SUPPLEMENTARY INFORMATION

A convenient modification of the Fischer indole synthesis with a solid acid

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Characterization data

Instruments employed: Perkin-Elmer 410 (FTIR); Bruker AV-400 (NMR); Micromass Q-TOF AMPS MAX 10/6A (HRESIMS); Stuart SMP10 (melting point); Büchi Rotavapor R-200 (rotary evaporator).

IR values ($\nu_{\max}$) are for KBr discs and are quoted in cm^{-1} . NMR spectra were recorded in CDCl_3 solution at either 400 MHz (δ_{H}) or 100 MHz (δ_{C}); the chemical shifts (δ) are in ppm downfield from internal TMS; ' J ' refers to the observed coupling constant. Abbreviations: mp (melting point), s (singlet); d (doublet); t (triplet); q (quartet); br (broad); dd (doublet of doublet). Nomenclatures of all the compounds were derived by ChemDraw (CambridgeSoft).

The characterization data has been tabulated below, the number at the top left hand corner in each case corresponding to the item number in Table 1 of the main paper. The references are listed separately at the end of the Table.

If the Fischer synthesis is performed with ketones possessing two different α -acidic sites, the final indole product may be either of two possible regio-isomers. Generally, precedent indicates that the reaction occurs via the more substituted ene-hydrazine (**I**), as was confirmed herein by melting point comparison with reported cases. When this was not possible, the ambiguity was resolved by assuming the intermediacy of the more stable **I**, based on substitution or conjugation. These pertain to cases 5, 18, 25 and 26 in the Tables. In the case of 25 and 26, the assigned structures are also supported by the ^1H NMR spectra.

Optimization studies. These were carried out with a mixture of phenylhydrazine and cyclohexanone (item 9 in Table 2 main paper, Table 3 below) in refluxing EtOH for various lengths of time. Two other solid acids, Amberlite[®] CG50 and Dowex[®] 50 were also tried, but gave far lower yields. The results of these studies are collected in Tables 1 and 2 below. As seen, the conditions in item 2 of Table 2 offered the best results.

Table 1. Optimization of the solid acid

Item	Solid acid	Conditions	Yield (%)
1	Amberlite [®] CG50	EtOH/reflux	45
2	Dowex [®] 50	EtOH/reflux	68
3	Amberlite [®] IR 120	EtOH/reflux	85

Table 2. Optimization of the solvent

Item	Solid acid	Solvent	T (°C)	Time (h)	Yield (%)
1	Amberlite [®] IR 120	MeOH	65	18	60
2	Amberlite [®] IR 120	EtOH	80	10	85
3	Amberlite [®] IR 120	EtOAc	78	12	75
4	Amberlite [®] IR 120	MeCN	82	12	45
5	Amberlite [®] IR 120	CHCl ₃	63	12	65
6	Amberlite [®] IR 120	Dioxane	100	12	52

Attempts to recycle the catalyst. The used resin from 5 batches was collected, washed with EtOH (or CH₂Cl₂) and treated with 6N HCl for 3-4 h. The liquids were then drained off and

Table 3. Characterization Data

the resin dried at 110 °C for 6-7 h. This recovered catalyst was tested with cyclopentanone, cyclohexanone and 4-methylcyclohexanone, and phenylhydrazine in each case, for the Fischer indole reaction. Under the above optimized conditions, product yields of 62%, 58% and 42% respectively were obtained.

