

A. H. MUNSELL DIARY

VOLUME B

1908 through February 1918

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*These 2 volumes have been microfilmed - ref- 39*

*Document 1207 - not listed at 250  
G. K. ...  
2101 East Avenue  
Wash - D.C.*

BOOK IV.

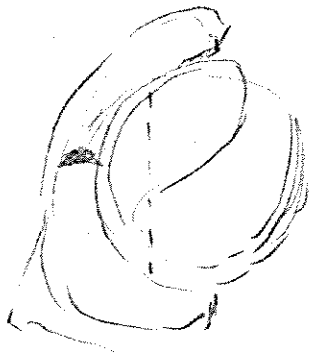
Page 1 contains a statement of the patent covering the five middle colors; also an advertisement of the Munsell Color System by Wadsworth-Howland & Co., Inc.

1.

Sept 10-  
21, '08

Dr. Lawrence Henderson - on Marquette.  
Is it practically conceivable that a change of Hue may take place without a corresponding change of chroma. (see p.75)

1a.



R & Y (middle) are certainly new.  
Why not show sphere to a scientific body?  
How came you to do this?

" did you obtain middle value?

- What does analysis of successful color combinations indicate as to balance?

17. Specify pigments used in Chart 20.

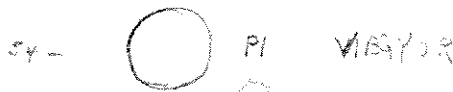
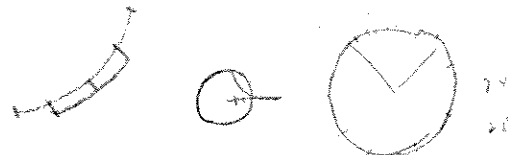
• 5R<sub>2</sub> and 5 BG<sub>2</sub> do not appear to balance at  
5 5 centre of mercator or color score.

18. Score should show at what part of a picture the color noted occurs.

Given a pattern in 3 areas: (successful design) vary the same interval throughout the chart, and note change of centre of balance.



(1b is the original copy of 1a. After the question 1b. about analysis of successful color combinations there appear the following diagrams:)



May 8  
1908

Took Leslie Thompson to lunch and to studio

1.

14

Sent lecture notes to Royal E. Farnum - Cleveland School of Art - as loan for his course in Summer School of the South.

Rec. six copies "Color Notation" to be credited at W & H - .80 516.

23

Portrait of Judge Charles F. Perkins - completed after five sittings - to be credited for \$500.- against legal services in connection with patents, etc Dr. to Nov. 15 --- 271.24  
Bal. in my favor 228.77

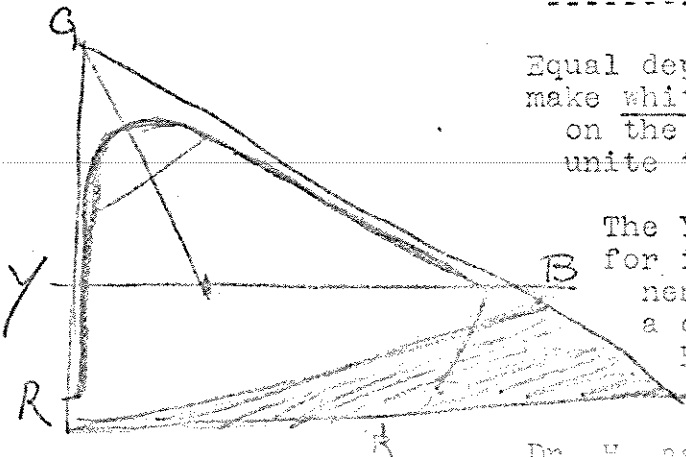
May 28 Portrait delivered- (----)

June 6 Sailed on "Venezia" for Naples -  
 meeting Dr. Lawrence Henderson) Harvard Medical  
 Dr. Wm. Lord Smith )  
 Ed. W. Sawyer - sculptor  
 Prof. Bright - Johns Hopkins.

Sept 10 Sailed on "Marquette" from Antwerp for Boston.  
 Met Dr. Henderson again  
 Prof. & Mrs. Franklin - Johns Hopkins  
 Prof. LeCompte  
 Prof. F.G. Harrison Yale

Gave advance copy of "Color Notation" (2nd edition) to Elihu Vedder (Capt.)  
 Loaned my copy to Mrs. Franklin.

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Equal departures on either side of G- 2.  
 make white (extin-) but points taken apart  
 on the straight line of the figure  
 unite to make their intermediate (bleus)

The Yellow (blend) not like others,  
 for it does not suggest its components - therefore Mrs. F. calls it  
 a color fusion, and places it with  
 R & G & B as a unitary color.

Dr. W. asks if the 3 point test - R.B.G.  
 does not fix the departures of B & G from  
 BG. Mrs. F. thinks b', g' would also  
 work. i.e. She questions the "degree of  
 freedom".



(Can the opposite pairs be crowded together, and still pass the test?)

Degree of freedom )  
 $x^2 + ax = b$  ) will b'g' serve for correct  
 $x^2 + ay = b$  ) distribution as well as BG?

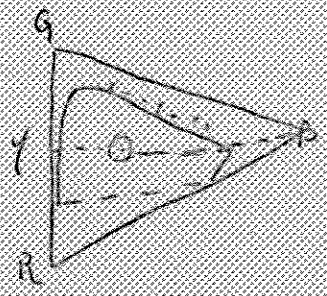
Mrs. F. wants me to arrange my 3 sets of discs to find middle green (leaning toward neither Y or -

YG G BG

Also wishes to disperse a spectrum not according to wave-length but according to relative discrimination in each color.

Sept 23 11-1 At Studio - Mrs. Franklin & Dr. Henderson. 3.

- 
1. Color Sphere - total balance (opposite)
  2. Middle Colors - " " & tested by (pairs -
  3. Photometer. (3-5 equidist
  4. Charts - horizontal & vertical - (ant points
  - large chart of 60V - masks to
  - find balanced color
  5. Color Tree.



-----

Koenig's curve for the spectrum, inside the ideal triangle - (instrument now in charge of Nagel of Berlin.)

Mrs. F. calls R, Y, and B - unitary colors

- R & G Yellow - color fusion
- Y & B White - " extinction
- B & G Blue-green - " bland
- R & B Purple - " "

Color-fusion gives a new unitary color, in which we can discern neither red nor green, while RG & RB - each suggest their components. (She wishes to omit purple, also calls it porphory.)



Hegg of Barne furnishes 4 standard colors, by perimetric test.



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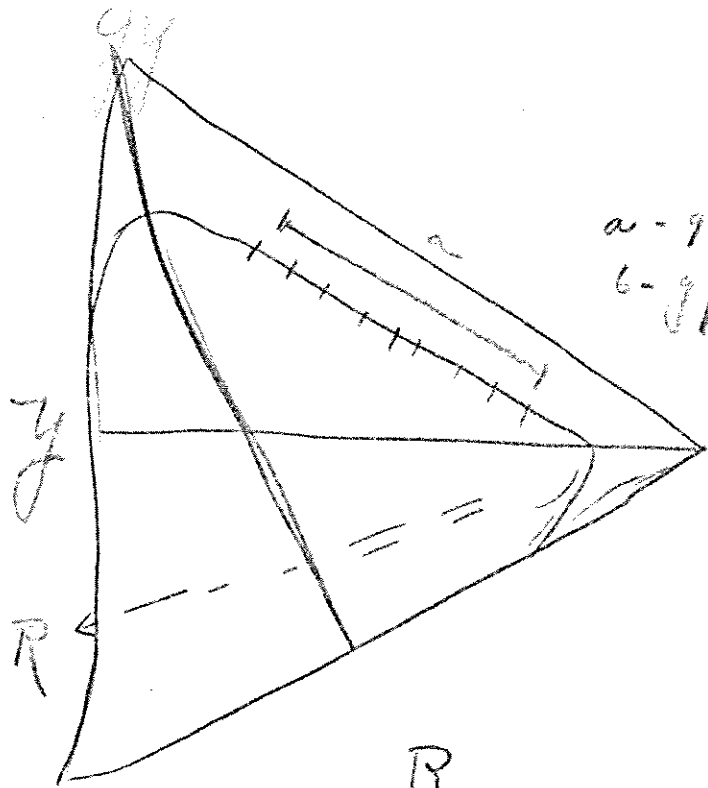
R & BG are opposited (complements) - i.e. R fixes BG - but BG is a union of B & G - i.e. it fixes B & G - hence R fixes the equal departure of B & G -

In the same way BG fixes RP & RY as equal departures from B.

