D. B. Judd

2.1 Note

INTER-SOCIETY COLOR COUNCIL

NEWS LETTER No. 90

SEPTEMBER, 1950

News Letter Committee:

Faber Birren
I. H. Godlove
Deane B. Judd
Dorothy Nickerson

I. H. Godlove, Editor
General Aniline and Film Corp.
Easton, Pennsylvania

Dorothy Nickerson, Circulation Manager
Box 155, Benjamin Franklin Station
Washington 4, District of Columbia

For matters of business,
Address the Circulation Manager

Subscription price to non-members:
$4.00 annually

1951 ANNUAL MEETING Plans for holding the 1951 annual meeting of the Inter-Society Color Council at the National Bureau of Standards in Washington, D. C., are well under way. Dr. Deane B. Judd of the Bureau is chairman of the Program Committee for this meeting. As noted in the annual report, the National Bureau of Standards this next year is celebrating its 50th anniversary. In connection with the celebration of this anniversary, the ISCC has accepted the Bureau's invitation to hold its 1951 annual meeting in Washington. The date is February 28. The meeting will be followed by a 3-day session of the Optical Society of America. It looks now as if Committee E-12 (Appearance) of the A.S.T.M. would hold its meeting on February 27. ISCC members are invited to attend sessions of either or both the O.S.A. and E-12 groups. Program plans will be announced later.

CALIFORNIA COLOR SOCIETY The Editor has received notices of two meetings of this active society in recent months. On Wednesday evening, July 19, they met at Art Center School Auditorium, 5353 West 3rd Street, Los Angeles, to hear a talk by Professor Harry Helson on "The Dimensions of Color," along with stimulating demonstration material. Dr. Helson, chairman of the psychology department, Brooklyn College, New York, and outstanding American psychologist, is a member of the Executive Committee of the ISCC, has published a great many articles on color research, and has been visiting professor of psychology at University of California, Los Angeles. On August 23, the Society held a Patio Party Meeting at Art Center School Patio. This was a "get acquainted" party for members and their guests and non-members who planned to join the society. We are sure that a good time was had by all.

COURSE IN COLOR While on the subject of California color events it is a good place to pass on information about an Engineering Extension course to be given by the University of California, Los Angeles. It is Group Study of Color Problems XL 198, meeting every week on Wednesday evenings, 7:30-9:30 p.m. for 15 weeks beginning September 20 in room 125 Chemistry Building, on the Los Angeles campus; fee, $18.00. Mr. P. F. O'Brien, Coordinator of the course, is an assistant in engineering on the Los Angeles campus of the University. Authorities from the faculty of the University and members of science, art and industry will deliver individual lectures. The prospectus indicates that the course will cover all phases of color work. It is a Directed Group Study for Upper Division Students, the prerequisite being senior standing in engineering or the equivalent or at least five years of practical experience with color systems.

ERROR We are informed by Prof. C. Villalobos-Dominguez that an error appeared in the copy of his letter published in the November News Letter. In the third paragraph, line 11 of page 9, the phrase "triangular compromise" should be read "rectangular compromise." We are sorry for the slip. The following item was received from Professor Villalobos before the last issue was made up and is dated February 6, but a backlash of other material caused its publication to be delayed.

VILLALOBOS ON COLOR MIXTURES The present note does not pretend to describe a new way of mixing colors: it only aims at pointing out the characteristics peculiar to one of the known ways of mixing them, which justify its being separated as a type or species in its own right, thus getting rid of the harmful confusion that exists regarding it.

Up to the present time, it has been considered that there are two types of color mixtures: additive and subtractive; but incidentally it is convenient to note that the latter is not properly a "mixture" of colors, since in reality it is a partial reciprocal or successive absorption, and sometimes even a practically total disappearance of chromatic rays, achieved by means of mixtures or juxta-positions of substances that separately and by themselves have the property of reflecting or transmitting those rays. Therefore, it is conventional and inaccurate to classify these processes as mixtures of colors, their chromatic result being not either an accumulation or an intermediate color, but a residue; and this residue can be null. The substances have been mixed, but their colors have not.

Instead, a mixture of light radiations of different colors is indeed a mixture, correctly designated as "additive mixture of colors." The sensation caused by such a mixture is the addition of the luminous effects that the given radiations caused in our visual organ. This is proved by the fact that the brightness of the mixture is always greater than that of each of its components.

But it is also unusual, - and incorrectly so, - to consider as additive the mixture of different colors covering different parts of a rapidly rotating disk, or by motionless surfaces uniformly covered by very minute dots, whose images, when looked at from a certain distance, are mixed in the retina. In this type of mixtures there is no addition of the colors or of their effects, for the result is the mean average of those effects, - if the agents are balanced, - or else the effect is proportional to the power of stimulus of the elements that make up the mixture. For this reason, I think it would be convenient to recognize these ways of mixing colors as a separate type of mixture, which can be called partitive.

