Digital Photography for the Analysis of Fluorescence Responses

Thimon Schwaebel, Oliver Trapp and Uwe H. F. Bunz*

Organisch-Chemisches Institut, Ruprecht-Karls-Universität Heidelberg, Im Neuenheimer Feld 270, 69120 Heidelberg, FRG .

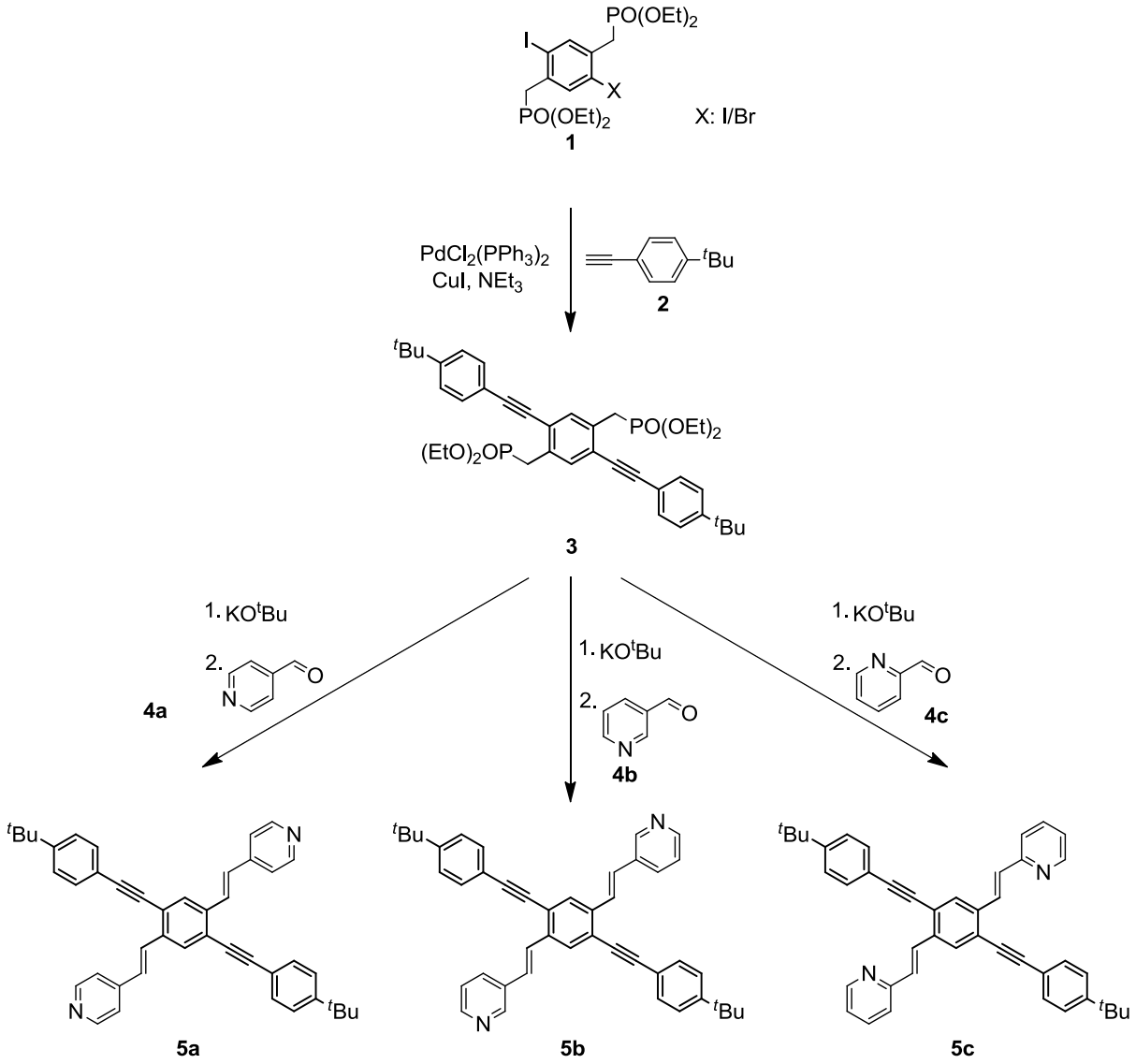
Email: Uwe.bunz@oci.uni-heidelberg.de

Supporting Information

Detailed Contents

1 Synthesis:

Scheme S1. Synthesis of XF **5a-c**



General Experimental Methods:

All chemicals were used without purification unless otherwise specified. All chemicals have been purchased from Sigma Aldrich unless otherwise specified. Column chromatography was performed using Standard Grade silica gel 60 Å. NMR spectra were recorded at 298 K on a 300 MHz or 500 MHz spectrometer. Chemical shifts are reported in parts per million (ppm), using residual solvent (chloroform-*d* δ = 7.26 ppm). Data is reported as follows: chemical shift, multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet), coupling constant, and integration. All absorption and emission spectra were recorded using a Jasko V660, Jasko FP6500 or a PTI QuantumMaster40 spectrometer. Quantum yields for the cruciform fluorophores were measured using standard procedures with quinine sulfate as a standard.[1] Photographs were taken with a Canon EOS 7D (objective: EF-S60mm f/2.8 Macro USM) with shutter speeds 0.2s-0.04s.

Product **1** has been prepared according to the literature[2]

1,4-Bis-(diethyloxyphosphonylmethyl)-2,5-bis(4-*tert*-butylphenylethynyl)-benzene **3:**

A solution of **1** (5.04 g, 8.0 mmol) in dry THF (40 mL) and NEt_3 (7.8 mL) was degased for 15 min. After that $PdCl_2(PPh_3)_2$ (112.3 mg, 2 mol%), CuI (76.2 mg, 5 mol%), and 1-*tert*-butyl-4-ethynylbenzene (3.04 g, 19.2 mmol) were added to the reaction solution. After 68 h the reaction solution was filtered, 100 mL aqueous solution of 0.5 mol L^{-1} HCl was added and extracted with DCM (3 x 40 mL). The organic layer was dried with $MgSO_4$ and the solvent was evaporated *in vacuo*. The crude product was recrystallized twice in ethyl acetate to yield colorless crystals suitable for x-ray analysis (3.648 g, 66%). To improve the yield the solution of the recrystallization was concentrated *in vacuo* and purified by column chromatography (PE/EE 1:3) to yield the product (793 mg, 14%; total: 4.441 g, 80%) and the side product (1-bromo-2,5-bis-(diethyloxyphosphonyl-methyl)-4-(4-*tert*-butylphenylethynyl)-benzene) (821 mg, 17%). Product: Mp.: 167 °C. ^{1}H-NMR (500 MHz, $CDCl_3$): δ = 7.63 (d, *J* = 1.9 Hz, 2H), 7.48 (d, *J* = 8.4 Hz, 4H), 7.39 (d, *J* = 8.4 Hz, 4H), 4.07 (q, *J* = 7.2 Hz, 8H), 3.47 (d, *J* = 20.8 Hz, 4H), 1.36 (s, 18H), 1.26 (t, *J* = 7.07 Hz, 12H). ^{13}C{^{1}H}{^{31}P}-NMR (75 MHz, $CDCl_3$): δ = 152.06, 133.71, 132.38, 131.40, 125.55, 123.84, 120.1, 95.48, 87.01, 62.32, 34.93, 31.53, 31.25, 16.46. MS (HR-EI): $[M]^+$ 690.3230 (calc. 690.3239) Elem. Anal.: C, 69.33; H, 7.54 (calc. C, 69.55; H, 7.59) IR (cm^{-1}): 2954.41, 2906.2, 2867.63, 1736.58, 1516.74, 1473.35, 1463.71, 1444.42, 1417.42, 1389.46, 1363.43, 1259.29, 1217.83, 1184.08, 1162.87, 1113.69, 1103.08, 1052.94, 1020.16, 943.02, 898.666, 886.131, 823.455, 791.636, 765.601, 733.782, 714.497, 694.248, 641.215, 559.255, 539.007, 524.543, 472.474, 453.19, 429.084, 417.513, 404.014, 401.121. Side product: ^{1}H-NMR (500 MHz, $CDCl_3$): δ = 7.64 (d, *J* = 2.3, 1H), 7.59 (d, *J* = 2.4, 1H), 7.43 (d, *J* = 8.5, 2H), 7.39 (d, *J* = 8.5, 2H), 4.04 (q, *J* = 7.3, 8H), 3.40 (d, *J* = 21.5, 2H), 3.34 (d, *J* = 21.4, 2H), 1.30 (s, 9H), 1.27 – 1.21 (m, 12H). ^{13}C{^{1}H}{^{31}P}-NMR (75 MHz, $CDCl_3$): δ = 152.13, 134.70, 134.37, 134.20, 131.34, 130.78, 125.54, 124.67, 123.45, 119.78, 94.90, 86.12, 62.41, 62.32, 34.91, 33.03, 31.38, 31.26, 31.22, 16.42. MS (HR-ESI): $[M+CN_3H_6]^+$ 672.2207 (calc. 672.1962).

(E)-1,4-Bis[2-(2-azaphenyl)vinyl]-2,5-bis(4-*tert*-butylphenylethynyl)-benzene **5c**: (Gerneral Procedure for Horner coupling)

A solution of **3** (300.0 mg, 0.72 mmol) in dry THF was stirred at 0°C under N_2 atmosphere while KO^tBu (2.1 equiv., 102.34 mg, 0.91 mmol)) was added. The solution turned dark purple and was allowed to stir for 10 min. Then the picolinealdehyde **4c** (2.3 equiv., 107.0 mg, 1.00 mmol) was added to the solution as quickly as possible. Letting the solution warm to room temperature, after 1 to 3 h methanol was added and the desired product was formed. The solution was centrifuged and the solid was washed 3x methanol, 1x ethyl acetate and 1x petroleum ether and dried *in vacuo*. Yellow solid (153.0 mg, 60%). Yellow crystals, suitable for X-ray analysis, have been obtained from slowly evaporing chloroform in a NMR-tube. Mp.: 274 °C (decomposition). ^{1}H-NMR (300 MHz, $CDCl_3$): δ = 8.65 (dd, *J* = 4.8 Hz, *J* = 0.9 Hz, 2H), 8.16 (d, *J* = 16.2 Hz, 2H), 7.97 (s, 2H), 7.67 (td, *J* = 11.5 Hz, *J* = 1.8 Hz, 2H), 7.58 (d, *J* = 8.5 Hz, 4H), 7.50 – 7.36 (m, 8H), 7.17 (ddd, *J* = 7.4 Hz, *J* = 4.8 Hz, *J* = 0.9 Hz, 2H), 1.36 (s, 18H). ^{13}C{^{1}H}-NMR: δ = 155.84, 152.09, 150.02, 137.42, 136.57, 131.59, 130.69, 129.97, 129.85, 125.62, 123.10, 122.38, 122.04, 120.27, 96.29, 87.26, 77.58, 77.16, 76.74, 35.02, 31.34. IR (cm^{-1}): 2957, 1582, 1562, 1505, 1482, 1461, 1427, 1405, 1360, 1266, 1146, 1103, 1092, 1049, 964, 856, 829, 767, 756, 737, 691, 683, 662, 611, 557, 517, 485, 469, 449, 443. MS (HR-EI): $[M]^+$ 596.3204 (calc. 596.3192). λ_{abs} = 334nm, ε(334nm) = 93584 L mol^{-1} cm^{-1}. λ_{em} = 427, 451nm. $\Phi_F(CH_2Cl_2)$ = 0.38.

(E)-1,4-Bis[2-(3-azaphenyl)vinyl]-2,5-bis(4-*tert*-butylphenylethynyl)-benzene **5b:**

The general procedure for Horner coupling was utilized, using **3** (400.0 mg, 0.58 mmol) as staring material, KO^{t}Bu (136.5 mg, 1.22 mmol) and nicotinealdehyde **5b** (142.7 mg, 1.33 mmol). Yellow solid (228.7 mg, 66%). Yellow crystals, suitable for X-ray analysis, have been obtained from slowly evaporing chloroform in a NMR-tube. Mp.: 278 °C (decomposition). ^{1}H-NMR (300 MHz, $CDCl_3$): δ = 8.81 (d, *J* = 2.0 Hz, 2H), 8.52 (dd, *J* = 4.7 Hz, *J* = 1.5 Hz, 2H), 7.92 (s, 2H), 7.67 (dt, *J* = 7.9 Hz, *J* = 1.8 Hz, 2H), 7.74 (d, *J* = 16.5 Hz, 2H), 7.54 (d, *J* = 8.5 Hz, 4H), 7.43 (d, *J* = 8.5 Hz, 4H), 7.34 – 7.24 (m, 4H), 1.36 (s, 18H). ^{13}C{^{1}H}-NMR: δ = 152.38, 149.06, 148.89, 137.18, 133.10, 133.06, 131.48, 129.17, 127.83, 127.21, 125.76, 123.79, 122.81, 119.94, 96.45, 86.91, 35.05, 31.32. IR (cm^{-1}): 2950, 1568, 1504, 1484, 1405, 1265, 1102, 1022, 957, 893, 828, 792, 745, 703, 558, 446, 421. MS (HR-EI): $[M]^+$ 596.3227 (calc. 596.3192). λ_{abs} = 332nm, ε(332nm) = 83302 L mol^{-1} cm^{-1}. λ_{em} = 433, 456nm. $\Phi_F(CH_2Cl_2)$= 0.38.

(E)-1,4-Bis[2-(4-azaphenyl)vinyl]-2,5-bis(4-*tert*-butylphenylethynyl)-benzene **5a:**

The general procedure for Horner coupling was utilized, using **3** (500.0 mg, 0.72 mmol) as starting material, KO^{t}Bu (170.6 mg, 1.52 mmol) and isonicotinealdehyde **5c** (178.3 mg, 1.66 mmol). Yellow solid (321.0 mg, 74%). Yellow crystals, suitable for X-ray analysis, have been obtained from slowly evaporing dichloromethane. The spectroscopic data were in good agreement with the literature[3]

2 Quantum chemical calculation (Spartan ’10, B3LYP/6-311++G**):

Quantum chemical calculations have been done using Spartan ’10, B3LYP/6-311++G**. **5’a-c** differ from **5a-c** in the substitution of the ^{t}Bu-group to a Me-group.

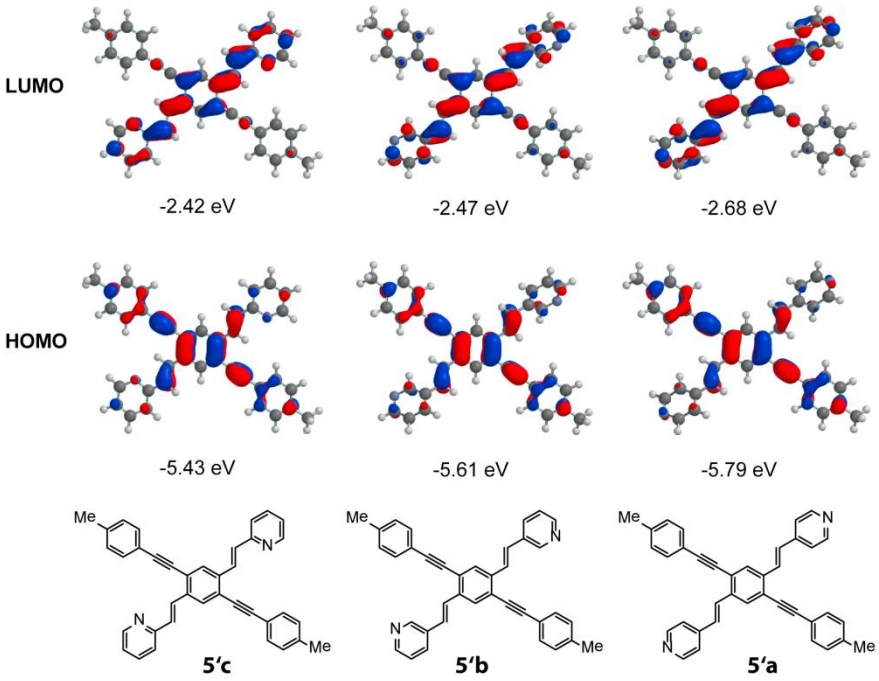


Figure S 1 Calculated frontier orbitals of XF 5’a-c using Spartan ’10, B3LYP/6-311++G** (^{t}Bu-group has been replace with Me-group).

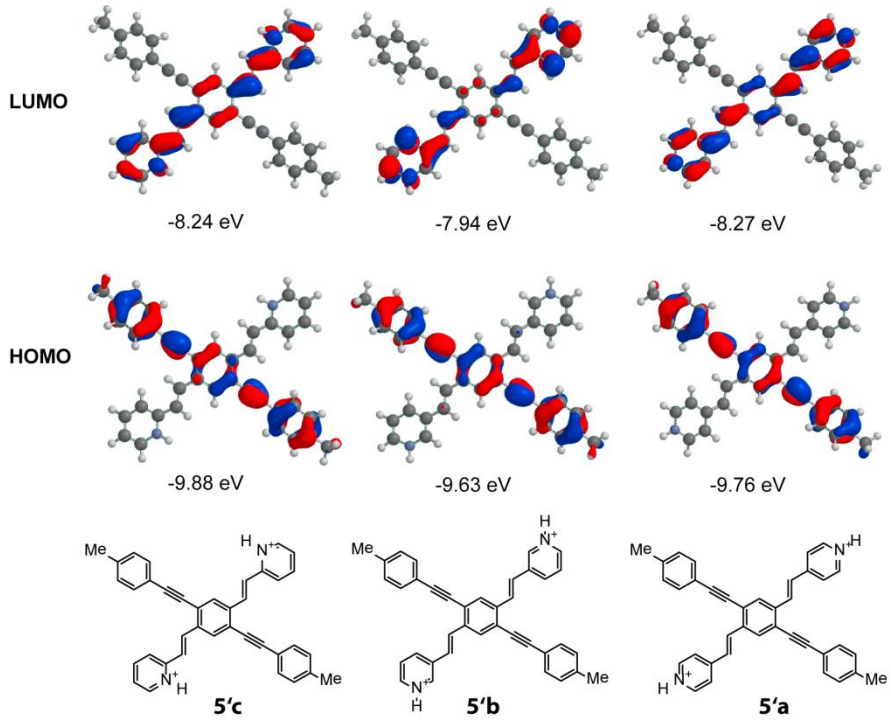


Figure S 2 Calculated frontier orbitals of double pronated XF **5'a-c** using Spartan '10, B3LYP/6-311++G** (^{t}Bu-group has been replace with Me-group).

Table S1. Comparison of frontier orbitals of unprotonated and double protonated XF **5'a-c**.

XF	Frontier Orbital	Unprotonated / eV	Double pronated / eV	Differences / eV
5'a	LUMO	-2.68	-8.27	5.59
	HOMO	-5.79	-9.76	3.97
5'b	LUMO	-2.47	-7.94	5.47
	HOMO	-5.61	-9.63	4.02
5'c	LUMO	-2.42	-8.24	5.82
	HOMO	-5.43	-9.88	4.45

Cartesian coordinates of DFT energy minimized structures in Å and total energy in atomic units (au):

5'a: total energy: -1574.693522au

Atom	X (Å)	Y (Å)	Z (Å)
H1	0.5076178	2.4110374	0.1550999
C1	0.2716847	1.3550993	0.1204576
C4	-0.2716847	-1.3550993	0.1204576
C2	-1.0649749	0.9516492	0.1055991
C6	1.3383642	0.4470482	0.1195516
C5	1.0649749	-0.9516492	0.1055991
C3	-1.3383642	-0.4470482	0.1195516
H4	-0.5076178	-2.4110374	0.1550999

C7	-2.6678883	-0.947933	0.1323938
C8	2.6678883	0.947933	0.1323938
C9	-3.7911382	-1.4029355	0.1437808
C10	3.7911382	1.4029355	0.1437808
C11	-2.1659143	1.913314	0.1074536
H7	-3.1234335	1.5116996	0.4226448
C12	-2.0957052	3.2009427	-0.2792546
H8	-1.1618347	3.5853758	-0.6810006
C13	2.1659143	-1.913314	0.1074536
H9	3.1234335	-1.5116996	0.4226448
C14	2.0957052	-3.2009427	-0.2792546
H10	1.1618347	-3.5853758	-0.6810006
C15	-5.1064546	-1.9433141	0.1616744
C16	-7.7251616	-3.0216501	0.2102902
C17	-6.2246063	-1.1377197	-0.124571
C18	-5.3234754	-3.2967074	0.4718611
C19	-6.6114313	-3.8188222	0.4946941
C20	-7.5048363	-1.6725343	-0.0978941
H3	-6.0771814	-0.0923942	-0.3687177
H11	-4.4749747	-3.931253	0.698475
H12	-6.7541207	-4.8662834	0.7397492
H13	-8.3514242	-1.0307068	-0.3205618
C21	-3.2020281	4.1601933	-0.2664149
N1	-5.2930772	6.069249	-0.3249017
C23	-3.0954569	5.3545537	-0.9941755
C24	-4.3971928	3.9688764	0.4459516
C25	-5.3922322	4.9358799	0.3816002
C26	-4.1530439	6.2587991	-0.9954475
H2	-2.1975926	5.5716103	-1.5627835
H15	-4.5489396	3.0898662	1.0608753
H16	-6.3185785	4.7984254	0.9328151
H17	-4.079246	7.182484	-1.5630254
C27	5.1064546	1.9433141	0.1616744
C28	7.7251616	3.0216501	0.2102902
C29	6.2246063	1.1377197	-0.124571
C30	5.3234754	3.2967074	0.4718611
C31	6.6114313	3.8188222	0.4946941
C32	7.5048363	1.6725343	-0.0978941
H6	6.0771814	0.0923942	-0.3687177
H19	4.4749747	3.931253	0.698475
H20	6.7541207	4.8662834	0.7397492
H21	8.3514242	1.0307068	-0.3205618
C33	3.2020281	-4.1601933	-0.2664149
N2	5.2930772	-6.069249	-0.3249017
C35	3.0954569	-5.3545537	-0.9941755
C36	4.3971928	-3.9688764	0.4459516
C37	5.3922322	-4.9358799	0.3816002

C38	4.1530439	-6.2587991	-0.9954475
H5	2.1975926	-5.5716103	-1.5627835
H23	4.5489396	-3.0898662	1.0608753
H24	6.3185785	-4.7984254	0.9328151
H25	4.079246	-7.182484	-1.5630254
C22	-9.1204026	-3.5946458	0.2162959
H14	-9.5134605	-3.6811073	-0.8025426
H18	-9.8102189	-2.9566967	0.7759756
H26	-9.14006	-4.5900379	0.6642313
C34	9.1204026	3.5946458	0.2162959
H22	9.5134605	3.6811073	-0.8025426
H27	9.8102189	2.9566967	0.7759756
H28	9.14006	4.5900379	0.6642313

5'b: total energy: -1574.691794au

Atom	X (Å)	Y (Å)	Z (Å)
H1	0.5262475	2.4061125	0.1370789
C1	0.2812334	1.3522944	0.1002201
C4	-0.2812334	-1.3522944	0.1002201
C2	-1.0588791	0.9605634	0.0799395
C6	1.3413511	0.4363316	0.101127
C5	1.0588791	-0.9605634	0.0799395
C3	-1.3413511	-0.4363316	0.101127
H4	-0.5262475	-2.4061125	0.1370789
C7	-2.6735854	-0.9296855	0.1275903
C8	2.6735854	0.9296855	0.1275903
C9	-3.7978727	-1.3812907	0.1598427
C10	3.7978727	1.3812907	0.1598427
C11	-2.1530458	1.9299446	0.0612499
H7	-3.1194442	1.5358675	0.3576934
C12	-2.0635082	3.2150862	-0.3313143
H8	-1.1156701	3.5843875	-0.7157334
C13	2.1530458	-1.9299446	0.0612499
H9	3.1194442	-1.5358675	0.3576934
C14	2.0635082	-3.2150862	-0.3313143
H10	1.1156701	-3.5843875	-0.7157334
C15	-5.1120652	-1.922091	0.2109893
C16	-7.7262096	-3.0044981	0.3410453
C17	-6.2427702	-1.1002487	0.0465862
C18	-5.3143342	-3.294107	0.4401164
C19	-6.5999049	-3.8182637	0.5034674
C20	-7.520798	-1.6374469	0.1127444
H3	-6.1078798	-0.0398294	-0.1304226
H11	-4.4553902	-3.9409594	0.5735741
H12	-6.7308873	-4.8799299	0.686512
H13	-8.3773192	-0.9824891	-0.0119811

C21	-3.1535371	4.1913574	-0.3504777
C22	-5.230121	5.9956445	-0.4048527
C23	-3.0385651	5.3587113	-1.1187593
C24	-4.3467194	4.0383966	0.3813769
N1	-5.3596724	4.902122	0.3561921
C26	-4.0865511	6.2698039	-1.1507125
H2	-2.1350521	5.5389435	-1.692676
H15	-4.4780786	3.179485	1.03314
H17	-4.0223709	7.175705	-1.7421315
H18	-6.0730802	6.6803728	-0.4089004
C27	5.1120652	1.922091	0.2109893
C28	7.7262096	3.0044981	0.3410453
C29	6.2427702	1.1002487	0.0465862
C30	5.3143342	3.294107	0.4401164
C31	6.5999049	3.8182637	0.5034674
C32	7.520798	1.6374469	0.1127444
H6	6.1078798	0.0398294	-0.1304226
H19	4.4553902	3.9409594	0.5735741
H20	6.7308873	4.8799299	0.686512
H21	8.3773192	0.9824891	-0.0119811
C33	3.1535371	-4.1913574	-0.3504777
C34	5.230121	-5.9956445	-0.4048527
C35	3.0385651	-5.3587113	-1.1187593
C36	4.3467194	-4.0383966	0.3813769
N2	5.3596724	-4.902122	0.3561921
C38	4.0865511	-6.2698039	-1.1507125
H5	2.1350521	-5.5389435	-1.692676
H23	4.4780786	-3.179485	1.03314
H25	4.0223709	-7.175705	-1.7421315
H26	6.0730802	-6.6803728	-0.4089004
C39	9.1202356	3.5785022	0.3926668
H22	9.5578895	3.638298	-0.6098711
H27	9.7841184	2.9565782	0.9993799
H28	9.120546	4.5857624	0.8139195
C40	-9.1202356	-3.5785022	0.3926668
H14	-9.5578895	-3.638298	-0.6098711
H29	-9.7841184	-2.9565782	0.9993799
H30	-9.120546	-4.5857624	0.8139195

