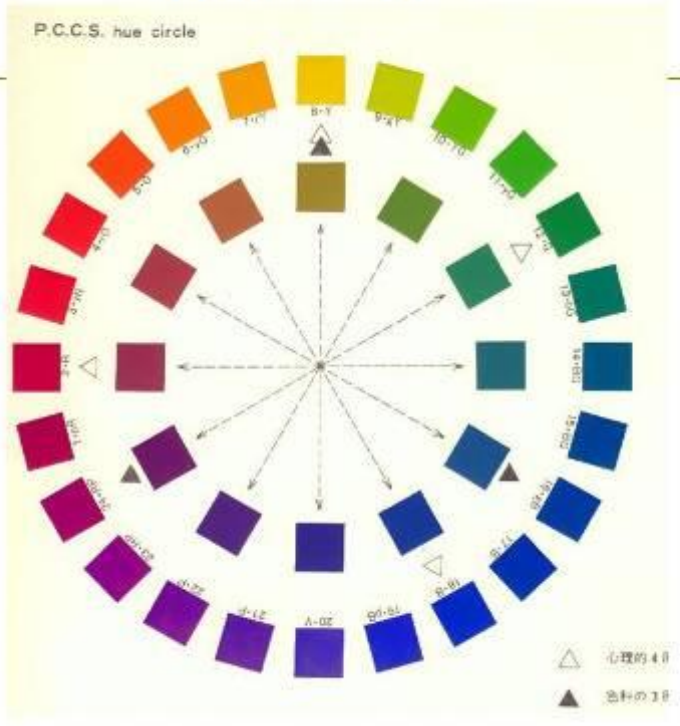
伊登Itten的配色面積比



伊登Itten色系

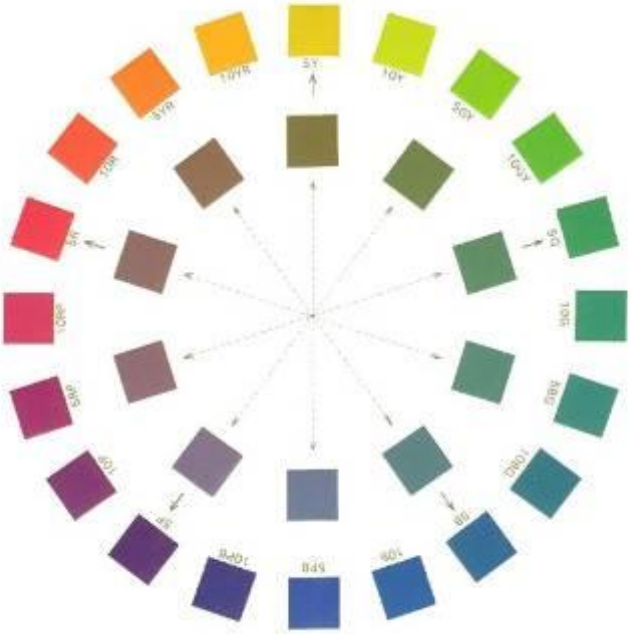
日系PCCS系統



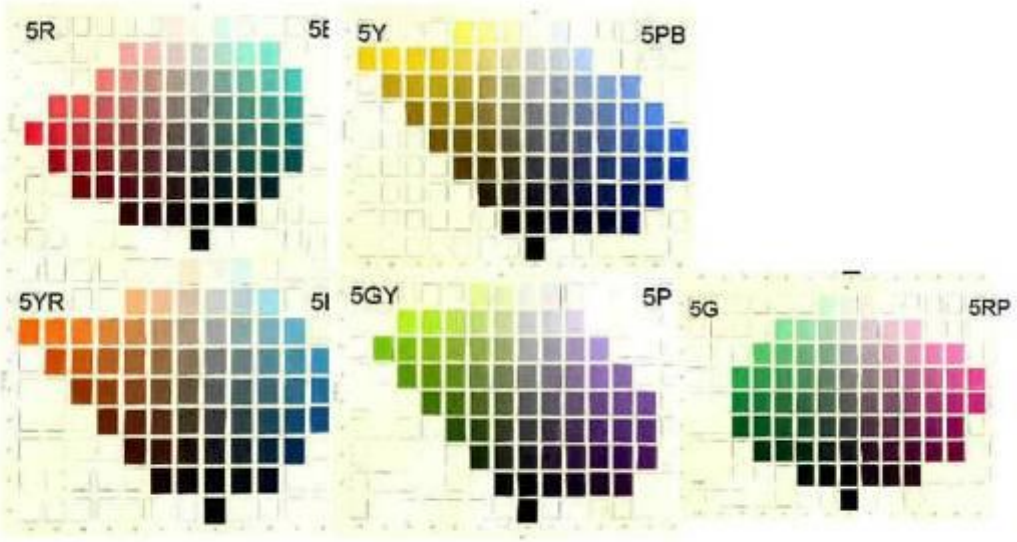
德系奧斯華Ostwald 系統



美系曼塞爾Munsell系統



Munsell表色系的十個縱切面



JOURNAL OF THE OPTICAL SOCIETY OF AMERICA VOLUME 34, NUMBER 4

配色美度

Aesthetic Measure Applied to Color Harmony*

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AND

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1. INTRODUCTION

THE problem of why some things are beautiful and others are not has been the subject of much speculation. Plato said,[1] "Measure and proportion always pass into beauty and excellence." The Greek view[2] was that "beauty consists in the . . . expression of *unity in variety*." This basic idea is still alive today[3] and is perhaps the most firmly established principle of modern aesthetics.