This mixture of moving or motionless retinal images is quite different from true additive mixtures; and Helmholtz made a mistake (without having been hitherto rectified, to the best of my knowledge) when he considered both types as "equivalent, so far as mixing the colors is concerned." (Physiological Optics, II, English translation, page 132).

The differences between the three types referred to can be clearly apprehended if we consider, for instance, the mixture of pure Scarlet and Green colors:

In the balanced "additive" mixture they yield YELLOW color, in which the lightness of Scarlet and lightness of Green are added, and its hue is a compound of the hues of both. (The balanced mixture of the three simple, or of the main double saturated colors, yields WHITE.)

In the balanced "partitive" mixture we obtain a YELLOW color in which the hue is equally a compound, and its lightness is the average of those of the colors that take part in the mixture. (The balanced mixture of the three simple, or of the three main double saturated colors, yields GRAY.)

In the balanced "subtractive" mixture of the same Scarlet and Green substances we will obtain BLACK, which, of course, has neither hue nor lightness. (The balanced mixture of the three simple, or of the three main double saturated coloring substances, yields BLACK.

All the hues and their possible partitive mixtures can be correctly represented by means of a regular hexagon made up of two concentric triangles; at the vertices of one of these triangles are situated the simple hues: Scarlet, Green and Ultramarine; at the vertices of the other triangle are situated the main double hues: Yellow, Turquoise and Magenta. They are represented in that manner in the "Chromatic Hexagon," which is the basis of the Colour Atlas (in the Plate I). The intersections of any straight line joining any two points within the Hexagon with the radii cut by that line, will indicate the hues yielded by the mixtures, and the degree of chromaticity of the respective colors.

The partitive mixtures of rotating colors have two important properties: one of them is that the proportioning of the mixtures is accurate, and easily performed. Maxwell took great advantage of these qualities in his excellent works in the field of color investigation. The other property is that, in the mixtures of a color with White, or Black, the hues remain unchanged, while on the other hand, they are altered when, instead of employing the partitive, we employ the subtractive type. Therefore, a scale of several values of any color, made by the mixing of pigments, must have adjusted its hues by means of a disk of the same color; or more easily, by means of an atlas so adjusted, and having complete scales from Black to White for every color shown on it.

(Signed) C. Villalobos-Dominguez

Note by the Editor for Science: Dr. Villalobos' criticism of the term "subtractive color mixture" is well taken. The expression, colorant mixture, is to be preferred. Likewise he is correct in excluding rotary mixture from the idea of additive color mixture. It is an averaging process, not an additive process. However, it is not strictly true that the rotary mixture of a chromatic color with black or white leaves the hue of the perceived color of the mixture unchanged. Dominant wave length is held constant in such mixtures, but significant hue changes, for example in the red to orange hue range, are often perceived.

D.B.J.

1951 SPRING COLORS Since our last report on the subject we have received five bulletins issued by The Textile Color Card Assoc. of the U. S. to its members, all of them dealing with the Association's 1951 colors. The basic collections are of course the Spring Woolen and Rayon Colors.

The latter, called Spanish Brilliants are described as vivid colors "As gay as a fiesta and as exciting as a bullfight." Featured are Fandango Turquoise, Spanish Gold, Flamenco Green, Toreador Red, Valencia Orange, Hispano Lime, Chiquita Rose and Castilian Blue. These will figure prominently in sports, play and beach wear, and as bright accents to basic neutrals. In a lighter mood are Aloha Pastels. This range includes Aloha Pink, Blue Paradise, Lei Orchid, Tapa Beige, Hawaiian Surf, Hibiscus Yellow and Hula Green. According to Margaret Hayden Rorke, Managing Director of the Association, the colors are "positive in character, approaching medium tonality." Among basic color families, emphasis is on warm rich "spice tones," as Tawny Topaz and Chinese Ginger. Others are Candied Orange and coppery-tinted Orange Spice, Coral Petal, Skyflame, Crayon Aqua and Green Vista. The Beige to brown range includes Honeywheat, a "creamy blond" shade, and Mocha Caramel, a café-au-lait type. In the green range are Absinthe Frappé, Banana Green and the livelier Iced Mint and Banshee Green. Violets include Riviera Cyclamen, Pink Violine, Lilac Sky, and in celebration of the 250th Anniversary of the Place Vendome, the color Vendome Violet. Completing the collection are Sweet Cherry, Laurel Rose, Paris Cornflower, Starry Blue, Silver Dawn (a horizon gray), and Gray Heather.

