Access to Endocyclic and Exocyclic Allylic Alcohols by Nickel-Catalyzed Reductive Cyclization of Ynals.

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Unless otherwise noted, all reactions were conducted in flame-dried or oven dried (120 °C) glassware with magnetic stirring under an atmosphere of dry nitrogen or argon. Reaction solvents were purified prior to use. Diethyl ether, tetrahydrofuran, and methylene chloride were purified by passage through a solvent column composed of activated alumina (A-1).¹ Toluene was dried by distillation from calcium hydride. *N,N*-Dimethylformamide and chloroform were dried over activated 4 Å molecular sieves. Ni(COD)₂ (Strem Chemicals, Inc.), 1,3-bis(2,4,6-trimethyl-phenyl)imidazolium chloride, 1,3-bis(2,6-diisopropyl-phenyl)imidazolium chloride and KO*t*-Bu (Aldrich) were stored and weighed in an inert atmosphere glovebox. Tributylphosphine (Aldrich) and trimethylphosphine (Strem Chemicals, Inc.) were distilled just prior to use.

Analytical thin layer chromatography (TLC) was performed on Kieselgel 60 F254 (250 µm silica gel) glass plates or aluminum oxide 60 F254 (250 µm) alumina plates and compounds were visualized with UV light, iodine, *p*-anisaldehyde stain, ceric ammonium molybdate stain, or aqueous KMnO₄ solution. Flash column chromatography was performed using Kieselgel 60 (230-400 mesh) silica gel. Eluent mixtures are reported as v:v percentages of the minor constituent in the major constituent and correspond to R_f values between 0.2 and 0.3. All compounds purified by column chromatography were sufficiently pure for use in further experiments unless otherwise indicated.

¹H NMR spectra were measured at 400 MHz on a Varian Mercury 400 instrument or at 500 MHz on a Varian Unity 500 instrument. The proton signal of the residual, non-deuterated solvent (δ 7.26 for CHCl₃) was used as an internal reference for ¹H NMR spectra. ¹³C NMR spectra were completely heterodecoupled and measured at 125 or 100 MHz. Residual chloroform (δ 77.0) was used as an internal reference. High resolution

mass spectra were recorded on a VG 70-250-s spectrometer manufactured by Micromass Corp. (Manchester UK) at the University of Michigan Mass Spectrometry Laboratory.

General procedure A– carbene-mediated ynal cyclizations.

To a solution of Ni(COD)₂ (20 mmol%), imidazolium salt **2** or **3** (20 mol%), and KO*t*-Bu (20 mol%) in toluene (0.006M) was added Et₃SiH (5 eq.). The resulting mixture was heated to 75 °C. After 15 min the aldehyde (1 eq.) was added dropwise. The reaction mixture was heated at 75 °C for an additional 1 h. The solution was cooled to rt, the solvent removed *in vacuo*, and the residue purified via column chromatography to afford the desired macrocycles.

General procedure B- phosphine-mediated ynal cyclizations.²

To a solution of Ni(COD)₂ (20 mol%) in toluene (0.006M), Bu₃P or Me₃P (40 mol%) and Et₃B (4 eq.) were added. The resulting mixture was heated to 60 °C for 5 min. The aldehyde (1 eq.) was then added as a toluene solution. The reaction mixture was then stirred overnight at 60 °C. The solution was then cooled to rt, the solvent removed *in vacuo*, and the residue purified via column chromatography to give the desired macrocycle.

(Cycloundec-2(*E*)-enyloxy)-triethylsilane (**4b**)

Following general procedure A, Ni(COD)₂ (0.017 g, 0.060 mmol), imidazolium salt **2** (0.020 g, 0.060 mmol), KO*t*-Bu (0.007 g, 0.06 mmol), triethylsilane (0.24 mL, 1.5 mmol) and undec-10-ynal (0.050 g, 0.30 mmol) gave, after column chromatography (5% ether/hexanes), **4b** as a light-colored semi-solid (0.042 g, 50%). ¹H NMR (CDCl₃, 400 MHz) δ 5.56 (ddd, *J* = 5.6, 9.6, 14.8 Hz, 1H), 5.38 (dd, *J* = 8.0, 15.6 Hz, 1H), 4.00 (dt, *J* = 4.0, 9.2 Hz, 1H), 2.21-2.15 (m, 1H), 2.05-1.96 (m, 1H), 1.77-1.70 (m, 1H), 1.64-1.59 (m, 1H), 1.50-1.09 (m, 11H), 1.07-0.98 (m, 1H), 0.93 (t, *J* = 8.1 Hz, 9H), 0.57 (q, *J* = 8.1 Hz, 6H); ¹³C NMR (CDCl₃, 100 MHz) δ 134.3, 130.7, 75.6, 36.7, 34.2, 26.7, 26.34, 26.3, 25.6, 20.8, 7.1, 5.1; IR (thin film) ν 3405, 2930, 1461, 1064, 726 cm⁻¹; HRMS (ES+) calcd. for C₁₇H₃₄OSi [M]⁺ 282.2379, found: 282.2377.

(Cyclotetradec-2(*E*)-enyloxy)-triethylsilane (4c**).**

Following general procedure A, Ni(COD)₂ (0.013 g, 0.048 mmol), imidazolium salt **2** (0.016 g, 0.048 mmol), KO*t*-Bu (0.005 g, 0.05 mmol), triethylsilane (0.19 mL, 1.2 mmol) and tetradec-13-ynal (0.050 g, 0.24 mmol) gave, after column chromatography (5% ether/hexanes), **4c** as a white semi-solid (0.048 g, 62%). ¹H NMR (CDCl₃, 400 MHz) δ 5.40 (ddd, *J* = 15.4, 8.9, 4.1 Hz, 1H), 5.32 (dd, *J* = 7.3, 15.4 Hz, 1H), 4.10 (ddd, *J* = 3.2, 7.3, 10.5 Hz, 1H), 2.20-2.14 (m, 1H), 2.01-1.92 (m, 1H), 1.57-1.21 (m, 20H), 0.94 (t, *J* = 8.1 Hz, 9H), 0.57 (q, *J* = 8.1 Hz, 6H); ¹³C NMR (CDCl₃, 100 MHz) δ 134.8, 131.4, 74.0, 37.1, 31.2, 27.3, 26.5, 26.1, 25.2, 25.0, 24.3, 23.4, 23.3, 21.8, 6.8, 4.9; IR (thin film) ν 2929, 2857, 1710, 1458, 1413, 1349, 1238, 1070, 1006, 971, 743 cm⁻¹; GCMS calcd. for C₂₀H₄₀OSi [M]⁺ 324, found: 324.

