Society is gratefully acknowledged. We also thank Professor D. S. Matteson (Washington State University) for his generous gift of diol 4 prior to publication of the paper on its preparation, and Clark Eid for characterization of 6.

Supplementary Material Available: ^{13}C NMR spectra of 5, 11, the *O*-methylmandelate ester of 10, and (2*S*,3*S*)-1,4-dimethoxy-2,3-butanediol cyclic ethyl orthoester (4 pages). Ordering information is given on any current masthead page.

Alkylation and Rearrangement of Lithiated 3-Methyl-1,2-benzisoxazoles

James E. Oliver,*,† Rolland M. Waters,‡ and William R. Lusby†

Insect Hormone Laboratory, USDA, ARS, B-467, BARC-East, Beltsville, Maryland 20705, and Insect Chemical Ecology Laboratory, USDA, ARS, B-001, BARC-West, Beltsville, Maryland 20705

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Setal exudates of lace bugs of the genus *Stephanitis* contain acetogenins that can be considered derivatives of 2,6-dihydroxyacetophenone elaborated, often with a 10-carbon unit, at the 2′-position.[1a,b] While considering synthetic pathways to certain of these compounds, including 2,6-dihydroxyalkanophenones, we became curious about possible reactions of deprotonated 3-methyl-1,2-benzisoxazoles with electrophiles. Their monocyclic counterparts, 3,5-dialkylisoxazoles, have been widely used as protected 1,3-dicarbonyl compounds.[2a-d] 3,5-Dimethylisoxazole, for example, can be selectively deprotonated at the 5-methyl group; after reaction with an appropriate electrophile, the functionalized isoxazole can be disassembled by reductive cleavage of the N–O bond. The resulting enamino ketone can be employed as such, or hydrolyzed to an elaborated 1,3-dicarbonyl compound.[2a-d] Similar reduction and hydrolysis of a 3-alkyl-1,2-benzisoxazole can be expected to provide an *o*-hydroxyalkanophenone.[2e]

The 3-position of a 1,2-benzisoxazole is analogous to the 3- and not the 5-position of an isoxazole. However, Brunelle[3] has reported that although 3,5-dimethylisoxazole was indeed first deprotonated and alkylated at the 5-methyl group, further reaction with *sec*-butyllithium followed by R–X led to alkylation at the 3-methyl group, whereby 3,5-dialkylisoxazoles could be obtained. Indeed, we found that if deprotonation of 3-methyl-1,2-benzisoxazole (**1a**) was effected with lithium diisopropylamide (LDA) at −75 °C *in the presence of* 1-bromodecane, a satisfactory (52%) yield of 3-undecyl-1,2-benzisoxazole (**1c**) could be obtained. Similarly, the 5-TBDMS ether **1d** was obtained (>70%) from **1b**.

In contrast to the considerable literature on isoxazole deprotonations, we found only one report of attempted deprotonation of 3-methyl-1,2-benzisoxazole (**1a**). Ranganathan et al.[4] treated **1a** with lithium dibutylamide at 0 °C and later added styrene. The only product isolated was a yellow solid (5%), mw 264, to which they assigned structure **2**; they did not comment on the mechanism or oxidation state change but suggested that the formation of this product established that deprotonation had occurred. Consistent with these results, we found that *sequential* treatment of **1a**[5] with *sec*-butyllithium (or LDA) and 1-bromodecane at −75 °C gave products resulting from a self-condensation of **1a** and little or no consumption of alkyl bromide. Flash chromatography afforded two yellow solids, **3a** and **4a**. The molecular weight (264) and melting point (218–219 °C) of **4a** indicated that it was probably the yellow solid described by Ranganathan et al.[4]

It soon became apparent that solutions of **3a** were unstable and that **3a** was rather rapidly converted to **4a**.[6] Aged solutions of **3a**, or even freshly prepared **3a** slowly desorbed from the probe, gave mass spectra identical with those of **4a** (mw 264). Rapidly desorbed **3a**, however, provided satisfactory spectra of a different compound whose molecular weight was 266. Molecular ions constituted the most abundant ions in the electron impact mass spectra (EIMS) of both **3a** and **4a**, both, but especially that of 4a, being surprisingly free of fragment ions. Chemical ionization mass spectra (CIMS) confirmed the molecular weights, and ammonia/deuterioammonia CI comparisons established three and two exchangeable hydrogens for **3a** and **4a**, respectively. These results indicated that **3a** was an easily oxidizable dihydro derivative of **4a**.