Among the new Woolen colors are the Barn Dance Colors, spirited ones "to swing your lady with." These are Fiesta Turquoise, Cherryblush, Twinkle Gold, Sparkle Green, Rancho Coral, Plantation Lime, Hacienda Blue and Exciting Red. In the softer, pastel range the Sugartints, for cruise, resort and summer wear, and "good enough to eat," embrace Sugar Pink, Bonbon Lime, Peach Whip, Meringue Glacé, Icing Blue, Lemon Candy, Cream Pistache and French Nougat. In the basic color range the oranges are prominent. Such are the yellowish Melon Heart and Fire Orange, and the coral types Orange Sweet and Hot Tangerine. They combine well with grays, natural tones, browns and greens. Closely allied are the Titian Amber and Canyon Copper, the "nut tone," Cachou Brown and Eggshell Beige. Warmer versions include Curry Gold, Chutney Brown, while Golden Sulphur and Yellow Iris are softer and more subtle. In the violine range are Fresh Lavender and Blueberry Mauve; and in the red range Wineflame and Ruby Pink. The fashion tendency toward bluish greens is represented by Green Opal and Jasper Green. An important spring neutral is Anchor Navy, grouped with Pinafore Blue. Medium and light grays include Graychalk and Moon Shadow; and completing the collection are Seafoam Blue and Florida Surf.

Twenty colors for women's and twenty-one for men's shoes were chosen for spring and summer of 1951 by the Joint Color Committee of the Tanner's Council of America, National Shoe Manufacturers Association and the National Shoe Retailers Association in cooperation with the TCCA. Among new Smooth Leather colors for women's town wear are a new light navy, a new eggshell type and the repeated colors Admiral Blue, Café Brown, Cognac Brown, Cherry Red, Green Pepper and Turftan. The last two are recommended for casual wear, along with a new "Sunnytan" and the repeated color, Golden Wheat. Among suede colors for town wear are the new light navy and eggshell colors, a new neutral gray and the repeated colors Maple, Admiral Blue and Café Brown. In suede casual-wear colors, the new eggshell type and Coppertone are included, the latter carried over from earlier collections. Completing the collection are Black and White and seven brilliant pastels in blue, pink and green, a new bright red and a bright blue, and the repeated Buttercup Yellow and Irish Green.

The men's Shoe and Leather colors, adopted by the same groups, classify for smooth leathers a new "orangy tan," a new dark navy, a "burnished tan," and the repeated colors Brown Oak, British Tan, Redwood Brown, Cherrytone and American Burgundy. Carried over for grained leathers are Golden Harvest and Barkbrown. The brushed leather group include a new reddish brown, a new creamy "butter shade and the repeated colors Prairie Brown, Saddletone, Admiral Blue, Desert Copper, Slate Grey and Forest Green. Featured in a special collection of promotional colors for casual wear are a new off-white, Golden Wheat and the repeated color, Natural Tan. Completing the men's collection are of course Black and White.

The new colors for women's gloves are 15 in number. Selected from the woolen collection's Sugartints are the pastel glove shades Sugar Pink, Meringue Glacé, Icing Blue, Lemon Candy, and Cream Pistache. Other new colors from the woolen card are Graychalk, Blueberry Mauve, Chutney Brown, Hot Tangerine and Exciting Red, while Sweet Cherry comes from the 1951 Spring Rayon Card and Café Brown, Admiral Blue, Maple and Irish Green from the shoe colors. Sugar Pink, Icing Blue and Cream Pistache appear in the Association's spring shoe and handbag collection illustrating the close tie-up between gloves, shoes and bags. The glove collection is completed by white, chamois and black.

DICTIONARY OF COLOURS — The British Colour Council, 13 Portman Square, London, England, has recently published a Dictionary of Colour for Interior Decorators. The object of this work is to create a practical reference for dyers or colorists concerned with interior decoration, and to provide a sound basis for color research. The 378 colors illustrated in this large three-volume dictionary are shown on three surfaces - matt, gloss and pile fabric. Each color shown in this way has been given a name and reference number. Work on this dictionary began in 1939, when associations and individuals in the interior decoration trades were asked to contribute color patterns fully representative of those essential or important to their industries.

Classification and the necessary editing of colors to produce a range of reasonable proportions was undertaken by the British Colour Council, under the direction of Mr. Robert F. Wilson and Miss B. K. Battersby. The work illustrates colors found in all varieties of art and used by artists practising the various forms of interior decoration. The range is so comprehensive that it will no doubt be used in any part of the world; the colors are adaptable to most materials. The names chosen are those considered to be most generally acceptable and least likely to give rise to confusion when translated into other languages.

The colors are arranged in the order of the spectrum. Volume 1 contains the most intense colors, Volume 2 the least intense colors, while Volume 3 carries explanatory text and an alphabet index to the colors, together with historical and other notes. The volumes are arranged in the form of loose-leaf books. Pages are seven by ten inches with one color on each page shown in six steps from dark to light vertically arranged and three finishes horizontally arranged. Each leaf is folded in three sections. The volumes are bound in red cloth, and neatly packaged in a box of the same color.

(Signed) C. R. Conquergood

NICKERSON-GARDNER COLORIMETER — We recently received copy of an announcement (dated August, 1950) by the Henry A. Gardner Laboratory of the new automatic colorimeter for cotton developed from performance specifications prepared by Dorothy Nickerson of the Product Marketing Administration of the U. S. Department of Agriculture. These specifications were for an instrument which could be used in the Cotton Classing Room to show automatically, and without manipulation by the operator, the exact color of each sample of cotton brought to it. Richard S. Hunter and Marshall G. Powell of the Gardner Laboratory, 4723 Elm Street, Bethesda 14, Maryland, applied the successful color-measurement methods of the manual Hunter Color and Color-Difference Meter to the automatic measurement of the color of cotton. For these colors, Hunter's coordinates "R_d" and "b" provide, upon conversion, a picture close to that of measurements in terms of Munsell value and chroma.