5'c: total energy: -1574.700300au

Atom	X (Å)	Y (Å)	Z (Å)
H1	0.42879	2.4265111	0.0883886
C1	0.22497	1.3636367	0.0702203
C4	-0.22497	-1.3636367	0.0702203
C2	-1.0988108	0.9174703	0.0610939
C6	1.3210401	0.4926994	0.0704966

C5	1.0988108	-0.9174703	0.0610939
C3	-1.3210401	-0.4926994	0.0704966
H4	-0.42879	-2.4265111	0.0883886
C7	-2.6342226	-1.0337108	0.0757565
C8	2.6342226	1.0337108	0.0757565
C9	-3.7547736	-1.4945198	0.0782357
C10	3.7547736	1.4945198	0.0782357
C11	-2.2373412	1.8303276	0.0542256
H7	-3.2103219	1.3793609	0.2127034
C12	-2.208179	3.1608936	-0.1479474
H8	-1.2708936	3.6743964	-0.3415462
C13	2.2373412	-1.8303276	0.0542256
H9	3.2103219	-1.3793609	0.2127034
C14	2.208179	-3.1608936	-0.1479474
H10	1.2708936	-3.6743964	-0.3415462
C15	-5.0837959	-1.9992336	0.0793068
C16	-7.7387542	-2.9849542	0.0841484
C17	-6.1806115	-1.1179426	0.0303739
C18	-5.3402757	-3.3801713	0.1343013
C19	-6.6457475	-3.8569558	0.1371414
C20	-7.4786862	-1.6092065	0.0337512
H3	-5.9997385	-0.0501201	-0.0071649
H11	-4.5077204	-4.0724184	0.178123
H12	-6.8185933	-4.9274352	0.1842043
H13	-8.3091673	-0.9108754	-0.0013366
C21	-3.3973385	4.0167172	-0.1424378
C22	-5.636528	5.616356	-0.1332632
C23	-3.2654277	5.3966983	-0.3734121
N1	-4.6016571	3.4537556	0.0846692
C25	-5.675733	4.2380294	0.0867866
C26	-4.3967478	6.2027605	-0.3681626
H2	-2.284101	5.8212946	-0.5529092
H16	-6.6258206	3.7438252	0.2747354
H17	-4.3117892	7.2694206	-0.5446745
H18	-6.5482324	6.2011911	-0.1193184
C27	5.0837959	1.9992336	0.0793068
C28	7.7387542	2.9849542	0.0841484
C29	6.1806115	1.1179426	0.0303739
C30	5.3402757	3.3801713	0.1343013
C31	6.6457475	3.8569558	0.1371414
C32	7.4786862	1.6092065	0.0337512
H6	5.9997385	0.0501201	-0.0071649
H19	4.5077204	4.0724184	0.178123
H20	6.8185933	4.9274352	0.1842043
H21	8.3091673	0.9108754	-0.0013366
C33	3.3973385	-4.0167172	-0.1424378
C34	5.636528	-5.616356	-0.1332632

C35	3.2654277	-5.3966983	-0.3734121
N2	4.6016571	-3.4537556	0.0846692
C37	5.675733	-4.2380294	0.0867866
C38	4.3967478	-6.2027605	-0.3681626
H5	2.284101	-5.8212946	-0.5529092
H24	6.6258206	-3.7438252	0.2747354
H25	4.3117892	-7.2694206	-0.5446745
H26	6.5482324	-6.2011911	-0.1193184
C24	-9.1542072	-3.5057969	0.0573099
H14	-9.550975	-3.5105179	-0.9641192
H15	-9.8196516	-2.8829344	0.6609001
H23	-9.2109883	-4.5288442	0.4356428
C36	9.1542072	3.5057969	0.0573099
H22	9.550975	3.5105179	-0.9641192
H27	9.8196516	2.8829344	0.6609001
H28	9.2109883	4.5288442	0.4356428

5'a + 2H$^+$: total energy: -1575.422303au

Atom	X (Å)	Y (Å)	Z (Å)
C1	-1.3509299	-0.4494185	-0.0681178
C4	1.3509299	0.4494185	-0.0681178
C2	-1.0524179	0.9527143	-0.0744508
C6	-0.2870528	-1.3577285	-0.0737258
C5	1.0524179	-0.9527143	-0.0744508
C3	0.2870528	1.3577285	-0.0737258
H6	-0.5320342	-2.4115211	-0.0946071
H3	0.5320342	2.4115211	-0.0946071
C7	-2.1459447	1.9037131	-0.1209462
C8	-2.074054	3.2420224	0.0957616
H2	-3.1104094	1.4551943	-0.3391917
H7	-1.1285038	3.690999	0.3804232
C9	2.1459447	-1.9037131	-0.1209462
C10	2.074054	-3.2420224	0.0957616
H5	3.1104094	-1.4551943	-0.3391917
H9	1.1285038	-3.690999	0.3804232
C11	-2.6795036	-0.9373241	-0.0464002
C12	-3.7996252	-1.4040466	-0.0062142
C13	2.6795036	0.9373241	-0.0464002
C14	3.7996252	1.4040466	-0.0062142
C15	-3.1843918	4.1599452	0.0073547
N1	-5.2395648	6.0207121	-0.1292082
C17	-4.4871298	3.7988435	-0.4234119
C18	-2.9869227	5.5190198	0.3596861
C19	-4.0148839	6.4236634	0.2866602
C20	-5.4862663	4.7339508	-0.4821484
H8	-4.721014	2.7873353	-0.7245965

H11	-2.0166533	5.8618393	0.6951456
H12	-3.9082531	7.4681683	0.5466613
H13	-6.4923969	4.5062905	-0.8073249
C21	3.1843918	-4.1599452	0.0073547
N2	5.2395648	-6.0207121	-0.1292082
C23	4.4871298	-3.7988435	-0.4234119
C24	2.9869227	-5.5190198	0.3596861
C25	4.0148839	-6.4236634	0.2866602
C26	5.4862663	-4.7339508	-0.4821484
H10	4.721014	-2.7873353	-0.7245965
H15	2.0166533	-5.8618393	0.6951456
H16	3.9082531	-7.4681683	0.5466613
H17	6.4923969	-4.5062905	-0.8073249
C27	-5.1027541	-1.9652776	0.0348448
C28	-7.6921437	-3.0971947	0.1156478
C29	-5.371643	-3.1907381	-0.6044209
C30	-6.1498173	-1.3160421	0.7144384
C31	-7.4178649	-1.8786621	0.7514009
C32	-6.645299	-3.7375069	-0.5628695
H1	-4.5771611	-3.7005477	-1.1361406
H19	-5.9559649	-0.3792948	1.224223
H20	-8.2115334	-1.3673618	1.2853888
H21	-6.8351058	-4.6789425	-1.0671979
C33	5.1027541	1.9652776	0.0348448
C34	7.6921437	3.0971947	0.1156478
C35	5.371643	3.1907381	-0.6044209
C36	6.1498173	1.3160421	0.7144384
C37	7.4178649	1.8786621	0.7514009
C38	6.645299	3.7375069	-0.5628695
H4	4.5771611	3.7005477	-1.1361406
H23	5.9559649	0.3792948	1.224223
H24	8.2115334	1.3673618	1.2853888
H25	6.8351058	4.6789425	-1.0671979
C39	-9.0629652	-3.7163934	0.1814118
H22	-9.1117329	-4.4573439	0.9868396
H27	-9.3133727	-4.2312635	-0.7484897
H28	-9.8320075	-2.9674192	0.3782526
C40	9.0629652	3.7163934	0.1814118
H26	9.1117329	4.4573439	0.9868396
H29	9.3133727	4.2312635	-0.7484897
H30	9.8320075	2.9674192	0.3782526
H31	-5.9908944	6.6992942	-0.1819318
H34	5.9908944	-6.6992942	-0.1819318

5'b + 2H$^+$: total energy: -1575.407534au

Atom	X (Å)	Y (Å)	Z (Å)

C1	-1.3389896	0.4727077	-0.0771795
C4	1.3493324	-0.4470343	-0.0797316
C2	-1.0575011	-0.9296074	-0.0825534
C6	-0.2663663	1.3716347	-0.0842568
C5	1.0679133	0.9551692	-0.0824716
C3	0.2765867	-1.3459861	-0.0868415
H6	-0.5028631	2.4275854	-0.106311
H3	0.5130599	-2.4018848	-0.1112617
C7	-2.1666999	-1.8712989	-0.1186485
C8	-2.1121145	-3.2037298	0.0982896
H2	-3.1259377	-1.4087372	-0.3308016
H7	-1.1701899	-3.6690801	0.3702781
C9	2.1773477	1.8965286	-0.1181606
C10	2.1231735	3.2290186	0.0985814
H5	3.13651	1.4336061	-0.3299726
H9	1.1812361	3.6947782	0.3698015
C11	-2.6656619	0.9728438	-0.0575874
C12	-3.7864641	1.4366004	-0.0222715
C13	2.67514	-0.9494907	-0.0628699
C14	3.7921241	-1.4225202	-0.0284632
C15	-3.2481295	-4.110219	0.0206405
C16	-5.3383418	-5.9916367	-0.074288
C17	-4.5480991	-3.751725	-0.4064857
C22	-3.0695828	-5.4489519	0.3827862
N1	-4.0937502	-6.3226944	0.3243132
C20	-5.57879	-4.679789	-0.44821
H8	-4.7511818	-2.7344447	-0.7168719
H13	-6.5701666	-4.3968138	-0.7766904
C21	3.2595318	4.1351114	0.0215366
C18	5.3503066	6.0159501	-0.0724852
C23	4.5596793	3.7761756	-0.4046785
C24	3.0811083	5.4739807	0.383251
N2	4.1055465	6.3474265	0.3252501
C26	5.590644	4.7039552	-0.4459652
H10	4.7626926	2.7587738	-0.7147079
H17	6.5821556	4.4206503	-0.7737569
C27	-5.097138	1.9847574	0.015899
C28	-7.7019846	3.083233	0.096421
C29	-5.4001417	3.167601	-0.683614
C30	-6.1165885	1.3640819	0.7605338
C31	-7.3918084	1.9107429	0.7980803
C32	-6.6807871	3.6997377	-0.6397641
H1	-4.6257069	3.6601336	-1.2594148
H19	-5.8946166	0.4649332	1.3239361
H20	-8.161281	1.4248333	1.3882445
H21	-6.8947842	4.6126657	-1.1853918
C33	5.0948019	-1.9893379	0.0085944

C34	7.6788716	-3.1355586	0.0921919
C35	5.3758618	-3.1807806	-0.6877876
C36	6.126313	-1.3828939	0.7461701
C37	7.392652	-1.9529135	0.7844964
C38	6.6455055	-3.7352716	-0.643346
H4	4.5921445	-3.6599926	-1.2622844
H23	5.9229701	-0.4751362	1.3027422
H24	8.172813	-1.4756529	1.367401
H25	6.8428141	-4.6527553	-1.1880151
C39	-9.0963737	3.6523005	0.1136026
H22	-9.6725574	3.2834491	-0.7420356
H27	-9.0837964	4.7422963	0.0505863
H28	-9.635143	3.3665707	1.018919
C40	9.0510389	-3.7554282	0.1320413
H26	9.4896486	-3.8000019	-0.8695143
H29	9.006545	-4.7811634	0.5094082
H30	9.7293846	-3.1897882	0.7722551
H11	-6.0811969	-6.7768609	-0.0826312
H14	6.0933799	6.800971	-0.0805214
H15	3.9271309	7.309998	0.5966606
H12	-3.9152635	-7.2851611	0.5960409
H16	-2.1216206	-5.8446145	0.7222402
H18	2.1330278	5.8699757	0.7219875

5'c + 2H$^+$: total energy: -1575.419304au

Atom	X (Å)	Y (Å)	Z (Å)
C1	-1.3482572	0.4574506	-0.0750263
C4	1.3554547	-0.439745	-0.0779702
C2	-1.0475403	-0.9436436	-0.0821604
C6	-0.2839095	1.3659228	-0.0822612
C5	1.0547639	0.9612717	-0.0823137
C3	0.2910254	-1.3482366	-0.0849682
H6	-0.5311614	2.419454	-0.1044316
H3	0.5382479	-2.4017244	-0.1093864
C7	-2.1442564	-1.8929426	-0.1238998
C8	-2.0790678	-3.2295806	0.0879454
H2	-3.1089387	-1.4422566	-0.335966
H7	-1.1333624	-3.6899081	0.3599645
C9	2.1515607	1.9104367	-0.1240442
C10	2.0866991	3.2468552	0.0892839
H5	3.1159938	1.4598394	-0.3374974
H9	1.1412611	3.706912	0.3626511
C11	-2.6779749	0.9420054	-0.0519688
C12	-3.8028737	1.3977463	-0.012382
C13	2.6847083	-0.9256415	-0.0576463
C14	3.8073431	-1.387086	-0.0191766

C15	-3.2084976	-4.1249583	-0.0003556
C16	-5.2217024	-6.0908635	-0.0804753
C17	-4.5112998	-3.7986725	-0.4133878
N3	-2.9974906	-5.430251	0.3457654
C19	-3.9455666	-6.3994238	0.3170877
C20	-5.4999966	-4.7644902	-0.4504007
H8	-4.7328575	-2.7842987	-0.7135026
H12	-3.6296981	-7.38906	0.6189668
H13	-6.4986691	-4.4954937	-0.7741051
C21	3.2160655	4.1422789	0.0007537
C18	5.2292301	6.1081958	-0.0796929
C23	4.518373	3.8163791	-0.4140996
N4	3.005473	5.4472292	0.3484173
C25	3.9535463	6.4163919	0.319622
C26	5.507076	4.7821879	-0.4512457
H10	4.7395665	2.8022931	-0.7154518
H16	3.638047	7.4057276	0.6228674
H17	6.5053738	4.513463	-0.7763283
C27	-5.1150617	1.9375804	0.027256
C28	-7.7243995	3.0214226	0.1069154
C29	-5.4124184	3.1434245	-0.6357843
C30	-6.1422293	1.2862591	0.7350787
C31	-7.4195348	1.8264881	0.7729457
C32	-6.6955683	3.6677711	-0.5929351
H1	-4.631924	3.658178	-1.1833172
H19	-5.9248055	0.3686244	1.2696065
H20	-8.1959045	1.3176673	1.3338956
H21	-6.9068228	4.5972853	-1.1107209
C33	5.114248	-1.9395191	0.0199037
C34	7.709224	-3.0570571	0.1042262
C35	5.396637	-3.151367	-0.6409634
C36	6.149619	-1.2982219	0.7228359
C37	7.421104	-1.8549287	0.7622703
C38	6.6718931	-3.6913426	-0.5965919
H4	4.6098336	-3.6564716	-1.1884715
H23	5.9452012	-0.3743822	1.2517496
H24	8.204814	-1.3519725	1.3180361
H25	6.87164	-4.6239826	-1.1137589
C39	-9.1212278	3.583039	0.1218151
H22	-9.680552	3.2418119	-0.7562786
H27	-9.1134674	4.6746694	0.0971231
H28	-9.6734735	3.2624532	1.0069884
C40	9.0886962	-3.65932	0.1407507
H26	9.5266821	-3.6909632	-0.8618273
H29	9.0575854	-4.6882987	0.5101685
H30	9.7603274	-3.0888735	0.7836616
H11	-5.9810206	-6.8603092	-0.1065609

H14	5.9885378	6.8776478	-0.1058578
H32	-2.0657656	-5.6920249	0.650416
H18	2.0741245	5.7087473	0.6544463

3 Acid sensing

3.1 Sample preparation of fluorescent solutions

The fluorescent solutions used for taking the picture contained concentrations of a dye $2 \cdot 10^{-6}$ mol L^{-1} and an acid of 0.13 mol L^{-1}. To prepare these solutions the corresponding amount of acid has been weight out in 5 mL vials and a stock solution (10^{-3} mol L^{-1}) of the used cruciform fluorophor was mixed in dichlormethane.

In order to set up the fluorescent solvent, a volume of 200 µL of the stock solution was taken with a glass syringe and placed in a 100 mL graduated cylinder. The cylinder was replenished with the corresponding solvent to obtain a concentration of $2 \cdot 10^{-6}$ mol L^{-1}. Using a 5 mL graduated pipette the fluorescent solvent was distributed to each vial. After that the cap was screwed on and the vials were shaken.

Following solvents and acids have been used: dichloromethane, ethyl acetate, acetonitrile, dimethylformamide, isopropanol, methanol, 4-hydroxybenzoic acid (B, $pK_a = 4.55$)[4], 2-(4-hydroxyphenyl)acetic acid (C, $pK_a = 4.50$)[4], ibuprofen (D, $pK_a = 4.50$)[4] (purchased from ABCR), aspirine (E, $pK_a = 3.48$)[5], 4-methylbenzoic acid (F, $pK_a = 4.35$)[5], phenylacetic acid (G, $pK_a = 4.28$)[4], 4-chlorophenylacetic acid (H, $pK_a = 4.19$)[4], benzoic acid (I, $pK_a = 4.19$)[4], 3,5-dihydroxybenzoic acid (J, $pK_a = 4.04$) [4], 2-fluorobenzoic acid (K, $pK_a = 3.27$)[5], 2,4-dichlorobenzoic acid (L, $pK_a = 2.76$[4]) and trifluoroacetic acid (M, $pK_a = 0.52$)[5].

3.2 Settings of the image acquisition

To take pictures of the emission color all vials have been placed on an UV lamp (Herolab NU-15, excitation wavelength 365 nm) and were photographed with a digital camera (Canon EOS 7D). The UV lamp was also used as a light source with an excitation wavelength of 365 nm. A photograph and sketch of the setup is shown in Figure S 3. The camera and vials have been placed in a self-made black box for protection against stray light. The camera was connected via USB to a laptop and was controlled using the program EOS Utility provided by Canon.

All pictures have been recorded with a focal aperture of F2.8, a film speed of ISO 100 and a shutter speed between 0.2 to 0.04 seconds. The photographs were saved either in file format JPEG or RAW with a resolution of 5184 x 3456 pixels. Corresponding to their format the color depth of a JPEG image was 24 bit and of a RAW image 42 bit.

Saving as a JPEG picture the white balance was varied between automatic and 6500 K.

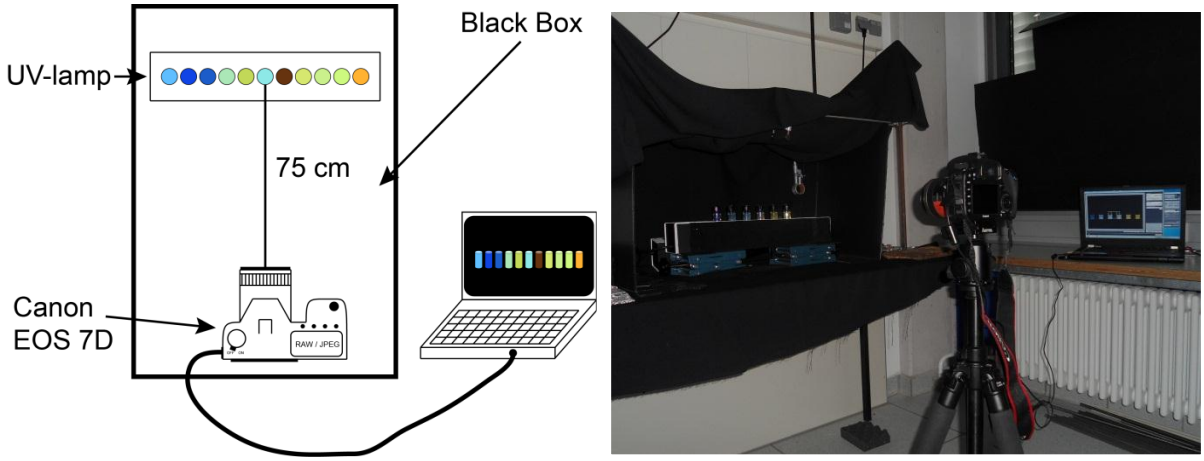


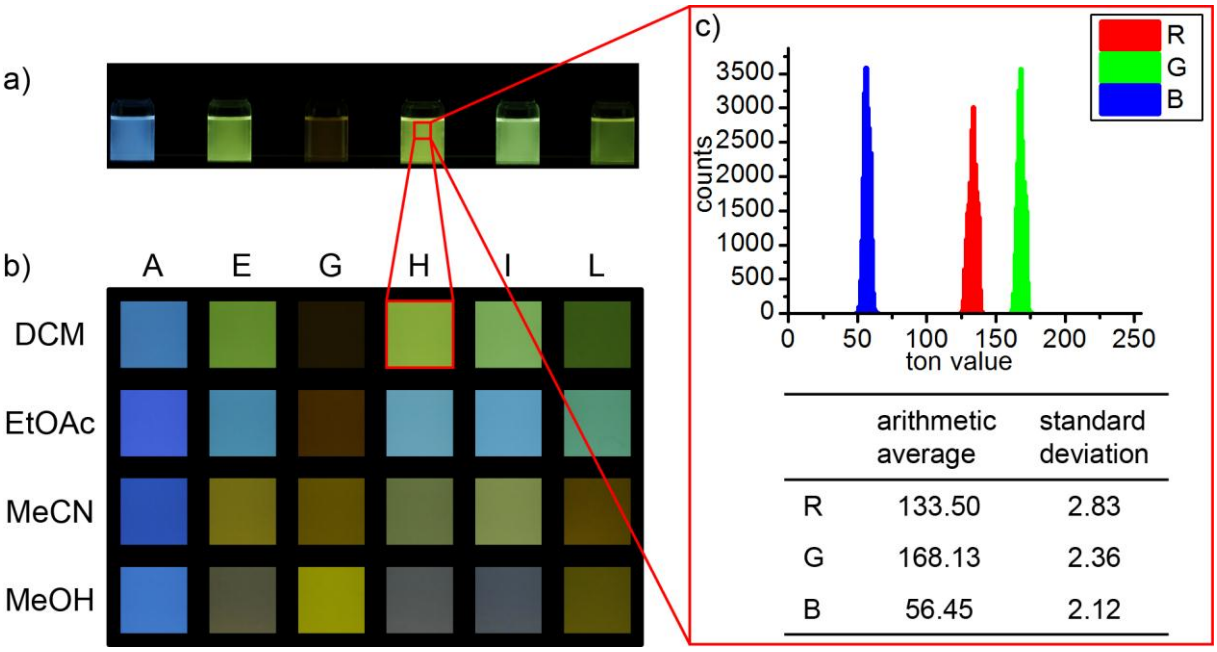
Figure S 3 Setup for taking photographs of emission color.

3.3 Extraction of RGB values

Retaining the color space a JPEG picture was opened with Adobe Photoshop CS5 Extendent Version 12.0 and was used instantly for determining RGB values.

Opening a RAW picture in Adobe Photoshop a Camera RAW Converter opened. In this converter all settings were adopted except to basic settings. The white balance was set with a color temperature of 6500 K and all other settings (tint, exposure, recovery, fill light, black, brightness, contrast, clarity, vibrancy and saturation) were set to zero. Additionally the color space was set to sRGB IEC61966-2.1, Adobe RGB (1998) or ProPhoto RGB with a color depth of 16 bit for each ton value.

To determine numeric ton values of each emission color a segment of 141 x 141 pixels was selected and Adobe Photoshop determined the arithmetic average and standard deviation of each color in an 8 bit ton value. This segment was also copied in Microsoft PowerPoint 2010 or Adobe Illustrator CS5 to build up an array of all emission colors (this procedure is shown in Figure S 4).



	arithmetic average	standard deviation
R	133.50	2.83
G	168.13	2.36
B	56.45	2.12

Figure S 4 The original picture of **XF 5c** dissolved in DCM in 5 mL vials with 5 different acids (A = reference, E = aspirin, G = phenylacetic acid, H = 4-chlorophenylacetic acid, I = benzoic acid, L = 2,4-dichlorobenzoic acid) (a). A segment of 141 x 141 pixels (marked red) is used to build up the array of all emission colors for six acids in four solvents (b) and to determine the arithmetic average and standard deviation of the ton value (c).

3.4 Converting RGB values to XYZ values:[6]

The extracted RGB values have been divided by 255, the number of ton values, to be in the range of zero to one. We define:

$$\mathcal{V} \in \{R, G, B\}$$

$$R, G, B \in [0; 1]$$

$$\mathcal{v} \in \{R', G', B'\}$$

The first step is to respect the Gama function. For the color space sRGB following is defined:

$$\mathcal{v} \begin{cases} \dfrac{\mathcal{V}}{12.92} & \mathcal{V} \leq 0.04045 \\ \left(\dfrac{\mathcal{V} + 0.055}{1.055}\right)^{2.4} & \mathcal{V} > 0.04045 \end{cases} \qquad \text{(S I)}$$

For all other color spaces (Adobe RGB, ProPhoto RGB) it is defined:

$$\mathcal{v} = \mathcal{V}^{\gamma} \qquad \text{(S II)}$$

The next step is to convert the R'G'B' values with the matrix [M] into tristimulus values XYZ of the color space CIE XYZ:

$$\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = [M] \begin{pmatrix} R' \\ G' \\ B' \end{pmatrix} \qquad \text{(S III)}$$

Color Space	Matrix $[M]$ with white point D50
sRGB	$\begin{pmatrix} 0.4360747 & 0.3850649 & 0.1430804 \\ 0.2225045 & 0.7168786 & 0.0606169 \\ 0.0139322 & 0.0971045 & 0.7141733 \end{pmatrix}$
Adobe RGB (1998)	$\begin{pmatrix} 0.6097559 & 0.2052401 & 0.1492240 \\ 0.3111242 & 0.6256560 & 0.0632197 \\ 0.0194811 & 0.0608902 & 0.7448387 \end{pmatrix}$
ProPhoto RGB	$\begin{pmatrix} 0.7976749 & 0.1351917 & 0.0313534 \\ 0.2880402 & 0.7118741 & 0.0000857 \\ 0 & 0 & 0.8252100 \end{pmatrix}$

For these conversions an Excel file has been written.