PR & YR are opposites (complements) of G & B - but PR is a union of P & R; i.e. it fixes P and YR " " " " Y & R " " " Y

This stepping process will complete the circle of color.

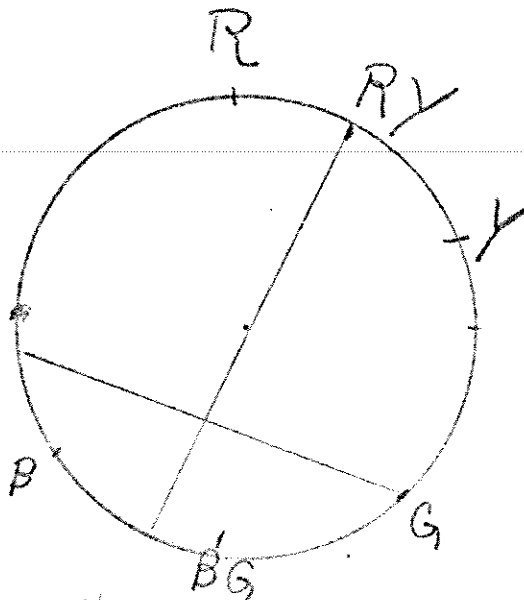
Dr. Henderson says, "Now place your five colors by wave-length, and see what their intervals are."



$$a - y + b = g +$$

$$b - g + b_y = \text{desing.}$$

3a.  
(1).

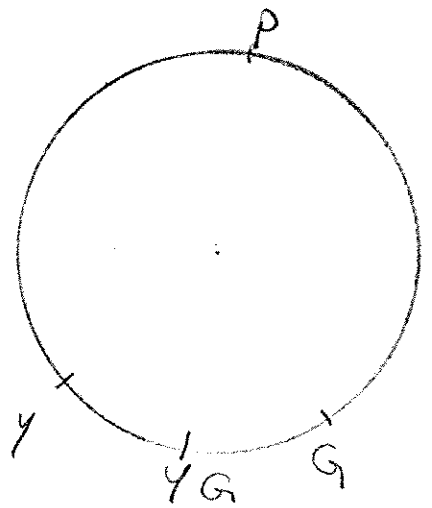
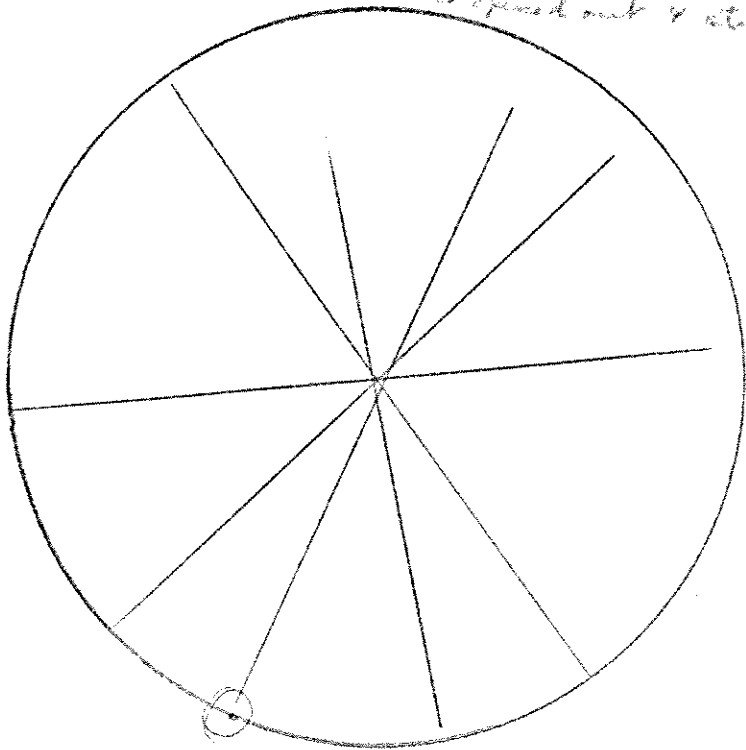


(2)

1-11 of Review  
Standard Volume  
New store book

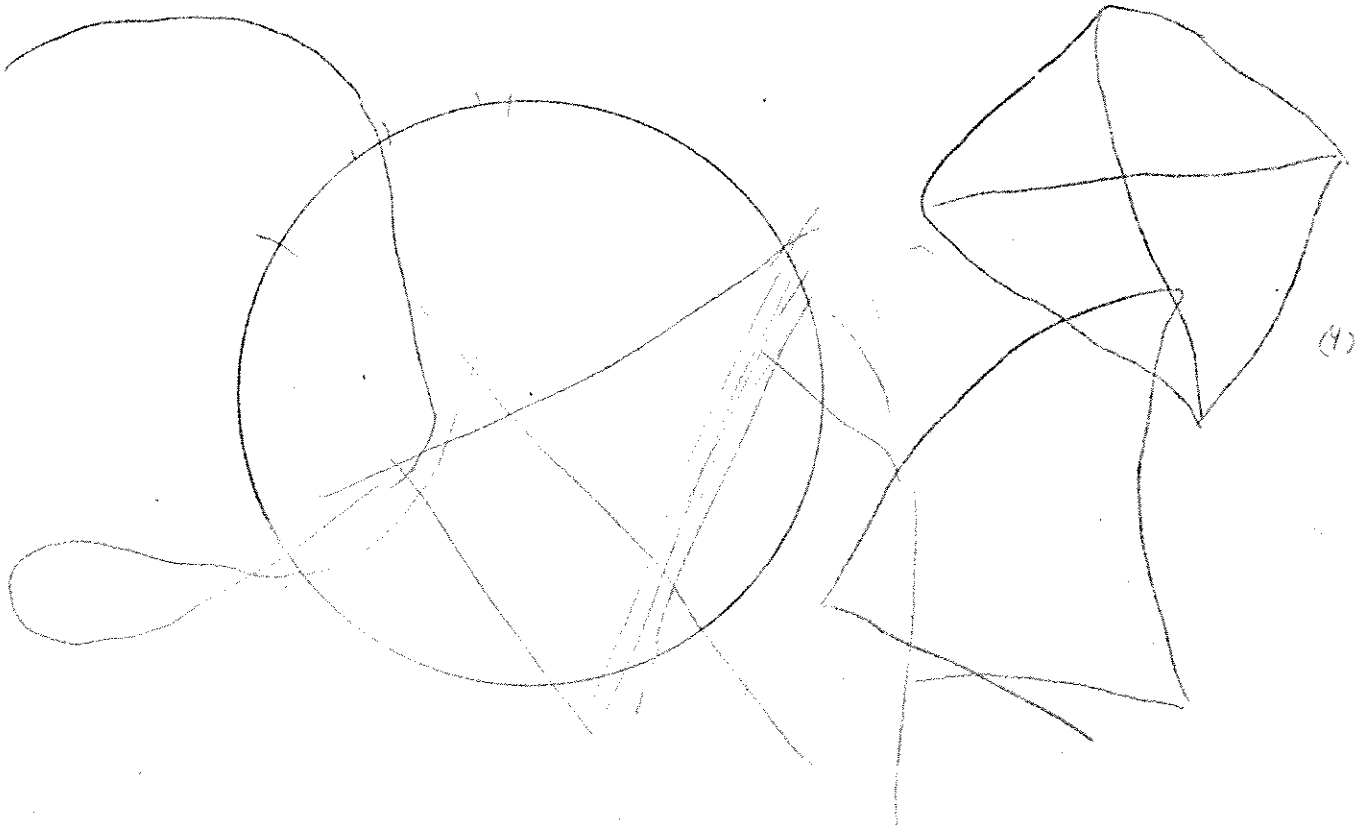
R		Y
G		B

can diameters (comp pieces) be crowded together  
or spread out & still prove total balance.