The instrument was designed to show graphically on a two-dimensional scale simultaneous values for reflectance and yellowness. Further, the instrument is self-contained in a movable cabinet about table height, with a minimum of exposed parts. The exposure of samples and reading of results is done in the horizontal plane of the table. Electrical measurements of photocell currents are converted to color as in the Color-Difference Meter, except that Brown ElectroniK amplifiers replace the galvanometer, and reversible motors, responding to the signals from these amplifiers, replace the human operator, both in standardizing the instrument and in turning dials to obtain color settings. While this particular instrument is limited to the range of cotton colors, the principles upon which it is designed are adaptable to other limited ranges of color, in either two or three dimensions.

NEW GLOSS METER

Another instrument announced by the Gardner Laboratory at the same time as that of the foregoing item, is a new portable glossmeter. This instrument is P 34 - 85° Glossmeter with constant-voltage transformer. It measures 85° specular gloss according to Method 611.1, Federal Specification TT- P-141 b. The instrument consists of an exposure head with lamp, lens and sensitive light meter in essentially the arrangement employed in the new Gardner 60° Portable Glossmeter. With this head is a power supply that may be either a transformer or a battery. This new unit has been designed especially for the measurement of interior wall paints and camouflage paints.

NEW B & L "MONOCHROMATIC" COLORIMETER

This recently announced instrument is a colorimeter for clinical and general analytical work. It is a single-cell, direct-reading, photoelectric colorimeter in which light, controlled by a constant-voltage transformer, passes through a heat filter, narrow-band interference filter, the sample and then to a barrier-layer cell. Current output of the cell is measured by a double-suspension galvanometer. The interference filters (430, 500, 550 and 630 millimicrons) have a narrow-band-pass of 20 millimicrons and a transmission of forty percent. This high transmission of a narrow portion of the spectrum gives great sensitivity and minimizes Beer-Lambert law errors.

The lamp is easily and quickly replaced; a blue test-glass provides quick, accurate checking and a "floating spotlight" on the scale permits precise reading to one percent with possible estimation of tenths. The colorimeter operates on 115-volt, 60-cycle A.C. Catalog No. 23-754 is complete with three test tubes, voltage regulator, four filters, blue test-glass, occluder, filter box, one spare lamp and direction manual. The price is $200.00. Other interference filters than those indicated are available, as are also calibration curves for 17 of the most common clinical determinations (hemoglobin, blood sugar, and so on).

ISCC-NBS COLOR NAMES

In the preceding issue of the News Letter (No. 89, pp. 6-8), we have commented on the present status of this system of color description, giving statistics by which to assess the success of the method in defining colors, using only a few words per color, in the way usual to and most understandable by the average person. In the present issue we are beginning the publication, in alphabetical order, the ISCC-NBS equivalents of many common color names. It is planned to publish other installments of the names from time to time.

It was explained in News Letter No. 89 that the Munsell notations, used as a basis for the ISCC-NBS names, are the average of from one to five determinations by Dorothy Nickerson, Mrs. Genevieve Reimann, the Editor and others for the colors based upon one authority. This source is the Maerz and Paul "Dictionary of Color" (hereafter abbreviated MP). The other main authority comprises the 9th Edition of the Color Card of America and the U.S. Army Color Card standards issued by the Textile Color Card Assoc. of the U. S. (abbreviated TC), as judged by the measurements published by the National Bureau of Standards (J. Opt. Soc. Amer. 36, 128; 1946). For the MP colors, the Editor cut up two copies and used a third by the mask method, as previously explained, to minimize errors of reproduction, while Miss Nickerson used still another copy. It should be noted that, although on the whole TC and MP agree well, in some cases textile and pigment or other standard practices disagree. The outstanding example is Lilac. TC's Lilac (moderate purple) is that very commonly employed in the textile industry today, while MP's (light grayish red) is that obtained by average actual matches of lilacs under specified conditions, and used by a French authority in 1905. Fortunately, the substantial agreements are much more numerous than the disagreements. In the tabulations which follow, if the general use of the color name was earlier than its use in the textile field, as in the case of Old Rose, MP's exemplar of it is given first and TC's is marked as Old Rose "of TC," and so on. Conversely, if the original use of the color name was in the textile field, "of MP" is attached to the MP representation of the name. In this case any difference between TC and MP may be in part due to matching errors, as the intention of MP was to reproduce exactly the TC color. Besides the TC and MP colors, a few more from other sources will be included. Some of these are the colors from Ridgway's "Color Standards and Nomenclature." For the notations of the Ridgway colors, the Munsell-notation determinations of Prof. D. H. Hamly (J. Opt. Soc. Amer. 39, 592; 1949) have been used. The first portion of the color-name equivalents follows.

