidin-2-yl)butane-1,3-diol (15a). To a solution of **14a** (0.270 g, 0.521 mmol) in ethanol (3 mL) was added sodium hydroxide (0.042 g, 1.042 mmol). The reaction mixture was stirred and irradiated with microwaves in a CEM microwave reactor for 1 h at 110 ^oC using a maximum applied power of 200 W. After cooling the reaction mixture was concentrated *in vacuo* to give a yellow semi-solid. Purification by flash column chromatography (increasing polarity from 2.5:97.5 to 7.5:92.5 MeOH/CH_2Cl_2 as eluent) gave the title compound (0.216 g, 84%) as a light yellow oil. R_f 0.32 (7.5:92.5 MeOH/CH_2Cl_2). $[\alpha]_D^{24}$ +13.6 (*c* 1.00, $CHCl_3$). IR υ_{max} (cm^{-1}): 3359, 3088, 3062, 3032, 2955, 2893, 2858, 1147, 1085, 1049. δ_H (500 MHz): 7.36-7.23 (15H, ArH), 4.86 (1H, d, *J* = 11.4 Hz, OC*H*HPh), 4.60 (1H, d, *J* = 11.9 Hz, OC*H*HPh), 4.55 (1H, d, *J* = 11.9 Hz, OC*H*HPh), 4.54 (1H, d, *J* = 11.4 Hz, OC*H*HPh), 4.48 (1H, d, *J* = 11.9 Hz, OC*H*HPh), 4.43 (1H, d, *J* = 11.9 Hz, OC*H*HPh), 4.14 (1H, t, *J* = 5.0 Hz, H3), 4.13-4.10 (1H, m, H1'), 4.01-3.93 (1H, m, H3'), 3.90 (1H, t, *J* = 5.0 Hz, H4), 3.54-3.46 (2H, m, H1''), 3.47-3.44 (1H, m, H5), 3.10 (1H,

dd, *J* = 5.0, 8.5 Hz, H2), 1.73-1.60 (2H, m, H2'), 1.17 (3H, d, *J* = 6.3 Hz, H4'). δ_C (125 MHz): 137.9 (ArC), 137.8 (ArC), 137.7 (ArC), 128.6 (ArC), 128.4 (ArC), 128.4 (ArC), 128.0 (ArC), 128.0 (ArC), 127.8 (ArC), 127.7 (ArC), 127.7 (ArC), 127.7 (ArC), 80.5 (C4), 79.9 (C3), 73.3 (O*C*H_2Ph), 73.2 (O*C*H_2Ph), 72.6 (O*C*H_2Ph), 70.5 (C1'), 69.7 (C1''), 65.3 (C3'), 63.0 (C2), 60.7 (C5), 44.5 (C2'), 23.8 (C4'). ESIMS *m/z* 492 (100%) $[MH]^+$, HRESIMS found 492.2758, calc for $C_{30}H_{38}NO_5$, 492.2750 $[MH]^+$.

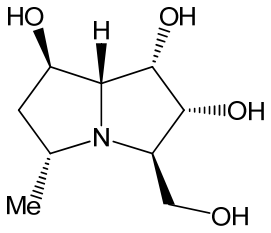
General Method for Mesylation-Cyclization



(1*R*,3*R*,5*R*,6*R*,7*S*,7a*R*)-6,7-bis(benzyloxy)-5-(benzyloxymethyl)-3-methylhexahydro-1*H*-pyrrolizin-1-ol (16). To solution of **15a** (0.130 g, 0.264 mmol) in CH_2Cl_2 (15 mL) at 0 ^oC was added *via* syringe triethylamine (20.4 μL, 0.264 mmol) and a 0.11 M solution of $MeSO_2Cl$ in CH_2Cl_2 (2.5 mL, 0.264 mmol $MeSO_2Cl$). The reaction mixture was stirred at 0 ^oC for 1.5 h and quenched with sat. $NaHCO_3$ solution (3 mL), followed by extractions with EtOAc (3 x 15 mL). The combined organic extracts were dried ($MgSO_4$) and concentrated *in vacuo* to give a yellow oil. Purification by flash column chromatography (increasing polarity from 4:1 to 100:0 EtOAc/petrol as eluent) gave the title compound (0.079 g, 63%) as a colorless oil. R_f 0.20 (4:1 EtOAc/petrol). $[\alpha]_D^{25}$ +25.0 (*c* 1.00, $CHCl_3$). IR υ_{max} (cm^{-1}): 3380, 2955, 2919, 2858, 1362, 1127, 1096, 1055, 1024. δ_H (500 MHz): 7.36-7.25 (15H, m, ArH), 4.73 (1H, d, *J* = 11.7 Hz, OC*H*HPh), 4.67-4.63 (1H, dd, *J* = 4.4,

10.5 Hz H7), 4.59-4.50 (5H, m, 5 x OC*H*HPh), 4.15 (1H, t, *J* = 4.8 Hz, H1), 3.91 (1H, t, *J* = 4.5 Hz, H2), 3.77 (1H, dq, *J* = 6.6, 15.6 Hz, H5), 3.66 (1H, dd, *J* = 4.7, 7.0 Hz, H7a), 3.48 (1H, dd, *J* = 4.2, 8.5 Hz, $H8_A$), 3.43-3.40 (1H, m, H3), 3.41-3.37 (1H, m, $H8_B$), 1.90-1.86 (2H, m, $H6_A$ and $H6_B$), 1.19 (3H, d, *J* = 6.8 Hz, H9). δ_C (125 MHz): 138.1 (ArC), 138.1 (ArC) 137.9 (ArC), 128.4 (ArC), 128.4 (ArC), 128.3 (ArC), 127.8 (ArC), 127.8 (ArC), 127.7 (ArC), 127.7 (ArC), 127.6 (ArC), 127.6 (ArC), 81.0 (C2), 76.2 (C1), 75.7 (C7a), 73.4 (O*C*H_2Ph), 73.1 (O*C*H_2Ph), 72.2 (O*C*H_2Ph), 71.1 (C7), 71.1 (C8), 60.1 (C3), 57.1 (C5), 42.3 (C6), 16.0 (C9). ESIMS *m/z* 474 (100%) $[MH]^+$, HRESIMS found 474.2624, calc for $C_{30}H_{36}NO_4$, 474.2644 $[MH]^+$.