The chemical stability of **4a** paralleled its resistance to fragmentation. It was poorly soluble in nonpolar solvents and was stable to KOH in refluxing aqueous methanol and to H_2SO_4 in refluxing aqueous acetic acid. With Ac_2O/pyridine, **4a** gave a colorless diacetate **4c**; in contrast, **3a** was not cleanly acetylated, giving a mixture from which only **4c** was identified. In the presence of excess CH_2N_2 (3 h, room temperature) **4a** gave a red solution from which the monomethyl ether **4d** was the major product.

The TBDMS ether **1b** of 4-hydroxy-3-methyl-1,2-benzisoxazole[7] behaved in a somewhat similar fashion to **1a**, but in this case the initial dihydro analogue **3b** was more stable toward air oxidation than **3a** had been. Either silver oxide or activated manganese dioxide converted **3b** to **4b**; the latter reaction was rapid and preferred, since Ag_2O tended to promote some scrambling of the TBDMS groups.

Selected ^1H NMR spectral data for **4a**, **4b**, and several derivatives are included in Table I and the Experimental Section. Noteworthy features are the absence of either methyl or methylene absorptions, and two different phenolic O–H's for both **4a** and **4b** (best observed with C_5D_5N as solvent). Also evident in each spectrum is a pair of deshielded doublets (J = 1.8–2.1) coupled only to each other. The collective data suggest a six-membered heteroaromatic ring containing two nitrogens and substituted with two nonidentical hydrogens and two *o*-hydroxyaryl groups, which are also in nonidentical environments. Of the possibilities, it is seen that one of the possible pyri-

† Insect Hormone Labortory.
‡ Insect Chemical Ecology Laboratory.

(1) (a) Oliver, J. E.; Neal, J. W., Jr.; Lusby, W. R.; Aldrich, J. R.; Kochansky, J. P. *J. Chem. Ecol.* **1985**, *11*, 1223. (b) Oliver, J. E.; Neal, J. W., Jr.; Lusby, W. R. *Ibid.* **1987**, *13*, 763.

(2) (a) Kashima, C.; Yamamoto, Y.; Tsuda, Y. *Heterocycles* **1977**, *6*, 805. (b) Baraldi, P. G.; Barco, A.; Benetti, S.; Pollini, G. P.; Simoni, D. *Synthesis* **1987**, 857. (c) Wakefield, B. J.; Wright, D. J. *Adv. Heterocycl. Chem.* **1979**, *25*, 148 (d) Kochetkov, N. K.; Sokolov, S. D. *Adv. Heterocycl. Chem.* **1963**, *2*. (e) Smalley, R. K. *Adv. Heterocycl. Chem.* **1981**, *29*, 1.

(3) Brunelle, D. J. *Tetrahedron Lett.* **1981**, *22*, 3699.

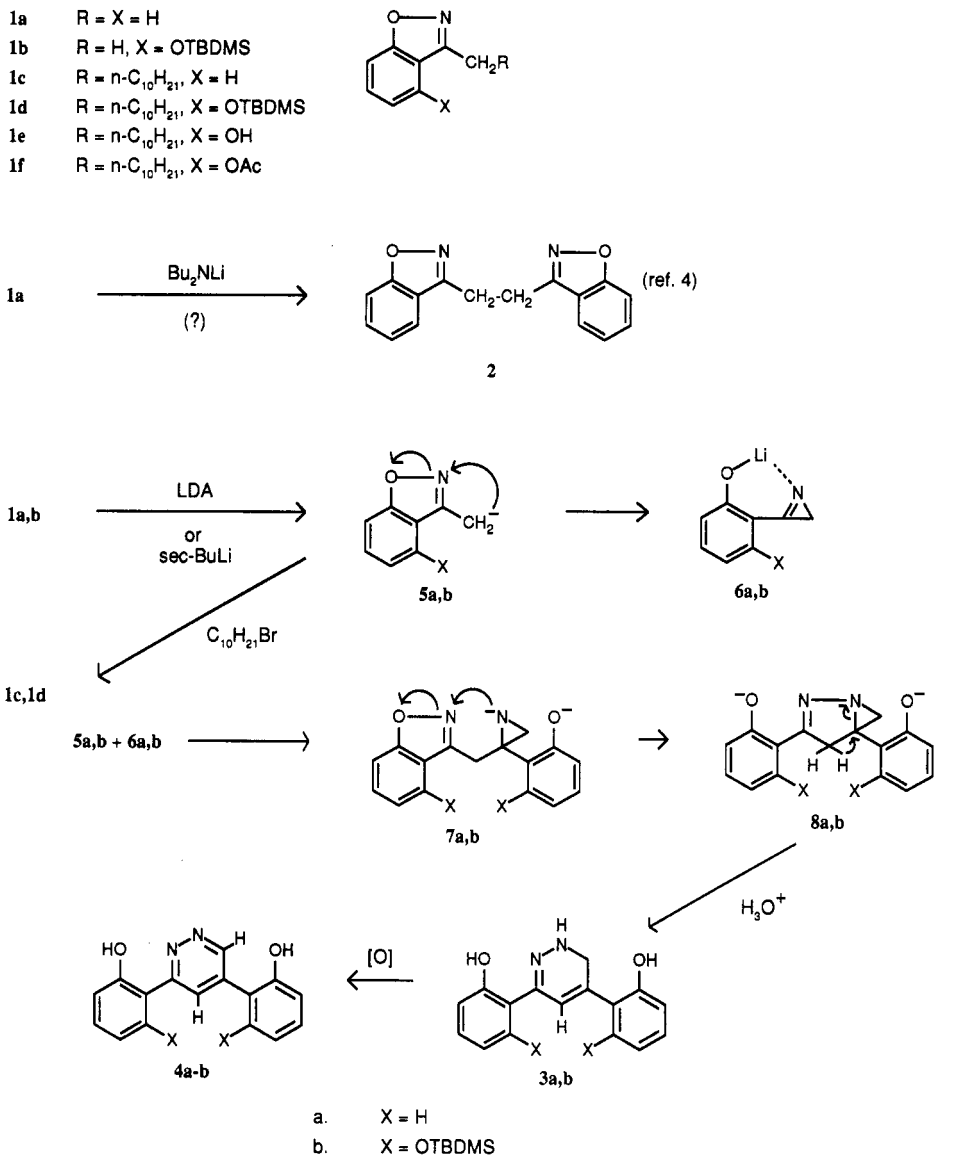
(4) Ranganathan, S.; Ranganathan, P. V.; Ramachandran, P. V.; Mahanty, M. K.; Bamezai, S. *Tetrahedron* **1981**, *24*, 4171.