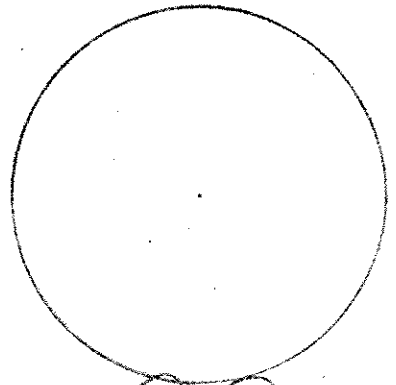
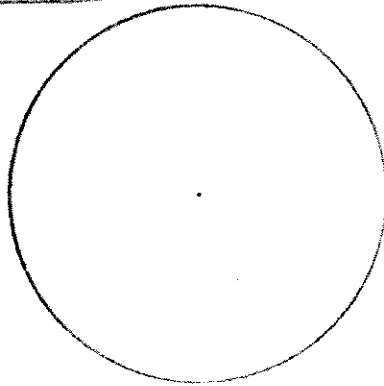
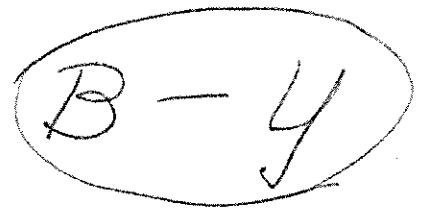
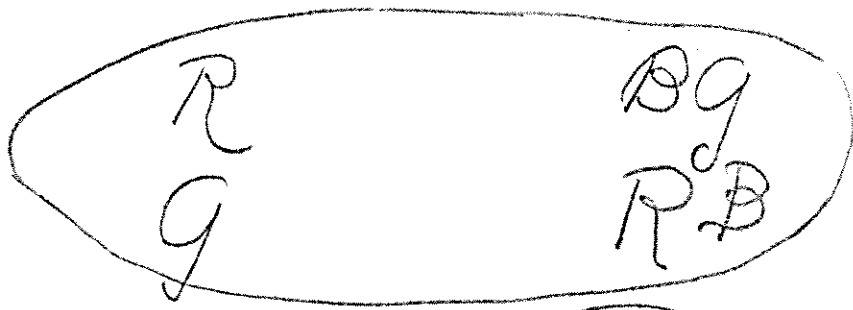


(3)

Dependent not by transitivity  
but by selected decision stability.



(4)



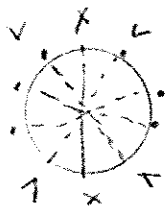
(5)

y-g

g  
B  
R  
Y

Bg

degree of freedom

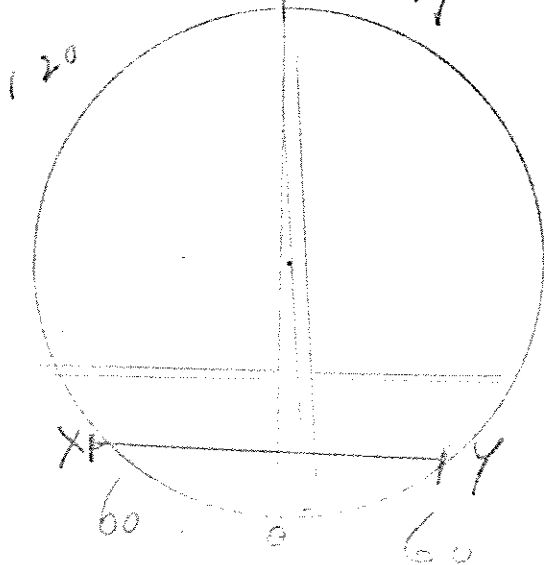


$$x^2 + ay = b$$

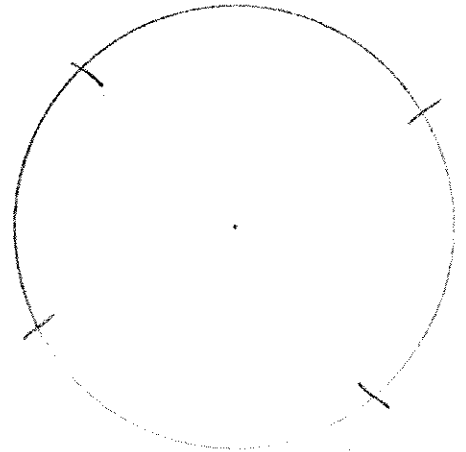
$$x^2 + ay = b$$



Do 3 equidistant points  
prove correct distribution?  
Will y reverse as well as ab.



120



b

Sept 24 9-10:30 At studio.

5.

Mrs. Franklin wishes first to present this idea, which is ignored by the physicist:

"You cannot say that yellow is made of red and green, but only that yellow light can be made out of red and green light, though it may equally well be homogeneous.

(The dichromate sees yellow, tho' he sees no red nor green.)

Triadic colored-light mixture, but

Four fold psychic (or subjective) color-field.

No psychologist admits other than four real sensations. (Esquimos have 4 real colors - Rivers' expedition.)

When she speaks of Tichener, Calkins, Baird & Mueller, - asking me to read their psychological works on color - I question whether I could profitably attack a new and unfamiliar line of study, at my stage of physical research in color.

When she asks where the two pairs of her theory R-G and B\*Y would fall on my equator of color.

I say that she must furnish the particular colors she employs. My impression, however, is that the first pair are not complements (unless the green is bluish or the red purplish) and that they leave out a wide interval of cool color. (unbalanced circle.)

As to terms - she thinks Chroma ( <sup>(impressiveness)</sup> & ) two things. (saturation )

I ask if that is not due to width of slit (spectroscopic) which makes overlapping spectra and diminishes saturation? - and Quote confusion in all treatises on color: such as "brighter, intensity, tone, etc.

She wishes to distinguish between "color paper" and "color".

(In speaking of this theory with Mr. Gilman (tel.) h. he said he thought it might still be debatable, rather than proved, - as her anxiety indicated. I told him her criticisms of Helmholtz, Koenig's and Abney.

Triangular coordinates - rather than



in Koenig's diagram.



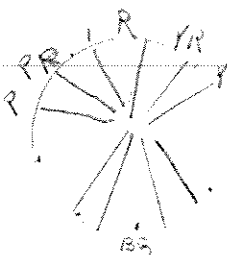
(Over telephone with Prof. Cross. - He thought the psychologists differed so much among themselves, that we should wait until they came to an agreement on color. The fact that 3 colors sufficed in photography seemed a good reason for adhering to the Helmholtz-Koenig theory.

(Page 5a consists of Mrs. Franklin's notes which are included in the previous page.) 5a.

Sept 28 At W & H Factory - Malden - with J. Otto Anderson and Mr. Carlsen.

Tested changes in old standards  
 Find Red darkens and cools)  
 Blue lightens ( ) Hence green seems  
 Purple " " " ) to grow stronger.  
 Prepare 3 copper spheres (5") and old 6"  
 plaster globe. (To replace sphere of Sept 22)  
 10 hues - 9 values

Oct 14



Test circle by opposite pairs.  
 " 3 equidistant points  
 " 5 " "

Test by photometer & discs.