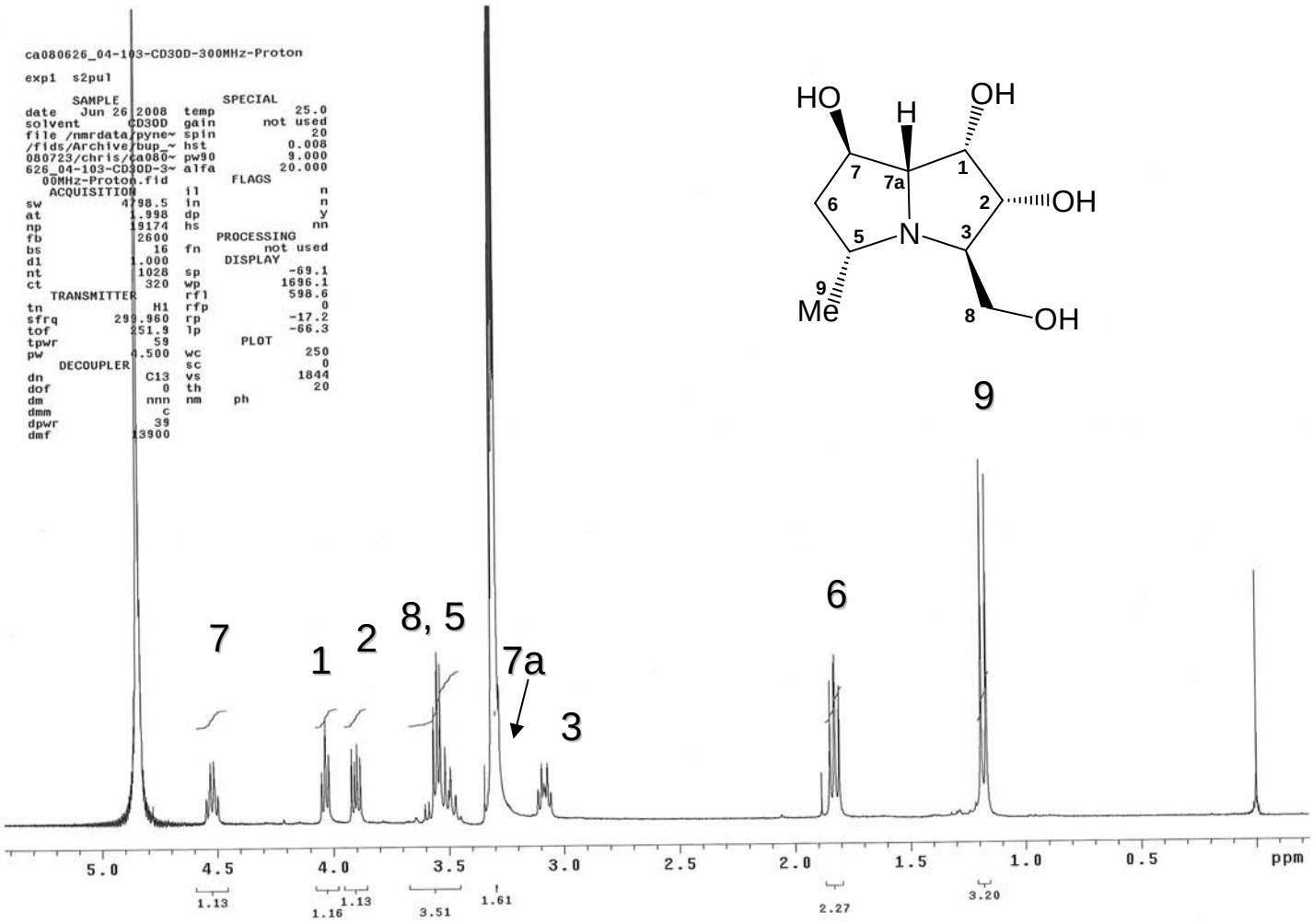
General Method for Hydrogenolysis of Benzyl Ethers

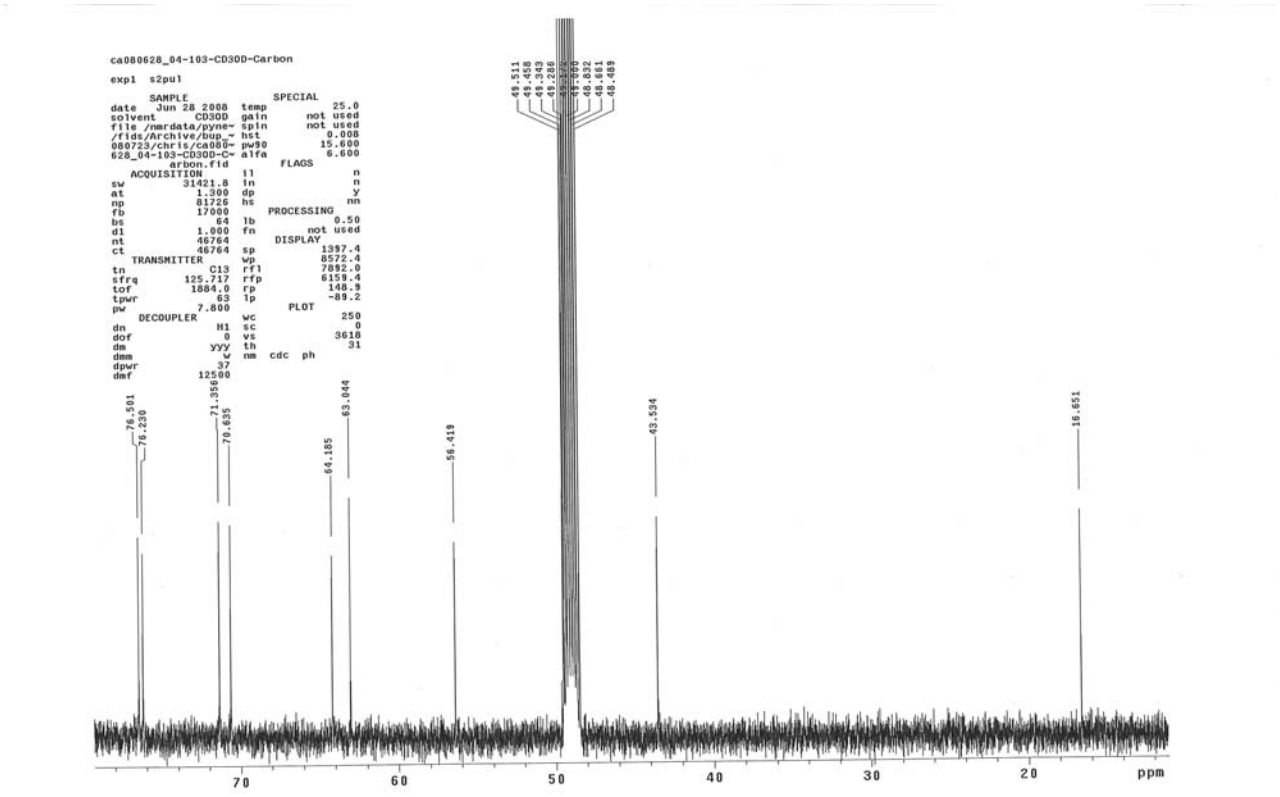


(1*S*,2*R*,3*R*,5*R*,7*R*,7a*R*)-3-(hydroxymethyl)-5-methylhexahydro-1*H*-pyrrolizine-1,2,7-triol (hyacinthacine B_3) (2). To a H_2 flushed solution of the cyclized product **16** (17 mg, 0.036 mmol) in MeOH was added $PdCl_2$ (7 mg, 0.039 mmol). The reaction mixture was stirred at rt under a H_2 atmosphere (balloon) for 8 h and then filtered through a pad of celite and the solids were washed with MeOH. The combined filtrates were concentrated *in vacuo* to give a colorless film, which was dissolved in water (2 mL) and held for 15 min in a column containing Amberlyst A-26 (OH^-) ion-exchange resin (1 g). Elution with water (5 x 5 mL) followed by evaporation *in vacuo* gave the title compound (5 mg, 68%)