(5) Thakar, K. A.; Goswami, D. D.; Bhawal, B. M. *Ind. J. Chem.* **1977**, *15B*, 1058.

(6) The **3a** → **4a** transformation also occurred in the solid state, but much more slowly (substantial quantities of **3a** remained after 2–3 months). The infrared spectral data reported by Ranganathan et al. contained bands from both **3a** and **4a**, and it is likely that they were working with a mixture of the two.

(7) Crabbe, P.; Villarino, A.; Muchowski, J. M. *J. Chem. Soc., Perkin Trans. 1* **1973**, 2220.

Scheme I



midines, two of the pyridazines, and all of the pyrazines can be excluded because their symmetry would require simpler spectra.

The chemical shifts and coupling constants of the deshielded signals seem consistent with those published for 3,5-disubstituted pyridazines.[8a-c] We prepared and recorded spectra of 3,5-diphenylpyridazine 4;[9] the results (Table I) compare favorably to those of our unknowns. In addition to the H's on the pyridazine ring, two doublets of doublets (2 H each) are separated from the bulk of the aromatic signals of **4**. Two comparable double doublets are also seen in the spectra of **4a,c,d** but only 1 H each; in the spectra of **4b,e–g** (both ortho positions occupied by O) these signals are absent. Note that the individual aryl rings of **4e–g** are symmetrically substituted, simplifying the spectra so that most assignments could be made without difficulty. ^{13}C NMR spectral data are in full accord with the assigned structures and, along with assigments, are available as supplementary material.

The ^1H NMR spectra of dihydropyridazines **3a** and **3b** are also consistent with the assigned structures; in addition to the aromatic H's, **3a** produced singlets at δ 7.36 (1 H) and 3.65 (2 H) in acetone whereas the corresponding signals from **3b** occur at 7.36 and 3.91 ppm.

A plausible mechanism of the self-condensation is illustrated in Scheme I. Evidently anion **5**, in the absence of an electrophile, rearranges to the azirine **6**. Condensation of **5** with **6** involves the reaction of two anionic species, but we suggest that the tight coordination of Li in **6** allows the strained azirine ring to be sufficiently electrophilic to be attacked by the very reactive **5**. Intramolecular phenoxide displacement of **7** would provide the fused aziridine **8**, which would then open to dihydropyridazine **3**.

There is precedent for *o*-(hydroxyphenyl)azirine formation from 3-substituted 1,2-benzisoxazoles. Deprotonations of 1,2-benzisoxazole-3-acetic acid derivatives and related compounds have been studied, and phenylazirine formation has been established or suggested.[10a-c] In those

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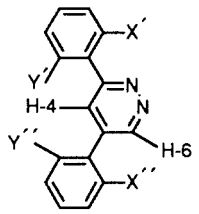
(10) (a) Ueda, S.; Naruto, S.; Yoshida, T.; Sawayama, T.; Uno, H. *J. Chem. Soc., Chem. Commun.* **1985**, 218. (b) Naruto, S.; Nagamoto, N.; Mizuta, H.; Yoshida, T.; Uno, H. *Chem. Pharm. Bull.* **1982**, *30*, 3418. (c) Ueda, S.; Naruto, S.; Yoshida, T.; Sawayama, T.; Uno, H. *J. Chem. Soc., Perkin Trans. 1* **1988**, 1013.

