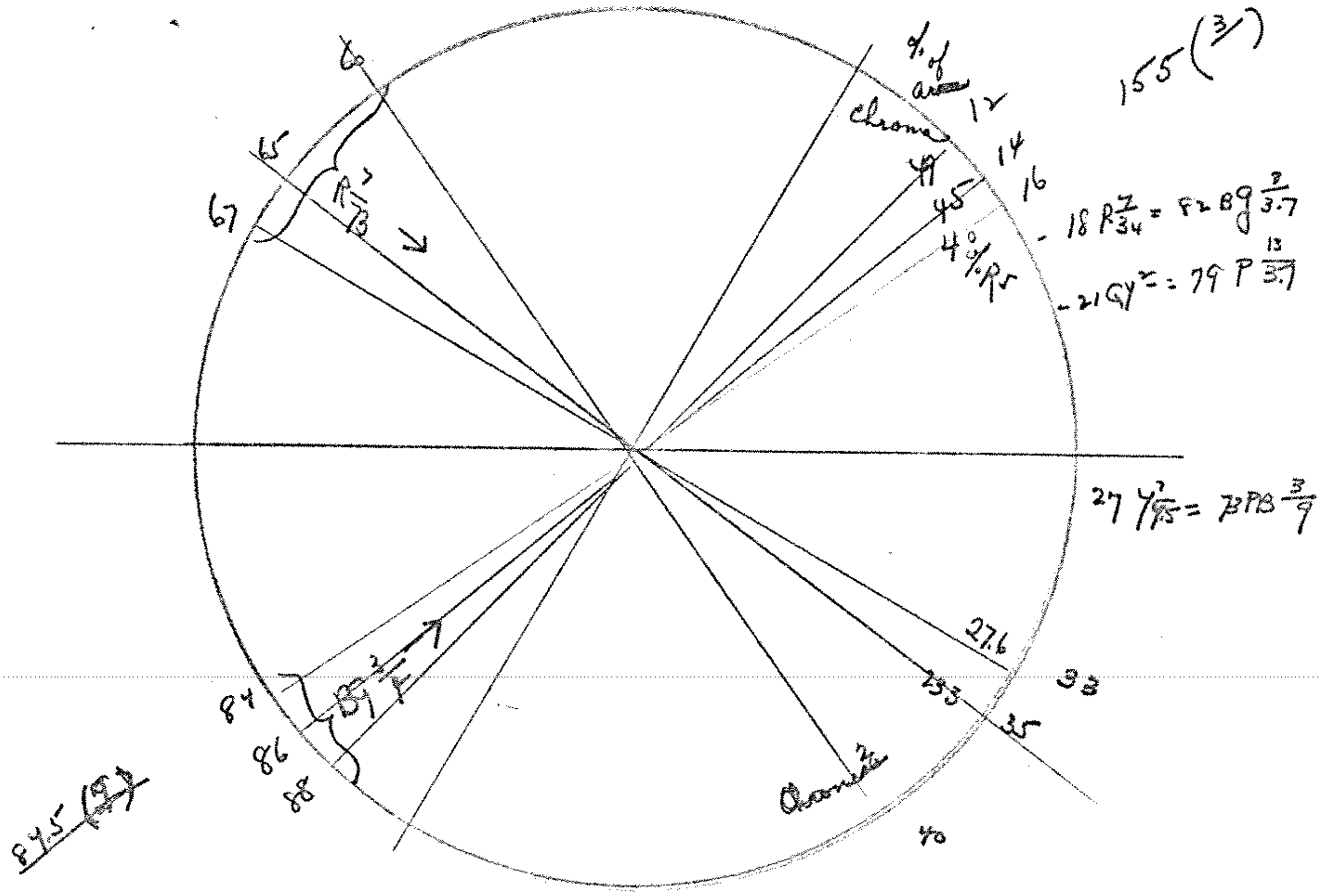
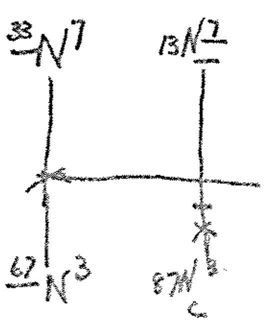
155 (3/)



Equal Chromas of 1^r and 3^r (49:9) balance on ave $\overline{87}^3 : \overline{15}^5$

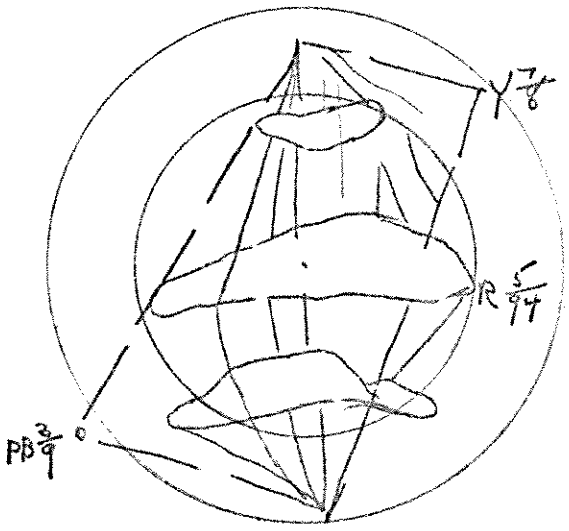
$\frac{70}{B9} = 66.6\% R$ $\frac{30}{B9} = 43\% R$



see page 83.

300 | 320

with regular scales, & written symbols



A study of space relations presenting a graphic image of pigment chroma and value.

1 Varieties of a single hue - vertical section
2 Ten hues in a circuit - horizontal "
3 Union of all varieties of the ten hues - A Color Solid
4 Balance
  a. light and dark balance
  b. warm and cold "
  c. weak and strong "

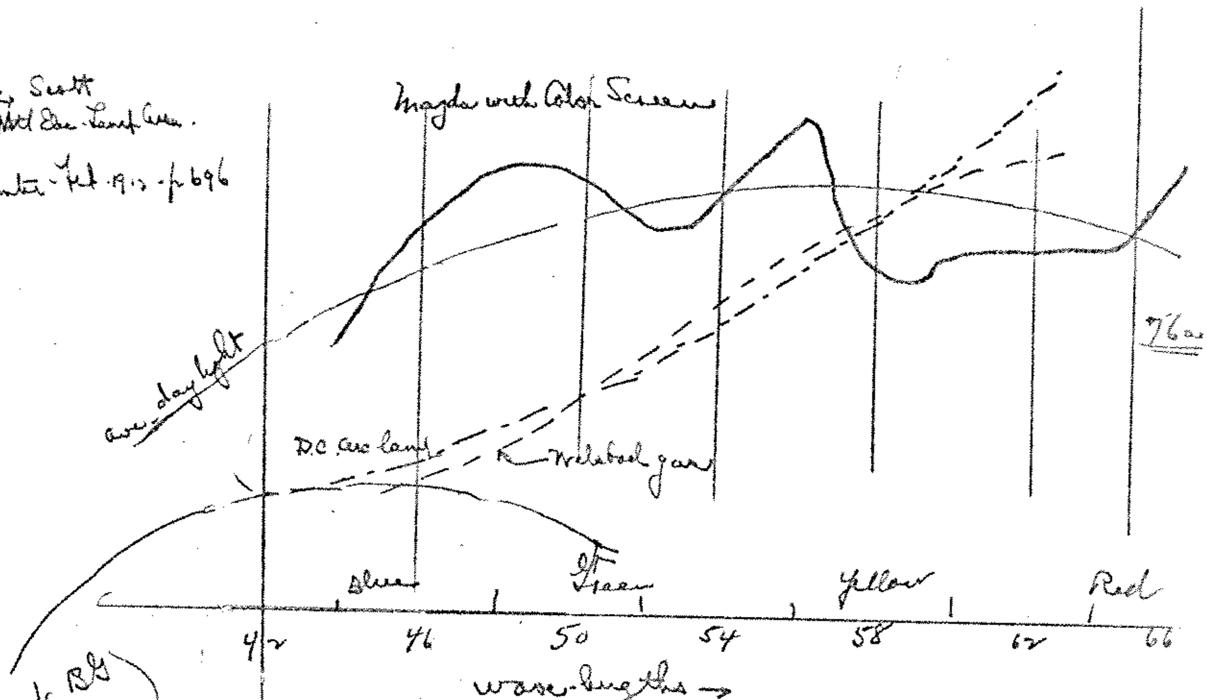
Feb 5 Dr. Henderson at studio 3-5 76.
Tells me of Pope's criticism that the value steps are longer than those of chroma - bu optical balance. I say this does not affect the horizontal charts - only opens out the light intervals between them, i.e. lengthens the axis.