<p>1</p>	<p>2,3-Dimethyl-1-<i>H</i>-indole. TLC R_f 0.55 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 5/95); yellowish solid, mp 105-107 °C (lit.¹ 106-108 °C); yield 80%.</p> <p>$\nu_{\max}$ 3390, 1465, 749; δ_H 7.59 (brs, 1H), 7.46-7.44 (d, 1H, J 8 Hz), 7.20-7.10 (m, 1H), 7.10-7.00 (m, 2H), 2.28 (s, 3H), 2.20 (s, 3H); δ_C 135.0, 130.6, 129.3, 129.1, 120.7, 118.8, 117.8, 112.9, 109.9, 106.8, 11.3, 8.3.</p>
<p>2</p>	<p>2-Ethyl-3-methyl-1-<i>H</i>-indole. TLC R_f 0.65 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 10/90); white solid, mp 62-64 °C (lit.² 64-66 °C); yield 75%.</p> <p>$\nu_{\max}$ 3392, 1454, 732; δ_H 7.69 (brs, 1H), 7.54-7.52 (d, 1H, J 8 Hz), 7.30-7.28 (d, 1H, J 8 Hz), 7.18-7.11 (m, 2H), 2.80-2.74 (q, 2H, J 8 Hz), 2.28 (s, 3H), 1.32-1.28 (t, 3H, J 8 Hz); δ_C 136.3, 134.9, 129.3, 120.7, 118.8, 117.9, 110.0, 106.0, 19.2, 13.9, 8.2; m/z calcd. for M+H 160.1023, found 160.1027.</p>
<p>3</p>	<p>3-Ethyl-5-methoxy-2-methyl-1-<i>H</i>-indole. TLC R_f 0.45 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 10/90); white solid, mp 102-104 °C (lit.² 102-104 °C); yield 75%.</p> <p>$\nu_{\max}$ 3462, 3410, 3042, 2917, 2353, 1590, 1484, 1270, 1222, 1134, 1028, 732; δ_H 7.64 (brs, 1H), 7.15-7.13 (d, 1H, J 8.8 Hz), 7.06-7.05 (d, 1H, J 2 Hz), 6.84-6.82 (m, 1H), 3.92 (s, 3H), 2.77-2.71 (q, 2H, J 7.6 Hz), 2.35 (s, 3H), 1.29-1.26 (t, 3H, J 7.6 Hz);</p>

	<p>δ_C 153.5, 131.2, 130.3, 128.7, 113.5, 110.7, 110.1, 100.5, 55.9, 31.5, 22.6, 17.3, 15.2, 11.4; m/z calcd. for M+H 190.1144, found 190.1152.</p>
<p>4</p>	<p>3-Isopropyl-1-<i>H</i>-indole. TLC R_f 0.35 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 10/90); yellowish solid, mp 38-40 °C (lit.¹ 40-42 °C); yield 70%.</p> <p>ν_{max} 3872, 2956, 1450, 1124; δ_H 7.81-7.79 (m, 2H), 7.39-7.37 (d, 1H, J 8 Hz), 7.33-7.31 (d, 1H, J 8 Hz), 7.27-7.23 (t, 1H, J 6.8 Hz), 6.97-6.96 (d, 1H, J 4 Hz), 3.37-3.30 (m, 1H), 1.50-1.48 (d, 6H, J 8 Hz); δ_C 136.5, 126.7, 123.8, 121.7, 119.3, 118.9, 111.1, 25.4, 23.2; m/z calcd. for M+H 160.1024, found 160.1029.</p>
<p>5</p>	<p>3-Isopropyl-2-methyl-1-<i>H</i>-indole. TLC R_f 0.40 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 10/90); yellow oil; yield 82 %.</p> <p>ν_{max} 3396, 2978, 1618, 1460, 1024; δ_H 7.68-7.66 (m, 2H), 7.27-7.25 (d, 1H, J 7.6 Hz), 7.11-7.03 (m, 2H), 3.22-3.15 (m, 1H), 2.39 (s, 3H), 1.43-1.41 (d, 6H, J 6.8 Hz); δ_C 135.4, 129.3, 127.4, 120.5, 119.3, 118.7, 117.7, 110.4, 25.9, 23.0, 12.0; m/z calcd. for M+H 174.1210, found 174.1224.</p>

