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The oxidation of 2-amino-4-methylphenol **1**, by ferricyanide, in acetic acid yields benzoquinonimine **2**, phenoxazinonimine **3** and **4**, triphenodioxazines **5** and phenoxazinone **6**. The reaction mechanism seems to start with an electrophilic substitution of the quinonimine, from **1**, on the electron rich **1**, rather than with a nucleophilic attack of **1** on the arising quinonimine.

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Introduction.

Concerning the biosynthesis of natural compounds like ommochromes, actinomycines and cinnabarins, and melanins [1,2] the reactivity of *o*-aminophenols in various media is of interest. Oxidative condensation of *o*-aminophenols which are unsubstituted in the *p*-positions to nitrogen and oxygen is a prominent process during the formation of these pigments. Since the early work of v. Auvers [3] it is known that substituents like halogen, carboxyl and acetyl in the *p*-position to nitrogen can be split off during phenoxazinone formation; alkyl substituents hinder the ring closure, in this case formation of phenylquinonimines is a prominent process.

In order to obtain more information about *o*-aminophenol reactivity under oxidizing conditions, we examined

the oxidation of 2-amino-4-methylphenol in acidic medium; with this compound the normal oxidative condensation to give the phenoxazinone system is not possible.

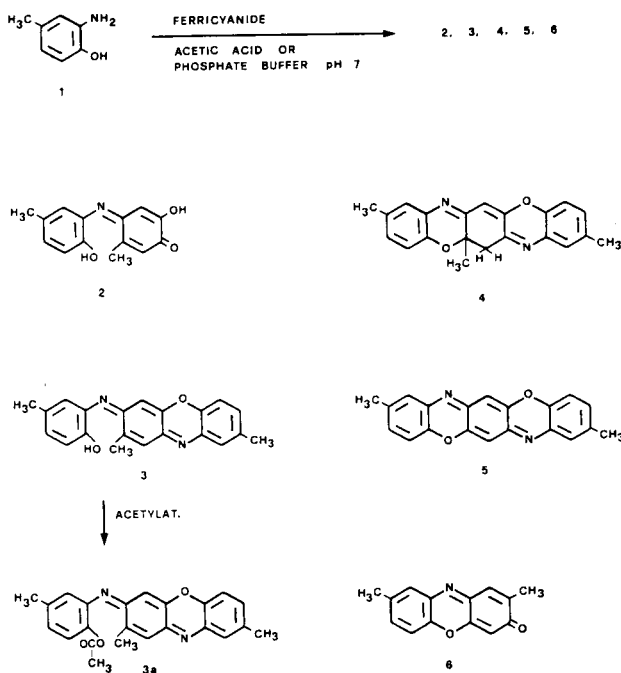
Results and Discussion.

A solution of 2-amino-4-methylphenol (**1**) in acetic acid, stirred for three days at room temperature, yielded a complex mixture of coloured products. After dilution, neutralization and extraction with chloroform from the organic layer compounds **2**, **3**, **4**, **5** and **6** were isolated and purified by tlc; structures were established by spectral (uv, ir, nmr, ms) and elemental analysis.

The most polar compound **2** was identified as a phenylquinonimine type compound, especially by its uv maximum at 370 nm and the intensive molecular ion at *m/e* 243, accompanied by an ion at *m/e* 245 which is characteristic for quinones of high redox potential. Compounds **3** and **4** are the main products. The yellow brown **3** can also be envisaged as a phenylquinonimine analogue; its ms shows the easy loss of a methyl radical ($M^+ - 15$) or hydroxy radical ($M^+ - 17$) under formation of a stable triphenodioxazinium ion and thus differentiates this compound from the light yellow, less polar, **4** which is a cyclisation product of **3**. As expected its ms shows only a fragment ion at $M - CH_3$ but not $M - OH$. By acid treatment it is possible to convert **4** to **3**. Compound **3** was also converted to its acetyl derivative. The pink fluorescent **5** was identified as 2,9-dimethyl-triphenodioxazine by comparison of its chemical and spectroscopic properties with an authentic sample, and **6** was established to be 2,7-dimethyl-3*H*-phenoxazin-3-one by comparison of its ms, uv and nmr data with well known analogues from this laboratory. Spectral data and elemental analyses are summarized in the experimental section.