Color Name	Source	Munsell notation	ISCC-NBS Name
Absinthe green	MP.20J5	5 GY 6.3/4.7	moderate yellow-green
" "	Hamly	5 GY 6.6/5.5	Moderate yellow-green
Acorn	MP.15E7	9.3 YR 4/2	grayish yellowish brown
Admiral	MP.48E12	10 PB 1.1/1	purplish black to blackish purple
African	MP.8E8	7.8 YR 2.8/0.9	brownish gray
African brown	TC.96	5 YR 2.4/1.2	dark grayish brown
" " of MP	MP.8H5	0.5 YR 2.2/2.1	dark grayish reddish brown
Agate	MP.6H12	1.3 YR 3.6/7.5	dark reddish orange
Alabaster	MP. 10A2	6.5 YR 8.1/1.5	pale yellowish pink
Algerian	MP.14B8	7 YR 4.7/3.7	light brown
Alice Blue	MP.35G5	10 B 5.5/2.7	pale to grayish blue
" "	Hamly	10 B 6.5/4.0	pale blue
Almond (brown)	MP.13B6	8.7 YR 5.7/2.7	light grayish yellowish brown
Almond green	TC.130	10 GY 4.6/1.7	grayish green
" " of MP	MP.30E6	4.5 G 4.9/2.2	grayish green
Aloma	MP.13C7	8 YR 5.6/4	light brown to yellowish brown
Amaranth	MP.44L8	10 P 3/9	deep reddish purple
Amaranth pink	Hambly	2.5 RP 6.0/11.0	deep purplish pink
" "	MP.49D8	1 RP 5.9/12	deep purplish pink

Amaranth purple	Hamly	8.5 RP 3.2/11.0	deep purplish red
" "	MP.53L3	9.7 RP 3.2/11.0	deep purplish red
Amber	MP.11L5	3.3 Y 7.2/6.3	moderate yellow
Amber brown	MP.13K12	4.5 YR 4.8/7.5	brownish orange
" "	Hamly	5 YR 3.8/8.0	strong brown
Amber yellow	MP.10J3	4.8 Y 7.9/6.7	moderate yellow
Amberlite	TC.115	8.8 YR 6.4/5.7	light yellowish brown
American Beauty	TC.52	1 R 2.6/11	vivid to deep red or deep purplish red
" " of MP	MP.6F6	0.5 R 3.1/9.2	deep purplish red
Amethyst (violet)	MP.45J8	7.5 P 3.4/5	dark purple
" of TC	TC.134	7.0 P 3.7/6.2	moderate purple
" violet	Hamly	2.5 P 3.4/15	vivid violet
Andover green	Hamly	5 GY 4.8/2.0	grayish yellow-green
Antique bronze	MP.14L10	9.8 YR 4.3/4.3	moderate yellowish brown
Antwerp blue	MP. 36L8	9.8 B 3.3/8	moderate blue
" "	Hamly	10 B 3.0/5.0	grayish to moderate or dark blue
Appleblossom (pink)	MP.4I3	0.8 R 4.9/5.1	grayish purplish red
Apple green	MP.19J6	5.7 GY 6.7/5.5	moderate yellow-green
Apple red	TC.179	5 R 4.2/14	vivid red
Apricot	MP.10F7	6.5 YR 7.2/6.8	moderate orange
" of TC	Tc.37	6.4 YR 7.0/6.1	moderate orange
Apricot buff	Hamly	5 YR 7.0/7.5	moderate orange
Apricot orange	Hamly	2.5 YR 6.0/9.0	moderate orange
Aqua (green)	TC.145	7.1 BG 5.4/3.0	moderate bluish green
" " of MP	MP.18B7	10 GY 7.1/4.7	light yellowish green
Aquamarine	MP.35I3	4 B 5.7/3	pale blue to light greenish blue
Argus brown	Hamly	6 YR 3.8/4.0	moderate brown
Arbutus (pink)	TC.16	4 R 7.7/7.2	strong pink to yellowish pink
" " of MP	MP.1B4	9 RP 6.4/10	deep purplish pink to pink
Artificial ultramarine	MP.41F12	7.5 PB 3.2/10.5	strong purplish blue
Ash (gray)	MP.27 A2	5 GY 8/1	light greenish gray
Ashes of rose(s)	TC.189	6.0 RP 5.1/5.7	grayish purplish red
" " " of MP	MP.4A4	8.7 RP 5.2/5.3	grayish purplish red
Atmosphere	MP.12A3	7.5 YR 6.8/2	brownish pink
Aubergine	MP.48H12	5 P 1.7/1.2	blackish purple
Auburn	MP.7C11	4.8 YR 3.5/3.5	moderate brown
Aureolin	MP.10L2	5 Y 8.2/9.0	brilliant yellow
Aurora (orange)	MP.1G10	7.2 R 6.4/9	moderate reddish orange
Aurora yellow	MP. 9L8	6.8 YR 7.1/10.5	strong orange
Aurore	MP.2E7	5.2 R 7.9/3.3	moderate pink
Autumn	MP.8A12	9.5 YR 2.7/2	dark grayish yellowish brown
Autumn brown	MP.8E10	9 YR 2.7/1.3	dark grayish yellowish brown
" " of TC	TC.107	8.2 YR 2.6/2.7	dark yellowish brown
Autumn green	MP.22K7	6 GY 4.8/5	moderate yellow-green
Autumn leaf	MP.5A12	4.8 YR 4.6/9.7	brownish orange
Aztec	MP.13I8	9 YR 5.2/5	moderate to strong yellowish brown
Azure blue	(too general and indefinite to standardize)		
Azurite blue	MP.36K7	9.5 B 4.2/5.8	moderate blue