as a colorless film. $[\alpha]_D^{23}$ +10.8 (*c* 0.33, H_2O). [Lit. $[\alpha]_D$ +3.3 (*c* 0.31, H_2O), temperature unknown]. IR υ_{max} (cm^{-1}): 3317, 2960, 2929, 2878, 1652, 1338, 1133. δ_H (500 MHz, CD_3OD): 4.52 (1H, m, H7), 4.04 (1H, t, *J* = 4.4 Hz, H1), 3.91 (1H, dd, *J* = 4.2, 7.3 Hz, H2), 3.57 (1H, dd, *J* = 4.9, 11.0 Hz, H8$_\beta$), 3.53 (1H, dd, *J* = 4.5, 11.1 Hz, H8$_\alpha$), 3.50 (1H, m, H5), 3.30 (1H, t, *J* = 4.6 Hz, H7a), 3.10 (1H, ddd, *J* = 4.7, 4.9 7.3 Hz, H3), 1.86-1.82 (2H, m, H6$_\alpha$ and H6$_\beta$), 1.19 (3H, d, *J* = 6.9 Hz, H9). δ_H (75 MHz, CD_3OD): 76.5 (C2), 76.2 (C7a), 71.4 (C1), 70.6 (C7), 64.2 (C8), 63.0 (C3), 56.4 (C5), 43.5 (C6), 16.7 (C9). ESIMS *m/z* 204 (100%) $[MH]^+$, HRESIMS found 204.1297, calc for $C_9H_{18}NO_4$, 204.1236 $[MH]^+$.

^{1}H NMR (500 MHz, CD_3OD) of hyacinthacine B_3





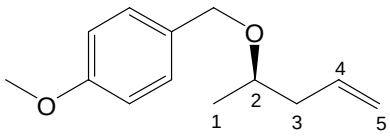
^{13}C NMR (125 MHz, CD_3OD) of hyacinthacine B_3.

Table 1. Comparison of literature ^{13}C NMR chemical shifts (125 MHz, CD_3OD) of natural hyacinthacine B_3 (Lit.) and synthetic **2** (Syn.)

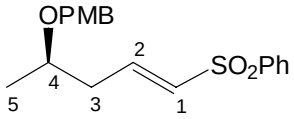
C	Lit.* δ_C	Syn. δ_C	$\Delta\ \delta_C$
1	**72.2**	**71.3**	**-0.9**
2	**77.4**	**76.5**	**-0.9**
3	**63.8**	**63.0**	**-0.8**
5	**57.1**	**56.4**	**-0.7**
6	**44.4**	**43.5**	**-0.9**
7	**71.5**	**70.6**	**-0.9**
7a	**77.0**	**76.2**	**-0.8**
8	**65.0**	**64.2**	**-0.8**
9	**17.5**	**16.7**	**-0.8**

*** *J. Nat. Prod.*, 2002, *65*, 1875**

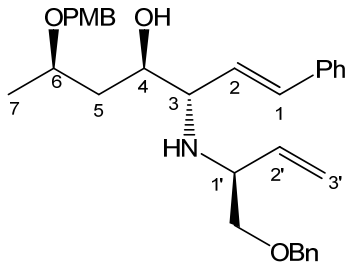
Experimental for the Synthesis of Purported hyacinthacine B_7



1-Methoxy-4-{[(2*R*)-pent-4-en-2-yloxy]methyl}benzene (5b). Following the general method described for *O*-PMB protection using (*R*)-4-penten-2-ol (1.008 g, 11.703 mmol, $[\alpha]_D^{24}$ -5.0 (neat), > 98% ee, Aldrich), 4-methoxybenzyl chloride (3.15 mL, 23.242 mmol), tetrabutylammonium iodide (0.369 g, 1.161 mmol) and sodium hydride (0.418 g, 17.415 mmol), the title compound was obtained as a colorless oil (2.062 g, 86 %). $[\alpha]_D^{23}$ -11.0 (*c* 1.00, $CHCl_3$). Spectroscopic data were the same as those of **5a**.

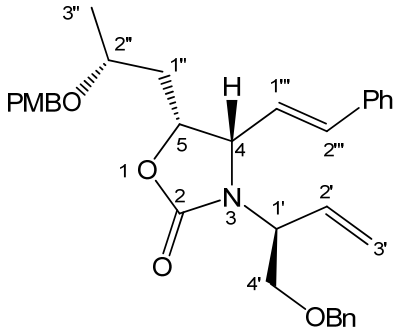


(1*E*,4*R*)-4-[(4-Methoxybenzyl)oxy]pent-1-en-1-yl phenyl sulfone (6b). Following the general method described for olefin cross metathesis using **5b** (0.066 g, 0.319 mmol), phenyl vinyl sulfone (0.107 g, 0.638 mmol), Grubbs II catalyst (14 mg, 0.160 mmol) and CH_2Cl_2 (3 mL), the vinyl sulfone **6b** (0.079 g, 71 %) was obtained as a pale yellow oil. $[\alpha]_D^{23}$ +17.5 (*c* 1.0, $CHCl_3$). Spectroscopic data were the same as those of **6a**.



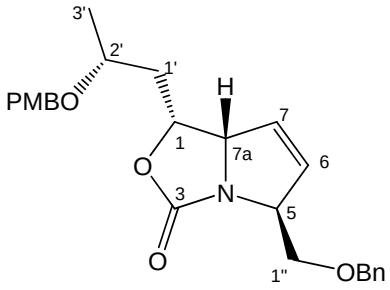
(3*S*,4*R*,6*R*,*E*)-3-((*S*)-1-(Benzyloxy)but-3-en-2-ylamino)-6-(4-methoxybenzyloxy)-1-phenylhept-1-en-4-ol (9b). Following the general method described for Sharpless asymmetric dihydroxylation and the Petasis reaction using the vinyl sulfone **6b** (./ 0.849 g, 2.451 mmol), potassium ferric cyanide (2.420g, 7.352 mmol), potassium carbonate (1.016 g, 7.352 mmol), methanesulfonamide (0.233 g, 2.451 mmol), potassium osmate dihydrate (5 mg, 0.015 mmol), DHQD-IND (17 mg, 0.0368 mmol), H_2O (23 mL) and *t*-BuOH (23 mL) in the Sharpless ADH and using (*E*)-2-phenylvinylboronic acid (0.363 g, 2.451 mmol), (2*S*)-1-(benzyloxy)but-3-en-2-amine (0.434 g, 2.451 mmol) and CH_2Cl_2 (30 mL) in the Petasis reaction gave the title compound (0.491 g, 40 %, 2 steps) as a brown oil. R_f 0.24 (5:95 MeOH/CH_2Cl_2). $[\alpha]_D^{23}$ +10.6 (*c* 2.00, $CHCl_3$). δ_H (500 MHz): 7.36-7.19 (12H, m, ArH), 6.85-6.79 (2H, m, ArH), 6.43 (1H, d, *J* = 16.0 Hz, H1), 6.09 (1H, dd, *J* = 8.5, 16.0 Hz, H2), 5.59 (1H, ddd, *J* = 7.7, 9.9, 17.4 Hz, H2'), 5.22-5.15 (2H, m, H3'), 4.55-4.36 (4H, m, OC*H*$_2$Ph and OC*H*$_2$PMP), 4.02 (dt, *J* = 3.8, 6.3 Hz, H4), 3.88-3.78 (1H, m, H6), 3.77 (3H, s, OCH_3), 3.24 (1H, dd, *J* = 3.8, 8.5 Hz, H3), 3.50-3.40 (3H, m, H1' and H1''), 1.57 (2H, dd, *J* = 5.7, 6.3 Hz, H5), 1.21 (3H, d, *J* = 6.2 Hz, H7). δ_C (125 MHz): 159.2 (ArC), 138.1 (ArC), 137.9 (C2'), 136.9 (ArC), 132.8 (C1), 129.4 (ArC), 130.2 (ArC), 128.4 (ArC), 128.3 (ArC), 128.2 (C2), 127.6 (ArC), 127.5 (ArC), 127.4 (ArC), 126.3 (ArC), 117.9 (C3'), 113.9 (ArC), 75.3 (C6), 73.8 (C4), 73.4 (C1''), 72.9 (O*C*H$_2$Ph), 70.0 (O*C*H$_2$PMP), 62.1 (C3), 57.7 (C1'), 55.2 (OCH_3), 40.3 (C5), 19.5