Table I. ^{1}H NMR Absorptions for Diarylpyridazines



4: X′ = X″ = Y′ = Y″ = H
4a: X′ = X″ = H; Y′ = Y″ = OH
4b: X′ = X″ = OTBDMS; Y′ = Y″ = OH
4c: X′ = X″ = H; Y′ = Y″ = OAc
4d: X′ = X″ = H; Y′ = OH, Y″ = OCH_3
4e: X′ = X″ = Y′ = Y″ = OTBDMS
4f: X′ = X″ = Y′ = Y″ = OH
4g: X′ = X″ = Y′ = Y″ = OAc

	chemical shift,[a] δ			
compd	H-4	H-6	H-6′	H-6″
4	8.39 (a)	9.54 (a)	8.32 (a)	8.02 (a)
	8.27 (p)	9.70 (p)	8.45 (p)	7.88 (p)
4a	8.62 (a)	9.47 (a)	8.12 (a)	7.68 (a)
	8.72 (p)	9.81 (p)	8.14 (p)	7.68 (p)
4b	8.72 (c)	9.13 (c)	–	–
4c	7.92 (a)	9.29 (a)	7.91 (a)	7.70 (a)
	8.06 (p)	9.59 (p)	7.99 (p)	–
	7.77 (c)	9.29 (c)	7.82 (c)	7.55 (c)
4d[b]	8.51 (p)	9.50 (p)	8.14 (p)	ca. 7.53 (p)
4e	8.10 (p)	9.59 (p)	–	–
	8.04 (c)	9.50 (c)	–	–
4f	9.82 (p)	9.97 (p)	–	–
4g	7.48 (c)	9.09 (c)	–	–

[a] a = acetone-d_6; p = pyridine-d_5; c = chloroform-d. [b] The assigned structure of **4d**, as opposed to the possible isomeric monomethyl ether, was derived from the ^{1}H NMR spectrum. The spectrum of **4a** in C_5D_5N contained two signals for the phenolic O–H's: a relatively sharp singlet at δ 14.44 and a broader singlet at δ 12.67. Only the O–H on the ring at the 3-position is capable of intramolecular H-bonding, and to that was assigned the deshielded, sharper signal. The spectrum of **4d**, in the same solvent contained a single, relatively sharp O–H signal at δ 14.32.

cases, additional electrophilic sites provided subsequent intramolecular reaction pathways unavailable to the simpler analogues studies here.

Sato et al.[11] described successful reaction of 2-phenylazirine with selected carbanions, and since the rearrangement of **5a** can be at least partly diverted by generating it in the presence of an electrophile, we felt we might be able to support the mechanism outlined in Scheme I by generating **5a** in the presence of 2-phenylazirine.[12] However, 2-phenylazirine, in the presence or absence of **1a**, reacted immediately with LDA at −75 °C to give deep red solutions from which 2,5-diphenylpyrazine was the only product identified. The latter has been observed to form from 2-phenylazirine under a variety of conditions, including some described by Sato et al.[11]

In summary, alkylation of 3-methyl-1,2-benzisoxazoles **1a** or **1b** could be achieved by deprotonating the methyl groups in the presence of 1-bromodecane. An obvious limitation to the alkylation is the requirement that the electrophile be stable to the strong base required for the deprotonation. Alternatively, addition of **1a** or **1b** to excess base in the absence of the alkyl halide provides a unique and easy synthesis of 3,5-bis(*o*-hydroxyaryl)pyridazines or dihydro versions thereof, compounds virtually inaccessible by known procedures. For example, **1b** gave dihydropyridazine **3b** (41%) along with a small amount of **4b** (2%). In the case of **1a**, product purification was complicated by the instability of dihydropyridazine **3a** and also by the presence in the crude compound of an unidentified product that was barely distinguishable from **3a** by TLC. We suspect, without firm evidence, that this was a tautomer of **3a** because of the considerable simplification (as judged by TLC) resulting from oxidation of the crude product with activated MnO_2. By telescoping the process, i.e. addition of **1a** to excess LDA followed by MnO_2 oxidation of the crude product, we were able to obtain pyridazine **4a** in 61% yield.