11-Triethylsilyloxy-oxacyclopentadec-12(*E*)-en-2-one (4d**).**

Following general procedure A, Ni(COD)₂ (0.011 g, 0.040 mmol), imidazolium salt **2** (0.014 g, 0.040 mmol), KO*t*-Bu (0.004 g, 0.04 mmol), triethylsilane (0.17 mL, 1.0 mmol) and aldehyde **1d** (0.049 g, 0.21 mmol) gave, after column chromatography (10% ether/hexanes), **4d** as a colorless oil (0.050 g, 69%). ¹H NMR (CDCl₃, 400 MHz) δ 5.54 (m, 2H), 4.23 (ddd, *J* = 4.9, 7.3, 11.4 Hz, 1H), 4.10-4.02 (m, 2H), 2.40 (m, 2H), 2.33 (ddd, *J* = 4.9, 7.3, 9.7 Hz, 2H), 1.69-1.47 (m, 4H), 1.37-1.18 (m, 10H), 0.94 (t, *J* = 8.1 Hz, 9H), 0.57 (q, *J* = 8.1 Hz, 6H); ¹³C NMR (CDCl₃, 100 MHz) δ 174.4, 136.0, 127.6, 73.4, 63.9, 37.5, 33.4, 31.0, 27.0, 26.9, 26.5, 25.8, 24.8, 22.7, 6.8, 4.9; IR (thin film) ν 2933, 2875, 2859, 1735, 1458, 1236, 1173, 1149, 1057, 1005, 968, 743 cm⁻¹; HRMS (ES⁺) calcd. for C₂₀H₃₈O₃SiNa [M+Na]⁺ 377.2488, found: 377.2484.

11-Triethylsilyloxy-oxacyclopentadec-12(*E*)-en-2-one (4e**).**

Following general procedure A, Ni(COD)₂ (0.017 g, 0.060 mmol), imidazolium salt **2** (0.020 g, 0.060 mmol), KO*t*-Bu (0.007 g, 0.06 mmol), triethylsilane (0.24 mL, 1.5 mmol) and aldehyde **1e** (0.088 g, 0.30 mmol) gave, after column chromatography (10%

ether/hexanes), **4e** as a colorless oil (0.086 g, 70%). ^1H NMR (CDCl_3 , 500 MHz) δ 5.48 (ddd, $J = 5.7, 8.1, 15.4$ Hz, 1H), 5.34 (dd, $J = 7.3, 15.4$ Hz, 1H), 4.09 (m, 2H), 4.00 (m, 1H), 2.31 (app. t, $J = 6.5$ Hz, 2H), 2.09-1.94 (m, 2H), 1.67-1.53 (m, 4H), 1.48-1.21 (m, 18H), 0.93 (t, $J = 8.1$ Hz, 9H), 0.57 (q, $J = 8.1$ Hz, 6H); ^{13}C NMR (CDCl_3 , 125 MHz) δ 173.9, 134.1, 130.7, 73.9, 63.9, 49.6, 37.9, 34.6, 31.5, 29.3, 29.2, 28.7, 28.6, 28.2, 27.8, 25.9, 24.9, 24.7, 6.8, 4.9; IR (thin film) ν 2930, 2855, 1736, 1237, 1063, 1005, 970, 743 cm^{-1} ; HRMS (ES+) calcd. for $\text{C}_{24}\text{H}_{46}\text{O}_3\text{SiNa}$ $[\text{M}+\text{Na}]^+$ 433.3114, found: 433.3108.

11-Triethylsilanyloxy-oxacyclodocos-12(*E*)-en-2-one (**4f**).

Following general procedure A, $\text{Ni}(\text{COD})_2$ (0.008 g, 0.03 mmol), imidazolium salt **2** (0.010 g, 0.030 mmol), $\text{KO}t\text{-Bu}$ (0.004 g, 0.03 mmol), triethylsilane (0.12 mL, 0.74 mmol) and aldehyde **1f** (0.050 g, 0.15 mmol) gave, after column chromatography (10% ether/hexanes), **4f** as a colorless oil (0.044g, 67%). ^1H NMR (CDCl_3 , 400 MHz) δ 5.42 (ddd, $J = 4.9, 8.1, 15.4$ Hz, 1H), 5.30 (dd, $J = 7.3, 15.4$ Hz, 1H), 4.10 (dt, $J = 2.4, 6.5$ Hz, 2H), 3.98 (dt, $J = 4.9, 8.1$ Hz, 1H), 2.29 (t, $J = 7.3$ Hz, 2H), 2.10-2.04 (m, 1H), 1.99-1.90 (m, 1H), 1.61-1.51 (m, 4H), 1.45-1.25 (m, 24H), 0.93 (t, $J = 8.1$ Hz, 9H), 0.56 (q, $J = 8.1$ Hz, 6H); ^{13}C NMR (CDCl_3 , 100 MHz) δ 173.9, 134.1, 130.9, 74.0, 63.9, 38.4, 34.9, 31.7, 29.7, 29.6, 29.2, 29.1, 28.9, 28.7, 28.5, 28.3, 26.0, 25.5, 25.3, 6.8, 4.9; IR (thin film) ν 2927, 2854, 2874, 1736, 1463, 1237, 1154, 1066, 1005, 970, 744 cm^{-1} ; HRMS (ES+) calcd. for $\text{C}_{27}\text{H}_{52}\text{O}_3\text{SiNa}$ $[\text{M}+\text{Na}]^+$ 475.3583, found: 475.3687.

3,12-Bis-triethylsilanyloxy-cyclooctadeca-1,10(*E,E*)-diene (**5a**).

Following general procedure A, $\text{Ni}(\text{COD})_2$ (0.020 g, 0.072 mmol), imidazolium salt **2** (0.028 g, 0.072 mmol), $\text{KO}t\text{-Bu}$ (0.008 g, 0.07 mmol), triethylsilane (0.29 mL, 1.8 mmol) and non-8-ynal (0.050 g, 0.30 mmol) gave, after column chromatography (5% ether/hexanes), **5a** as a mixture of inseparable diastereomers (0.030 g, 33%). ^1H NMR (CDCl_3 , 500 MHz) δ 5.37 (ddd, $J = 5.6$ Hz, $J = 5.6, 9.1, 15.0$ Hz, 2H), 5.27 (dd, $J = 7.0$ Hz, 15.0 Hz, 2H), 4.02-3.94 (m, 2H), 2.15-2.06 (m, 2H), 2.00-1.85 (m, 2H), 1.57-1.15 (m, 20H), 0.94 (t, $J = 8.1$ Hz, 18H), 0.57 (q, $J = 8.1$ Hz, 12H); ^{13}C NMR (CDCl_3 , 100 MHz) δ 134.3, 131.3,

130.9, 74.4, 73.9, 38.4, 38.2, 32.1, 31.8, 29.5, 29.1, 28.7, 28.5, 26.0, 25.6, 6.8, 4.9; IR (thin film) ν 2926, 2854, 1460, 1237, 1068, 1005, 968, 743 cm^{-1} ; HRMS (ES+) calcd. for $\text{C}_{30}\text{H}_{60}\text{O}_2\text{Si}_2\text{Na}$ $[\text{M}+\text{Na}]^+$ 531.4030, found: 531.4037.

12-Methyl-11-triethylsilanyloxy-oxacyclodocos-12-en-2-one (7c) and 12-Ethylidene-11-triethylsilanyloxy-oxacycloheneicosan-2-one (8c) — Table 2, Entry 3.

