Gold and Silver Catalyzed Reactions of Propargylic Alcohols in the Presence of Protic Additives.

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Abstract:

A wide range of primary, secondary and tertiary propargylic alcohols undergo Meyer-Schuster rearrangement to give enones at room temperature in the presence of a gold(I) catalyst and small quantities of MeOH or $PMPB(OH)_2$. The synthesis of the enone natural products Isoegomaketone and Daphenone was achieved using this reaction as the key step. The rearrangement of primary propargylic alcohols can readily be combined in a one-pot procedure with the addition of a nucleophile to the resulting terminal enone, giving β-aryl, β-alkoxy, β-amino or β-sulfido ketones. Propargylic alcohols bearing an adjacent electron-rich aryl group can also undergo silver-catalyzed substitution of the alcohol with oxygen, nitrogen and carbon nucleophiles. This latter reaction was initially observed with a batch of gold catalyst which was probably contaminated with small quantities of silver salt.

Introduction

α,β-Unsaturated carbonyl compounds are important building blocks in organic synthesis and are commonly used as substrates in a wide variety of transformations including Michael-additions,[1] Diels-Alder reactions,[2] cyclopropanations[3] and a wide variety of organocatalytic processes.[4] This diversity in application makes them common intermediates in the total synthesis of natural products and the synthesis of drug molecules. Traditionally α,β-unsaturated carbonyl compounds are synthesised via aldol condensation reactions, or via a Wittig,[5] Horner-Wadsworth-Emmons[6] or Petersen[7] olefination reaction. The Meyer-Schuster rearrangement[8]-[9] of a propargylic alcohol can provide a convenient alternative to these processes, which avoids the production of stoichiometric byproducts such as phosphorous oxides.

The required propargylic alcohol can readily be synthesised through an alkynyl anion addition to an aldehyde or ketone, typically a high yielding process which is also highly effective even with sterically hindered carbonyls. This two step process can therefore offer a highly attractive method to synthesise α,β-unsaturated carbonyl compounds (Scheme 1).

The classical Meyer-Schuster rearrangement involves heating the alcohol with strong acid, and is hence incompatible with many functional groups.[8] However, more recently a number of highly effective metal-catalyzed methods for achieving this reaction have been reported.[10]-[14] The emergence of Au(I) catalysis[15] in particular has revived this reaction, and conditions have been developed which enable the rearrangement to take place under very mild conditions. The first reports required the alcohol to be converted to the corresponding acetate derivative,[11] but more recently procedures have been developed for the direct rearrangement of the alcohols themselves.[12] We have previously reported that carrying out the Au-catalyzed rearrangement in a non-coordinating solvent, in the presence of one equivalent of methanol, greatly accelerates the reaction.[14]

Herein we report on the full scope of this room temperature Meyer-Schuster rearrangement with regard to the rearrangement of secondary and tertiary propargylic alcohols, and its application to the synthesis of the natural products Isoegomaketone and Daphenone. We also report convenient one-pot procedures for the direct conversion of primary propargylic alcohols into

β-arylketones, β-alkoxyketones, β-aminoketones and β-sulfidoketones via intermediate terminal enones. During the course of these studies it was observed that propargylic substitution reactions of electron rich propargylic alcohols took place in some cases. This interesting side reaction, which works with a wide range of oxygen, carbon and nitrogen nucleophiles, was shown to be mediated by silver salts, probably present as impurities in some batches of gold catalyst.

Results and Discussion

Rearrangement of Secondary Propargylic Alcohols

In our preliminary experiments we quickly identified that the Au-catalyzed Meyer-Schuster rearrangement was more efficient using a cationic gold catalyst[16] in non-polar solvents in the presence of a small quantity of a protic additive (either a boronic acid or methanol).[14] A wide range of secondary propargylic alcohols underwent Meyer-Schuster rearrangement at room temperature upon treatment with 2 mol% Au(I) catalyst and 1 eq. of MeOH (Table 1) in PhMe as solvent. In nearly all cases the enone was obtained as the pure *E* isomer after purification (see Supporting Information).

A variety of alkyl, alkenyl and aryl substituents at R^1 on the alkyne were tolerated (Entries 1-7) and the reaction could be run on a 1 g scale without difficulty using only 1 mol% Au catalyst (Entry 1). An alkoxy group could be incorporated to give access to an α,β-unsaturated ester (Entry 8). Compounds containing both electron rich aromatic groups (Entry 6) and electron deficient aromatic groups (Entry 5) at R^1 rearranged smoothly, as did a substrate containing a thiophene ring (Entry 7). The sterically congested substrate containing a tertiary butyl substituent (Entry 2) rearranged to the corresponding enone in very good yield, but required a prolonged reaction time of 16 hours. A substrate containing a conjugated alkene at R^1 (Entry 3) gave a lower yield, but this probably reflects the relative instability of the dienone product **2c** rather than the yield of the reaction itself. A variety of substituents could also be incorporated at the R^2 position (Entries 9-15). Benzylic alcohols rearrange efficiently (Entries 9-17) with substrates containing electron deficient (Entries 11-13) or moderately electron-donating (Entry 10) substituents giving excellent yields. Whilst electron-rich alcohol **1n** gave the corresponding enone **2n** in excellent yield, dimethylaniline **1o** gave only a 15% yield of the corresponding enone **2o**. This may be due to the presence of the co-ordinating nitrogen atom which can potentially interfere with the gold catalyst (*vide infra*). Propargylic alcohols containing electron-rich heterocycles gave the corresponding enones in good yield (Entries 16-17), and there was no evidence for Au-catalyzed reaction of the electron-rich hetereocycle with the pendant enone in the product.[17] Further combinations of substituents could also be incorporated (Entries 18-22) including cyclopropanes (**1r** and **1v**), which did not undergo ring-opening during the rearrangement reaction. The dienone **2v** (Entry 22) can be generated in excellent yield from the corresponding propargylic alcohol **1v**. Interestingly the initial major product observed from the rearrangement was the *E*,*E* isomer. However after purification the pure *E*,*Z* isomer **1v** was obtained cleanly in good yield. Presumably this latter isomer is actually thermodynamically more stable in this case.

Application to Natural Product Synthesis

Isoegomaketone **6** is an essential oil component of *perilla frutescens britt* and has been shown to exhibit anti-inflammatory properties.[18]-[19] The natural product **6** was synthesised in two steps via fluoride-mediated addition[20] of commercially available silylacetylene **3** to aldehyde **4**, followed by Meyer-Schuster rearrangement of the resulting mixture of alcohol **5a** and its corresponding TMS ether **5b**, with concomitant silyl deprotection. (Scheme 2). The natural product **6** was obtained in 86% overall yield with high *E*:*Z* selectivity from the two-step sequence.

We also carried out a short synthesis of Daphenone **13** (Scheme 3), a natural product isolated from *daphne odora* which showed cytotoxicity against five human tumor cell lines.[21] Sonigashira coupling of 4-iodophenol **8** with TMS-acetylene **7** gave phenol **9**[22] after desilylation. After protection of the phenol as a silyl ether, the alkyne **10** was lithiated and reacted with dihydrocinnamaldehyde **11** to give propargylic alcohol **12**. Meyer-Schuster rearrangement of **12** proceeded cleanly without deprotection of the silyl ether, which was cleaved with fluoride to give the natural product **13** (58% yield over 6 steps from **8**).

Problematic Substrates for the Meyer-Schuster Rearrangement

As mentioned above, propargylic alcohols containing nitrogen functionality did not undergo efficient Meyer-Schuster rearrangement (Table 1, entry 15 and Scheme 4). Tertiary amine **14** was completely unreactive, whereas pyridine **15** gave the abnormal rearrangement product **16** in 10% yield. The low reactivity of these substrates is presumably a consequence of the ability of the basic nitrogen atom to co-ordinate to the Au-catalyst and deactivate it. Addition of 1 eq. of pyridine to alcohol **1f** completely inhibited the Meyer-Schuster rearrangement of this otherwise reactive substrate. It should be noted that there are virtually no reports of the Au-catalyzed Meyer-Schuster rearrangement of nitrogen containing compounds in the literature.[23]

Propargylic Substitution Reactions

During the course of our evaluation of the substrate scope of the reaction (Table 1), we initially observed the formation of propargylic substitution product **17a** in 54% yield when rearrangement of electron rich alcohol **1n** was attempted, with **2n** being produced as a minor product (Scheme 5). It subsequently transpired that the formation of such products was not reproducible, and appeared to be dependent on the batch of gold catalyst used in the reaction – with a new batch of catalyst the Meyer-Schuster rearrangement proceeded cleanly in good yield (Table 1, entry 14).

