

Optical Properties of the Chalon Issues

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Tables

Table 1:

Summary of the CIE L*a*b* shade measurements made on “unprinted” areas in the value tablets for 81 of the Chalons in this study.

Each stamp is identified by its SG and CP Catalogue numbers.

“U” denotes “Used”, and “UN” denotes “Unused”.

Sometimes, measurements were made on several different examples of stamps with the same catalogue number, and these are denoted by “Ex No” in column 4.

On two occasions measurements were made on a joined horizontal pair, with “LH” and “RH” denoting the left-hand and right-hand stamp respectively.

The designated shade of each stamp, according to the CP Catalogue, is given in column 5, while the paper type used to print each stamp and the watermark are listed in columns 6 and 7 respectively.

The means and standard deviations for each optical coordinate are for the 10 measurements that were made on each stamp.

Table 1: Summary of CIE L*a*b* shade measurements

SG	CP	U/UN	Ex No	Shade	Paper	Watermark	L*		a*		b*	
							Mean	SD	Mean	SD	Mean	SD
1	A1a	U	1	Deep Carmine-red	Rush Mills	Star	80.08	2.38	2.21	0.48	18.48	1.23
2	A2a	U	1	Deep (Greenish) Blue	Rush Mills (Blued)	Star	76.92	1.68	-5.74	0.25	10.29	0.91
3	A6a	U	1	Yellow-green	Rush Mills (Blued)	Star	81.60	1.08	-6.25	0.69	11.36	1.20
4	A1c(1)	UN	1	Bright Red	Gazette (Blue)	None (usually)	74.34	1.27	-3.22	0.24	0.36	1.47
4	A1c(1)	U	1	Bright Red	Gazette (Blue)	None (usually)	77.22	1.27	-2.76	0.29	-0.46	0.85
4	A1c(2)	U	1	Red	Gazette (Blue)	None (usually)	74.05	1.32	-3.23	0.96	5.09	5.88
5	A2b(1)	U	1	Blue	Gazette (Blue)	None (usually)	78.00	1.29	-5.09	0.51	5.00	0.89
5	A2b(1)	U	2	Blue	Gazette (Blue)	None (usually)	75.06	1.20	-4.97	0.29	-7.62	2.23
5	A2b(2)	U	1	Pale Blue	Gazette (Blue)	None (usually)	74.79	1.74	-6.08	0.24	3.60	1.64
6	A6b	U	1	Green	Gazette (Blue)	None (usually)	72.69	1.57	-5.32	0.47	3.81	1.73
8	A1d(1)	U	1	Dull Orange	White (Thick, HM)	None	83.94	1.72	4.23	0.78	22.06	1.42
8	A1d(2)	U	1	Dull Orange	White (Thin, VM)	None	90.14	1.08	0.12	0.51	13.61	1.89
8a	A2c(1)	U	1	Deep Ultramarine	White (Thick, HM)	None	86.23	0.85	-1.57	0.58	11.61	0.85
9	A2c(2)	U	1	Pale Blue	White (Thick, HM)	None	87.28	1.58	-3.03	0.88	9.50	1.13
9	A2c(2)	U	2	Pale Blue	White (Thick, HM)	None	82.27	1.42	-3.65	0.59	13.27	1.59
9	A2c(2)	U	3	Pale Blue	White (Thick, HM)	None	83.09	1.68	-3.10	0.55	12.17	1.31
9	A2c(5)	U	1	Pale Blue	White (Thin, VM)	None	77.44	1.90	-5.38	0.64	13.02	1.57
10	A2c(3)	U	1	Blue	White (Thick, HM)	None	88.06	0.86	-3.66	0.39	10.40	0.60
10	A2c(7)	U	1	Blue	White (Thin, VM)	None	86.04	1.13	-6.65	0.97	10.72	1.86
11	A2c(4)	U	1	Deep Blue	White (Thick, HM)	None	82.54	0.77	-2.61	0.52	16.22	0.65

Table 1 continued

SG	CP	U/UN	Ex No	Shade	Paper	Watermark	L*		a*		b*	
							Mean	SD	Mean	SD	Mean	SD
12	A5a(2)	U	1	Bistre	White (Thick, HM)	None	83.80	1.57	1.67	0.53	17.47	1.24
13	A5a(3)	U	1	Deep Brown	White (Thick, HM)	None	84.41	1.04	-0.31	0.21	13.35	0.50
13	A5a(4)	U	1	Brown	White (Thick, HM)	None	84.84	1.50	2.64	0.54	21.87	0.75
13	A5a(10)	U	1	Brown	White (Thin, VM)	None	88.27	0.90	0.65	0.29	15.38	0.61
14	A5a(5)	UN	1	Pale Brown	White (Thick, HM)	None	80.90	1.41	1.59	0.32	18.39	0.79
14	A5a(5)	U	1	Pale Brown	White (Thick, HM)	None	76.50	1.88	0.58	0.25	18.08	1.33
14	A5a(6)	U	1	Tan Brown	White (Thick, HM)	None	86.32	1.65	0.31	0.23	14.66	0.61
14	A5a(11)	U	1	Pale Brown	White (Thin, VM)	None	83.99	2.15	1.01	0.34	19.41	0.95
15	A5a(12)	U	1	Chestnut	White (Thin, VM)	None	84.35	1.44	1.58	0.31	19.38	0.71
16	A6c(1)	U	1	Dull Emerald-green	White (Thick, HM)	None	86.18	1.06	-1.24	0.51	13.40	0.75
17	A6c(2)	U	1	Blue-green	White (Thick, HM)	None	80.61	0.78	-3.28	0.54	17.76	0.93
33	A1e(1)	U	1	Bright Orange-vermilion	Rush Mills	Star	81.22	1.41	2.46	0.40	17.66	0.85
33	A1e(2)	U	1	Orange-vermilion	Rush Mills	Star	82.77	0.68	2.34	1.19	17.67	1.79
34	A1e(3)	UN	1	Vermilion	Rush Mills	Star	82.85	1.33	5.05	0.71	20.74	0.99
34	A1e(3)	U	1	Vermilion	Rush Mills	Star	79.83	1.52	1.47	0.65	16.11	0.91
35	A1e(4)	UN	1	Carmine-vermilion	Rush Mills	Star	83.59	1.01	6.98	0.83	20.91	0.84
35	A1e(4)	U	1	Carmine-vermilion	Rush Mills	Star	82.28	0.85	4.01	0.77	19.28	0.82
35	A1e(5)	U	1	Carmine	Rush Mills	Star	80.01	2.66	3.36	1.54	21.46	2.29
36	A2d(2)	U	1	Deep Blue	Rush Mills	Star	81.16	1.52	-5.13	0.79	9.91	0.75