Following general procedure A, $\text{Ni}(\text{COD})_2$ (0.007 g, 0.03 mmol), imidazolium salt **2** (0.009 g, 0.03 mmol), $\text{KO}t\text{-Bu}$ (0.003 g, 0.03 mmol), triethylsilane (0.10 mL, 0.65 mmol) and aldehyde **6b** (0.045 g, 0.13 mmol) gave, after column chromatography (10% ether/hexanes), **7c** and **8c** as an inseparable 1:1 mixture of isomers (0.036 g, 60%). ^1H NMR peaks for **7c** (CDCl_3 , 500 MHz) δ 5.22 (dd, $J = 6.1, 8.6$ Hz, 1H), 4.14-4.07 (m, 2H), 3.94 (dd, $J = 9.1, 5.1$ Hz, 1H), 2.30 (t, $J = 7.1$ Hz, 2H), 2.14-2.06 (m, 1H), 1.97-1.87 (m, 1H), 1.65-1.56 (m, 7H), 1.54-1.42 (m, 2H), 1.39-1.17 (m, 22H), 0.92 (t, $J = 8.1$ Hz, 6H), 0.55 (q, $J = 8.1$ Hz, 9H); ^1H NMR peaks for **8c** (CDCl_3 , 500 MHz) δ 5.34 (q, $J = 7.1$ Hz, 1H), 4.14-4.07 (m, 2H), 3.89 (t, $J = 6.6$ Hz, 1H), 2.30 (t, $J = 6.6$ Hz, 2H), 2.14-2.06 (m, 1H), 1.97-1.87 (m, 1H), 1.65-1.56 (m, 7H), 1.54-1.42 (m, 2H), 1.39-1.17 (m, 22H), 0.91 (t, $J = 8.1$ Hz, 6H), 0.54 (q, $J = 8.1$ Hz, 9H); ^{13}C NMR of **7c/8c** mixture (CDCl_3 , 125 MHz) δ 173.9, 136.9, 126.4, 121.0, 94.8, 78.8, 78.6, 64.2, 63.9, 36.7, 35.8, 35.1, 34.8, 30.0, 29.7, 29.6, 29.5, 29.4, 29.3, 29.2, 29.1, 29.0, 28.9, 28.7, 28.5, 27.0, 26.5, 26.2, 25.9, 25.7, 25.6, 25.4, 13.1, 10.5, 6.8, 4.8; IR of **7c/8c** mixture (thin film) ν 2928, 2854, 2874, 1736, 1460, 1237, 1065, 1005, 724 cm^{-1} ; HRMS (ES+) calcd. for $\text{C}_{28}\text{H}_{54}\text{O}_3\text{SiNa}$ $[\text{M}+\text{Na}]^+$ 489.3740, found: 489.3752.

To a solution of **7c** and **8c** (0.020 g, 0.043 mmol) in THF (0.22 mL) at 0 $^\circ\text{C}$, TBAF (0.064 mL of a 1.0 M solution in THF) was added. The resulting solution was stirred at 0 $^\circ\text{C}$ for 2 h. The reaction mixture was then concentrated and purified via column chromatography (20% ethyl acetate/hexanes) to give 0.006 g of **7d** and 0.007 g **8d**. These compounds were spectroscopically identical to those obtained from **6b** using general procedure B.

Table 2, Entry 4.

Following general procedure A, Ni(COD)₂ (0.013 g, 0.046 mmol), imidazolium salt **3** (0.019 g, 0.046 mmol), KO^{*t*}-Bu (0.005 g, 0.05 mmol), triethylsilane (0.180 mL, 1.2 mmol) and aldehyde **6b** (0.080 g, 0.23 mmol) gave, after column chromatography (10% ether/hexanes), **7c** and **8c** as an inseparable 1:5 mixture of isomers (0.099 g, 93%).

11-Hydroxy-12-methyl-oxacyclodocos-12-en-2-one (**7d**) and 12-Ethylidene-11-hydroxy-oxacycloheneicosan-2-one (**8d**).

Following general procedure B, Ni(COD)₂ (0.009 g, 0.03 mmol), Me₃P (0.006 mL, 0.06 mmol), triethylborane (0.63 mL of a 1.0 M solution in toluene) and aldehyde **6a** (0.055 g, 0.16 mmol) gave, after column chromatography (25% ethyl acetate/hexanes), a mixture of **7d** and **8d** (0.049g, 89%). The alcohols could be separated after a careful column (20% ethyl acetate/hexanes) to give 0.039 g of **7d** and 0.08 g of **8d**. Data for **7d**: ¹H NMR (CDCl₃, 400 MHz) δ 5.32 (app. t, *J* = 7.3 Hz, 1H), 4.10 (dt, *J* = 6.5, 1.6 Hz, 2H), 4.00 (t, *J* = 7.3 Hz, 1H), 2.29 (t, *J* = 7.3 Hz, 2H), 2.16-2.07 (m, 1H), 2.01-1.93 (m, 1H), 1.62-1.51 (m, 10H), 1.36-1.10 (m, 22H); ¹³C NMR (CDCl₃, 100 MHz) δ 173.9, 136.4, 127.8, 78.2, 63.9, 35.0, 34.2, 30.0, 29.7, 29.6, 29.4, 29.3, 29.2, 28.8, 28.6, 28.5, 27.0, 25.9, 25.6, 25.5, 10.6; IR (thin film) ν 3316, 2923, 2850, 1729, 1456, 1339, 1251, 1164, 1103, 1063, 1013

cm⁻¹; HRMS (ES+) calcd. for C₂₂H₄₀O₃Na [M+Na]⁺ 375.2875, found: 375.2865. Data for **8d**: ¹H NMR (CDCl₃, 400 MHz) δ 5.47 (q, *J* = 6.5 Hz, 1H), 4.11 (dt, *J* = 5.6, 1.6 Hz, 2H), 3.96 (t, *J* = 6.5 Hz, 1H), 2.31 (t, *J* = 6.5 Hz, 2H), 2.13-2.07 (m, 1H), 1.99-1.95 (m, 1H), 1.63-1.48 (m, 10H), 1.40-1.28 (m, 22H); ¹³C NMR (CDCl₃, 100 MHz) δ 174.0, 142.5, 122.0, 77.8, 64.2, 35.2, 34.7, 29.7, 29.5, 29.4, 29.2, 29.1, 29.0, 28.9, 28.8, 28.7, 26.6, 26.2, 26.2, 25.7, 25.3, 13.2; IR (thin film) ν 3423, 2926, 2854, 1734, 1463, 1384, 1236, 1178, 1103, 1039 cm⁻¹; HRMS (ES+) calcd. for C₂₂H₄₀O₃Na [M+Na]⁺ 375.2875, found: 375.2865.

12-Benzylidene-11-triethylsilanyloxy-oxacycloheneicosan-2-one (**8a**).