90
80
70
60
50
40
30
20
10



white template on gray

white additions

black template on gray

black additions



(Pages 7a, 7b, and 7c consist of charts of the sphere.)

Oct 20

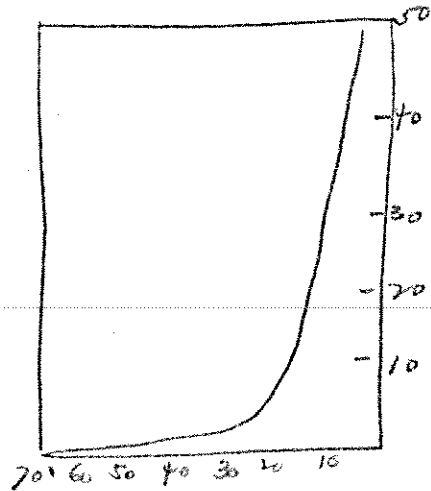
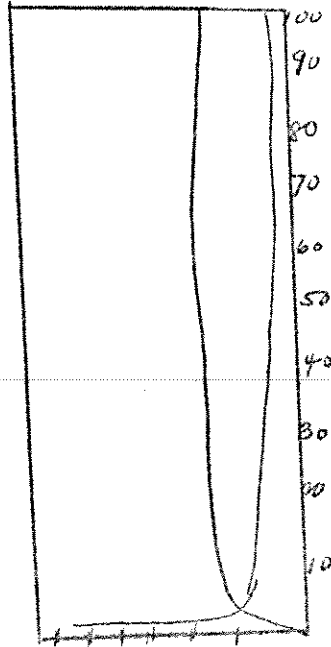
Prof. Cross tells me of Dr. Louis Bell's paper on the physiological Basis of Illumination. (Amer. Acad. of Arts & S. 43-4)

9.

(5-6 Mr. Pritchard at studio.)

"color vagaries of the eye"

"co-efficients of reflection range from .80 to about 01  
Fechner's fraction is from .02 to .0055"

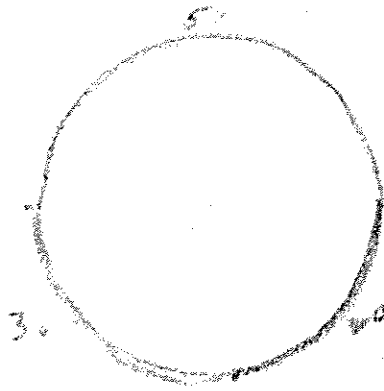


(visual acuity & shade perception)

iris aperture (without this assistance it would be extremely difficult to get about at night - even in moonlight.)

"the eye works most efficiently at moderate illumination!"  
"the retina has a certain amount of visual inertia, which furnishes protection against my rapid changes -"  
"Whether, as Mrs. Franklin\*surmised, there are definite intermediate phases of sensitiveness between the achromatic vision of the rods and the full chromatic vision of the cones is an important topic for research."

\*Mind N.S. 2. 473 et seq.



"In closing I may mention an interesting question which arises with reference to obtaining a light of high efficiency by building it up from the monochromatic primary components. Would the eye see clearly by such a light and could it discriminate colors properly? The answer is probably yes. The equation for white is roughly

$$W = 20R + .30G + .50B$$

These are quantities as determined by slit width in the spectrum, or a like process.

Oct 22 11-12:30 Sky very clear and blue (reflections from opposite buildings and ceiling of room) 11.  
 With Mr. F. A. Olmstead - at Arthur D. Little -

Red<sup>1</sup> { R 40 43<sup>2</sup>  
           { G 21 23  
           { B 19 20

Red<sup>2</sup> { 42 38  
           { 24<sup>(22)</sup> 22  
           { 20 20

Green I { 15  
           { 28  
           { 14

Green<sup>2</sup> { 16<sup>2</sup> 5<sup>2</sup>  
           { 32 21  
           { 18 9<sup>2</sup> } same by tint-meter.

Clear blue sky required adjustment of sliding scale to R<sub>30</sub>

Oct 29

Scales from Malden Factory

	Red	Y	G	B	P	
90						
80	87 <sup>↑</sup>	82 <sup>↓</sup>	83 <sup>↓</sup>		88 <sup>↑</sup>	changes of value indicated by arrow.
70	74 <sup>↑</sup>				72 <sup>↓</sup>	
60	72 <sup>↓</sup>	62 <sup>↓</sup>				
-50					52 <sup>↓</sup>	
40						
30			38 <sup>↑</sup>	38 <sup>↑</sup>		
20						

- Nov 6 Studio 5-6 Miss Locke and Miss F-- come to talk 13.  
over color in the elementary grades -
- 13 Studio 4:30-6 Same teachers with Miss Patrick -  
1st evening talk 8-9 at M.N.A.S. - to Boston teachers.
- 14 Lecture at Huntington Hall, M.I.T. 10:30 a.m.  
500-600 present. "A Measured Training of the  
Color Sense."
- 17 3-4 With Mr. Howland and Mr. Putnam-  
Presented question of making a Measured Value Scale 1  
" " Color Atlas 2

Suggested north-lighted room at Malden factory, to  
properly test colors.  
Both favorably impressed, and Mr. H. will talk over  
with Otto.

Agreed to give evening lecture on color at the  
N.A.S. 50.

Nov 13	The Color Sense	
20	" Measures	
Dec 4	" Balance	Fridays 8-9
11	" Records	
18	" Design	

Illustrated by 9 grades of children's work (Somerville)  
Specimen lessons by students M.N.A.S.

Paintings

Japanese prints

Color Sphere

" Tree

" Photometer

" Beads, Crayons & Water colors

" Enamels

" Charts & Masks

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Color Vision - pp181-183

Brightness is a misleading word to many uneducated 13a  
people. Better to say darker rather than brighter.

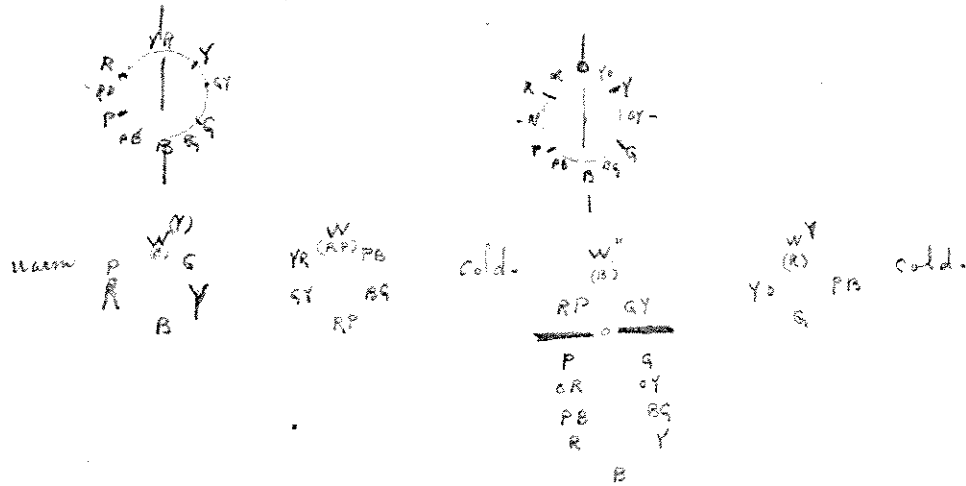
Red-blind matches a brilliant red with a feeble white.  
Violet " " " yellow " " "