(C7). ESIMS *m/z* 502 (100%) $[MH]^+$, HRESIMS found 502.2954, calc for $C_{32}H_{40}NO_4$, 502.2957 $[MH]^+$.



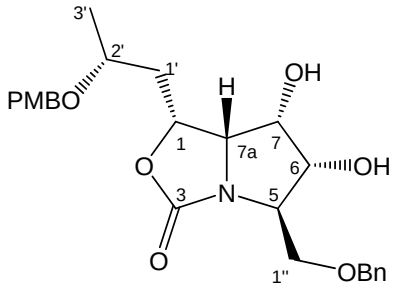
(4*S*,5*R*)-3-((*S*)-1-(Benzyloxy)but-3-en-2-yl)-5-((*R*)-2-(4-methoxybenzyloxy)propyl)-4-styryloxazolidin-2-one (10b). Following the general method for the synthesis of oxazolidinones using the 1,2-amino alcohol **9b** (0.288 g, 0.574 mmol), triethylamine (160 μL, 1.148 mmol), triphosgene (0.085 g, 0.287 mmol) and dry CH_2Cl_2 (20 mL), the title compound (0.163 g, 54%) was obtained as a colorless oil. R_f 0.30 (1:3 EtOAc/petrol). $[\alpha]_D^{22}$ +7.1 (*c* 5.20, $CHCl_3$). δ_H (300 MHz): 7.37-7.19 (12H, m, ArH), 6.89-6.82 (2H, m, ArH), 6.23 (1H, d, *J* = 15.9 Hz, H2'''), 5.99 (1H, dd, *J* = 9.6, 15.9 Hz, H1'''), 5.79 (1H, ddd, *J* = 7.4, 10.3, 17.5 Hz, H2'), 5.25 (1H, d, *J* = 17.3 Hz, H3'$_{trans}$), 5.17 (1H, d, *J* = 10.3 Hz, H3'$_{cis}$), 4.67 (1H, dt, *J* = 5.1, 8.7 Hz, H5), 4.60 (1H, d, *J* = 11.7 Hz, OC*H*HPh), 4.49 (1H, d, *J* = 11.4 Hz, OC*H*HPMP), 4.48 (1H, d, *J* = 11.7 Hz, OC*H*HPh), 4.35-4.27 (1H, m, H4), 4.31 (1H, d, *J* = 11.4 Hz, OC*H*HPMP), 4.29-4.21 (1H, m, H1'), 3.89-3.78 (1H, m, H4'$_A$), 3.79 (3H, s, OCH_3), 3.70-3.63 (1H, m, H2''), 3.61 (1H, dd, *J* = 5.2, 10.2 Hz, H4'$_B$), 2.02 (1H, ddd, *J* = 5.7, 9.0, 14.5 Hz, H1''$_A$), 1.66-1.57 (1H, m, H1''$_B$), 1.20 (3H, d, *J* = 6.1 Hz, H3''). δ_C (75 MHz): 159.2 (ArC), 157.2 (ArC), 137.9 (ArC), 135.5 (ArC),

135.1 (C2’’’), 133.7 (C2’), 130.6 (ArC), 129.4 (ArC), 128.7 (ArC), 128.5 (ArC), 128.4 (ArC), 128.0 (ArC), 127.8 (ArC), 126.6 (ArC), 124.7 (C1’’’), 118.5 (C3’), 113.8 (ArC), 74.9 (C5), 73.0 (O*C*H_2Ph), 70.8 (C2’), 69.9 (O*C*H_2PMP), 68.9 (C4’), 61.4 (C1’), 56.1 (C4), 55.2 (OCH_3), 37.3 (C1’’), 19.0 (C3’’). ESIMS *m/z* 550 (100%) $[MNa]^+$, 528 (10%) $[MH]^+$, HRESIMS found 528.2845, calc for $C_{33}H_{38}NO_5$, 528.2750 $[MH]^+$.



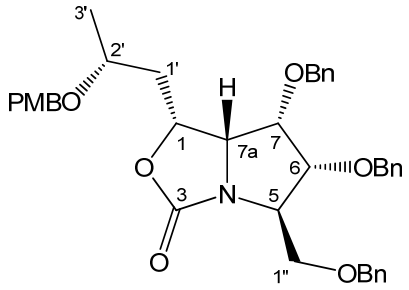
(1*R*,5*S*,7a*S*)-5-(Benzyloxymethyl)-1-((*R*)-2-(4-methoxybenzyloxy)propyl)-1,7a-dihydropyrrolo[1,2-*c*]oxazol-3(5*H*)-one (11b). Following the general method for the ring-closing metathesis of oxazolidinones using the oxazolidinone **10b** (0.400 g, 0.759 mmol), the Grubbs II catalyst (32 mg, 0.038 mmol) and CH_2Cl_2 (3 mL), the title compound (0.280 g, 87 %) was obtained as a yellow oil. R_f 0.45 (1:2 EtOAc/petrol). $[\alpha]_D^{24}$ -87.6 (*c* 1.00, $CHCl_3$). IR υ_{max} (cm^{-1}): 2960, 2929, 2858, 1752, 1512, 1247, 1030. δ_H (500 MHz): 7.38-7.22 (7H, m, ArH), 6.89-6.86 (2H, m, ArH), 6.04-6.02 (1H, m, H7), 5.86 (1H, dd, *J* = 1.7, 6.1 Hz, H6), 4.87 (1H, dt, *J* = 5.5, 8.4 Hz, H1), 4.82-4.79 (1H, m, H5), 4.70 (1H, dd, *J* = 3.5, 11.8 Hz, H7a), 4.57-4.56 (2H, m, OC*H*$_2$PMP), 4.53 (1H, d, *J* = 11.3 Hz, OC*H*HPh), 4.35 (1H, d, *J* = 11.3 Hz, OC*H*HPh), 3.79 (3H, s, OCH_3), 3.75-3.69 (1H, m, H2’), 3.54 (1H, d, *J* = 5.1 Hz, H1’’), 1.96 (1H, ddd, *J* = 5.5, 8.6, 14.1 Hz, H1’$_A$), 1.73-1.67 (1H, m, H1’$_B$), 1.28 (3H, d, *J* = 6.1 Hz, H3’). δ_C (125 MHz): 162.3 (ArC), 159.2 (ArC), 137.9 (ArC), 133.2 (C7), 130.4 (ArC), 129.2 (ArC), 128.3 (ArC),

127.8 (C6), 127.6 (ArC), 127.4 (ArC), 113.8 (ArC), 75.8 (C1), 73.2 (O*C*H_2PMP), 71.0 (C1''), 70.9 (C2'), 70.1 (O*C*H_2Ph), 68.2 (C7a), 66.9 (C5), 55.2 (OCH_3), 38.7 (C1'), 19.0 (C3'). ESIMS *m/z* 446 (60%) $[MNa]^+$, HRESIMS found 446.1938, calc for $C_{25}H_{29}NO_5Na$ 446.1943 $[MNa]^+$.