Following general procedure A, Ni(COD)₂ (0.011 g, 0.039 mmol), imidazolium salt **2** (0.013 g, 0.039 mmol), KO^t-Bu (0.004 g, 0.04 mmol), triethylsilane (0.16 mL, 0.97 mmol) and aldehyde **6a** (0.080 g, 0.19 mmol) gave, after column chromatography (10% ether/hexanes), **8a** as a colorless oil (0.070 g, 68%). ¹H NMR (CDCl₃, 400 MHz) δ 7.34–7.30 (m, 2H), 7.25–7.18 (m, 3H), 6.42 (s, 1H), 4.12–4.09 (m, 3H), 2.33–2.15 (m, 4H), 1.66–1.60 (m, 6H), 1.46–1.25 (m, 24H), 0.96 (t, *J* = 8.1 Hz, 9H), 0.60 (q, *J* = 8.1 Hz, 6H); ¹³C NMR (CDCl₃, 100 MHz) δ 174.1, 145.3, 138.2, 128.6, 128.1, 126.1, 125.7, 78.0, 64.2, 36.8, 34.8, 29.8, 29.5, 29.2, 29.0, 28.9, 28.8, 28.7, 28.6, 28.4, 28.0, 26.1, 25.5, 25.4, 7.0, 4.9; IR (thin film) ν 2928, 2874, 2854, 1735, 1460, 1237, 1175, 1070, 1005, 743, 698 cm⁻¹; HRMS (ES⁺) calcd. for C₃₃H₅₆O₃SiNa [M+Na]⁺ 551.3896, found: 551.3895.

12-Benzylidene-11-hydroxy-oxacycloheneicosan-2-one (**8b**).

Following general procedure B, Ni(COD)₂ (0.007 g, 0.03 mmol), Bu₃P (0.012 mL, 0.048 mmol), triethylborane (0.070 mL, 0.49 mmol) and aldehyde **6a** (0.050 g, 0.12 mmol) gave, after column chromatography (10% ethyl acetate/hexanes), **8b** as a colorless oil (0.024 g, 48%). (A small amount (8%) of an isomer of undetermined structure was present by ¹H NMR. It is possible that this is the endocyclic isomer.) ¹H NMR (CDCl₃, 400 MHz) δ 7.37–7.31 (m, 2H), 7.28–7.19 (m, 3H), 6.5 (s, 1H), 4.18 (t, *J* = 6.8 Hz, 1H), 4.11 (t, *J* = 5.6 Hz, 2H), 2.31 (t, *J* = 7.2 Hz, 2H), 1.66–1.58 (m, 7H), 1.49–1.43 (m, 3H), 1.35–1.25 (m, 21H); ¹³C NMR (CDCl₃, 100 MHz) δ 174.3, 145.5, 137.9, 128.9, 128.4, 126.7, 126.3, 77.28, 64.4, 35.6, 35.0, 29.8, 29.6, 29.4, 29.3, 29.2, 29.1, 28.9, 28.8, 28.6, 28.3, 26.3, 25.8, 25.5; IR (thin film) 3416, 2926, 2853, 1733, 1463, 698 cm⁻¹; HRMS (EI) calcd. for C₂₇H₄₂O₃ [M]⁺ 414.3143, found: 414.3128.

Starting Materials

Non-8-ynal (**1a**),³ undec-10-ynal (**1b**),³ and tetradec-13-ynal (**1c**)⁴ were all prepared according to literature methods. Macrolactone precursors were prepared according to the following scheme:

10(*tert*-Butyl-diphenyl-silanyloxy)-decanoic Acid Methyl Ester (**14**).

To a solution of alcohol **13** (1.00 g, 4.95 mmol) in DMF (36 mL) was added TBDPS-Cl (1.63 g, 5.94 mmol) followed by imidazole (0.808 g, 11.9 mmol). The resulting solution was then stirred at rt for 2 hr. The reaction mixture was diluted with ether (100 mL) and washed with brine (3 x 100 mL). The ethereal layer was dried over MgSO₄, filtered and concentrated *in vacuo*. The crude product was purified by column chromatography (5% Et₂O/hexanes) to give the desired TBDPS-ether as a light colored oil (1.89 g, 89%). ¹H NMR (CDCl₃, 400 MHz) δ 7.68-7.65 (m, 4H), 7.41-7.35 (m, 6H), 3.67 (s, 3H), 3.65 (t, *J* = 6.5 Hz, 2H), 2.30 (t, *J* = 7.3 Hz, 2H), 1.64-1.58 (m, 2H), 1.58-1.52 (m, 2H), 1.36-1.23 (m, 10H), 1.05 (s, 9H); ¹³C NMR (CDCl₃, 100 MHz) δ 174.3, 135.6, 134.1, 129.4, 127.5, 63.9, 51.4, 34.1, 32.5, 29.4, 29.3, 29.2, 29.1, 26.9, 25.7, 24.9, 19.2; IR (thin film) ν 2929, 2855, 1740,

1471, 1427, 1170, 1110, 701 cm^{-1} . HRMS (ES+) calcd. for $\text{C}_{27}\text{H}_{40}\text{O}_3\text{SiNa}$ $[\text{M}+\text{Na}]^+$ 463.2644, found: 463.2642.

10-(*tert*-Butyl-diphenyl-silanyloxy)-decanoic Acid (**15**).

To a solution of methyl ester **14** (1.89 g, 4.28 mmol) in 10:1 MeOH/H₂O (40 mL) was added Ba(OH)₂ (3.66 g, 21.4 mmol). The reaction mixture was then stirred at room temperature for 2 h. The reaction mixture was quenched with 1 N HCl (50 mL) and then extracted with ethyl acetate (5 x 50 mL). Combined organic extracts were then dried over MgSO₄, filtered, and concentrated to give the pure acid (1.82 g, 100%). ¹H NMR (CDCl₃, 400 MHz) δ 7.70-7.67 (m, 4H), 7.43-7.37 (m, 6H), 3.67 (t, J = 6.5 Hz, 2H), 2.36 (t, J = 7.3 Hz, 2H), 1.64 (pent, J = 6.5 Hz, 2H), 1.38-1.25 (m, 10H), 1.07 (s, 9H); ¹³C NMR (CDCl₃, 100 MHz) δ 180.1, 135.6, 134.2, 129.5, 127.5, 64.0, 34.1, 32.5, 29.4, 29.3, 29.2, 29.0, 26.9, 25.7, 24.7, 19.2; IR (thin film) ν 3070, 3048, 2929, 2856, 1708, 1428, 1111, 823, 739, 701, 612 cm^{-1} . HRMS (ES+) calcd. for $\text{C}_{26}\text{H}_{38}\text{O}_3\text{SiNa}$ $[\text{M}+\text{Na}]^+$ 449.2488, found: 449.2499.

10-(*tert*-Butyl-diphenyl-silanyloxy)-decanoic Acid But-3-ynyl Ester (**16a**).