3.5 Conversion of XYZ values in u'v' values of the CIE LUV color space:[7]

For this transformation following equations have been used:

$$u' = \frac{4X}{X + 15Y + 3Z} \qquad \text{(S IV)}$$

$$v' = \frac{9Y}{X + 15Y + 3Z} \qquad \text{(S V)}$$

For these conversions an Excel file has been written.

3.6 Conversion of emission spectra into u'v' values:[7]

First the emission spectra (5 nm step width) have been normalized. After that the XYZ values have been calculated with following equations:

$$X = 5 * k \sum_{360nm}^{800nm} P(\lambda)\bar{x}(\lambda) \qquad \text{(S VI)}$$

$$Y = 5 * k \sum_{360nm}^{800nm} P(\lambda)\bar{y}(\lambda) \qquad \text{(S VII)}$$

$$Z = 5 * k \sum_{360nm}^{800nm} P(\lambda)\bar{z}(\lambda) \qquad \text{(S VIII)}$$

$$k = \frac{100}{5 * \sum_{360nm}^{800nm} P(\lambda)\bar{y}(\lambda)} \qquad \text{(S IX)}$$

For the transformation into u'v' values the equations (S IV) and (S V) have been used.

3.7 Emission spectra of 5a (A) and 5a + acid (B-M) Calibration Set:

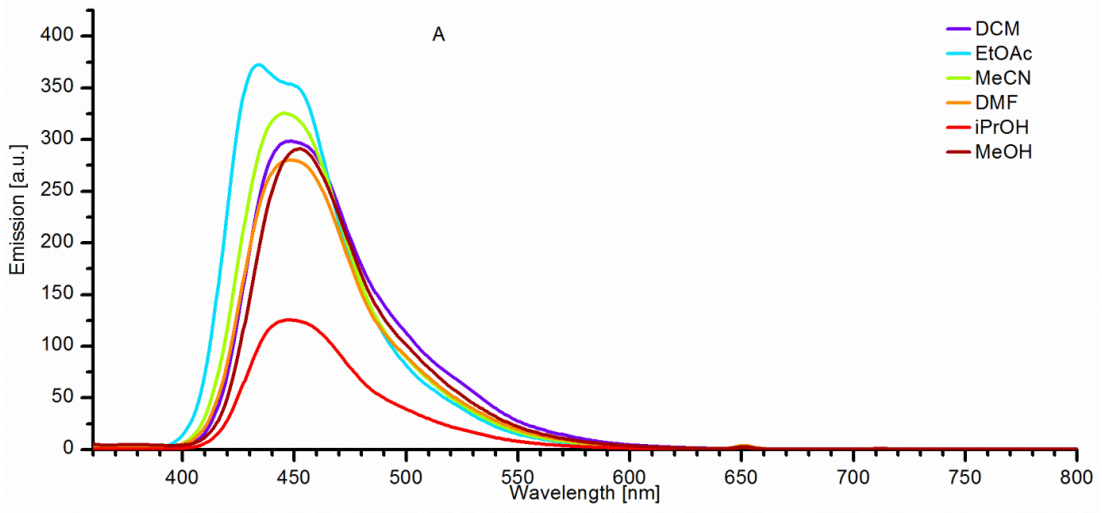


Figure S 5 Emission spectra of **5a** in different solvents.

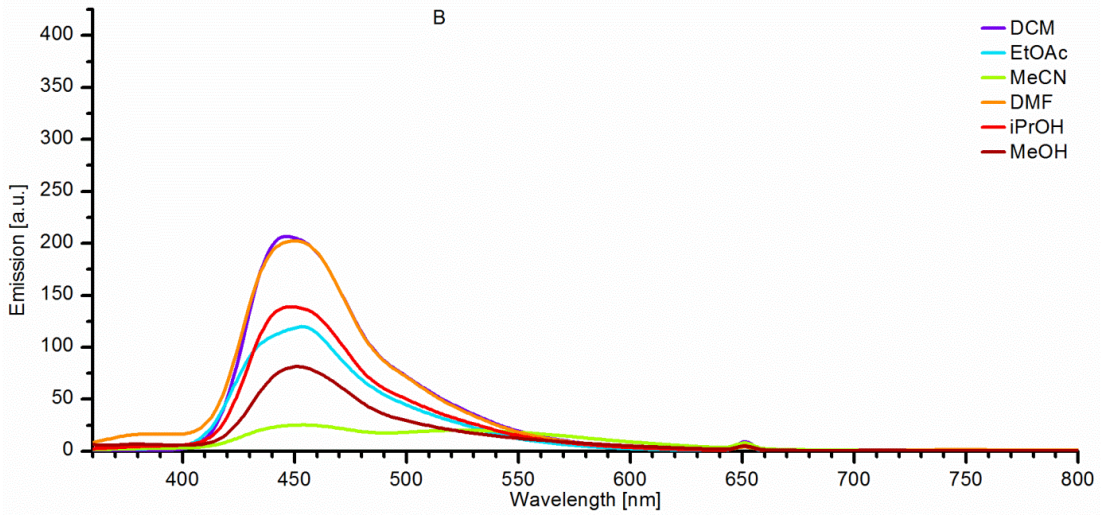


Figure S 6 Emission spectra of **5a + B** in different solvents.

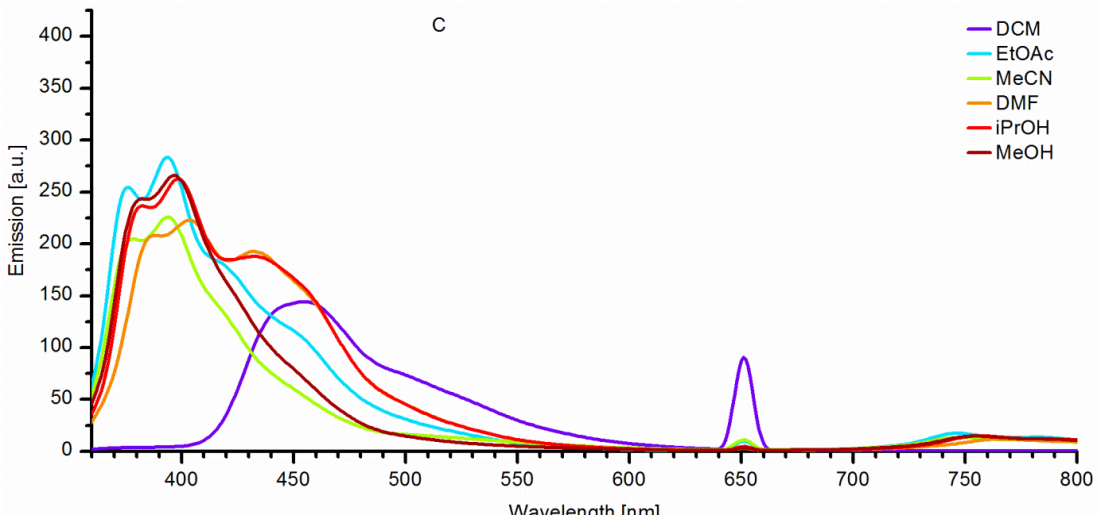


Figure S 7 Emission spectra of **5a + C** in different solvents.

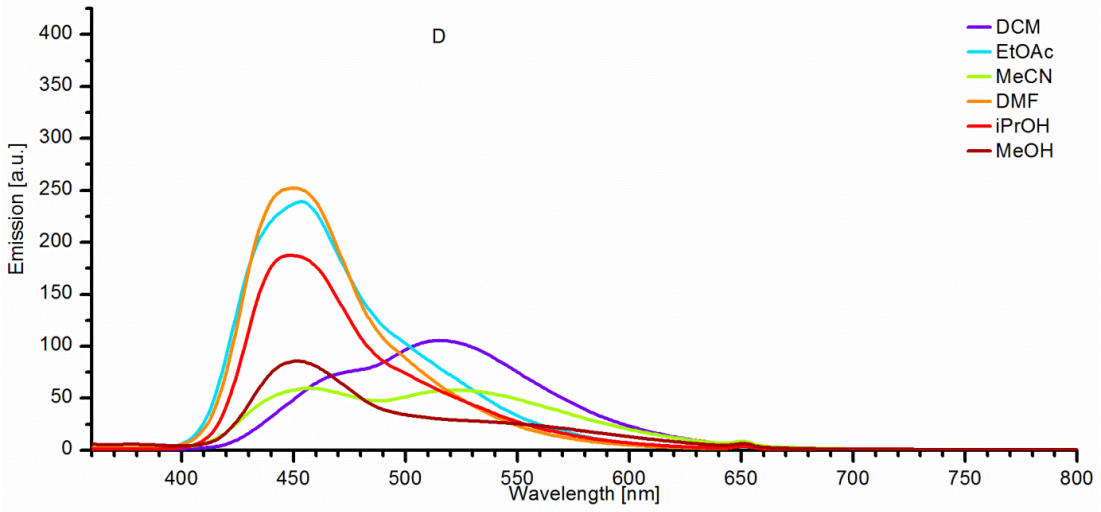


Figure S 8 Emission spectra of **5a + D** in different solvents.

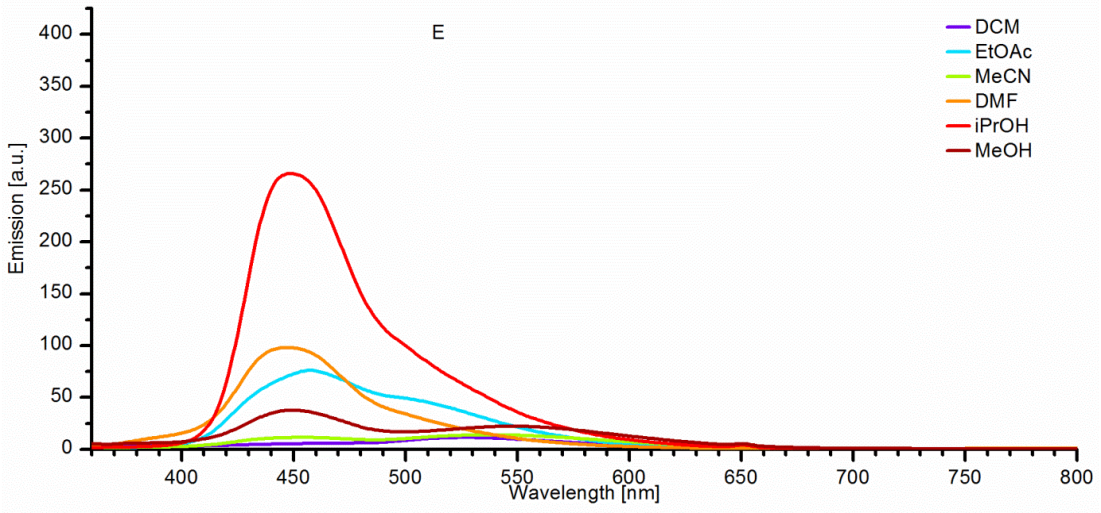


Figure S 9 Emission spectra of **5a + E** in different solvents.

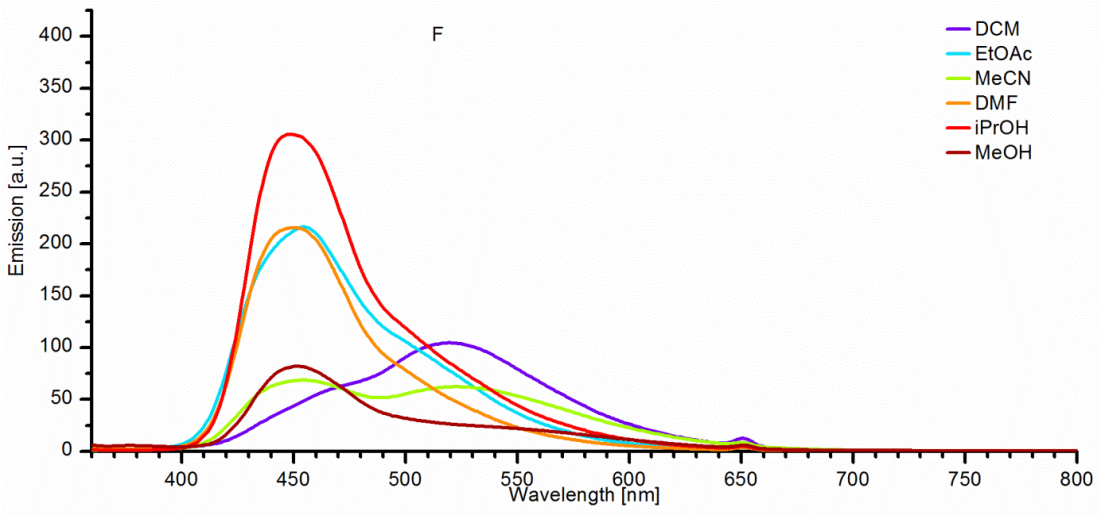


Figure S 10 Emission spectra of **5a + F** in different solvents.

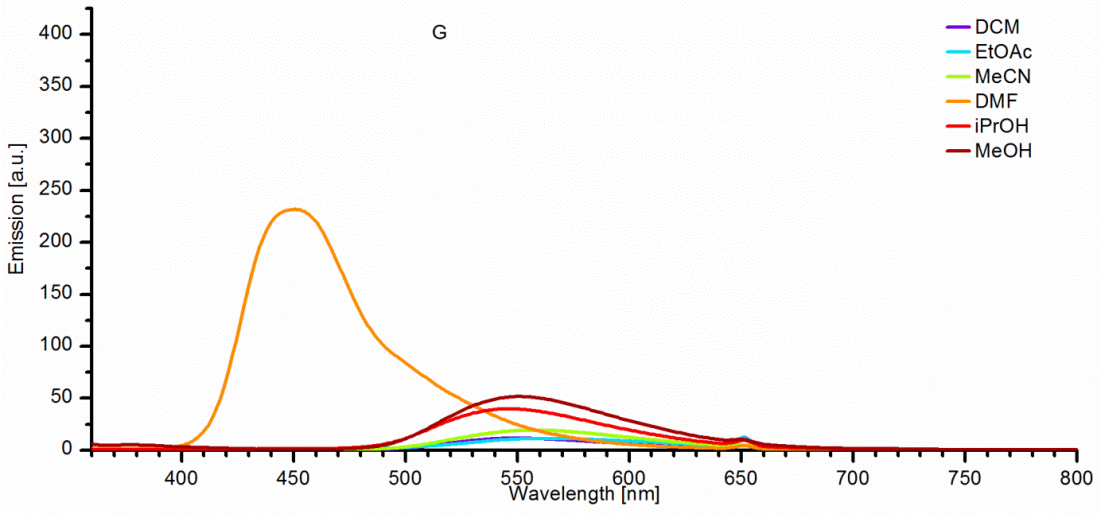


Figure S 11 Emission spectra of **5a + G** in different solvents.

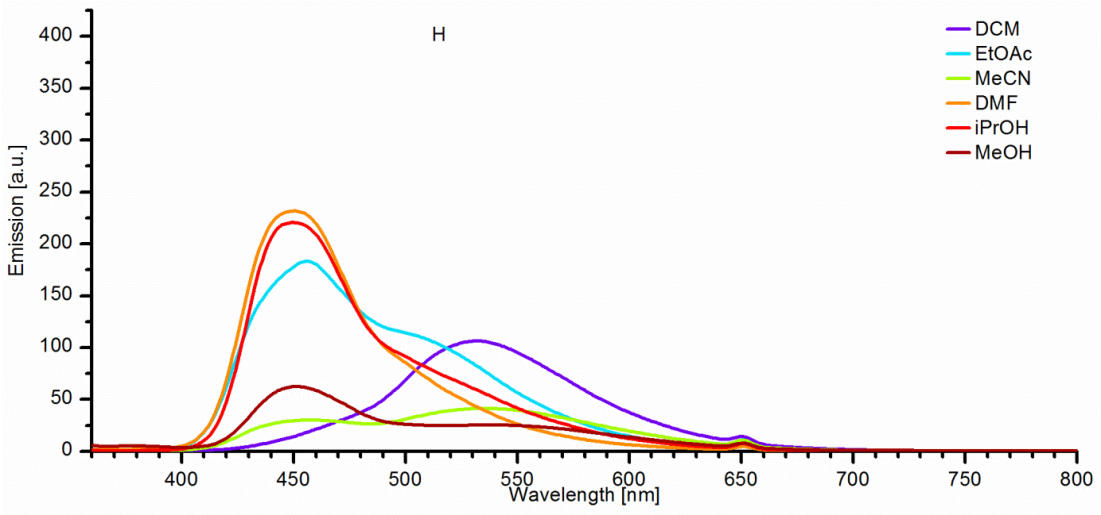


Figure S 12 Emission spectra of **5a + H** in different solvents.

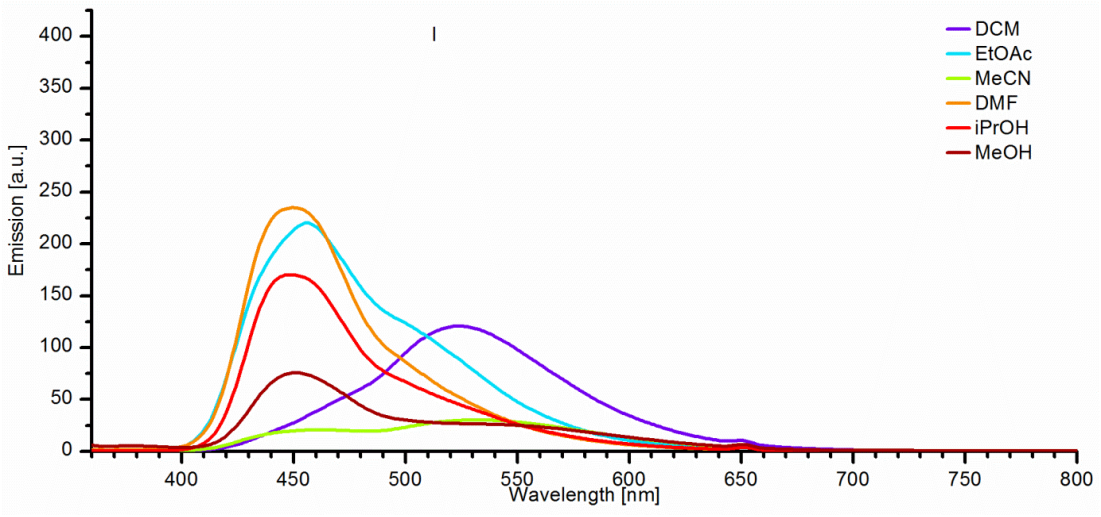


Figure S 13 Emission spectra of **5a + I** in different solvents.

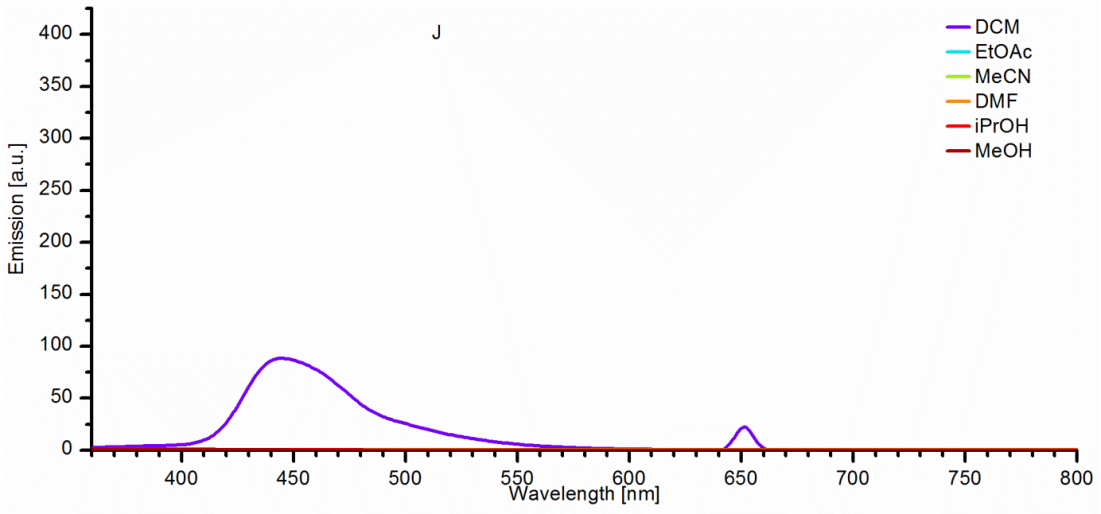


Figure S 14 Emission spectra of **5a + J** in different solvents.

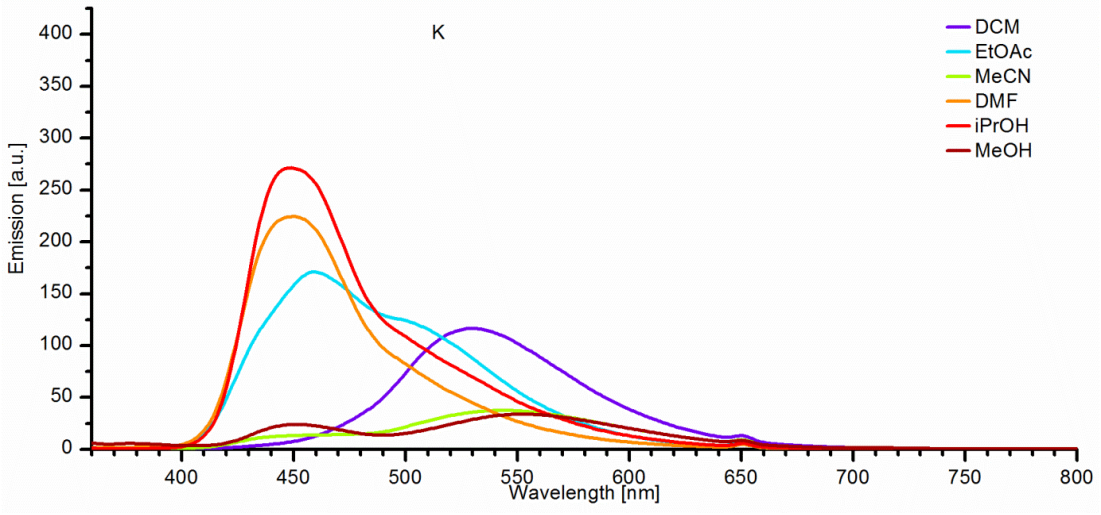


Figure S 15 Emission spectra of **5a + K** in different solvents.

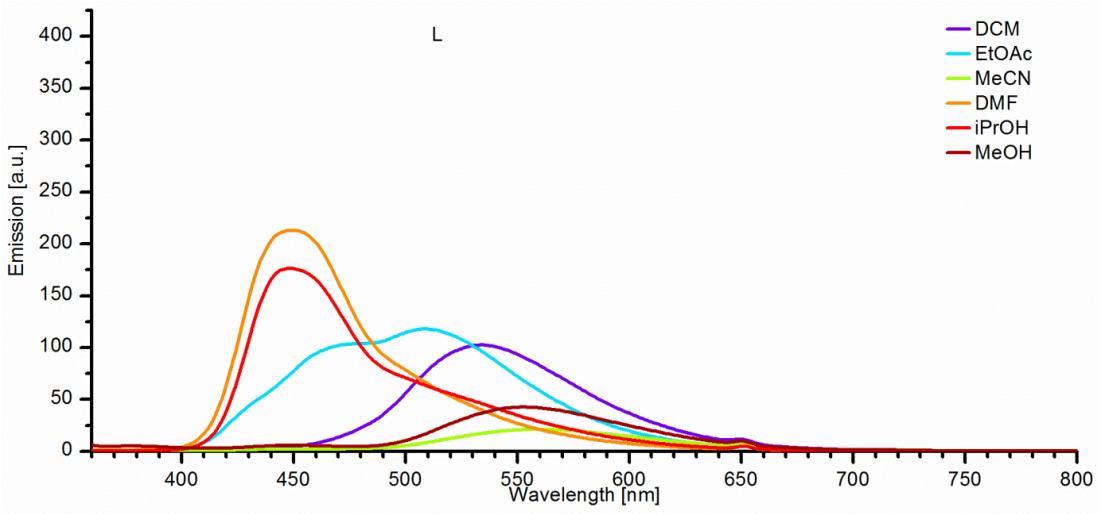


Figure S 16 Emission spectra of **5a + L** in different solvents.

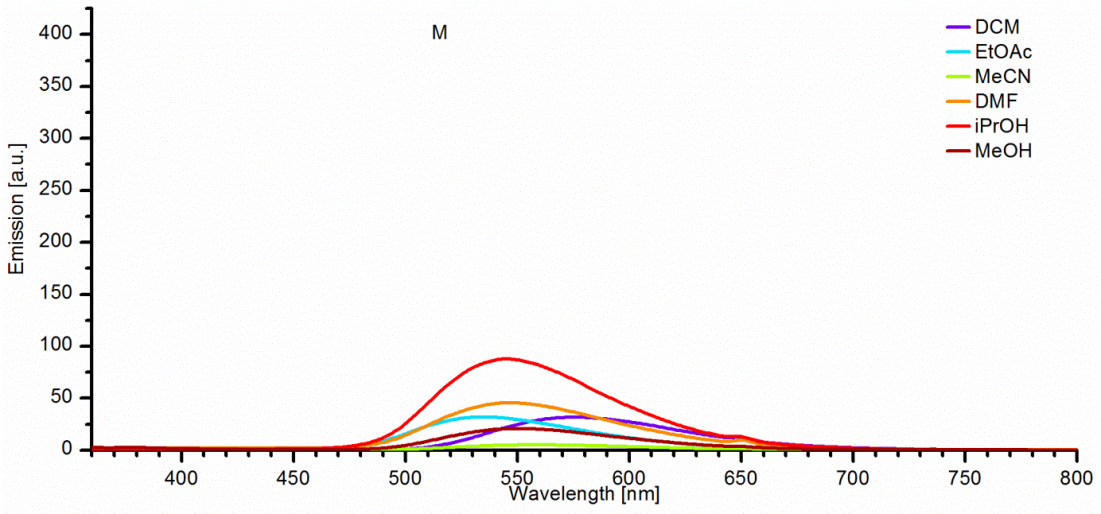


Figure S 17 Emission spectra of **5a + M** in different solvents.