(1*R*,5*R*,6*R*,7*S*,7a*S*)-5-(Benzyloxymethyl)-6,7-dihydroxy-1-((*R*)-2-(4-methoxy-benzyloxy)propyl)tetrahydropyrrolo[1,2-*c*]oxazol-3(1*H*)-one (12b). Following the general method for *syn*-dihydroxylation using the alkene **11b** (0.203 g, 0.480 mmol), *N*-morpholine-*N*-oxide (0.113 g, 0.961 mmol) and potassium osmate dihydrate (9 mg, 0.024 mmol), acetone (4 mL) and H_2O (2.5 mL), the title compound (0.196 g, 89 %) was obtained as a brown oil. R_f 0.13 (1:1 EtOAc:petrol). $[\alpha]_D^{24}$ -35.2 (*c* 1.00, $CHCl_3$). δ_H (500 MHz): 7.39-7.17 (7H, m, ArH), 6.84 (1H, d, *J* = 8.3 Hz, ArH), 4.78 (1H, q, *J* = 7.1 Hz, H1), 4.56 (2H, q, *J* = 11.9 Hz, OC*H*$_2$PMP), 4.51 (1H, d, *J* = 11.4 Hz, OC*H*HPh), 4.31 (1H, d, *J* = 11.4 Hz, OC*H*HPh), 4.23-4.18 (1H, m, H7), 3.87-3.85 (1H, m, H6), 3.76 (3H, s, OCH_3), 3.76-3.70 (1H, m, H5), 3.72-3.65 (1H, m, H1''$_A$), 3.70-3.66 (1H, m, H2'), 3.63-3.58 (1H, m, H1''$_B$), 3.43 (1H, dd, *J* = 4.1, 6.6 Hz, H7a), 2.35 (1H, dt, *J* = 6.9, 14.0 Hz, H1'$_A$), 2.14 (1H, m, H1'$_B$), 1.25 (1H, d, *J* = 6.1 Hz, H3'). δ_C (125 MHz): 162.7 (C3), 159.2 (ArC), 137.9 (ArC), 130.4 (ArC), 129.5 (ArC), 128.4 (ArC), 127.8 (ArC), 127.7 (ArC), 113.8 (ArC), 76.3 (C7), 73.5 (O*C*H_2PMP), 73.4 (C1), 72.1 (C6), 71.0 (C2') 70.3

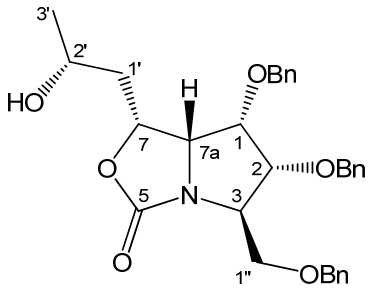
(C1''), 69.8 (O*C*H_2Ph), 64.8 (C7a), 62.2 (C5), 55.3 (OCH_3), 36.2 (C1'), 19.2 (C3'). ESIMS *m/z* 480 (82%) $[MH]^+$, HRESIMS found 480.2035, calc for $C_{25}H_{31}NO_7Na$ 480.1998 $[MNa]^+$.



(1*R*,5*R*,6*R*,7*S*,7a*R*)-6,7-Bis(benzyloxy)-5-(benzyloxymethyl)-1-((*R*)-2-(4-methoxy-benzyloxy)propyl)tetrahydropyrrolo[1,2-*c*]oxazol-3(1*H*)-one (13b). Following the general method for bisbenzylation using diol **12b** (0.160 g, 0.350 mmol), benzyl bromide (0.170 mL, 0.239 mmol) and tetrabutylammonium iodide (13 mg, 0.035 mmol), sodium hydride (50% dispersion in mineral oil, 50 mg, 25 mg NaH, 1.050 mmol) and THF (25 mL), the title compound (0.210 g, 94 %) was obtained as a colorless oil. R_f 0.72 (1:1 EtOAc:petrol). $[\alpha]_D^{24}$ +2.4 (*c* 1.00, $CHCl_3$). δ_H (500 MHz): 7.36-7.20 (15H,m, ArH), 7.14 (2H, d, *J* = 8.6 Hz, ArH), 6.82 (2H, d, *J* = 8.6 Hz, ArH), 5.02 (1H, d, *J* = 11.5 Hz, OC*H*HAr), 4.74 (1H, dd, *J* = 7.3, 14.2 Hz, H1), 4.61-4.37 (6H, m, 6 x OC*H*HAr), 4.19 (1H, d, *J* = 11.6 Hz, OC*H*HAr), 4.16 (1H, dd, *J* = 2.8, 8.3 Hz, H6), 3.96 (1H, dt, *J* = 3.0, 8.1 Hz, H5), 3.82 (1H, t, *J* = 2.4 Hz, H7), 3.75 (3H, s, OCH_3), 3.74 (1H, dd, *J* = 2.9, 10.2 Hz, H1''$_A$), 3.60 (1H, dd, *J* = 2.9, 10.2 Hz, H1''$_B$), 3.59-3.56 (1H, m, H2'), 3.52 (1H, dd, *J* = 2.3, 7.5 Hz, H7a), 2.24 (1H, ddd, *J* = 6.0, 7.4 13.9 Hz, H1'$_A$), 1.90 (1H, dt, *J* = 6.2, 13.9 Hz, H1'$_B$), 1.16 (3H, d, *J* = 6.2 Hz, H3'). δ_C (125 MHz): 162.0 (C3), 159.2 (ArC), 138.2 (ArC), 137.9 (ArC), 137.5 (ArC), 130.5 (ArC), 129.4 (ArC), 128.5 (ArC), 128.3

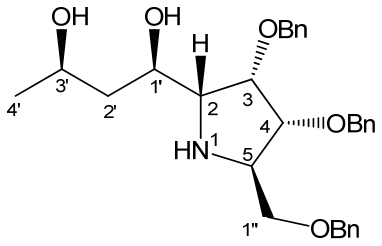
(ArC), 128.3 (ArC), 128.0 (ArC), 127.7 (ArC), 127.6 (ArC), 127.6 (ArC), 127.3 (ArC), 127.0 (ArC), 113.7 (ArC), 83.3 (C6), 76.9 (C7), 73.3 (O*C*H_2Ar), 73.2 (O*C*H_2Ar), 72.9 (C1), 72.7 (O*C*H_2Ar),70.8 (C2), 69.7 (O*C*H_2Ar), 69.2 (C1''), 64.0 (C7a), 60.8 (C5), 55.2 (OCH_3), 35.2 (C1'), 18.9 (C3').