We hypothesised that the propargylic substitution reaction was probably mediated by an impurity present in the original batch of gold catalyst.[22] The most likely candidate seemed to be $AgNTf_2$,[23] used during the preparation of the catalyst,[16] and pleasingly treatment of propargylic alcohol **1n** with $AgNTf_2$/MeOH in PhMe led to the formation of substitution product **17a** in good yield (Table 2, Entry 1). Reaction of alcohol **1n** with $HNTf_2$/MeOH in PhMe led to a complex mixture of products suggesting that this is not simply an acid-catalyzed process.[24]-[25]

These reaction conditions were applied to a range of different nucleophiles to illustrate the scope of the reaction (Table 2). Substitution reactions with oxygen, (Entries 1-3) carbon (Entries 4-7), and nitrogen nucleophiles (Entries 8-9) were all possible. In the absence of an external nucleophile, dimerisation of the propargylic alcohol took place to form the symmetrical ether as a mixture of diastereoisomers (Entry 10). The presence of both an alkyne and an electron rich aromatic ring at R^1 seem to be necessary for the substitution reaction to take place. Propargylic alcohols **1a**, **1f** and **1l** did not react in the presence of $AgNTf_2$ and MeOH even at 60 °C; similarly, benzhydrol (Ph_2CHOH) and 1-phenylethanol were also unreactive. It should be noted that neither $HNTf_2$ nor $AgNTf_2$ were able to mediate the Meyer-Schuster rearrangement of the propargylic alcohols **1a**, **1f** and **1l**, suggesting that an Au catalyst is essential for this reaction.[25]

It is notable that the Ag-catalyzed substitution reaction must be highly efficient as it was the dominant reaction pathway in our original experiments, even though the quantity of Ag present as impurity in the 2 mol% Au-catalyst used must have been very small. We carried out an NMR experiment to determine the relative rates of the silver and gold catalyzed reactions (Scheme 6). Treatment of alcohol **1n** with 1 mol% of each of the catalysts in the presence of 2 eq. MeOH in C_6D_6 gave a 20:1 ratio of substitution product **17a** to Meyer-Schuster rearrangement product **2n** after 10 minutes at room temperature, illustrating that the substitution reaction is considerably faster than the Meyer-Schuster rearrangement. There are several reports in the literature of metal-catalyzed substitution reactions of alcohols[23],[26] and in the light of these results, it is possible that some of these processes may actually be mediated or assisted by trace quantities of Ag-salts that are present, particularly where Ag salts have been added as a co-catalyst.[27] However, it should be noted that Au(III)-catalyzed substitution reactions have been reported to work with propargylic alcohols which do not contain an electron-rich aromatic substitutent.[26d]

During the course of these investigations, we also explored the rearrangement of terminal propargylic alcohols to see whether it was possible to obtain α,β-unsaturated aldehydes via Meyer-Schuster rearrangement.[28] The initial reactions were carried out by treatment of alcohol **18** with the contaminated Au catalyst and gave a mixture of the desired aldehyde **19** and α-methoxyketone **20**. (Scheme 7). The latter product is presumably formed via Ag-mediated substitution of the alcohol, followed by Au-catalyzed hydration of the terminal alkyne.[29] Reaction of **18** with a new batch of catalyst gave α-hydroxyketone **21** as the major product, together with traces of aldehyde **19**. As above (Table 2), treatment of alcohol **18** with catalytic $AgNTf_2$ in the presence of MeOH gave the substitution product **22** cleanly in good yield. Treatment of **22** with catalytic Au gave ketone **20**, providing evidence that product **20** was formed in our original experiment via two separate steps catalyzed by the two different metals.[27]

Tertiary Propargylic Alcohols

Tertiary propargylic alcohols **23** can be easily prepared by addition of alkynyl anions to ketones, and provide access to sterically congested trisubstituted enones **24** upon Meyer-Schuster rearrangement. We were able to demonstrate the formation of a range of symmetrically and unsymmetrically substituted enones **24** in good to excellent yield and with high levels of geometric control in some cases (Table 3). Where there is a large difference in the size of the propargylic substituents, impressive selectivity is observed (Entry 4), and even when the groups are of similar size moderate selectivity is still obtained (Entry 2). In general, reactions of tertiary propargylic alcohols were found to be slower than those of secondary propargylic alcohols.

The use of *p*-methoxyphenyl boronic acid[13]-[14],[30] **25** rather than MeOH as the reaction additive was found to give higher yields and higher *E*:*Z* selectivity in many cases, though longer reaction times were necessary. Extending the reaction time with MeOH as the additive did not increase the *E*:*Z* selectivity however. Interestingly, addition of boronic acid **25** to the 3:1 ratio of enone **24d** obtained from Au/MeOH catalyzed rearrangement, led to further isomerisation of the product to give an enhanced *E*:*Z* ratio (Scheme 8). This indicates that the boronic acid is involved in the isomerisation of the alkene, possibly via an addition process to give cyclic boronate **26**.

Primary Propargylic Alcohols

The rearrangement of primary propargylic alcohols should provide a highly effective and mild method for accessing terminal enones. However, during the rearrangement of **27** in the presence of methanol as the additive, some addition of MeOH to enone **28a** was observed to give **29** (Scheme 9).[12a]

Pleasingly, in the presence of boronic acid **25** as an additive, clean rearrangement to the unsubstituted enone **28a** was observed. The reaction provides a mild method for generating highly reactive terminal enones, and the crude product is clean enough to be used directly in further transformations. We therefore developed reaction conditions for the synthesis of a range of functionalised products by addition of nucleophiles to the crude enone, generated in situ from the propargylic alcohol (Table 4). In our preliminary report we outlined how Pd-catalyzed addition of boronic acids[31] could be used to access β-aryl ketones **30** in moderate to good yield (Entries 1-4).[14] β-Alkoxyketones **31** (Entries 5-6), β-aminoketones **32** (Entries 7-12) and β-sulfidoketones **33** (Entries 13-14) can also be readily prepared via simple one-pot procedures, by addition of the appropriate nucleophile directly to the reaction mixture after the Meyer-Schuster rearrangement reaction is complete.

Conclusion

In the presence of catalytic PPh_3AuNTf_2 and a protic additive such as MeOH or $PMPB(OH)_2$, the Meyer-Schuster rearrangement of a wide range of propargylic alcohols occurs in generally good to excellent yield. Secondary alcohols rearrange with high selectivity for the *E*-isomer of the enone product and tertiary alcohols with moderate to high selectivity. This reaction was employed as a key step in the synthesis of the enone natural products Isoegomaketone and Daphenone. The rearrangement of primary propargylic alcohols can be combined with the addition of carbon, oxygen or nitrogen nucleophiles to the resulting terminal enone to give access to β-substituted ketones in a one-pot procedure. During the course of this work, we also observed that propargylic alcohols bearing an electron-rich aryl group readily undergo substitution of the alcohol, with a variety of oxygen, carbon and nitrogen nucleophiles in the presence of a silver catalyst. This latter reaction was the dominant pathway over the desired Meyer-Schuster rearrangement with a batch of Au(I) catalyst that was probably contaminated with Ag(I) salts.

Experimental Section

All reactions were carried out under an atmosphere of air unless otherwise indicated. Tetrahydrofuran was used following purification from a zeolite drying apparatus. All other chemicals were used as supplied unless otherwise indicated. Column chromatography was carried out using silica gel (40-60 μm) and analytical thin layer chromatography was carried out using aluminium-backed plates coated with silica gel. Components were visualised using combinations of ultra-violet lights, iodine, ceric ammonium molybdate, phosphomolybdic acid and potassium permanganate. ^{1}H NMR spectra were recorded at at 500 MHz or at 600 MHz in $CDCl_3$ using residual protic solvent $CHCl_3$ (δ = 7.26 ppm, s) as the internal standard. Chemical shifts are quoted in ppm using the following abbreviations: s, singlet; d, doublet; t, triplet; q, quartet; qn, quintet; m, multiplet; br, broad or a combination of these. The coupling constants (*J*) are measured in Hertz. ^{13}C NMR spectra were recorded at 125 MHz or at 150 MHz in $CDCl_3$ using the central reference of $CHCl_3$ (δ = 77.0 ppm, t) as the internal standard.

Meyer-Schuster Rearrangements to give enones 2, 16, and 24

Compounds **2a**-**2b, 2d**, **2f**, **2r**, **2u**, and **24a**-**24f** have previously been reported.[14]

General Procedure A (Preparation of compounds 2, 6 and 13): $[Ph_3PAuNTf_2]_2PhMe$ (1 mol%) and methanol (1 eq.) or 4-methoxyboronic acid (0.2 eq.) were added to a solution of propargylic alcohol in toluene (10 mL/g) and the solution stirred magnetically at room temperature until starting material had disappeared (TLC). The solvent was removed *in vacuo* and the crude product purified by column chromatography

(*E*)-1-(Cyclohex-1-en-1-yl)hex-2-en-1-one (2c):[10c] IR (film) ν = 2962, 2936, 2875, 1711 cm^{-1}; ^{1}H NMR ($CDCl_3$, 600 MHz): δ = 6.91-6.88 (m, 1H), 6.84 (dt, *J* = 15.4, 7.4 Hz, 1H), 6.63 (br d, *J* = 15.4 Hz, 1H), 2.30-2.24 (m, 4H), 2.20 (app q, *J* = 7.4 Hz, 2H), 1.68-1.56 (m 4H), 1.50 (app sx, *J* = 7.4 Hz, 2H), 0.94 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 191.6, 147.0, 140.00, 139.96, 125.0, 34.8, 26.3, 23.5, 22.1, 21.7, 21.6, 13.9 ppm; Found (EI): [M] 178.13492, $C_{12}H_{18}O$ requires 178.13522.