Experimental Section

Melting points are uncorrected. Mass spectra were obtained from a gas chromatograph–mass spectrometer equipped with a 30 m × 0.32-mm i.d. DB-1 (J&W Scientific, Inc.) fused silica column. EI mass spectra were collected at 70 eV and a source block temperature of 150 °C. Ammonia chemical ionization spectra were obtained at a source temperature of 60 °C and a reagent gas pressure of 0.5 Torr. The NMR spectra were obtained by using a General Electric QE-300 NMR spectrometer. ^{1}H Chemical shift assignments were made by decoupling experiments; coupling constants are measured in hertz. Because of long relaxation times of the quaternary carbons, the ^{13}C NMR and APT spectra were recorded with 20–30-s delays between pulses. UV spectra were recorded on ca. 1.3×10^{-3} M methanol solutions. Tetrahydrofuran was freshly distilled from $LiAlH_4$. *CAUTION: This procedure for purifying THF may be hazardous* (see: *Organic Syntheses*; Wiley: New York, 1973; Collect. Vol. V, p 976). 3-Methyl-1,2-benzisoxazole[6] and 4-hydroxy-3-methyl-1,2-benzisoxazole[7] were prepared by reported procedures.

3-Methyl-4-[[(1,1-dimethylethyl)dimethylsilyl]oxy]-1,2-benzisoxazole (1b) was prepared in the usual way (96%) and was recrystallized from EtOH–H_2O: mp 57–58 °C; ^{1}H NMR ($CDCl_3$) δ 0.341 (6 H, s, CH_3-Si), 1.04 (9 H, s, $(CH_3)_3C$), 2.66 (3 H, s, CH_3), 6.59 (1 H, d, J = 7.8), 7.09 (1 H, d, J = 8.1), 7.33 (1 H, t); UV (MeOH) 285 (4100), 246 (sh), 241 (10 300), 210 (23 000). Anal. Calcd for $C_{14}H_{21}NO_2Si$: C, 63.83; H, 8.04. Found: C, 63.53; H, 8.12.

3-Undecyl-1,2-benzisoxazole (1c). A solution of **1a** (10 mmol) and 1-bromodecane (10 mmol) in THF (8–10 mL) was cooled under N_2 to −75 °C and stirred while 11 mL of freshly prepared ca. 1 M LDA in hexane–THF was slowly added by syringe. After 5–7 min at −75 °C, the reaction mixture was poured onto a mixture of ice, saturated NH_4Cl, and HOAc, and the resulting mixture was extracted well with ether. The combined extracts were rinsed with H_2O, aqueous $NaHCO_3$, and brine. Concentration and flash chromatography (ca. 15% EtOAc in hexane) gave 1.42 g (52%) of **1c** as a white solid. An analytical sample was recrystallized from methanol: mp 42.5–43.5 °C; UV (MeOH) 289 (sh), 280 (2700), 242 (sh), 234 (7600), 205 (10 600); EI MS 273 (8, M^+), 202 (16), 188 (32), 175 (24), 174 (24), 160 (12), 146 (48), 133 (100), 55 (18); ^{1}H NMR ($CDCl_3$) δ 0.87 (3 H, t, J = 7, CH_3), 1.25 (methylene), 1.85 (2 H, m, H-2′), 3.01 (2 H, t, J = 7.5, H-1′), 7.30 (1 H, m) 7.55 (2 H, m), 7.67 (1 H, d, J = 7.8). Anal. Calcd for $C_{18}H_{27}NO$: C, 79.07; H, 9.96. Found: C, 78.73; H, 10.17.

4-Hydroxy-3-undecyl-1,2-benzisoxazole (1e). The same procedure with **1b** (10 mmol) gave 2.95 g (73%) of **1d** as an oil (eluted with 10% EtOAc in hexane). This material was not completely characterized (UV ≈ same as that of **1b**, EI MS 403 (15, M^+), 346 (100, $M^+ - C_4H_9$), 220 (22), 207 (53), 192 (30), 166 (17), 73 (37)), but instead was desilylated by stirring 2.89 g in CH_2Cl_2 (25 mL) with 1.1 M tetrabutylammonium fluoride in THF (7 mL) overnight at 20 °C under N_2. Aqueous workup followed by flash chromatography (10% EtOAc in toluene) gave 1.89 g (91%) of **1e** as a white solid (mp 108–109 °C): EI MS 289 (6, M^+), 204 (17), 191 (17), 190 (18), 162 (37), 149 (100), 135 (14), 55 (19); ^{1}H NMR ($CDCl_3$) 0.87 (3 H, t, J = 7, CH_3), 1.24 (methylene), 1.86 (2 H, m, H-2′), 3.06 (2 H, t, J = 7.5, H-1′), 6.58 (1 H, d, J = 7.8), 7.09 (1 H, d, J = 8.4), 7.34 (1 H, t, J = 8.1). The phenolic **1e** produced gels upon attempted recrystallization, and therefore a portion was converted to the acetate **1f**: mp 50–51 °C (EtOH–

(11) Sato, S.; Kato, H.; Ohta, M. *Bull. Chem. Soc. Jpn.* **1967**, *40*, 2936.
(12) Hortmann, A. G.; Robertson, D. A.; Gillard, B. K. *J. Org. Chem.* **1972**, *37*, 322.