Describes new book he plans - Correspondances, chemical, etc. pointing to a plan- Wonders if the Jesuits would acclaim such a study. We take up the question - whether total effect of a color sensation is product of degree of value, degree of chroma and area of stimulation.

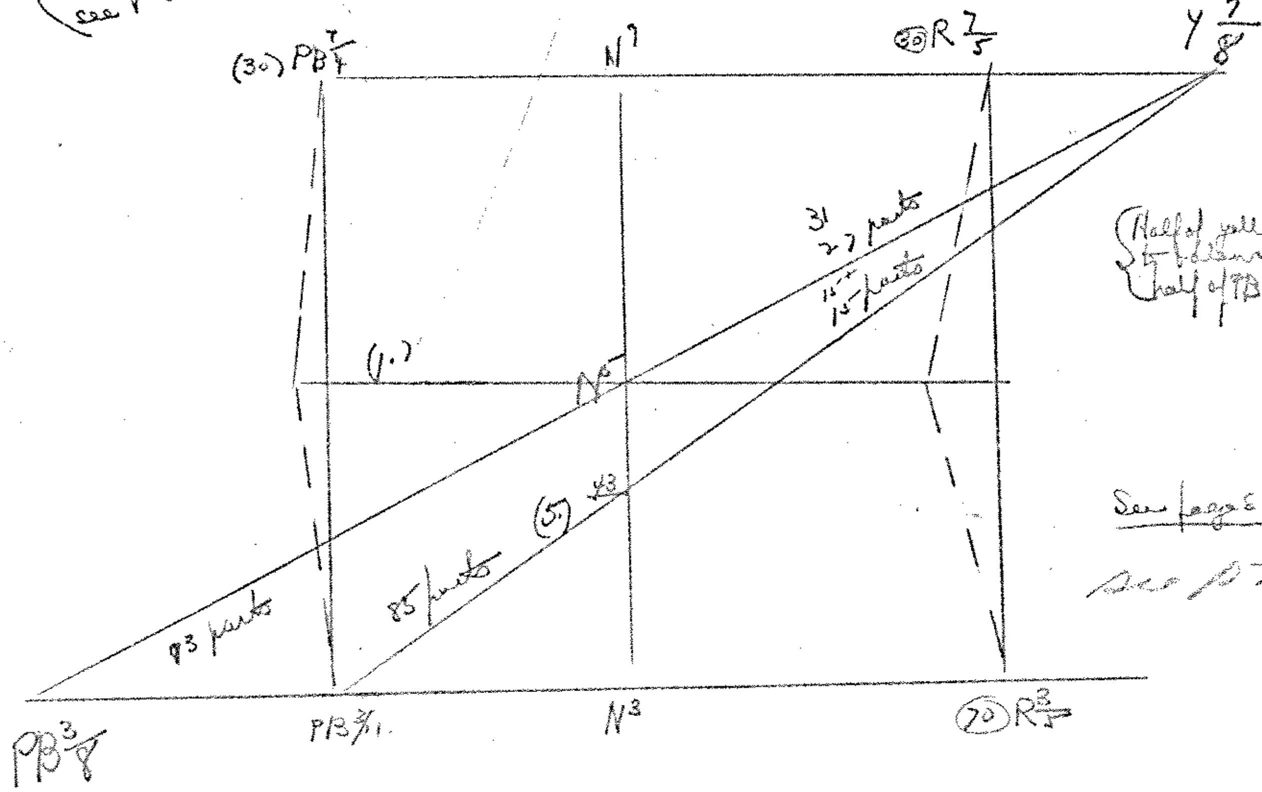
Asks how chroma is measured? - and I describe balance by this diagram.

We then balance by the five steps (1,2,3,4,5) as illustrated - finding that the inequalities of area in 2 and 7 roughly indicate their values 2 and 7.

By Pierce, Scott
I.L. Natl Elec. Lamp Assn.
from: Inland Printer - Feb 1913 - p 696



(Is this not BG
see PY mutting)



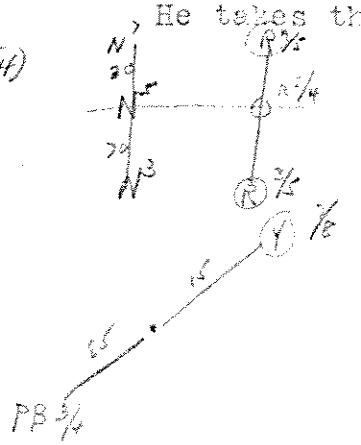
Half of yellow area
to balance
half of PB chroma

See page 53

See p 32..

He takes these data home for study.

(4)

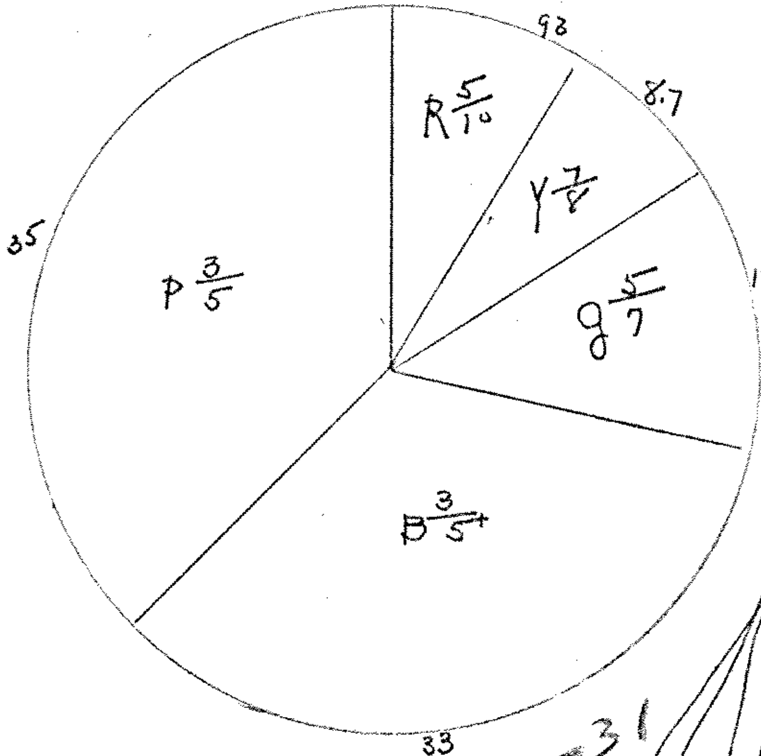


(Ratios all point to dial readings as approximate ratio of areas to compensate difference of chroma.)