Table 1 continued

SG	CP	U/UN	Ex No	Shade	Paper	Watermark	L*		a*		b*	
							Mean	SD	Mean	SD	Mean	SD
36	A2d(3)	U	1	Blue	Rush Mills	Star	80.44	1.99	-4.62	0.44	11.15	0.97
36	A2d(4)	U	1	Bright Blue	Rush Mills	Star	78.42	1.85	-8.47	1.34	6.08	1.80
37	A2d(5)	U	1(LH)	Ultramarine (bright-dull)	Rush Mills	Star	79.21	2.60	-3.81	1.42	15.63	1.10
37	A2d(5)	U	2(RH)	Ultramarine (bright-dull)	Rush Mills	Star	79.59	1.00	-4.16	1.28	15.02	1.98
37	A2d(6)	U	1	Slate Blue	Rush Mills	Star	76.86	1.86	-6.48	0.63	7.74	1.12
37	A2d(7)	U	1	Greenish Slate-blue	Rush Mills	Star	72.59	1.04	-7.34	0.67	12.86	1.72
37a	A2d(8)	U	1	Pale or Milky Blue	Rush Mills	Star	82.26	1.53	-6.81	1.01	8.29	1.33
38	A2d(10)	U	1	Pale Greenish Blue	Rush Mills	Star	72.43	2.88	-10.31	1.50	1.11	2.66
38	A2d(11)	UN	1	Greenish Blue	Rush Mills	Star	81.18	2.41	-8.42	1.26	8.41	1.91
38	A2d(11)	U	1	Greenish Blue	Rush Mills	Star	76.56	1.24	-5.07	0.73	13.05	1.52
38	A2d(12)	U	1	Dull Deep Blue	Rush Mills	Star	78.32	2.54	-8.45	0.95	3.19	1.85
38	A2d(12)	U	2	Dull Deep Blue	Rush Mills	Star	84.95	1.18	-8.01	0.97	2.19	1.50
38	A2d(12)	U	3	Dull Deep Blue	Rush Mills	Star	76.01	1.00	-8.13	1.42	12.00	2.03
39	A2d(14)	U	1	Dull Blue	Rush Mills	Star	78.57	1.64	-7.53	0.72	10.26	1.26
39	A2d(14)	U	2	Dull Blue	Rush Mills	Star	80.94	1.82	-3.80	0.66	12.49	1.29
39	A2d(14)	U	3	Dull Blue	Rush Mills	Star	83.04	1.53	-4.90	0.65	9.80	0.92
39	A2d(14)	U	4	Dull Blue	Rush Mills	Star	78.96	1.72	-8.86	0.64	4.59	1.58
39	A2d(15)	U	1(LH)	Blue	Rush Mills	Star	78.59	1.89	-5.94	0.63	10.35	1.51
39	A2d(15)	U	2(RH)	Blue	Rush Mills	Star	79.06	1.16	-4.84	0.72	11.48	0.91
40	A3a(1)	U	1	Brown-lilac	Rush Mills	Star	77.87	0.93	1.25	0.39	18.89	1.14
40	A3a(2)	UN	1	Deep Brown-lilac	Rush Mills	Star	82.73	1.94	2.85	0.68	19.12	1.61

Table 1 continued

SG	CP	U/UN	Ex No	Shade	Paper	Watermark	L*		a*		b*	
							Mean	SD	Mean	SD	Mean	SD
40	A3a(2)	U	1	Deep Brown-lilac	Rush Mills	Star	74.44	2.23	4.81	0.79	21.80	1.03
40	A3a(2)	U	2	Deep Brown-lilac	Rush Mills	Star	79.50	1.24	2.28	0.69	20.14	1.45
40	A3a(2)	U	3	Deep Brown-lilac	Rush Mills	Star	79.85	1.88	0.87	0.80	15.49	1.95
41	A5b(1)	U	1	Black-brown	Rush Mills	Star	81.40	1.60	-0.61	0.37	15.88	1.25
41	A5b(1)	U	2	Black-brown	Rush Mills	Star	80.70	1.77	-0.56	0.31	16.74	1.02
41	A5b(1)	U	3	Black-brown	Rush Mills	Star	80.67	1.74	-0.69	0.40	16.39	1.34
42	A5b(2)	U	1	Grey-black	Rush Mills	Star	80.78	1.35	-0.79	0.26	15.49	0.69
42	A5b(3)	U	1	Brown	Rush Mills	Star	76.38	1.98	-0.36	0.27	16.64	0.97
43	A5b(4)	U	1	Deep Red-brown	Rush Mills	Star	84.76	1.51	1.70	1.21	15.22	1.40
43	A5b(4)	U	2	Deep Red-brown	Rush Mills	Star	80.40	1.27	1.70	0.47	16.41	0.58
43	A5b(4)	U	3	Deep Red-brown	Rush Mills	Star	77.99	1.34	2.07	0.94	18.77	0.75
43	A5b(4)	U	4	Deep Red-brown	Rush Mills	Star	80.88	1.66	3.40	0.65	17.59	1.59
43	A5b(4)	U	5	Deep Red-brown	Rush Mills	Star	77.08	3.04	2.98	0.58	19.77	0.92
43	A5b(5)	U	1	Red-brown	Rush Mills	Star	84.76	1.51	3.00	0.71	18.31	1.16
43	A5b(6)	UN	1	Pale Red-brown	Rush Mills	Star	82.49	1.16	2.87	0.60	18.61	1.31
44	A6d(1)	U	1	Bluish-green	Rush Mills	Star	83.23	1.04	-1.91	0.50	17.03	0.78
45	A6d(3)	U	1	Yellow-green	Rush Mills	Star	84.93	0.95	-3.68	0.86	18.48	0.78
45	A6d(4)	U	1	Dull, Deep Yellow-green	Rush Mills	Star	80.01	1.35	-4.33	0.76	20.63	1.47
45	A6d(5)	U	1	Bronze-green	Rush Mills	Star	80.29	0.96	-5.10	0.65	18.29	1.03
45	A6d(6)	U	1	Olive-green	Rush Mills	Star	84.70	1.22	-6.20	0.77	22.09	1.74
46	A6d(7)	U	1	Deep Green	Rush Mills	Star	82.86	1.40	-2.83	0.47	17.48	1.19