While oxidation reactions of *p*-phenyldiamine and its derivatives as well as *p*-aminophenols have been studied in detail, only a little knowledge is available about the reactivity of *o*-aminophenols. Oxidative condensation of *o*-aminophenols is mostly suggested to proceed by a nucleophilic attack [4] of a molecule of *o*-aminophenol to its quinonimine formed *in situ*; further formation of a phenoxaz-

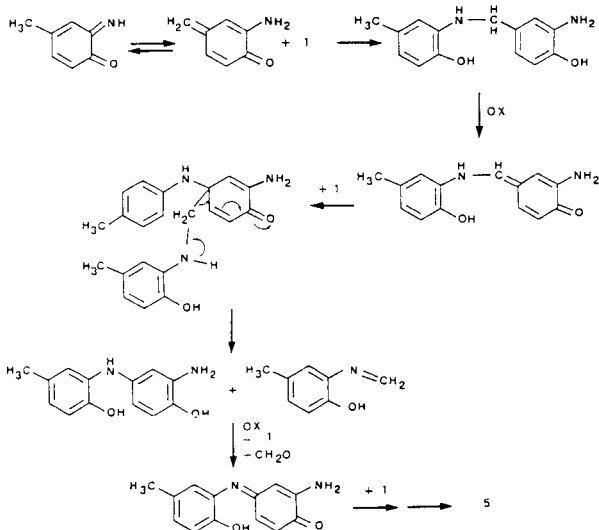
SCHEME 1



inone- or phenylquinonimine system depends on the substitution of the aminophenol. Nevertheless Corbett [5,6] interprets the reaction of *p*-benzoquinonediimine and *m*-aminophenols as an electrophilic attack of the diimine on the electron rich *m*-aminophenol, followed by oxidation. It is also known that *o*-quinonimine can be generated *in situ* by oxidation of the corresponding aminophenol with potassium ferricyanide or, more slowly, with air.

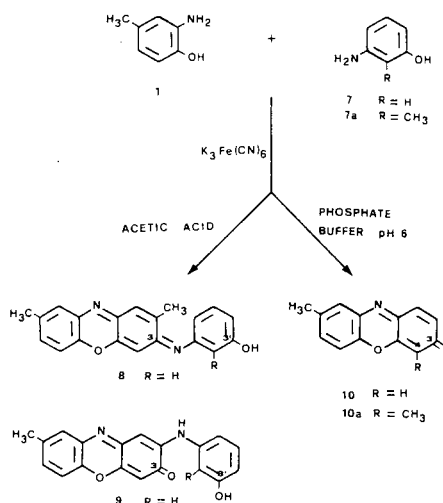
In order to get information about the oxidation of **1** in acetic acid by air, we carried out this oxidation also by ferricyanide both in acetic acid and phosphate buffer at pH 4.5. The relative distribution of the oxidation products of **1** in air-acetic acid, in ferricyanide-acetic acid and in ferricyanide phosphate buffer demonstrates that the reaction proceeds always in the same way, under the reported conditions. The larger amount of a black intractable residue (typical of phenol oxidation) in the longer air-acetic acid oxidation explains the different overall yields of the reaction. While in acetic acid with or without ferricyanide all the described products are present in the reaction mixture, no trace of **5**, however, present in a small amount, was detected in phosphate buffer mixture, showing that its formation is dependant on the reaction medium. Concerning **5**, it is important to know that, under the reported conditions, **3** and **4** are not transformed to this triphenodioxazine, from which one methyl group is lost in respect to three molecules of **1**. To explain this methyl group displacement, it may be supposed that in acetic acid, and not in phosphate buffer, a quinonemethide form of the dehydrogenated **1** is present, taking advantage of a more stabilized amino group-acetic acid interaction. Horspool [7] observed such a methyl group displacement by the reaction of primary aromatic amines and 4-alkyl substituted

SCHEME 2



1,2-benzoquinones, and justified this behaviour with a quinone-methide formation. Scheme 2 shows a possible methyl group displacement from **1** to yield **5**. We did not investigate the presence of formaldehyde because of its small amount and the complexity of the reaction mixture. As all the other products retain their methyl substituent, it seems that **5** is formed in quite a different synthetic way. In order to get information about Corbett's hypothesis [5,6] a very diluted solution of **1** in acetic acid was added to *m*-aminophenol **7** and ferricyanide (Scheme 3). The solution of **1** was added slowly and dropwise to avoid an autocondensation reaction.