3:7::30:70 Neutrals & equal chromas at 3/ and 7/

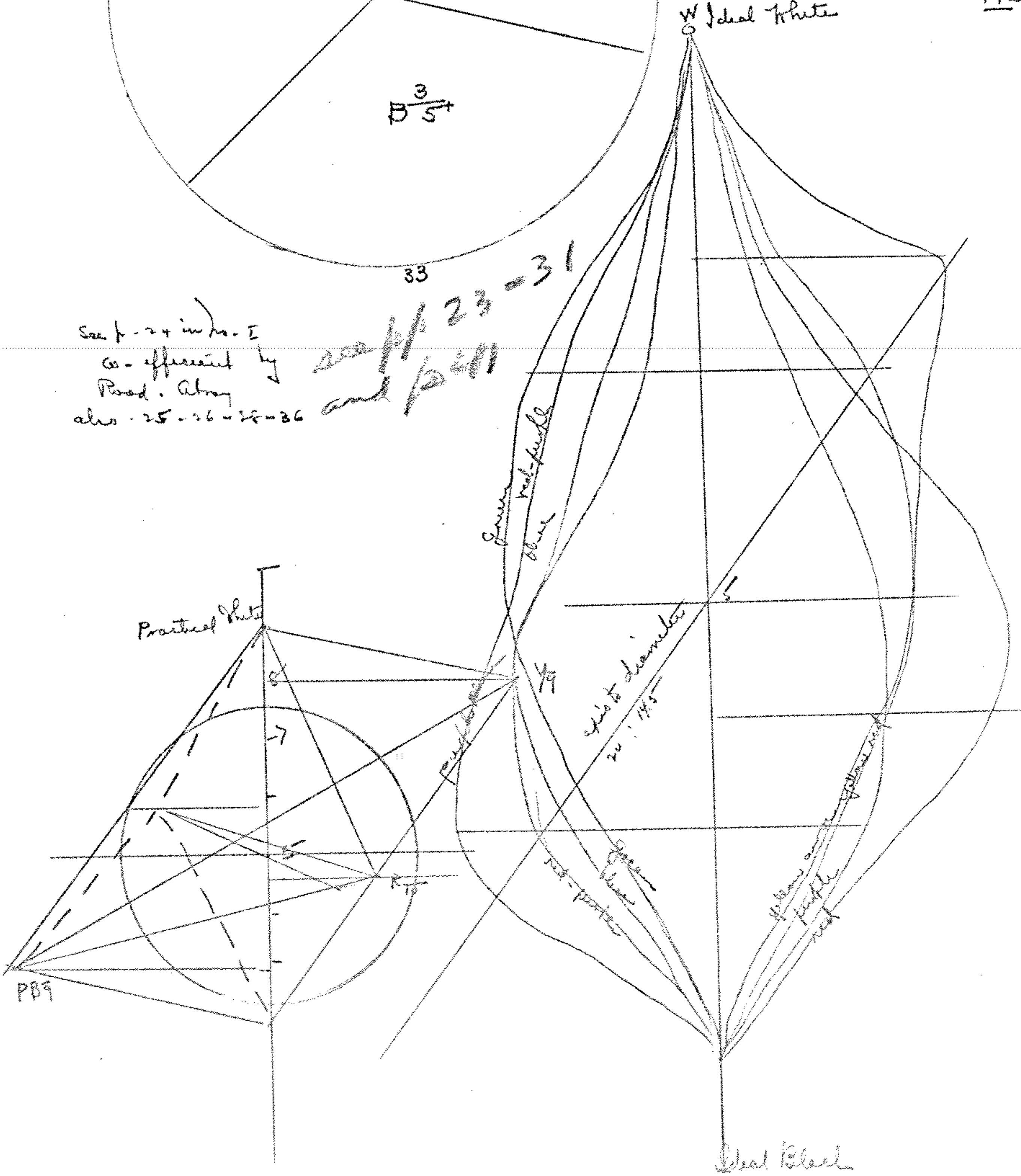
4:8::15:30 Chromas at 3/ and 7/

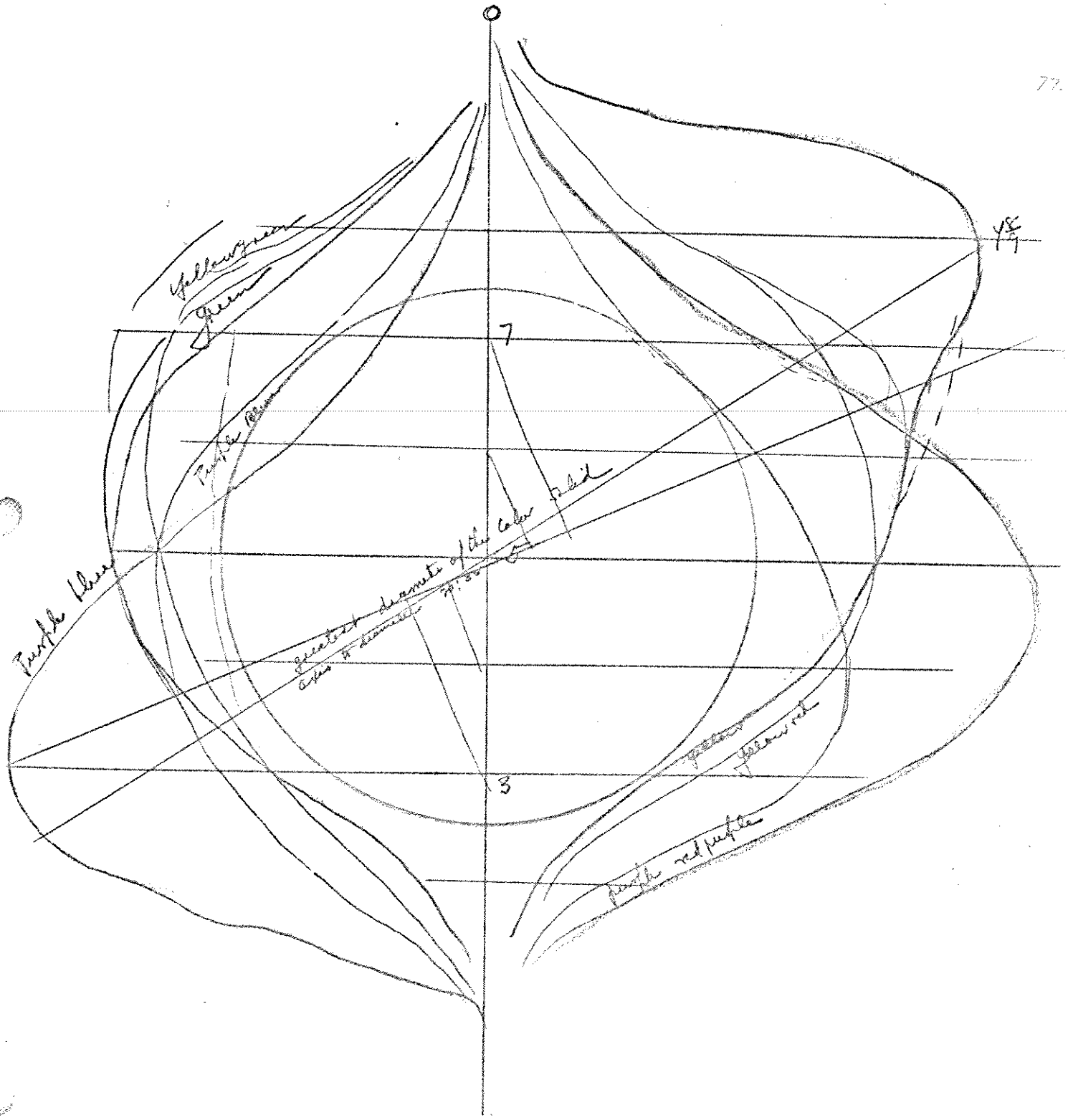
Feb 8 Retested maxima of R. Y. G. B. & P. finding that green and red hold their first chroma reading (false) better than yellow (soon degraded) blue or purple. See average areas on next page. 77.



See p. 24 in No. I
co-efficient by
Rood. Abney
also 25-26-28-36

see pp 23-31
and p 48





The color sphere is limited between N 75/ and N 25/

Feb. 12 - 1912

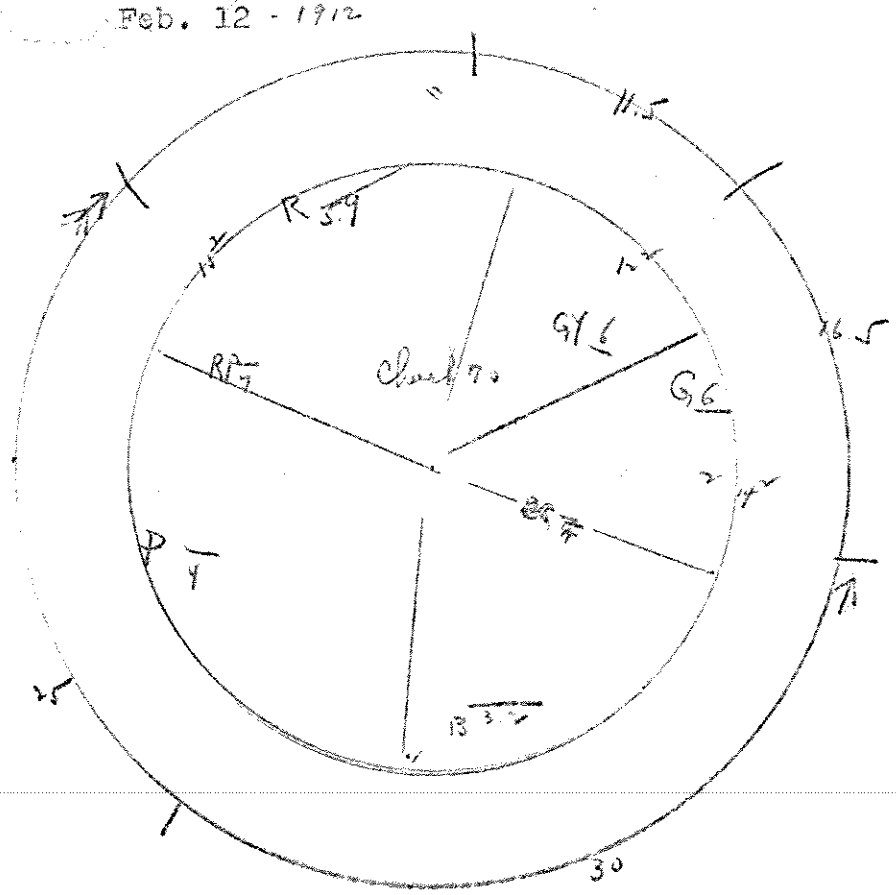


Chart 70

R	58.6	6	
YR	70	7	B: 57/51
Y	60	8	
GY	61	6	
G	65?	6	
BG	40	4	BG: 67/57
B	82	3	
RP	27.3	2.5	RP: 78 G
P	34.6	3	P: 77 .43 Y
RP	38.6	3.7	RP: 73/89

Evening at C.H. Mr. Arthur S. Allen telephones that he has talked my color system over with Philip Ruxton, and foresees that a change from their present system (Maratta) must be made presently. He therefore asks if I would consent to the use of my colors in a chart made with their inks. Also refers to colored papers in my measured relations. I agree to hold the matter open and let him know before closing with other persons. Also ask him to draw up a satisfactory form of agreement to be submitted to my counsel in this system.