Table 2:

Averages and standard deviations of the three optical coordinates for “unprinted” areas of all 81 Chalons listed in Table 1, this time gathered according to the main paper type used to print the stamps.

Here the mean values are not only the mean values for all the stamps printed on the same type of paper, but also the mean values for all the measurements made on stamps with this paper. Thus, e.g., the mean values reported in Table 2 for the 51 stamps printed on the star-watermarked paper from Rush Mills are also the mean values for 510 separate measurements.

The standard deviations listed in Table 2 are the SD’s of the mean values listed in Table 1 for the 51 stamps - rather than the SD’s for all 510 measurements.

These two SD’s are not quite the same, but both give strong indications of the degree of “spread” in the measurements.

Paper	Samples	L*		a*		b*	
		Mean	SD	Mean	SD	Mean	SD
Rush Mills	51	80.21	2.92	-1.97	4.58	14.77	5.34
Rush Mills (Blued)	2	79.26	N.A.	-6.00	N.A.	10.83	N.A.
Gazette (Blue)	7	75.16	1.85	-4.38	1.29	1.40	4.53
White (Thick, HM)	15	83.80	3.00	-0.76	2.52	15.35	3.88
White (Thin, VM)	6	85.04	4.40	-1.61	3.79	15.25	3.54

Table 3:

Means and standard deviations of the CIE L*a*b* shade co-ordinates for the “unprinted” areas of the stamps printed on the hand-made star-watermarked paper from Rush Mills, for each of the main colours used to print the stamps. The same comments regarding the means and standard deviations described in the caption for Figure 2 also apply here.

Denomination	Main Ink Colour	Samples	L*		a*		b*	
			Mean	SD	Mean	SD	Mean	SD
1d	Red and Orange	8	81.58	1.49	3.49	1.81	19.04	1.89
2d	Blue	20	78.96	3.10	-6.55	1.94	9.28	4.10
3d	Lilac	5	78.88	3.04	2.41	1.56	19.09	2.32
6d	Brown	12	80.69	2.63	1.23	1.70	17.15	1.44
1s	Green	6	82.67	2.11	-4.01	1.55	19.00	1.96

Table 4:

The same as Table 2, but now excluding the stamps that were printed in blue and green, and a single “outlier” (CPA5a(5)) amongst the Richardson white paper prints on thick horizontal mesh paper.

Paper	Samples	L*		a*		b*	
		Mean	SD	Mean	SD	Mean	SD
Rush Mills	25	80.61	2.51	2.19	1.93	18.14	1.96
Rush Mills (Blued)	2	79.26	N.A.	-6.00	N.A.	10.83	N.A.
Gazette (Blue)	7	75.16	1.85	-4.38	1.29	1.40	4.53
White (Thick, HM)	14	84.34	2.30	-0.86	2.59	15.15	3.95
White (Thin, VM)	6	85.04	4.40	-1.61	3.79	15.25	3.54

Table 5:

**Means and standard deviations of the optical co-ordinates for 12 of the red/orange stamps included in this study -
for 100 measurements and for 10 measurements respectively, made on the same areas.**

SG	CP	U/UN	Shade	For 100 Measurements						For 10 Measurements					
				L*		a*		b*		L*		a*		b*	
				Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	A1a	U	Deep Carmine-red	49.63	2.46	30.89	2.27	25.94	1.88	48.32	2.53	30.96	1.51	25.90	1.64
4	A1c(1)	UN	Bright Red (on Blue)	54.41	2.97	18.28	4.96	22.54	4.35	51.90	2.97	17.17	5.46	20.93	4.84
4	A1c(1)	U	Bright Red (on Blue)	59.33	1.55	28.73	2.95	29.37	2.33	58.58	1.29	29.99	1.70	30.38	1.97
4	A1c(2)	U	Red (on Blue)	57.42	2.81	17.84	5.86	24.80	3.59	55.46	2.38	16.86	6.12	24.15	3.98
8	A1d(1)	U	Dull Orange (HM Paper)	59.89	4.23	31.55	4.39	35.26	5.02	60.67	2.53	32.02	4.24	36.14	4.43
8	A1d(2)	U	Dull Orange (VM Paper)	60.65	3.19	28.46	3.41	30.51	3.21	59.28	2.68	26.78	3.54	28.95	3.51
33	A1e(1)	U	Bright Orange-vermilion	55.87	2.23	40.07	3.43	38.85	2.28	56.20	2.13	39.77	3.57	38.07	2.48
33	A1e(2)	U	Orange-vermilion	56.65	2.34	43.72	4.49	43.43	3.54	55.32	1.86	43.36	2.82	42.57	1.73
34	A1e(3)	UN	Vermilion	52.00	3.10	32.96	5.18	27.39	4.33	49.68	3.06	30.85	5.81	25.53	8.01
35	A1e(4)	UN	Carmine-vermilion	54.70	2.54	38.22	2.39	30.73	2.24	53.88	2.11	37.11	3.06	29.55	2.31
35	A1e(4)	U	Carmine-vermilion	52.49	2.31	41.33	1.80	34.01	1.82	51.58	1.83	41.11	1.28	33.32	1.32
35	A1e(5)	U	Carmine	54.27	2.73	29.91	2.88	29.64	2.17	53.00	2.71	28.26	2.81	28.47	2.96