While it is true that many works of art appeal largely because of their connotative associations, it is also true that much beauty is of a more formal nature, as exemplified by regular geometric shapes, by musical chords, and by related colors. There is hope that this latter type of beauty is simple enough to be analyzed, and it is to this subject that we apply the idea that beauty is "order in complexity." Fechner[4] stated the principle in 1876, but it was first placed on a quantitative basis by G. D. Birkhoff[5] in his *Theory of aesthetic measure* (1933).

Birkhoff applied his theory to ornaments, vases, music, and poetry; but he did not apply it to color. The purpose of the present paper is to show that aesthetic measure can be employed to good advantage in color harmony.

2. AESTHETIC MEASURE

According to Birkhoff, aesthetic measure is defined by the equation,

$$M = O/C, \qquad (1)$$

where O represents the number of elements of order and C is the number of elements of complexity. Evidently a high aesthetic measure can be obtained with a very simple design (small C), though still higher measures may be possible with a complex design having a sufficiently orderly arrangement (large O). Equation (1) is a mathematical statement of the principle given in the preceding section. Other equations would express the principle equally well, and only a great amount of further experimental research can settle the question of whether the simple form of

Aesthetic Measure for Color Hamony

- 源自柏拉圖所謂「適度與均衡皆美。」
- 源自美學史中希臘人的觀點：「美來自變化中的統一表現。」
- 源自費西納的見解「美存在於複雜中的秩序。」
- 源自G. D. Birkhoff的公式M=U/V（Unity in variety，**多樣中的統一**）

美度公式：M＝O／C

- 其中M是美度，以0．5以上為合格，數字越高越好。
- O是秩序量(Order)它們的色相差、明度差、彩度差三者的得分合計起來，即為秩序量。
- C是複雜量(Complexity)，C＝色數＋有色相差的色對＋有明度差的色對＋有彩度差的色對

美度計算：



色彩對象

作品顏色						
看整回色彩顏色						
色票讀數	2.5R 6/6	7.5YR 8/4	5B 5/8	10R 5/12	N9	N2

色相差　明度差　彩度差



	色相差異得分		明度差異得分		彩度差異得分	
同色調和		+1.5	V	-1.3	VV	+0.8
中間區 1		0		-1.0		0
類色調和	VV	+1.1	VVV	+0.7	VVVVV	+0.1
中間區 2	VV	+0.7	V	-0.2		0
對比調合	VV	+1.7	VVVVV	+3.7	VVVVVV	+0.4
			VVVV			
有關彩互配	VVVVVVV	0				
無彩互配	V	+1				

O=秩序量(1.1x2+0.7x2+1.7x2+1)+(-1.3+0.7x3-0.2+3.7x10)+(0.8x2+0.1x5+0.4x7)

O=8+37.6+5

O=50.6

C=複雜量

C=6+15+14+13=48

美度 M = O/C → 50.6/48=**1.054**

中時酒326作品



色彩對象

補助顏色						
看整回色彩顏色						
色票讀數	7.5R 5/14	5R 8/6	5Y 9/6	2.5B 6/8	N9	N2

色相差　明度差　彩度差



	色相差異得分		明度差異得分		彩度差異得分	
同色調和		+1.5	V	-1.3	VV	+0.8
中間區 1	V	0		-1.0	VV	0
類色調和		+1.1	VVV	+0.7		+0.1
中間區 2	VV	+0.7	V	-0.2	VVVVV	0
對比調合	VVV	+1.7	VVVVV	+3.7	VVVVVV	+0.4
			VVVV			
有關彩互配	VVVVVVV	0				
無彩互配	V	+1				

O=秩序量(0.7x2+1.7x3+1)+(-1.3+0.7x3-0.2+3.7x10)+(0.8x2+0.4x6)