Feb 14 Returned Galley proof of Washington address for Amer. Journal of Psych. and sent six cuts to the Brandon Printing Co. - Albany, N. Y. by Amer. Express.

15 4-6 Denman Ross at studio. Speaks of his interest in Chinese and their art. Says they have used five colors for centuries - viz.

Purple
Scarlet
Yellow
Green
Blue

} Also that he took these from Potter. I tell him of Rood's acceptance of my "5 Color Lyon" in 1900.

Sees large charts-

Feels Blues lighter than the reds and yellows-
We measure them in photometer - (Evidently reads <u>warm color low</u>)

	PB 7/3	Y 7/8	R 5/1	R 5/10
Ross	72	66	51	42
Self	72	72	49	45²
	0	-6	+2	-3²

When Mazda lamp is lighted - he <u>reverses</u> the warm and cold estimate - so I tell him that colors so closely measured-are very sensitive to every change of illumination-serve as a test of various lamps. I tell him that Science does not accept personal bias: wishes <u>measures</u>, - that the five middle colors are at the Bureau of Standards.
Then I show him the pigment curves (page 77) he studies them carefully then says that as we may yet get stronger pigments, he "prefers" to treat them all as equal. So I call his attention to the R-BG diameter, red being twice as strong as BG. He says he thinks he shall go back to the RYB triangle - altho deploring the way his ideas have been presented by Prang.
Thinks Vᵗᵉ Emeraude is complement of Rose Madder i.e. as palette mixture. Does not accept rotation mixtures, - yet I tell him he cannot measure the quantities of a palette mixture or make it two days alike.
Prefers Aureolin to Zinc Yellow. Does not hesitate to mix paints from various makers. Would estimate all textures in painting. Seems to be where I found him in color ten years ago - no definite, scientific foundation.

Feb 19 Warm blue sky and rosy haze - thawing snow - 9-12. 60
Chart 70

	RP	P	PB	B	BG	G	GY	Y	YR	R	
Feb 19	40	34	22	32	10	64	60	80	70	60	RP=.75? P=.52? PB=.[illegible] B=.[illegible] BG=.62?
Feb 21 NE cloudy - threatening snow	28	[illegible]	26	30	37	72	65	30	70	68	RP=.67? (Is G too blue? RP " red)
Feb 23 NW clear	26	35	22	32	33	61	61	80	70	61	(Asked [illegible] to make [illegible] to test against [illegible])

Feb 26

RP	P	PB	B	BG	G	GY	Y	YR	R
46.6	40	21	31	31	60.5	63.6	60	70	60

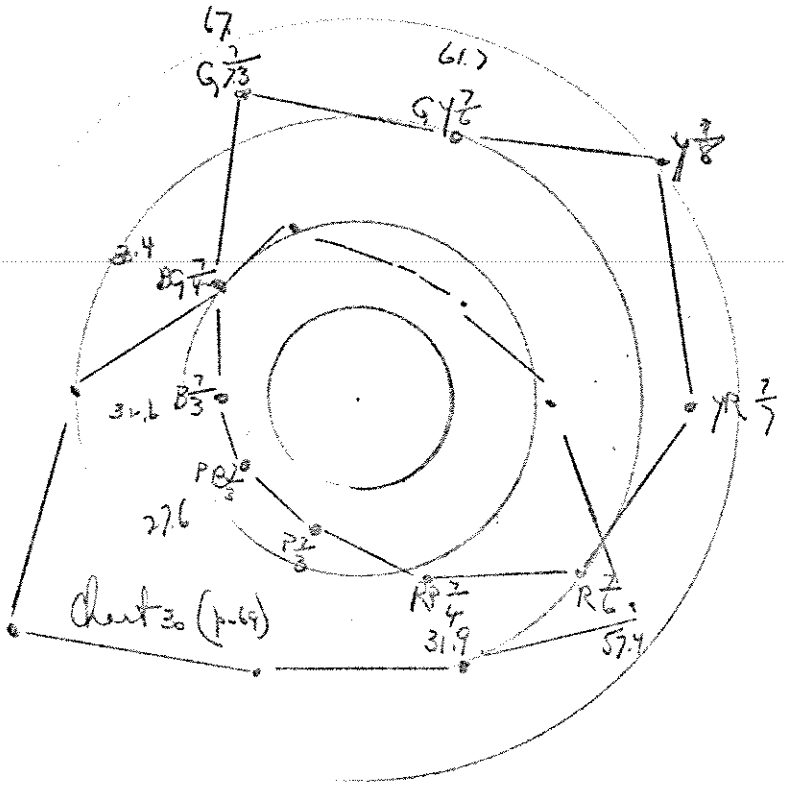
(RP .660 *
(RP .660 now

29	N	RP	P	PB	B	BG	G	GY	Y	YR	R
J	66	70	70	69	69	69	66^2	68^2	69	69	66
F	66^2	69^2	69^2	67^2	68^2	63	63	70	46	53	63^2
M	66	70	70	70	71	67	66^2	70^2	72	69^2	69^2
	66	70	69.3	68.6	67.3	66.3	66	69	62	64.3	66.3

Snow squall - A.M. Add 1.2 to all readings

80a.

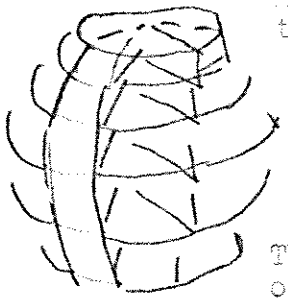
Received 100 reprints abstract for Wash. Psych. Assn.



Mar 1

Studio 2-5 Mr. Arthur Rowland, Jr. 81.
Asks what this will do for a child - If the child can understand why the five middle colors are first given.
His salesmen ask "what is the Munsell System for?" Has how we can include the strongest colors - and if he could be well to varnish half of each color [illegible]. I suggest that otto send me such a sample. We speak of absolute pitch in music and whether any ordinary person can memorize color exactly. I show him [illegible] by help of the notation. The child unconsciously gains a basis for comparing colors. I show him the Munsell circles; to help him, name, match, imitate, and finally <u>select</u> colors.

Asks about preserving the colors as in porcelain.
I tell him of my enamels and the Bureau of Standards.
He suggests large model in colored sections (to take apart).



Sees the vertical charts.

Reads W . N5 - G 36 and R 48 on photometer and sees discs.

Thinks time is ripe to show the progressive character of this system in a large book - reproducing the childrens work with concise descriptions - and having reproductions of the charts to refer to.
A popular book: object, simply stated
progressive lessons
lead up to sphere
Ideas of balance
Finally- identify colors by measure - 3 dimensions.
A non-personal, balanced system, - scientifically established.

Mar 5 Received first of Buff's copy of the photometer 82, and wrote as to shrinking front piece - hole making leak of light, - untrimmed fitted opening to match metal plate - and omission of rubber headed nails in bottom.
New RP1 far too purple, but taking 55% of Feb.20 sample plus 10% of the new RP1 - it balances 54% of the new lot of green of Feb. 27.

Mar 7 New RP1 about right.
" RP2 still needs a little green.

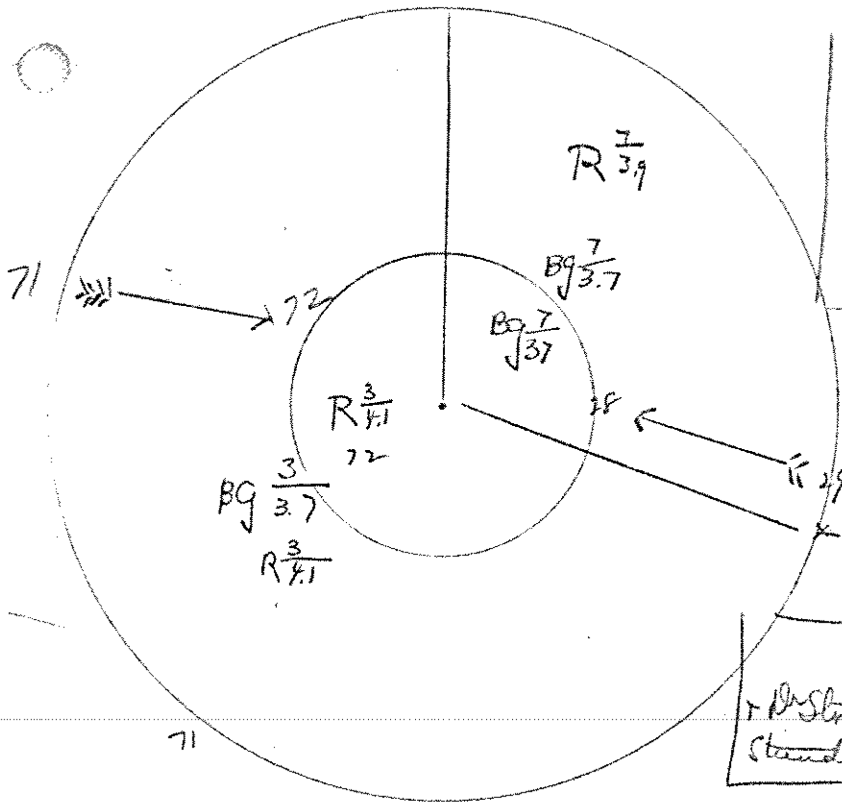
8 p.m. Huntington Hall - M.I.T.
Prof Louis Derr - on Color Photography.