SCYTHIAN AND ASIATIC ART AND COLOR

Scattered references have recently been appearing in various journals dealing with the interesting Scythian and Siberian arts and cultures. To review them in this publication devoted to color, but not read by persons trained in archaeology or pre-history, it will be necessary to speak of historical and culture-elements that are non-color items of background. But our justification lies in certain phrases, used by E. H. Minns, outstanding authority on the Scyths, such as "riotous use of color," and "striving after color," along with the phrase "instinct with life," in a fine article on the Northern Nomad (Scytho-Siberian) art. This appeared in the 1942 issue of the Proceedings of the British Academy. In the April-June, 1949, issue of the American Journal of Archaeology is a well reasoned article by Max Loehr on "Weapons and Tools from Anyang, and Siberian Analogies." This has little to nothing about color in it, but this treatment of the artifacts from the capitol of the Shang-Yin dynasty deals with origins of the Scytho-Siberian animal art and with background materials. In the sections Archaeological News and Digest of this same journal have been many scattered references of interest in the past few years. For example, in the issue just mentioned is a description of a Scythian house of the third century B.C. in Neapolis, near modern Simferpol in the Crimea. Its tiled roof was of red, yellow and green plaster and polished brown clay. Painted vaults in a necropolis of 28 rock-cut tombs included a red-and-black dog attacking a boar. Another issue told about finding here sculptured portraits of the Scythian emperors, Skilur and Palak. The January, 1950, issue includes a review of paintings in Uzbekistan which is replete with color notes.

The "dazzling and ephemeral" Scythians and related peoples were to eastern Europe and western Asia what their contemporaries, the Kelts, were to western Europe. While the latter were displaced by the Germanic peoples, the Scyths were ousted by the Slavs. The Scyths were first noticed about 700 B.C. in the land north of the Black Sea. During the time when iron was coming into use, their culture, broadly considered, extended from South Russia and the Caucasus to the Perm district in the north and to Minusinsk on the upper Yenesei in Siberia, the Altai mountains, Lake Baikal and Mongolia. The Scythian area proper went from the Carpathians and the Danube to the Don; but beyond them were their relatives, the Sarmatians, the mysterious Cimmerians and other similar peoples. According to Herodotus, the Sarmatians resulted from a mass marriage of Scythian youths to Amazon maidens.

The Scyths were nomads who wore trousers, rode horses astride and slept in covered wagons. But they never slept enough to allow the great armies of Darius to catch them. Their life was a dangerous one requiring excellent skill in the management of several kinds of domestic animals and in fending these from enemies. Their leader had to be good and be endowed with authority to match his responsibilities. And he "could take it with him," along with his riches, to the next world. For wife, servants, retainers, horses and special gear all were buried with him when he passed on. In a typical tomb at Ksotromskaya is a model of his tent (above), wherein is set out his weapons and gear, while below he lies in a safe cache. Above him (at ground level) are his retainers and his horses.

His chief weapon was a doubly-curved bow of horn and sinew, useful on horseback. He used also a short double-edged dagger with heart-shaped guard. Besides trousers, the Scyths wore jackets and pointed hoods, while Europeans wore sheets and plaids fastened by pins and clasps. Their clothes were often fur-trimmed. Their hair was worn long and they also wore beards. We know how they looked (as perhaps modified by baggy trousers and full hoods) from one aspect of their own art, a distinctive realistic style in gold repoussée. Minns reproduced an often-copied picture of four Scyths taken from the famous "Kul Oba vase." Some relatives were also pictured similarly by Persians employing a very different style of art. Moreover, we know their racial type from one district (Bessarabia, Rumania) from 77 crania. The large majority were long-headed, the minority round-headed, the mean being mesocephalic. They were tall people whose skull-vaults were moderately low and noses of moderate width. They were, moreover, metrically identical with a group from the Minusinsk district of southern Siberia. If the broadheads are not counted, the remainder are narrower faced and narrower nosed, in fact metrically like central European Nordics. They are also like an Iranian type of Nordic of the Early Iron Age found in Armenia, the type which may have settled in Persia and India. The Scyths were thus members of the racial complex associated with the spread of Satem Aryan languages (Slavic, Baltic, Armenian, Indic and Iranian) in Eastern Europe and Asia.