<p>6</p>	<p>3-<i>n</i>-Pentyl-1-<i>H</i>-indole. TLC R_f 0.55 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane:5/95); white solid, mp 40-42 °C (lit.¹ 42-44 °C); yield 72%.</p> <p>$\nu_{\max}$ 3390, 2927; δ_H 7.84 (brs, 1H), 7.70-7.68 (d, 1H, J 8 Hz), 7.38-7.36 (d, 1H, J 8 Hz), 7.27-7.24 (t, 1H, J 8 Hz), 7.21-7.17 (t, 1H, J 7.2 Hz), 6.97 (s, 1H), 2.84-2.80 (t, 2H, J 7.6 Hz), 1.81-1.76 (m, 2H), 1.46-1.44 (t, 4H, J 3.6 Hz), 1.01-0.97 (t, 3H, J 6.8 Hz); δ_C 136.2, 127.5, 121.6, 120.9, 118.9, 117.0, 110.9, 31.8, 29.8, 25.0, 22.5, 14.0; m/z calcd. for M+H 188.1349, found 188.1353.</p>
<p>7</p>	<p>5-Methoxy-2-methyl-3-<i>n</i>-pentyl-1-<i>H</i>-indole. TLC R_f 0.35 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 10/90); yellow solid; mp 102-104 °C (lit.² 104-106 °C); yield 84 %.</p> <p>$\nu_{\max}$ 3410, 3050, 2966, 2937, 2862, 1461, 1262, 1293, 1264, 1230, 1020, 742; δ_H 7.59 (brs, 1H), 7.16-7.14 (d, 1H, J 8.4 Hz), 6.98-6.97 (d, 1H, J 2 Hz), 6.79-6.76 (m, 1H), 3.88 (s, 3H), 2.67-2.63 (t, 2H, J 7.6 Hz), 2.35 (s, 3H), 1.64-1.60 (m, 3H), 1.37-1.34 (m, 3H), 0.92-0.89 (t, 3H, J 6.4 Hz); δ_C 153.5, 131.5, 130.2, 129.1, 112.2, 110.5, 109.9, 100.7, 55.9, 31.6, 30.2, 29.5, 23.9, 22.5, 14.0, 11.6; m/z calcd. for M+H 232.1638, found 232.1644.</p>

<p>8</p>	<p>1,2,3,4-Tetrahydrocyclopenta[b]indole. TLC R_f 0.35 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 10/90); white solid, mp 104-106 °C (lit.² 105-107 °C); yield 84%.</p> <p>$\nu_{\max}$ 3383, 1660, 1602, 1410, 1223, 735; δ_H 7.78 (brs, 1H), 7.50-7.48 (t, 1H, J 4.8 Hz), 7.30-7.28 (t, 1H, J 4 Hz), 7.15-7.13 (t, 2H, J 4 Hz), 2.90-2.86 (t, 4H, J 6.8 Hz), 2.61-2.54 (m, 2H); δ_C 143.6, 140.8, 124.6, 120.3, 119.5, 119.3, 118.3, 111.2, 28.5, 25.7, 24.3; m/z calcd. for M+H 158.0889, found 158.0893.</p>
<p>9</p>	<p>2,3,4,9-Tetrahydro-1-<i>H</i>-carbazole. TLC R_f 0.35 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 10/90); white solid, mp 116-118 °C (lit.² 118-120 °C); yield 85%.</p> <p>$\nu_{\max}$ 3392, 2297, 1618, 1454, 1234, 742; δ_H 7.67 (brs, 1H), 7.48-7.46 (d, 1H, J 8 Hz), 7.29-7.27 (t, 1H, J 8 Hz), 7.14-7.06 (m, 2H), 2.75-2.71 (m, 4H), 1.93-1.87 (m, 4H); δ_C 135.5, 133.9, 127.6, 120.8, 118.9, 117.6, 110.2, 110.0, 23.2, 23.1, 20.7; m/z calcd. for M+H 172.1054, found 172.1056.</p>