SCHEME 3



The products **8** and **9** were recovered together with the autocondensation products **2**, **3**, **4** and **5**. The product **8** was identified as *N*-(3'-hydroxyphenyl)2,8-dimethyl-3*H*-phenoxazin-3-onimine, arising from the reaction of an autocondensation product like **6** with **7**. Compound **9** was identified as 1-(3'-hydroxyphenylamino)-8-methyl-3*H*-phenoxazin-3-one. It is in a good agreement with Corbett's point of view, as it seems that the *o*-quinonimine, from **1**, attacks the *m*-aminophenol (**7**) in oxidizing medium to form a substituted *p*-quinonanil which, upon dehydrogenation, cyclization and hydrolysis, undergoes hydroxyl group substitution by another molecule of **7** yielding **9**. This result may also explain the fact that the oxidation of **1** in a very diluted solution yielded **2** as the main product, with only small amounts of **3**, **4**, **6**, supporting the hypothesis it is the first product.

In order to get information about the chemical nature of the reacting species, a very diluted solution of **1** in phosphate buffer was added, slowly and dropwise, with ferricyanide, respectively, to a solution of *m*-aminophenol (**7**) and to 3-amino-*o*-cresol (**7a**). This **7a** was selected to establish, univocally, the attack position. The yellow orange reaction

products were identified as 8-methyl-3*H*-phenoxazin-3-one (**10**) and 4,8-dimethyl-3*H*-phenoxazin-3-one (**10a**) respectively, Scheme 3.

Formation of **10** and **10a** as well as **9** seems to exclude a nucleophilic attack of the amino group of **7** or **7a** to the quinonimine of **1** formed *in situ*, but suggests that oxidized **1** attacks the electron rich substrates **7** and **7a** to give **9**, **10** and **10a**, upon further intramolecular cyclization, dehydrogenation and hydrolysis. In the same way formation of **2** from **1** in buffer solution or in acetic acid could be an electrophilic substitution of the *in situ* oxidized **1** on the electron rich **1**; but in the present case, however, this assumption cannot be differentiated from the nucleophilic attack of **1** on the quinonimine of **1**.

If the reaction is performed with a higher concentration of the components, especially of **1**, the intermediate **2** may react with another molecule of **1** to yield **3**. This reaction [8] involves Schiff's base formation or, more probably, a substitution of the hydroxyl group of **2** by the amino group of **1** followed by cyclization to a hemiketal intermediate and subsequent *o*-aminophenol exchange reaction. Compound **4** is easily understood as a cyclization product from **3**.

It is also well known that phenoxazines [8] are formed from *o*-aminophenols in protic medium and that they are quickly transformed into phenoxazinones under weakly oxidizing conditions [9,10,11]. In this way, the presence of the phenoxazinone **6** in the reaction mixture as well as the formation of **8** in the reaction between **1** and **7** in acetic acid could be explained; Scheme 3.

Summing up, the oxidation of 4-methylaminophenol in protic medium seems to be an electrophilic substitution of the nitrogen of the quinonimine on the electron rich aminophenol substrate, rather than the previously reported nucleophilic reaction of the aminophenol on its arising quinonimine. At the same time, in acid medium it is possible to observe products arising from the phenoxazine system as **6** and **8**, and the product **5** probably arising from the Horspool 4-methyl-1,2-quinonimine substitution. The last one is not formed in aqueous medium.

EXPERIMENTAL

The following spectroscopic apparatus were used: Perkin-Elmer 550S spectrometer for uv, PE-399-spectrometer for ir, Bruker 270 MHz and 500 MHz spectrometers for nmr, using tetramethylsilan as an internal reference and Varian/Finnigan CH7A and MAT-312 apparatus for ms. Melting points are uncorrected, microanalysis were performed by Divisione di Microanalisi dell' Istituto Farmacologico Italiano di Napoli. Tlc was performed on silica plates F-254, 0.25 mm and 0.5 mm with fluorescent baking (Merck).

Oxidation of 2-Amino-4-methylphenol (**1**) in Acetic Acid with Air.