H_2O); ^1H NMR ($CDCl_3$) δ 0.88 (3 H, t, J = 7, CH_3), 1.26 (methylene), 1.78 (2 H, m, H-2'), 2.40 (3 H, s, CH_3CO), 2.94 (2 H, t, J = 7.8, H-1'), 7.07 (1 H, d, J = 7.8, H-7), 7.42 (1 H, d, J = 7.9, H-5), 7.52 (1 H, t, J = 8.1, H-6). Anal. Calcd for $C_{20}H_{29}NO_3$: C, 72.47; H, 8.82. Found: C, 72.76; H, 9.31.

3,5-Bis[2-[[(1,1-dimethylethyl)dimethylsilyl]oxy]-6-hydroxyphenyl]-1,6-dihydropyridazine (3b). A solution of **1b** (10 mmol) in THF (5 mL) was slowly added by syringe to a cold (−75 °C) solution of LDA (13 mmol, prepared at −15 °C by treatment of diisopropylamine in THF with 2.5 M butyllithium in hexanes). The mixture was stirred 10 min, quenched with aqueous NH_4Cl + HOAc, and extracted thoroughly with ether. The ether was washed with water followed by aqueous $NaHCO_3$ and finally brine and then was concentrated to give 2.93 g of an amber semisolid that was boiled briefly in hexane and then chilled. Filtration gave 1.04 g of essentially pure **3b** as a light tan solid. Gradient flash chromatography of the filtrate (hexane and then increasing amounts of ethyl acetate in hexane) gave an additional 0.04 g of **3b** (1.08 g, 41% total) and 0.05 g (ca. 2%) of **4b**. The remaining material consisted of a number of products, none comprising a substantial portion of the mixture, that were not further investigated. The dihydropyridazine **3b** was recrystallized from heptane plus a little EtOAc: mp 178.5–180.5 °C; IR (KBr) 3378, 2959, 2930, 2885, 2858, 1616, 1605, 1578, 1456, 1253, 1236, 1048, 854, 839, 811, 796, 782 cm^{-1}; UV (MeOH) 270 (17 700), 217 (32 100), 204 (33 600); ^1H NMR (acetone-d_6) δ 0.158 (6 H, s, CH_3Si), 0.195 (6 H, s, CH_3Si), 0.837 (9 H, s, $(CH_3)_3C$), 0.879 (9 H, s, $(CH_3)_3C$), 3.91 (2 H, skewed multiplet, coupled to N), 6.37 (1 H, dd, J = 8.1 and 0.9), 6.43–6.52 (2 H, m), 6.55 (1 H, dd, J = 8.2 and 1.2), 6.66 (skewed d), 7.0 (2 H, overlapping t's) 7.19 (s), 8.66 (s), 11.92 (s). Anal. Calcd for $C_{28}H_{42}N_2O_4Si_2$: C, 63.84; H, 8.04. Found: C, 63.87; H, 8.20.

3,5-Bis[2-[[(1,1-dimethylethyl)dimethylsilyl]oxy]-6-hydroxyphenyl]pyridazine (4b). Activated MnO_2[13] (600 mg) was added to a solution of **3b** (250 mg) in CH_2Cl_2 (10 mL), and the mixture was stirred at room temperature for 1 h. Filtration through a pad of Celite, concentration of the filtrate, and recrystallization of the residue from heptane–benzene gave **4b**: yield 185 mg (74%); mp 198–199 °C; IR (KBr) 3422, 3173, 3147, 3082, 3065, 2955, 2932, 2896, 2887, 2860, 1610, 1587, 1463, 1364, 1259, 1231, 1048, 841, 787 cm^{-1}; UV (MeOH) 275 (28 500), 215 (sh), 205 (74 500); ^1H NMR ($CDCl_3$) 0.092 (6 H, s, CH_3Si), 0.104 (6 H, s, CH_3Si), 0.726 (9 H, s, $(CH_3)_3C$), 6.44 (1 H, dd, J = 8.1 and 0.9), 6.52 (1 H, dd, J = 8.1 and 0.6), 6.60 (1 H, dd, J = 8.7 and 0.6), 6.75 (1 H, dd, J = 8.2 and 0.9), 7.13–7.20 (2 H, 6 peaks), 8.72 (1 H, d, J = 2.1), 9.13 (1 H, d, J = 2.1). Anal. Calcd for $C_{28}H_{40}H_2O_4Si_2$: C, 64.08; H, 7.68. Found: C, 64.15; H, 7.76.