<p>10</p>	<p>6-Methoxy-2,3,4,9-tetrahydro-1-<i>H</i>-carbazole. TLC R_f 0.40 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 10/90); yellow solid, mp 108-110 °C (lit.² 110-112 °C); yield 85%.</p> <p>$\nu_{\max}$ 3392, 2910, 1583, 1480, 1210, 1025; δ_H 7.69 (brs, 1H), 7.15-7.13 (d, 1H, J 8 Hz), 6.93-6.92 (d, 1H, J 2 Hz), 6.77-6.74 (m, 1H), 3.85 (s, 3H), 2.70-2.66 (m, 4H), 1.89-1.86 (m, 4H); δ_C 153.6, 134.9, 130.6, 128.0, 110.8, 110.3, 109.8, 108.8, 100.1, 55.8, 23.1, 23.0, 20.8; m/z calcd. for M+H 202.1148, found 202.1139.</p>
<p>11</p>	<p>2,3,4,9-Tetrahydro-1-<i>H</i>-carbazole-6-carbonitrile. TLC R_f 0.45 (20% EtOAc/Hexane); Purified on silica gel 100-200 mesh (EtOAc/Hexane 10/90); yellowish solid, mp 122-124 °C (lit.¹ 123-124 °C); yield 80%.</p> <p>$\nu_{\max}$ 3310, 2910, 2843, 2223, 1672, 1615, 1477, 1319, 1224, 1189, 868, 804, 782, 613; δ_H 8.38 (s, 1H), 7.76 (s, 1H), 7.32 (s, 2H), 2.77-2.74 (t, 2H, J 6.4 Hz), 2.69-2.66 (t, 2H, J 6 Hz), 1.93-1.86 (m, 4H); δ_C 137.4, 136.7, 127.5, 123.8, 122.9, 121.3, 111.0, 110.7, 101.2, 22.9, 22.8, 22.7, 20.4; m/z calcd. for M+H 197.2237, found 197.2249.</p>

<p>12</p>	<p>6-Bromo-2,3,4,9-tetrahydro-1-<i>H</i>-carbazole. TLC R_f 0.50 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 10/90); yellowish solid, mp 150-152 °C (lit.¹ 152-154 °C); yield 88%.</p> <p>$\nu_{\max}$ 3410, 2940, 2919, 2870, 1572, 1423, 1312, 1233, 1038, 971, 865, 792; δ_H 7.70 (brs, 1H), 7.57 (s, 1H), 7.20-7.17 (m, 1H), 7.14-7.12 (d, 1H, J 8.4 Hz), 2.73-2.71 (t, 2H, J 6.0 Hz), 2.67-2.64 (t, 2H, J 5.6 Hz), 1.94-1.83 (m, 4H); δ_C 135.4, 134.0, 129.5, 123.4, 120.2, 112.1, 111.5, 109.8, 23.0, 22.9, 22.8, 20.5; m/z calcd. for M+H 250.0142, found 250.0153.</p>
<p>13</p>	<p>3-Methyl-2,3,4,9-tetrahydro-1-<i>H</i>-carbazole. TLC R_f 0.65 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 10/90); white solid, mp 110-112 °C (lit.¹ 112-113 °C); yield 82%.</p> <p>$\nu_{\max}$ 3397, 3276, 2929, 1652, 1455, 1327, 1008, 738; δ_H 7.62 (brs, 1H), 7.50-7.48 (d, 1H, J 8 Hz), 7.29-7.27 (d, 1H, J 8 Hz), 7.16-7.09 (m, 2H), 2.90-2.85 (m, 1H), 2.75 (s, 2H), 2.34-2.28 (m, 1H), 2.00-1.98 (t, 2H, J 2.4 Hz), 1.65-1.55 (m, 1H), 1.18-1.17 (d, 3H); δ_C 135.8, 133.7, 127.6, 120.8, 118.9, 117.5, 110.2, 109.9, 31.3, 29.5, 29.2, 22.7, 21.6; m/z calcd. for M+H 186.1207, found 186.1224.</p>