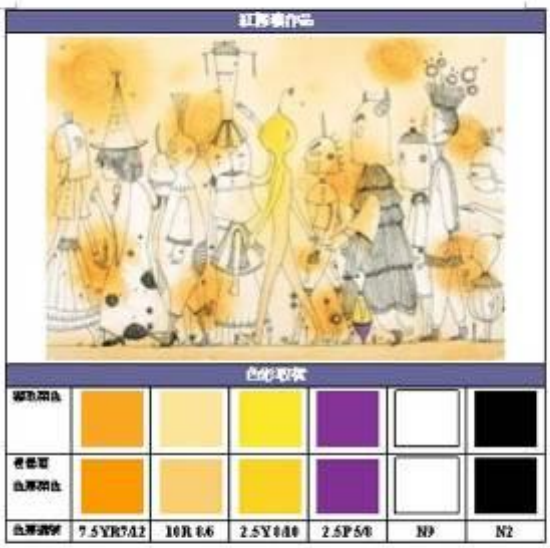
O=7.5+37.6+6

O=49.1

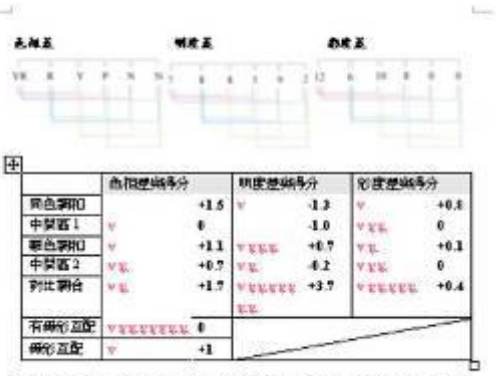
C=複雜量

C=6+15+14+13=48

美度 M = O/C → 49.1/48=**1.02**



配色用色						
骨架用色						
色票番号	7.5YR7/12	10R 8/6	2.5Y 8/10	2.5P 5/8	N9	N2



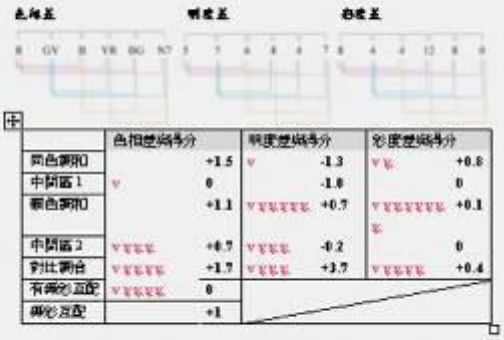
	色相差異得点		明度差異得点		彩度差異得点	
同色調和		+1.5	V	-1.3	V	+0.8
中間色1	V	0		-1.0	VVV	0
類色調和	V	+1.1	VVVV	+0.7	VV	+0.1
中間色2	VV	+0.7	VV	-0.2	VVV	0
対比調合	VV	+1.7	VVVVVV	+3.7	VVVVVV	+0.4
			VV			
有彩色配	VVVVVVVV	0				
無彩配	V	+1				

O=秩序量(1.1+0.7×2+1.7×2+1)+(-1.3+0.7×4-0.2×2+3.7×8)+(0.8+0.1×2+0.4×6)
O=6.9+31.5+3.6
O=41.8

C=被験量
C=6+15+14+14=49
類度 M=O/C → 41.8/49=**0.853**



配色用色						
骨架用色						
色票番号	2.5R 5/8	7.5GY 7/4	2.5B 6/4	10YR 8/12	10BG 4/8	N7



	色相差異得点		明度差異得点		彩度差異得点	
同色調和		+1.5	V	-1.3	VV	+0.8
中間色1	V	0		-1.0		0
類色調和		+1.1	VVVVVV	+0.7	VVVVVVV	+0.1
					V	
中間色2	VVVV	+0.7	VVVV	-0.2		0
対比調合	VVVVV	+1.7	VVVV	+3.7	VVVVV	+0.4
有彩色配	VVVVV	0				
無彩配		+1				

O=秩序量(0.7×4+1.7×5)+(-1.3+0.7×6-0.2×4+3.7×6)+(0.8×2+0.1×8+0.4×5)
O=11.3+16.9+4.4
O=32.6

C=被験量
C=6+15+14+13=48
類度 M=O/C → 32.6/48=**0.679**

総計：

被験者	可塑王	中村義326	紅原瞳	飛禾
類度M	1.054	1.022	0.853	0.679


L:M=1.058
5Y 8/10
5YR 7/12
5B 4/8
R:M=1.38
5Y 9/2
5PB 4/8
5Y 8/8
L:M=8.2/10=0.82
5R 5/14
5B 3/6
5B 7/6
R:M=9/9=1
5P 3/10
5P 7/4
5YR 5/4

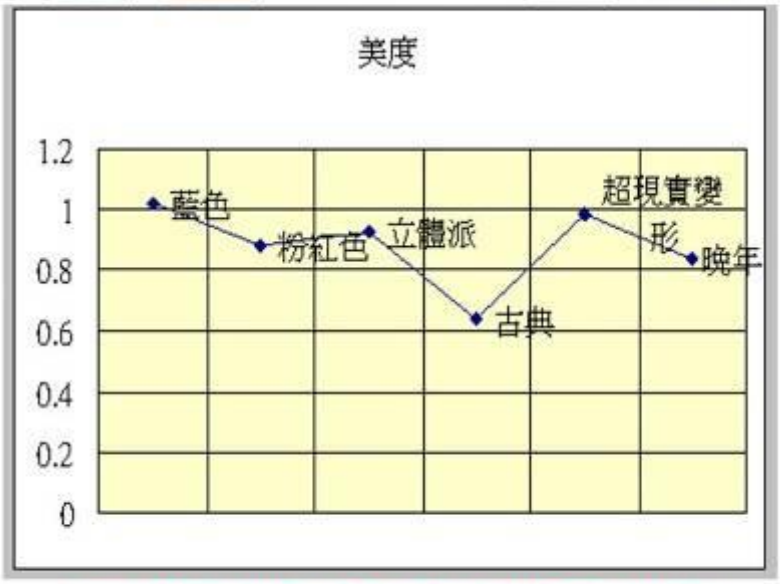

L:M=18.4/7=2.6
5BG 2/4
5BG 8/4
5YR 5/4
R:M=13.3/8=1.67
5RP 2/4
5RP 8/4
5RP 6/12
L:M=1.008
5Y 9/6
5PB 4/12
5GY 6/4
R:M=0.791
5RP 8/6
5P 5/10
5R 5/4








