INTER-SOCIETY COLOR COUNCIL

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WASHINGTON-BALTIMORE COLORISTS

The first meeting of the 20th season (the earliest meeting being held November 1933) of the Washington-Baltimore Colorists will be jointly sponsored by the Capital Section of the Illuminating Engineering Society. It will be held on Wednesday evening, November 5, at 8:00 P.M., in the auditorium of the Potomac Electric Power Company, the regular meeting place of the local I.E.S. on the first Wednesday of each month. Ralph M. Evans, head of the Color Control Division of Eastman Kodak, I.S.C.C. secretary, and outstanding authority in the field of color, will present to the group his excellent and most recent illustrated lecture, The Expressiveness of Color.

This meeting adds something new in the way of cooperation. Because the lecture is such a fine one, and one that all groups can enjoy and understand, the cosponsoring groups have suggested - and Dr. Stearns, I.S.C.C. Chairman, has acceded - that all ISCC member bodies be informed of this meeting, and an invitation extended to members of all local chapters in the Washington area to attend the meeting, even for such local chapters to cosponsor the meeting if they care to do so. In this way it is hoped that we can reach and serve on a local level the diverse interests of ISCC Member Bodies. If we can gain cooperation at a local level for a first rate color meeting each year, not only will it serve the aims and purposes of the ISCC to stimulate and coordinate the color work being done by our various Member Bodies, but it will help to make ISCC purposes better known and make the local membership aware of each national body's membership in the ISCC.

Dr. E. I. Stearns of Calco Chemical Division, American Cyanamid Company, Chairman of the I.S.C.C., will be a guest at the meeting. Mr. Waldron Faulkner, chairman of delegates to the ISCC from the American Institute of Architects, at present a member of the ISCC Executive Committee, is chairman of the Program Committee for the Colorists, and Mr. Claude Engle for the local I.E.S. chapter. All who are interested are welcome to attend this meeting.

D. N.

IES CONFERENCE ON LIGHTING

Too late for our July issue, we received copy of the program of the Illuminating Engineering Society's National Conference on Lighting, held at Edgewater Beach Hotel, Chicago, on September 8-12. This was the 44th National Conference since the Society was founded in 1906. Since it is now past history, we shall content ourselves with a mere description of the nature of the papers. Dr. J. N. Aldington, Past-President of I.E.S., London, spoke on the morning of the 9th on the subject "A Vision of the Future of Lamps and Lighting." On the afternoon of September 9th, there was an Outdoor Lighting Session, with papers on the Lighting of Airfields, Streets and Highways; also the daylighting of school classrooms. In sessions on the afternoon of the 8th and the morning of the 10th, the papers were on the general subject of quality and quantity of interior illumination, including a paper on the Visibility of School Tasks. Submarine and small-vessel lighting was a feature of the morning session on the 11th, while A Report of Lighting Progress, by T. C. Sargent, Chairman of the I.E.S. Progress Committee, featured the evening of the 10th. The latter was preceded in the afternoon by a Lighting Service Forum which brought together the winners in the Society's Regional Contests. A Residence Lighting Forum followed on the morning of the 12th. On the afternoon of the 11th, color television was discussed by C. M. Hoyler of R.C.A. Laboratories, Princeton, N. J. This session also included the special feature, an illustrated lecture, The Expressiveness of Color, by Ralph M. Evans, Head of the Color Control Dept., of Eastman Kodak Co., and ISCC Secretary.

ARTIST PIGMENT STANDARDS

The following summary, received from E. Taylor Duncan late in June, is self explanatory. His report has been slightly abbreviated editorially because of considerations of available space.

CS 98-42 is the federal government's designation for a voluntary Commercial Standard dealing with the manufacturing, testing and selling of artists' oil paints. "The purposes of the . . . standards are to serve as a guide to artists in the purchase of paints of satisfactory color, working quality and durability; to eliminate confusion in nomenclature; to promote fair competition among manufacturers by providing criteria for differentiation among paints of known satisfactory composition and others of unknown or inferior quality and thus to provide a basis for certification of quality." This quotation is from p. 1, Artists' oil paints, recorded voluntary standard of the trade. 1942. ii + 23 p.il. (Commercial standard CS 98-42.) C13.20:98, Paper, 5¢ from the Superintendent of Documents, Washington 25, D. C.

When it had become apparent that a standard was necessary, the Massachusetts Art Project of the W.P.A. filed a report with the National Bureau of Standards in 1938. A standing committee was formed under the chairmanship of Mr. Rutherford J. Gettens, then of Harvard's Fogg Art Museum. This committee of manufacturers' representatives and artists' organizations succeeded in drawing up a standard that was officially declared effective by the National Bureau of Standards in 1942.