***(E)*-1-(4-(Trifluoromethyl)phenyl)hex-2-en-1-one (2e):** ^{1}H NMR ($CDCl_3$, 600 MHz): δ = 8.00 (d, *J* = 8.3 Hz, 2H), 7.73 (d, *J* = 8.3 Hz, 2H), 7.12-7.07 (dt, *J* = 15.4, 7.2 Hz, 1H), 6.86-6.83 (br dt, *J* = 15.4, 1.4 Hz, 1H), 2.33 (br qd, *J* = 7.2, 1.5 Hz, 2H), 1.60-1.53 (app sx, *J* = 7.4 Hz, 2H), 0.98 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 190.2, 151.6, 141.0, 134.0 (q, *J* = 32.5 Hz), 128.9, 125.9, 125.7 (q, *J* = 3.7 Hz), 123.9 (q, *J* = 274 Hz), 35.1, 21.5, 13.9 ppm; Found (EI): [M] 242.09084, $C_{13}H_{13}OF_3$ requires 242.09130

(*E*)-1-(Thiophen-3-yl)hex-2-en-1-one (2g): IR (film) ν = 2963, 2933, 2874, 1665 cm^{-1}; ^{1}H NMR ($CDCl_3$, 600 MHz): δ = 8.05 (m, 1H), 7.59 (br d, *J* = 4.9 Hz, 1H), 7.33-7.31 (m, 1H), 7.08 (dt, *J* = 15.5, 7.1 Hz, 1H), 6.77 (br d, *J* = 15.5 Hz, 1H), 2.30-2.25 (m, 2H), 1.54 (app sx, *J* = 7.4 Hz, 2H), 0.96 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 184.4, 149.1, 142.9, 132.1, 127.6, 126.7, 125.4, 34.9, 21.6, 13.9 ppm; Found (EI): [M] 180.06071, $C_{10}H_{12}OS$ requires 180.06034

(*E*)-Ethyl 5-phenylpent-2-enoate (2h):[32] ^{1}H NMR ($CDCl_3$, 600 MHz): δ = 7.29 (t, *J* = 7.5 Hz, 2H), 7.20 (t, *J* = 7.5 Hz, 1H), 7.18 (d, *J* = 7.5 Hz, 2H), 7.00 (dt, *J* = 15.7, 6.9 Hz, 1H), 5.84 (dt, *J* = 15.7, 1.6 Hz, 1H), 4.18 (q. *J* = 7.2 Hz, 2H), 2.77 (t, *J* = 7.6 Hz, 2H), 2.55-2.50 (m, 2H), 1.28 ppm (t, *J* = 7.2 Hz, 3H); ^{13}C

NMR ($CDCl_3$, 150 MHz): δ = 166.7, 148.2, 140.9, 128.6, 128.4, 126.3, 121.9, 60.3, 34.4, 34.1, 14.4 ppm; Found (EI): [M-OEt] 159.08089, $C_{11}H_{11}O$ requires 159.08044.

(*E*)-1-Phenylhept-1-en-3-one (2i):[33] IR (film) ν = 2955, 2942, 2926, 2866, 1649 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.55 (d, *J* = 16.3 Hz, 1H), 7.56-7.53 (m, 2H), 7.41-7.38 (m, 3H), 6.75 (d, *J* = 16.3 Hz, 1H), 2.64 (t, *J* = 7.5 Hz, 2H), 1.69-1.64 (m, 2H), 1.39 (app sx, *J* = 7.5 Hz, 2H), 0.94 ppm (t, *J* = 7.5 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 200.9, 142.4, 134.7, 130.5, 129.1, 128.4, 126.4, 40.8, 26.6, 22.6, 14.1 ppm.

(*E*)-1-(4-Tolyl)hept-1-en-3-one (2j):[33] IR (film) ν = 2955, 2930, 2862, 1648 cm^{-1}; ^1H NMR ($CDCl_3$, 500 MHz): δ = 7.53 (d, *J* = 16.3 Hz, 1H), 7.45 (d, *J* = 8.0 Hz, 2H), 7.20 (d, *J* = 8.0 Hz, 2H), 6.70 (d, *J* = 16.3 Hz, 1H), 2.65 (t, *J* = 7.5 Hz, 2H), 2.38 (s, 3H), 1.65 (qn, *J* = 7.5 Hz, 2H), 1.39 (sx, *J* = 7.5 Hz, 2H), 0.94 ppm (t, *J* = 7.5 Hz, 3H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ = 201.0, 142.5, 141.0, 131.9, 129.8, 128.4, 125.5, 40.7, 26.7, 22.6, 21.6, 14.1 ppm.

(*E*)-1-(4-Fluorophenyl)hept-1-en-3-one (2k):[10c] ^1H NMR ($CDCl_3$, 500 MHz): δ = 7.53 (br dd, *J* = 8.6, 5.4 Hz, 2H), 7.50 (d, *J* = 16.2 Hz, 1H), 7.08 (t, *J* = 8.6 Hz, 2H), 6.67 (d, *J* = 16.2 Hz, 1H), 2.65 (t, *J* = 7.4 Hz, 2H), 1.65 (qn, *J* = 7.4 Hz, 2H), 1.38 (app sx, *J* = 7.4 Hz, 2H), 0.94 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ = 200.5, 162.2 (d, *J* = 250.7 Hz), 141.0, 130.9 (d, *J* = 3.8 Hz), 130.2 (d, *J* = 8.6 Hz), 126.0 (d, *J* = 1.9 Hz), 116.1 (d, *J* = 22.0 Hz), 40.9, 26.5, 22.5, 14.0 ppm; Found (CI): [M+H] 207.11852, $C_{13}H_{16}OF$ requires 207.11806.

(*E*)-1-(4-(Trifluoromethyl)phenyl)hept-1-en-3-one (2l):[10c] ^1H NMR ($CDCl_3$, 500 MHz): δ = 7.63 (s, 4H), 7.56 (d, *J* = 16.3 Hz, 1H), 6.80 (d, *J* = 16.3 Hz, 1H), 2.68 (t, *J* = 7.4 Hz, 2H), 1.67 (qn, *J* = 7.4 Hz, 2H), 1.38 (app sx, *J* = 7.4 Hz, 2H), 0.95 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ = 200.2, 141.3, 138.1, 131.9 (q, *J* = 32.7 Hz), 128.4, 128.3, 125.6 (q, *J* = 3.8 Hz), 123.9 (q, *J* = 271.6 Hz), 41.1, 26.3, 22.5, 14.0 ppm; Found (CI): [M+H] 257.11501, $C_{14}H_{16}OF_3$ requires 257.11532.

(*E*)-1-(4-Bromophenyl)hept-1-en-3-one (2m): IR (film) ν = 2964, 2951, 2930, 2868, 1685 cm^{-1}; ^1H NMR ($CDCl_3$, 500 MHz): δ = 7.52 (d, *J* = 8.5 Hz, 2H), 7.50 (d, *J* = 16.1 Hz, 1H), 7.40 (d, *J* = 8.5 Hz, 2H), 6.72 (d, *J* = 16.1 Hz, 1H), 2.65 (t, *J* = 7.4 Hz, 2H), 1.65 (app qn, *J* = 7.4 Hz, 2H), 1.38 (app sx, *J* = 7.4 Hz, 2H), 0.94 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ = 200.4, 140.9, 133.6, 132.2, 129.7, 126.8, 124.7, 41.0, 26.5, 22.5, 14.0 ppm; Found (CI): [M+H] 267.03824, $C_{13}H_{16}OBr$ requires 267.03845.

(*E*)-1-(4-Methoxyphenyl)hept-1-en-3-one (2n):[10c] IR (film) ν = 2958, 2934, 2872, 1685 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.51 (d, *J* = 16.0 Hz, 1H), 7.50 (d, *J* = 8.6 Hz, 2H), 6.91 (d, *J* = 8.6 Hz, 2H), 6.63 (d, *J* = 16.0 Hz, 1H), 3.84 (s, 3H), 2.64 (t, *J* = 7.5 Hz, 2H), 1.67 (app qn, *J* = 7.5 Hz, 2H), 1.38 (app sx, *J* = 7.5 Hz, 2H), 0.94 ppm (t, *J* = 7.5 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 200.9, 161.6, 142.2, 130.1, 127.3, 124.2, 114.5, 55.5, 40.7, 26.8, 22.6, 14.1 ppm.

(*E*)-1-(4-(Dimethylamino)phenyl)hept-1-en-3-one (2o): IR (film) ν = 2956, 2931, 2871, 1646 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.50 (d, *J* = 16.0 Hz, 1H), 7.45 (d, *J* = 8.8 Hz, 2H), 6.68 (d, *J* = 8.8 Hz, 2H), 6.56 (d, *J* = 16.0 Hz, 1H), 3.03 (s, 6H), 2.62 (t, *J* = 7.5 Hz, 2H), 1.65 (app qn, *J* = 7.5 Hz, 2H), 1.38 (app sx, *J* = 7.5 Hz, 2H), 0.94 ppm (t, *J* = 7.5 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 201.1, 152.0, 143.3, 130.1, 122.3, 121.7, 112.0, 40.4, 40.3, 27.1, 22.7, 14.1 ppm; Found (EI): [M] 231.16240, $C_{15}H_{21}ON$ requires 231.16176.

