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for Bacteriologists.

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(With the Author's Compliments).

NOMENCLATURE OF COLORS FOR BACTERIOLOGISTS.

By E. B. SHUTTLEWORTH, Phar. D., F. C. S., Bacteriologist to the Board of Health, Toronto.

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ALTHOUGH the colors formed by bacteria are liable to be influenced by age and conditions of growth, they are, under similar circumstances, sufficiently constant to afford a valuable means for the identification of species. This has been practically recognized by the frequent references to color which are to be found in all bacteriological descriptions. Every worker must, however, have realized more or less difficulty in distinguishing and characterizing color, and in recording his observations in a manner satisfactory to himself and intelligible to others. As individuals differ in their appreciation of color, and the eye of the observer is also liable to be affected by various influences, these difficulties may be expected to recur. A great deal, however, may be done by the employment of a systematic nomenclature, and by the selection of words to which a meaning as definite as possible has been attached. In any case such meaning can only be approximate, as the value of the terms used must be referred to imperfect and often erroneous mental impressions, or to objects, or pigments, of which the color is always to some extent variable.

I have not yet had the opportunity of seeing the recently published work of Saccardo† on color nomenclature, but have with much interest consulted that of Ridgway,‡ which is, however, more particularly adapted to the use of ornithologists. It contains a chromatic range unnecessarily large for bacteriological work, but may still be used with great advantage, more especially with reference to the plates by which the various modifications of color are represented. These have been executed with great fidelity, and, with few exceptions, have apparently resisted the effects of time. I have, therefore, when practicable, given the numbers indicating these colors, so that they may be employed in illustrating and comparing the various hues.

In the scheme of color which I have ventured to present, I have interfered as little as possible with the words heretofore used in bacteriological descriptions, and have avoided a strictly scientific arrangement, preferring one of a more practical character, such as has been suggested by daily work in the laboratory. A rigidly scientific plan could be devised by few, and would not be followed by many, as the colors of bacteria are seldom primary or secondary, but consist of tint shades and modifications of a complicated and perplexing nature.

It may be noted that it is, perhaps, better to accept the terms, tints, shades and hues as understood by artists—a *tint* meaning an admixture of colors with white; a *shade*, colors with black, and a *hue*, color with color. The word *grey*, in an artistic sense, is limited to simple mixtures of black and white, while *gray*, though also cinereous and cool, is composed of colors of which blue and its related combinations are mixed with white, as blue gray, green gray, purple gray, etc. Yellow or red grays are properly browns. Bacteriological writers sometimes select one or other of these terms, and many use them indiscriminately. I think it would be better to ignore these artistic niceties and employ the word *gray* to designate cool colors of this class.

The colors of bacteria are generally much more easily reproduced in an oily than an

† P. A. Saccardo. Chromotanea seu Nomenclator Colorum Polyglottis. Friedlander, Berlin.

‡ Robert Ridgway. Nomenclature of Colors. Little, Brown & Co., Boston. 1886.

aqueous medium, and seem more akin to those mixed with the former. This probably arises from the greater transparency of oil. Transparency and opacity modify very much the character of colors, and the transmission, refraction, reflection, absorption, or disposal of light, other than that giving rise to actual color, suggest some descriptive terms which, with certain convenient, though perhaps barbarous interpolations, may be thus formulated :—

CHARACTERS DEPENDING ON DISPOSITION OF LIGHT, ETC.

Transparent.

Vitreous—Transparent and colorless.

Oleaginous—Transparent and yellow ; olive to linseed oil colored.

Resinous—Transparent and brown ; varnish or resin colored.

Translucent.

Paraffinous—Translucent and white ; porcelaneous.

Opalescent—Translucent, grayish white by reflected light ; smoky brown by transmitted light.

Nacreous—Translucent ; grayish white, with pearly lustre.

Sebaceous—Translucent ; yellowish or grayish white ; tallowy.

Butyrous—Translucent and yellow.

Ceraceous—Translucent and wax colored.

Opaque.

Cretaceous—Opaque and white ; chalky.

Dull—Without lustre.

Glossy—Shining.

Fluorescent.

Iridescent.

In compiling the following list of colors I have used any designation best suited to convey the intended meaning, and, for purposes of illustration, have introduced the names of well-known colored objects or pigments, but, as far as possible, have tried to confine the terms to those commonly employed in indicating ordinary hues. The most difficulty is presented in characterizing colors in which yellow predominates. This has been realized by every bacteriologist, some of whom, in their published descriptions, use twenty-four words to express different modifications. The terms are often synonymous, or vague, and, as in the case of "bluish yellow," are not in harmony with correct ideas of the composition of colors. It has, no doubt, been remarked that the color of butter or cheese represents best the yellow chromogens. Such hues are produced by admixtures of yellow, red and white.