To a solution of acid **15** (0.415 g, 0.974 mmol) in ether (6 mL), 3-butyne-1-ol (0.075 g, 1.1 mmol), DCC (0.220 g, 1.07 mmol), and DMAP (0.012 g, 0.097 mmol) were added. The resulting solution was then stirred for 16 h at rt. The reaction mixture was then filtered and concentrated *in vacuo*. The crude residue was then purified via column chromatography (5% ether/hexanes) to give the desired ester **16a** as a light colored oil (0.419 g, 90%). ¹H NMR (CDCl₃, 400 MHz) δ 7.69-7.65 (m, 4H), 7.44-7.36 (m, 6H), 4.18 (t, J = 6.5 Hz, 2H), 3.65 (t, J = 6.5 Hz, 2H), 2.53 (ddd, J = 7.3, 6.5, 2.4 Hz, 2H), 2.32 (t, J = 7.3 Hz, 2H), 1.99 (t, J = 2.4 Hz, 1H), 1.65-1.53 (m, 4H), 1.38-1.26 (m, 10H), 1.06 (s, 9H); ¹³C NMR (CDCl₃, 100 MHz) δ 173.6, 135.6, 134.2, 129.5, 127.6, 80.1, 69.8, 64.0, 61.9, 34.2, 32.6, 29.4, 29.3, 29.2, 29.1, 26.9, 25.7, 24.9, 19.2, 19.0; IR (thin film) ν 2929, 2855, 1739, 1471, 1427, 1388, 1237, 1167, 1110, 825, 739, 702 cm^{-1} . HRMS (ES+) calcd. for $\text{C}_{30}\text{H}_{42}\text{O}_3\text{SiNa}$ $[\text{M}+\text{Na}]^+$ 501.2801, found: 501.2819.

10-(*tert*-Butyl-diphenyl-silanyloxy)-decanoic Acid Oct-7-ynyl Ester (**16b**).

To a solution of acid **15** (0.418 g, 0.981 mmol) in ether (6 mL), 7-octyn-1-ol (0.135 g, 1.08 mmol), DCC (0.222 g, 1.08 mmol), and DMAP (0.012 g, 0.098 mmol) were added. The resulting solution was then stirred for 16 h at rt. The reaction mixture was then filtered and concentrated *in vacuo*. The crude residue was then purified via column chromatography (5% ether/hexanes) to give the desired ester **16b** as a light colored oil (0.436 g, 93%). ¹H NMR (CDCl₃, 400 MHz) δ 7.69-7.67 (m, 4H), 7.44-7.36 (m, 6H), 4.08 (t, *J* = 6.5 Hz, 2H), 3.66 (t, *J* = 7.3 Hz, 2H), 2.30 (t, *J* = 7.3 Hz, 2H), 2.20 (ddd, *J* = 7.3, 6.5, 2.4 Hz, 2H), 1.94 (t, *J* = 2.4 Hz, 1H), 1.68-1.51 (m, 8H), 1.48-1.26 (m, 14H), 1.06 (s, 9H); ¹³C NMR (CDCl₃, 100 MHz) δ 173.9, 135.5, 134.1, 129.4, 127.5, 84.4, 68.3, 64.2, 63.9, 34.4, 32.5, 29.4, 29.3, 29.2, 29.1, 28.5, 28.3, 26.8, 25.7, 25.4, 25.0, 19.2, 18.3; IR (thin film) ν 3309, 2930, 2856, 1735, 1463, 1427, 1388, 1360, 1171, 1110, 823, 702, 613 cm⁻¹. HRMS (ES+) calcd. for C₃₄H₅₀O₃SiNa [M+Na]⁺ 557.3247, found: 557.3422.

10-(*tert*-Butyl-diphenyl-silanyloxy)-decanoic Acid Dodec-10-ynyl Ester (**16c**).

To a solution of acid **15** (0.181 g, 0.424 mmol) in ether (2 mL), 10-undecyn-1-ol (0.078 g, 0.47 mmol), DCC (0.096 g, 0.47 mmol), and DMAP (0.005 g, 0.04 mmol) were added. The resulting solution was then stirred for 16 h at rt. The reaction mixture was then filtered and concentrated *in vacuo*. The crude residue was then purified via column chromatography (5% ether/hexanes) to give the desired ester **16c** as a light colored oil (0.214 g, 88%). ¹H NMR (CDCl₃, 400 MHz) δ 7.68-7.66 (m, 4H), 7.42-7.35 (m, 6H), 4.06 (t, *J* = 6.5 Hz, 2H), 3.66 (t, *J* = 6.5 Hz, 2H), 2.29 (t, *J* = 7.3 Hz, 2H), 2.18 (ddd, *J* = 7.3, 6.5, 2.4 Hz, 2H), 1.93 (t, *J* = 2.4 Hz, 1H), 1.64-1.49 (m, 8H), 1.44-1.27 (m, 20H), 1.06 (s, 9H); ¹³C NMR (CDCl₃, 100 MHz) δ 174.0, 135.6, 134.2, 129.4, 127.5, 84.7, 68.1, 64.33, 64.0, 34.4, 32.6, 29.4, 29.3, 29.2, 29.1, 29.0, 28.7, 28.6, 28.4, 26.9, 25.9, 25.7, 25.0, 19.2, 18.4; IR (thin film) ν 2929, 2855, 1735, 1463, 1427, 1389, 1360, 1173, 1110 cm⁻¹. HRMS (ES+) calcd. for C₃₇H₅₆O₃SiNa [M+Na]⁺ 599.3896 found: 599.3891.

10-(*tert*-Butyl-diphenyl-silanyloxy)-decanoic Acid Dodec-10-ynyl Ester (16d).

To a solution of acid **15** (0.809 g, 1.90 mmol) in ether (9 mL), dodec-10-yn-1-ol (0.315 g, 1.73 mmol), DCC (0.391 g, 1.90 mmol), and DMAP (0.022 g, 0.17 mmol) were added. The resulting solution was then stirred for 16 h at rt. The reaction mixture was then filtered and concentrated *in vacuo*. The crude residue was then purified via column chromatography (5% ether/hexanes) to give the desired ester **16d** as a light colored oil (0.999 g, 98%). ¹H NMR (CDCl₃, 400 MHz) δ 7.68-7.66 (m, 4H), 7.44-7.35 (m, 6H), 4.06 (t, *J* = 6.5 Hz, 2H), 3.65 (t, *J* = 6.5 Hz, 2H), 2.29 (t, *J* = 7.3 Hz, 2H), 2.14-2.08 (m, 2H), 1.78 (t, *J* = 2.4 Hz, 3H), 1.65-1.59 (m, 4H), 1.57-1.52 (m, 2H), 1.47 (pent, *J* = 7.3 Hz, 2H), 1.38-1.24 (m, 20H), 1.05 (s, 9H); ¹³C NMR (CDCl₃, 100 MHz) δ 174.0, 135.5, 134.1, 129.4, 127.5, 79.3, 75.3, 64.4, 64.0, 34.4, 32.5, 29.4, 29.3, 29.2, 29.1, 29.0, 28.8, 28.6, 26.8, 25.9, 25.7, 25.0, 19.2, 18.7, 3.5; IR (thin film) ν 2929, 2855, 1736, 1463, 1427, 1172, 1110, 739, 702, 687 cm⁻¹. HRMS (ES+) calcd. for C₃₈H₅₈O₃SiNa [M+Na]⁺ 613.4053, found: 613.4051.