3,5-Bis(2-hydroxyphenyl)pyridazine (4a). A solution of 3-methyl-1,2-benzisoxazole (**1a**) (20 mmol) in 3 mL of THF was added dropwise to cold (−75 °C) 1 M LDA (40 mL). After 5–7 min at −75 °C the mixture was added to a mixture of ice, saturated NH_4Cl, and HOAc. After extraction into Et_2O and rinsing with H_2O and aqueous $NaHCO_3$, the solvent was dried and evaporated, and the remaining crude red oil (3.26 g) was dissolved in THF (30 mL) and stirred with activated MnO_2[13] (4 g). After 40 min additional MnO_2 (1 g) was added; after 20 more min TLC indicated that the faster migrating materials had been converted to **4a** (R_f 0.22 vs 0.31–0.35 for dihydro compounds, 8:2 toluene–EtOAc). Filtration through Celite and evaporation of solvent provided 2.96 g of a dark residue from which **4a** (1.62 g, 61%) was isolated as a solid by trituration with 25 mL of benzene. Recrystallization from acetone gave a pure sample, mp 218–219 °C (a bright red melt slowly lost its color upon cooling and remelted at approximately the same temperature, again turning bright red): IR (KBr) 1600, 1452, 1416, 1378, 1293, 1234, 996, 905, 758, 637; UV (MeOH) 320 (11 800), 261 (20 000), 212 (27 000), 205 (28 000); EIMS 264 (100, M^+), 263 (28), 245 (13), 246 (23), 118 (13), 90 (27), 89 (28); ^1H NMR (acetone-d_6) δ 7.0–7.25 (4 H, m), 7.4–7.5 (2 H, m), 7.68 (1 H, dd, J = 6.0 and 1.8), 8.12 (1 H, dd, J = 6.6 and 1.5), 8.62 (1 H, d, J = 1.8), 9.47 (1 H, d, J = 1.8). Anal. Calcd for $C_{16}H_{12}N_2O_2$: C, 72.71; H, 4.58. Found: C, 72.78; H, 4.66.

(13) Vogel, A. *Textbook of Practical Organic Chemistry*, 4th ed.; Longman: London, 1978; p 302.

3,5-Bis(2-hydroxyphenyl)-1,6-dihydropyridazine (3a). Instead of subjecting the crude product from 10 mmol of **1a** to MnO_2 oxidation, it was dissolved in boiling benzene under nitrogen; chilling overnight gave 0.58 g of **3a** (44%) as a bright yellow solid: mp 153–156 °C (depended on rate of heating); IR (KBr) 3408, 1544, 1617, 1598, 1489, 1447, 1370, 1305, 1277, 1256, 1237, 1215, 1199, 1156, 742, 557, 406 cm^{-1}; UV (MeOH) 370 (9700), 240 (sh), 208 (36 500); EI MS 266 (100, M^+), 173 (16), 146 (33), 91 (38); ^1H NMR (acetone-d_6) δ 3.65 (2 H, s, CH_2, 6.85–6.95 (4 H, incompletely resolved m), 7.06 (1 H, td), 7.24 (1 H, td), 7.30 (dd), 7.36 (s), 7.56 (dd), 9.04 (br s), 12.31 and 12.32 (skewed d).

Diacetate 4c was prepared from **4a** (71 mg) by reaction with acetic anhydride (150 μL) in pyridine (100 μL) at 25 °C (overnight). Concentration in vacuo and recrystallization of the residue from heptane plus a little benzene gave 76 mg (81%) of **4c**: mp 122.5–123 °C; IR (KBr) 3067, 1765, 1609, 1591, 1486, 1447, 1403, 1372, 1217, 1190, 1158, 1118, 1093, 1015, 912, 881, 826, 771 cm^{-1}; UV (MeOH) 246 (42 400), 203 (75 000); EI MS 348 (5, M^+), 306 (100, $M - C_2H_2O$), 264 (70, $M - 2(C_2H_2O)$); ^1H NMR ($CDCl_3$) δ 2.17 (3 H, s, CH_3CO), 2.19 (3 H, s, CH_3CO), 7.24–7.57 (m, aromatic), 7.76 (1 H, d, J = 2.1, H-4), 7.81 (1 H, dd, J = 7.6 and 1.8), 9.29 (1 H, d, J = 2.1, H-6).