藍色	1.02
粉紅色	0.88
立體派	0.93
古典	0.64
超現實變形	0.99
晚年	0.84



美度與嚴肅/親切　壓力/輕鬆 的排名最爲相似









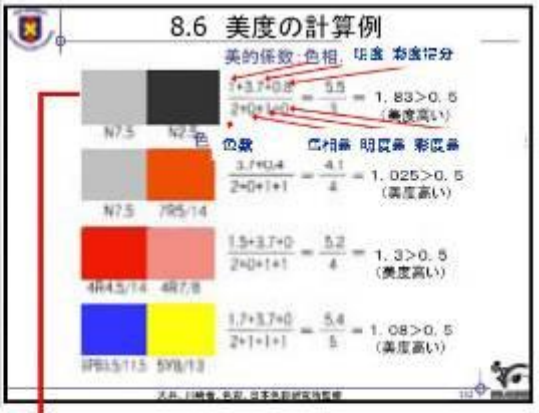






1．調和與不調和的範圍及其計分可依下表來界定（表1）：

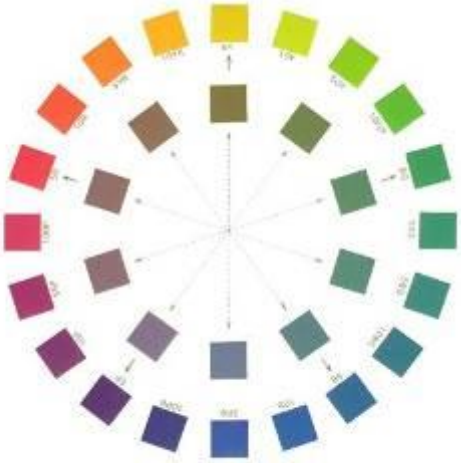
愉快的配色	不愉快的配色	色相差與得分		明度差與得分		彩度差與得分	
同色調和		0~1.5/C	+1.5	0~0.04	-1.3	0~0.1	+0.8
	中間區 I	2/C~6.9	0	0.05~0.49	-1.1	0.2~2.9	0
類色調和		7~11.9	+1.1	0.5~1.49	+0.7	3~4.9	+0.1
	中間區 II	12~27.9	+0.7	1.5~2.49	-0.2	4~6.9	0
對比調和		28~50.0	+1.7	2.5~10	+3.7	7以上	+0.4

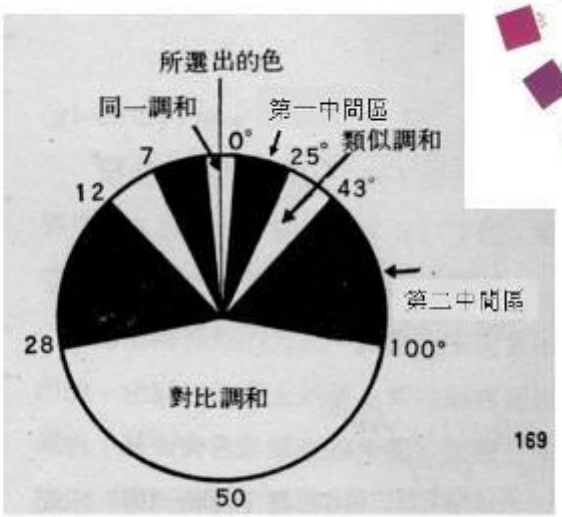


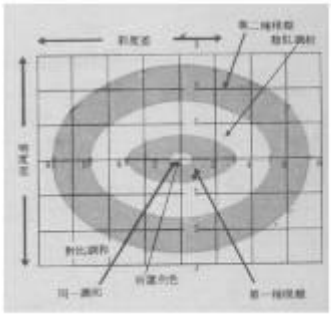
⊿0 +1　⊿5 +3.7　⊿0 +0.8

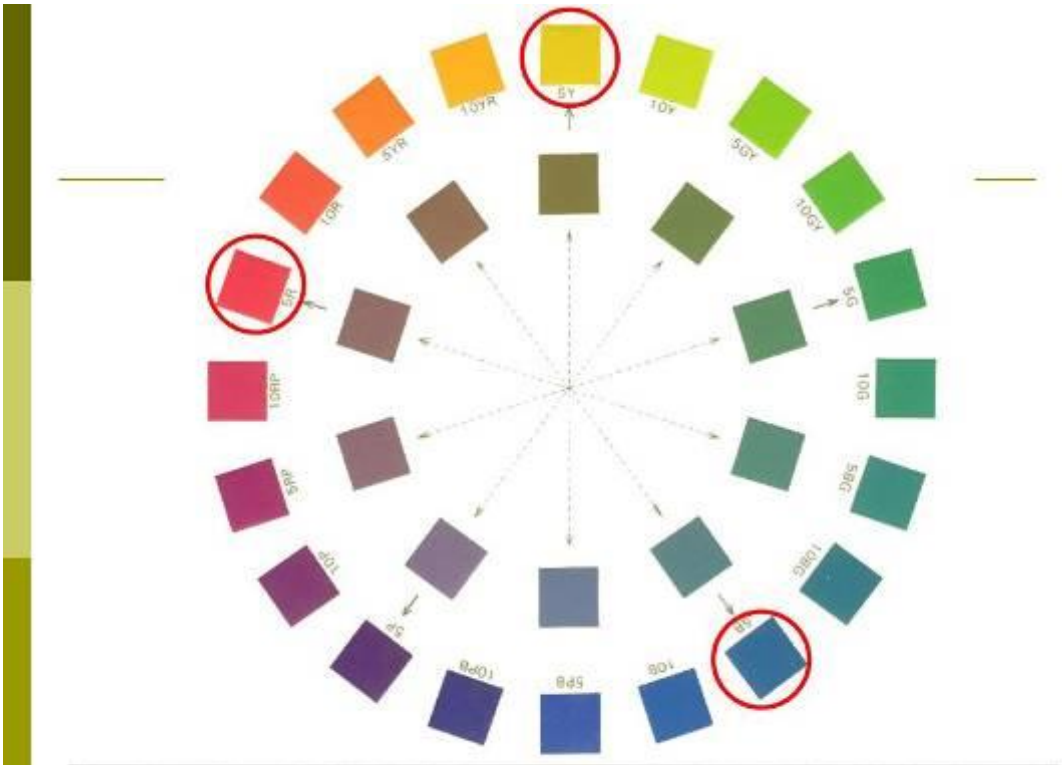
	美度排名	SPSS 美感排名	SPSS 觀感排名	SPSS 趣味排名
1	藍色	古典	藍色	超現實變形
2	超現實變形	粉紅色	立體派	立體派
3	立體派	立體派	超現實變形	晚年
4	粉紅色	藍色	粉紅色	藍色
5	晚年	超現實變形	晚年	粉紅色
6	古典	晚年	古典	古典