Table 6:

CIE L*a*b* colour co-ordinates for all of the 136 stamps included in this study - all from the author's collection, and all certified.

The means and standard deviations are for 10 measurements made in the full-tone areas in the value tablet, more-or-less evenly spread from left to right.

Most of the stamps are used (U), while a few are unused (UN).

In some cases, data is available for more than one example of the same stamp (see the "Ex No" column).

In three cases, measurements were carried out on joined horizontal pairs, with "LH" denoting the left hand stamp and "RH" denoting the right-hand stamp.

The shades are those designated by prominent philatelists, and listed in the Campbell Paterson Catalogue.

SG	CP	U/UN	Ex No	Designated Shade	L*		a*		b*	
					Mean	SD	Mean	SD	Mean	SD
1	A1a	U	1	Deep Carmine-red	48.32	2.53	30.96	1.51	25.90	1.64
2	A2a	U	1	Deep (Greenish) Blue	49.10	1.68	-18.33	0.99	-9.62	1.51
3	A6a	U	1	Yellow-green	50.47	4.10	-20.62	2.78	23.33	3.64
4	A1c(1)	UN	1	Bright Red (on Blue)	51.90	2.97	17.17	5.46	20.93	4.84
4	A1c(1)	U	1	Bright Red (on Blue)	58.58	1.29	29.99	1.70	30.38	1.97
4	A1c(2)	U	1	Red (on Blue)	55.46	2.38	16.86	6.12	24.15	3.98
5	A2b(1)	U	1	Blue (on Blue)	50.96	1.92	-15.89	0.63	-10.07	2.06
5	A2b(1)	U	2	Blue (on Blue)	45.65	1.79	-13.57	1.15	-14.42	3.70
5	A2b(2)	U	1	Pale Blue (on Blue)	47.91	2.14	-14.39	0.89	-13.19	2.63
6	A6b	U	1	Green (on Blue)	57.27	4.45	-15.86	1.32	18.74	1.54
6	A6b	U	2	Green (on Blue)	51.06	3.04	-15.77	1.27	17.78	1.69
8	A1d(1)	U	1	Dull Orange (HM paper)	60.67	2.53	32.02	4.24	36.14	4.43
8	A1d(2)	U	1	Dull Orange (VM paper)	59.28	2.68	26.78	3.54	28.95	3.51
8a	A2c(1)	U	1	Deep Ultramarine (HM)	54.76	2.60	-16.77	1.51	-10.52	2.33
9	A2c(2)	U	1	Pale Blue (HM)	60.89	2.42	-18.82	0.82	-11.22	2.44
9	A2c(2)	U	2	Pale Blue (HM)	51.91	2.42	-17.27	0.63	-11.30	2.84

Table 6 continued

SG	CP	U/UN	Ex No	Designated Shade	L*		a*		b*	
					Mean	SD	Mean	SD	Mean	SD
9	A2c(2)	U	3	Pale Blue (HM)	55.15	2.58	-17.62	0.91	-14.09	1.42
9	A2c(5)	U	1	Pale Blue (VM)	51.57	1.38	-16.69	0.82	-12.68	1.40
10	A2c(3)	U	1	Blue (HM)	57.05	1.82	-16.34	1.02	-15.77	1.42
10	A2c(7)	U	1	Blue (VM)	50.30	3.44	-15.70	1.65	-15.58	3.50
11	A2c(4)	U	1	Deep Blue (HM)	48.85	2.81	-16.18	1.37	-8.63	2.21
12	A5a(2)	U	1	Bistre	53.06	2.29	7.78	1.08	20.06	0.76
13	A5a(3)	U	1	Deep Brown	49.89	2.40	17.04	1.60	25.70	1.48
13	A5a(4)	U	1	Brown	51.75	1.38	16.26	1.03	25.77	1.12
13	A5a(10)	U	1	Brown	55.66	3.00	17.77	1.27	27.12	1.48
14	A5a(5)	UN	1	Pale Brown	54.03	1.58	19.38	1.64	26.33	1.52
14	A5a(5)	U	1	Pale Brown	52.81	1.84	14.45	0.78	24.01	1.25
14	A5a(6)	U	1	Tan Brown	56.15	1.77	21.80	0.70	28.41	1.28
14	A5a(11)	U	1	Pale Brown	54.89	2.26	18.21	3.37	25.13	2.46
15	A5a(12)	U	1	Chestnut	56.99	2.16	26.61	1.56	32.97	1.42
16	A6c(1)	U	1	Dull Emerald-green	64.18	1.98	-19.77	1.74	11.84	2.62
17	A6c(2)	U	1	Blue-green	59.31	2.13	-20.68	1.01	2.03	2.93
18	A1d(X)	U	1	Dull Orange	63.37	2.23	30.18	4.02	37.56	2.13
29	A5a(X)	U	1	Brown	44.72	2.42	13.88	2.22	23.67	1.75
33	A1e(1)	U	1	Bright Orange-vermilion	56.20	2.13	39.77	3.57	38.07	2.48
33	A1e(2)	U	1	Orange-vermilion	55.32	1.86	43.36	2.82	42.57	1.73
34	A1e(3)	UN	1	Vermilion	49.68	3.06	30.85	5.81	25.53	8.01
34	A1e(3)	U	1	Vermilion	51.41	2.01	27.29	3.05	26.60	2.64