2-Amino-4-methylphenol (**1 g**) was stirred in acetic acid (100 ml)

at room temperature for three days. The reaction mixture was diluted with water, neutralized with diluted sodium hydrogen carbonate and extracted with chloroform. The organic phase was dried, concentrated *in vacuo*, placed on tlc plates and developed with chloroform. The chromatograms afforded six coloured products: **2** (4 mg), **3** (18 mg), **4** (12 mg), **5** (3 mg) and **6** (2 mg); over all yield about 5%.

2-Hydroxy-5-methyl-*N*-(2'-hydroxy-5'-methylphenyl)benzoquinone Monoimine (**2**).

From the reaction mixture yellow crystals of mp 154-155° and Rf 0.5 in chloroform-methanol (95:5 v/v) were isolated; ir (chloroform): 3495 cm⁻¹, 1520, 1510; uv (chloroform): λ max (log ε) 370 (3.18) nm; ¹H nmr (deuteriomethanol): 2.26 (s, 5-CH₃, 3H), 2.30 (s, 5'-CH₃, 3H), 5.95 (s, 1-H, 1H), 6.74 (s, 4-H, 1H), 6.82 and 6.86 (d, J = 7.5 Hz, 3'-H and/or 4'-H, 2H), 6.91 (s, 6'-H, 1H); ms: 243 (100%, M⁺), 245 (70).

Anal. Calcd. for C₁₄H₁₃NO₂: C, 69.12; H, 5.39; N, 5.76. Found: C, 69.15; H, 5.45; N, 5.89.

N-(2'-Hydroxy-5'-methylphenyl)-2,8-dimethyl-3*H*-phenoxazin-3-onimine (**3**).

Compound **3** was isolated as yellow brown crystals of mp 113-114° and Rf 0.4 in chloroform; ir (chloroform): 3500 cm⁻¹, 1580, 1490; uv (chloroform): λ max log (ε): 544 (shoulder) nm, 517 (3.70), 465 (3.65), 358 (3.75); ¹H nmr (deuteriodichloromethane): 2.35 and 2.38 (s, 8-CH₃ and 5'-CH₃, 6H), 2.42 (s, 2-CH₃, 3H), 6.87, 6.94, and 7.17, 7.27 (d, H-6,7,3',4', 4H), 6.76, 6.84 (s, H-1,4, 2H), 7.12, 7.53 (s, H-9,6', 2H); ms: 330 (93%, M⁺), 315 (98, M-CH₃) 313 (100, M-OH).

Anal. Calcd. for C₂₁H₁₉N₂O₂: C, 76.34; H, 5.49; N, 8.48. Found: C, 76.41; H, 5.54; N, 8.39.

N-(2'-Acetoxy-5'-methylphenyl)-2,8-dimethyl-3*H*-phenoxazin-3-onimine (**3a**).

Thirty mg of **3** was refluxed in a mixture of 5 ml of acetic anhydride and 0.3 ml of pyridine for one hour; after usual workup and tlc purification 18 mg of **3a** were obtained as yellow brown crystals 162°; ir (chloroform): 1760 cm⁻¹, 1580; uv (chloroform): λ max (log ε) 458 nm (3.93), 355 (3.95); ¹H nmr (deuteriochloroform): δ 2.35 and 2.38 (s, 8-CH₃ and 5'-CH₃, 6H) 2.32 (s, 2-CH₃, 3H), 2.16 (s, COCH₃, 3H), 6.37 and 6.76 (s, H-1, H-4, 2H), 7.03, 7.06, 7.10, 7.24 (d, H-4',6',3',7, 4H), 7.15 and 7.49 (s, H-6,9, 2H); ms: 372 (76%, M⁺), 329 (50, M-COCH₃), 313 (100, M-OCOCH₃).

Anal. Calcd. for C₂₃H₂₀N₂O₃: C, 74.17; H, 5.41; N, 7.52. Found: C, 74.23; H, 5.52; N, 7.61.

2,9-Dimethyl-5a,6-dihydro-5a-methyltriphendioxazine (**4**).

A red powder of mp 198-200° and Rf 0.8 in chloroform was isolated by preparative tlc; ir (chloroform): 1590 cm⁻¹, 1580; uv (chloroform): λ max (log ε) 449 nm (shoulder), 420 (4.31), 396 (shoulder); ¹H nmr (deuteriodichloromethane): δ 1.27 (s, 5a-CH₃, 3H), 2.32 and 2.37 (s, 2-CH₃ and 9-CH₃, 6H), 3.16 and 3.30 (d, J = 15.9 Hz, 6-H, 2H), 6.09 (s, 13-H, 1H), six aromatic protons: 6.79 and 6.96 (d, J = 8.54 Hz, H3,4), 6.96 and 7.11 (d, J = 8.54, H-11,10), 7.13, 7.27 (s, H1,8) ms: 330 (87%, M⁺), 315 (100, M-CH₃).