觀感包含：嚴肅/親切　快樂/憂鬱　壓抑/自由　壓力/輕鬆　生動/呆板

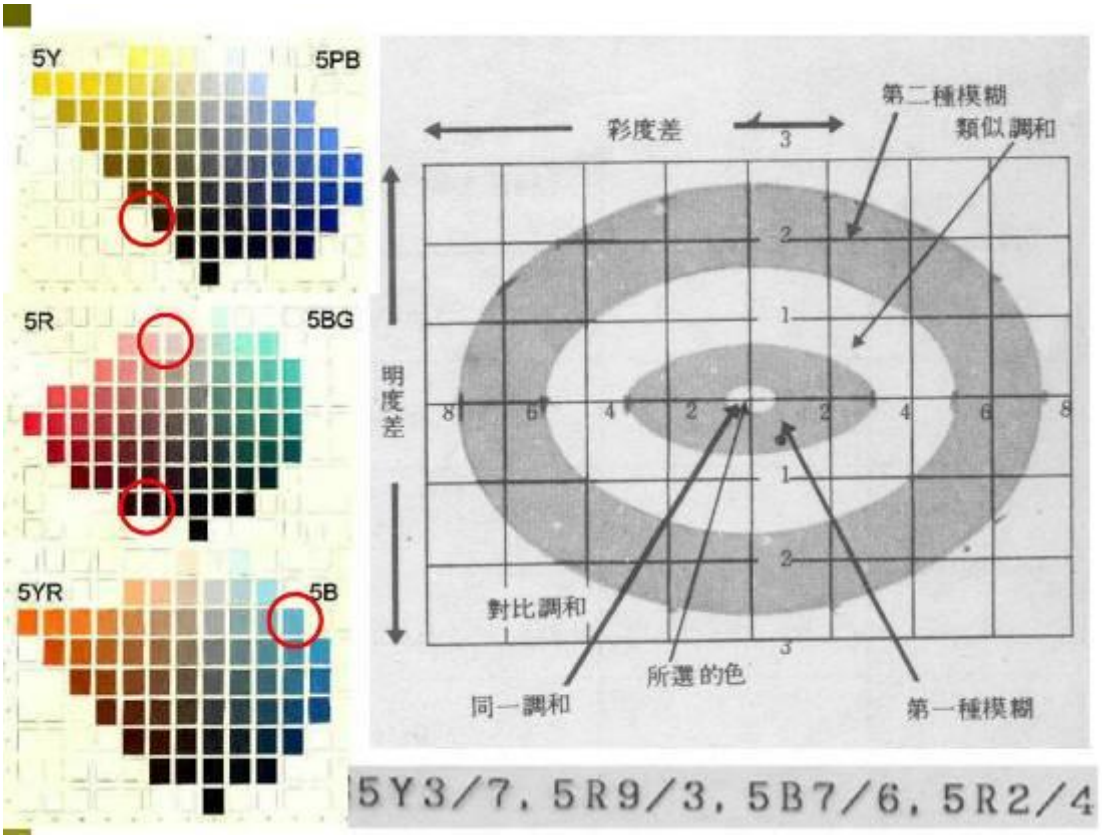




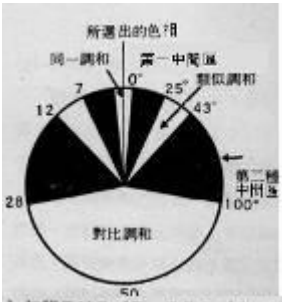


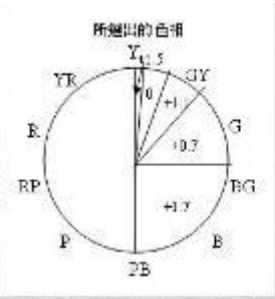


5Y3/7，5R9/3，5B7/6，5R2/4四種顏色



5Y3/7，5R9/3，5B7/6，5R2/4



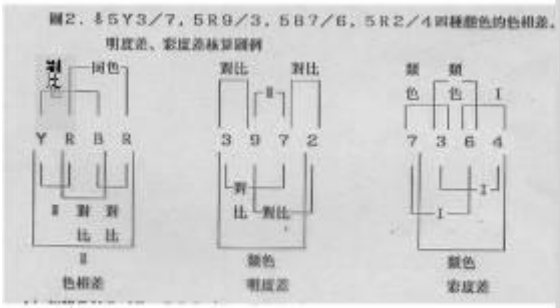


) 如將5Y3/7, 5R9/3, 5B7/6, 5R2/4四種顏色的
算, 都歷：O=1.5+2×0.7+3×1.7 +0.7-0.2+4×3.7 +3×0.1 =23.6
(色相差得分) (明度差得分) (彩度差得分)