ESIMS *m/z* 660 (100%) $[MNa]^+$, HRESIMS found 660.2987, calc for $C_{39}H_{43}NO_7Na$, 660.2937 $[MNa]^+$.



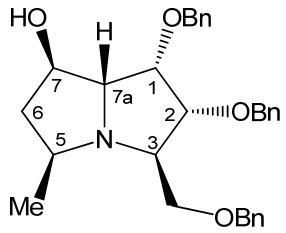
(1*R*,5*R*,6*R*,7*S*,7a*R*)-6,7-Bis(benzyloxy)-5-(benzyloxymethyl)-1-((*R*)-2-hydroxypropyl)-tetrahydropyrrolo[1,2-*c*]oxazol-3(1*H*)-one (14b). Following the general method for PMB deprotection using **13b** (0.173 g, 0.272 mmol), 2,3-dichloro-5,6-dicyanobenzoquinone (DDQ) (0.136 g, 0.598 mmol), CH_2Cl_2 (10 mL) and H_2O (1.25 mL) the title compound (0.130 g, 92 %) was obtained as a yellow oil. R_f 0.33 (2.5:97.5 MeOH:CH_2Cl_2). $[\alpha]_D^{24}$ +14.3 (*c* 1.00, $CHCl_3$). δ_H (500 MHz): 7.35-7.17 (15H, m, ArH), 5.01 (1H, d, *J* = 11.4 Hz, OC*H*HPh), 4.74 (1H, dd, *J* = 7.5, 13.5 Hz, H1), 4.64 (1H, d, *J* = 11.8 Hz, OC*H*HPh), 4.56 (1H, d, *J* = 11.8 Hz, OC*H*HPh), 4.51 (1H, d, *J* = 11.4 Hz, OC*H*HPh), 4.48 (1H, d, *J* = 11.7 Hz, OC*H*HPh), 4.38 (1H, d, *J* = 11.7 Hz, OC*H*HPh), 4.27 (1H, dd, *J* = 1.7, 7.8 Hz, H6), 4.02-4.01 (1H, m, H7), 4.00-3.96 (1H, m, H5), 3.89-3.82 (1H, dd, *J* = 6.1, 11.2 Hz, H2'), 3.74 (1H, dd, *J* = 3.4, 10.4 Hz, H1''$_A$), 3.74-3.71 (1H, m, H7a), 3.58 (1H, dd, *J* = 2.4, 10.4 Hz, H1''$_B$), 2.09 (1H, dt, *J* = 7.6, 14.6 Hz,

H1'$_A$), 1.81 (1H, *J* = 4.9, 14.6 Hz, H1'$_B$), 1.10 (3H, d, *J* = 6.2 Hz, H3'). δ_C (125 MHz): 161.9 (C3), 137.9 (ArC), 137.7 (ArC), 137.3 (ArC), 128.4 (ArC), 128.2 (ArC), 128.2 (ArC), 127.9 (ArC), 127.6 (ArC), 127.6 (ArC), 127.5 (ArC), 127.3 (ArC), 127.1 (ArC), 83.1 (C6), 76.5 (C7), 73.9 (C1), 73.1 (O*C*H$_2$Ph), 73.1 (O*C*H$_2$Ph), 72.6 (O*C*H$_2$Ph), 69.1 (C1''), 65.5 (C2'), 64.0 (C7a), 60.8 (C5), 37.7 (C1'), 23.0 (C3'). ESIMS *m/z* 540 (100%) $[MH]^+$, 518 (40%) $[MNa]^+$, HRESIMS found 518.2532, calc for $C_{31}H_{36}NO_6$, 518.2543 $[MH]^+$.



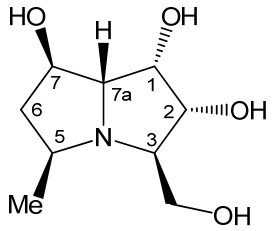
(1*R*,3*R*)-1-((2*R*,3*S*,4*R*,5*R*)-3,4-Bis(benzyloxy)-5-(benzyloxymethyl)pyrrolidin-2-yl)butane-1,3-diol (15b). Following the general method for the hydrolysis of oxazolidinones using **14b** (0.105 g, 0.203 mmol), sodium hydroxide (0.016 g, 0.406 mmol) and EtOH (4 mL), the title compound (0.090 g, 91 %) was obtained as a light yellow oil. R_f 0.08 (2.5:97.5 MeOH:CH_2Cl_2). $[\alpha]_D^{24}$ +14.2 (*c* 1.00, $CHCl_3$). δ_H (500 MHz): 7.39-7.22 (15H, ArH), 4.88 (1H, d, *J* = 11.4 Hz, OC*H*HPh), 4.61 (1H, d, *J* = 11.9 Hz, OC*H*HPh), 4.56 (1H, d, *J* = 11.4 Hz, OC*H*HPh), 4.53 (1H, d, *J* = 11.9 Hz, OC*H*HPh), 4.50 (1H, d, *J* = 11.9 Hz, OC*H*HPh), 4.44 (1H, d, *J* = 11.9 Hz, OC*H*HPh), 4.17 (1H, t, *J* = 4.2 Hz, H3), 4.06 (1H, ddd, *J* = 2.9, 7.7, 10.2 Hz, H1'), 4.02 (1H, ddd, *J* = 2.7, 6.2, 8.9 Hz, H3'), 3.89 (1H, dd, *J* = 4.2, 6.5 Hz, H4), 3.54 (1H, dd, *J* = 5.6, 11.5 Hz, H1''$_A$), 3.49-3.46 (1H, m, H5), 3.48-3.46 (1H, m, H1''$_B$), 3.02 (1H, dd, *J* = 4.2, 7.7 Hz, H2), 1.73 (1H,

dt, J = 2.6, 14.3 Hz, H2'$_A$), 1.44 (1H, ddd, J = 8.9, 10.2, 14.3 Hz, H2'$_B$), 1.16 (3H, d, J = 6.2 Hz, H4'). δ_C (125 MHz): 138.0 (ArC), 137.9 (ArC), 137.8 (ArC), 128.5 (ArC), 128.4 (ArC), 128.3 (ArC), 128.0 (ArC), 128.0 (ArC), 127.8 (ArC), 127.7 (ArC), 127.7 (ArC), 127.6 (ArC), 81.1 (C4), 79.0 (C3), 73.4 (O*C*H$_2$Ph), 73.2 (O*C*H$_2$Ph), 72.7 (O*C*H$_2$Ph), 72.6 (C1'), 70.1 (C1''), 68.1 (C3'), 62.9 (C2), 60.2 (C5), 42.4 (C2'), 23.6 (C4'). ESIMS *m/z* 492 (100%) $[MH]^+$, HRESIMS found 492.2765, calc for $C_{30}H_{38}NO_5$, 492.2750 $[MH]^+$.