Table 6 continued

SG	CP	U/UN	Ex No	Designated Shade	L*		a*		b*	
					Mean	SD	Mean	SD	Mean	SD
35	A1e(4)	UN	1	Carmine-vermilion	53.88	2.11	37.11	3.06	29.55	2.31
35	A1e(4)	U	1	Carmine-vermilion	51.58	1.83	41.11	1.28	33.32	1.32
35	A1e(5)	U	1	Carmine	53.00	2.71	28.26	2.81	28.47	2.96
36	A2d(1)	U	1	Dull Deep Blue	42.65	4.26	-13.83	1.60	-14.33	2.73
36	A2d(2)	U	1	Deep Blue	45.22	2.38	-14.88	0.95	-17.03	1.18
36	A2d(3)	U	1	Blue	45.43	3.08	-14.37	1.21	-9.95	3.20
36	A2d(4)	U	1	Bright Blue	50.13	2.56	-16.02	0.75	-17.32	1.52
37	A2d(5)	U	1 (LH)	Ultramarine (bright-dull)	43.00	4.46	-6.89	2.47	-18.28	5.45
37	A2d(5)	U	2 (RH)	Ultramarine (bright-dull)	44.26	3.14	-8.88	2.00	-14.23	4.63
37	A2d(6)	U	1	Slate Blue	40.59	3.98	-11.85	1.58	-11.64	2.38
37	A2d(7)	U	1	Greenish Slate-blue	41.16	2.16	-13.64	1.02	-10.16	2.21
37a	A2d(8)	U	1	Pale or Milky Blue	44.14	3.00	-14.05	1.26	-14.90	1.32
38	A2d(10)	U	1	Pale Greenish Blue	40.23	1.67	-12.66	1.04	-16.18	2.22
38	A2d(11)	UN	1	Greenish Blue	42.37	1.24	-11.52	1.13	-9.25	1.82
38	A2d(11)	U	1	Greenish Blue	38.60	2.23	-12.90	1.22	-11.44	0.75
38	A2d(12)	U	1	Dull Deep Blue	39.73	2.54	-12.88	1.21	-16.01	1.91
38	A2d(12)	U	2	Dull Deep Blue	41.45	3.22	-11.36	1.40	-16.90	2.59
38	A2d(12)	U	3	Dull Deep Blue	40.45	3.09	-14.51	1.45	-11.82	1.64
39	A2d(14)	U	1	Dull Blue	43.74	2.76	-14.26	1.35	-8.16	1.18
39	A2d(14)	U	2	Dull Blue	45.22	2.89	-12.15	1.06	-11.71	1.90
39	A2d(14)	U	3	Dull Blue	45.88	3.31	-12.15	0.99	-12.41	2.45
39	A2d(14)	U	4	Dull Blue	43.64	5.82	-11.26	1.27	-11.83	1.39

Table 6 continued

SG	CP	U/UN	Ex No	Designated Shade	L*		a*		b*	
					Mean	SD	Mean	SD	Mean	SD
39	A2d(15)	U	1 (LH)	Blue	42.33	2.84	-13.99	1.31	-12.73	1.57
39	A2d(15)	U	2 (RH)	Blue	40.84	4.17	-12.84	1.79	-13.92	2.15
40	A3a(1)	U	1	Brown-lilac	47.04	3.31	1.89	1.30	7.08	1.72
40	A3a(2)	UN	1	Deep Brown-lilac	56.00	4.17	7.20	3.18	7.16	2.35
40	A3a(2)	U	1	Deep Brown-lilac	46.37	5.58	4.07	2.83	4.26	5.78
40	A3a(2)	U	2	Deep Brown-lilac	51.43	6.37	4.82	1.73	8.42	5.74
40	A3a(2)	U	3	Deep Brown-lilac	49.70	5.33	3.95	2.26	6.27	3.79
41	A5b(1)	U	1	Black-brown	38.66	2.15	-2.49	0.64	8.86	1.43
41	A5b(1)	U	2	Black-brown	43.62	1.89	-1.40	0.77	10.02	1.62
41	A5b(1)	U	3	Black-brown	42.21	3.36	-4.87	0.44	8.92	1.70
42	A5b(2)	U	1	Grey-black	41.98	2.37	-2.38	0.62	9.98	1.32
42	A5b(3)	U	1	Brown	37.92	2.83	2.04	1.29	11.68	2.16
43	A5b(4)	U	1	Deep Red-brown	42.84	1.10	13.60	1.66	14.95	1.47
43	A5b(4)	U	2	Deep Red-brown	41.84	1.41	14.43	1.07	15.56	1.03
43	A5b(4)	U	3	Deep Red-brown	41.70	1.35	12.80	1.51	15.08	0.92
43	A5b(4)	U	4	Deep Red-brown	42.33	1.30	11.09	1.52	13.52	1.22
43	A5b(4)	U	5	Deep Red-brown	42.81	1.87	12.67	1.55	14.29	1.51
43	A5b(5)	U	1	Red-brown	44.23	2.74	16.25	1.60	16.58	1.69
43	A5b(6)	UN	1	Pale Red-brown	46.69	3.68	17.60	1.59	18.79	2.26
44	A6d(1)	U	1	Bluish-green	45.96	2.40	-15.77	1.99	14.07	4.70
45	A6d(3)	U	1	Yellow-green	47.16	3.91	-17.94	2.46	14.65	2.56
45	A6d(4)	U	1	Dull, Deep Yellow-green	48.65	3.39	-21.16	1.24	17.18	2.47