Hot	3 negatives superposed	
McDonough	Red, Yellow, Blue parallel lines	
	RP	YP PB
Lumiere	RP1	3 starch grains
Kinemacolor	GP1	2 comp. screens -No PB

Shows that 90% of light is absorbed
:that we can omit PB sensation, by using a RG-
:that a nearly flat illumination is necessary
(objects good, chroma bad; chroma bad, objects good)
VanNordoff color mixer (R-G)

Spectrum R - G - VP
Glasses to imitate frontispiece in Church's "Colour"
Colors of pigments added - white black
" " " " " white
[illegible]

March - 11 - 1912



$R\frac{7}{3.7}$ balanced $BG\frac{3}{3.7}$ on N^5 – in ratio of areas 30/39 + 70 +

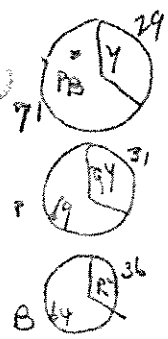
$\frac{7}{210}$ $\frac{3}{210}$

< Area inversely as Value reading

63

* Sent cheque with bill to Bureau of Standards

+ Dr Stratton says the Bureau will purchase my color standards



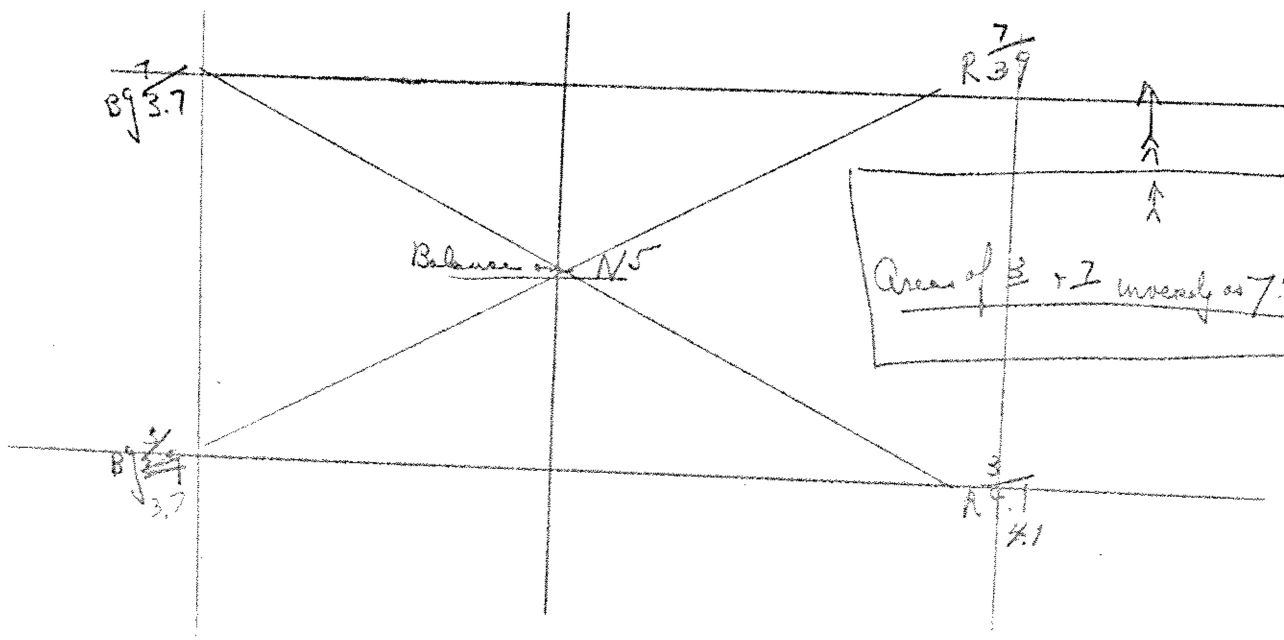
PB = 41 Y

P = 45 GY

B = 56 RY

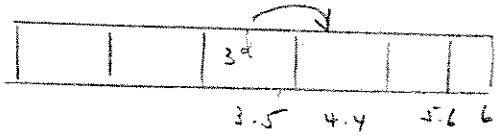
Cold Hues E by – strengthens Blue – & weakens Red & Yellow

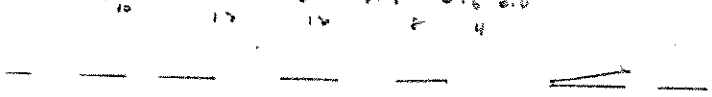
49
297
299
24-5
301
311
312



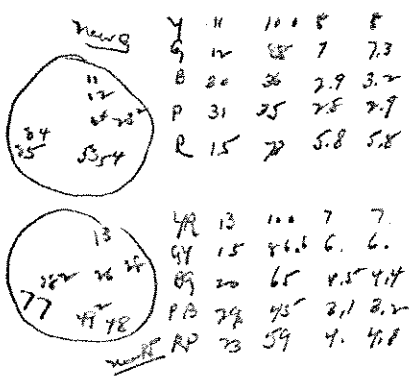
Areas of 3 + 7 inversely as 7 : 3

Mar 11 Write Otto that the 3d step of Red 7/3 in the new scale (R 7/1-9) is really /3.8 - probably due to the poor light in the present dark room conditions - and advise a change. 83a.

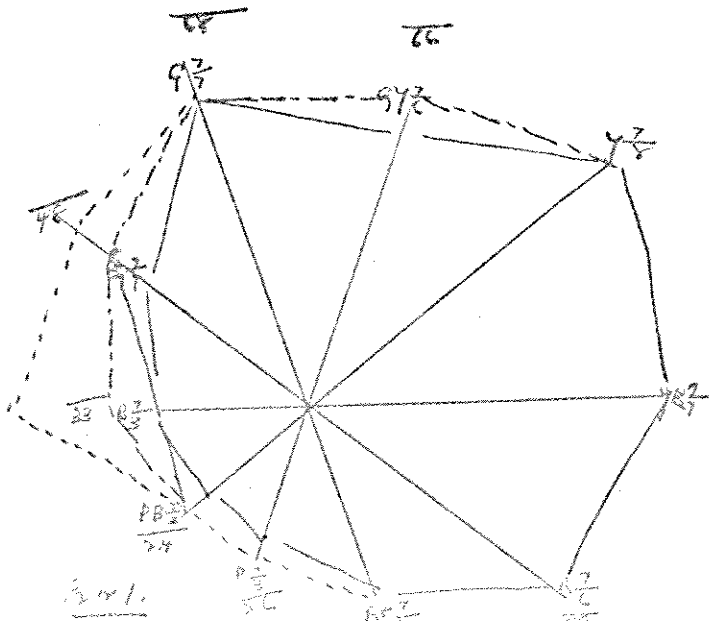




March 5 - 1912



AP = 56 G
P = 47 49
PB = 39
B = 56 YR
BG = 64 R



Mar 13 Dr. Henderson at studio - 12:30-1:30 then lunch at "Louis" and go to Schoenhof's for "I'sle des Penguins".

Show him test of balance 3/:7/ - inversely as the areas - first of equal chromas and then of unequal chromas $18^{a}:81^{c}$)
$31:69$)
He asks how Ross received these tests?
Thinks this ratio of a logarithmic and arithmetic progression reliable. Would be an interesting problem for a mathematician.

Mar 14 Called at Mr. Howland's office to ask if the remodelling at the Malden factory would permit of a better installation for Otto - and offered to give my time, when he wished, to advising on this point. He plans to put Otto where the carpenter is now - north exposure over the city yard.