<p>14</p>	<p>3-(<i>tert</i>-Butyl)-6-methoxy-2,3,4,9-tetrahydro-1<i>H</i>-carbazole.</p> <p>TLC R_f 0.35 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane ratio); white solid, mp 116-118 °C (lit.² 114-116 °C); yield 90%.</p> <p>$\nu_{\max}$ 2953, 2868, 1659, 1470, 1213, 1031, 735; δ_H 7.84 (s, 1H), 6.98-6.97 (d, 1H, J 4.4 Hz), 6.92-6.91 (d, 1H, J 4.4 Hz), 6.74-6.72 (m, 1H), 3.84 (s, 3H), 2.78-2.67 (m, 3H), 2.39-2.33 (m, 1H), 2.02 (s, 1H), 1.52-1.49 (t, 2H, J 6.4 Hz), 0.99 (s, 9H); δ_C 158.0, 153.6, 135.0, 131.0, 128.1, 120.2, 113.5, 110.9, 110.3, 110.0, 108.6, 99.8, 81.6, 60.2, 55.7, 45.3, 41.1, 32.4, 24.6, 24.0, 22.1, 14.0; m/z calcd. for M+H 258.1762, found 258.1753.</p>
<p>15</p>	<p>2-Bromo-5,6,7,8,9,10-hexahydrocyclohepta[b]indole. TLC R_f 0.40 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 20/80); white solid, mp 160-162°C; yield 88 %.</p> <p>$\nu_{\max}$ 2924, 2855, 1454, 1323, 1204, 1104, 1085, 787; δ_H 7.66 (s, 1H), 7.28-7.26 (d, 1H, J 8.8 Hz), 7.22-7.20 (d, 1H, J 8.4 Hz), 5.77-5.76 (d, 1H, J 4.4 Hz), 3.34-3.25 (m, 2H), 3.10-3.06 (m, 1H), 2.81-2.74 (m, 1H), 1.30-1.26 (m, 3H), 1.12-1.08 (m, 3H); δ_C 138.8, 134.4, 126.7, 124.7, 120.4, 113.0, 109.8, 103.0, 82.8, 63.1, 33.8, 31.4, 29.6, 29.5, 27.1, 24.7, 23.2, 14.6; m/z calcd. for M+H 263.0314, found 265.0334.</p>

<p>16</p>	<p>6,7,8,9,10,11-Hexahydro-5-<i>H</i>-cycloocta[b]indole. TLC R_f 0.65 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 8/92); white solid, mp 74-76 °C (lit.¹ 76-77 °C); yield 80%.</p> <p>$\nu_{\max}$ 3334, 1629, 1445, 1332, 738; δ_{H} 7.67-7.65 (t, 1H, J 4Hz), 7.56 (s, 1H), 7.34-7.32 (m, 1H), 7.27-7.25 (t, 2H, J 4 Hz), 3.02-2.99 (t, 2H, J 6 Hz), 2.89-2.86 (t, 2H, J 6.4 Hz), 1.99-1.82 (m, 4H), 1.59-1.56 (m, 4H); δ_{C} 135.7, 135.0, 128.5, 120.5, 118.8, 117.6, 111.4, 110.4, 29.6, 29.4, 25.8, 22.1; m/z calcd. for M+H 200.1345, found 200.1369.</p>
<p>17</p>	<p>6,7,8,9,10,11,12,13,14,15-Decahydro-5-<i>H</i>-cyclododeca[b]indole. TLC R_f 0.55 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 10/90); white solid, mp 182-184 °C; yield 78%.</p> <p>$\nu_{\max}$ 3398, 3336, 2928, 1699, 1463, 741; δ_{H} 8.98 (s, 1H), 7.73-7.70 (d, 1H, J 8.4 Hz), 7.35-7.32 (m, 2H), 7.14-7.10 (m, 1H), 3.08-3.04 (t, 2H, J 8 Hz), 2.91-2.87 (t, 2H, J 8.4 Hz), 1.83-1.77 (m, 4H), 1.63-1.60 (m, 6H), 1.50-1.40 (m, 6H); δ_{C} 194.4, 171.0, 146.3, 129.8, 128.0, 123.8, 119.7, 119.6, 119.3, 111.7, 109.8, 109.6, 60.2, 40.5, 27.9, 26.0, 25.7, 24.0, 23.5, 22.5, 22.0, 21.6, 20.9, 14.0; m/z calcd. for M+H 256.1963, found 256.1954.</p>