10-(*tert*-Butyl-diphenyl-silanyloxy)-decanoic Acid 11-Phenyl-Undec-10-ynyl Ester (16e).

To a solution of acid **15** (0.600 g, 1.41 mmol) in ether (8 mL), 11-phenyl-undec-10-yn-1-ol (0.375 g, 1.54 mmol), DCC (0.319 g, 1.54 mmol), and DMAP (0.018 g, 0.14 mmol) were added. The resulting solution was then stirred for 16 h at rt. The reaction mixture was then filtered and concentrated *in vacuo*. The crude residue was then purified via column chromatography (5% ether/hexanes) to give the desired ester **16e** as a light colored oil (0.758 g, 82%). ¹H NMR (CDCl₃, 500 MHz) δ 7.72-7.70 (m, 4H), 7.46-7.39 (m, 8H), 7.31-7.26 (m, 3H), 4.10 (t, *J* = 7.1 Hz, 2H), 3.69 (t, *J* = 6.6 Hz, 2H), 2.43 (t, *J* = 7.1 Hz, 2H), 2.32 (t, *J* = 7.1 Hz, 2H), 1.68-1.56 (m, 8H), 1.50-1.46 (m, 2H), 1.40-1.36 (m, 11H), 1.32-1.29 (m, 7H), 1.09 (s, 9H); ¹³C NMR (CDCl₃, 125 MHz) δ 173.9, 135.5, 134.1, 131.5, 129.4, 128.1, 127.5, 127.4, 127.0, 90.3, 80.6, 64.3, 63.9, 34.3, 32.5, 29.4, 29.3, 29.2, 29.1, 29.0, 28.8, 28.7, 28.6, 26.8, 25.9, 25.7, 25.0, 19.3, 19.2; IR (thin film) ν 2929, 2855, 1735, 1489,

1463, 1427, 1238, 1174, 1111, 756, 740, 702 cm^{-1} . HRMS (ES+) calcd. for $\text{C}_{43}\text{H}_{60}\text{O}_3\text{SiNa}$ $[\text{M}+\text{Na}]^+$ 675.4205, found: 675.4208.

10-Hydroxy-decanoic Acid But-3-ynyl Ester (17a).

To a solution of TBDPS-ether **16a** (0.317 g, 0.663 mmol) in THF (4 mL) was added TBAF (0.99 mL of a 1M solution in THF, 0.99 mmol). The resulting solution was then stirred at rt for 16h. The reaction mixture was diluted with ether (10 mL) and washed with NaHCO_3 (10 mL). The ethereal layer was then dried over MgSO_4 , filtered and concentrated. The crude product was then purified via column chromatography (30% ethyl acetate/hexanes) to give 0.158 g (99%). ^1H NMR (CDCl_3 , 400 MHz) δ 4.16 (t, J = 6.5 Hz, 2H), 3.60 (t, J = 7.3 Hz, 2H), 2.51 (ddd, J = 7.3, 6.5, 2.4 Hz, 2H), 2.30 (t, J = 7.3 Hz, 2H), 1.98 (t, J = 2.4 Hz, 1H), 1.62-1.50 (m, 5H), 1.34-1.27 (m, 10H); ^{13}C NMR (CDCl_3 , 100 MHz) δ 173.6, 80.1, 69.8, 62.9, 61.9, 34.1, 32.7, 29.3, 29.3, 29.1, 29.0, 25.6, 24.8, 18.9; IR (thin film) ν 3278, 2916, 2850, 1739, 1471, 1463, 1411, 1266, 1181, 1072, 734, 704, 640 cm^{-1} . HRMS (ES+) calcd. for $\text{C}_{14}\text{H}_{24}\text{O}_3\text{Na}$ $[\text{M}+\text{Na}]^+$ 263.1623, found: 263.1625.

10-Hydroxy-decanoic Acid Oct-7-ynyl Ester (17b).

To a solution of TBDPS-ether **16b** (0.736 g, 2.14 mmol) in THF (7 mL) was added TBAF (2.1 mL of a 1M solution in THF, 2.1 mmol). The resulting solution was then stirred at rt for 16h. The reaction mixture was diluted with ether (15 mL) and washed with NaHCO_3 (15 mL). The ethereal layer was then dried over MgSO_4 , filtered and concentrated. The crude product was then purified via column chromatography (30% ethyl acetate/hexanes) to give 0.406 g (96%). ^1H NMR (CDCl_3 , 500 MHz) δ 4.02 (t, J = 6.6 Hz, 2H), 3.56 (t, J = 6.6 Hz, 2H), 2.23 (t, J = 7.6 Hz, 2H), 2.14 (dt, J = 6.6, 2.5 Hz, 2H), 1.89 (t, J = 2.5 Hz, 1H), 1.60-1.46 (m, 8H), 1.43-1.35 (m, 2H), 1.34-1.24 (m, 12H); ^{13}C NMR (CDCl_3 , 125 MHz) δ 173.9, 84.3, 68.2, 64.1, 62.7, 34.2, 32.6, 29.3, 29.2, 29.0, 28.4, 28.2, 25.6, 25.3, 24.8, 18.2; IR (thin film) ν 3309, 2930, 2856, 1734, 1464, 1351, 1248, 1177, 1099, 1056, 627 cm^{-1} . HRMS (ES+) calcd. for $\text{C}_{18}\text{H}_{32}\text{O}_3\text{Na}$ $[\text{M}+\text{Na}]^+$ 319.2249, found: 319.2245.

10-Hydroxy-decanoic Acid Undec-10-ynyl Ester (17c).

To a solution of TBDPS-ether **16c** (1.03 g, 1.78 mmol) in THF (9 mL) was added TBAF (2.7 mL of a 1M solution in THF, 2.7 mmol). The resulting solution was then stirred at rt for 16h. The reaction mixture was diluted with ether (20 mL) and washed with NaHCO₃ (20 mL). The ethereal layer was then dried over MgSO₄, filtered and concentrated. The crude product was then purified via column chromatography (30% ethyl acetate/hexanes) to give 0.584 g (97%). ¹H NMR (CDCl₃, 500 MHz) δ 4.04 (t, *J* = 6.6 Hz, 2H), 3.60 (t, *J* = 6.6 Hz, 2H), 2.26 (t, *J* = 7.6 Hz, 2H), 2.17 (dt, *J* = 6.6, 2.5 Hz, 2H), 1.92 (t, *J* = 2.5 Hz, 1H), 1.63-1.49 (m, 10H), 1.44-1.28 (m, 18H); ¹³C NMR (CDCl₃, 125 MHz) δ 173..9, 84.4, 68.2, 64.2, 62.9, 34.3, 32.7, 29.3, 29.1, 29.0, 28.5, 28.3, 25.7, 25.4, 24.9, 18.3; IR (thin film) ν 3356, 2928, 2854, 1735, 1465, 1176, 1056 cm⁻¹. HRMS (ES+) calcd. for C₂₁H₃₈O₃Na [M+Na]⁺ 361.2719, found: 361.2726.