Monomethyl Ether (4d). A solution of **4a** (12 mg) in THF (0.5 mL) was treated with excess ethereal CH_2N_2 at room temperature. After 3 h the solution was concentrated, and the residue was streaked on a 20 × 20 cm silica gel plate which was then developed with 8:2 C_6H_6–EtOAc. The major band (R_f 0.65) was collected and eluted with THF to provide 9 mg of **4d** as a pale yellow solid: UV approximately same as that of **4a**; EI MS 278 (100, M^+), 277 (48), 247 (11), 179 (16), 171 (17), 132 (18), 131 (37), 89 (29); ^1H NMR (C_5D_5N) δ 3.72 (3 H, s, CH_3O), 7.0–7.6 (m, aromatic), 8.14 (1 H, dd, J = 1.2 and 8.1), 8.51 (1 H, d, J = 1.2), 9.51 (1 H, d, J = 1.8), 14.32 (1 H, s, OH).

Tetrakis(*tert*-butyldimethylsilyl) Ether (4e). A sample of **4b** (45 mg) was converted to **4e** with *tert*-butyldimethylchlorosilane (34 mg) and imidazole (22 mg) in DMF (0.4 mL) at 25 °C (overnight). Workup and flash chromatography (10% EtOAc in hexane) gave a colorless glass (55 mg, 85%), a portion of which was crystallized from MeOH–H_2O: mp 151.5–153 °C; CI MS (NH_3) 753 (100, M + H^+, virtually no ammonium adduct ions), 639 (22); EI MS m/z 649 (3), 581 (5), 565 (6), 523 (7), 249 (7), 233 (4), 223 (3), 73 (100); IR (KBr) 1601, 1575, 1463, 1244, 1069, 1057, 829, 815, 784 cm^{-1}; ^1H NMR (C_6D_6) δ 0.053 (6 H) and 0.169 (6 H) (Si-CH_3), 0.868 (9 H) and 0.91 (9 H) ($(CH_3)_3$ C-Si), 6.56 (2 H, d, J = 8.4), 6.72 (2 H, d, J = 8.1), 6.92 (1 H, t, J = 8.1), 7.07 (1 H, t, J = 8.4), 8.04 (1 H, d, J = 2.1), 9.50 (1 H, d, J = 2.1).

3,5-Bis(2,6-dihydroxyphenyl)pyridazine (4f). A solution of **4b** (0.66 g) in CH_2Cl_2 (10 mL) was stirred under N_2 and treated with 2.5 mL of 1.1 M $Bu_4N^+F^-$ in THF. After the mixture was stirred overnight, a few drops of HOAc were added, and crude **4f** was collected by filtration as a tan solid for which no satisfactory recrystallization solvent was found. It could be precipitated from MeOH by addition of H_2O: CI MS(CH_4) 297 (100, M + H^+), 325 (20, M + $C_2H_5^+$), 337 (7, M + $C_3H_5^+$); EI MS 296 (M^+, 100), 187 (10), 149 (23), 137 (32), 125 (26), 78 (25), IR (KBr) 1620, 1600, 1469, 1402, 1378, 1266, 1006, 790, 782 cm^{-1}; UV (MeOH) 310 (sh), 275 (15 000), 219 (18 000), 204 (22 000); ^1H NMR (C_5D_5N) δ 6.8–6.9 (4 H, m), 7.2–7.3 (2 H, m), 9.82 (1 H, d, J = 2.1), 9.97 (1 H, d, J = 2.1), 12.2 (1 H, br s), 13.9 (1 H, br s).

Because of the solubility limitations of **4f**, a portion was converted to tetraacetate **4g** (excess Ac_2O/pyridine): mp 163–164 °C (heptane–benzene); EI MS 464 (14, M^+), 422 (62), 380 (100), 338 (29), 296 (24), 295 (30), 267 (25), 161 (22); ^1H NMR (acetone-d_6) δ 2.02 (6 H, s, CH_3CO), 2.06 (6 H, CH_3CO), 7.25 (2 H, d, J = 8.1), 7.27 (2 H, d, J = 8.1), 7.48 (1 H, d, J = 2.1), 7.60 (1 H, t, J = 8.1), 7.62 (1 H, t, J = 8.1), 9.09 (1 H, d, J = 2.1). Anal. Calcd for $C_{24}H_{20}N_2O_8$: C, 62.07; H, 4.34. Found: C, 61.98; H, 4.33.

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Supplementary Material Available: Table of ^{13}C NMR data and assignments for six 3,5-diarylpyridazines (1 page). Ordering information is given on any current masthead page.