Advise dark room well ventilated: intensified arc and curves - diffuser over window - ground glass
gold kelseri skin
cheese cloth

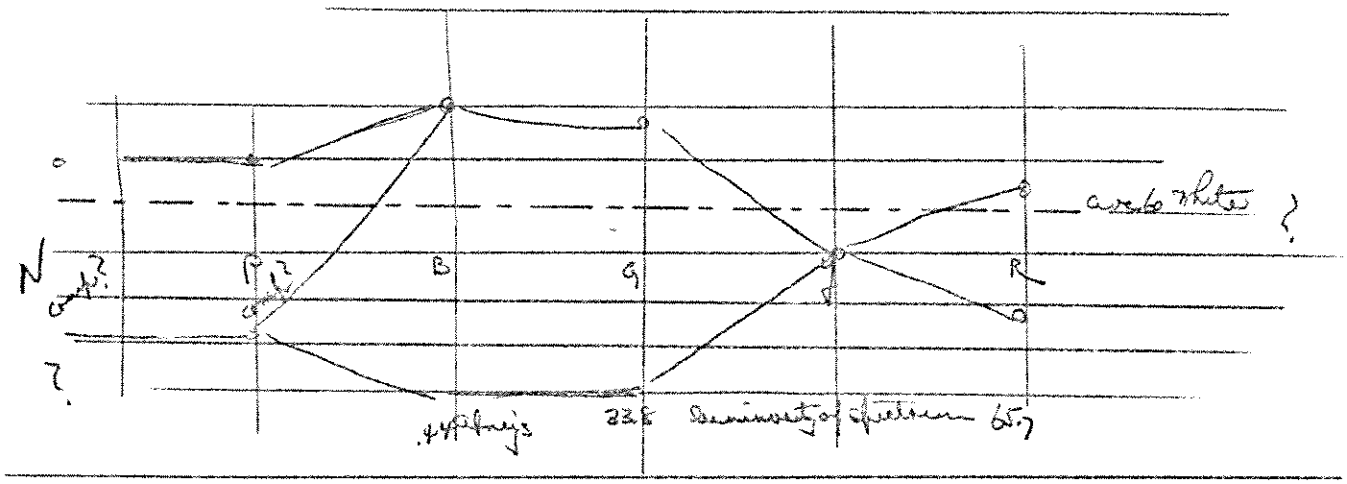
Filing cabinet for accepted papers.
Understudy.

Says he will be glad of my assistance when the change is to be made.

Report of Bureau of Standards -(Feb. 28-'12 -No.10696) 85.
on
6 Mat Color Standards (by P.G.Nutting)

	Wave-length Dom. hue	% white	Reflection Co-efficient	Rood's wave-length -p.3
Red	612 ✓	62 ✓	0.19 ✓	6290 Vermilion
Yellow	585 ✓	50 ✓	0.23 ✓	6061 Red lead
Green	508 ✓	78 ✓	0.25 ✓	5920 pale chr.
Blue	488 ✓	80 ✓	0.20 ✓	5284 Emerald
Lt Purple	560 (comp. hue)a.	31(b)	0.22 ✓	5899 Prussian
Dk "	" "	" "	0.08 ✓	4790 Cobalt
				4775 Ult.
				4472 "

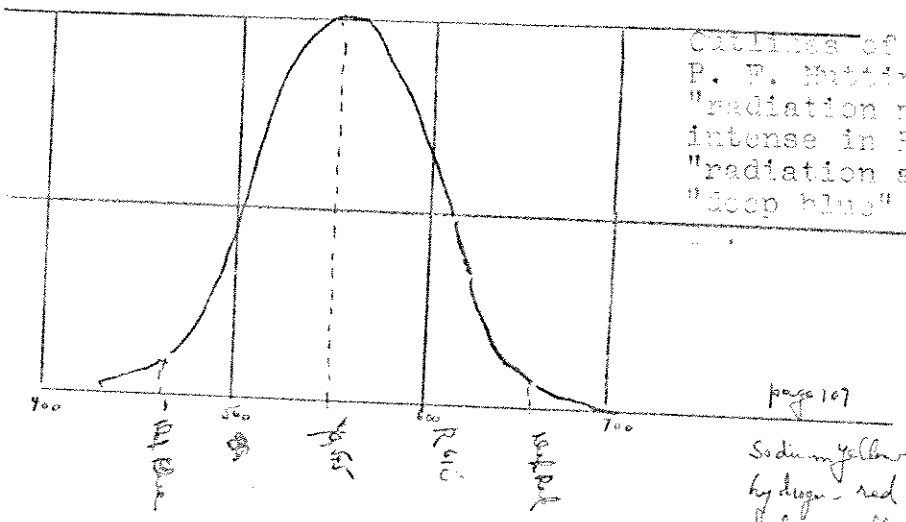
(a) Wave length of complementary hue.
(b) Per cent of added hue to match white.



"All the visual sensibilities are subject to variations amounting to 10 or 20 percent or more with Attention, Expectation, Experience (habit), and with Fatigue and condition of health - both of the retina and of the whole system. p.194

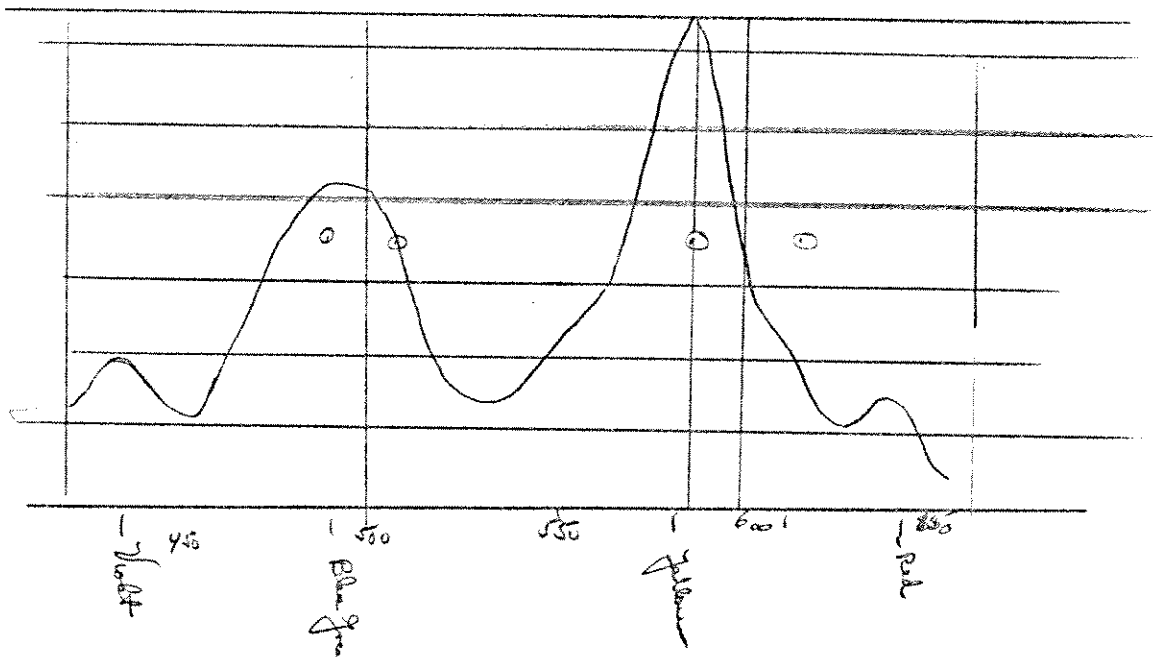
Sodium line (589) Pale chrome (582) and "middle yellow" (585) approximately same length.

+ ℓ of white must be referred to spectral curve of luminosity.



Outlines of Applied Optics - P. P. Mutting, page 107
"radiation must be twice as intense in PC and R as in YG. "radiation at "deep red" and "deep blue" one-tenth that of

850



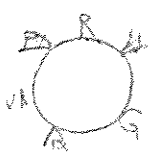
Sensibility Color difference Standard's eye.
Mar-1906

Color difference

Mar 19. Sale of "ahmed". (more in notes) 86.

25 Eaton sits from 9-11.

26 2½ - 5.30 - Mr. Adelbert Ames of No. Easton, Mass to ask about photometer and color measures, etc. Has read Abney & Rood and "Color Rotation". Asks if I am not too severe on the R-Y-B theory. if palette mixture does not give vibration - by cross mixture (thinks my drawing with black a mistake.) Confuses green with blue-green in book - and quotes Abney's chroma of Em. Gr. & vermilion as 60:65 - while I find 70:100



Wishes to know how I measure chroma-
Asks if Maxwell disc method is reliable -
if Y. R. & B pigments do not each unite two sensations and so serve to imitate their spectral equivalents.
I show him curve of irregular absorption - Subtractive - instead of additive.