(*E*)-1-(5-Methylthiophen-2-yl)hept-1-en-3-one (2p): IR (film) ν = 2960, 2932, 2873, 1651 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.58 (d, *J* = 15.8 Hz, 1H), 7.08 (br d, *J* = 3.6 Hz, 1H), 6.72 (br d, *J* = 3.6 Hz, 1H), 6.41 (dd, *J* = 15.8 Hz, 1H), 2.59 (t, *J* = 7.4 Hz, 2H), 2.50 (s, 3H), 1.63 (app qn, *J* = 7.4 Hz, 2H), 1.38 (app sx, *J* = 7.4 Hz, 2H), 0.93 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 200.4, 144.4, 138.1, 135.4, 132.5, 126.8, 123.9, 40.9, 26.7, 22.6, 16.0, 14.1 ppm; Found (EI): [M] 208.09115, $C_{12}H_{16}OS$ requires 208.09164.

(*E*)-1-(Furan-2-yl)hept-1-en-3-one (2q): IR (film) ν = 2961, 2934, 2875, 1611 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.49 (br d, *J* =1.5 Hz, 1H), 7.32 (d, *J* = 15.8 Hz, 1H), 6.65 (d, *J* = 3.4 Hz, 1H), 6.64 (d, *J* = 15.8 Hz, 1H), 6.47 (br dd, *J* = 3.4, 1.5 Hz, 1H), 2.60 (t, *J* = 7.4 Hz, 2H), 1.67-1.61 (m, 2H), 1.36 (app sx, *J* = 7.4 Hz, 2H), 0.93 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 200.4, 151.3, 144.9, 128.6, 123.5, 115.7, 112.6, 41.3, 26.6, 22.6, 14.0 ppm; Found (EI): [M] 178.09903, $C_{11}H_{14}O_2$ requires 178.09883.

1-(4-Methoxyphenyl)hept-2-en-1-one (2s): IR (film) ν = 2962, 2935, 1600 cm^{-1}; *Z*-Enone: ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.94 (d, *J* = 8.6 Hz, 2H), 6.90 (d, *J* = 8.6 Hz, 2H), 6.75 (dt, *J* = 11.6, 1.5 Hz, 1H), 6.26 (dt, *J* = 11.6, 7.5 Hz, 1H), 3.87 (s, 3H), 2.60 (qd, *J* = 7.5, 1.5 Hz, 2H), 1.45 (app qn, *J* = 7.5 Hz, 2H), 1.35 (app sx, *J* = 7.5 Hz, 2H), 0.90 ppm (t, *J* = 7.5 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 191.1, 163.3, 148.7, 131.7, 130.8, 124.5, 113.8, 55.6, 31.6, 29.7, 22.6, 14.1 ppm; *E*-Enone: ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.95 (d, *J* = 8.8 Hz, 2H), 6.75 (dt, *J* = 15.5, 7.0 Hz, 1H), 6.95 (d, *J* = 8.8 Hz, 2H), 6.89 (dt, *J* = 15.5, 1.5 Hz, 1H), 3.87 (s, 3H), 2.31 (qd, *J* = 7.5, 1.5 Hz, 2H), 1.50 (app qn, *J* = 7.5 Hz, 2H), 1.38 (app sx, *J* = 7.5 Hz, 2H), 0.93 ppm (t, *J* = 7.5 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 189.3, 163.3, 149.2, 131.0, 130.9, 125.6, 113.8, 55.6, 32.7, 30.5, 22.5, 14.0 ppm; Found (CI): [M+H] 219.13812, $C_{14}H_{19}O_2$ requires 219.13850

(*E*)-1-(4-Methoxyphenyl)-5-phenylpent-2-en-1-one (2t): IR (film) ν = 2965, 2938, 1618 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.91 (d, *J* = 8.9 Hz, 2H), 7.31 (t, *J* = 7.6 Hz, 2H), 7.22 (m, 3H), 7.07 (dt, *J* = 15.4, 6.9 Hz, 1H), 6.94 (d, *J* = 8.9 Hz, 2H), 6.88 (dt, *J* = 15.4, 1.3 Hz, 1H), 3.05 (s, 3H), 2.85 (t, *J* = 7.5 Hz, 2H), 2.64 ppm (m, 2H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 189.2, 163.4, 147.5, 141.1, 131.0, 130.8, 128.63, 128.55, 126.3, 113.9, 55.6, 34.69, 34.66 ppm; Found (EI): [M] 266.13090, $C_{18}H_{18}O_2$ requires 266.13013.

(2*E*,4*Z*)-1-Cyclopropylocta-2,4-dien-1-one (2v): IR (film) ν = 2965, 2936, 2876, 1704 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.23-7.18 (dd, *J* = 15.4, 9.6 Hz, 1H), 6.21 (d, *J* = 15.4 Hz, 1H), 6.21-6.15 (m, 2H), 2.18-2.14 (m, 2H), 2.14-2.10 (m, 1H), 1.50-1.42 (app sx, *J* = 7.4 Hz, 2H), 1.10-1.06 (m, 2H), 0.92 (t, *J* = 7.4 Hz, 3H), 0.91-0.87 ppm (m, 2H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 200.6, 145.6, 142.8, 129.2, 128.1, 35.3, 22.0, 19.3, 13.8, 11.1 ppm; Found (EI): [M] 164.11993, $C_{11}H_{16}O$ requires 164.11957.

(*E*)-1-(Pyridin-2-yl)hept-2-en-1-one (16): IR (film) ν = 2960, 2933, 2831, 1621 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 8.71 (m, 1H), 8.12 (d, *J* = 7.9 Hz, 1H), 7.85 (td, *J* = 7.9, 1.5 Hz, 1H), 7.58 (dt, *J* = 15.6, 1.2 Hz, 1H), 7.49-7.45 (m, 1H), 7.24 (dt, *J* = 15.6, 7.0 Hz, 1H), 2.35 (br qd, *J* = 7.0, 1.2 Hz, 2H), 1.55-1.48 (m, 2H), 1.41-1.35 (m, 2H), 0.93 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 189.7, 154.3, 150.8, 148.9, 137.1, 126.9, 124.5, 123.0, 32.8, 30.4, 22.5, 14.0 ppm; Found (CI): [M+H] 190.12364, $C_{12}H_{16}ON$ requires 190.12319.

1,3,3-Triphenylprop-2-en-1-one (24g):[34] ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.91 (br d, *J* = 7.3 Hz, 2H), 7.49 (br t, *J* = 7.3 Hz, 1H), 7.41-7.36 (m, 7H), 7.29-7.25 (m, 3H), 7.20-7.17 (m, 2H), 7.12 ppm (s, 1H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 192.8, 154.9, 141.5, 139.1, 138.3, 132.8, 129.9, 129.5, 128.9, 128.7, 128.58, 128.51, 128.49, 128.2, 124.1 ppm; Found (CI): [M+H] 283.11288, $C_{21}H_{16}O$ requires 283.1174.

Synthesis of the Natural Products Isoegomaktone (6) and Daphenone (13):

(*E*)-Isoegomaketone (6):[18]-[19] Isobutraldehyde (110 mg, 1.52 mmol), (furan-3-ylethynyl)trimethylsilane (500 mg, 3.65 mmol), and tetrabutylammonium triphenyldifluorosilicate (8 mg, 0.15 mmol) were dissolved in dry THF (5 mL). The resultant solution was stirred for 20 min at 0 °C. The reaction was quenched with aq. $NaHCO_3$ and the organic phase extracted with diethyl ether. The combined organic phases were washed with brine, dried ($MgSO_4$) and concentrated *in vacuo* to give **5a** and **5b** as a mixture. **5** was submitted without further purification to the Meyer-Schuster Rearrangement reaction conditions (General Procedure C) to give *E*-Isoegomaketone in 86% yield over the two steps. IR (film) ν = 2966, 2934, 2873, 1667 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 8.04 (m, 1H), 7.45 (app br t, *J* = 1.7 Hz, 1H), 7.02 (dd, *J* = 15.4, 6.8 Hz, 1H), 6.83 (br dd, *J* = 1.7, 0.8 Hz, 1H), 6.49 (dd, *J* = 15.4, 1.5 Hz, 1H), 2.53 (app sxd, *J* = 6.8, 1.3 Hz, 1H), 1.11 ppm (d, *J* = 6.8 Hz, 6H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 185.0, 154.7, 147.2, 144.3, 128.2, 124.1, 109.3, 31.4, 21.5 ppm; Found (EI): [M] 164.08354, $C_{10}H_{12}O_2$ requires 164.08318.