Table 6 continued

SG	CP	U/UN	Ex No	Designated Shade	L*		a*		b*	
					Mean	SD	Mean	SD	Mean	SD
45	A6d(5)	U	1	Bronze-green	44.37	4.03	-16.69	2.56	13.60	2.06
45	A6d(6)	U	1	Olive-green	49.05	2.31	-17.64	1.81	17.18	2.79
46	A6d(7)	U	1	Deep Green	50.40	2.61	-21.56	0.97	17.53	1.21
48	A1e(X)	U	1	Vermillion	58.57	1.73	22.23	3.32	26.07	2.20
48a	A1e(W)	U	1	Carmine	52.59	1.48	36.27	2.82	29.74	1.58
49	A2d(Y)	U	1	Deep Blue	46.26	1.89	-14.51	1.09	-12.97	1.03
50	A2d(O)	U	1	Slate Blue	48.46	2.76	-14.75	1.53	-16.18	1.83
51	A2d(N)	U	1	Pale Blue	44.23	1.74	-10.07	1.86	-1.85	3.40
52	A3a(Z)	U	1	Deep Brown-lilac	51.17	5.66	5.30	2.57	2.83	6.21
53	A5b(Y)	U	1	Black-brown	43.87	3.44	-2.54	0.73	9.46	2.26
54	A5b(X)	U	1	Brown	44.74	3.71	-0.45	0.55	11.36	1.27
55	A5b(V)	U	1	Red-brown	42.76	1.75	15.25	1.25	15.91	0.95
56	A6d(Z)	U	1	Dull Green	44.03	1.90	-15.92	1.69	12.71	2.60
57	A6d(Y)	U	1	Yellow-green	50.52	2.50	-21.50	1.34	17.94	1.72
58	A6d(X)	U	1	Deep Green	47.48	2.78	-18.93	1.53	14.07	1.79
60	A2d(W)	U	1	Deep Blue	46.06	1.75	-13.04	1.30	-15.60	0.77
67h	A5b(S)	U	1	Black-brown	40.74	2.53	-2.45	1.16	10.65	2.48
68	A1f(1)	U	1	Orange-vermilion	58.92	2.59	44.63	5.14	39.29	3.90
69	A1f(2)	U	1	Carmine-vermilion	49.59	1.22	24.96	3.05	21.82	2.13
69	A1f(3)	U	1	Vermilion	58.79	3.51	36.03	2.96	36.32	2.76
70	A2e(1)	U	1	Deep Blue	42.23	3.46	-12.09	1.28	-1.51	1.48
71	A2e(3)	U	1	Slate Blue	44.69	3.39	-12.26	1.20	-7.43	1.77

Table 6 continued

SG	CP	U/UN	Ex No	Designated Shade	L*		a*		b*	
					Mean	SD	Mean	SD	Mean	SD
72	A2e(5)	U	1	Blue	44.51	5.58	-13.63	1.43	-10.30	2.13
72a	A2e(4)	U	1	Pale or Milky Blue	58.22	3.53	-17.98	1.17	-14.58	1.78
72	A2e(6)	U	1	Dull Blue	42.14	3.61	-12.45	1.89	-9.80	2.53
72	A2e(7)	U	1	Blue	43.25	4.19	-14.01	1.75	-14.93	1.84
72	A2e(8)	U	1	Deep Blue	40.30	3.38	-11.22	1.63	-9.47	1.09
73	A2e(9)	U	1	Pale Blue	39.89	3.48	-12.11	2.05	-12.29	1.75
73	A2e(10)	U	1 (LH)	Blue	40.26	2.02	-11.61	0.91	-14.66	2.13
73	A2e(10)	U	2 (RH)	Blue	40.52	3.47	-11.38	1.32	-14.86	2.00
74	A3b	U	1	Brown-lilac	53.68	4.81	3.68	2.20	8.19	6.02
75	A5c(1)	U	1	Black-brown	41.23	3.13	-2.25	0.71	9.49	1.39
76	A5c(2)	U	1	Brown	41.90	2.10	1.68	0.88	11.70	1.35
77	A5c(3)	U	1	Deep Red-brown	41.32	1.35	10.71	1.50	13.35	1.15
77	A5c(4)	U	1	Red-brown	44.46	2.51	14.09	1.55	16.48	1.46
78	A6e(2)	U	1	Bronze-green	47.51	2.14	-17.10	1.49	15.03	1.90
79	A6e(3)	U	1	Dull to Deep Green	43.93	2.04	-15.14	1.04	12.41	1.49
80	A6e(5)	U	1	Dull, Deep Yellow-green	50.25	2.33	-21.01	1.05	22.71	2.27
97	A1j	U	1	Carmine-vermilion	52.01	2.46	29.26	7.06	25.23	5.17
100	A6h(1)	UN	1	Green	42.69	2.12	-14.19	1.06	11.77	0.90
110	A1m(1)	UN	1	Carmine-vermilion	54.34	3.19	36.86	3.02	30.85	2.93
110	A1m(2)	UN	1	Carmine	53.56	1.86	39.87	2.40	31.59	2.18
113	A2m(3)	UN	1	Blue	43.27	2.55	-12.07	1.07	-11.11	1.92