<p>18</p>	<p>3-Benzyl-5-methoxy-2-methyl-1H-indole. TLC R_f 0.30 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 10/90); yellow solid, mp 112-114 °C; yield 85%.</p> <p>$\nu_{\max}$ 3389, 1576, 1382, 1210; δ_H 7.68 (brs, 1H), 7.26-7.24 (d, 4H, J 8 Hz), 7.17-7.15 (d, 2H, J 8 Hz), 6.86 (s, 1H), 6.78-6.76 (d, 1H, J 8 Hz), 4.05 (s, 2H), 3.78 (s, 3H), 2.36 (s, 3H); δ_C 153.7, 141.4, 132.5, 130.2, 129.2, 128.1, 125.5, 110.6, 110.3, 110.2, 100.7, 55.7, 29.9, 11.7; m/z calcd. for M+H 252.1335, found 252.1339.</p>
<p>19</p>	<p>5-Methoxy-3-methyl-2-phenyl-1-H-indole. TLC R_f 0.30 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 10/90); white solid, mp 85-86 °C; yield 88%.</p> <p>$\nu_{\max}$ 3342, 3049, 1621, 1575, 1523, 1439, 1263; δ_H 7.92 (s, 1H), 7.59-7.57 (d, 2H, J 8 Hz), 7.50-7.46 (t, 2H, J 8 Hz), 7.37-7.34 (t, 1H, J 7.2 Hz), 7.28-7.26 (d, 1H, J 8 Hz), 7.05-7.04 (d, 1H, J 4 Hz), 6.89-6.87 (m, 1H), 3.90 (s, 3H), 2.45 (s, 3H); δ_C 153.9, 134.8, 133.2, 130.8, 130.2, 128.6, 127.5, 127.1, 112.2, 111.3, 108.3, 100.6, 55.8, 9.6; m/z calcd. for M+H 238.1135, found 238.1147.</p>

<p>20</p>	<p>5-Bromo-2-(4-chlorophenyl)-3-methyl-1<i>H</i>-indole. TLC R_f 0.55 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane ratio 10/90); white solid, mp 120-122 °C; yield 82%.</p> <p>$\nu_{\max}$ 3337, 3054, 1607, 1583, 1536, 1449, 1265, 640, 580; δ_{H} 8.02 (s, 1H), 7.71 (s, 1H), 7.50-7.44 (m, 4H), 7.30-7.22 (m, 2H), 2.39 (s, 3H); δ_{C} 134.3, 133.9, 133.5, 131.5, 131.0, 128.9, 128.7, 125.1, 121.5, 112.7, 112.0, 108.6, 29.5; m/z calcd. for $M+H$ 319.9752, found 319.9742.</p>
<p>21</p>	<p>2,3-Diphenyl-1-<i>H</i>-indole. TLC R_f 0.45 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 10/90); white solid, mp 122-124 °C (lit.² 125-127 °C); yield 74%.</p> <p>$\nu_{\max}$ 3408, 3045, 1608, 1453, 1239, 1068, 954, 732, 690; δ_{H} 8.24 (s, 1H), 7.76-7.74 (d, 1H, J 8 Hz), 7.51-7.41 (m, 6H), 7.36-7.30 (m, 6H), 7.23-7.19 (t, 1H, J 7.2 Hz); δ_{C} 135.8, 134.9, 134.0, 132.6, 130.0, 128.6, 128.5, 128.4, 128.1, 127.6, 126.1, 122.6, 120.3, 119.6, 114.9, 110.8; m/z calcd. for $M+H$ 270.1224, found 270.1230.</p>

<p>22</p>	<p>2-Benzyl-3-phenyl-1-<i>H</i>-indole. TLC R_f 0.45 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 10/90); white solid, mp 102-104 °C (lit.¹ 103-105 °C); yield 80%.</p> <p>$\nu_{\max}$ 3408, 3050, 1600, 1459, 1240, 1068, 954, 732, 692; δ_H 7.92 (brs, 1H), 7.80-7.70 (m, 1H), 7.66-7.60 (m, 2H), 7.51-7.50 (m, 2H), 7.50-7.12 (m, 9H), 4.28 (s, 2H); δ_C 129.4, 128.7, 128.6, 126.6, 126.0, 121.8, 119.9, 119.0, 110.6, 32.5; m/z calcd. for M+H 284.1354, found 284.1339.</p>
<p>23</p>	<p>2-(4-Methoxyphenyl)-3-(4-nitrophenyl)-1-<i>H</i>-indole. TLC R_f 0.25 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 20/80); orange solid, mp 132-134 °C; yield 72%.</p> <p>$\nu_{\max}$ 3365, 2925, 1590, 1508, 1499, 1334, 1254, 1029, 830; δ_H 8.32 (brs, 1H), 8.23-8.21 (d, 2H, J 8 Hz), 7.72-7.70 (d, 1H, J 8 Hz), 7.60-7.58 (d, 2H, J 8 Hz), 7.47-7.45 (d, 1H, J 8 Hz), 7.35-7.33 (d, 2H, J 8 Hz), 7.33-7.22 (m, 1H), 7.22-6.93 (m, 1H), 6.93-6.91 (d, 2H, J 8 Hz), 3.85 (s, 3H); δ_C 194.7, 163.9, 159.7, 146.8, 145.5, 143.0, 142.4, 136.1, 135.9, 130.8, 130.5, 130.1, 129.9, 129.8, 129.0, 127.7, 124.1, 123.7, 122.8, 121.0, 118.7, 114.4, 111.2, 55.5, 55.2, 44.6; m/z calcd. for M+H 345.1172, found 345.1164.</p>