10-Hydroxy-decanoic Acid Dodec-10-ynyl Ester (17d).

To a solution of TBDPS-ether **16d** (0.893 g, 1.51 mmol) in THF (8 mL) was added TBAF (2.3 mL of a 1M solution in THF, 2.3 mmol). The resulting solution was then stirred at rt for 16h. The reaction mixture was diluted with ether (20 mL) and washed with NaHCO₃ (20 mL). The ethereal layer was then dried over MgSO₄, filtered and concentrated. The crude product was then purified via column chromatography (30% ethyl acetate/hexanes) to give 0.527 g (99%). ¹H NMR (CDCl₃, 500 MHz) δ 3.96 (t, *J* = 7.1 Hz, 2H), 3.53 (t, *J* = 7.1 Hz, 2H), 2.52 (bs, 1H), 2.20 (t, *J* = 7.1 Hz, 2H), 2.05-2.01 (m, 2H), 1.69 (t, *J* = 2.5 Hz, 3H), 1.56-1.44 (m, 6H), 1.42-1.35 (m, 2H), 1.30-1.19 (m, 20H); ¹³C NMR (CDCl₃, 125 MHz) δ 173..9, 84.4, 68.2, 64.2, 62.9, 34.3, 32.7, 29.3, 29.1, 29.0, 28.5, 28.3, 25.7, 25.4, 24.9, 18.3; IR (thin film) ν 3356, 2928, 2854, 1735, 1465, 1176, 1056 cm⁻¹. HRMS (ES+) calcd. for C₂₂H₄₀O₃Na [M+Na]⁺ 375.2875, found: 375.2874.

10-Hydroxy-decanoic Acid 11-Phenyl-undec-10-ynyl Ester (**17e**).

To a solution of TBDPS-ether **16e** (0.312 g, 0.478 mmol) in THF (3 mL) was added TBAF (0.72 mL of a 1M solution in THF, 0.72 mmol). The resulting solution was then stirred at rt for 16h. The reaction mixture was diluted with ether (10 mL) and washed with NaHCO₃ (10 mL). The ethereal layer was then dried over MgSO₄, filtered and concentrated. The crude product was then purified via column chromatography (30% ethyl acetate/hexanes) to give 0.183 g (93%). ¹H NMR (CDCl₃, 500 MHz) δ 7.37-7.35 (m, 2H), 7.26-7.22 (m, 3H), 4.03 (t, *J* = 7.1 Hz, 2H), 3.58 (t, *J* = 7.1 Hz, 2H), 2.37 (t, *J* = 7.1 Hz, 2H), 2.26 (t, *J* = 7.1 Hz, 2H), 1.99 (s, 1H), 1.61-1.56 (m, 6H), 1.54-1.49 (m, 2H), 1.43-1.40 (m, 2H), 1.33-1.25 (18H); ¹³C NMR (CDCl₃, 125 MHz) δ 173.9, 131.4, 128.0, 127.3, 123.9, 90.2, 80.5, 64.2, 62.7, 34.2, 32.6, 29.2, 29.21, 29.1, 29.0, 29.0, 28.9, 28.7, 28.6, 28.5, 25.8, 25.6, 24.8, 19.2; IR (thin film) ν 3398, 2927, 2854, 1734, 1489, 1464, 1175, 1056, 756, 691 cm⁻¹. HRMS (ES+) calcd. for C₃₇H₄₂O₃Na [M+Na]⁺ 437.3032, found: 437.3030.

10-Oxo-decanoic Acid But-3-ynyl Ester (**1d**).

To a solution of alcohol **17a** (0.228 g, 0.957 mmol) in 4.5 mL of CH₂Cl₂ and 0.39 mL of pyridine at 0 °C was added Dess-Martin periodinane (1.0 g, 2.4 mmol). After stirring for 10 min, 0.5 mL of 'wet' CH₂Cl₂ (pre-washed with water) was added dropwise. The cooling bath was removed and the mixture stirred at ambient temperature for 1 h. A 1:1 mixture of aqueous NaHCO₃/Na₂S₂O₃ was added and the biphasic mixture stirred vigorously for 20 min. The reaction mixture was then extracted with ether (3 x 10 mL). The combined organic extracts were dried over MgSO₄, filtered and concentrated. The very sensitive crude aldehyde was then quickly purified via column chromatography (10% ether/hexanes) to give 0.202 g of **1d** (89%), which was used immediately in the next reaction. ¹H NMR (CDCl₃, 500 MHz) δ 9.76 (t, *J* = 2.0 Hz, 1H), 4.18 (t, *J* = 6.5 Hz, 2H), 2.52 (dt, *J* = 6.5, 2.5 Hz, 2H), 2.41 (dt, *J* = 7.6, 2.5 Hz, 2H), 2.32 (t, *J* = 7.6 Hz, 2H), 2.00 (t, *J* = 2.5 Hz, 1H), 1.64-1.59 (m, 4H), 1.34-1.29 (m, 8H); ¹³C NMR (CDCl₃, 125 MHz) δ 202.8, 173.5, 80.1, 69.8, 61.9, 43.9, 34.1, 29.1, 29.0, 28.9, 24.8, 22.0, 19.0; IR

(thin film) ν 2932, 2857, 1731, 1454, 1250, 1174, 1086 cm^{-1} . MS (ES+) calcd. for $\text{C}_{14}\text{H}_{22}\text{O}_3\text{Na}$ $[\text{M}+\text{Na}]^+$ 261.1, found: 261.1.

10-Oxo-decanoic Acid Oct-7-ynyl Ester (**1e**).

To a solution of alcohol **17b** (0.190 g, 0.646 mmol) in 3.5 mL of CH_2Cl_2 and 0.26 mL of pyridine at 0 °C was added Dess-Martin periodinane (0.685 g, 1.62 mmol). After stirring for 10 min, 0.5 mL of 'wet' CH_2Cl_2 (pre-washed with water) was added dropwise. The cooling bath was removed and the mixture stirred at ambient temperature for 1 h. A 1:1 mixture of aqueous $\text{NaHCO}_3/\text{Na}_2\text{S}_2\text{O}_3$ was added and the biphasic mixture stirred vigorously for 20 min. The reaction mixture was then extracted with ether (3 x 10 mL). The combined organic extracts were dried over MgSO_4 , filtered and concentrated. The very sensitive aldehyde was then quickly purified via column chromatography (10% ether/hexanes) to give 0.150 g of **1e** (80%), which was used immediately in the next reaction. ^1H NMR (CDCl_3 , 500 MHz) δ 9.75 (t, J = 1.5 Hz, 1H), 4.06 (t, J = 6.6 Hz, 2H), 2.41 (dt, J = 7.1, 1.5 Hz, 2H), 2.28 (t, J = 7.6 Hz, 2H), 2.18 (dt, J = 7.1, 2.5 Hz, 2H), 1.93 (t, J = 2.5 Hz, 1H), 1.66-1.58 (m, 6H), 1.56-1.50 (m, 2H), 1.46-1.40 (m, 1H), 1.39-1.34 (m, 1H), 1.32-1.28 (m, 10H); ^{13}C NMR (CDCl_3 , 125 MHz) δ 202.8, 173.9, 84.5, 68.2, 64.2, 43.9, 34.3, 29.1, 29.0, 28.5, 28.3, 25.4, 24.9, 22.0, 18.3; IR (thin film) ν 2929, 2855, 1731, 1470, 1359, 1248, 1174, 1112 cm^{-1} . MS (ES+) calcd. for $\text{C}_{17}\text{H}_{30}\text{O}_4\text{SiNa}$ $[\text{M}+\text{Na}]^+$ 317.2093, found: 317.2.