Table 6 continued

SG	CP	U/UN	Ex No	Designated Shade	L*		a*		b*	
					Mean	SD	Mean	SD	Mean	SD
114	A2n(5)	UN	1	Deep Royal Blue	41.90	2.06	-11.29	1.35	-14.08	2.05
116	A3d(1)	UN	1	Brown-lilac	52.44	3.26	2.63	1.14	1.63	3.67
117	A3d(6)	UN	1	Bluish-lilac	51.60	5.86	0.87	1.92	-12.73	4.48
119	A4a(2)	UN	1	Deep Rose	56.77	3.56	31.06	4.53	22.76	3.54
120	A4b(2)	UN	1	Yellow	80.43	1.40	7.44	1.24	63.42	3.94
120	A4b(4)	UN	1	Bright Yellow	72.71	1.76	10.56	1.21	61.49	2.02
122	A5h(3)	UN	1	Dull Red-brown	43.82	1.92	10.00	1.14	15.21	1.04
125	A6m(5)	UN	1	Pale Yellow-green	54.59	2.45	-15.03	2.49	22.11	1.74
130	A2r(Y)	UN	1	Orange-vermilion	60.07	2.89	33.70	3.82	43.49	2.69
130	A2r(Y)	UN	2	Orange-vermilion	62.42	2.58	34.24	3.79	45.50	1.19
134	A2s(W)	UN	1	Orange-vermilion	61.27	2.26	37.56	2.81	42.75	2.57

Table 7:

The averages of the standard deviations of the colour co-ordinates for the measurements made on the unprinted areas of the 81 stamps listed in Table 1, and the full-tone areas of the 136 stamps listed in Table 6, respectively.

	L*	a*	b*
Unprinted Areas	1.51	0.66	1.30
Printed Full-tone Areas	2.74	1.83	2.31

Table 8:

CIE L*a*b* colour co-ordinates for the 114 examples of used stamps included in this study. The stamps have been grouped under the major printings (printer, paper type) for the reasons mentioned in the text, but all the stamps with the same designated shade within the same group have been included (except two examples of SG69 - see text).

"London Prints" (Perkins Bacon):

SG	CP	Denomination	Main Colour	Designated Shade	Shade Code	Ex No	L*		a*		b*	
							Mean	Range	Mean	Range	Mean	Range
1	A1a	1d	Red/Orange	Deep Carmine-red	1	1	48	-	31	-	26	-
2	A2a	2d	Blue	Deep (Greenish) Blue	2	1	49	-	-18	-	-10	-
3	A6a	1/-	Green	Yellow-green	3	1	50	-	-21	-	23	-
Richardson "Blue Paper Prints":												
SG	CP	Denomination	Main Colour	Designated Shade	Shade Code	Ex No	L*		a*		b*	
							Mean	Range	Mean	Range	Mean	Range
4	A1c(1)	1d	Red/Orange	Bright Red (on Blue)	4	1	59	-	30	-	30	-
4	A1c(2)	1d	Red/Orange	Red (on Blue)	5	1	55	-	17	-	24	-
5 (2x)	A2b(1) (2x)	2d	Blue	Blue (on Blue)	6	2	48	5.3	-15	2.3	-12	4.4
5	A2b(2)	2d	Blue	Pale Blue (on Blue)	7	1	48	-	-14	-	-13	-
6 (2x)	A6b (2x)	1/-	Green	Green (on Blue)	8	2	54	6.2	-16	0.1	18	1.0

Table 8 continued

Richardson "White Paper Prints":

SG	CP	Denom.	Main Colour	Designated Shade	Shade Code	Ex No	L*		a*		b*	
							Mean	Range	Mean	Range	Mean	Range
8, 8, 18	A1d(1), A1d(2), A1d(X)	1d	Red/Orange	Dull Orange	9	3	61	4.1	30	5.2	34	8.6
8a	A2c(1)	2d	Blue	Deep Ultramarine	10	1	55	-	-17	-	-11	-
9 (4x)	A2c(2) (3x), A2c(5)	2d	Blue	Pale Blue	11	4	55	9.0	-18	2.1	-12	2.9
10 (2x)	A2c(3), A2c(7)	2d	Blue	Blue	12	2	54	6.8	-16	0.6	-16	0.2
11	A2c(4)	2d	Blue	Deep Blue	13	1	49	-	-16	-	-9	-
12	A5a(2)	6d	Brown	Bistre	14	1	53	-	8	-	20	-
13	A5a(3)	6d	Brown	Deep Brown	15	1	50	-	17	-	26	-
13 (2x), 29	A5a(4), A5a(10), A5a(X)	6d	Brown	Brown	16	3	51	10.9	16	3.9	26	3.5
14 (2x)	A5a(5), A5a(11)	6d	Brown	Pale Brown	17	2	54	2.1	16	3.8	25	1.1
14	A5a(6)	6d	Brown	Tan Brown	18	1	56	-	22	-	28	-
15	A5a(12)	6d	Brown	Chestnut	19	1	57	-	27	-	33	-
16	A6c(1)	1/-	Green	Dull Emerald-green	20	1	64	-	-20	-	12	-
17	A6c(2)	1/-	Green	Blue-green	21	1	59	-	-21	-	2	-

Table 8 continued

Davies "Star Watermarked Prints":