<p>24</p>	<p>2-(4-Nitrobenzyl)-3-(4-nitrophenyl)-1-<i>H</i>-indole. TLC R_f 0.10 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 25/75); orange solid, mp 60-62 °C; yield 64%.</p> <p>$\nu_{\max}$ 3402, 2253, 1652, 1024, 825, 763; δ_H 8.27-8.25 (d, 2H, J 8 Hz), 8.14-8.12 (d, 2H, J 8 Hz), 7.69-7.67 (d, 2H, J 8 Hz), 7.63-7.61 (d, 1H, J 8 Hz), 7.42-7.39 (m, 3H), 7.17-7.14 (1H, t, J 8 Hz), 7.10-7.06 (t, 1H, J 7.2 Hz), 4.40 (s, 2H); δ_C 147.3, 146.4, 145.2, 142.8, 136.2, 135.1, 129.7, 129.5, 126.5, 124.3, 124.0, 122.3, 120.5, 118.4, 112.6, 111.9, 32.2; m/z calcd. for M+H 374.1056, found 374.1029.</p>
<p>25</p>	<p>6,7-Dihydro-5<i>H</i>-benzo[c]carbazole. TLC R_f 0.45 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 10/90); mp 158-160 °C; yield 86%.</p> <p>$\nu_{\max}$ 3408, 3023, 1440, 1321, 733; δ_H 7.99-7.97 (d, 1H, J 8 Hz), 7.82-7.80 (d, 1H, J 8 Hz), 7.57 (s, 1H), 7.28-7.25 (m, 1H), 7.18-7.13 (m, 2H), 7.11-7.03 (m, 3H), 2.88-2.84 (t, 2H, J 8 Hz), 2.63-2.59 (t, 2H, J 8 Hz); δ_C 137.4, 136.1, 133.8, 133.3, 128.0, 126.9, 124.7, 124.2, 122.1, 121.3, 120.4, 119.3, 111.2, 110.2, 29.3, 22.1; m/z calcd. for M+H 220.1037, found 220.1047.</p>

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10-Methoxy-6,7-dihydro-5H-benzo[c]carbazole. TLC R_f 0.45 (20% EtOAc/Hexane); purified on silica gel 100-200 mesh (EtOAc/Hexane 10/90); yellowish solid, mp 164-166 °C; yield 90%.

$\nu_{\max}$ 3480, 1595, 1440, 1230, 754; δ_H 8.04 (s, 1H), 7.89-7.83 (d, 1H, J 2.4 Hz), 7.83-7.80 (m, 1H), 7.52-7.51 (d, 1H, J 2 Hz), 7.36-7.32 (t, 1H, J 7.6 Hz), 7.27-7.25 (t, 1H, J 7.2 Hz), 7.14-7.09 (m, 1H), 6.88-6.85 (m, 1H), 3.95 (s, 3H), 3.06-3.02 (t, 2H, J 7.2 Hz), 2.92-2.88 (t, 2H, J 8 Hz); δ_C 154.6, 138.0, 133.7, 133.1, 131.1, 129.0, 127.8, 127.2, 126.7, 125.2, 124.0, 122.8, 122.7, 121.8, 113.4, 112.6, 115.5, 110.5, 110.3, 104.9, 102.2, 55.9, 29.3, 22.4; m/z calcd. for $M+H$ 250.1142, found 250.1158.

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