3.8 Emission spectra of 5a (1) and 5a + acid (2-12) Test Set:

Order of the test data set:

1 = **5a**, 2 = **5a** + H, 3 = **5a** + C, 4 = **5a** + F, 5 = **5a** + K, 6 = **5a** + I, 7 = **5a** + J, 8 = **5a** + D, 9 = **5a** + G, 10 = **5a** + L, 11 = **5a** + E, 12 = **5a** + B:

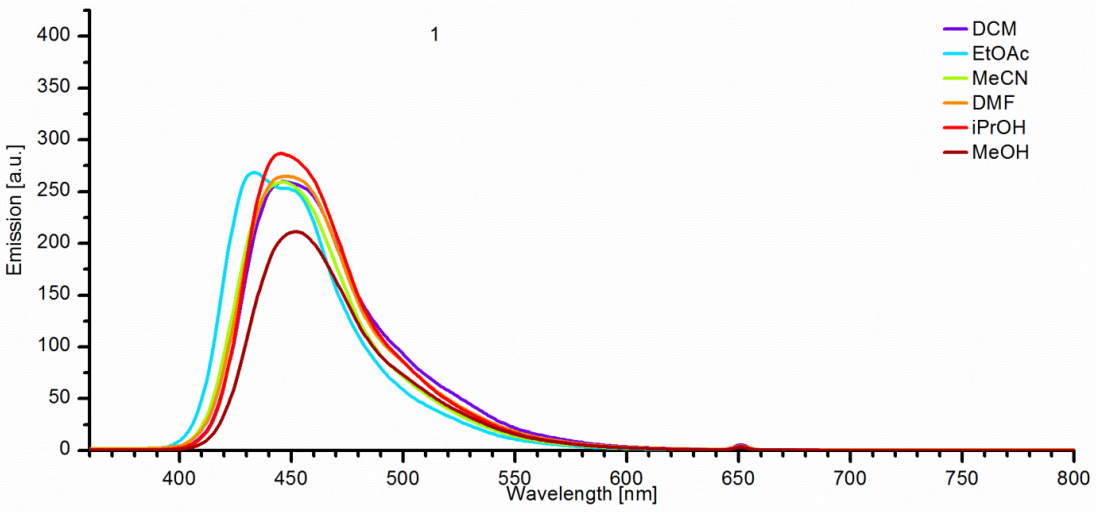


Figure S 18 Emission spectra of **5a** in different solvents.

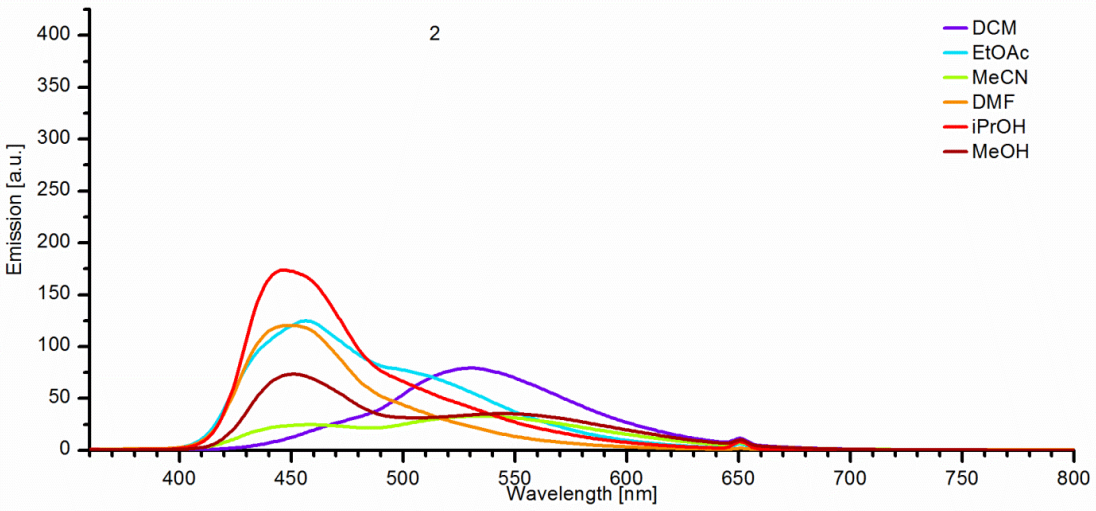


Figure S 19 Emission spectra of **5a +** unknown acid in different solvents.

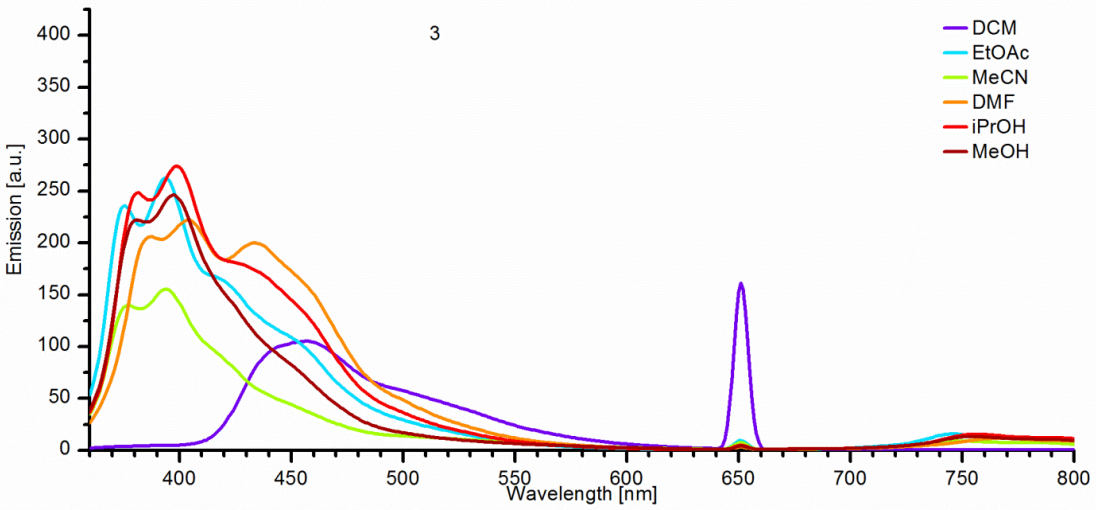


Figure S 20 Emission spectra of **5a +** unknown acid in different solvents.

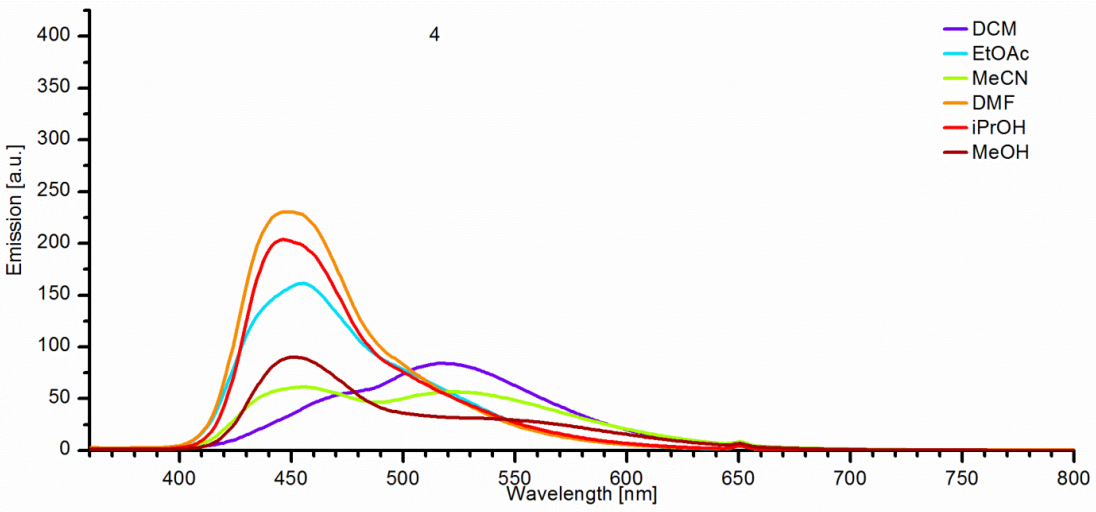


Figure S 21 Emission spectra of **5a +** unknown acid in different solvents.

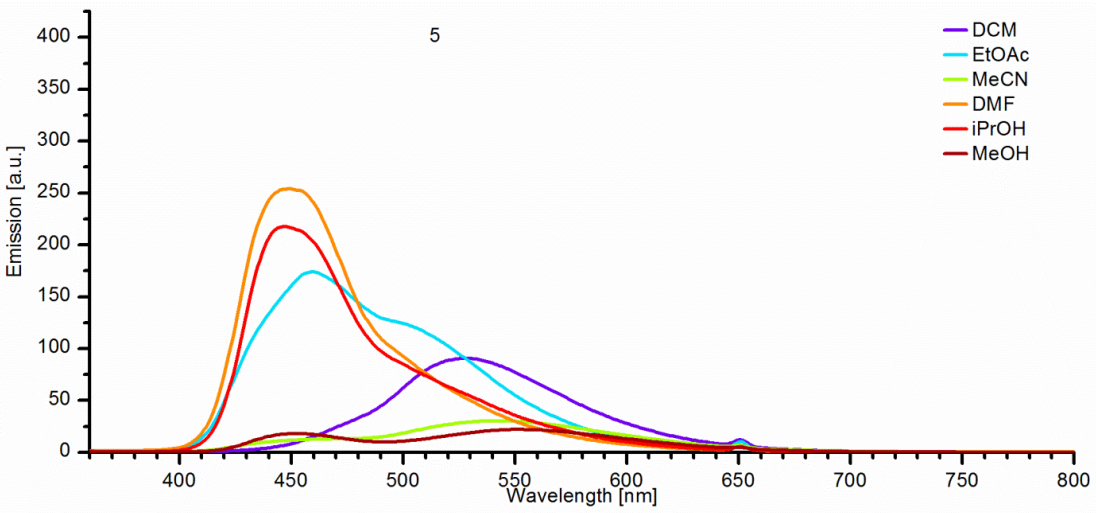


Figure S 22 Emission spectra of **5a +** unknown acid in different solvents.

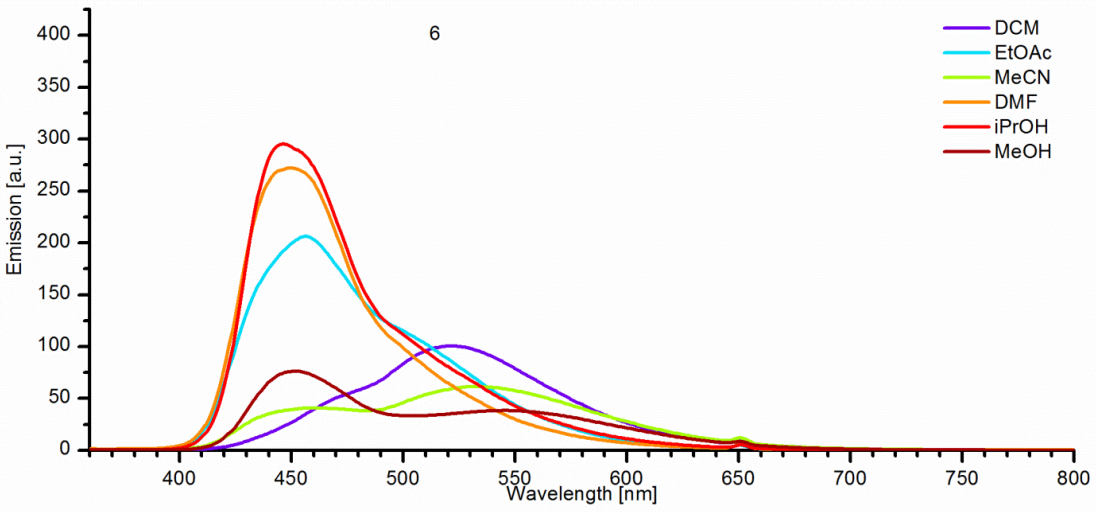


Figure S 23 Emission spectra of **5a +** unknown acid in different solvents.

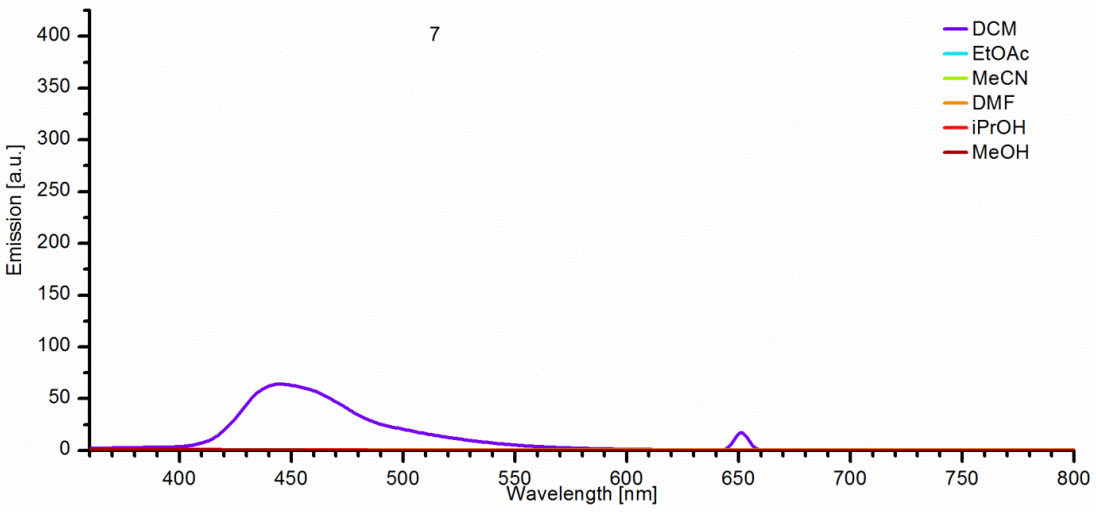


Figure S 24 Emission spectra of **5a +** unknown acid in different solvents.

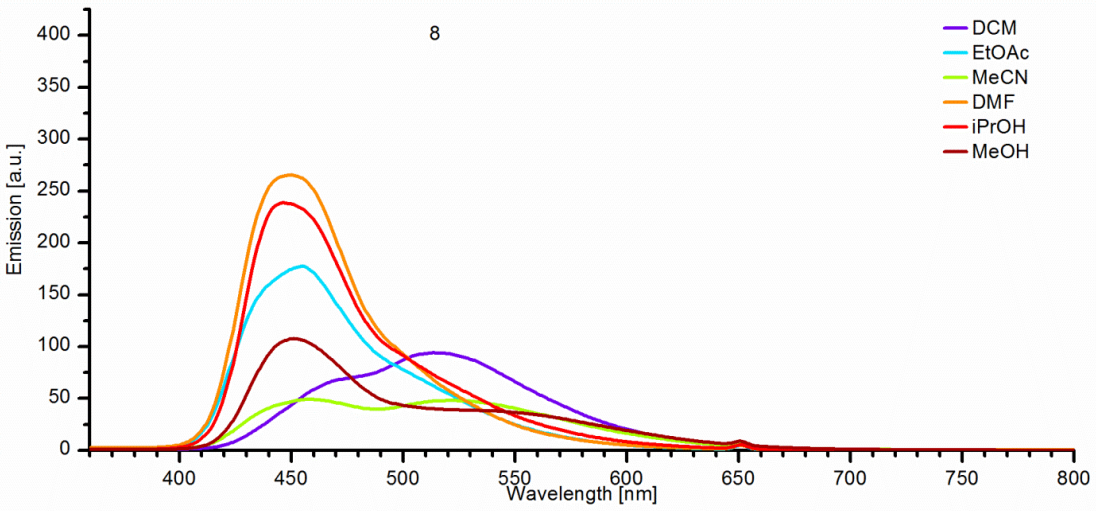


Figure S 25 Emission spectra of **5a +** unknown acid in different solvents.

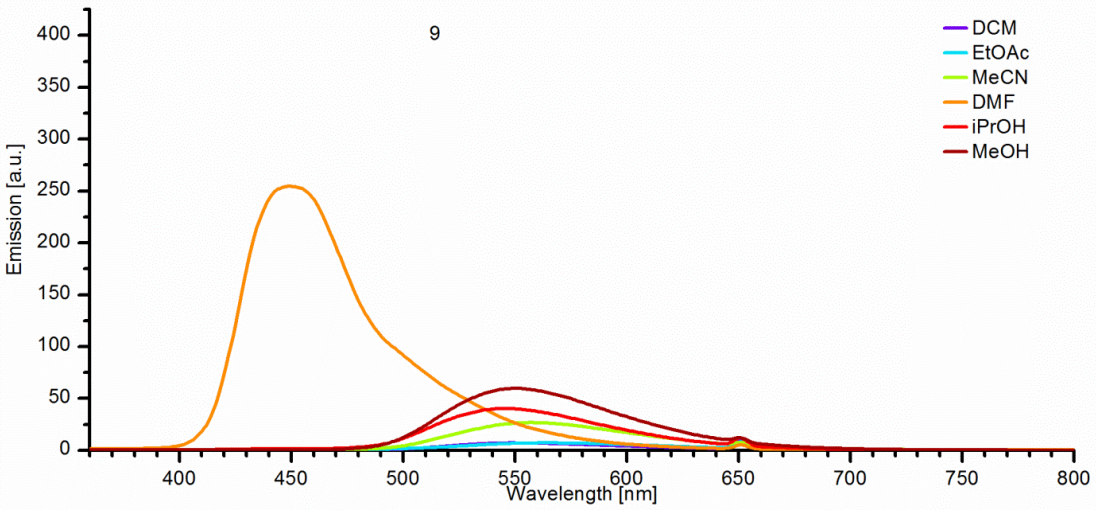


Figure S 26 Emission spectra of **5a +** unknown acid in different solvents.

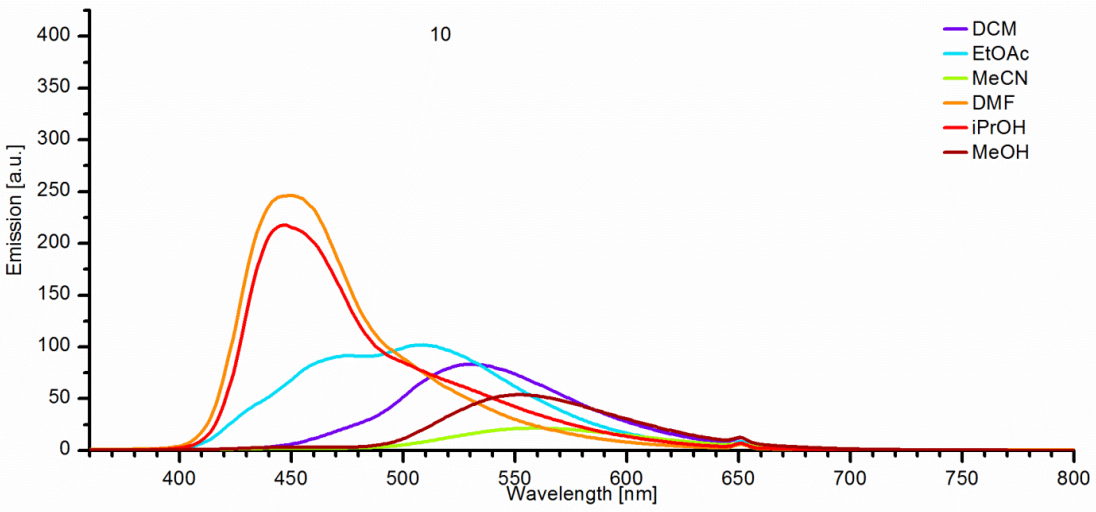


Figure S 27 Emission spectra of **5a +** unknown acid in different solvents.

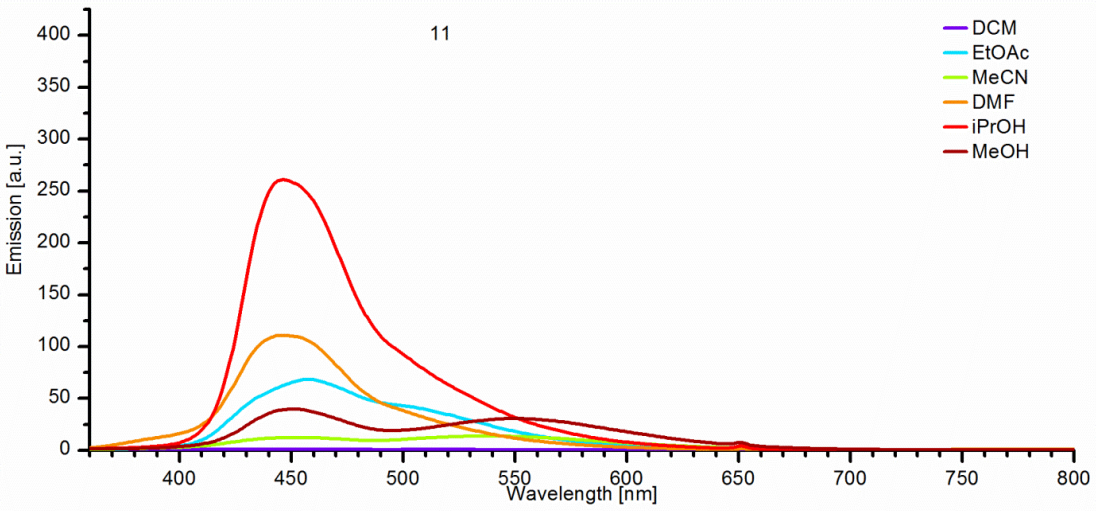


Figure S 28 Emission spectra of **5a +** unknown acid in different solvents.

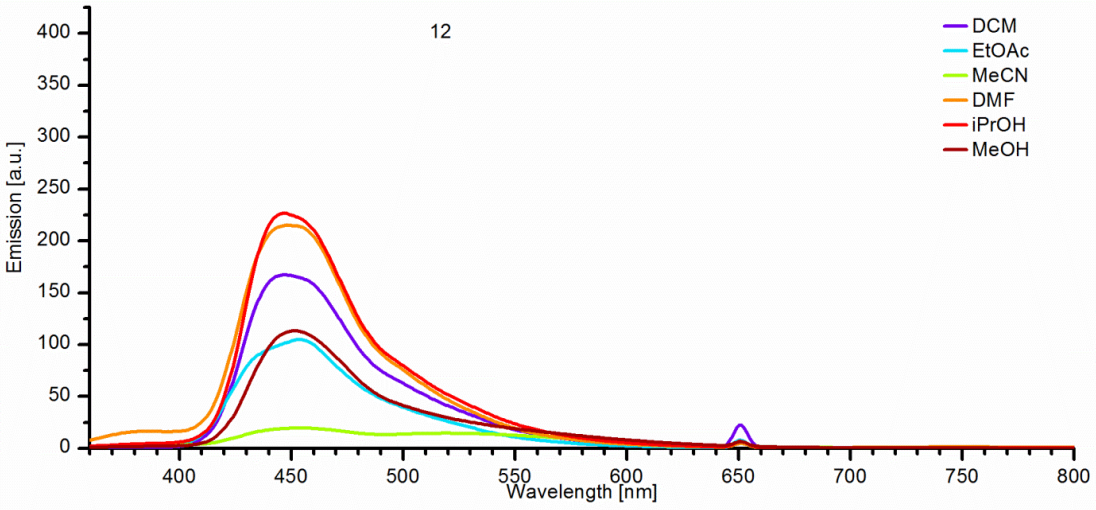


Figure S 29 Emission spectra of **5a +** unknown acid in different solvents.

3.9 Chromatic Adaption

To compare u'v' values extracted from pictures and emission spectra the white points of the color spaces CIE XYZ or u'v' have to be equal. Therefor the XYZ values of the pictures have been adapted from white point D50 to white point E using Bradford matrix[6] and following equation:

$$\begin{pmatrix} X' \\ Y' \\ Z' \end{pmatrix} = [M] \begin{pmatrix} X \\ Y \\ Z \end{pmatrix} \qquad \text{(S XII)}$$

$$[M] = \begin{pmatrix} 1.0025535 & 0.0036238 & 0.0359837 \\ 0.0096914 & 0.9819125 & 0.0105947 \\ 0.0089181 & -0.0160789 & 1.2208770 \end{pmatrix}$$

4 Multivariate Analysis of Variance of the Experimentally Obtained RGB and u'v' values

The obtained RGB or u'v' value of a color are used as a vector. Each acid fluorophore complex (AFC) is described by six colors (six solvents) and therefor with six vectors. In the analysis the deviation σ is determined between an unknown ACF (test) and a known ACF (calibration) using following equation:

$$\sigma_{test,cal}(R,G,B) = \frac{\sqrt{\sum_{solv=1}^{6}((R_{test}-R_{cal})^2+(G_{test}-G_{cal})^2+(B_{test}-B_{cal})^2)}}{3*6} \qquad \text{(S X)}$$

$$\sigma_{test,cal}(u',v') = \frac{\sqrt{\sum_{solv=1}^{6}((u'_{test}-u'_{cal})^2+(v'_{test}-v'_{cal})^2)}}{3*6} \qquad \text{(S XI)}$$

Each unknown AFC(test) n is compare with every AFC(calibration) m and the smallest value of the deviation $\sigma_{n,m}$ indicates the identity of the unknown AFC. With this method a n x m matrix is formed when using n unknown AFCs and m AFCs for calibration.