With their mode of life, it was only natural that the Scyths should develop an animal art. It was not, however, like that of the Paleolithic Cave Men, which was marked by a dynamic realism, showing the animals in rapid motion, as seen when hunting them. Instead, there was a compact representation of the "pure idea" of the animal. There was a curious blend of naturalism and conventionalism; the subjects, stylistically and decoratively treated, were almost exclusively animal subjects. The interest in the figures was primarily in the animal as a pattern, which was often amplified to enhance the design. Thus, the antlers of stags were greatly elaborated and were frequently made to end in bird's heads. Such features were no doubt due to influences from Mesopotamia, the breeding-place of mythical monsters. Animals commonly portrayed were the reindeer and birds of prey. But in spite of impossible and unnatural features and conventionalism, the art gave a suggestion of vigorous life. Connections of Scythian art and culture with various other sources (Minoan-Mycenaean, Greek, etc.) have been claimed by various authors. The art was somewhat akin to Chinese art in the treatment of line and space, in the sense of design, and in superimposing one animal on another. But it is not derived from Chinese art. Minns believes that the Scythians came to South Russia from the northeast, and that their art first arose northof Central Siberia. The strong Iranian influences, ultimately from Mesopotamia, were late (300 - 200 B.C.). The earlier art of Kelermes, in the western Caucasus (about 575 - 550) exhibited a mixture of Scythian with Transcaucasian or "Assyrian" (Hittite, Mitanni and Urartu survivals); for example, ibixes on both sides of the "tree of life," the guilloche pattern and archer-monsters with fish wings. Scythian religion includes powerful wizards akin to the shamans of northern Asia.

In one direction, until a decade ago we could point only to Iranian craftsmen's use of lapis lazuli (natural ultramarine blue), blue turquoise and red garnets. Now we have textiles, felt-work and other appliqués in red and black or blue and green taken from the tents to adorn the tombs; and their use probably goes back to the beginnings of Scytho-Siberian art. From a tomb at Pazyryk in the Altai came examples of colored horse-gear. Red straps of the bridle and crupper were adorned with motifs in gilt and silvered wood; the mane cover was blue. The saddle was decorated above with a combat scene in colored appliqués, and below with three elaborate tassels, red and silver with blue fringes. Another saddle was red and blue, while combat scenes combined these scenes with yellow. Horses' masks were in red, blue, scarlet, gold and silver.

Across the north of Finland and Siberia has been found a primitive art (axes with butts in the shape of animals' heads) going back to Neolithic or even Mesolithic times; also horn and bone carvings. Max Loehr dates realistic animal carvings in northern Eurasia in post-Mesolithic times (third millenium B.C.). In central Siberia was an "underdog Scythian" art, that of more settled folk purposefully near sources of metal. It is at its best at Minusinsk on the upper middle Yenesei, while a simpler variety occurs at Krasnoyarsk. On the Yenesei was first found the so-called Afanasieva culture (2000 B.C., according to Minns and Loehr), a chalcolithic one, when Neolithic folk were just becoming acquainted with copper. Then followed, around 1700 (Loehr), the Seima culture of central Russia, with animal-head terminals (elk-heads) on daggers. Around 1600 appeared the Andronovo (or Seima-Andronovo) culture in Minusinsk, an Early Bronze age. About 1400 or somewhat later, according to Loehr (or 1000 - 750, Minns) came a Late Bronze stage in Minusinsk, the Karasuk stage, with animal-style artifacts related to Mesolithic survivals. An important author, Prof. B. Karlgren, says Loehr, confounded "Karasuk" with "Scythian" and thus arrived at a bad chronology for these cultures and Chinese-Siberian relations; but he praises Karlgren's work in establishing some new Chinese dates. The time of the advent of the Chou dynasty, Karlgren proved, was not 1122 B.C., as long believed, but 1027. As a corollary, the dates of the Shang dynasty (1523 - 1028) and the Yin (that is, Anyang), the last stage or permanent residence of this dynasty (1300 - 1028), were established. Loehr and Karlgren agree on 1300 B.C. for the time of the animal-style artifacts in Anyang; these are ring-pommel knives, axes and "horse-frontlets." Loehr speaks of influences from the north, carrying animal-style elements.

In the Karasuk stage was the beginning of certain special types: knives, daggers, mirrors and cauldrons. Minns mentions a stage, the Tagar culture, still later than Karasuk, when bronze was accompanied by some iron and there was an immense variety of objects: gouges, scyths, cauldrons, mirrors, daggers, picks, etc. The knives derived from Siberia; cauldrons, mirrors and little plaques stretched from Manchuria to Hungary. The Scythians used round mirrors with a loop at the back. All their gear of course had to be portable: shields, bow-cases and quivers, daggers, horse-gear, hones, etc. The Scyths used some inlay work; but in the fourth century the Iranians added brighter blue turquoise and red garnet, exhibiting a taste for bright color, as at Pazyryk.