says "They are of the same darkness" -

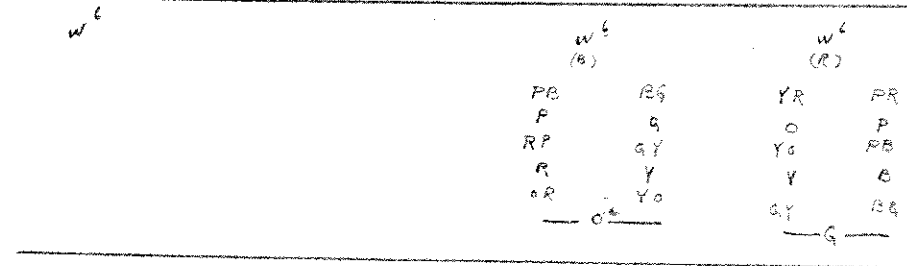
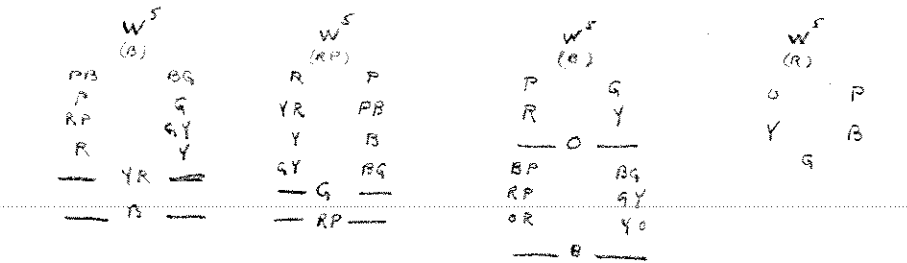
or "One is a little darker than the other.

Abney says that when matched - "equality of tone is  
established."

(Of red and green equalized by the slit of the  
spectrum - he says, "both alike and of the same  
darkness" - Equalization here is equality of V & C.  
(tone)



13 b.



Training of the Color-Sense.

12.

(Trans. Nov. 14, '08.)

Next Saturday, Nov. 14, at 10:30 A.M., in Huntington Hall, M.I.T., there will be an illustrated talk on the "Training of the Color-sense by Measured Intervals." This address is to be given by Mr. A. H. Munseil of the M.N.A.S., in response to frequent requests from those who have not had an opportunity to learn of the new methods, and who are attracted by the excellent results shown where the system is in use.

Among leading directors and supervisors of art education who have adopted it are Mr. Arthur Dow of the Teachers' College, and Mr. James Hall of the Ethical Culture School in New York; Miss Haven of the Kindergarted Institute in Chicago; Mr. J. Frederick Hopkins of the Maryland Institute in Baltimore; Mr. Leslie W. Miller of the Museum and School of Industrial Art at Philadelphia; Mr. R. B. Farnum of the Cleveland Art School, and Miss M. L. Patrick, supervisor of

drawing in the schools of Somerville. It aims to replace color guesses by definite color measures, and some results will be shown.

Trans.  
Nov 14

-----  
Errors in Color Teaching.

A. H. Munsell explains his measured training of the color sense.

"Measured Training of the Color Sense" was the subject of a lecture by A. H. Munsell of the N. A. S., in which he explained his system of teaching color sense.

The address was given in Huntington Hall this morning, and the many teachers and artists present received it with enthusiasm. While this method has been in practical use for three years with good results, it has not yet been very generally adopted.

According to the speaker, his system, instead of one of personal bias, is based on the latest knowledge of the action of the eye. It begins with measured degrees of tempered color, just as the training of the other senses begins with tempered degrees. Harmonious middle colors, rather than extremes are used at first.

He criticised the present method of teaching that red, yellow and blue are primary colors and the basis of color harmony, claiming that the true basis is red, green and yellow.\* This is due to the action of the retina. The correct complementary colors, he said are "red and blue-green, green and purple,\* violet-blue and yellow." The old color circle of red, yellow and blue gave orange an undue field. Color has three dimensions, hue, value and chroma.

Mr. Munsell illustrated his talk with drawings on the blackboard and charts. At the close of his address, many of those present availed themselves of the opportunity to ask questions and secure more detailed information.

Dec 4

-----  
"Color Notation" - Statement on cost and returns of first edition. 15.

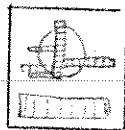
Jan 1905	G.A. Andrews -color plate	30.
	Suff. Eng. Co. cuts	20.
	G.H. Ellis - 1000 copies	271.09
	Eng. copyright & copies	12.30
	100 circulars & electros	10.37
	Advertising & postage	22.
		<hr/>
		365.76
	Cost. on sales 1000	69.55
		<hr/>
		296.21

Total cost 425.31

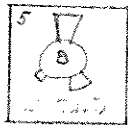
Dec 1908	Total rec. by cheque & cash	}	
	759 sold by G.H.E.		
	195 " & given away by A.H.M.		
	17 on hand		
	17 damaged		
	15 distributed		
			<u>646.18</u> 220.87

Jan 2 Studio 9-9:30 Mr. Putnam - Charts & color scale-  
 how large)  
 what form) advise with Parsons,  
 " cost) Daniels, Hall.  
 "Says we want to make at once." - patents will run  
 out later. Mr. H. is ready: - paints at cut prices  
 do not pay-  
 but this protected system can be made to pay well.  
 I make appointment for 1:30 at store.

Mr. Howland's office 1:30-2:30



Talk over an understudy for Otto (Carlson or "Dan") - Talk over permanency of enamels - (in safe deposit) -



I show how PB<sup>2</sup> has darkened one step. Discuss size of charts, no. of steps, and manufacture - Mr. P. wants some teachers of children to consult with me on these charts. (Parsons, Hall or Daniels)

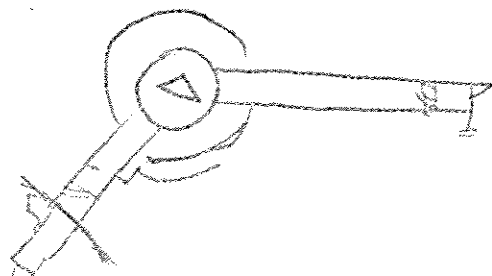
1909  
(22 x 28) k  
fold - 22 x 14

Accepts idea of these two charts first.

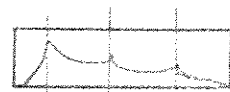
1. Neutral scale - with chromas of color maxima  
Five middle colors, with lighter & darker of each-
2. Chart 50 - in skeleton -

Jan 27 Studio - James Hall, Mr. Pritchard, Miss Peterson, Mr. Anderson - Show sketch charts - full size - 17.  
 Advisability of white mounts with gray margin to avoid thumb marks.  
 Mr. Anderson brings samples for test, - and to see how order of colors on sphere should run-Also to ask about width of colors on 15 color sphere (5")  
 I advise all of same importance.

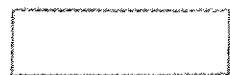
With Mr. Drisco at M.I.T.  
 Tried spectro-photometric measures of the five middle colors - by daylight and by tungsten lamp.