Anal. Calcd. for C₂₁H₁₈N₂O₂: C, 76.34; H, 5.49; N, 8.48. Found: C, 76.40; H, 5.56; N, 8.41.

2,9-Dimethyltriphendioxazine (**5**).

Violet material of mp $>250^\circ$ and Rf 0.5 in chloroform-carbon tetrachloride (80:20, vv) was obtained from tlc purification; ir (chloroform): 1615 cm^{-1} , 1572; uv (chloroform): λ max (log ϵ) 516 nm (4.05), 482 (3.92), 454 (shoulder); ^1H nmr (deuteriodichloromethane): δ 2.36 (s, 2- CH_3 and 9- CH_3 , 6H), 6.49 (s, H-6,13, 2H), aromatic protons: 6.97 and 7.04 (d, 4H), 7.23 (s, 2H); ms: 314 (100%, M^+).

Anal. Calcd. for $\text{C}_{20}\text{H}_{14}\text{N}_2\text{O}_2$: C, 76.42; H, 4.49; N, 8.91. Found: C, 76.51; H, 4.38; N, 8.93.

2,8-Dimethyl-3H-phenoxazin-3-one (6).

Orange solid mp 162° and Rf 0.6 in chloroform was obtained after tlc separation; ir (chloroform): 1580 cm^{-1} , 1650; uv (chloroform): λ max (log ϵ) 452 nm (3.81), 353 (4.02); ^1H nmr (deuteriodichloromethane): δ 2.20 (s, 8- CH_3 , 3H), 2.51 (s, 2- CH_3 , 3H), 6.26 (s, H-4, 1H), 7.32 (s, H-1, 1H), 7.26 and 7.37 (d, H-6 and H-7, 2H), 7.72 (s, H-9, 1H); ms: 225 (100%, M^+).

Anal. Calcd. for $\text{C}_{14}\text{H}_{11}\text{NO}_2$: C, 76.65; H, 4.92; N, 6.22. Found: C, 76.71; H, 4.87; N, 6.01.

Oxidation of 2-Amino-4-methylphenol (1) in Acetic Acid by Potassium Ferricyanide.

To a solution of 5 mmoles (0.6 g) of **1** in 100 ml of acetic acid was added 20 mmoles (50 ml of 0.4M) potassium ferricyanide. After 30 minutes the mixture was diluted with water, neutralized with sodium carbonate and extracted with chloroform. Purification of the organic phase by tlc yielded **2** (40 mg), **3** (160 mg), **4** (158 mg), **5** (20 mg) and **6** (25 mg).

Oxidation of 2-Amino-4-methylphenol (1) in Phosphate Buffer at pH 4.5 by Potassium Ferricyanide.

To a solution of 5 mmoles (0.6 g) of **1** in phosphate buffer (200 ml, 0.1M, pH 4.5) was added 20 mmoles (50 ml, 0.4M) of potassium ferricyanide. After 30 minutes the mixture was extracted with chloroform. Purification of the organic phase material by tlc yielded **2** (51 mg), **3** (163 mg), **4** (141 mg), **6** (18 mg).

Oxidation of 2-Amino-4-methylphenol (1) in Phosphate Buffer at pH 4.5 with Potassium Ferricyanide under Diluted Conditions.

To a solution of 5 mmoles (0.6 g) of **1** in phosphate buffer (2 l, 0.1M, pH 4.5) was added 20 mmoles (50 ml, 0.4M) of potassium ferricyanide. After 30 minutes the mixture was extracted with chloroform. Purification of the organic phase material by tlc yielded 102 mg of **2** and small amounts of **3**, **4** and **6**.

Oxidation of a Mixture of 2-Amino-4-methylphenol (1) and *m*-Aminophenol (7) in Acetic Acid by Potassium Ferricyanide.