Tells of his method of photometry - has written Lovibond, Ravelvin drum - and shows me thirteen neutrals numerically of equal differences from white to black - which he has made by my photometer (see next page)
Asks about angular dispersion of the hues - and I show

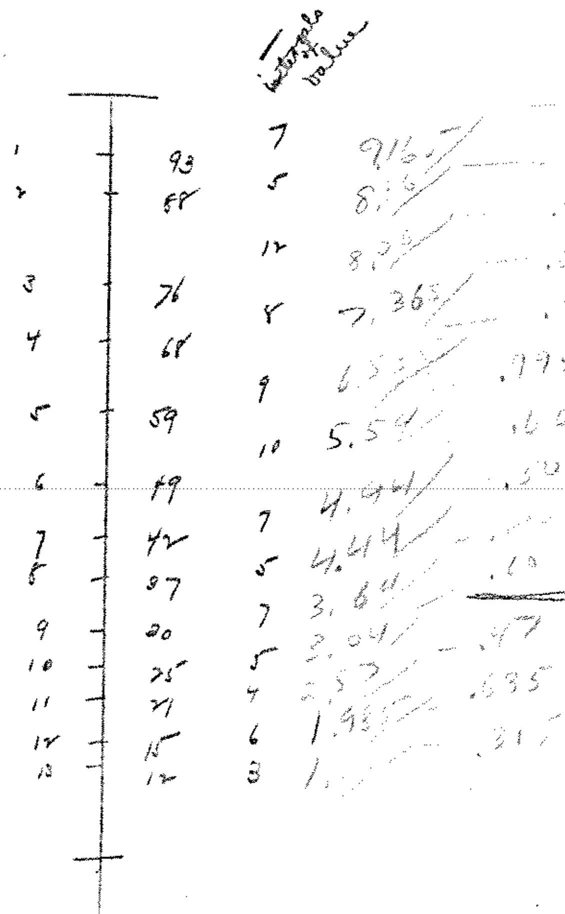
ORDINATES:- BOOK OF COLOR VALUE STEPS.

ABCISSA:- 1.23x, 2.0 , 2.77 , 3.53 , 4.4 , 5.07 , 5.83 , 6.6 ,

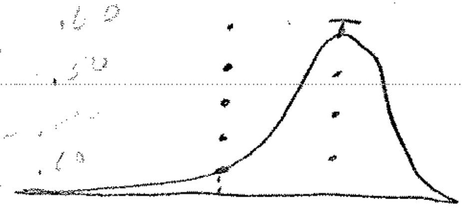
7.37 , 8.14 , 8.9 , 9.67 .

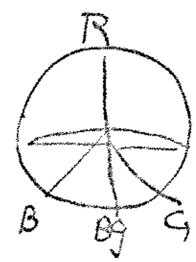
See p376

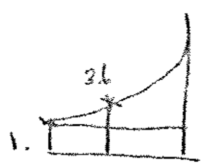
him method - by chords.
Thinks my book is not easily accessible (Lauriat did not know of it).



7442





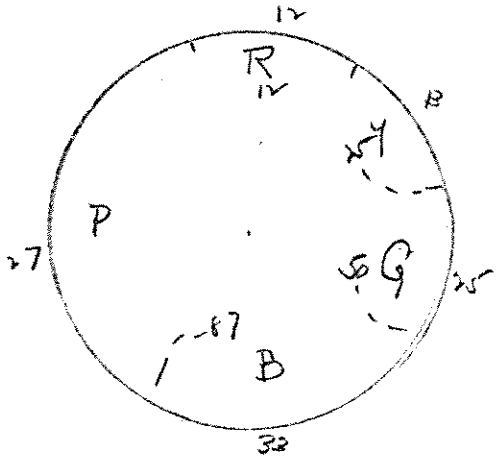


Speaks of madder well c Bergter base?

not natural log

log		Base	%	Categories	Discrepancy
100	1000	90	100	100	—
90	794	69.4	77.14	81	3.86
80	631.	53.1	59.	64	5.
70	502	40.2	44.57	49	4.43
60	399	29.9	33.12	36	2.88
50	316	21.6	24	25	1.
40	251	15.1	16.8	16	.8
30	199.5	9.9	11.15	9	2.05
20	158.5	5.8	6.45	4	2.45
10	125.5	2.6	2.76	1	1.76

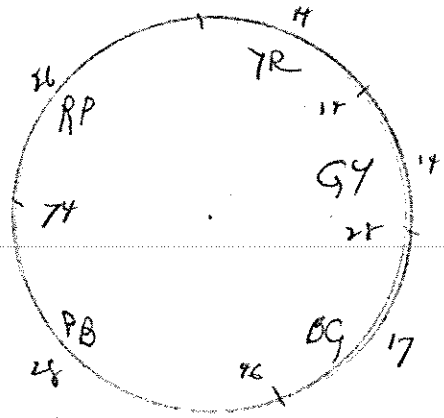
Mar 25 - 1912



100 - 80 Y
92 - 73 G
48 - 38 B
36 - 28 P
70 56 Red

Tests of new { Blue, Blue-green, Yellow-green } 67

Add one step in each
blue from 3.2 - 4 - 38 ?
BG " 4.4 . 54
GY " 6. . 7.

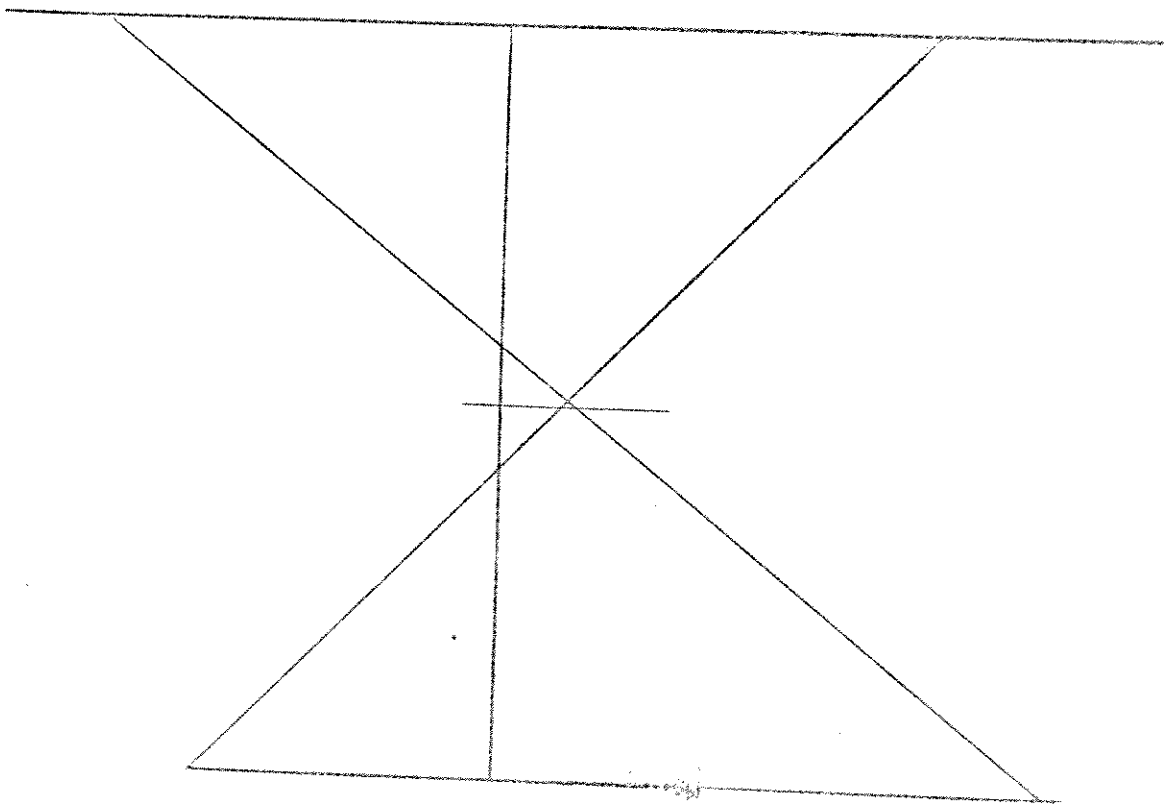


101 - 70 YR
100 - 70 GY
78 - 57.6 BG
50 - 35 PB 29.6
54 - 37 RP 39

B = 56 YR warm

BY = 38 Y
RP 549 cool

wingless 29	Y	11.75	4.75	100	80
	G	25	B.25	88	70.4
	B	50.	12.5	96	76.8
11 wing good	P	63.	15.5	86	68.8
	R		11	70	56



(On page 86a there is a clipping from the Electrical World - NY 3/16/12. It describes Dr. Ives variable absorption screens for photometry.
Page 86b consists of another clipping on the same subject and its application to portable photometers - taken from the same paper.)

(Page 87a contains samples of B 75/38, BG 75/52, and GY 72/70 - all dated Mar.28,'12.)