To read each

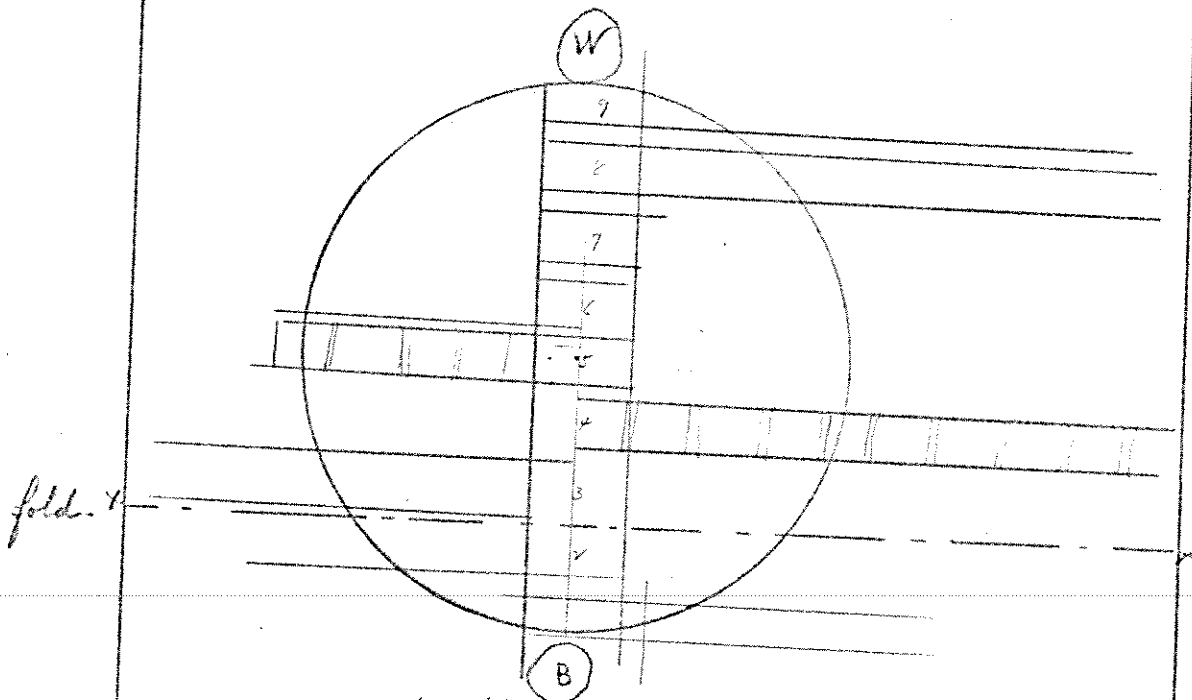


& maxima

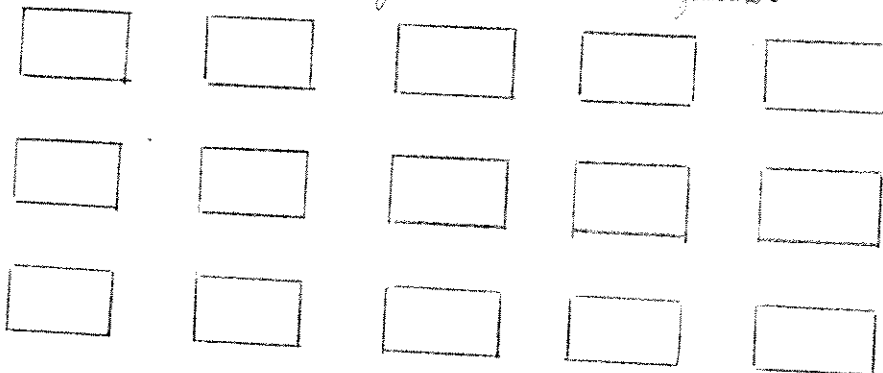


as check on my tests of 20 & 27

Munsell Color System  
 color Maxima, in measured relation to the neutral scale  
 of Values

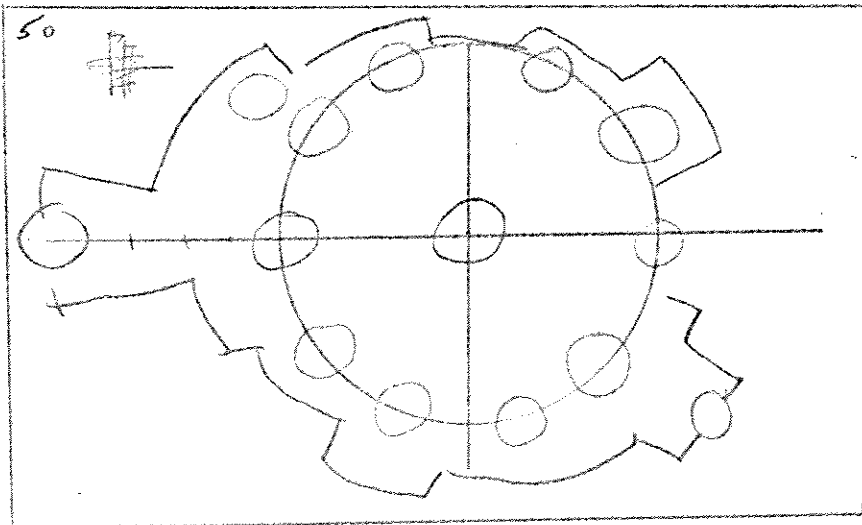
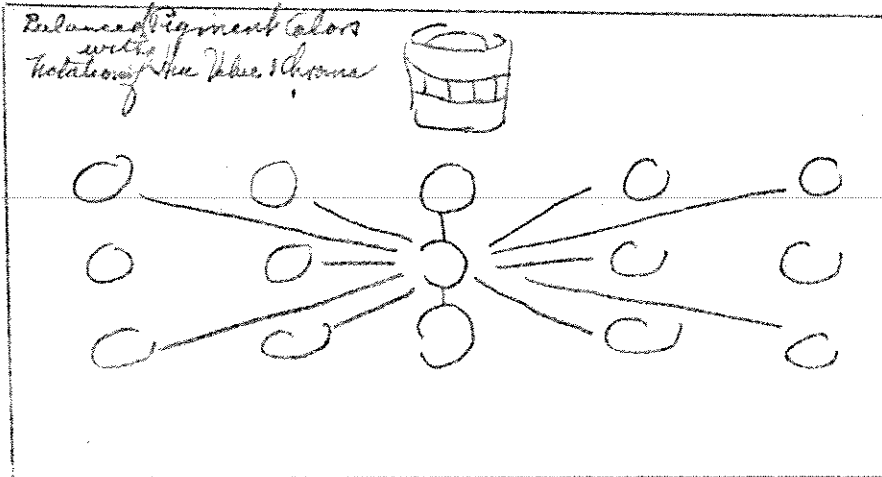
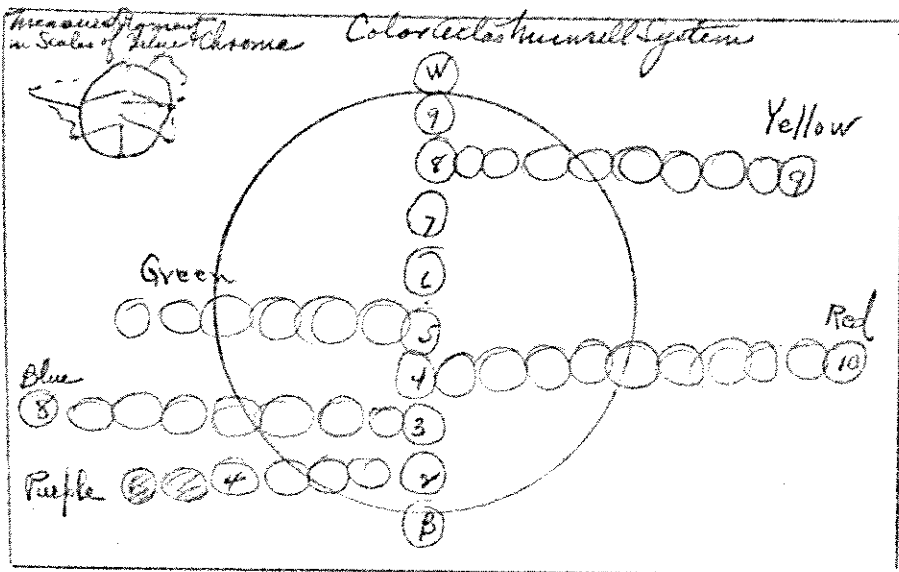


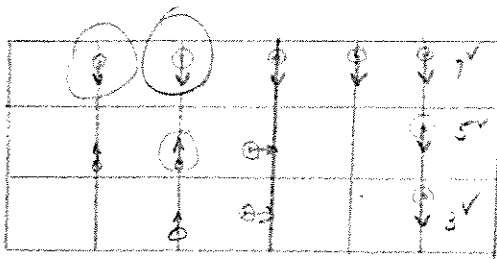
Five tints of color - Balanced  
 with a lighter & darker value of each.



scale 1/4-







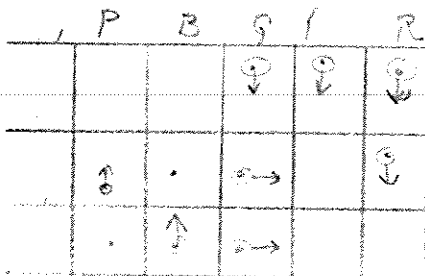
All of 7<sup>V</sup> are too light (except B & P) -  
 P & R of 5<sup>V</sup> is too dark - and G too blue - R too light  
 B of 3<sup>V</sup> is too dark, G too blue & R too light -

Green 3 & 5 the only error in Hue - (too cold) the other changes being caused by tendency to exaggerate the value of 7<sup>V</sup> in R Y & G - and darken the blue 3 - also th lighten R<sup>2</sup> and to darken the purple<sup>2</sup> - also to lighten R<sup>5</sup>.