10-Oxo-decanoic Acid Undec-10-ynyl Ester (**1f**).

To a solution of alcohol **17c** (0.200 g, 0.591 mmol) in 2.5 mL of CH_2Cl_2 and 0.24 mL of pyridine at 0 °C was added Dess-Martin periodinane (0.627 g, 1.48 mmol). After stirring for 10 min, 0.5 mL of 'wet' CH_2Cl_2 (pre-washed with water) was added dropwise. The cooling bath was removed and the mixture stirred at ambient temperature for 1 h. A 1:1 mixture of aqueous $\text{NaHCO}_3/\text{Na}_2\text{S}_2\text{O}_3$ was added and the biphasic mixture stirred vigorously for 20 min. The reaction mixture was then extracted with ether (3 x 10 mL). The combined organic extracts were dried over MgSO_4 , filtered and concentrated.

The very sensitive aldehyde was then quickly purified via column chromatography (10% ether/hexanes) to give 0.178 g of **1f** (90%), which was used immediately in the next reaction. ^1H NMR (CDCl_3 , 400 MHz) δ 9.75 (t, J = 1.6 Hz, 1H), 4.05 (t, J = 6.5 Hz, 2H), 2.41 (dt, J = 7.3, 1.6 Hz, 2H), 2.28 (t, J = 7.3 Hz, 2H), 2.18 (dt, J = 7.3, 2.4 Hz, 2H), 1.93 (t, J = 2.4 Hz, 1H), 1.63-1.59 (m, 6H), 1.55-1.48 (m, 2H), 1.39-1.30 (m, 18H); ^{13}C NMR (CDCl_3 , 125 MHz) δ 202.8, 173.9, 94.7, 84.7, 68.1, 64.4, 43.9, 34.3, 29.3, 29.2, 29.1, 29.0, 28.7, 28.6, 28.4, 25.9, 24.9, 22.0, 18.4; IR (thin film) ν 2929, 2855, 1731, 1464, 1359, 1243, 1174, 1107 cm^{-1} . MS (ES+) calcd. for $\text{C}_{21}\text{H}_{36}\text{O}_3\text{Na}$ $[\text{M}+\text{Na}]^+$ 359.2, found: 359.2.

10-Oxo-decanoic Acid 11-Phenyl-undec-10-ynyl Ester (**6a**).

To a solution of alcohol **17e** (0.200 g, 0.484 mmol) in 2.5 mL of CH_2Cl_2 and 0.197 mL of pyridine at 0 °C was added Dess-Martin periodinane (0.513 g, 1.21 mmol). After stirring for 10 min, 0.5 mL of 'wet' CH_2Cl_2 (pre-washed with water) was added dropwise. The cooling bath was removed and the mixture stirred at ambient temperature for 1 h. A 1:1 mixture of aqueous $\text{NaHCO}_3/\text{Na}_2\text{S}_2\text{O}_3$ was added and the biphasic mixture stirred vigorously for 20 min. The reaction mixture was then extracted with ether (3 x 10 mL). The combined organic extracts were dried over MgSO_4 , filtered and concentrated. The very sensitive aldehyde was then purified via column chromatography (10% ether/hexanes) to give 0.178 g of **6a** (90%), which was then used immediately in the next reaction. ^1H NMR (CDCl_3 , 500 MHz) δ 9.75 (t, J = 1.5 Hz, 1H), 7.39-7.37 (m, 2H), 7.29-7.24 (m, 3H), 4.05 (t, J = 6.6 Hz, 2H), 2.42-2.88 (m, 4H), 2.28 (t, J = 7.6 Hz, 2H), 1.62-1.58 (m, 8H), 1.46-1.43 (m, 2H), 1.35-1.29 (m, 16H); ^{13}C NMR (CDCl_3 , 125 MHz) δ 202.8, 173.9, 131.5, 128.1, 127.4, 124.1, 90.4, 80.6, 64.4, 43.9, 34.3, 29.4, 29.4, 29.2, 29.1, 29.0, 28.9, 28.7, 28.6, 25.9, 24.9, 22.0, 19.4; IR (thin film) ν 2929, 2855, 1731, 1489, 1464, 1389, 1353, 1243, 1173, 1100, 1069, 756, 692 cm^{-1} . MS (ES+) calcd. for $\text{C}_{27}\text{H}_{40}\text{O}_3\text{Na}$ $[\text{M}+\text{Na}]^+$ 435.3, found: 435.3.

10-Oxo-decanoic Acid Dodec-10-ynyl Ester (**6b**).

To a solution of alcohol **17d** (0.182 g, 0.517 mmol) in 2.5 mL of CH_2Cl_2 and 0.210 mL of pyridine at 0 °C was added Dess-Martin periodinane (0.548 g, 1.29 mmol). After stirring for 10 min, 0.5 mL of 'wet' CH_2Cl_2 (pre-washed with water) was added dropwise. The cooling bath was removed and the mixture stirred at ambient temperature for 1 h. A 1:1 mixture of aqueous $\text{NaHCO}_3/\text{Na}_2\text{S}_2\text{O}_3$ was added and the biphasic mixture stirred vigorously for 20 min. The reaction mixture was then extracted with ether (3 x 10 mL). The combined organic extracts were dried over MgSO_4 , filtered and concentrated. The crude product was purified via column chromatography (10% ether/hexanes) to give 0.178 g of aldehyde **6b** (901%). ^1H NMR (CDCl_3 , 500 MHz) δ 9.76 (t, J = 2.0 Hz, 1H), 4.05 (t, J = 7.1 Hz, 2H), 2.41 (dt, J = 7.1 Hz, 2H), 2.28 (t, J = 7.6 Hz, 2H), 2.13-2.09 (m, 2H), 1.77 (t, J = 2.5 Hz, 3H), 1.63-1.57 (m, 6H), 1.49-1.43 (m, 2H), 1.38-1.26 (m, 18H); ^{13}C NMR (CDCl_3 , 125 MHz) δ 203.6, 174.2, 79.6, 75.6, 64.6, 44.1, 34.6, 29.6, 29.4, 29.3, 29.1, 28.9, 26.1, 25.2, 22.3, 18.9, 3.7; IR (thin film) ν 2928, 2855, 1732, 1590, 1463, 1391, 1172, 1098 cm^{-1} . MS (ES+) calcd. for $\text{C}_{22}\text{H}_{38}\text{O}_3\text{Na}$ $[\text{M}+\text{Na}]^+$ 373.2, found: 373.2.

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