C=4+5+6+6=21

M=O/C=23.6÷21=1.12

C＝色數＋有色相差的色對＋有明度差的色對＋有彩度差的色對



1. 調和與不調和的範圍及其計分可依下表來界定（表1）：

C=c1+c2

愉快的配色	不愉快的配色	色相差與得分		明度差與得分		彩度差與得分	
同色調和		0~1.9/C	+1.5	0~0.04	-1.3	0~0.1	+0.8
	中間區I	2/C~6.9	0	0.05~0.49	-1.0	0.2~2.9	0
類色調和		7~11.9	+1.1	0.5~1.49	+0.7	3~4.9	+0.1
	中間區II	12~27.9	+0.7	1.5~2.49	-0.2	4~6.9	0
對比調和		28~50.0	+1.7	2.5~10	+3.7	7以	+0.4

	色相差與得分		明度差與得分		彩度差與得分	
同色調和	✓	+1.5		-1.3		+0.8
中間區I		0		-1.0	✓✓✓	0
類色調和		+1.1	✓	+0.7	✓✓✓	+0.1
中間區II	✓✓	+0.7	✓	-0.2		0
對比調和	✓✓✓	+1.7	✓✓✓✓	+3.7		+0.4



關於0~1.9/C

5R 5/0.8, 6.9R 5/0.2

如色相差0~1.9/C等於同色相

其中1.9/C=1.9/(c1+c2),

亦即1.9/(c1+c2)=1.9/1=1.9

則色相差0~1.9/C=0~1.9,如是則5R 5/0.8, 6.9R 5/0.2**是同色相**

5R 5/8, 5.2R 5/2

如色相差0~1.9/C等於同色相

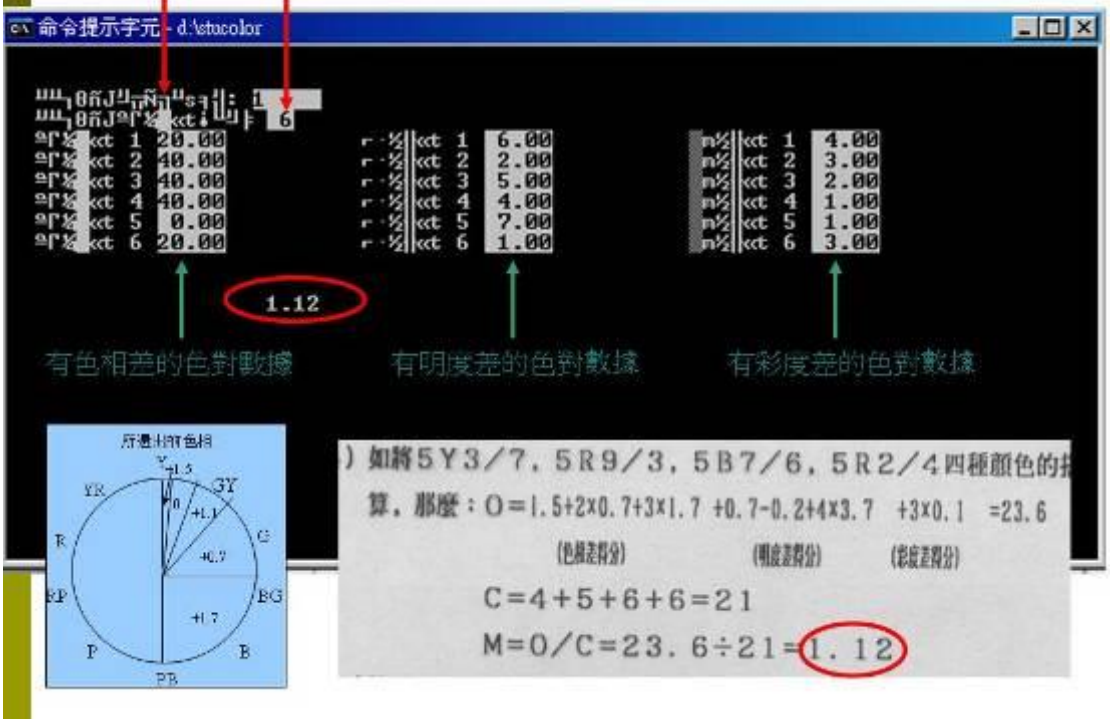
其中1.9/C=1.9/(c1+c2),

亦即1.9/(c1+c2)=1.9/10=0.19

則色相差0~1.9/C=0~0.19,如是則5R 5/8, 5.2R 5/2**非同色相**

輸入樣本編號　　色對總個數

5Y3/7, 5R9/3, 5B7/6, 5R2/4



) 如將5Y3/7, 5R9/3, 5B7/6, 5R2/4四種顏色的
算, 那麼：O=1.5+2x0.7+3x1.7 +0.7-0.2+4x3.7 +3x0.1 =23.6
(色相差得分)　(明度差得分)　(彩度差得分)