SG	CP	Denom.	Main Colour	Designated Shade	Shade Code	Ex No	L*		a*		b*	
							Mean	Range	Mean	Range	Mean	Range
33	A1e(1)	1d	Red/Orange	Bright Orange-vermilion	22	1	56	-	40	-	38	-
33, 68	A1e(2), A1f(1)	1d	Red/Orange	Orange-vermilion	23	2	57	3.6	44	1.3	41	3.3
34, 48	A1e(3), A1e(X)	1d	Red/Orange	Vermilion	24	2	55	7.2	25	5.1	26	0.5
35	A1e(4)	1d	Red/Orange	Carmine-vermilion	25	1	52	-	41	-	33	-
36, 39 (2x), 72 (2x), 73 (2x)	A2d(3), A2d(15) (2x), A2e(5), A2e(7), A2e(10) (2x)	2d	Blue	Blue	26	7	42	5.2	-13	3.0	-13	5.0
36, 49, 60, 70, 72	A2d(2), A2d(Y), A2d(W), A2e(1), A2e(8)	2d	Blue	Deep Blue	27	5	44	6.0	-13	3.7	-11	15.5
36, 38 (3x)	A2d(1), A2d(12) (3x)	2d	Blue	Dull Deep Blue	28	4	41	2.9	-13	3.2	-15	5.1
36	A2d(4)	2d	Blue	Bright Blue	29	1	50	-	-16	-	-17	-
37 (2x)	A2d(5) (2x)	2d	Blue	Ultramarine (bright-dull)	30	2	44	1.3	-8	2.0	-16	4.1
37, 50, 71	A2d(6), A2d(O), A2d(3)	2d	Blue	Slate Blue	31	3	45	7.9	-13	2.9	-12	8.8
37	A2d(7)	2d	Blue	Greenish Slate-blue	32	1	41	-	-14	-	-10	-
37a, 72a	A2d(8), A2e(4)	2d	Blue	Pale or Milky Blue	33	2	51	14.1	-16	3.9	-15	0.3
38	A2d(10)	2d	Blue	Pale Green-blue	34	1	40	-	-13	-	-16	-
38	A2d(11)	2d	Blue	Greenish Blue	35	1	39	-	-13	-	-11	-
39 (4x), 72	A2d(14) (4x), A2e(6)	2d	Blue	Dull Blue	36	5	44	3.7	-12	3.0	-11	4.3
51, 73	A2d(N), A2e(9)	2d	Blue	Pale Blue	37	2	42	4.4	-11	2.0	-7	10.4

Table 8 continued

Davies "Star Watermarked Prints" continued

SG	CP	Denom.	Main Colour	Designated Shade	Shade Code	Ex No	L*		a*		b*	
							Mean	Range	Mean	Range	Mean	Range
40, 74	A3a(1), A3b	3d	Lilac	Brown-lilac	38	2	50	6.6	3	1.8	8	1.1
40 (3x), 52	A3a(2) (3x), A3a(Z)	3d	Lilac	Deep Brown-lilac	39	4	50	5.1	5	1.4	5	5.6
42, 54, 76	A5b(3), A5b(X), A5c(2)	6d	Brown	Brown	40	3	42	6.8	1	2.5	12	0.3
41 (3x), 53, 67h, 75	A5b(1) (3x), A5b(Y), A5b(S), A5c(1)	6d	Brown	Black-brown	41	6	42	5.2	-3	3.5	10	1.8
42	A5b(2)	6d	Brown	Grey-black	42	1	42	-	-2	-	10	-
43 (5x), 77	A5b(4) (5x), A5c(3)	6d	Brown	Deep Red-brown	43	6	42	1.5	13	3.7	14	2.2
43, 55, 77	A5b(5), A5b(V), A5c(4)	6d	Brown	Red-brown	44	3	44	1.7	15	2.2	16	0.7
45, 57	A6d(3), A6d(Y)	1/-	Green	Yellow-green	45	2	49	3.4	-20	3.6	16	3.3
44	A6d(1)	1/-	Green	Bluish-green	46	1	46	-	-16	-	14	-
45, 80	A6d(4), A6e(5)	1/-	Green	Dull, Deep Yellow-green	47	2	49	1.6	-21	0.2	20	5.5
45, 78	A6d(5), A6e(2)	1/-	Green	Bronze-green	48	2	46	3.1	-17	0.4	14	1.4
45	A6d(6)	1/-	Green	Olive-green	49	1	49	-	-18	-	17	-
46, 58	A6d(7), A6d(X)	1/-	Green	Deep Green	50	2	49	2.9	-20	2.6	16	3.5
56	A6d(Z)	1/-	Green	Dull Green	51	1	44	-	-16	-	13	-
79	A6e(3)	1/-	Green	Dull to Deep Green	52	1	44	-	-15	-	12	-

Table 9:

**CIE L*a*b* colour co-ordinates for 21 of the unused stamps in the author's collection
(the remainder were "away from home" when the shade measurements were made).**

SG	CP	Designated Shade	Shade Code	L*	a*	b*
4	A1c(1)	Bright Red (on Blue)	1	52	17	21
14	A5a(5)	Pale Brown	2	54	19	26
34	A1e(3)	Vermilion	3	50	31	26
35	A1e(4)	Carmine-vermilion	4	54	37	30
38	A2d(11)	Greenish Blue	5	42	-12	-9
40	A3a(2)	Deep Brown-lilac	6	56	7	7
43	A5b(6)	Pale Red-brown	7	47	18	19
100	A6h(1)	Green	8	43	-14	12
110	A1m(1)	Carmine-vermilion	9	54	37	31
110	A1m(2)	Carmine	10	54	40	32
113	A2m(3)	Blue	11	43	-12	-11
114	A2n(5)	Deep Royal Blue	12	42	-11	-14
116	A3d(1)	Brown-lilac	13	52	3	2
117	A3d(6)	Bluish-lilac	14	52	1	-13
119	A4a(2)	Deep Rose	15	57	31	23
120	A4b(2)	Yellow	16	80	7	63
120	A4b(4)	Bright Yellow	17	73	11	61
122	A5h(3)	Dull Red-brown	18	44	10	15
125	A6m(5)	Pale yellow-green	19	55	-15	22
130	A2r(Y)	Orange-vermilion (2x)	20	61	34	45
134	A2s(W)	Orange-vermilion	21	61	38	43