***t*-Butyl(4-ethynylphenoxy)dimethylsilane (10):**[35] (4-Hydroxyphenyl)acetylene **9**[20] (400 mg, 3.43 mmol) and imidazole (230 mg, 3.43 mmol) were dissolved in DMF (10 ml) and TBSCl (510 mg, 3.43 mmol) was added. The reactants were stirred at room temperature overnight and then quenched with the addition of water. The resultant slurry was extracted with diethyl ether, the combined organic phases were washed with brine, dried ($MgSO_4$) and concentrated *in vacuo*. The residue was purified by flash column chromatography to give the protected acetylene **10**. IR (film) ν = 2957, 2930, 2896, 2860, 2157 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.38 (d, *J* = 8.6 Hz, 2H), 6.78 (d, *J* = 8.6 Hz, 2H), 2.99 (s, 1H), 0.98 (s, 9H), 0.20 ppm (s, 6H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 156.4, 133.7, 120.3, 114.9, 83.8, 76.0, 25.7, 0.17, -4.3 ppm; Found (EI): [M] 233.12850, $C_{14}H_{20}OSi$ requires 232.12779

1-(4-((*t*-Butyldimethylsilyl)oxy)phenyl)-5-phenylpent-1-yn-3-ol (12): Prepared according to general procedure S_A (see Supporting Information); IR (film) ν = 3650, 3007, 2944, 2293 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.32 (d, *J* = 8.6 Hz, 2H), 7.31-7.28 (m, 2H), 7.26-7.24 (m, 2H), 7.22-7.19 (m, 1H), 6.79 (d, *J* = 8.6 Hz, 2H), 4.59 (br t, *J* = 5.5 Hz, 1H), 2.86 (t, *J* = 7.5 Hz, 2H), 2.14-2.08 (m, 2H), 1.96 (br s, 1H), 0.98 (s, 9H), 0.20 ppm (s, 6H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 156.2, 141.5, 133.3, 128.7, 128.6, 126.1, 120.3, 115.4, 88.6, 85.4, 62.5, 39.5, 31.6, 25.8, 18.3, -4.3 ppm; Found (EI): [M] 366.20131, $C_{23}H_{30}O_2Si$ requires 366.20096

Daphenone (13):[21] Prepared according to General Procedure A; IR (film) ν = 2954, 2926, 2856, 1737 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.85 (d, *J* = 8.8 Hz, 2H), 7.29 (m, 2H), 7.21 (m, 3H), 7.07 (dt, *J* = 15.3, 6.8 Hz, 1H), 6.89 (d, *J* = 8.8 Hz, 2H), 6.88 (dt, *J* = 15.3, 1.3 Hz, 1H), 6.44 (br s, 1H), 2.84 (t, *J* = 7.5 Hz, 2H), 2.64 ppm (m, 2H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 189.7, 160.4, 148.1, 141.0, 131.4, 130.6, 128.6, 128.5, 126.30, 126.26, 115.5, 34.69, 34.63 ppm; Found (EI): [M] 252.11537, $C_{17}H_{16}O_2$ requires 252.11448.

Silver Catalyzed Substitution of Propargylic Alcohols

General Procedure B (Preparation of compounds 17 and 22): $AgNTf_2$ (1 mol%) and nucleophile (2 eq.) were added to a solution of propargylic alcohol in toluene (10 mL/g) and the solution stirred magnetically at room temperature until the starting material has disappeared (TLC) or at 60 °C overnight. The reaction was quenched with aq. $NaHCO_3$ and the organic phase extracted with diethyl ether. The combined organic phases were washed with brine, dried ($MgSO_4$) and concentrated *in vacuo*. The residue was purified by flash column chromatography to give **17**.

1-Methoxy-4-(1-methoxyhept-2-yn-1-yl)benzene (17a):[36] ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.42 (d, *J* = 8.6 Hz, 2H), 6.89 (d, *J* = 8.6 Hz, 2H), 5.02 (br t, *J* = 1.9 Hz, 1H), 3.81 (s, 3H), 3.37 (s, 3H), 2.29 (td, *J* = 7.2, 1.9 Hz, 2H), 1.56-1.51 (m, 2H), 1.47-1.40 (m, 2H), 0.92 ppm (t, *J* = 7.3 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 159.7, 131.5, 128.9, 113.8, 88.5, 77.8, 72.9, 55.5, 55.4, 30.9, 22.1, 18.7, 13.7 ppm; Found (EI): [M] 232.14620, $C_{15}H_{20}O_2$ requires 232.14578.

2-(3-(Cyclohex-1-en-1-yl)-1-methoxyprop-2-yn-1-yl)-5-methylthiophene (17b): IR (film) ν = 3007, 2958, 2238 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 6.94 (d, *J* = 3.4 Hz, 1H), 6.60 (m, 1H), 6.19 (m, 1H), 5.37 (s, 1H), 3.39 (s, 3H), 2.46 (s, 3H), 2.19-2.14 (m, 2H), 2.12-2.08 (m, 2H), 1.66-1.61 (m, 2H), 1.61-1.55 ppm (m, 2H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 141.1, 139.9, 136.0, 126.5, 124.6, 120.1, 89.0, 83.3, 68.8, 55.0, 29.2, 25.7, 22.3, 21.5, 15.6 ppm; Found (EI): [M] 246.10810, $C_{15}H_{18}OS$ requires 246.10729.

1-(1-(Benzyloxy)hept-2-yn-1-yl)-4-methoxybenzene (17c): IR (film) ν = 2958, 2933, 2872, 2230 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.45 (d, *J* = 8.6 Hz, 2H), 7.39-7.33 (m, 4H), 7.28 (m, 1H), 6.89 (d, *J* = 8.6 Hz, 2H), 5.16 (br t, *J* = 1.9 Hz, 1H), 4.65 (d, *J* = 11.7 Hz, 1H), 4.62 (d, *J* = 11.7 Hz, 1H), 3.81 (s, 3H), 2.31 (td, *J* = 7.1, 1.9 Hz, 2H), 1.55 (app qn, *J* = 7.4 Hz, 2H), 1.45 (app sx, *J* = 7.4 Hz, 2H), 0.93 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 159.6, 138.2, 131.6, 129.0, 128.5, 128.2, 127.7, 113.8, 88.6, 78.0, 70.4, 69.6, 55.4, 30.9, 22.1, 18.7, 13.8 ppm; Found (EI): [M] 308.17794, $C_{21}H_{24}O_2$ requires 308.17708.

2-(1-(4-Methoxyphenyl)hept-2-yn-1-yl)furan (17d): IR (film) ν = 2957, 2930, 2871, 2265, 1607 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.32 (d, *J* = 8.7, 2H), 7.30 (m, 1H), 6.86 (d, *J* = 8.7 Hz, 2H), 6.28 (br dd, *J* = 3.2, 1.9 Hz, 1H), 6.16 (br dt, *J* = 3.2, 0.9 Hz, 1H), 4.96 (br t, *J* = 2.2 Hz, 1H), 3.79 (s, 3H), 2.26 (td, *J* = 7.1, 2.2 Hz, 2H), 1.52 (app qn, *J* = 7.4 Hz, 2H), 1.43 (app sx, *J* = 7.4 Hz, 2H), 0.91 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 158.8, 155.1, 142.1, 131.8, 128.9, 114.0, 110.3, 106.1, 84.2, 78.2, 55.4, 36.6, 31.1, 22.1, 18.7, 13.8 ppm; Found (EI): [M] 268.14630, $C_{18}H_{20}O_2$ requires 268.14577.

2-(1-(4-Methoxyphenyl)hept-2-yn-1-yl)-5-methylfuran (17e): IR (film) ν = 2956, 2932, 2871, 2837, 2249, 1609 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.32 (d, *J* = 8.7 Hz, 2H), 6.86 (d, *J* = 8.7 Hz, 2H), 6.02 (br d, *J* = 2.9 Hz, 1H), 5.86 (br dd, *J* = 2.9, 1.1 Hz, 1H), 4.91 (br s, 1H), 3.79 (s, 3H), 2.26 (td, *J* = 7.1, 2.2 Hz, 2H), 2.23 (s, 3H), 1.53 (app qn, *J* = 7.4 Hz, 2H), 1.43 (app sx, *J* = 7.4 Hz, 2H), 0.92 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 158.7, 153.2, 151.7, 132.1, 128.9, 113.9, 106.8, 106.2, 84.0, 78.5, 55.4, 36.6, 31.1, 22.1, 18.7, 13.77, 13.76 ppm; Found (EI): [M] 282.16170, $C_{19}H_{22}O_2$ requires 282.16142.

3-(1-(4-Methoxyphenyl)hept-2-yn-1-yl)pentane-2,4-dione (17f): IR (film) ν = 2957, 2928, 2871, 2160, 1700 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.23 (d, *J* = 8.7 Hz, 2H), 6.83 (d, *J* = 8.7 Hz, 2H), 4.36 (dt, *J* = 10.8, 2.3 Hz, 1H), 4.05 (d, *J* = 10.8 Hz, 1H), 3.78 (s, 3H), 2.30 (s, 3H), 2.16 (td, *J* = 7.1, 2.3 Hz, 2H), 1.89 (s, 3H), 1.47-1.41 (m, 2H), 1.35 (app sx, *J* = 7.4 Hz, 2H), 0.88 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 202.31, 202.29, 158.9, 130.9, 129.1, 114.2, 85.3, 79.0, 76.4, 55.4, 37.1, 31.4, 30.9, 28.6, 22.0, 18.5, 13.7 ppm; Found (EI): [M] 300.17241, $C_{19}H_{24}O_3$ requires 300.17200.