4.1 Tables of correlations:

The patches of the data set for calibration are named with letters and the patches of the test data set are named with numbers. In the test data set the order was unknown except for 1 = A.

Order of the test data set recorded with a digital camera:

1 = A, 2 = E, 3 = K, 4 = I, 5 = C, 6 = L, 7 = H, 8 = G, 9 = F, 10 = D, 11 = J, 12 = B

Picture properties: file format: JPEG; color space: sRGB, white balance: automatic, shutter speed: 0.1s

Table S1: Autocorrelation C 0.1s in RGB values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
A	0.0	58.5	61.2	56.6	94.7	70.0	167.9	87.9	84.4	113.5	112.3	115.2	160.6
B	58.5	0.0	46.3	76.8	94.3	83.8	153.5	101.4	97.8	80.1	117.7	105.0	157.8
C	61.2	46.3	0.0	85.9	106.6	99.6	166.1	112.2	109.0	68.2	132.2	115.4	171.8
D	56.6	76.8	85.9	0.0	45.9	49.1	145.3	46.6	41.7	117.9	69.3	75.5	132.0
E	94.7	94.3	106.6	45.9	0.0	62.3	124.5	33.9	35.7	117.2	42.7	39.8	112.3
F	70.0	83.8	99.6	49.1	62.3	0.0	139.3	48.9	38.8	134.4	65.4	77.4	134.3
G	167.9	153.5	166.1	145.3	124.5	139.3	0.0	124.4	126.2	146.4	116.5	102.0	71.6
H	87.9	101.4	112.2	46.6	33.9	48.9	124.4	0.0	19.9	132.7	31.9	54.4	110.3
I	84.4	97.8	109.0	41.7	35.7	38.8	126.2	19.9	0.0	131.5	39.3	54.4	116.5
J	113.5	80.1	68.2	117.9	117.2	134.4	146.4	132.7	131.5	0.0	146.4	111.9	160.8
K	112.3	117.7	132.2	69.3	42.7	65.4	116.5	31.9	39.3	146.4	0.0	52.0	101.9
L	115.2	105.0	115.4	75.5	39.8	77.4	102.0	54.4	54.4	111.9	52.0	0.0	103.7
M	160.6	157.8	171.8	132.0	112.3	134.3	71.6	110.3	116.5	160.8	101.9	103.7	0.0

Table S2: Correlation C 0.1s T 0.1s in RGB values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	84.5	112.1	122.5	71.8	85.7	45.1	143.6	58.2	57.0	160.7	72.1	100.2	135.4
2	118.4	129.6	144.0	81.3	64.8	64.3	118.3	42.2	46.1	163.3	30.2	68.9	106.3
3	125.3	139.9	153.3	87.0	74.3	71.9	124.0	53.7	55.8	174.8	41.4	79.9	109.6
4	114.3	135.5	149.6	87.5	88.5	62.5	136.7	61.1	61.2	180.3	60.8	97.9	124.6
5	62.8	84.3	86.9	64.5	82.2	43.6	144.0	63.3	61.1	129.5	81.9	94.1	142.0
6	145.8	149.8	163.7	103.8	75.9	91.7	115.7	67.7	70.5	173.7	42.3	70.4	102.0
7	114.0	134.9	147.4	84.8	82.3	62.6	132.8	53.6	55.6	175.6	54.3	91.1	119.2
8	175.4	165.3	181.9	147.8	124.1	140.1	53.6	122.5	125.3	165.1	110.9	101.9	78.9
9	102.1	127.7	139.8	79.6	86.9	54.3	140.3	57.7	56.6	173.7	64.8	98.4	129.0
10	94.7	118.0	130.3	72.5	79.7	44.3	138.7	52.0	50.7	164.9	60.7	92.8	128.4
11	71.6	67.6	71.8	81.4	96.0	89.1	136.2	97.2	93.8	89.6	113.0	104.6	135.7
12	72.1	88.3	102.5	56.2	68.9	28.8	133.7	49.0	42.9	138.2	62.4	82.0	132.1

Table S3: Correlation C 0.1s T 0.04s in RGB values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	41.0	72.8	74.7	52.5	80.6	49.4	154.6	67.8	64.6	119.3	94.0	99.5	150.3
2	92.1	87.4	97.9	54.5	26.8	60.3	112.0	37.4	37.6	104.4	45.6	27.9	106.9
3	94.8	99.6	110.2	49.2	25.3	55.5	116.4	29.5	27.3	123.7	33.3	38.5	104.3
4	73.7	87.9	99.5	37.9	42.3	28.0	128.5	26.6	18.4	127.5	44.8	59.8	118.8
5	59.6	49.6	38.6	72.5	87.9	76.4	144.8	90.2	86.5	75.0	107.7	94.2	149.9
6	119.0	112.8	124.0	78.7	44.0	79.7	103.6	55.2	55.9	122.3	46.3	27.8	93.2
7	78.3	90.8	99.2	41.7	36.8	39.8	124.1	22.2	18.9	121.3	43.5	51.8	112.6
8	155.5	134.0	147.1	135.5	115.4	136.6	61.3	124.0	124.7	116.4	120.6	92.6	93.6
9	60.5	79.2	86.8	33.1	49.4	29.9	133.2	36.3	28.7	118.7	59.4	67.1	125.0
10	58.0	67.0	74.4	38.7	51.4	36.6	132.9	47.9	42.0	104.9	67.7	67.1	127.5
11	95.1	71.7	60.3	101.5	107.9	117.0	138.0	119.8	117.1	42.7	133.9	107.8	143.4
12	59.6	47.6	55.3	57.7	70.1	62.4	132.4	74.8	68.9	80.6	90.7	77.9	136.1

Table S4: Autocorrelation C 0.1s in u'v' values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
A	0.000	0.051	0.064	0.054	0.084	0.067	0.131	0.079	0.079	0.044	0.092	0.097	0.126
B	0.051	0.000	0.075	0.071	0.095	0.081	0.140	0.095	0.094	0.043	0.103	0.108	0.137
C	0.064	0.075	0.000	0.110	0.139	0.121	0.181	0.136	0.135	0.051	0.148	0.153	0.179
D	0.054	0.071	0.110	0.000	0.032	0.032	0.094	0.034	0.033	0.071	0.044	0.048	0.086
E	0.084	0.095	0.139	0.032	0.000	0.036	0.074	0.018	0.021	0.098	0.018	0.022	0.064
F	0.067	0.081	0.121	0.032	0.036	0.000	0.080	0.025	0.020	0.085	0.036	0.043	0.071
G	0.131	0.140	0.181	0.094	0.074	0.080	0.000	0.067	0.069	0.147	0.061	0.063	0.025

H	0.079	0.095	0.136	0.034	0.018	0.025	0.067	0.000	0.010	0.098	0.016	0.026	0.056
I	0.079	0.094	0.135	0.033	0.021	0.020	0.069	0.010	0.000	0.097	0.020	0.027	0.059
J	0.044	0.043	0.051	0.071	0.098	0.085	0.147	0.098	0.097	0.000	0.109	0.113	0.145
K	0.092	0.103	0.148	0.044	0.018	0.036	0.061	0.016	0.020	0.109	0.000	0.017	0.048
L	0.097	0.108	0.153	0.048	0.022	0.043	0.063	0.026	0.027	0.113	0.017	0.000	0.050
M	0.126	0.137	0.179	0.086	0.064	0.071	0.025	0.056	0.059	0.145	0.048	0.050	0.000

Table S5: Correlation C 0.1s T 0.1s in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	0.068	0.085	0.119	0.042	0.044	0.021	0.074	0.030	0.029	0.087	0.041	0.050	0.066
2	0.092	0.105	0.148	0.048	0.027	0.033	0.054	0.017	0.018	0.110	0.012	0.021	0.042
3	0.095	0.105	0.149	0.050	0.028	0.035	0.052	0.020	0.022	0.111	0.014	0.022	0.040
4	0.084	0.097	0.139	0.046	0.035	0.025	0.057	0.020	0.020	0.103	0.024	0.033	0.047
5	0.053	0.080	0.089	0.060	0.076	0.051	0.105	0.065	0.064	0.071	0.076	0.083	0.099
6	0.102	0.111	0.156	0.055	0.030	0.043	0.049	0.026	0.028	0.118	0.015	0.019	0.036
7	0.085	0.100	0.140	0.046	0.033	0.027	0.056	0.018	0.019	0.105	0.023	0.031	0.045
8	0.122	0.132	0.175	0.081	0.061	0.066	0.024	0.055	0.055	0.139	0.049	0.048	0.027
9	0.078	0.093	0.132	0.044	0.038	0.020	0.063	0.022	0.021	0.098	0.031	0.039	0.054
10	0.075	0.091	0.129	0.041	0.037	0.018	0.066	0.022	0.021	0.095	0.031	0.039	0.056
11	0.077	0.087	0.107	0.074	0.084	0.053	0.106	0.073	0.068	0.084	0.082	0.088	0.101
12	0.066	0.077	0.118	0.039	0.044	0.018	0.079	0.032	0.028	0.083	0.041	0.050	0.070

Table S6: Correlation C 0.1s T 0.04s in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	0.046	0.074	0.084	0.051	0.070	0.049	0.109	0.062	0.061	0.059	0.075	0.081	0.104
2	0.085	0.097	0.141	0.035	0.011	0.031	0.068	0.014	0.014	0.101	0.012	0.016	0.057
3	0.089	0.099	0.144	0.038	0.013	0.032	0.067	0.017	0.017	0.104	0.013	0.016	0.056
4	0.073	0.087	0.129	0.029	0.023	0.014	0.073	0.013	0.009	0.091	0.023	0.031	0.063
5	0.046	0.068	0.052	0.077	0.101	0.079	0.138	0.095	0.093	0.047	0.107	0.112	0.135
6	0.099	0.109	0.154	0.050	0.024	0.042	0.059	0.026	0.026	0.115	0.016	0.008	0.047
7	0.075	0.091	0.131	0.030	0.022	0.018	0.070	0.009	0.007	0.094	0.022	0.028	0.060
8	0.124	0.133	0.174	0.083	0.065	0.069	0.032	0.060	0.060	0.138	0.055	0.053	0.041
9	0.063	0.081	0.118	0.028	0.035	0.009	0.080	0.023	0.019	0.083	0.036	0.043	0.071
10	0.060	0.077	0.113	0.026	0.035	0.014	0.084	0.027	0.024	0.077	0.039	0.046	0.075
11	0.032	0.049	0.063	0.056	0.081	0.061	0.124	0.076	0.075	0.036	0.088	0.094	0.120
12	0.051	0.055	0.098	0.039	0.056	0.033	0.099	0.050	0.046	0.061	0.059	0.067	0.092

Picture properties: file format: JPEG; color space: sRGB, white balance: automatic, shutter speed: 0.04s

Table S7: Autocorrelation C 0.04s in RGB values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
A	0.0	69.4	71.3	65.1	99.0	74.3	149.2	95.3	93.8	107.3	109.9	109.9	148.7
B	69.4	0.0	28.0	56.3	76.9	75.4	110.9	85.0	86.5	50.1	97.9	75.9	117.7
C	71.3	28.0	0.0	59.9	76.7	78.3	118.2	85.8	87.5	43.2	101.8	74.6	126.9
D	65.1	56.3	59.9	0.0	43.3	45.4	119.3	44.5	43.3	86.2	57.6	63.6	108.6
E	99.0	76.9	76.7	43.3	0.0	47.2	115.1	22.3	26.8	95.4	31.5	34.7	106.4
F	74.3	75.4	78.3	45.4	47.2	0.0	130.0	42.1	35.5	108.5	53.0	62.0	129.1
G	149.2	110.9	118.2	119.3	115.1	130.0	0.0	120.9	125.5	103.4	119.5	97.5	79.1
H	95.3	85.0	85.8	44.5	22.3	42.1	120.9	0.0	15.8	107.1	24.4	45.7	107.7
I	93.8	86.5	87.5	43.3	26.8	35.5	125.5	15.8	0.0	111.0	28.3	51.5	116.4
J	107.3	50.1	43.2	86.2	95.4	108.5	103.4	107.1	111.0	0.0	120.2	83.7	116.5
K	109.9	97.9	101.8	57.6	31.5	53.0	119.5	24.4	28.3	120.2	0.0	52.6	104.8

L	109.9	75.9	74.6	63.6	34.7	62.0	97.5	45.7	51.5	83.7	52.6	0.0	101.9
M	148.7	117.7	126.9	108.6	106.4	129.1	79.1	107.7	116.4	116.5	104.8	101.9	0.0

Table S8: Correlation C 0.04s T 0.1s in RGB values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	130.8	155.4	162.2	121.3	121.3	103.0	155.6	105.3	104.8	186.5	102.0	133.0	144.6
2	158.6	162.3	170.1	127.3	113.3	112.5	140.0	101.0	102.4	186.8	87.7	120.6	126.0
3	165.8	173.5	180.6	136.4	123.9	123.2	148.2	111.9	113.0	197.6	98.3	131.8	132.3
4	159.3	175.7	183.7	140.8	134.4	124.2	158.5	120.0	120.4	204.0	110.6	143.4	144.6
5	99.1	125.8	129.9	96.0	100.6	74.3	144.6	85.0	83.7	157.9	87.7	111.4	139.3
6	179.5	175.3	182.0	141.0	122.1	129.2	141.6	114.1	115.8	194.4	96.8	126.1	126.5
7	158.5	172.4	179.9	136.7	128.8	121.4	154.4	114.1	115.1	199.3	104.8	137.6	138.8
8	188.2	165.8	174.3	155.8	141.1	158.0	89.3	140.8	147.8	170.3	130.5	128.3	101.2
9	148.7	169.0	176.4	133.5	129.8	116.6	158.3	114.1	114.1	198.2	107.2	139.6	144.8
10	139.9	160.2	167.5	124.7	121.2	106.4	154.1	105.8	105.6	190.2	99.2	131.9	141.4
11	60.3	77.6	85.1	57.2	83.4	68.6	120.7	75.7	76.2	108.6	83.4	91.4	114.0
12	114.6	133.2	141.0	101.3	99.6	78.8	140.1	85.0	82.8	166.0	80.6	110.5	135.4

Table S9: Correlation C 0.04s T 0.04s in RGB values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	85.2	115.0	119.2	82.6	90.8	64.3	149.6	74.2	72.8	148.7	82.6	106.2	140.7
2	118.3	108.9	114.3	74.3	53.0	61.5	112.5	41.9	45.2	131.2	30.2	60.4	101.8
3	126.4	125.6	130.9	84.8	68.5	74.4	123.0	56.8	58.1	148.5	42.2	79.6	106.1
4	114.1	125.5	131.8	86.1	79.1	67.5	133.7	63.3	62.6	154.7	56.4	91.9	119.8
5	60.6	75.0	73.9	57.1	68.3	39.0	127.5	60.9	59.3	106.3	73.5	76.2	129.0
6	141.4	127.0	132.2	94.6	72.1	87.8	111.4	66.8	71.0	143.0	51.3	72.9	95.6
7	115.5	121.9	127.1	82.0	72.1	67.2	128.4	55.3	56.7	148.0	49.5	84.0	111.8
8	153.4	119.5	126.3	121.1	108.7	129.4	60.3	113.9	121.7	118.3	109.2	90.5	85.9
9	100.6	116.4	121.8	76.4	75.1	58.4	133.5	57.6	56.1	146.4	56.8	88.9	120.9
10	89.9	103.0	107.7	65.4	64.7	44.3	128.3	49.0	47.8	133.4	51.1	78.7	118.3
11	68.5	41.2	35.7	47.7	66.1	65.2	106.7	70.5	72.3	55.7	85.2	65.3	108.3
12	74.1	78.3	82.9	54.1	58.2	32.6	118.2	49.4	46.9	109.9	57.4	67.2	118.0

Table S10: Autocorrelation C 0.04s in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
A	0.000	0.064	0.020	0.095	0.124	0.094	0.180	0.120	0.115	0.074	0.133	0.142	0.179
B	0.064	0.000	0.066	0.074	0.097	0.070	0.157	0.096	0.089	0.052	0.106	0.116	0.156
C	0.020	0.066	0.000	0.097	0.126	0.100	0.189	0.125	0.119	0.074	0.138	0.147	0.189
D	0.095	0.074	0.097	0.000	0.038	0.022	0.122	0.041	0.028	0.027	0.053	0.065	0.120
E	0.124	0.097	0.126	0.038	0.000	0.045	0.106	0.023	0.025	0.055	0.029	0.037	0.102
F	0.094	0.070	0.100	0.022	0.045	0.000	0.113	0.039	0.026	0.035	0.050	0.061	0.111
G	0.180	0.157	0.189	0.122	0.106	0.113	0.000	0.093	0.099	0.131	0.084	0.086	0.026
H	0.120	0.096	0.125	0.041	0.023	0.039	0.093	0.000	0.019	0.057	0.019	0.036	0.088
I	0.115	0.089	0.119	0.028	0.025	0.026	0.099	0.019	0.000	0.049	0.028	0.041	0.095
J	0.074	0.052	0.074	0.027	0.055	0.035	0.131	0.057	0.049	0.000	0.069	0.080	0.130
K	0.133	0.106	0.138	0.053	0.029	0.050	0.084	0.019	0.028	0.069	0.000	0.031	0.079
L	0.142	0.116	0.147	0.065	0.037	0.061	0.086	0.036	0.041	0.080	0.031	0.000	0.079
M	0.179	0.156	0.189	0.120	0.102	0.111	0.026	0.088	0.095	0.130	0.079	0.079	0.000

Table S11: Correlation C 0.04s T 0.1s in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	0.118	0.103	0.130	0.070	0.071	0.056	0.073	0.051	0.054	0.077	0.052	0.063	0.069
2	0.147	0.123	0.156	0.080	0.065	0.069	0.053	0.049	0.055	0.093	0.039	0.047	0.046

3	0.148	0.123	0.157	0.082	0.066	0.071	0.051	0.050	0.057	0.094	0.041	0.047	0.044
4	0.137	0.115	0.148	0.079	0.070	0.065	0.056	0.051	0.056	0.089	0.046	0.054	0.051
5	0.089	0.094	0.103	0.075	0.089	0.063	0.104	0.072	0.072	0.073	0.078	0.089	0.101
6	0.155	0.129	0.164	0.086	0.068	0.077	0.048	0.054	0.060	0.100	0.042	0.047	0.041
7	0.139	0.118	0.149	0.079	0.069	0.066	0.055	0.050	0.056	0.090	0.045	0.053	0.049
8	0.173	0.149	0.183	0.110	0.094	0.100	0.023	0.081	0.086	0.122	0.073	0.070	0.030
9	0.131	0.111	0.142	0.076	0.071	0.062	0.062	0.051	0.055	0.086	0.049	0.057	0.057
10	0.128	0.109	0.139	0.073	0.069	0.060	0.066	0.049	0.053	0.083	0.047	0.056	0.060
11	0.103	0.096	0.117	0.086	0.102	0.069	0.105	0.086	0.081	0.086	0.090	0.097	0.102
12	0.116	0.094	0.127	0.067	0.069	0.051	0.078	0.050	0.051	0.073	0.050	0.062	0.073

Table S12: Correlation C 0.04s T 0.04s in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	0.083	0.085	0.095	0.059	0.078	0.050	0.108	0.062	0.060	0.058	0.071	0.084	0.105
2	0.140	0.115	0.148	0.067	0.050	0.058	0.067	0.034	0.040	0.082	0.024	0.033	0.060
3	0.142	0.116	0.150	0.069	0.051	0.060	0.066	0.037	0.043	0.084	0.026	0.033	0.059
4	0.127	0.104	0.137	0.062	0.054	0.049	0.072	0.035	0.039	0.075	0.032	0.043	0.066
5	0.051	0.073	0.065	0.075	0.100	0.068	0.137	0.089	0.086	0.062	0.099	0.110	0.136
6	0.153	0.127	0.161	0.081	0.060	0.072	0.058	0.048	0.054	0.095	0.036	0.035	0.051
7	0.130	0.109	0.139	0.064	0.054	0.052	0.069	0.034	0.040	0.077	0.031	0.041	0.063
8	0.172	0.148	0.181	0.109	0.093	0.100	0.031	0.082	0.086	0.120	0.075	0.071	0.043
9	0.117	0.098	0.127	0.059	0.058	0.044	0.079	0.038	0.040	0.069	0.040	0.052	0.074
10	0.112	0.094	0.122	0.054	0.056	0.041	0.083	0.036	0.038	0.064	0.039	0.053	0.078
11	0.061	0.059	0.073	0.057	0.080	0.048	0.123	0.069	0.065	0.045	0.079	0.091	0.121
12	0.096	0.070	0.107	0.055	0.067	0.038	0.098	0.051	0.048	0.055	0.056	0.070	0.094

Picture properties: file format: RAW; color space: sRGB, white balance: 6500K, shutter speed: 0.1s

Table S13: Autocorrelation C 0.1s in RGB values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
A	0.0	54.3	56.5	53.3	91.6	72.2	115.7	83.9	72.6	83.9	109.4	94.7	148.5
B	54.3	0.0	31.5	44.9	60.4	65.0	82.3	67.2	59.7	47.6	91.4	56.7	123.2
C	56.5	31.5	0.0	61.5	75.7	79.8	96.6	81.5	75.3	39.8	106.0	71.3	134.2
D	53.3	44.9	61.5	0.0	44.0	29.2	88.6	35.4	23.7	82.6	59.7	53.0	121.8
E	91.6	60.4	75.7	44.0	0.0	41.3	79.6	24.4	32.3	87.0	36.7	30.7	108.4
F	72.2	65.0	79.8	29.2	41.3	0.0	102.7	27.4	25.2	102.5	45.3	62.2	126.1
G	115.7	82.3	96.6	88.6	79.6	102.7	0.0	88.9	88.8	85.7	98.5	63.1	80.9
H	83.9	67.2	81.5	35.4	24.4	27.4	88.9	0.0	15.8	97.2	29.2	47.3	112.8
I	72.6	59.7	75.3	23.7	32.3	25.2	88.8	15.8	0.0	92.1	40.3	48.8	114.8
J	83.9	47.6	39.8	82.6	87.0	102.5	85.7	97.2	92.1	0.0	119.4	71.9	120.3
K	109.4	91.4	106.0	59.7	36.7	45.3	98.5	29.2	40.3	119.4	0.0	56.9	118.1
L	94.7	56.7	71.3	53.0	30.7	62.2	63.1	47.3	48.8	71.9	56.9	0.0	99.9
M	148.5	123.2	134.2	121.8	108.4	126.1	80.9	112.8	114.8	120.3	118.1	99.9	0.0

Table S14: Correlation C 0. 1s T 0.1s in RGB values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	54.4	84.8	90.4	66.0	95.9	63.1	139.3	83.7	77.9	123.3	102.2	111.3	165.5
2	111.7	90.7	108.3	61.6	37.4	46.6	100.6	36.0	45.4	123.0	20.3	59.9	124.1
3	128.5	115.9	132.6	80.5	64.6	62.2	120.1	55.0	62.7	147.3	31.3	84.0	134.7
4	111.5	110.4	127.2	71.5	72.1	48.8	130.1	56.1	59.2	148.2	48.9	94.8	144.1
5	41.4	51.3	50.7	48.6	78.1	58.9	115.2	74.1	65.4	85.8	95.5	84.0	150.6
6	135.3	116.3	133.4	85.5	62.1	72.5	107.4	59.2	67.9	143.3	33.4	75.1	121.6

7	117.0	113.2	128.4	75.3	68.6	52.5	129.2	52.3	59.0	147.9	41.1	92.9	140.6
8	140.8	112.7	131.8	108.7	98.0	116.8	43.8	104.2	106.0	125.8	106.0	88.7	87.1
9	88.3	93.4	110.0	52.7	67.1	36.9	118.5	47.4	45.3	130.7	53.9	86.5	135.6
10	76.2	79.6	94.2	41.1	59.5	23.9	114.2	44.5	40.7	119.3	54.1	77.4	138.1
11	53.1	27.1	26.6	53.9	73.1	73.2	90.8	76.9	68.5	41.6	100.6	65.9	125.4
12	53.7	43.2	61.3	35.2	61.2	42.1	99.7	59.3	50.6	86.2	79.3	68.6	133.8

Table S15: Correlation C 0.1s T 0.04s in RGB values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	59.2	50.2	45.9	60.9	76.3	74.0	92.8	74.7	70.3	62.5	99.9	76.3	124.4
2	86.6	48.2	61.4	45.9	25.1	55.6	68.5	41.0	41.6	65.5	56.8	18.2	103.0
3	92.5	62.2	76.0	45.9	23.8	50.0	73.8	32.9	35.0	81.3	42.6	24.3	102.0
4	70.0	49.9	64.8	22.5	28.3	27.7	84.1	24.2	17.8	80.7	46.9	39.9	111.0
5	54.2	30.7	15.6	59.6	76.6	78.4	94.7	81.2	73.5	40.2	105.2	70.3	131.6
6	98.8	66.0	80.2	53.4	27.7	58.5	65.5	39.5	42.8	81.6	46.1	17.4	94.6
7	77.8	55.4	67.4	32.4	22.4	35.0	81.7	18.7	19.9	80.3	42.2	36.6	106.7
8	114.6	79.0	87.9	92.3	84.3	107.9	30.9	95.4	94.3	73.7	107.9	65.9	88.1
9	60.4	41.8	53.8	21.7	37.3	32.9	86.6	34.0	26.7	71.5	59.0	45.2	113.2
10	55.8	31.9	41.8	28.8	45.9	47.0	80.7	47.2	39.3	58.7	71.0	44.2	113.3
11	78.6	46.0	37.5	77.5	85.0	97.2	86.3	93.3	87.3	13.9	115.5	70.5	119.1
12	60.6	21.4	28.9	52.6	65.2	71.2	82.1	72.3	65.0	38.0	95.6	57.3	118.9