Dear Mr. Howland: -

This has been a poor light for color tests, because of the raw blue sky, but I send you the results of measuring the samples submitted by Mr. Anderson.

17a.



As the diagram shows, the only change of hue needed is in the green, which is slightly blue: but several changes in VALUE are needed to make the three color-levels right.

In the upper level (V<sub>1</sub>) red, yellow and blue are each of them too light. At the middle level (V<sub>2</sub>) the red is too light and the purple too dark. At the lower level (V<sub>2</sub>) the red is too light and the blue too dark.

Perhaps it would be wise to let me test them again with the above corrections.

Yours truly,

Feb. 1, 1909.

19.

Jan 30	1st lecture	M.N.A.S. - Color Measures)	Class A -Public
Feb 6	2nd "	" " "	Balance ) School Class -
Feb 13	3rd "	" " "	Records ) Mr. Burnham, Phelps Miss Wells -

See next page (To create a definite mental image of all color relations - To train the memory of color arrangements - (visualization and writing necessary for constructive imagination.)

Scale of Value (photometer)	)	united by	Meaning of
" " Chroma (maxwell discs)	)	color tree &	Middle
" " Hue (spectroscope)	)	color sphere	Colors

Feb 13 Daily importance of a trained color sense.

Discrimination

Imaginative use (gratify desire for color pleasure as soon as possible.)

The Color Sense - Its mechanism - Color blindness  
rarity

menace to life

Aim of color study - to perceive, define, relate, imitate and  
memorize - later to enjoy and use (balance )

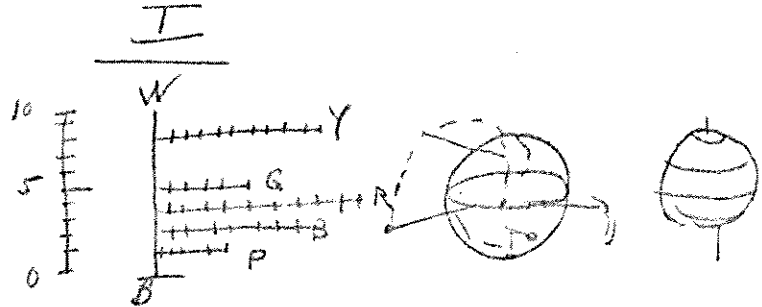
(accent )

(translate) - 1/2

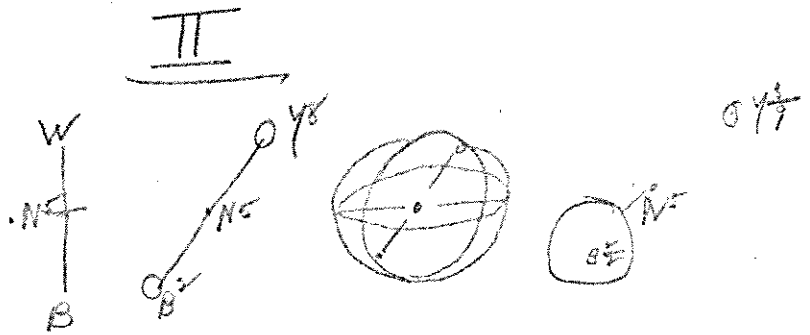
picturesquely , decoratively

(invent )

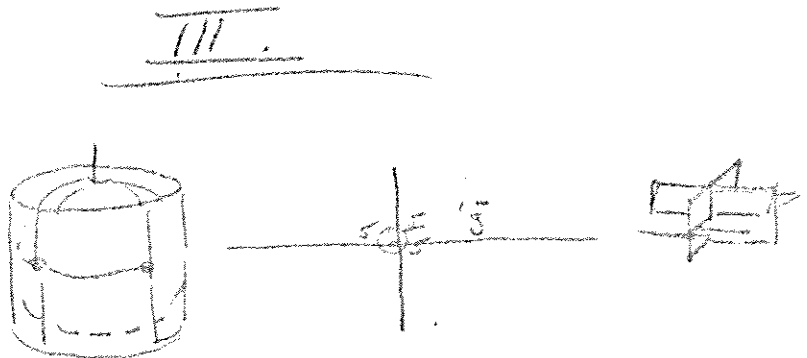
Color Measure



Color Balance



Color Records



Centre of sphere (light & dark ) (Desire to  
 a centre of balance(weak & strong)area as a (regain  
 (warm & cool )compensater(VisualEas

Each point (Hue Scale)Chroma written ( ( 5YR8  
 self-described(Value " ) as a sub-script( 9  
 Groups & silhouettes -  
 Search for laws of Harmony.

Feb 25 Colonial Club - Cambridge 6:30-10 21.

Dr. Henderson invites me to meet Prof. Richards -  
 I show color sphere - V & H charts & notation  
 chart - Prof. Richards says "it is convincing". Now  
 I can clearly relate and describe what before was  
 confined in my thought about color.

"I shall study to find pigment bases and media  
 that will make these "middle colors chemically  
 permanent."

Dr. Henderson remarks how any real quantitative  
 work finds valuable application in many fields of  
 study. Thinks this research will be especially  
 valuable to the new dept. of commercial chemistry.

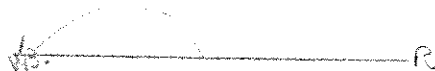
Prof. R. in discussing color-blinds - tells me  
 of the report by Lord Rayleigh - in Trans. of the  
 Royal Soc. for 1893.



green blind



red "



red & green  
 blind

which seems adequate proof of the 3 retinal sensa-  
 tions - (I tell him how both Mr. Ross and Mrs.  
 Franklin wish to omit purple - which leaves no  
 balance for YG) also Rood's "Your five fold idea  
 seems to me a good one", - and give him a box of  
 the crayons (5) with the pamphlet "Children's studies"  
 which he will give his daughter, to whom he is show-  
 ing color schemes.)

Mar 4 Prof. F.W. Richards at studio - 5.00 - 6 P.M. 23.

Has tested his children on middle value comparisons,  
 and says Miss Norton is interested in these balanced  
 colors. Sees photometer (too dark for tests) but  
 reads his grey (52) - I give him Tech. reprint &  
 he asks when I made sphere.

Tell him of twirling double pyramid -(1878)

Empiric scale of values 1893

Maxwell discs (velvet & white 1898

sensations)

Spherical diagram for night pictures Nov 12, '98.  
 Sphere used to plot colors " Sept "  
 "War Cloud" " Nov 11  
 (Ross' exhibition at Botolph  
 Photometer works in Jan. 1901

-----  
 Refers to his nephritoscope for matching cloudy media.

-----  
 Show him photos of portraits, & some canvasses.

\*\*\*\*\*

Mar 6 Mr. Arthur S. Gibbs brings Prof. Clifford's photometer which I fit with new eye piece, - Intends to compare with a Weber P. in testing the illumination of several theaters & halls.