1-(Dec-1-en-5-yn-4-yl)-4-methoxybenzene (17g):[26c] IR (film) ν = 2958, 2933, 2873, 2250, 1641 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.27 (d, *J* = 8.8 Hz, 2H), 6.86 (d, *J* = 8.8 Hz, 2H), 5.86 (m, 1H), 5.07 (m, 2H), 3.79 (s, 3H), 3.68 (m, 1H), 2.45 (app t, *J* = 7.0 Hz, 2H), 2.25 (td, *J* = 7.0, 2.3 Hz, 2H), 1.51 (m, 2H), 1.42 (app sx, *J* = 7.4 Hz, 2H), 0.92 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 158.4, 136.0, 134.2, 128.5, 116.3, 113.9, 84.0, 81.5, 55.4, 43.3, 37.6, 31.3, 22.1, 18.7, 13.8 ppm; Found (CI): [M+H] 243.17533, $C_{17}H_{22}O$ requires 243.17489.

***t*-Butyl (1-(4-methoxyphenyl)hept-2-yn-1-yl)carbamate (17h):** IR (film) ν = 3351, 2959, 2933, 2870, 2250, 1699 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.41 (br d, *J* = 8.7 Hz, 2H), 6.86 (d, *J* = 8.7 Hz, 2H), 5.57 (br s, 1H), 4.96 (br s, 1H), 3.80 (s, 3H), 2.24 (td, *J* = 7.1, 2.1 Hz, 2H), 1.50 (app qn, *J* = 7.4 Hz, 2H), 1.44 (s, 9H), 1.40 (app sx, *J* = 7.4 Hz, 2H), 0.91 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 159.2, 154.9, 132.6, 128.2, 113.9, 85.3, 80.0, 78.6, 55.4, 46.0, 30.8, 28.5, 22.1, 18.6, 13.7 ppm; Found (EI): [M] 340.1881, $C_{19}H_{27}O_3NNa$ requires 340.1889.

N-(1-(4-Methoxyphenyl)hept-2-yn-1-yl)-4-methylbenzenesulfonamide (17i): IR (film) ν = 3270, 2958, 2933, 2872, 2251 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.76 (br d, *J* = 8.1 Hz, 2H), 7.37 (d, *J* = 8.8 Hz, 2H), 7.28 (br d, *J* = 8.1 Hz, 2H), 6.82 (d, *J* = 8.8 Hz, 2H), 5.24 (br dt, *J* = 8.8, 2.1 Hz, 1H), 4.79 (br d, *J* = 8.8 Hz, 1H), 3.78 (s, 3H), 2.42 (s, 3H), 1.96 (td, *J* = 7.0, 2.1 Hz, 2H), 1.30-1.22 (m, 4H), 0.85 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 159.6, 143.3, 137.7, 130.4, 129.5, 128.7, 127.6, 114.0, 87.4, 76.9, 55.4, 49.1, 30.5, 22.0, 21.7, 18.3, 13.7 ppm; Found (ES): [M+Na] 394.1446, $C_{21}H_{25}NO_3SNa$ requires 394.1453.

4,4'-(Oxybis(hept-2-yne-1,1-diyl))bis(methoxybenzene) (17j): Mixture of distereoisomers A and B, crude ratio of A:B was 1.3:1; IR (film) ν = 2956, 2932, 2871, 2238 cm^{-1}; **A**: ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.47 (d, *J* = 8.7 Hz, 4H), 6.86 (d, *J* = 8.7 Hz, 4H), 5.53 (br t, *J* = 1.9 Hz, 2H), 3.79 (s, 6H), 2.32 (td, *J* = 7.2, 1.9 Hz, 4H), 1.55 (m, 4H), 1.45 (app sx, *J* = 7.4 Hz, 4H), 0.93 (t, *J* = 7.4 Hz, 6H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 159.5, 131.8, 129.2, 113.7, 88.5, 78.1, 69.2, 57.4, 30.9, 22.1, 18.7, 13.8 ppm; **B**: ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.41 (d, *J* = 8.7 Hz, 4H), 6.88 (d, *J* = 8.7 Hz, 4H), 5.14 (br t, *J* = 1.9 Hz, 2H), 3.8 (s, 6H), 2.26 (td, *J* = 7.2, 1.9 Hz, 4H), 1.54-1.49 (m, 4H), 1.41 (app sx, *J* = 7.4 Hz, 4H), 0.91 ppm (t, *J* = 7.4 Hz, 6H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 159.7, 131.5, 129.4, 113.9, 88.3, 78.4, 68.5, 55.4, 30.8, 22.2, 18.8, 13.8 ppm; Found (ES): [M+H] 419.2600, $C_{28}H_{35}O_3$ requires 419.2586.

Attempted Meyer-Schuster Rearrangement of Terminal Alkynes

Reaction of **18** using contaminated gold catalyst[22] according to General Procedure A gave a 1:5 mixture of **19** and **20**, respectively. Reaction of **18** using a different batch of gold catalyst gave a mixture of compounds **19** and **21**.

(*E*)-3-(4-Methoxyphenyl)acrylaldehyde (19): ^1H NMR ($CDCl_3$, 600 MHz): δ = 9.65 (d, *J* = 7.6 Hz, 1H), 7.53 (d, *J* = 8.8 Hz, 2H), 7.43 (d, *J* = 15.8 Hz, 1H), 6.95 (d, *J* = 8.8 Hz, 2H), 6.62 (dd, *J* = 15.8, 7.6 Hz, 1H), 3.86 ppm (s, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 193.9, 162.3, 152.9, 127.9, 126.9, 126.7, 114.7, 55.64 ppm.

1-Methoxy-1-(4-methoxyphenyl)propan-2-one (20):[37] Reaction of **22** according to General Procedure A with an uncontaminated batch of gold catalyst gave **20** as the sole product. IR (film) ν = 3002, 2937, 2909, 1716 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.29 (d, *J* = 8.5 Hz, 2H), 6.91 (d, *J* = 8.5 Hz, 2H), 4.61 (s, 1H), 3.81 (s, 3H), 3.35 (s, 3H), 2.10 ppm (s, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 206.8, 160.1, 130.5, 128.5, 114.4, 89.0, 57.1, 55.4, 25.4 ppm;

1-Hydroxy-1-(4-methoxyphenyl)propan-2-one (21): General Procedure A: IR (film) ν = 3465, 3055, 2988, 1712 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.23 (d, *J* = 8.9 Hz, 2H), 6.91 (d, *J* = 8.9 Hz, 2H), 5.05 (br d, *J* = 3.5 Hz, 1H), 4.24 (br d, *J* = 3.5 Hz, 1H), 3.81 (s, 3H), 2.07 ppm (s, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 207.5, 160.0, 130.1, 128.8, 114.5, 79.7, 55.4, 25.4 ppm; Found (EI): [M] 180.07883, $C_{10}H_{12}O_3$ requires 180.07810.

1-Methoxy-4-(1-methoxyprop-2-yn-1-yl)benzene (22): Prepared according to General Procedure B; IR (film) ν = 2995, 2936, 2904, 2174 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.44 (d, *J* = 8.7 Hz, 2H), 6.91 (d, *J* = 8.7 Hz, 2H), 5.04 (br d, *J* = 2.1 Hz, 1H), 3.81 (s, 3H), 3.42 (s, 3H), 2.65 ppm (br d, *J* = 2.1 Hz, 1H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 159.9, 130.3, 128.9, 114.0, 81.6, 75.7, 72.5, 55.8, 55.4 ppm; Found (EI): [M] 176.08350, $C_{11}H_{12}O_2$ requires 176.08318.

One-Pot Syntheses of β-Substituted Ketones 30-33

Compounds **30a-d** have previously been reported.[14]

General Procedure C (Preparation of compounds 31-33): $[Ph_3PAuNTf_2]_2PhMe$ (1 mol%) and alcohol (2 eq.) or 4-methoxyboronic acid (0.2 eq.) were added to a solution of propargylic alcohol in toluene (10 mL/g) and the solution stirred magnetically at room temperature until starting material had disappeared (TLC). After this time nucleophile (2 eq.) was added to the solution and it was stirred overnight at room temperature. The solvent was removed *in vacuo* and the crude product purified by column chromatography to give the β-substituted ketone.

1-(Benzyloxy)hexan-3-one (31a): IR (film) ν = 2963, 2935, 2875, 1712 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.36-7.25 (m, 5H), 4.51 (s, 2H), 3.74 (t, *J* = 6.3 Hz, 2H), 2.69 (t, *J* = 6.3 Hz, 2H), 2.43 (t, *J* = 7.3 Hz, 2H), 1.59 (app sx, *J* = 7.4 Hz, 2H), 0.91 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 209.6, 138.2, 128.5, 127.81, 127.77, 73.4, 65.5, 45.5, 43.0, 17.1, 13.8 ppm; Found (EI): [M+H] 207.13812, $C_{13}H_{19}O_2$ requires 207.13850.

1-Isopropoxyhexan-3-one (31b): IR (film) ν = 2966, 2935, 2875, 1710 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 3.62 (t, *J* = 6.5 Hz, 2H), 3.51 (septet, *J* = 6.1 Hz, 2H), 2.58 (t, *J* = 6.5 Hz, 2H), 2.37 (t, *J* = 7.4 Hz, 2H), 1.60 (app sx, *J* = 7.4 Hz, 2H), 1.08 (d, *J* = 6.1 Hz, 6H), 0.86 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 209.9, 71.8, 63.2, 45.4, 43.2, 22.1, 17.1, 13.8 ppm; Found (EI): [M+H] 159.13881, $C_9H_{19}O_2$ requires 159.13850.