Mar 29 In answer to Mr. Ames question of apparent contradiction on pp. 37 and 49 of Color Notation - "the popular notion of blue is represented by artificial ultramarine, which is a purplish-blue and the true complement of yellow - while cyan blue (see Rood) which is the complement of yellow-red, has not a hint of purple to the eye. This makes the error of angular distribution in circle 1." It is a case of misleading terminology. Footnote needed. 88.

3-4 P.M. Factory at Jamaica Plain - Buff & Buff. Took Ector out to see division engines, and test new photometers.
Found - diffuser openings not square
cat's eye " off centre
Wolff's eye-pieces not copies of the model

(smaller ... prism (one not a double 10)
(change of aperture) blurred
(2 diaphrams in place of one) field
Mr. Buff will take this up with Wolff and square the openings.

Mar 30 3-5 Henry Morss at studio.

31 Studied Alois Hoefler's "2 color solids" in Zeitschrift --Psychologie loaned by Dr. J. W. Baird of Clark Univ. Refers to Lambert's and Runge's models - saying but little progress has since appeared. Recognizes chrome of Red to Green - 10:66 - Says G. darker than R.

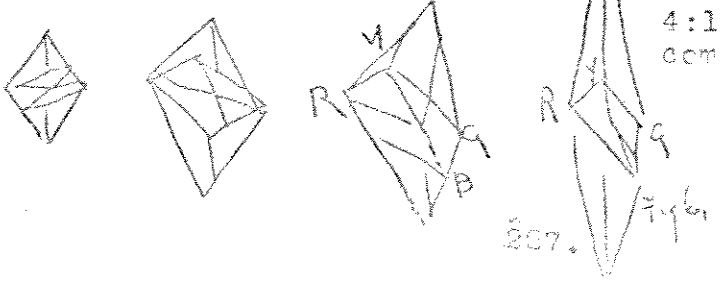


Fig. 6 has proportion of 4:1 for axes - calls green complement of red.

Apr 1 Mr. Wolff at 290 Boylston St. 89.
Says old sample double angle prism mislead him in making this new lot. Will make others giving field 3/8" dia. and if necessary omit second diaphragm.

Margaret reaches end of 3d Chap. "Color Notation" and asks how the notation R 5/5 can distinguish between a yellow-red and a purple-red. I have to acknowledge it is not explained until the 5th Chap. although Fig. 2 - page 23 shows the numeral before the initial.
Footnote needed 5R 5/5 - etc.

4-6 Psychological Laboratory with Dr. Langfeld - re-reads Höfler's "Zwei modellen - Farbenkörper
- is turn at the principal colors. R.Y.G.P.?
- is green darker than red? (Herring scheme)
Dr. L. asks if compensating errors might exist in each zone of the sphere undetected?
Says green to him seems to contain black.

Apr 2 At N.A.S. 1-2:30
Mr. Bartlett goes over the events of the last four months leading to his being placed as "emeritus" while Hopkins comes from Baltimore to be State Director of Drawing and the Art School - to take effect Sept. 1st.

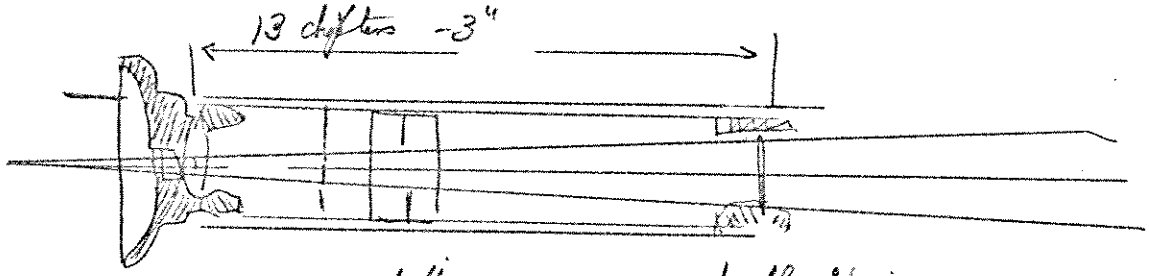
Apr 3 Chroma tests for chart 70 - 90.

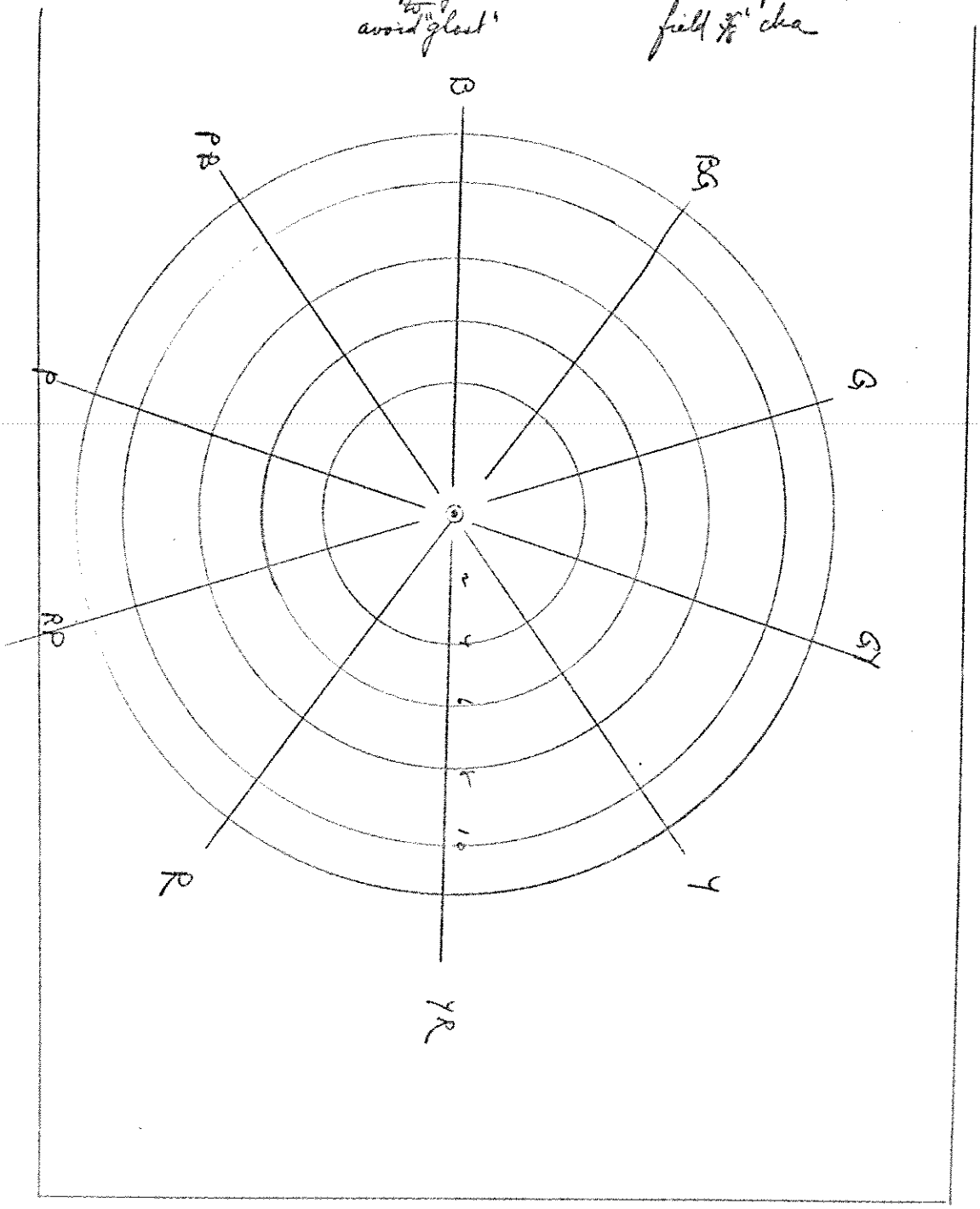
		/6c	/5c	/4	/3	/2	/1
R (set of Mar 20)				all strong in chroma			
Y	"	16		" dark (68) & strong			
GY		26		" strong in chroma			
G		19		"	"	"	
P		27		"	"	"	"

Sent to Otto with contour of chart 70 - as on page 230.

4 Tested eye-pieces & returned them to Mr. Wolff for keener edge between planes.

5 Adelbert Ames, Jr. at studio 10-11
Takes photometer after testing it out - asks if I should not show stronger chromas? - lest my scales compare unfavorably with others.
Say matt surface seems dull compared with varnished one. I show value scale for powder colors of 1900.
Recommend Mazda lamp with ammeter to equalise his current at Mc. Easton. Do not advise lamps because of color.


13 diopters -3"
diaphragm to avoid "ghost"
double 10° prism field ½" dia


90
60
30
0
330
300
270
240
210
180
150
120

89a