the color of the grafted tissue remains only while the embryos are alive and that the limits of the transplanted cells can no longer be traced by the stain in embryos which have been fixed and passed through alcohols. During the course of blood work in which supravital technique was employed, Miss Fazilé Shevket noted a method described by McJunkin (25)[2] for the examination in paraffin sections of tissue supravitally stained. This method with slight modifications was tried out by Miss Kathryn Stein on Amblystoma embryos stained in Nile-blue sulphate and gave good results. Because it may be of value to other workers in this field, the method, quoted from McJunkin (pp. 313–314), is given below.

The tissue stained supravitally in toto is fixed for twelve hours in a Zenker-formol solution, consisting of 15 cc of 40 per cent. formaldehyde and 85 cc of Zenker's fluid without acetic acid. It is then cut into pieces not to exceed 3 mm in thickness and transferred to Zenker's fluid without acetic acid for 12 to 25 hours. Bits of the tissue are then placed in pure absolute acetone for 1 hour (2 changes), in benzol for 20 minutes and in 52° C. paraffin for 20 minutes. Sections of the desired thickness are cut and attached to the albumin-coated slides by allowing them to dry overnight at room temperature. To stain, the paraffin is removed with xylol (10 seconds) and pure acetone (10 seconds). After immersion in water (5 seconds) the slide is stained very lightly with hematoxylin (Harris without acetic acid) for about 5 seconds and immersed in tap water (5 seconds). The section is then dehydrated with pure absolute acetone for 10 seconds, at once immersed in xylol for 10 seconds and mounted in balsam. To limit the action of the acetone and xylol to these times the slides are stained singly and the solutions run over them from a dropping bottle. A 0.05 per cent. aqueous solution of methylene blue may be substituted for the hematoxylin.

This method has been used on Amblystoma embryos up to stage 40 and the stained tissue showed clearly. There appears to be no reason for its not being applicable to older embryos provided the color is still visible in the living animal. The staining with Nile-blue sulphate was done in the usual way (Detwiler, 17)[1] and the embryos to be examined were fixed according to McJunkin's scheme and sectioned. It was found that they could remain in acetone longer than one hour without harm and that xylol could be substituted for benzol. An hour for infiltration did not appear to be detrimental. It also seemed to be unnecessary to stain the sections with hematoxylin unless the nuclei were to be examined particularly because the outlines of the vitally stained tissue were evident in the sections after mounting.

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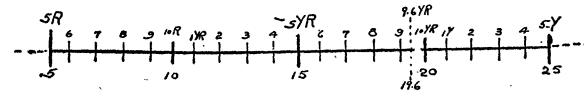
[2] F. A. McJunkin, "The Origin of the Mononuclear Phagocytes of Peritoneal Exudates," *Amer. Jour. Path.*, V. 1, 305–324, 1925.

COLOR DISCS IN SOIL ANALYSIS

IN a note[1] regarding color discs used in soil analysis, G. B. Bodman suggests that a ratio, $\frac{\text{"Red"}}{\text{"Yellow"}}$, as determined by color disc analysis is found to bring out the apparent striking color differences of two soils.

The ratio, $\frac{R}{R+Y}$, the proportion of R to the total color, will give better results, while the use of the notation of the Munsell color discs in the above ratio will give still better results in that it expresses the hue as the eye sees it. For example, the red disc being used in soil work is R 4/10, and the yellow, Y 8/9. The first figure in the notation represents the brilliance of color on a scale of 0 to 10, black to white, the second figure chroma, or color saturation, 0 being neutral, 10 expressing strong chroma.[2]



By translating the hue letters R and Y to figures, *i.e.*, R = 5, Y = 25 (the hue circle being completed in 100 steps, YR = 15, GY = 35, G = 45, BG = 55, B = 65, PB = 75, P = 85, RP = 95, back to 5R), and letting x equal the first hue (clockwise), while z equals the second, use the formula (which is essentially the same as $\frac{R}{R+Y}$):

$$z - \frac{S(A_1 \cdot B_1 \cdot C_1)}{S(A_1 \cdot B_1 \cdot C_1) + S(A_2 \cdot B_2 \cdot C_2)}(z - x),$$

when A = per cent. area, B = brillance, and C = chroma. The first area, A_1, applies to the hues taken in a clockwise direction, that is, to red, while A_2 applies to yellow. S is the summation sign.

For example, if the percentages matching a certain soil color are 10 per cent. red, 15 per cent. yellow, 70 per cent. black, and 5 per cent. white, when the Munsell notation for red is R 4/10, and that of yellow, Y 8/9, the relative hue may be found by substituting in the formula above:

$$25 - \frac{(10 \cdot 4 \cdot 10)}{(10 \cdot 4 \cdot 10) + (15 \cdot 8 \cdot 9)}(25 - 5) = 19.60.$$

[1] SCIENCE, April 27, 1928, p. 446.