1-(Diethylamino)hexan-3-one (32a): IR (film) ν = 2968, 2928, 2856, 1709 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 2.74 (t, *J* = 7.5 Hz, 2H), 2.55 (t, *J* = 7.5 Hz, 2H), 2.50 (q, *J* = 7.3 Hz, 4H), 2.40 (t, *J* = 7.3 Hz, 2H), 1.59 (app sx, *J* = 7.4 Hz, 2H), 1.01 (t, *J* = 7.3 Hz, 6H), 0.91 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 210.9, 47.4, 47.0, 45.3, 40.5, 17.3, 13.9, 11.8 ppm; Found (EI): [M] 171.16234, $C_{10}H_{21}ON$ requires 171.16177.

1-(Dibenzylamino)hexan-3-one (32b): IR (film) ν = 2961, 2932, 2874, 1708 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.33-7.22 (m, 10H), 3.55 (s, 4H), 2.76 (t, *J* = 7.2 Hz, 2H), 2.56 (t, *J* = 7.2 Hz, 2H), 2.23 (t, *J* = 7.4 Hz, 2H), 1.53 (app sx, *J* = 7.4 Hz, 2H), 0.85 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 210.6, 139.5, 129.0, 128.3, 127.1, 58.4, 48.7, 44.6, 41.0, 17.2, 13.8 ppm; Found (EI): [M] 295.19352, $C_{20}H_{25}NO$ requires 295.19307.

1-Morpholinohexan-3-one (32c): IR (film) ν = 2960, 2855, 2809, 1709 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 3.68 (br t, *J* = 4.6 Hz, 4H), 2.67-2.55 (m, 4H), 2.42 (br s, 4H), 2.40 (t, *J* = 7.4 Hz, 2H), 1.60 (app sx, *J* = 7.4 Hz, 2H), 0.90 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 209.9, 67.0, 53.7, 53.2, 45.1, 40.1, 17.2, 13.8 ppm; Found (EI): [M] 186.15011, $C_{10}H_{20}O_2N$ requires 186.14940.

1-(4-Methylpiperazin-1-yl)hexan-3-one (32d): IR (film) ν = 2961, 2936, 2876, 2794, 1711 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 2.65 (t, *J* = 7.1 Hz, 2H), 2.58 (t, *J* = 7.1, 2H), 2.39 (t, *J* = 7.4 Hz, 2H), 2.26 (s, 3H), 2.71-2.20 (m, 8H), 1.58 (app sx, *J* = 7.4 Hz, 2H), 0.89 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 210.2, 55.2, 53.1, 52.8, 46.1, 45.1, 40.4, 17.3, 13.9 ppm; Found (EI): [M] 198.17302, $C_{11}H_{22}ON_2$ requires 198.17266.

1-(1,2,3,4-Tetrahydroisoquinolin-2-yl)hexan-3-one (32e): IR (film) ν = 2960, 2931, 2874, 1709 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.13-7.07 (m, 3H), 7.01 (m, 1H), 3.63 (br s, 2H), 2.89 (br t, *J* = 6.0 Hz, 2H), 2.84 (t, *J* = 7.3 Hz, 2H), 2.74 (t, *J* = 6.0 Hz, 2H), 2.71 (t, *J* = 7.3 Hz, 2H), 2.44 (t, *J* = 7.4 Hz, 2H), 1.61 (app sx, *J* = 7.4 Hz, 2H), 0.91 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 210.2, 134.5, 134.2, 128.7, 126.7, 126.3, 125.8, 56.2, 52.7, 51.1, 45.2, 40.8, 29.2, 17.3, 13.9 ppm; Found (EI): [M] 232.1707, $C_{15}H_{22}ON$ requires 232.1701.

1-(Methyl(phenyl)amino)hexan-3-one (32f): IR (film) ν = 2963, 2951, 2810, 1710 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.24 (m, 2H), 6.71 (m, 3H), 3.64 (t, *J* = 6.9 Hz, 2H), 2.92 (br s, 3H), 2.67 (t, *J* = 6.9 Hz, 2H), 2.38 (t, *J* = 7.4 Hz, 2H), 1.63-1.54 (2H, m, CH_2), 0.89 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 210.5, 129.4, 128.7, 116.7, 112.5, 47.5, 45.6, 39.4, 38.6, 17.2, 13.8 ppm; Found (EI): [M] 205.14639 $C_{13}H_{19}ON$ requires 20514612.

1-Hexylsulfanyl-hexan-3-one (33a):[38] IR (film) ν = 2958, 2926, 2857, 1710 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 2.73 (m, 2H), 2.68 (m, 2H), 2.50 (t, *J* = 7.5 Hz, 2H), 2.40 (t, *J* = 7.5 Hz, 2H), 1.65-1.53 (m, 4H), 1.39-1.22 (m, 6H), 0.91 (t, *J* = 7.2 Hz, 3H), 0.88 ppm (t, *J* = 7.0 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 209.5, 45.1, 42.9, 32.6, 31.5, 29.7, 28.7, 25.9, 22.7, 17.3, 14.2, 13.8 ppm.

1-(Phenylthio)hexan-3-one (33b):[39] IR (film) ν = 2961, 2933, 2875, 1710 cm^{-1}; ^1H NMR ($CDCl_3$, 600 MHz): δ = 7.35-7.32 (m, 2H), 7.31-7.27 (m, 2H), 7.21-7.18 (m, 1H), 3.14 (t, *J* = 7.4 Hz, 2H), 2.72 (t, *J* = 7.4 Hz, 2H), 2.37 (t, *J* = 7.4 Hz, 2H), 1.55 (m, 2H), 0.90 ppm (t, *J* = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ = 209.2, 135.9, 129.5, 129.1, 126.4, 45.1, 42.2, 27.6, 17.3, 13.8 ppm.

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[28] For examples of Meyer-Schuster rearrangements which produce aldehydes, see reference 13.

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Scheme and Figure Legends

Scheme 1. Convenient access to α,β-unsaturated carbonyl compounds.

Scheme 2. Two-step synthesis of *E*-Isoegomaketone.

Scheme 3. Synthesis of Daphenone *via* a Meyer-Schuster rearrangement.

Scheme 4. Attempted Meyer-Schuster rearrangement of nitrogen-containing compounds.

Scheme 5. Substitution of the propargylic alcohol with 'contaminated' Au catalyst.

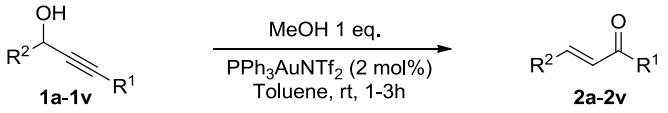
Scheme 6. Competition between the Au and Ag-catalyzed reactions of alcohol **1n**.

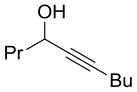
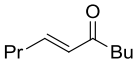
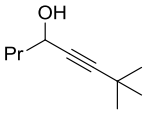
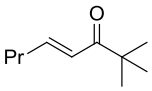
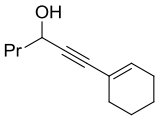
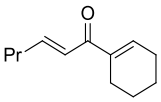
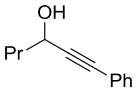
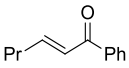
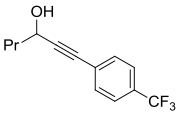
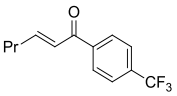
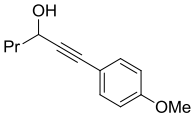
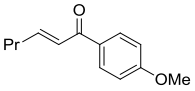
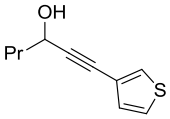
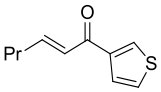
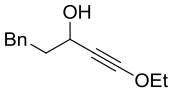
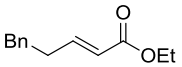
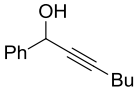
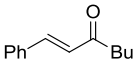
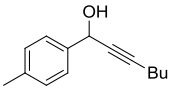
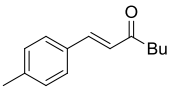
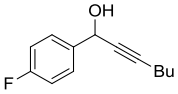
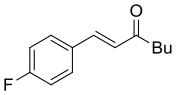
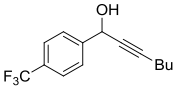
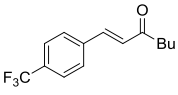
Scheme 7. Ag/Au-catalyzed reactions of terminal alkynes in the presence of MeOH.