Table S16: Autocorrelation C 0. 1s in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
A	0.000	0.066	0.048	0.079	0.103	0.085	0.130	0.097	0.092	0.041	0.107	0.112	0.142
B	0.066	0.000	0.089	0.050	0.069	0.054	0.098	0.065	0.059	0.030	0.074	0.079	0.109
C	0.048	0.089	0.000	0.104	0.128	0.110	0.156	0.122	0.116	0.063	0.134	0.137	0.172
D	0.079	0.050	0.104	0.000	0.030	0.011	0.068	0.023	0.016	0.058	0.035	0.040	0.083
E	0.103	0.069	0.128	0.030	0.000	0.026	0.050	0.011	0.016	0.081	0.009	0.017	0.063
F	0.085	0.054	0.110	0.011	0.026	0.000	0.061	0.016	0.011	0.064	0.031	0.037	0.075
G	0.130	0.098	0.156	0.068	0.050	0.061	0.000	0.052	0.057	0.111	0.047	0.047	0.048
H	0.097	0.065	0.122	0.023	0.011	0.016	0.052	0.000	0.008	0.076	0.016	0.023	0.065
I	0.092	0.059	0.116	0.016	0.016	0.011	0.057	0.008	0.000	0.070	0.022	0.028	0.071
J	0.041	0.030	0.063	0.058	0.081	0.064	0.111	0.076	0.070	0.000	0.086	0.090	0.124
K	0.107	0.074	0.134	0.035	0.009	0.031	0.047	0.016	0.022	0.086	0.000	0.013	0.059
L	0.112	0.079	0.137	0.040	0.017	0.037	0.047	0.023	0.028	0.090	0.013	0.000	0.063
M	0.142	0.109	0.172	0.083	0.063	0.075	0.048	0.065	0.071	0.124	0.059	0.063	0.000

Table S17: Correlation C 0.1s T 0.1s in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	0.023	0.059	0.064	0.063	0.087	0.069	0.114	0.081	0.076	0.041	0.091	0.097	0.125
2	0.106	0.072	0.132	0.033	0.009	0.029	0.049	0.015	0.020	0.085	0.006	0.014	0.059
3	0.108	0.075	0.135	0.037	0.011	0.033	0.047	0.018	0.024	0.087	0.003	0.013	0.057
4	0.099	0.065	0.126	0.026	0.015	0.019	0.050	0.009	0.013	0.078	0.016	0.023	0.060
5	0.025	0.069	0.026	0.081	0.106	0.088	0.135	0.100	0.094	0.042	0.111	0.115	0.150
6	0.115	0.082	0.143	0.045	0.020	0.039	0.042	0.025	0.032	0.095	0.013	0.016	0.050
7	0.100	0.068	0.128	0.030	0.013	0.022	0.050	0.010	0.016	0.080	0.015	0.025	0.057
8	0.133	0.100	0.161	0.070	0.052	0.063	0.016	0.053	0.059	0.114	0.048	0.049	0.035
9	0.096	0.065	0.123	0.031	0.032	0.021	0.052	0.023	0.026	0.078	0.033	0.039	0.065
10	0.083	0.055	0.111	0.010	0.027	0.009	0.061	0.018	0.013	0.063	0.029	0.035	0.075
11	0.042	0.028	0.066	0.049	0.075	0.056	0.106	0.069	0.062	0.011	0.080	0.085	0.118
12	0.070	0.023	0.096	0.030	0.050	0.033	0.080	0.045	0.039	0.041	0.054	0.059	0.092

Table S18: Correlation C 0.1s T 0.04s in u'v' values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	0.074	0.077	0.087	0.064	0.079	0.065	0.102	0.072	0.069	0.064	0.083	0.084	0.114
2	0.102	0.070	0.126	0.029	0.011	0.028	0.054	0.017	0.018	0.080	0.013	0.014	0.070
3	0.105	0.073	0.131	0.033	0.011	0.031	0.050	0.019	0.022	0.084	0.009	0.012	0.067
4	0.092	0.060	0.117	0.016	0.016	0.014	0.057	0.011	0.007	0.070	0.020	0.025	0.073
5	0.030	0.075	0.020	0.090	0.114	0.097	0.143	0.109	0.103	0.047	0.120	0.124	0.158
6	0.114	0.080	0.140	0.043	0.018	0.038	0.042	0.023	0.030	0.093	0.013	0.008	0.058
7	0.095	0.064	0.120	0.021	0.011	0.017	0.054	0.007	0.008	0.074	0.016	0.023	0.069
8	0.136	0.107	0.151	0.083	0.070	0.079	0.049	0.072	0.076	0.115	0.070	0.068	0.090
9	0.082	0.053	0.107	0.006	0.027	0.008	0.064	0.019	0.012	0.061	0.032	0.037	0.080
10	0.076	0.051	0.101	0.006	0.032	0.016	0.069	0.026	0.019	0.056	0.036	0.041	0.086
11	0.042	0.036	0.065	0.045	0.070	0.053	0.103	0.065	0.058	0.019	0.075	0.080	0.117
12	0.064	0.023	0.086	0.033	0.056	0.039	0.088	0.051	0.044	0.034	0.061	0.066	0.103

Picture properties: file format: RAW; color space: sRGB, white balance: 6500K, shutter speed: 0.04s

Table S19: Autocorrelation C 0.04s in RGB values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
A	0.0	35.5	37.0	33.1	58.6	45.4	71.6	54.5	45.7	54.4	70.8	59.8	92.7
B	35.5	0.0	17.0	27.5	37.8	41.1	49.4	42.6	37.1	29.6	58.1	34.5	75.6
C	37.0	17.0	0.0	35.3	45.0	48.0	56.9	49.0	44.6	25.6	65.0	41.2	81.2
D	33.1	27.5	35.3	0.0	28.9	19.8	54.2	24.6	15.4	50.5	40.0	33.1	76.3
E	58.6	37.8	45.0	28.9	0.0	26.8	49.4	14.9	20.7	54.2	23.2	19.8	67.1
F	45.4	41.1	48.0	19.8	26.8	0.0	64.2	19.6	16.7	64.4	30.8	39.6	79.3
G	71.6	49.4	56.9	54.2	49.4	64.2	0.0	54.9	54.8	50.9	61.6	38.2	52.2
H	54.5	42.6	49.0	24.6	14.9	19.6	54.9	0.0	12.1	60.4	19.3	29.1	69.9
I	45.7	37.1	44.6	15.4	20.7	16.7	54.8	12.1	0.0	57.0	27.1	30.4	71.7
J	54.4	29.6	25.6	50.5	54.2	64.4	50.9	60.4	57.0	0.0	74.7	43.5	72.3
K	70.8	58.1	65.0	40.0	23.2	30.8	61.6	19.3	27.1	74.7	0.0	36.1	73.5
L	59.8	34.5	41.2	33.1	19.8	39.6	38.2	29.1	30.4	43.5	36.1	0.0	61.1
M	92.7	75.6	81.2	76.3	67.1	79.3	52.2	69.9	71.7	72.3	73.5	61.1	0.0

Table S20: Correlation C 0.04s T 0.1s in RGB values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	93.2	114.5	118.4	97.9	111.6	88.5	139.4	103.0	100.5	140.4	107.1	124.1	151.2
2	118.7	114.0	122.8	94.1	83.1	79.4	114.9	78.7	84.0	136.4	65.2	97.2	121.3
3	139.8	138.6	147.1	116.7	107.5	101.8	137.3	101.6	106.1	159.9	87.2	120.9	139.1
4	132.7	138.5	146.9	115.9	113.6	100.4	144.9	105.8	108.0	162.9	96.3	128.0	146.7
5	61.0	77.5	79.7	63.2	79.2	57.3	107.4	73.3	68.5	103.3	79.3	88.9	126.6
6	140.9	135.5	144.4	115.1	102.6	102.1	127.6	98.4	103.9	154.7	82.1	113.5	128.1
7	134.9	139.1	146.7	116.7	111.4	100.8	143.8	103.4	107.2	162.0	93.1	126.6	143.9
8	131.1	119.5	130.5	111.1	103.8	110.9	83.2	104.4	106.9	131.4	98.7	103.0	94.8
9	111.0	121.2	129.8	97.6	101.0	84.3	129.9	91.0	91.4	145.6	85.5	114.4	133.4
10	99.9	109.6	116.9	86.8	91.3	72.6	122.7	82.7	82.6	135.4	77.6	104.5	130.9
11	29.0	33.9	38.7	27.1	47.7	31.7	70.1	45.7	37.8	58.1	58.1	51.4	90.2
12	67.5	75.0	83.6	59.3	70.1	49.2	97.6	65.5	61.6	102.9	68.0	80.8	114.0

Table S21: Correlation C 0.04s T 0.04s in RGB values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	48.0	57.0	57.7	48.2	60.4	46.5	77.9	54.0	52.0	75.1	66.8	66.9	94.2
2	71.5	58.0	66.3	41.0	24.2	31.0	63.3	23.1	29.8	77.5	12.6	38.7	78.2
3	83.1	73.9	82.1	53.7	40.8	41.8	74.9	36.5	41.7	92.4	20.2	53.1	84.3

4	70.9	71.5	79.5	48.3	47.7	32.8	83.8	39.3	40.2	95.0	34.5	62.0	93.3
5	28.1	33.7	33.7	31.0	49.8	36.6	72.3	48.3	41.5	56.9	61.9	53.9	95.3
6	86.9	75.1	83.6	57.0	41.2	47.7	69.4	38.8	45.0	91.8	21.9	50.2	77.9
7	74.5	72.4	79.4	49.9	43.6	34.7	81.2	34.2	38.7	93.5	27.3	59.2	88.8
8	87.9	70.0	77.7	69.1	62.6	74.9	30.8	66.7	67.7	75.8	68.5	55.9	63.0
9	59.3	62.7	69.7	39.3	44.1	23.0	81.1	34.5	33.6	86.6	36.1	58.2	91.1
10	47.1	49.8	56.5	26.4	37.5	15.0	70.5	29.3	25.0	74.1	35.8	48.2	86.1
11	35.9	16.5	15.3	30.8	42.8	44.2	53.1	46.0	39.9	25.6	61.0	37.3	74.9
12	34.4	27.4	36.0	21.3	37.3	25.1	61.3	37.5	30.4	54.0	50.1	42.1	83.3

Table S22: Autocorrelation C 0.04s in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
A	0.000	0.067	0.035	0.082	0.109	0.088	0.137	0.103	0.097	0.051	0.114	0.120	0.152
B	0.067	0.000	0.076	0.049	0.070	0.053	0.101	0.066	0.060	0.024	0.076	0.082	0.117
C	0.035	0.076	0.000	0.087	0.114	0.094	0.147	0.109	0.102	0.062	0.121	0.126	0.166
D	0.082	0.049	0.087	0.000	0.034	0.012	0.075	0.026	0.018	0.042	0.038	0.047	0.095
E	0.109	0.070	0.114	0.034	0.000	0.029	0.055	0.013	0.019	0.066	0.011	0.020	0.073
F	0.088	0.053	0.094	0.012	0.029	0.000	0.068	0.018	0.012	0.048	0.033	0.042	0.087
G	0.137	0.101	0.147	0.075	0.055	0.068	0.000	0.056	0.063	0.099	0.051	0.050	0.058
H	0.103	0.066	0.109	0.026	0.013	0.018	0.056	0.000	0.010	0.061	0.017	0.025	0.075
I	0.097	0.060	0.102	0.018	0.019	0.012	0.063	0.010	0.000	0.055	0.024	0.032	0.082
J	0.051	0.024	0.062	0.042	0.066	0.048	0.099	0.061	0.055	0.000	0.072	0.078	0.116
K	0.114	0.076	0.121	0.038	0.011	0.033	0.051	0.017	0.024	0.072	0.000	0.015	0.069
L	0.120	0.082	0.126	0.047	0.020	0.042	0.050	0.025	0.032	0.078	0.015	0.000	0.071
M	0.152	0.117	0.166	0.095	0.073	0.087	0.058	0.075	0.082	0.116	0.069	0.071	0.000

Table S23: Correlation C 0.04s T 0.1s in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	0.034	0.058	0.058	0.059	0.085	0.065	0.114	0.079	0.073	0.041	0.089	0.097	0.126
2	0.115	0.077	0.124	0.043	0.018	0.036	0.050	0.021	0.028	0.074	0.014	0.021	0.060
3	0.117	0.080	0.127	0.046	0.019	0.040	0.048	0.024	0.032	0.076	0.013	0.020	0.058
4	0.108	0.070	0.119	0.038	0.023	0.030	0.052	0.019	0.025	0.067	0.021	0.029	0.061
5	0.022	0.064	0.019	0.073	0.101	0.080	0.133	0.095	0.089	0.048	0.107	0.113	0.151
6	0.125	0.087	0.135	0.056	0.029	0.048	0.045	0.033	0.041	0.084	0.023	0.025	0.050
7	0.110	0.073	0.120	0.041	0.023	0.033	0.052	0.021	0.027	0.070	0.022	0.030	0.057
8	0.141	0.106	0.154	0.080	0.059	0.072	0.025	0.061	0.068	0.104	0.055	0.055	0.039
9	0.105	0.071	0.116	0.042	0.038	0.032	0.052	0.029	0.034	0.068	0.036	0.043	0.066
10	0.093	0.059	0.103	0.023	0.028	0.016	0.062	0.018	0.017	0.053	0.028	0.037	0.076
11	0.048	0.026	0.059	0.045	0.071	0.050	0.105	0.065	0.058	0.012	0.077	0.084	0.119
12	0.077	0.028	0.089	0.032	0.049	0.032	0.080	0.043	0.038	0.032	0.053	0.060	0.093

Table S24: Correlation C 0.04s T 0.04s in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	0.079	0.078	0.082	0.066	0.077	0.064	0.101	0.070	0.068	0.062	0.081	0.082	0.115
2	0.111	0.073	0.118	0.036	0.009	0.031	0.053	0.015	0.021	0.069	0.007	0.015	0.071
3	0.114	0.076	0.122	0.040	0.012	0.035	0.050	0.018	0.025	0.072	0.003	0.014	0.068
4	0.102	0.064	0.109	0.025	0.015	0.019	0.057	0.008	0.011	0.059	0.016	0.026	0.074
5	0.023	0.069	0.013	0.082	0.110	0.089	0.141	0.104	0.097	0.054	0.116	0.122	0.159
6	0.123	0.085	0.132	0.052	0.024	0.044	0.042	0.028	0.036	0.081	0.017	0.015	0.058
7	0.105	0.068	0.112	0.030	0.012	0.023	0.054	0.007	0.014	0.063	0.014	0.024	0.070
8	0.140	0.107	0.144	0.085	0.069	0.079	0.041	0.070	0.076	0.105	0.068	0.065	0.092
9	0.091	0.056	0.099	0.017	0.025	0.008	0.064	0.014	0.010	0.051	0.029	0.037	0.081
10	0.086	0.053	0.093	0.011	0.028	0.010	0.069	0.020	0.013	0.045	0.031	0.040	0.087
11	0.049	0.033	0.056	0.037	0.065	0.045	0.102	0.060	0.052	0.015	0.071	0.078	0.119
12	0.071	0.023	0.078	0.028	0.052	0.033	0.088	0.047	0.039	0.026	0.058	0.065	0.104

Picture properties: file format: RAW; color space: Adobe RGB, white balance: 6500K, shutter speed: 0.1s

Table S25: Autocorrelation C 0.1s in RGB values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
A	0.0	53.5	54.6	57.7	89.5	75.1	113.2	83.8	73.6	79.8	105.6	95.6	145.0
B	53.5	0.0	30.6	48.0	58.9	67.0	78.3	67.9	60.7	44.8	89.4	58.1	119.0
C	54.6	30.6	0.0	61.6	71.1	78.8	92.2	79.1	73.0	37.6	101.5	70.4	128.1
D	57.7	48.0	61.6	0.0	41.8	28.3	86.9	33.0	19.9	81.6	53.1	56.5	117.7
E	89.5	58.9	71.1	41.8	0.0	41.6	73.6	26.5	33.4	83.4	39.6	31.0	100.3
F	75.1	67.0	78.8	28.3	41.6	0.0	100.0	27.9	25.5	100.9	39.6	65.1	121.4
G	113.2	78.3	92.2	86.9	73.6	100.0	0.0	82.9	85.2	80.9	93.8	54.2	78.7
H	83.8	67.9	79.1	33.0	26.5	27.9	82.9	0.0	16.4	95.5	26.3	47.8	103.4
I	73.6	60.7	73.0	19.9	33.4	25.5	85.2	16.4	0.0	90.2	36.5	51.0	109.1
J	79.8	44.8	37.6	81.6	83.4	100.9	80.9	95.5	90.2	0.0	116.6	71.0	114.9
K	105.6	89.4	101.5	53.1	39.6	39.6	93.8	26.3	36.5	116.6	0.0	58.1	109.6
L	95.6	58.1	70.4	56.5	31.0	65.1	54.2	47.8	51.0	71.0	58.1	0.0	86.7
M	145.0	119.0	128.1	117.7	100.3	121.4	78.7	103.4	109.1	114.9	109.6	86.7	0.0

Table S26: Correlation C 0.1s T 0.1s in RGB values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	59.6	88.2	90.5	66.9	92.8	63.1	138.3	80.4	75.4	122.1	93.4	112.3	162.0
2	106.0	87.1	102.5	54.0	39.0	40.3	97.3	33.1	41.0	118.9	20.7	61.1	118.3
3	124.8	113.3	124.6	74.6	66.5	58.1	117.4	53.9	60.7	141.4	35.4	84.2	129.4
4	116.2	101.7	118.8	78.5	74.6	65.5	121.9	70.2	73.8	136.6	68.3	94.7	138.4
5	43.8	50.6	50.3	45.7	70.4	54.3	109.4	65.9	58.1	83.3	83.5	81.3	143.3
6	137.4	118.5	133.0	87.1	67.1	75.2	104.0	60.6	71.0	143.4	38.8	75.6	111.4
7	118.3	113.9	126.0	72.3	70.2	52.1	125.9	52.3	58.9	146.2	37.9	93.2	134.7
8	137.4	107.3	126.3	105.0	89.2	111.7	42.9	94.2	99.7	119.9	97.1	76.6	85.4
9	98.4	99.8	112.0	57.6	69.9	36.0	128.3	52.9	52.2	135.3	49.0	94.1	143.4
10	81.6	82.7	94.7	41.3	59.4	24.1	113.9	42.8	39.2	118.7	45.3	81.2	135.4
11	52.6	26.1	25.7	51.9	66.5	70.2	84.4	71.2	63.4	39.8	92.4	63.3	117.8
12	54.5	42.9	59.0	33.7	56.0	39.6	95.4	53.3	45.6	82.4	69.7	68.2	127.7

Table S27: Correlation C 0.1s T 0.04s in RGB values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	40.1	43.0	33.7	46.6	66.1	61.2	98.3	64.8	57.9	61.8	87.7	74.3	126.7
2	81.0	43.8	55.0	41.3	25.9	53.6	65.4	41.4	39.7	61.2	58.3	24.3	97.8
3	86.4	58.1	69.5	38.1	24.2	44.7	68.8	29.3	29.9	77.3	42.6	28.3	94.1
4	70.7	50.8	62.6	21.0	28.4	28.3	80.6	23.8	17.3	78.4	43.7	43.2	104.9
5	52.8	29.9	14.7	58.8	71.2	76.6	89.0	77.1	70.0	37.9	98.7	68.2	124.4
6	99.6	66.8	78.1	55.3	29.4	61.6	59.6	41.1	45.6	79.8	49.0	15.6	85.0
7	77.0	55.6	64.4	29.9	23.6	35.6	76.1	19.4	19.9	78.2	40.9	37.6	98.4
8	110.3	72.6	85.8	87.3	74.5	102.0	13.4	85.7	87.0	71.0	98.8	53.6	79.8
9	62.3	43.6	52.5	20.8	36.5	33.4	83.9	34.5	26.3	69.9	55.6	48.6	108.9
10	58.0	35.0	41.9	28.8	43.1	46.3	78.0	44.9	36.7	58.0	65.9	47.3	108.2
11	75.5	44.0	35.5	75.1	79.7	94.1	80.7	89.1	83.2	14.7	110.0	68.4	112.0
12	60.0	23.1	27.6	51.1	59.8	68.8	76.8	67.6	60.7	36.3	88.7	56.1	111.5

Table S28: Autocorrelation C 0.1s in u'v' values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
A	0.000	0.069	0.047	0.083	0.109	0.090	0.139	0.103	0.097	0.043	0.113	0.119	0.152

B	0.069	0.000	0.091	0.053	0.074	0.057	0.106	0.069	0.063	0.031	0.078	0.083	0.118
C	0.047	0.091	0.000	0.106	0.131	0.113	0.162	0.125	0.119	0.064	0.137	0.142	0.179
D	0.083	0.053	0.106	0.000	0.031	0.012	0.076	0.025	0.016	0.060	0.036	0.043	0.091
E	0.109	0.074	0.131	0.031	0.000	0.027	0.057	0.011	0.017	0.085	0.009	0.019	0.071
F	0.090	0.057	0.113	0.012	0.027	0.000	0.069	0.017	0.011	0.067	0.031	0.039	0.083
G	0.139	0.106	0.162	0.076	0.057	0.069	0.000	0.057	0.065	0.118	0.053	0.050	0.052
H	0.103	0.069	0.125	0.025	0.011	0.017	0.057	0.000	0.010	0.080	0.016	0.024	0.072
I	0.097	0.063	0.119	0.016	0.017	0.011	0.065	0.010	0.000	0.073	0.022	0.030	0.079
J	0.043	0.031	0.064	0.060	0.085	0.067	0.118	0.080	0.073	0.000	0.090	0.095	0.133
K	0.113	0.078	0.137	0.036	0.009	0.031	0.053	0.016	0.022	0.090	0.000	0.014	0.067
L	0.119	0.083	0.142	0.043	0.019	0.039	0.050	0.024	0.030	0.095	0.014	0.000	0.068
M	0.152	0.118	0.179	0.091	0.071	0.083	0.052	0.072	0.079	0.133	0.067	0.068	0.000

Table S29: Correlation C 0.1s T 0.1s in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	0.025	0.063	0.063	0.067	0.092	0.073	0.122	0.085	0.080	0.045	0.096	0.103	0.134
2	0.111	0.076	0.136	0.034	0.009	0.029	0.056	0.015	0.020	0.088	0.007	0.016	0.068
3	0.115	0.083	0.131	0.048	0.035	0.047	0.063	0.039	0.042	0.090	0.037	0.035	0.090
4	0.120	0.083	0.143	0.067	0.052	0.062	0.078	0.055	0.059	0.096	0.055	0.064	0.073
5	0.026	0.070	0.027	0.082	0.108	0.090	0.140	0.102	0.096	0.042	0.113	0.118	0.156
6	0.123	0.087	0.148	0.049	0.022	0.042	0.044	0.027	0.034	0.100	0.016	0.017	0.055
7	0.106	0.072	0.131	0.031	0.014	0.023	0.057	0.010	0.016	0.084	0.015	0.026	0.066
8	0.142	0.108	0.167	0.078	0.059	0.071	0.017	0.059	0.067	0.122	0.055	0.053	0.041
9	0.094	0.062	0.118	0.017	0.024	0.008	0.066	0.015	0.011	0.072	0.028	0.036	0.079
10	0.088	0.057	0.113	0.011	0.027	0.009	0.070	0.019	0.013	0.066	0.030	0.037	0.084
11	0.044	0.029	0.068	0.051	0.077	0.058	0.112	0.071	0.064	0.012	0.082	0.088	0.126
12	0.073	0.024	0.098	0.032	0.054	0.036	0.089	0.048	0.042	0.042	0.057	0.063	0.102

Table S30: Correlation C 0.1s T 0.04s in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	0.025	0.076	0.048	0.077	0.102	0.083	0.133	0.096	0.091	0.053	0.107	0.113	0.146
2	0.108	0.073	0.130	0.030	0.011	0.029	0.061	0.018	0.019	0.084	0.014	0.017	0.078
3	0.111	0.076	0.134	0.034	0.012	0.032	0.057	0.019	0.022	0.087	0.010	0.013	0.074
4	0.098	0.063	0.121	0.017	0.016	0.015	0.065	0.012	0.007	0.074	0.020	0.027	0.081
5	0.029	0.076	0.021	0.091	0.117	0.098	0.148	0.111	0.105	0.047	0.122	0.127	0.164
6	0.121	0.085	0.145	0.046	0.019	0.040	0.046	0.025	0.032	0.098	0.014	0.009	0.065
7	0.101	0.068	0.124	0.023	0.011	0.019	0.060	0.007	0.009	0.078	0.016	0.024	0.076
8	0.139	0.106	0.162	0.076	0.057	0.070	0.004	0.057	0.065	0.119	0.054	0.050	0.052
9	0.087	0.056	0.109	0.007	0.027	0.008	0.072	0.020	0.012	0.064	0.032	0.039	0.088
10	0.081	0.053	0.104	0.006	0.032	0.017	0.076	0.027	0.019	0.058	0.037	0.043	0.093
11	0.046	0.037	0.067	0.045	0.071	0.054	0.109	0.066	0.059	0.021	0.077	0.083	0.124
12	0.067	0.026	0.088	0.033	0.057	0.040	0.095	0.052	0.045	0.036	0.062	0.068	0.110

Picture properties: file format: RAW; color space: Adobe RGB, white balance: 6500K, shutter speed: 0.04s