To a solution of 5 mmoles (0.6 g) of **7** in 200 ml of acetic acid was added 20 mmoles (500 ml, 0.04M) of potassium ferricyanide and 5 mmoles of **1** (0.6 g in 2 l of acetic acid), dropwise and under stirring. After 30 minutes the mixture was diluted with water, neutralized with sodium carbonate and extracted with chloroform. Purification of the organic phase by tlc yielded **8** (50 mg), **9** (72 mg), and **2**, **3**, **4**, **5** and **6**.

N-(3'-Hydroxyphenyl)-2,8-dimethyl-3H-phenoxazin-3-onimine (8).

From the reaction mixture orange crystals of mp $111\text{--}112^\circ$, Rf 0.4 in chloroform were isolated; ir (chloroform): 3500 cm^{-1} , 1580, 1490; uv (chloroform): max log (ϵ): 454 (2.94), 353 (2.99); ^1H nmr (deuteriochloroform): 2.34 (s, 8- CH_3 , 3H), 2.39 (s, 2- CH_3 , 3H),

6.23 (s, 4-H, 1H), 6.35 (s, 2'-H, 1H), 6.42 (d, 6'-H, 1H; $J_o = 8.8$, $J_m = 2.2$ Hz), 6.62 (d, 4'-H, 1H; $J_o = 8.8$, $J_m = 2.2$ Hz), 6.98 (d, 6-H, 1H; $J_o = 8.09$ Hz), 7.07 (s, 1-H, 1H), 7.17 (d, 7-H, 1H; $J_o = 8.09$, $J_m = 1.47$ Hz), 7.25 (t, 5'-H, 1H; $J_o = 8.8$ Hz), 7.41 (s, 9-H, 1H; $J_m = 1.47$ Hz); ms: *m/e* 316 (100%, M^+), 299 (58%, $\text{M}^+\text{-OH}$).

Anal. Calcd. for $\text{C}_{20}\text{H}_{16}\text{N}_2\text{O}_2$: C, 75.93; H, 5.10; N, 8.89. Found: C, 75.98; H, 5.15; N, 8.92.

N-(3-Acetoxyphenyl)-2,8-dimethyl-3H-phenoxazin-3-onimine (8a).

Thirty mg of **8** was refluxed in a mixture of 5 ml of acetic anhydride and 0.3 ml of pyridine for one hour; after the usual workup and tlc purification 20 mg of mp 165° were obtained; ir (chloroform): 1760 cm^{-1} , 1580; uv (chloroform): max (log ϵ) 457 (3.82), 355 (3.84); ^1H nmr (deuteriochloroform): 2.30 (s, 3'- COOCH_3 , 3H), 2.34 (s, 8- CH_3 , 3H), 2.40 (s, 2- CH_3 , 3H), 6.24 (s, 4-H, 1H), 6.62 (s, 2'-H, 1H), 6.75 (d, 4'-H, 1H; $J_o = 8.8$, $J_m = 1.47$ Hz), 6.87 (d, 6'-H, 1H; $J_o = 8.8$, $J_m = 2.2$ Hz), 6.99 (d, 6-H, 1H; $J_o = 8.8$ Hz), 7.08 (s, 1-H, 1H), 7.18 (d, 7-H, 1H; $J_o = 8.8$, $J_m = 2.2$ Hz), 7.40 (t, 5'-H, 1H; $J_o = 8.8$ Hz), 7.42 (s, 9-H, 1H; $J_m = 2.2$ Hz); ms: 358 (100%, M^+), 315 (50%, $\text{M}^+\text{-CH}_3\text{CO}$).

Anal. Calcd. for $\text{C}_{22}\text{H}_{18}\text{N}_2\text{O}_3$: C, 73.73; H, 5.06; N, 7.82. Found: C, 73.77; H, 5.11; N, 7.88.

2-(3'-Hydroxyphenylamino)-8-methyl-3H-phenoxazin-3-one (9).