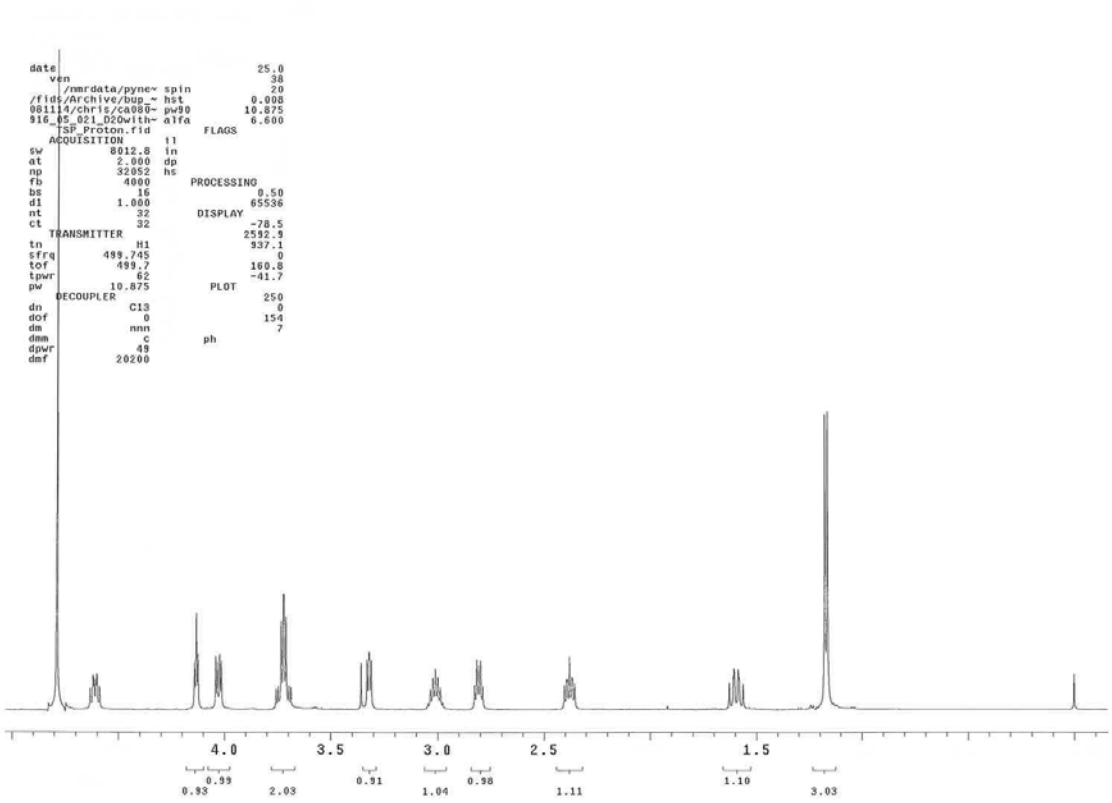
(1*R*,3*S*,5*R*,6*R*,7*S*,7a*R*)-6,7-bis(benzyloxy)-5-(benzyloxymethyl)-3-methylhexahydro-1*H*-pyrrolizin-1-ol (17). Following the general method for mesylation-cyclization using **15b** (0.056 g, 0.115 mmol), triethylamine (79 μL, 0.573 mmol), $MeSO_2Cl$ (8.9 μL, 0.115 mmol) and dry CH_2Cl_2 (10 mL), the title compound (0.028 g, 51 %) was obtained as a colorless oil. R_f 0.19 (4:1 EtOAc/petrol). $[\alpha]_D^{25}$ +7.2 (*c* 1.00, $CHCl_3$). δ_H (500 MHz): 7.39-7.18 (15H, m, ArH), 4.74 (1H, J = 11.8 Hz, OC*H*HPh), 4.68 (1H, dt, 6.6, 9.1, H7), 4.56-4.48 (5H, m, 5 x OC*H*HPh), 4.06 (1H, dd, J = 4.0, 5.4 Hz, H1), 3.93 (1H, dd, J = 4.0, 6.0 Hz, H2), 3.45 (1H, dd, J = 4.7, 9.8 Hz, H8$_A$), 3.42 (1H, dd, J = 5.4, 6.3 Hz, H7a), 3.42 (1H, dd, J = 5.3, 9.8 Hz, H8$_B$), 3.09 (1H, dd, J = 5.3, 10.9 Hz, H3), 3.07-3.01 (1H, m, H5), 2.27 (1H, ddd, J = 5.4, 6.9, 12.1 Hz, H6$_A$), 1.62-1.5 (1H, m, H6$_B$), 1.14 (3H, d, J = 6.3 Hz, CH_3). δ_C (125 MHz): 138.6 (ArC), 138.4 (ArC) 138.2 (ArC), 128.4 (ArC), 128.3 (ArC), 128.3 (ArC), 127.8 (ArC), 127.7 (ArC), 127.6 (ArC), 127.6 (ArC), 127.6 (ArC), 127.5

(ArC), 81.7 (C2), 77.6 (C1), 73.3 (O*C*H_2Ph), 73.0 (C7a), 73.0 (O*C*H_2Ph), 72.3 (O*C*H_2Ph), 71.7 (C8), 71.1 (C7), 68.1 (C3), 62.1 (C5), 43.8 (C6), 22.1 (C9). ESIMS *m/z* 474 (100%) $[MH]^+$, HRESIMS found 474.2665, calc for $C_{30}H_{36}NO_4$, 474.2644 $[MH]^+$.