Table S31: Autocorrelation C 0.04s in RGB values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
A	0.0	33.8	34.5	35.7	56.0	46.6	70.7	52.4	49.8	49.8	66.5	59.9	91.0
B	33.8	0.0	16.3	29.1	36.0	41.6	48.0	44.1	37.9	27.0	55.3	35.4	73.9
C	34.5	16.3	0.0	35.1	41.1	46.5	54.9	50.5	44.0	23.2	60.5	40.6	77.9
D	35.7	29.1	35.1	0.0	25.6	18.1	53.5	26.6	16.6	48.7	33.6	34.9	73.9
E	56.0	36.0	41.1	25.6	0.0	25.9	47.6	31.4	21.2	50.5	24.6	20.5	65.3

F	46.6	41.6	46.5	18.1	25.9	0.0	63.7	34.4	20.0	61.7	25.8	41.4	78.2
G	70.7	48.0	54.9	53.5	47.6	63.7	0.0	45.4	53.9	48.7	58.8	34.0	50.3
H	52.4	44.1	50.5	26.6	31.4	34.4	45.4	0.0	24.8	56.0	33.0	34.6	60.7
I	49.8	37.9	44.0	16.6	21.2	20.0	53.9	24.8	0.0	54.5	24.9	31.6	70.4
J	49.8	27.0	23.2	48.7	50.5	61.7	48.7	56.0	54.5	0.0	71.0	42.4	69.6
K	66.5	55.3	60.5	33.6	24.6	25.8	58.8	33.0	24.9	71.0	0.0	35.9	69.7
L	59.9	35.4	40.6	34.9	20.5	41.4	34.0	34.6	31.6	42.4	35.9	0.0	54.7
M	91.0	73.9	77.9	73.9	65.3	78.2	50.3	60.7	70.4	69.6	69.7	54.7	0.0

Table S32: Correlation C 0.04s T 0.1s in RGB values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	95.0	114.6	116.7	97.1	109.2	87.8	139.4	109.6	102.5	136.9	100.6	124.0	150.0
2	114.8	110.7	118.0	88.8	82.9	75.6	112.9	88.3	82.1	131.7	64.3	95.9	119.0
3	135.3	133.9	139.6	109.4	105.5	96.2	133.5	106.7	102.6	152.9	84.1	117.2	135.7
4	129.4	128.0	136.2	111.6	108.9	99.8	135.8	114.0	109.4	150.0	97.1	121.9	139.7
5	61.8	75.4	77.4	60.6	73.8	53.6	104.1	78.6	66.3	98.7	69.0	86.5	122.3
6	142.9	136.6	143.9	115.2	106.7	104.4	126.8	107.7	106.7	153.8	85.5	113.8	125.2
7	135.6	138.3	144.2	113.6	112.1	99.8	142.3	112.2	108.4	158.9	91.6	125.8	142.2
8	127.6	113.9	124.7	105.9	98.6	106.4	80.1	93.0	102.6	125.5	91.2	94.6	92.1
9	120.4	126.8	132.8	102.5	105.8	88.2	139.2	106.5	99.8	149.2	87.8	121.1	143.1
10	102.9	110.0	115.9	85.9	91.3	72.6	123.3	92.2	84.2	132.8	73.9	105.9	130.8
11	30.0	32.6	36.8	24.4	41.8	27.8	66.6	46.9	35.2	54.2	48.1	49.2	85.8
12	66.9	72.3	79.9	56.3	65.9	46.0	95.0	71.3	59.1	97.4	58.9	79.0	110.3

Table S33: Correlation C 0.04s T 0.04s in RGB values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	40.0	56.3	55.5	40.7	55.6	37.2	85.9	57.5	49.8	75.4	56.5	69.0	100.3
2	67.1	54.3	61.2	34.8	23.8	26.1	61.6	37.8	26.4	72.8	13.3	38.3	75.9
3	78.8	70.6	77.2	47.2	41.3	36.5	72.3	45.7	39.2	88.1	19.0	52.5	80.5
4	71.4	70.5	76.8	45.4	47.5	31.6	82.2	50.3	41.3	91.3	29.9	62.0	90.7
5	27.8	32.2	31.5	29.5	44.6	34.3	69.0	52.0	39.8	52.6	53.6	51.6	90.8
6	87.5	74.5	81.1	55.9	42.7	49.1	66.3	48.1	46.2	88.8	25.0	48.1	73.3
7	74.2	71.4	76.6	46.5	44.4	33.9	78.5	46.8	40.8	90.2	24.4	58.4	85.2
8	86.4	67.1	76.6	66.0	58.6	72.2	27.8	54.5	64.6	74.4	61.7	49.3	58.1
9	60.8	62.3	67.6	36.8	43.3	22.1	80.0	46.2	35.8	83.1	30.7	58.9	89.9
10	49.8	50.4	55.4	25.3	35.9	14.0	70.1	39.8	26.5	71.3	28.5	49.7	84.3
11	34.7	17.1	15.0	29.1	38.1	41.4	50.5	43.6	37.3	24.1	54.6	36.2	71.0
12	35.2	27.5	34.0	18.6	31.9	21.6	58.8	41.1	26.8	50.4	41.0	41.0	79.0

Table S34: Autocorrelation C 0.04s in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
A	0.000	0.070	0.035	0.085	0.114	0.092	0.145	0.122	0.105	0.051	0.119	0.127	0.161
B	0.070	0.000	0.078	0.052	0.074	0.056	0.109	0.087	0.063	0.024	0.079	0.086	0.125
C	0.035	0.078	0.000	0.088	0.118	0.096	0.153	0.131	0.107	0.062	0.124	0.131	0.173
D	0.085	0.052	0.088	0.000	0.035	0.012	0.082	0.057	0.021	0.047	0.040	0.050	0.102
E	0.114	0.074	0.118	0.035	0.000	0.029	0.063	0.047	0.019	0.074	0.011	0.021	0.080
F	0.092	0.056	0.096	0.012	0.029	0.000	0.075	0.048	0.015	0.053	0.034	0.044	0.094
G	0.145	0.109	0.153	0.082	0.063	0.075	0.000	0.052	0.071	0.110	0.058	0.053	0.062
H	0.122	0.087	0.131	0.057	0.047	0.048	0.052	0.000	0.048	0.088	0.043	0.048	0.075
I	0.105	0.063	0.107	0.021	0.019	0.015	0.071	0.048	0.000	0.064	0.024	0.034	0.090
J	0.051	0.024	0.062	0.047	0.074	0.053	0.110	0.088	0.064	0.000	0.078	0.086	0.127
K	0.119	0.079	0.124	0.040	0.011	0.034	0.058	0.043	0.024	0.078	0.000	0.015	0.076
L	0.127	0.086	0.131	0.050	0.021	0.044	0.053	0.048	0.034	0.086	0.015	0.000	0.076
M	0.161	0.125	0.173	0.102	0.080	0.094	0.062	0.075	0.090	0.127	0.076	0.076	0.000

Table S35: Correlation C 0.04s T 0.1s in u'v' values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	0.036	0.062	0.058	0.062	0.090	0.068	0.122	0.096	0.081	0.044	0.094	0.104	0.135
2	0.120	0.080	0.128	0.044	0.018	0.037	0.058	0.042	0.028	0.080	0.014	0.022	0.068
3	0.121	0.083	0.123	0.049	0.029	0.046	0.059	0.047	0.039	0.082	0.030	0.030	0.090
4	0.126	0.088	0.135	0.074	0.057	0.069	0.079	0.068	0.066	0.089	0.061	0.068	0.069
5	0.024	0.065	0.020	0.074	0.103	0.081	0.139	0.116	0.093	0.046	0.109	0.116	0.158
6	0.132	0.092	0.140	0.059	0.032	0.051	0.046	0.042	0.044	0.092	0.025	0.026	0.055
7	0.115	0.077	0.123	0.042	0.024	0.034	0.059	0.039	0.029	0.076	0.022	0.031	0.066
8	0.150	0.114	0.160	0.087	0.067	0.080	0.026	0.059	0.076	0.115	0.062	0.059	0.044
9	0.103	0.066	0.111	0.031	0.028	0.021	0.067	0.038	0.023	0.064	0.029	0.038	0.079
10	0.097	0.062	0.105	0.024	0.028	0.017	0.070	0.043	0.021	0.058	0.029	0.039	0.084
11	0.050	0.027	0.059	0.046	0.074	0.052	0.112	0.089	0.063	0.011	0.079	0.087	0.127
12	0.080	0.029	0.090	0.033	0.053	0.034	0.089	0.063	0.041	0.035	0.056	0.064	0.103

Table S36: Correlation C 0.04s T 0.04s in u'v' values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	0.032	0.074	0.043	0.071	0.099	0.077	0.132	0.108	0.090	0.054	0.104	0.113	0.147
2	0.117	0.076	0.121	0.037	0.009	0.032	0.061	0.046	0.021	0.076	0.007	0.016	0.078
3	0.120	0.080	0.126	0.042	0.013	0.036	0.057	0.043	0.026	0.079	0.003	0.014	0.075
4	0.107	0.067	0.112	0.027	0.016	0.019	0.065	0.041	0.013	0.066	0.017	0.027	0.081
5	0.023	0.070	0.014	0.083	0.112	0.090	0.147	0.125	0.102	0.052	0.118	0.125	0.166
6	0.130	0.090	0.137	0.055	0.026	0.047	0.047	0.039	0.039	0.090	0.019	0.015	0.065
7	0.110	0.072	0.116	0.032	0.013	0.024	0.060	0.041	0.017	0.070	0.014	0.025	0.076
8	0.146	0.110	0.155	0.084	0.063	0.077	0.009	0.054	0.072	0.111	0.058	0.055	0.055
9	0.096	0.060	0.101	0.018	0.026	0.009	0.071	0.044	0.015	0.056	0.029	0.039	0.088
10	0.090	0.056	0.095	0.012	0.028	0.010	0.076	0.051	0.018	0.051	0.032	0.042	0.094
11	0.053	0.034	0.058	0.037	0.067	0.045	0.108	0.085	0.056	0.018	0.072	0.081	0.125
12	0.074	0.025	0.080	0.028	0.054	0.033	0.094	0.070	0.041	0.029	0.059	0.067	0.111

Picture properties: file format: RAW; color space: Adobe RGB, white balance: 6500K, shutter speed: 0.1s

Table S37: Autocorrelation C 0.1s in RGB values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
A	0.0	50.4	53.9	42.1	69.3	62.0	86.5	62.6	54.2	79.1	83.2	71.1	107.1
B	50.4	0.0	21.3	43.3	47.0	64.6	53.9	58.4	53.7	42.1	81.6	38.4	85.0
C	53.9	21.3	0.0	53.5	56.0	72.6	65.2	67.2	63.1	36.1	90.5	48.4	93.4
D	42.1	43.3	53.5	0.0	33.0	29.8	66.9	23.6	15.2	77.9	46.1	41.5	82.9
E	69.3	47.0	56.0	33.0	0.0	34.8	59.5	24.8	30.5	76.6	41.7	26.5	69.8
F	62.0	64.6	72.6	29.8	34.8	0.0	84.1	19.8	25.3	99.0	28.6	55.2	87.2
G	86.5	53.9	65.2	66.9	59.5	84.1	0.0	71.0	70.5	64.7	86.8	43.0	64.5
H	62.6	58.4	67.2	23.6	24.8	19.8	71.0	0.0	12.7	89.7	25.9	42.3	75.3
I	54.2	53.7	63.1	15.2	30.5	25.3	70.5	12.7	0.0	85.3	34.4	42.2	78.2
J	79.1	42.1	36.1	77.9	76.6	99.0	64.7	89.7	85.3	0.0	112.7	59.7	91.4
K	83.2	81.6	90.5	46.1	41.7	28.6	86.8	25.9	34.4	112.7	0.0	59.7	84.1
L	71.1	38.4	48.4	41.5	26.5	55.2	43.0	42.3	42.2	59.7	59.7	0.0	61.6
M	107.1	85.0	93.4	82.9	69.8	87.2	64.5	75.3	78.2	91.4	84.1	61.6	0.0

Table S38: Correlation C 0.1s T 0.1s in RGB values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	59.9	89.8	93.9	63.3	80.3	54.4	117.4	67.7	67.4	126.0	72.9	96.9	127.7

2	86.8	82.4	93.1	50.5	42.4	32.2	88.2	34.0	42.5	117.2	20.3	62.8	90.7
3	106.6	112.3	122.0	73.9	72.9	53.6	115.0	57.2	63.6	145.0	34.3	91.4	108.3
4	104.1	116.2	125.7	77.3	80.7	54.0	125.3	63.6	69.0	151.5	45.3	100.9	118.2
5	47.3	51.2	53.6	40.5	54.0	45.9	85.3	50.2	47.2	85.8	64.9	62.0	106.5
6	111.4	109.3	120.4	75.6	68.5	59.8	104.7	57.7	64.5	140.2	35.6	82.5	95.1
7	105.3	115.3	124.0	76.6	77.5	53.3	123.3	60.4	66.8	149.4	40.5	98.1	114.3
8	107.2	84.1	99.2	82.7	75.1	92.0	44.8	82.1	84.0	104.5	88.6	69.4	79.1
9	90.1	103.6	111.9	65.2	70.8	40.6	118.4	53.3	58.3	138.9	40.1	91.6	112.9
10	71.0	83.4	91.7	45.8	55.3	24.6	99.4	37.1	40.6	119.3	31.3	73.8	101.8
11	51.5	24.0	22.9	49.0	56.2	68.8	63.1	62.9	57.6	37.4	85.5	46.0	86.7
12	47.1	44.2	53.7	30.4	42.1	33.9	73.8	39.4	37.5	81.3	55.5	51.0	90.7

Table S39: Correlation C 0.1s T 0.04s in RGB values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	34.4	32.4	28.7	37.5	50.2	55.3	71.3	52.1	47.3	56.9	75.5	51.2	91.1
2	62.9	30.3	38.3	35.3	25.3	51.1	48.7	39.5	37.9	53.0	60.8	15.6	67.9
3	63.5	45.2	53.3	28.6	23.0	39.9	57.0	26.8	25.8	69.0	46.0	24.6	66.7
4	51.7	43.8	51.7	18.2	25.1	28.2	66.5	20.8	17.5	74.2	44.1	35.7	74.6
5	52.7	23.6	14.2	52.2	57.6	71.7	64.4	65.9	61.1	36.1	88.7	48.0	91.4
6	71.9	47.7	56.9	37.7	24.5	48.4	49.5	33.3	33.8	68.6	49.3	15.2	57.8
7	57.7	44.9	51.5	22.8	22.1	32.9	62.7	19.9	19.0	71.3	42.8	30.1	69.7
8	85.8	49.1	59.4	69.0	62.0	88.0	13.3	75.2	73.7	54.1	93.1	42.9	66.5
9	49.3	37.6	43.5	21.8	28.7	35.6	64.9	28.9	25.2	65.1	52.1	33.7	74.6
10	48.3	28.4	32.5	30.1	36.5	48.7	58.0	40.7	36.0	52.6	63.7	31.8	75.7
11	74.7	41.2	34.7	73.3	74.2	94.0	65.2	85.1	80.3	11.6	107.8	57.8	89.4
12	56.3	21.6	21.8	50.8	53.9	70.0	57.8	63.3	58.7	33.3	86.0	42.5	83.0

Table S40: Autocorrelation C 0.1s in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
A	0.000	0.079	0.049	0.094	0.121	0.101	0.157	0.115	0.109	0.051	0.125	0.133	0.170
B	0.079	0.000	0.095	0.057	0.080	0.062	0.115	0.074	0.068	0.034	0.082	0.089	0.129
C	0.049	0.095	0.000	0.110	0.136	0.117	0.172	0.130	0.124	0.065	0.141	0.148	0.190
D	0.094	0.057	0.110	0.000	0.032	0.012	0.079	0.025	0.017	0.062	0.036	0.045	0.096
E	0.121	0.080	0.136	0.032	0.000	0.027	0.059	0.012	0.017	0.088	0.009	0.020	0.074
F	0.101	0.062	0.117	0.012	0.027	0.000	0.072	0.018	0.011	0.069	0.032	0.041	0.088
G	0.157	0.115	0.172	0.079	0.059	0.072	0.000	0.060	0.068	0.127	0.055	0.051	0.055
H	0.115	0.074	0.130	0.025	0.012	0.018	0.060	0.000	0.010	0.082	0.016	0.026	0.075
I	0.109	0.068	0.124	0.017	0.017	0.011	0.068	0.010	0.000	0.075	0.022	0.031	0.082
J	0.051	0.034	0.065	0.062	0.088	0.069	0.127	0.082	0.075	0.000	0.092	0.099	0.143
K	0.125	0.082	0.141	0.036	0.009	0.032	0.055	0.016	0.022	0.092	0.000	0.015	0.070
L	0.133	0.089	0.148	0.045	0.020	0.041	0.051	0.026	0.031	0.099	0.015	0.000	0.071
M	0.170	0.129	0.190	0.096	0.074	0.088	0.055	0.075	0.082	0.143	0.070	0.071	0.000

Table S41: Correlation C 0.1s T 0.1s in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	0.028	0.071	0.064	0.075	0.101	0.081	0.137	0.094	0.089	0.049	0.105	0.114	0.149
2	0.123	0.080	0.139	0.034	0.008	0.029	0.058	0.015	0.019	0.090	0.007	0.016	0.072
3	0.126	0.083	0.143	0.038	0.011	0.033	0.056	0.018	0.024	0.093	0.003	0.015	0.069
4	0.115	0.073	0.133	0.026	0.016	0.018	0.062	0.009	0.012	0.083	0.016	0.026	0.074
5	0.048	0.061	0.040	0.076	0.102	0.084	0.141	0.097	0.090	0.036	0.108	0.114	0.159
6	0.137	0.093	0.155	0.050	0.023	0.044	0.045	0.028	0.036	0.105	0.016	0.016	0.058
7	0.117	0.077	0.135	0.030	0.013	0.022	0.060	0.009	0.015	0.086	0.015	0.027	0.071
8	0.162	0.117	0.180	0.080	0.058	0.071	0.054	0.059	0.066	0.131	0.053	0.051	0.054
9	0.104	0.066	0.122	0.017	0.025	0.007	0.070	0.015	0.011	0.074	0.028	0.038	0.083
10	0.099	0.061	0.117	0.011	0.028	0.009	0.073	0.019	0.013	0.068	0.030	0.039	0.089
11	0.053	0.032	0.070	0.053	0.081	0.061	0.122	0.074	0.067	0.012	0.085	0.093	0.135

12	0.083	0.027	0.102	0.032	0.056	0.036	0.094	0.049	0.042	0.044	0.058	0.066	0.108

Table S42: Correlation C 0.1s T 0.04s in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	0.028	0.088	0.049	0.089	0.115	0.096	0.152	0.109	0.103	0.060	0.120	0.129	0.165
2	0.120	0.078	0.133	0.030	0.012	0.029	0.064	0.018	0.019	0.085	0.014	0.018	0.082
3	0.123	0.080	0.138	0.034	0.012	0.032	0.059	0.019	0.022	0.089	0.010	0.014	0.078
4	0.105	0.063	0.118	0.014	0.025	0.008	0.072	0.017	0.009	0.071	0.030	0.038	0.088
5	0.033	0.080	0.020	0.096	0.123	0.104	0.160	0.117	0.111	0.049	0.128	0.135	0.177
6	0.136	0.091	0.151	0.048	0.022	0.042	0.045	0.027	0.034	0.102	0.016	0.009	0.065
7	0.113	0.073	0.128	0.022	0.011	0.018	0.063	0.007	0.008	0.080	0.017	0.025	0.080
8	0.158	0.115	0.172	0.080	0.060	0.073	0.004	0.060	0.068	0.128	0.056	0.052	0.055
9	0.098	0.061	0.113	0.006	0.028	0.008	0.075	0.020	0.013	0.066	0.033	0.041	0.093
10	0.091	0.057	0.107	0.007	0.034	0.018	0.081	0.028	0.021	0.059	0.038	0.046	0.099
11	0.054	0.042	0.067	0.049	0.076	0.059	0.120	0.071	0.064	0.020	0.081	0.089	0.136
12	0.076	0.025	0.090	0.039	0.064	0.046	0.105	0.058	0.051	0.034	0.068	0.075	0.121

Picture properties: file format: RAW; color space: ProPhoto RGB, white balance: 6500K, shutter speed: 0.04s

Table S43: Autocorrelation C 0.04s in RGB values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
A	0.0	28.8	30.9	24.2	39.8	41.2	49.2	36.4	31.5	44.2	48.0	40.8	61.5
B	28.8	0.0	10.4	23.8	26.4	40.8	29.8	33.0	30.4	22.8	45.9	21.3	48.2
C	30.9	10.4	0.0	28.3	29.9	42.4	35.1	36.7	34.5	20.0	49.6	25.4	51.8
D	24.2	23.8	28.3	0.0	19.0	29.4	37.2	14.1	9.0	42.1	26.7	23.5	48.1
E	39.8	26.4	29.9	19.0	0.0	29.0	34.0	14.0	17.5	42.3	23.1	15.3	41.0
F	41.2	40.8	42.4	29.4	29.0	0.0	53.3	26.0	27.0	52.3	31.1	36.1	45.0
G	49.2	29.8	35.1	37.2	34.0	53.3	0.0	40.3	40.0	35.2	49.0	24.1	37.4
H	36.4	33.0	36.7	14.1	14.0	26.0	40.3	0.0	7.5	49.5	14.4	24.0	44.0
I	31.5	30.4	34.5	9.0	17.5	27.0	40.0	7.5	0.0	47.1	19.5	24.2	45.9
J	44.2	22.8	20.0	42.1	42.3	52.3	35.2	49.5	47.1	0.0	62.2	32.3	49.8
K	48.0	45.9	49.6	26.7	23.1	31.1	49.0	14.4	19.5	62.2	0.0	33.6	48.8
L	40.8	21.3	25.4	23.5	15.3	36.1	24.1	24.0	24.2	32.3	33.6	0.0	35.6
M	61.5	48.2	51.8	48.1	41.0	45.0	37.4	44.0	45.9	49.8	48.8	35.6	0.0

Table S44: Correlation C 0.04s T 0.1s in RGB values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	100.2	118.5	121.0	101.5	107.6	101.4	128.9	99.4	100.6	138.9	94.3	119.1	130.8
2	105.4	109.7	114.5	91.1	88.0	90.0	109.7	81.7	85.8	129.4	69.7	99.5	106.2
3	130.4	137.8	142.4	117.0	115.7	113.1	137.0	107.5	110.9	156.4	94.8	126.8	130.3
4	133.7	144.0	148.4	123.4	123.6	118.7	146.2	115.0	118.0	163.6	103.4	135.3	139.3
5	66.7	78.3	80.5	63.4	68.9	70.8	90.4	62.0	62.8	99.1	58.3	79.1	97.8
6	129.5	133.4	138.5	114.1	110.7	111.7	129.3	103.8	107.6	151.1	90.6	120.0	120.9
7	132.8	142.2	146.3	121.4	120.9	116.9	143.9	112.3	115.6	161.2	100.5	132.7	136.1
8	103.9	98.1	105.6	90.1	86.6	99.6	79.3	86.1	88.6	112.1	81.2	88.5	87.0
9	120.1	131.5	135.4	111.0	112.0	106.1	136.2	103.2	106.1	151.2	92.5	124.1	129.8
10	100.0	111.6	115.5	91.3	93.5	89.4	116.3	84.4	87.0	131.8	74.2	105.1	113.2
11	25.3	30.9	33.9	20.5	30.7	33.9	48.8	26.7	24.6	49.7	34.4	35.8	58.2
12	63.4	73.0	77.4	57.2	61.0	59.1	82.0	54.2	55.9	94.2	48.9	71.6	85.5

Table S45: Correlation C 0.04s T 0.04s in RGB values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	34.0	50.4	51.5	34.6	43.5	41.2	65.5	36.2	36.0	69.2	39.8	53.6	71.7
2	49.6	46.3	50.9	29.2	23.4	35.1	49.7	18.7	23.7	64.7	10.8	35.2	52.4
3	60.5	62.5	66.9	42.1	40.1	41.9	64.0	31.7	35.4	79.7	19.0	50.8	61.6
4	59.2	66.9	70.9	46.2	47.8	44.6	73.2	38.3	40.9	86.0	29.9	59.7	70.9
5	25.8	29.8	30.6	22.9	31.2	39.0	49.1	29.3	27.7	49.0	37.6	36.5	61.8
6	64.8	62.6	67.6	44.9	39.5	47.2	59.6	33.6	37.9	78.8	21.1	47.6	55.3
7	59.5	64.7	68.5	43.6	43.3	43.2	69.0	33.5	37.1	82.7	22.6	55.1	65.7
8	61.9	49.2	56.3	47.5	43.4	62.6	26.6	46.6	48.1	60.5	49.2	39.9	45.7
9	50.4	58.2	61.8	37.3	39.9	36.1	66.7	29.9	32.4	76.9	23.0	51.9	65.1
10	39.1	45.7	49.0	25.1	30.4	31.2	55.0	20.0	21.6	64.6	18.2	40.8	58.1
11	29.9	13.2	12.0	25.7	30.0	38.7	34.2	34.2	31.3	19.9	46.9	24.1	47.7
12	27.0	25.8	29.6	17.4	24.3	30.4	42.3	22.8	21.5	45.4	31.7	29.6	52.9

Table S46: Autocorrelation C 0.04s in u'v' values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
A	0.000	0.083	0.044	0.100	0.131	0.126	0.167	0.124	0.117	0.070	0.135	0.145	0.184
B	0.083	0.000	0.081	0.055	0.080	0.086	0.119	0.075	0.067	0.029	0.084	0.092	0.137
C	0.044	0.081	0.000	0.092	0.123	0.131	0.165	0.118	0.109	0.068	0.129	0.138	0.188
D	0.100	0.055	0.092	0.000	0.036	0.060	0.087	0.029	0.020	0.043	0.041	0.052	0.109
E	0.131	0.080	0.123	0.036	0.000	0.061	0.064	0.013	0.019	0.070	0.011	0.022	0.084
F	0.126	0.086	0.131	0.060	0.061	0.000	0.096	0.056	0.055	0.078	0.060	0.070	0.082
G	0.167	0.119	0.165	0.087	0.064	0.096	0.000	0.064	0.074	0.111	0.060	0.055	0.066
H	0.124	0.075	0.118	0.029	0.013	0.056	0.064	0.000	0.011	0.064	0.017	0.027	0.086
I	0.117	0.067	0.109	0.020	0.019	0.055	0.074	0.011	0.000	0.057	0.024	0.035	0.094
J	0.070	0.029	0.068	0.043	0.070	0.078	0.111	0.064	0.057	0.000	0.074	0.083	0.129
K	0.135	0.084	0.129	0.041	0.011	0.060	0.060	0.017	0.024	0.074	0.000	0.016	0.080
L	0.145	0.092	0.138	0.052	0.022	0.070	0.055	0.027	0.035	0.083	0.016	0.000	0.080
M	0.184	0.137	0.188	0.109	0.084	0.082	0.066	0.086	0.094	0.129	0.080	0.080	0.000

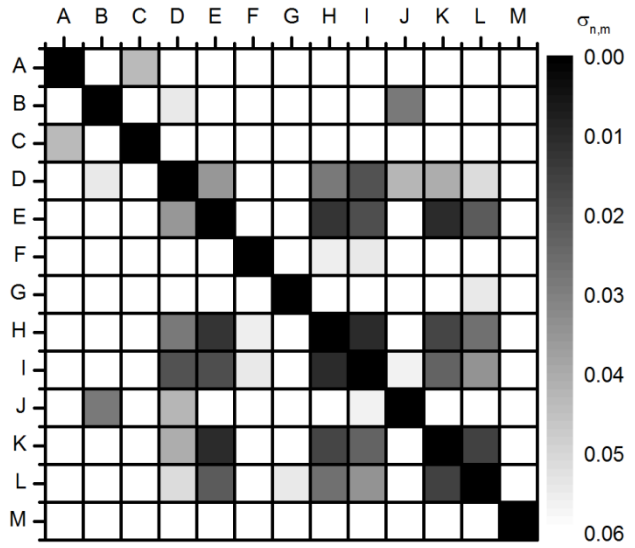


Figure S 30 Autocorrelation C 0.04s in u'v' values obtained from digital pictures (file format: RAW; color space: ProPhoto RGB, white balance: 6500K, shutter speed: 0.04s).