In 1949, it was stated by W. C. Pei that the Yangshao painted pottery, after degenerating to a so-called Maching stage, mixed on the Mongolian border with Scythian and Proto-Chinese (1700 - 1300) cultures, to become the Shaching culture. About 1400 - 1000, Proto-Chinese culture evolved to that of Dynastic China.

According to Dr. Henry Field, of the Field Museum, in a January, 1950 (AJA) article reviewing recent work in the Caucasus and Central Asia, the ancestors of the Scythians were the Tokhars of Syr-Daria, a people closely related to the Cimmerians. They once developed a great state; and the Tokharian language has been revealed as an Aryan one closer to Greek and Latin than to Sanscrit or other Aryan language. In the article Field describes the existence of an independent artistic center in Khwarazm (Choresm) in Uzbekistan (Central Asia), a school "exceptionally rich in its use of color." The region and its use of color have been described in many recent articles of the past few years. The fortified palace of the shahs of Khwarazm at Toprak-Kala was excavated in 1949. Here was found a great profusion of early paintings. We may profitably quote extracts from Dr. Field's report made by the Archaeological News editor of Amer. J. Archaeol.: "Here can be seen many shades of red, raspberry, rose, dark blue, azure, green, orange, yellow, violet, white, black and gray. The combinations of colors show both daring and variety; the pictures are painted on a scarlet, dark blue, black or white ground which presents a striking contrast to the figures. Particularly excellent are a hunting scene in lilac-gray and yellow-ocher tones on a vivid scarlet ground, a white and red vegetable design and a human figure on a black ground. The work is also remarkable for its great freedom and the original concise manner in which the subject is brought in relief with strokes of color. Especially good is a representation of a human body in the 'red room' of the west tower, in which the figure is painted with light green touches on a yellowish surface. Also well rendered is a representation of a woman, where the artist conveys the relief of her prominent chin by means of sure strokes of red on a pink ground." The date of these paintings was late third and early fourth century A.D.

Here also was discovered a new type of art in monumental sculptures in unfired clay. Life-size realistic statues still bore traces of paint, the faces flesh-color and the clothes "various shades of green, rose, azure, red or black." In another area, the same excavator found the oldest known wall painting of Central Asia (2nd-3rd century). It was a crude painting of circles and garlands in red on a white background framing a row of vaulted niches.

A striking motif common to both the Scytho-Siberian art and Minoan-Mycenaean art (of 1600 - 1000 B.C.) is the so-called "flying gallop," animals portrayed in rapid motion with their front legs stretched out forward together and their hind legs stretched almost in a straight line with the body. This is not true to nature, as shown by high-speed photography, for this is not a position actually taken by the galloping animal. But it is a very effective way to suggest swift motion. If a horse somehow got into the flying gallop, he would have a bad spill. The position is therefore a wholly conventional one; its objective falsity has not barred its use by artists. The only position of the running horse revealed by the camera which art uses is that of the landing of the horse on its hind legs after its final push into the air with its fore-feet (the reverse of the commonly pictured "prance"). Greek coins first portrayed this position; it was used on a Parthenon frieze, and Phidias popularized it. After about 200 A.D. it disappeared from Greek, Roman and Western art, while the prance, an unreal invention, was employed by ancient Mesopotamia, Egypt, Assyria, the Classical artists, Byzantines, Medieval France, Giotto and Raphael in Italy, and Vernet in early 19th-century France. Great artists like Raphael, Leonardo, Rubens and Velasquez, minimized the monotony of the prance by using foreshortened views of the animals.

The flying gallop of Minoan-Mycenaean art was not taken up much by Greek art. It appeared next in Scythian and Siberian art, possibly transmitted from Greek colonies on the north of the Black Sea; for it appeared on Greek luxury items, and the Scythian chieftains' burials were notable for their great wealth in gold capable of purchasing these. From the Ukraine, the Scythian style spread to Hungary, to the Goths ranging from the Baltic to the Crimea, to the Caucasus and the Caspian Sea, and to southwestern Siberia, where it persisted till 500 A.D. It spread also to Sassanian Persia, to Han and to T'ang China, and to Japan. It appeared first in Europe in England in 1794. The English were devotees of horse-racing, while the Scyths bred, rode and milked them. The style was used by Géricault in 1821 in his picture of the Epsom Derby. In 1886, another Frenchman, Morot, in a battle scene first copied portrayal of a horse as caught by the camera - with his four legs gathered under him. The undersized but artistic Bushmen of South Africa were the first to paint animals (in their case cattle) from their own observation, as the camera catches them, in this case with one foreleg pointing out forward and most of the weight of the body on the other.

Finally, since we have gone from color to art influences broadly, it should be noted that Loehr is not alone in deriving early Chinese metallurgy and art elements from Siberia. There is some evidence that the very common conventionalized lion's mask (the Tao-tieh or symbol of the Storm God) and the Chinese art-type of the dragon are also derived from Siberia. I. H. G.

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