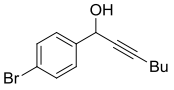
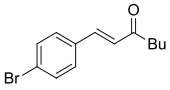
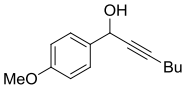
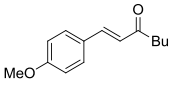
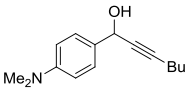
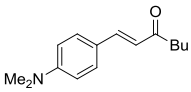
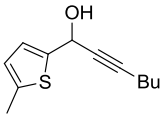
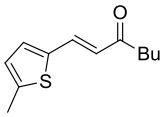
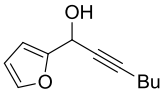
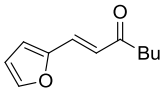
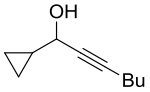
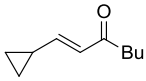
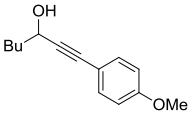
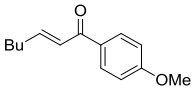
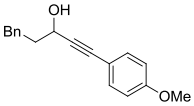
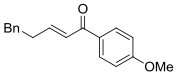
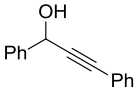
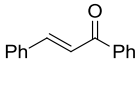
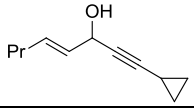
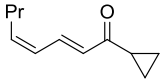
Scheme 8. Enhancement of the *E*:*Z* ratio via addition of boronic acid **25**.

Scheme 9. Meyer-Schuster rearrangement of a primary propargylic alcohols with MeOH as the additive.

Table 1. Meyer-Schuster rearrangement of secondary propargylic alcohols

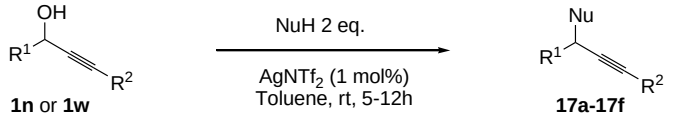


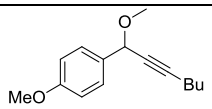
Entry	Propargylic Alcohol		Enone		Yield [%] (*E*:*Z*)[a]
1		**1a**		**2a**	91 83[b] (17:1)
2		**1b**		**2b**	80[c] (14:1)
3		**1c**		**2c**	43 (7:1)
4		**1d**		**2d**	99 (8:1)
5		**1e**		**2e**	97 (18:1)
6		**1f**		**2f**	99 (6:1)
7		**1g**		**2g**	88 (11:1)
8		**1h**		**2h**	91[d] (20:1)
9		**1i**		**2i**	96 (20:1)
10		**1j**		**2j**	98 (18:1)
11		**1k**		**2k**	77 (15:1)
12		**1l**		**2l**	78 (18:1)

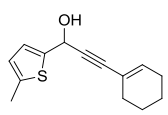
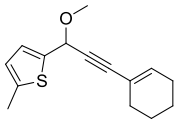
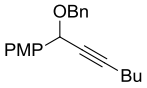
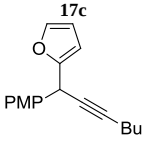
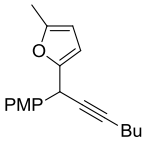
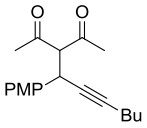
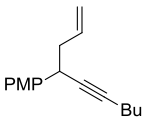
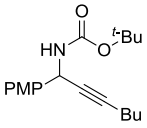
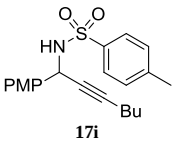
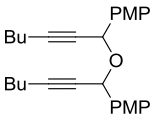
13		**1m**		**2m**	96 (19:1)
14		**1n**		**2n**	99 (12:1)
15		**1o**		**2o**	15 (8:1)
16		**1p**		**2p**	84 (7:1)
17		**1q**		**2q**	85 (5:1)
18		**1r**		**2r**	98 (13:1)
19		**1s**		**2s**	92 (5:1)
20		**1t**		**2t**	93 (24:1)
21		**1u**		**2u**	87 (10:1)
22		**1v**		**2v**	84 (3:2)[e]

[a] *E*:*Z* ratio measured by crude ^{1}H NMR. [b] 1 g scale with 1 mol% catalyst. [c] 16 h at room temperature. [d] EtOH was used instead of MeOH. [e] crude *E*,*E*:*E*,*Z* ratio, after chromatography the pure *E*:*Z* isomer was obtained.

Table 2. Ag-catalyzed substitution reactions of propargylic alcohols

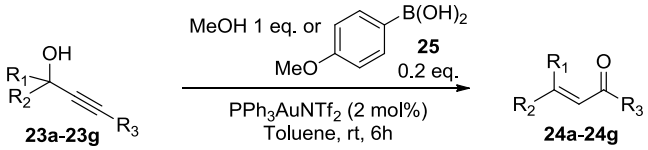


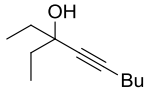
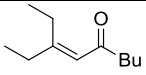
Entry	Propargylic Alcohol	NuH	Product	Yield
1	**1n**	MeOH	 **17a**	76

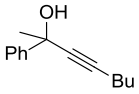
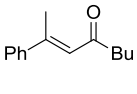
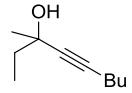
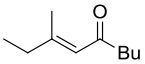
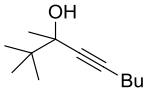
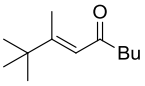
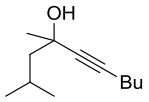
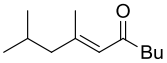
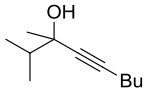
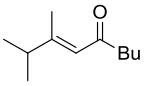
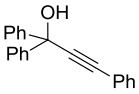
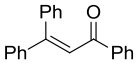
2	 **1w**	MeOH	 **17b**	77
3	**1n**	BnOH	 **17c**	82
4	**1n**	Furan	 **17d**	77
5	**1n**	2-methylfuran	 **17e**	96
6	**1n**	acac	 **17f**	83
7	**1n**	CH_2=$CHCH_2$ $SiMe_3$	 **17g**	98
8	**1n**	H_2NBoc	 **17h**	59[a]
9	**1n**	H_2NTs	 **17i**	74[a]
10	**1n**	None	 **17j**	80[b]

[a] 60˚C overnight. [b] 1.3:1 mixture of diastereoisomers.

Table 3. Meyer-Schuster rearrangement of tertiary propargylic alcohols.

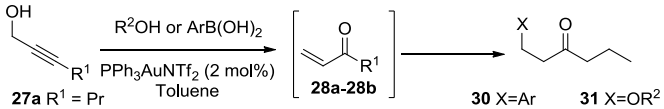


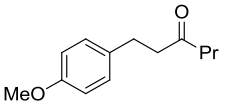
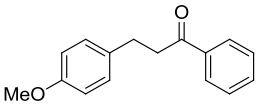
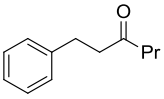
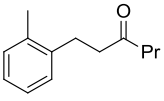
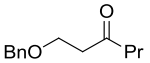
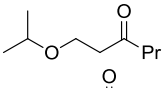
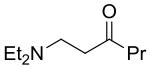
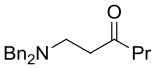
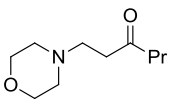
Entry	Propargylic Alcohol		Enone		Yield [%] (*E*:*Z*)[a]
1		**23a**		**24a**	75[c]

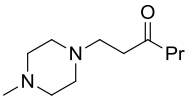
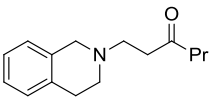
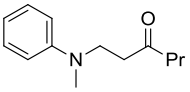
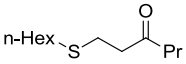
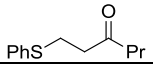
2		**23b**		**24b**	67 (3.5:1)[c]
3		**23c**		**24c**	78 (2:1)[c] 83 (2.3:1)[b]
4		**23d**		**24d**	74 (3:1)[c] 77 (>30:1)[b]
5		**23e**		**24e**	72 (1.3:1)[c] 83 (2.3:1)[b]
6		**23f**		**24f**	79 (1.5:1)[c] 82 (4.7:1)[b]
7		**23g**		**24g**	82[c]

[a]crude ratio determined by ^{1}H NMR [b] With 0.2 eq. boronic acid **25**, 16 h at rt. [c] With 1 eq. MeOH, 6 h at rt.

Table 4. Rearrangement of primary propargylic alcohols and addition of nucleophiles to the resulting terminal enones



Entry[a]	'Nucleophile'	Product[c]		Yield
1	**25**/cat. Pd		**30a**	81
2	**25**/cat. Pd		**30b**	58
3	$PhB(OH)_2$/cat. Pd		**30c**	45
4	*o*-tolyl$B(OH)_2$/cat. Pd		**30d**	39
5	BnOH		**31a**	63
6	^{i}PrOH		**31b**	76
7	$HNEt_2$		**32a**	70
8	Bn_2NH		**32b**	65
9	Morpholine		**32c**	83

10	*N*-Methyl piperazine		**32d**	79
11	Tetrahydroisoquinoline		**32e**	84
12	PhNHMe		**32f**	52
13	n-hexylSH		**33a**	41
14	PhSH		**33b**	46

Text for ToC

'Enones Made Easy'

Primary, secondary and tertiary propargylic alcohols undergo efficient Au-catalyzed Meyer-Schuster rearrangement, in the presence of protic additives. The rearrangement of primary alcohols can be combined with the addition of nucleophiles to the resulting enone to give β-substituted ketones in a one-pot procedure. Electron-rich propargylic alcohols undergo Ag-catalyzed substitution with a variety of oxygen, carbon and nitrogen nucleophiles.

Keywords

Gold

Meyer-Schuster Rearrangement

Propargylic Alcohols

Silver

Homogeneous Catalysis