Table S47: Correlation C 0.04s T 0.1s in u'v' values.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	0.042	0.069	0.062	0.069	0.099	0.091	0.137	0.092	0.085	0.051	0.103	0.114	0.150

2	0.137	0.085	0.133	0.045	0.018	0.053	0.059	0.021	0.028	0.076	0.013	0.022	0.072
3	0.140	0.088	0.136	0.049	0.020	0.056	0.057	0.024	0.032	0.078	0.013	0.021	0.069
4	0.129	0.078	0.127	0.040	0.024	0.046	0.063	0.019	0.025	0.069	0.021	0.031	0.074
5	0.053	0.054	0.034	0.065	0.096	0.103	0.139	0.091	0.082	0.042	0.103	0.111	0.160
6	0.151	0.099	0.149	0.062	0.033	0.061	0.048	0.036	0.045	0.090	0.025	0.025	0.058
7	0.131	0.082	0.129	0.043	0.023	0.046	0.062	0.020	0.027	0.071	0.021	0.032	0.070
8	0.174	0.124	0.175	0.092	0.066	0.084	0.058	0.067	0.076	0.117	0.060	0.057	0.052
9	0.118	0.071	0.117	0.032	0.029	0.044	0.071	0.019	0.020	0.060	0.029	0.040	0.084
10	0.112	0.066	0.111	0.026	0.029	0.045	0.074	0.019	0.018	0.055	0.029	0.040	0.089
11	0.064	0.030	0.064	0.047	0.077	0.077	0.121	0.070	0.062	0.015	0.081	0.091	0.136
12	0.095	0.033	0.096	0.034	0.054	0.058	0.094	0.047	0.041	0.033	0.057	0.066	0.109

Table S48: Correlation C 0.04s T 0.04s in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	0.035	0.084	0.048	0.082	0.111	0.108	0.151	0.105	0.098	0.064	0.117	0.127	0.165
2	0.133	0.081	0.126	0.038	0.010	0.058	0.063	0.015	0.021	0.071	0.007	0.017	0.082
3	0.136	0.084	0.131	0.042	0.013	0.060	0.059	0.018	0.026	0.074	0.003	0.015	0.078
4	0.117	0.067	0.112	0.026	0.025	0.049	0.072	0.014	0.012	0.058	0.028	0.038	0.089
5	0.032	0.073	0.017	0.086	0.117	0.121	0.158	0.111	0.104	0.059	0.123	0.132	0.178
6	0.149	0.096	0.145	0.058	0.028	0.066	0.046	0.031	0.041	0.087	0.020	0.016	0.066
7	0.126	0.077	0.121	0.033	0.013	0.052	0.063	0.007	0.016	0.066	0.014	0.026	0.080
8	0.169	0.121	0.168	0.089	0.066	0.092	0.010	0.065	0.075	0.112	0.061	0.056	0.058
9	0.111	0.064	0.107	0.019	0.026	0.050	0.075	0.016	0.011	0.052	0.029	0.041	0.093
10	0.104	0.059	0.100	0.012	0.030	0.054	0.080	0.022	0.014	0.046	0.033	0.044	0.100
11	0.066	0.038	0.059	0.040	0.071	0.078	0.119	0.066	0.057	0.019	0.076	0.086	0.136
12	0.087	0.024	0.083	0.033	0.060	0.069	0.104	0.054	0.046	0.025	0.064	0.073	0.122

Order of the test data set recorded with a spectral photometer:

1 = A, 2 = H, 3 = C, 4 = F, 5 = K, 6 = I, 7 = J, 8 = D, 9 = G, 10 = L, 11 = E, 12 = B

Table S49: Autocorrelation C(spectra) in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
A	0.000	0.061	0.035	0.090	0.104	0.091	0.175	0.111	0.104	0.031	0.126	0.145	0.193
B	0.061	0.000	0.074	0.058	0.069	0.060	0.138	0.076	0.069	0.057	0.089	0.106	0.157
C	0.035	0.074	0.000	0.094	0.110	0.094	0.184	0.114	0.107	0.034	0.133	0.152	0.203
D	0.090	0.058	0.094	0.000	0.024	0.007	0.105	0.026	0.017	0.094	0.043	0.065	0.129
E	0.104	0.069	0.110	0.024	0.000	0.022	0.090	0.015	0.015	0.107	0.024	0.044	0.116
F	0.091	0.060	0.094	0.007	0.022	0.000	0.104	0.022	0.014	0.095	0.042	0.064	0.126
G	0.175	0.138	0.184	0.105	0.090	0.104	0.000	0.085	0.095	0.179	0.077	0.064	0.072
H	0.111	0.076	0.114	0.026	0.015	0.022	0.085	0.000	0.011	0.113	0.025	0.045	0.110
I	0.104	0.069	0.107	0.017	0.015	0.014	0.095	0.011	0.000	0.107	0.031	0.052	0.118
J	0.031	0.057	0.034	0.094	0.107	0.095	0.179	0.113	0.107	0.000	0.130	0.147	0.195
K	0.126	0.089	0.133	0.043	0.024	0.042	0.077	0.025	0.031	0.130	0.000	0.024	0.103
L	0.145	0.106	0.152	0.065	0.044	0.064	0.064	0.045	0.052	0.147	0.024	0.000	0.093
M	0.193	0.157	0.203	0.129	0.116	0.126	0.072	0.110	0.118	0.195	0.103	0.093	0.000

Table S50: Correlation C(spectra) T(spectra) in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
1	0.003	0.061	0.035	0.091	0.106	0.093	0.177	0.112	0.106	0.030	0.128	0.146	0.194
2	0.110	0.076	0.115	0.026	0.011	0.023	0.087	0.006	0.012	0.113	0.021	0.042	0.112
3	0.034	0.070	0.009	0.088	0.104	0.088	0.179	0.108	0.101	0.034	0.126	0.146	0.199
4	0.092	0.061	0.097	0.007	0.019	0.005	0.103	0.021	0.013	0.096	0.039	0.061	0.126
5	0.124	0.087	0.131	0.041	0.021	0.040	0.079	0.023	0.029	0.127	0.003	0.026	0.105
6	0.106	0.071	0.112	0.020	0.010	0.019	0.092	0.013	0.010	0.110	0.024	0.046	0.116

7	0.028	0.059	0.031	0.094	0.107	0.094	0.179	0.113	0.106	0.007	0.129	0.147	0.195
8	0.091	0.059	0.096	0.004	0.021	0.008	0.104	0.025	0.016	0.096	0.040	0.063	0.128
9	0.175	0.138	0.184	0.105	0.090	0.104	0.001	0.086	0.095	0.179	0.077	0.064	0.072
10	0.145	0.106	0.153	0.066	0.045	0.065	0.065	0.046	0.053	0.147	0.025	0.003	0.094
11	0.095	0.053	0.106	0.036	0.026	0.037	0.098	0.039	0.037	0.096	0.041	0.055	0.122
12	0.059	0.005	0.073	0.055	0.065	0.057	0.136	0.073	0.066	0.056	0.086	0.103	0.155

Table S51: Correlation C(spectra) T(C 0.1s; ProPhoto RGB) in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
A	0.051	0.067	0.068	0.064	0.080	0.065	0.151	0.083	0.078	0.072	0.098	0.117	0.163
B	0.094	0.044	0.109	0.054	0.054	0.054	0.109	0.060	0.056	0.094	0.067	0.079	0.121
C	0.047	0.068	0.037	0.067	0.085	0.068	0.163	0.088	0.081	0.057	0.106	0.127	0.186
D	0.125	0.088	0.133	0.048	0.036	0.046	0.073	0.031	0.037	0.129	0.030	0.039	0.085
E	0.151	0.113	0.159	0.076	0.059	0.073	0.057	0.054	0.063	0.153	0.044	0.036	0.065
F	0.132	0.095	0.140	0.057	0.046	0.054	0.067	0.039	0.046	0.135	0.039	0.043	0.076
G	0.182	0.146	0.190	0.116	0.102	0.114	0.034	0.097	0.105	0.185	0.089	0.077	0.056
H	0.145	0.107	0.152	0.070	0.055	0.067	0.057	0.049	0.058	0.147	0.043	0.039	0.065
I	0.139	0.101	0.147	0.063	0.048	0.060	0.064	0.043	0.050	0.141	0.037	0.037	0.072
J	0.068	0.034	0.082	0.038	0.045	0.038	0.120	0.053	0.048	0.072	0.065	0.083	0.136
K	0.155	0.117	0.164	0.081	0.065	0.079	0.055	0.061	0.069	0.158	0.049	0.039	0.060
L	0.162	0.123	0.170	0.088	0.069	0.085	0.050	0.066	0.075	0.164	0.052	0.037	0.062
M	0.196	0.162	0.206	0.136	0.123	0.133	0.077	0.118	0.126	0.198	0.111	0.101	0.026

Table S52: Correlation C(spectra) T(C 0.04s; ProPhoto RGB) in u'v' values.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
A	0.04	0.07	0.06	0.07	0.09	0.08	0.16	0.1	0.09	0.07	0.11	0.13	0.18
B	0.09	0.04	0.1	0.05	0.05	0.05	0.11	0.06	0.05	0.09	0.07	0.08	0.13
C	0.05	0.06	0.05	0.06	0.08	0.06	0.16	0.08	0.07	0.06	0.1	0.12	0.18
D	0.12	0.08	0.13	0.04	0.02	0.03	0.08	0.02	0.03	0.12	0.02	0.04	0.1
E	0.15	0.11	0.15	0.07	0.05	0.07	0.06	0.05	0.06	0.15	0.03	0.03	0.08
F	0.15	0.11	0.15	0.08	0.08	0.08	0.1	0.07	0.07	0.15	0.07	0.08	0.07
G	0.18	0.14	0.19	0.11	0.1	0.11	0.03	0.09	0.1	0.18	0.09	0.07	0.06
H	0.14	0.1	0.15	0.06	0.05	0.06	0.06	0.04	0.05	0.14	0.03	0.03	0.08
I	0.13	0.1	0.14	0.05	0.04	0.05	0.07	0.03	0.04	0.14	0.03	0.03	0.08
J	0.08	0.04	0.09	0.03	0.04	0.03	0.11	0.04	0.04	0.08	0.05	0.07	0.12
K	0.15	0.11	0.16	0.08	0.06	0.07	0.06	0.05	0.06	0.15	0.04	0.03	0.07
L	0.16	0.12	0.17	0.08	0.07	0.08	0.05	0.06	0.07	0.16	0.05	0.03	0.07
M	0.2	0.16	0.21	0.14	0.12	0.14	0.08	0.12	0.13	0.2	0.11	0.1	0.03

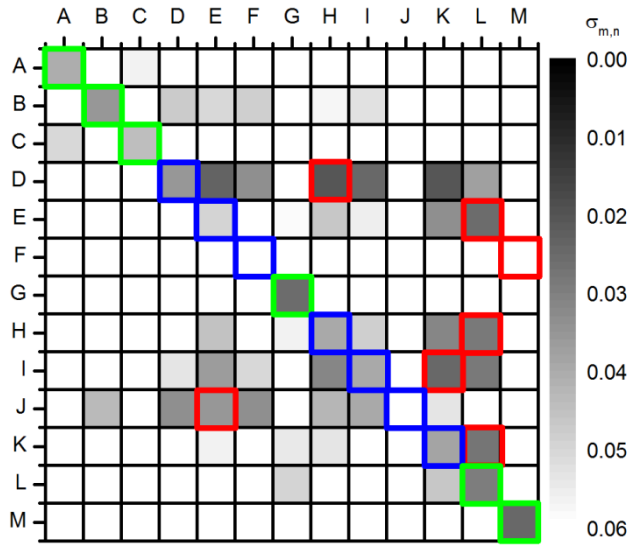


Figure S 31 Correlation plots of u'v' values with the calibration data set of the emission spectra and the calibration data set of the pictures (file format: RAW; color space: ProPhoto RGB, white balance: 6500K, shutter speed: 0.04s). The green squares mark the correctly identified acids; the red squares mark misidentified and the blue squares mark the correct acids.

5 NMR Spectra:

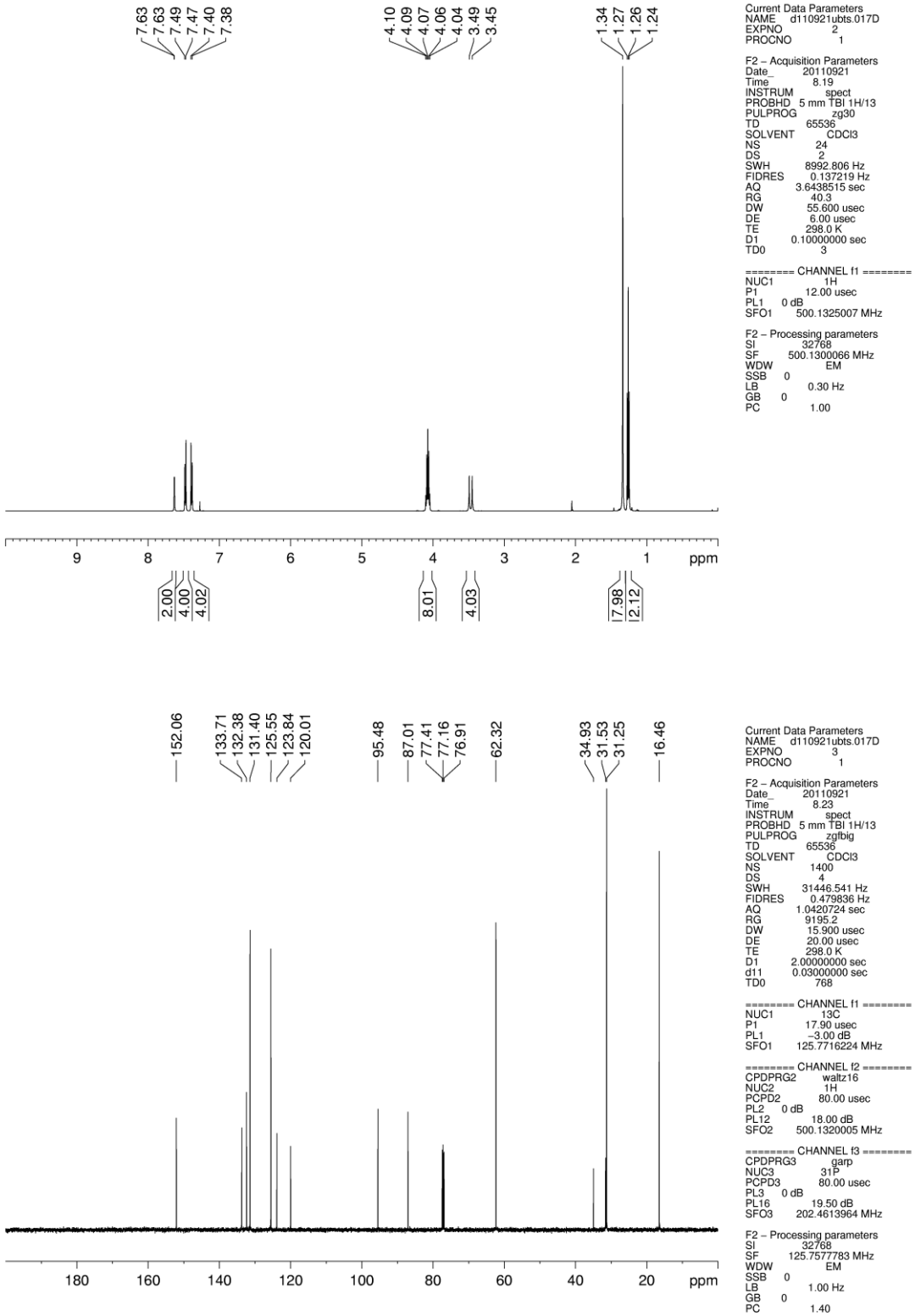


Figure S 32 (Top) ^{1}H-NMR spectrum and (bottom) $^{13}C\{^{1}H\}\{^{31}P\}$-NMR spectrum of **3**.

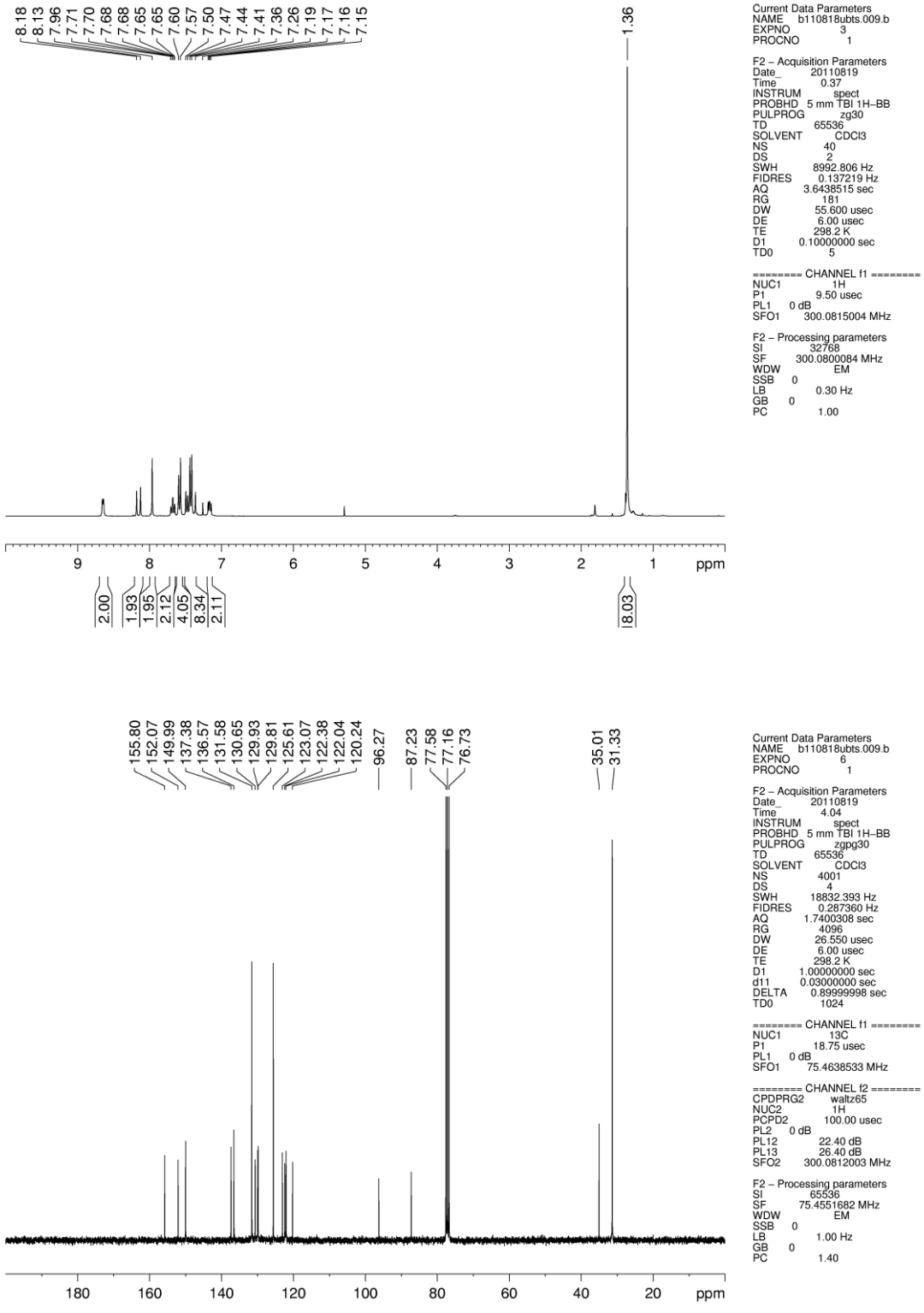


Figure S 33 (Top) ^{1}H-NMR spectrum and (bottom) ^{13}C{^{1}H}-NMR spectrum of **5c**.

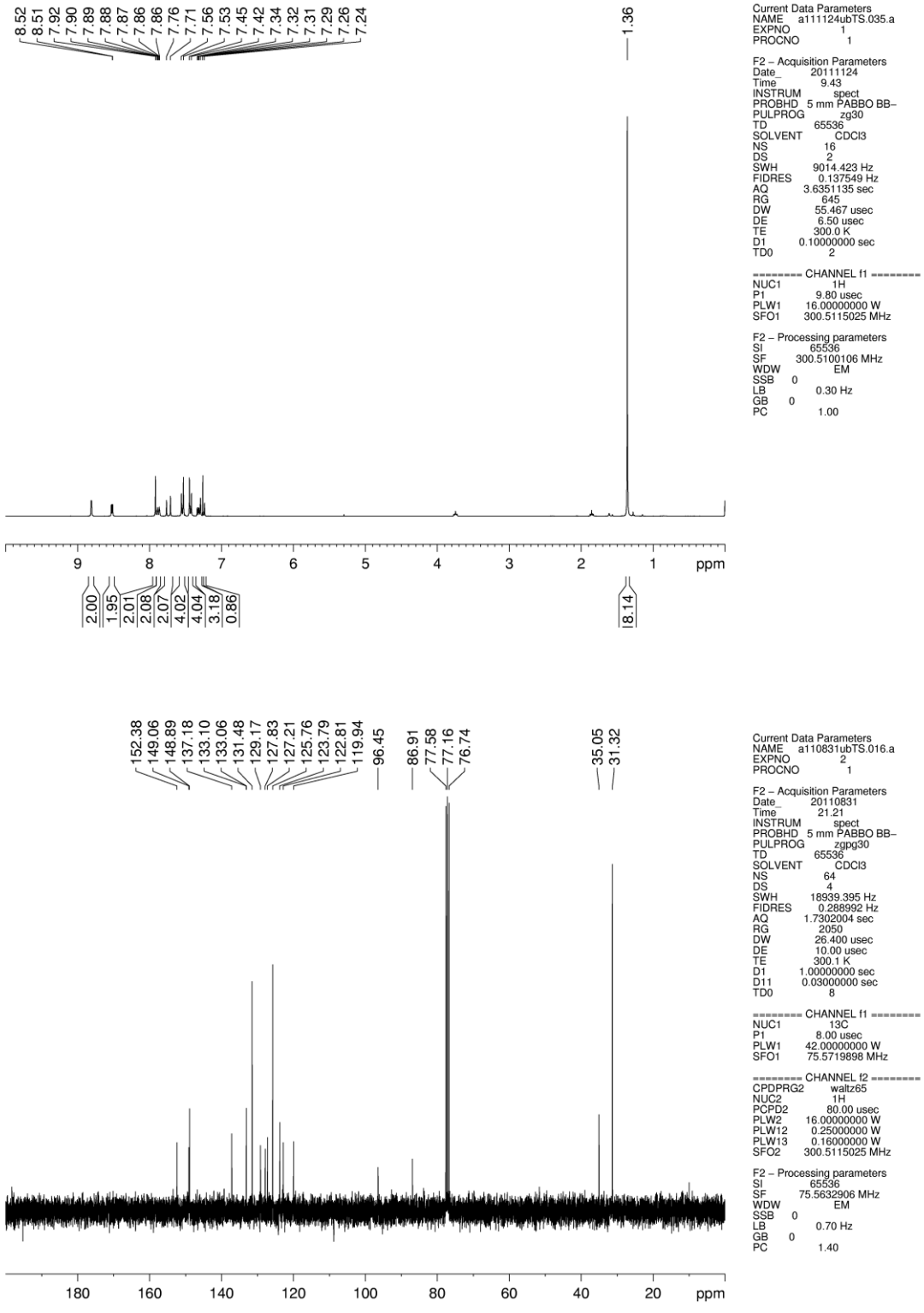


Figure S 34 (Top) ^{1}H-NMR spectrum and (bottom) ^{13}C{^{1}H}-NMR spectrum of **5b**.

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