Compound **9** was isolated as yellow crystals of mp $163\text{--}164^\circ$ and Rf 0.4 in chloroform-methanol (95:5, vv); ir (chloroform): 3500 cm^{-1} , 1640, 1570; max (log ϵ): 456 (4.06), 443 (4.06); ^1H nmr (deuteriodichloromethane): 2.43 (s, 8- CH_3 , 3H), 6.45 (s, 4-H, 1H), 6.63 (d, 4'-H, 1H; $J_o = 8.85$ Hz), 6.85 (s, 2'-H, 1H; $J_m = 2.2$ Hz), 6.87 (d, 6'-H, 1H; $J_o = 8.8$, $J_m = 2.2$ Hz), 6.97 (s, 1-H, 1H), 7.23 (t, 5'-H, 1H; $J_o = 8.8$ Hz), 7.30 (d, 6-H, 1H), 7.35 (d, 7-H, 1H; $J_o = 8.8$, $J_m = 2.2$ Hz), 7.52 (s, 9-H, 1H; $J_m = 2.2$ Hz), 7.58 (s, NH, 1H); ms: 318 (100%, M^+), 289 (40%, $\text{M}^+\text{-CHO}$).

Anal. Calcd. for $\text{C}_{19}\text{H}_{14}\text{N}_2\text{O}_3$: C, 71.69; H, 4.43; N, 8.80. Found: C, 71.74; H, 4.49; N, 8.85.

Oxidation of a Mixture of 2-Amino-4-methylphenol (1) and *m*-Aminophenol (7) in Phosphate Buffer with Potassium Ferricyanide.

To a mixture of 5 mmoles (50 ml of 0.1M solution) of **7** in phosphate buffer (0.1M, pH 6) and 20 mmoles (50 ml of 0.4M solution) of a potassium ferricyanide was added dropwise with stirring a solution of 2.5 mmoles (307.5 mg) of **1** in phosphate buffer (2 l, 0.1M, pH 6). After 1 hour the mixture was extracted with chloroform and the residue of the organic phase gave after tlc purification 23 mg of 8-methyl-3H-phenoxazin-3-one (**10**) together with **2**, **3**, **4** and **6**.

8-Methyl-3H-phenoxazin-3-one (10).

Yellow crystals of mp 167° and Rf 0.4 in chloroform-methanol (95:5, vv) were isolated; ir (chloroform): 1640 cm^{-1} , 1570; uv (chloroform): λ max (log ϵ) 349 (4.1), 461 (3.85); ^1H nmr (deuteriochloroform): δ 2.39 (s, 8- CH_3 , 3H), 6.25 (s, 4-H, 1H), 6.8 and 7.37 (d, 9.5 Hz, H-1,2, 2H), 7.15 and 7.29 (d, $J = 10.2$ Hz, H-6,7, 2H), 7.53 (s, 9-H, 1H); ms: 211 (100%, M^+), 183 (85%, $\text{M}^+\text{-CO}$).

Anal. Calcd. for $\text{C}_{13}\text{H}_9\text{NO}_2$: C, 73.92; H, 4.30; N, 6.63. Found: C, 74.07; H, 4.31; N, 6.65.

Oxidation of a Mixture of 2-Amino-4-methylphenol (1) and 3-Amino-*o*-cresol (7a) in Phosphate Buffer with Potassium Ferricyanide.

To a mixture of 5 mmoles (50 ml of 0.1M solution) of **7a** in

phosphate buffer (0.1M, pH 6) and 20 mmoles (50 ml of 0.4M solution) of potassium ferricyanide was added dropwise under stirring a solution of 2.5 mmoles (307.5 mg) of **1** in phosphate buffer (2 l, 0.1M, pH 6). After 1 hour the mixture was extracted with chloroform and the residue of the organic phase gave, after tlc purification, 25 mg of **10a** together with **2**, **3**, **4**, **6** arising from the autocondensation reaction.

4,8-Dimethyl-3H-phenoxazin-3-one (**10a**).

From the reaction mixture red-orange crystals of mp 168° and Rf 0.4 in chloroform-methanol (95:5, vv) were recovered; ir (chloroform): 1640 cm⁻¹, 1570; uv (chloroform): λ max (log ε) 349 (4.1), 461 (3.85); ¹H nmr (deuteriochloroform): δ 2.11 (s, 8-CH₃, 3H), 2.46 (s, 4-CH₃, 1H), 6.8 and 7.37 (d, J = 9.5 Hz, H-1,2, 2H), 7.37 and 7.29 (d, J = 10.2 Hz, H-7,6, 2H), 7.59 (s, 9-H, 1H); ms: 225 (100%, M⁺).

Anal. Calcd. for C₁₄H₁₁NO₂: C, 74.65; H, 4.92; N, 6.22. Found: C, 74.71; H, 4.89; N, 6.26.

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