C=4+5+6+6=21

M=O/C=23.6÷21=1.12

輸入樣本編號　　色對總個數

5Y 8/13.5　3PB 2.4/11　5B 5.5/10　4R 6/12



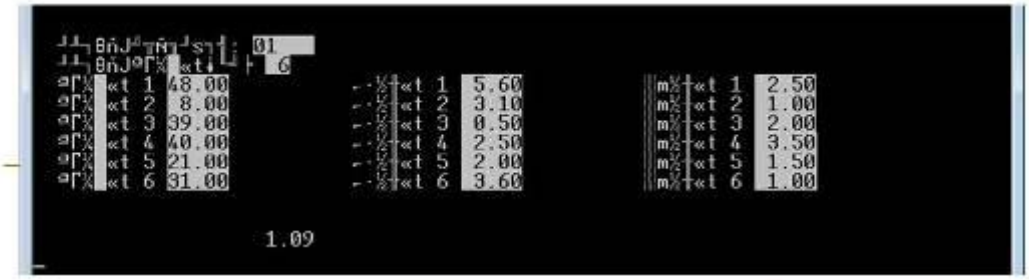
O=(1.1+0.7)+1.7x4+0.7-0.2+3.7x4+0.1
=1.8+6.8+0.7-0.2+14.8+0.1=24

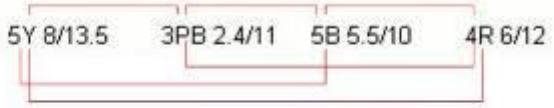
C=4+6+6+6=22

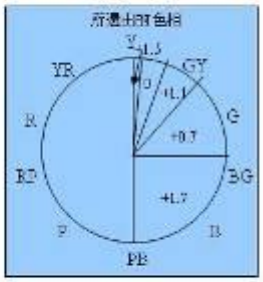
M=23.6/22=1.09

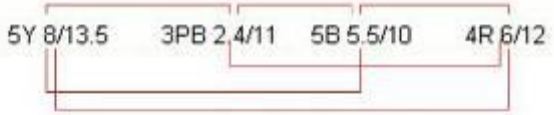
1. 調和與不調和的範圍及其計分可依下表來界定（表1）：

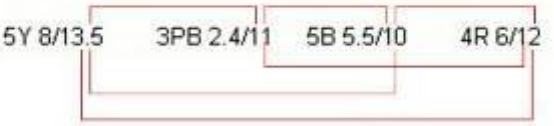
愉快的配色	不愉快的配色	色相差與得分		明度差與得分		彩度差與得分	
同色調和		0~1.9/C	+1.5	0~0.04	-1.3	0~0.1	+0.8
	中間區I	2/C~6.9	0	0.05~0.49	-1.8	0.2~2.9	0
類色調和		7~11.9	+1.1	0.5~1.49	+0.7	3~4.9	+0.1
	中間區II	12~27.9	+1.7	1.5~2.49	-0.2	4~6.9	0
對比調和		28~50.9	+1.7	2.5~10	+3.7	7以上	+0.4













美度= 24/22=1 09

1.07

面積比= s1:s2.s3.s4

=1:1.17:2.56:1.91



美度=(24+6)/22=1.36

面積合適加分

Moon－Spencer的面積計算

5Y 8/13.5, 3PB 2.4/11, 5B 5.5/10, 4R 6/12

$r1 \times S1 = r2 \times S2 = r3 \times S3 = \cdots\cdots rn \times Sn$，其中

S是各顏色的面積，$r = [C^2 + 64(V-5)^2]^{1/2}$

明度6-5與明度4-5同值

$(182.2+64\times9)^{1/2} \times S1 = (121+64\times6.7)^{1/2} \times S2 =$

→ $(100+64\times0.25)^{1/2} \times S3 = (144+64)^{1/2} \times S4$

$27.54 \times S1 = 23.44 \times S2 = 10.77 \times S3 = 14.42 \times S4$

$S1:S2:S3:S4 = 1 : 1.17 : 2.55 : 1.90$

Munsell方式：

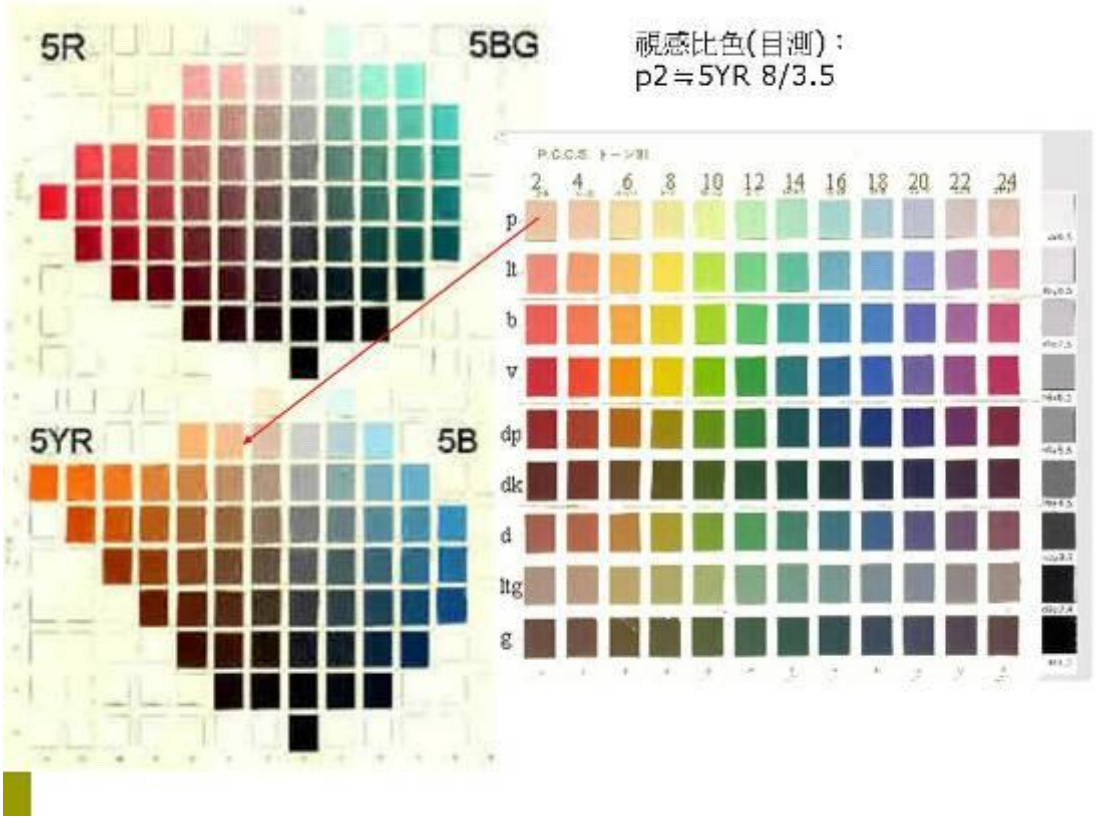
$S1:S2:S3:S4 = 1/(8\times13.5) : 1/(2.4\times11) : 1/(5.5\times10) : 1/(6\times12)$