The words *pale*, *light*, and *dark* are used by artists to designate gradations of the same hue, but as the first two terms are liable to give rise to confusion, it will probably be better to substitute the word *medial* for *light*. If these degrees are applied to the terms on the left hand side of the list, they will, of course, give them a threefold power of expression, and if one has a sufficiently good eye for color to use them in connection with the modifications in the right hand column, he will be able to indicate color with very considerable nicety. The colors in the right hand column are arranged as nearly as possible to show gradations from light to dark.

YELLOW AND ITS MODIFICATIONS.

Pure Yellow (Cadmium)	Primrose, vi. 13.
	Canary, vi. 12
	Lemon (Pale Cadmium), vi. 11.
Greenish	Sulphur, vi. 14.
	Citron yellow, vi. 15.
	Olive yellow, vi. 16.
Reddish	Chrome, vi. 8.
	Deep Chrome, vi. 9.
	Cadmium yellow, vi. 6.
Naples	Naples, vi. 18.
	Maize, vi. 21.
	Buff yellow, vi. 19.
Cream	Cream, vi. 20.
	Cream Buff, v. 11.
	Buff, v. 13.
Ochreous	Golden Ochre.
	Yellow Ochre, v. 9.
	Raw Sienna, v. 2.

ORANGE AND ITS MODIFICATIONS.

Orange	Orange, vi. 3.
	Orange Chrome, vii. 13.
	Chinese Orange, vii. 15.

RED AND ITS MODIFICATIONS.

Scarlet	Scarlet Vermilion (Mercuric Iodide).
	Vermilion.
	Deep Vermilion.
Crimson	Carmine.
	Deep Carmine (Fresh Blood) vii. 6.
	Blood Clot.
Brownish (Brick)	Rufous, iv. 7.
	Light Terra cotta, iv. 11.
	Dark Terra cotta, iv. 14.

WINE (Transparent) ..... Ruby.
Claret.
Garnet.

BLUISH PINK .. .. Rose, vii. 20.

YELLOWISH PINK..... Flesh.
Salmon Buff, iv. 19.
Salmon, vii. 17.

PURPLE AND ITS MODIFICATIONS.

REDDISH ..... Magenta, vii 14.
Aster, vii. 8.
Auricula, vii. 3.

BLUISH ..... Lilac, vii. 19.
Violet, vii. 10.
Royal, vii. 7.

BLUE AND ITS MODIFICATIONS.

PURE BLUE .. .. Ultramarine, ix. 9.
French Blue, ix. 6.

YELLOWISH ..... Turquoise, ix. 20.
Nile, ix. 23.

PURPLISH ..... Smalt, ix. 8.
Hyacinth, ix. 5.

GRAYISH ..... Glaucous, ix. 19.
Verditer, ix. 22.

BLACKISH ..... Indigo, ix. 1.
Marine, ix. 2.

GREEN AND ITS MODIFICATIONS.

YELLOWISH ..... Apple, x. 20.
Olive, x. 18.

BLUISH .. .. Glaucous, x. 17.

GRAYISH ..... Sage, x. 15.

BLACKISH ..... Myrtle, x. 2.

BROWN AND ITS MODIFICATIONS.

YELLOWISH ..... Tawny Olive, iii. 17.
Raw Umber, iii. 14.
Coffee Infusion (transparent).

GREENISH..... Olive Brown, iii. 9.

TAWNY .. .. Light Tan (ochraceous), v. 7.
Nut.
Dark Tan.

REDDISH ..... Fawn, iii. 22.
Mahogany.
Chocolate, iii. 4.

PURPLISH ..... Liver, iv. 4.
Claret Brown, iv. 1.
Maroon, iv. 2.

GRAY AND ITS MODIFICATIONS.

GREENISH ..... Olive Buff, v. 12.
Olive Gray, ii 14.

BLUISH ..... Pearl, ii. 20.
Lavender. ii. 19.
Lead, ii. 15.

BLACKISH ..... Grey, ii 8.
Grey, ii. 6.
Slate, ii. 4.

BROWNISH..... Smoke, ii. 12.
Mouse, ii. 11.

WHITE AND ITS MODIFICATIONS.

YELLOWISH ..Tints weaker than Primrose, vi. 13.
GREENISH.... " " " Sulphur, vi. 14.
CREAM ..... " " " Cream Yellow, vi. 20.
STRAW ..... " " " Straw Yellow, vi. 17.
PINKISH..... " " " Flesh.
GRAYISH .... " " " Pearl Gray, ii. 20.
BROWNISH....Dirty White.

MODIFICATIONS OF BLACK.

PURPLISH.
BLUISH.
BROWNISH.
GRAYISH.

I have ventured these suggestions with the hope that they will at least direct attention to the importance of this apparently trivial subject, and perhaps elicit a discussion, thus leading to the perfection of a scheme of color towards which this paper is offered as a crude attempt.