[2] *Cf.* Colorimetry Report of the Optical Society of America, 1920–21, *J. O. S. A.* and *R. S. I.*, Vol. VI, No. 6, August, 1922, pp. 534–5 for definition of hue, brilliance and chroma.

Just as 5 = 5R and 25 = 5Y, so 19.60 = 9.6 YR. See diagram, and refer to "A Practical Description of the Munsell System," by T. M. Cleland, for information concerning the Munsell notation.

The formula given will hold as long as the hues of the discs used are the same through any experiment, and as long as they are fairly close in hue relationship.

The ratio given for reflection as $\frac{I\,6500}{I\,5000}$ may also be improved by using $\sqrt{\frac{S\,(A \times B^2{}_{1.2.3\ \ldots})}{100}}$.

The value, or brilliance scale, of the Munsell color discs follows approximately the square root of the reflection, that is, on a scale of grays 0 to 10, black to white, middle gray, or 5, reflects about 25 per cent. of the light falling on it, while the seventh gray step will reflect about 49 per cent. of light.

In the example given for hue we might work out the brilliance as follows (when white is N(eutral) 9/ , and black N 1/):

$$\sqrt{\frac{(10 \times 4^2) + (15 \times 8^2) + (70 \times 1^2) + (5 \times 9^2)}{100}} = 3.99.$$

The brilliance, therefore, is 3.99 on a scale of equidistant steps from 0 to 10, black to white.

This formula, like the hue formula, may be used with confidence as long as the discs used in an experiment are of the same color. It will be closely approximate when other discs are used.

This material is passed on for the information of those who are using Munsell discs in their colorimetric work. Few people, although they use the papers, seem to realize the advantages that the Munsell notation offers for specifying and studying their color work.

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SPECIAL ARTICLES

THE STRUCTURE OF BORON HYDRIDES

IF the idea of the pseudo-atom[1] is extended to the hydrides of boron it is possible to write formulae for these substances that conform more nearly to our usual notion of molecular structure than do formulae advanced up to date. It is not necessary to involve the K electrons[2] of the boron atom in the building of a complete octet of L-electrons, nor to assume boron tetra or pentavalent,[3] nor need four electron bonds be assumed.[4] In fact, on the scheme given below a whole boron chemistry can be conceived of in complete analogy to carbon chemistry.

Atom	Pseudo atoms in carbon chemistry	Pseudo atoms in boron chemistry
=C–	=C=	=BH=
=N–	=CH–	$=BH_2$–
–O–	$-CH_2$–	$-BH_3$–
F–	CH_3–	BH_4–

For example, the hydrides with two central atoms (either two carbon or two boron atoms) have on this theory the following structures:

HYDROCARBONS

Ethane	CH_3–CH_3	C_nH_{2n+2}
Ethylene	CH_2=CH_2	C_nH_{2n}
Acetylene	CH=CH	C_nH_{2n-2}

HYDROBORONS

.....	BH_4–BH_4	B_nH_{3n+2}
Borethane	BH_3=BH_3	B_nH_{3n}
.....	BH_2=BH_2	B_nH_{3n-2}

While Stock[5] compares B_2H_6 to ethane and assumes boron tetravalent it seems equally reasonable to make comparison with ethylene, as the following figures show:

COMPARISON OF PHYSICAL PROPERTIES

	Melting point (°C)	Boiling point (°C)
C_2H_6	–172.0	–88.3
B_2H_6	–166.0	–92.0
C_2H_4	–169.4	–103.8

As far as the chemical behavior is concerned it is to be pointed out that the structure proposed for B_2H_6 differs from ethylene in the complexity of the positive change within an octet and so a difference in chemical behavior may be explained on this basis. That is, if the positions of the positive charges (B^{+++}, H^+, H^+ and H^+) within the octet are not further specified, then the bond holding the two radicals

1 H. G. Grimm, *Z. f. El. Chem.*, 31, 475, (1925).

2 E. D. Eastman, *J. Am. Chem. Soc.*, 44, 438–51 (1922) and E. Miller, *Z. f. El. Chem.*, 31, 382–5 (1925).

3 A. Stock, *Ber.*, 59, 2223–6 (1926) and J. A. Christiansen, *Z. f. allg. u. anorg. Chem.*, 160, 395–403 (1927) and J. Böeseken, *Ber.*, 58 (1) 268–70 (1925).

4 M. Huggins, *J. Phys. Chem.*, 26, 833–5 (1922).

5 A. Stock and Pohland, *Ber.*, 59, 2223–6 (1926).