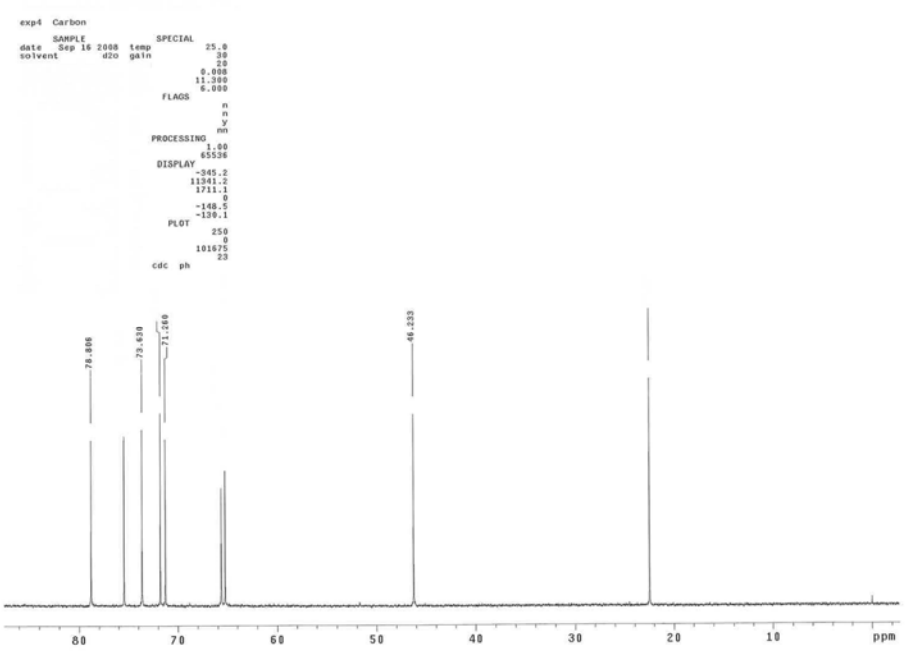


(1*S*,2*R*,3*S*,5*R*,7*R*,7a*R*)-3-(Hydroxymethyl)-5-methylhexahydro-1*H*-pyrrolizine-1,2,7-triol (putative hyacinthacine B_7) (3). Following the general method for the hydrolysis of benzyl ethers using the cyclized product **17** (27 mg, 0.059 mmol), $PdCl_2$ (16 mg, 0.088 mmol), MeOH (2 mL) and H_2 (in balloon), the title compound (10 mg, 84 %) was obtained as a colorless film. $[\alpha]_D^{24}$ + 31.2 (*c* 0.20, $CHCl_3$). δ_H (500 MHz, D_2O): 4.60 (1H, ddd, *J* = 5.8, 7.0, 9.2 Hz, H7), 4.13 (1H, app. t, *J* = 4.0 Hz, H1), 4.03 (1H, dd, *J* = 4.0, 9.1 Hz, H2), 3.74 (1H, dd, *J* = 4.9, 11.7 Hz, H8$_\beta$), 3.70 (1H, dd, *J* = 4.9, 11.7 Hz, H8$_\alpha$), 3.32 (1H, dd, *J* = 4.0, 5.8 Hz, H7a), 3.06-2.97 (1H, m, H5), 2.81 (1H, app. dd, *J* = 4.9, 9.1 Hz, H3), 2.38 (1H, ddd, *J* = 5.0, 7.0, 12.2 Hz, H6$_\beta$), 1.60 (1H, ddd, *J* = 9.3, 11.0, 12.2 Hz, H6$_\alpha$), 1.17 (1H, d, *J* = 6.3 Hz, H9). δ_H (125 MHz, D_2O): 78.1 (C2), 73.6 (C1), 71.8 (C3), 71.3 (C7), 75.4 (C7a), 65.6 (C8), 65.2 (C5), 46.2 (C6), 22.5 (C9). ESIMS *m/z* 204 ($[M+H]^+$), HRESIMS found 204.1319, calc for $C_9H_{18}NO_4$, 204.1236 ($[M+H]^+$).

^{1}H NMR (500 MHz, D_2O) of hyacinthacine B_7



^{13}C NMR (500 MHz, D_2O) of hyacinthacine B_7



NOESY (500 MHz, D_2O) of hyacinthacine B_7 (correlations between H-5 and H-7 are shown inside the square)

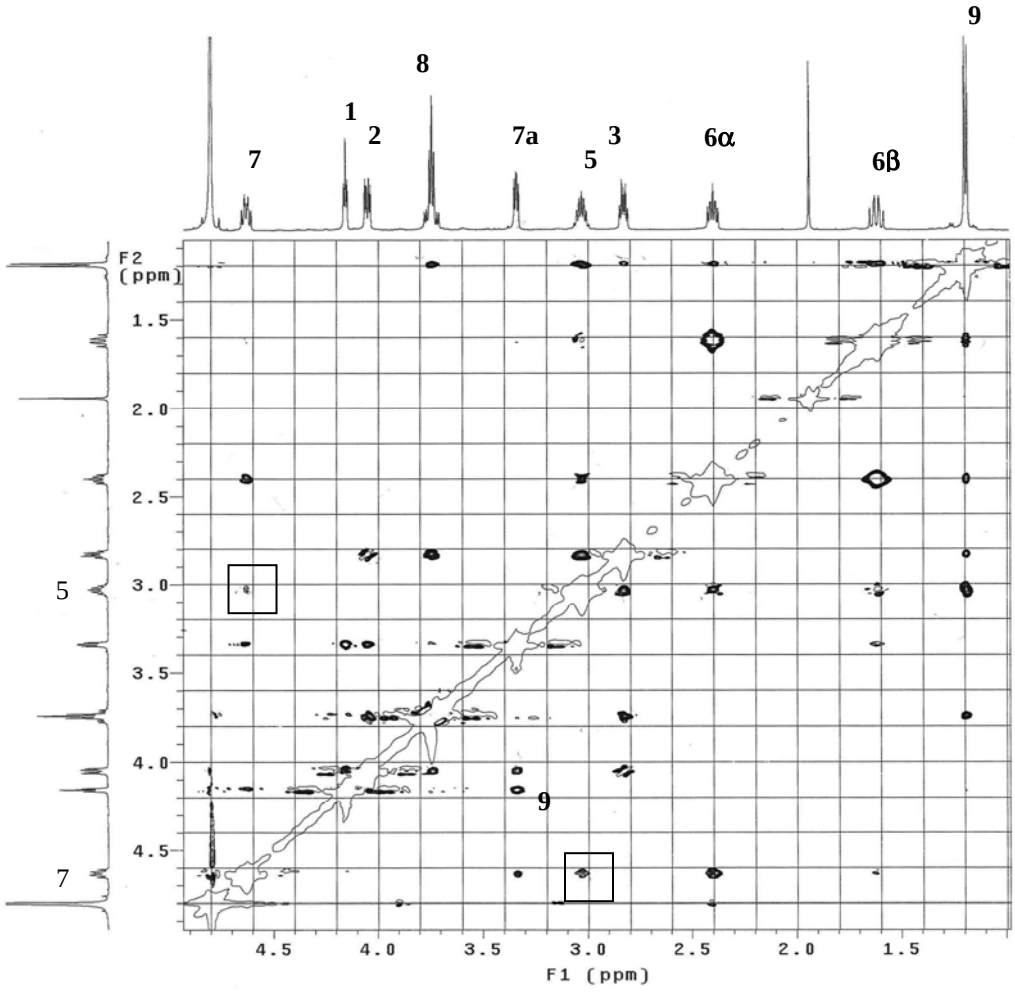


Table 2. Comparison of literature ^{1}H NMR chemical shifts (500 MHz, D_2O) of natural hyacinthacine B_7 (Lit.) and synthetic **3** (Syn.)

H	δ_H (Lit.)**	Mult., *J*(Hz) (Lit.) **	δ_H (syn.)	Mult., *J*(Hz) (syn.)
1	**4.35**	**t (4.4)**	**4.13**	**t (3.9)**
2	**3.97**	**dd (4.4, 7.6)**	**4.03**	**dd (3.9, 9.0)**
3	**3.29**	**ddd (7.6, 5.5, 3.5)**	**2.81**	**ddd (4.9, 4.9, 9.0)**
5	**3.22**	**m**	**3.01**	**m**
6α	**1.68**	**m**	**1.60**	**m**
6β	**2.16**	**m**	**2.38**	**m**
7	**4.50**	**m**	**4.61**	**m**
7a	**3.45**	**dd (4.4, 7.6)**	**3.32**	**dd (3.9, 5.9)**
8α	**3.57**	**dd (5.5, 11.5)**	**3.70**	**dd (4.9, 11.5)**

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Table 3. Comparison of literature ^{13}C NMR chemical shifts (125 MHz, D_2O) of natural hyacinthacine B_7 (Lit.) and synthetic **3** (Syn.)

C	Lit. δ_C**	Syn. δ_C	$\Delta\ \delta_C$
1	**77.9**	**73.6**	**-4.3**
2	**74.9**	**78.1**	**+3.2**
3	**66.2**	**71.8**	**+5.6**
5	**57.7**	**65.2**	**+7.5**
6	**45.2**	**46.2**	**+1.0**
7	**76.5**	**71.3**	**-5.2**
7a	**69.9**	**75.4**	**+5.5**
8	**66.8**	**65.6**	**-1.2**
9	**18.4**	**22.5**	**+4.1**

** *J. Nat. Prod.*, **2007**, *70*, 993