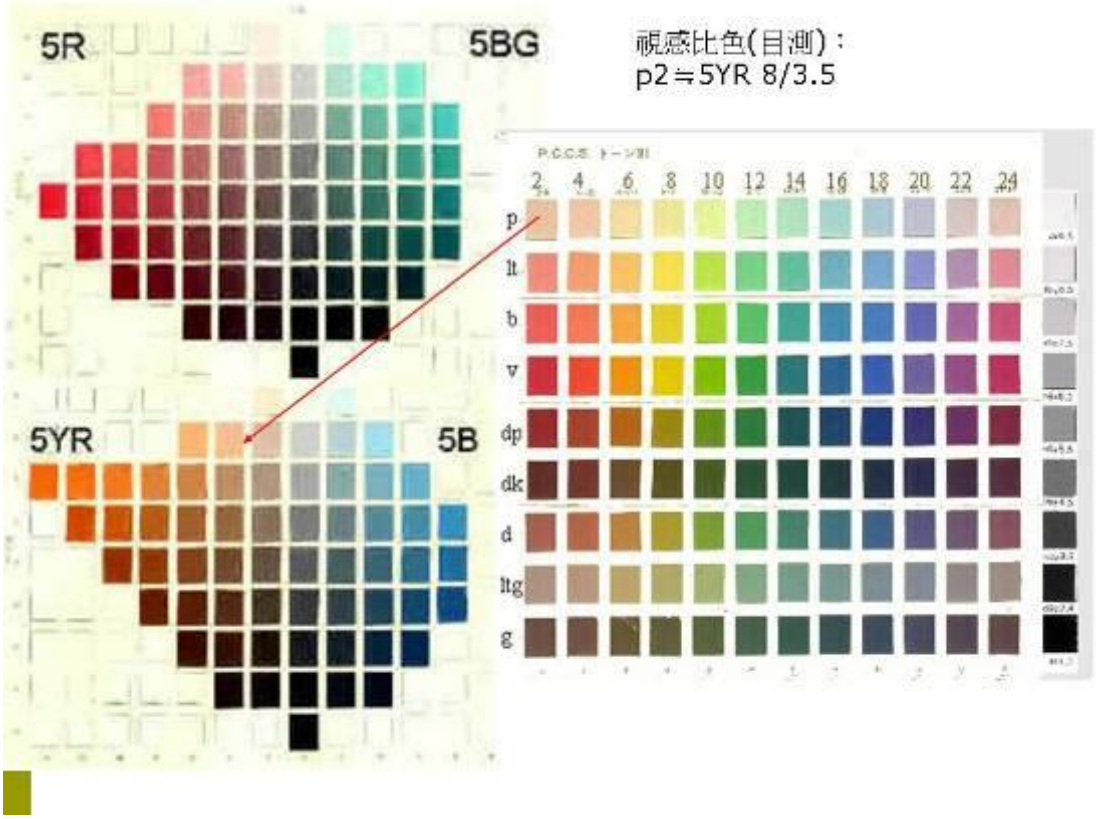
$= 0.009 : 0.038 : 0.018 : 0.014 = 1 : 4.2 : 2 : 1.6$

V ＼ C	/0	/2	/4	/6	/8	/10	/12	/14
0 と 10	40	—	—	—	—	—	—	—
1 と 9	32	32.1	32.4	32.6	33.0	33.6	34.2	35.0
2 と 8	24	24.1	24.4	24.8	25.3	26.0	26.8	27.8
3 と 7	16	16.1	16.5	17.1	17.9	18.9	20.2	21.3
4 と 6	8	8.25	8.94	10.0	11.3	12.8	14.4	16.1
5	0	2	4	6	8	10	12	14

明度6-5與明度4-5同值

表17 N5の周りのモーメント・アーム(moment arm)


5R
5BG
5YR
5B
視感比色(目測)：
p2≒5YR 8/3.5
2 4 6 8 10 12 14 16 18 20 22 24
p
lt
b
v
dp
dk
d
ltg
g


5R
5BG
5YR
5B
視感比色(目測)：
p2≒5YR 8/3.5
2 4 6 8 10 12 14 16 18 20 22 24
p
lt
b
v
dp
dk
d
ltg
g