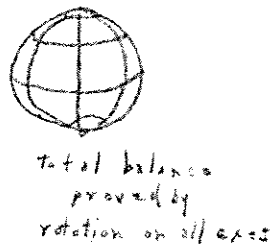
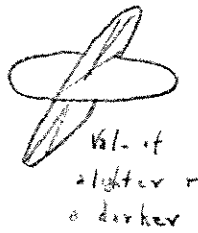
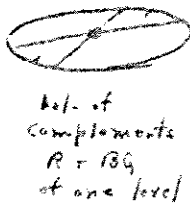
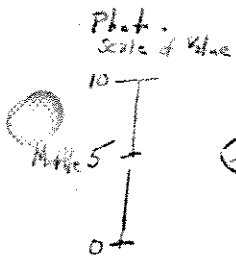
P		G		R
68 <sup>2</sup>	70	61 <sup>2</sup>	70 <sup>2</sup>	66 <sup>2</sup>
45 <sup>2</sup>	48 <sup>2</sup>	47 <sup>2</sup>	49 <sup>2</sup>	50 <sup>2</sup>
30 <sup>2</sup>	29 <sup>2</sup>	31	30	31

Light { P } too dark  
 { G }  
 { R }  
 Middle { P } too dark  
 { G }

Mar 11 Otto Anderson takes photometer (no. 11) away after readings of the maxima.

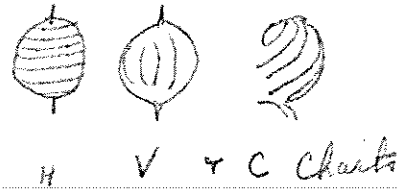
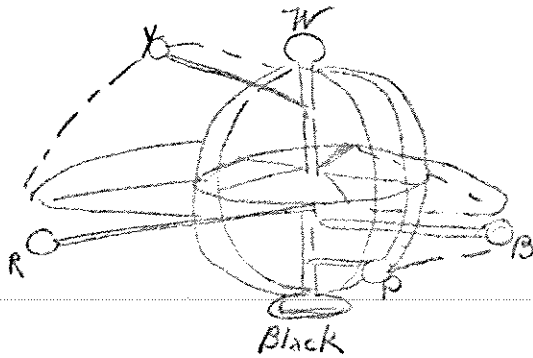
4-6 p.m. - clear. Photometric readings of the color maxima. 22.

	Anderson	Self
Neutrals	$\begin{array}{r} 43 \\ 46 \\ 44 \\ \hline 3)133 \\ 44 \frac{1}{3} \end{array}$	$\begin{array}{r} 43^2 \\ 44 \\ 45 \\ \hline 3)132^2 \\ 44 \frac{1}{6} \end{array}$
	$\begin{array}{r} 52 \\ 53 \\ 51^2 \\ \hline 3)157 \\ 52 \frac{1}{3} \end{array}$	$\begin{array}{r} 52 \\ 52 \\ 52 \end{array}$
Purple	$\begin{array}{r} 22 \\ 25 \\ 21^2 \\ \hline 3)68^2 \\ 22 \frac{5}{5} \end{array}$	$\begin{array}{r} 22 \\ 22 \\ 22 \end{array}$
Blue	24	21
Red	33	33
Green	$\begin{array}{r} 43 \\ 52^2 \end{array}$	$\begin{array}{r} 43 \\ 54 \end{array}$
Yellow	68 <sup>2</sup>	90

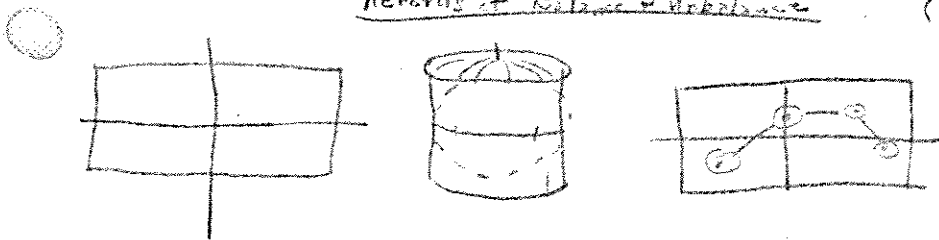


22.

Pigment Colors Unbalanced (physical tests)



Records of Balance & Unbalance (search for harmony)

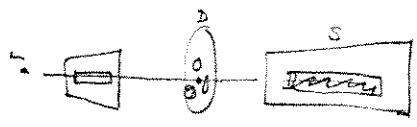



(Here there is pasted into the book a clipping on which is written "Mr. Schenk-Coraopolio Record - Feb. 11, 1909 - Pittsburg". It tells of a lecture on the Munsell color system given at the meeting of the Bible Class of the First Methodist Episcopal church Sunday school at the home of Miss Hahn on Fifth Ave.)

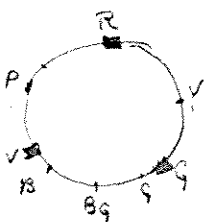
RVG

Spectral simple

Pigment complex



pigment imitation of spectrum by glass in rotating disc also by 



Yellow spot - influences color match

Color of light (neutral)



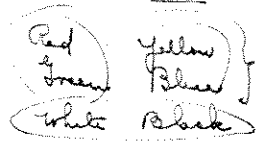
118 R  
14 = 9  
9 = V } 75 W  
285 B

Brightness & Luminosity used as syn.

Young 1860 - Color box

A diagram of color mixtures (arbitrarily chosen) not "sensations"

Hering (4)



each pair generic "assimilation" "discrimination"

Red-green visual substance } complementary + antagonistic  
Yellow-blue " " }

Dalton

"Blood looks like bottle, green" } Red-blind  
"Lacquer leaf" "scaling wax" }

Mono-chromatic vision very rare - (imitates photographic plates)

124. We can place two patches of white light on the screen, and gradually reduce one in intensity, keeping the other of its original value.

Oct 15 - 1908

Value scale

10  
8 1/2  
7 1/2  
6 1/2  
5 1/2  
4 1/2  
3 1/2  
2 1/2  
1 1/2  
1/2

added N

100  
75 25  
51 24  
36 15

(76 B) (24 N)

36 15  
51 24  
75 25  
91 10  
100  
added B

Gray Remaining

0	5
25	7
49	8
64	9
81	9
100	100

8 1/2 4  
7 1/2 9  
5 1/2 25  
3 1/2 9  
gray remaining

9	1.187
8	1.275
7	.75
6	1.5
5	3.
4	6.
3	12.
2	24.
1	48
	96.7

Series  
(Teacher)  
half  
or  
double

10	.10	.10
9	1.195	.20
8	.39	.40
7	.79	.80
6	1.587	1.60
5	3.175	3.20
4	6.35	6.40
3	12.5	12.80
2	25	25.6
1	50.	51.2
	100.4	

Series  
(Squares)

- 1.
- 4.
- 9.
- 16.
- 25.
- 36.
- 49.
- 64.
- 81.
- 100.

$$\frac{45}{30+15} \quad \frac{R}{139}$$

old & new green (blue)  
R needs 1/3 more blue (needs to be stronger)

$$\frac{45}{25+20} \quad \frac{A}{6-10}$$

Green 1/3 " " (to weaker)  
new green (20-25) show and strengthen when dry

$$\frac{50}{50} \quad \frac{Y}{PB}$$

$$\frac{78}{26-26} \quad \frac{Y}{R-12}$$

$$\frac{42}{54} \quad \frac{G}{RP}$$

$$\frac{42}{24-24} \quad \frac{G}{R-P}$$

Green's contradicts 2  
new green (30-30) stronger

$$\frac{45}{15+30} \quad \frac{B}{TR}$$

$$\frac{45}{20-30} \quad \frac{B}{R-Y}$$

YR needs 1/4 more yellow  
Blue too strong

$$\frac{50}{39-} \quad \frac{P}{9'}$$

G needs more yellow

$$\frac{50}{27-22} \quad \frac{P}{1-2}$$

new green stronger (50)