Recent developments with regard to a revision of the standard started with a meeting held on June 21, 1950. At that time, the standing committee was reorganized under the chairmanship of Mr. Ralph Mayer, author and lecturer on artists' materials at Columbia University. On October 4, 1950 a committee meeting considered some related questions, such as new tinting strength standards. A number of materials were considered, among them being polyvinyl acetate and other supposedly non-yellowing organic binders, but objections were brought up with regard to each. Porcelain enamel standards were acceptable except for prohibitive production costs.

A number of new colors and definitions were authorized in the amendment (dated - January 1, 1952). The additional paint names authorized were Mars Black, Mars Brown and Naples Yellow. Cremnitz white and Van Dyke Brown were discontinued. Descriptive adjectives such as "pale", "light", "medium" or "deep" may be added after paint names. Table 3 of the amendment refers to the master set of tinting-strength standards on file at the National Bureau of Standards, and gives both their tristimulus values and Munsell notations.

A more complete report on CS 98-42 and the amendment is given in Art Material Trade News, vol. 2, pp. 27-28, September, 1950, and vol. 2, p. 23+, December, 1950.

WARM EYE OR COOL EYE

Dr. Godlove, your editor, has done me the honor of inviting my rejoinder to his July article based on his critique of John Kobler's recent Cosmopolitan article about my work. I am all too happy to comply for two reasons: One, I have immense respect for your ISCC News Letter readership, and kindred respect for the opinions of your editor. The latter, prompted by the sensitive nature of the true scientist, is of the impression that his July critique might appear unsympathetic or ungenerous. I have assured him that such is not the case; that his views and mine are not in conflict at all. A study of his review of the Kobler article convinces me of my own personal failure, during the all too short period we had together one day in June, in clearly expressing my views. In order that he may better understand my system (if it can be honored by the word), resulting from two Sabbatical years of study and research, I will try to put it into print as clearly and tersely as I may.

My concern with color relates to the fourth dimension—the "harmony quotient." I am concerned with the proven psychological impacts of color on the brain. It is also well known and demonstrable that every "color" (hue)* the eye can see is, or can be, in reality, of two "colors" (hues). It can be an orange red or a magenta red; an aqua green or a Kelly green; a clear cool blue or a muted or gray blue. So, when I hear someone say, "I like yellow best," I want to know whether he likes a cool or chartreuse yellow or a chrome-type yellow. The preference for a color is psychological; the preference for the "color" (hue) of that color seems to be physiological. That is, it seems to be within the construction of the eye. The most logical unproved theory is based upon variation of rod and cone balance in the retinas of various individuals.

At any rate, I have proved by impressive, but not exhaustive, consumer research that most normal-eyed adults have a dependable preference for colors (hues) in decor and in wardrobe that have a predominant warm cast (as though viewed through a film of yellow) or a cool cast (as though seen through a bluish film). This rule applies to all colors, regardless of the ends of the spectrum. Those preferring cool-cast colors I call "cool-eyed;" those of warm-cast preference, "warm-eyed." If warm eyes like green (a cool color) they like Kelly green; if cool eyes prefer reds they go for a magenta red, and so on.

There does not seem to be any class, racial, geographical or psychological basis for this cast preference. Two Mexicans who like bright oranges, reds and yellows may differ in their cast preference.

The interesting parallel to these physiological preferences is that all cool-cast colors are harmonious when grouped. Conversely are all warm-cast colors. Thus we see that our Maker did his best to equip us with tools to select friendly colors. But we in our frailty fail to surround ourselves with harmonious groupings within

our cast preference. We fail 25% of the time on the average. This means that the average home and wardrobe contains one object in four that "fights" or is in disharmony with the other three. This is not good. It can bring about tensions and psychiatric phenomena.

My remedy for this as yet uncorrected color harmony "astigmatism" is a quasi-scientific precision instrument of great simplicity, to aid the uninitiated eye in selecting colors that go together in harmony. I call it a "Color Selector"; it is patent-applied-for. It consists of a small folding fan having seven petals. When opened one sees seven colors (hues). Turn it over and one sees the "same" seven colors (hues) -- with a difference. One side has an overcast of blue; the other of yellow. By placing one side of the opened fan on a colored item then reversing the "Color Selector," the untrained eye can readily tell with which side the item is more harmonious. If all subsequent items selected for the home or wardrobe are purchased in the same way -- with one side constantly used as a positive check and the other negative -- there is never a chance to group unharmonious colored items. The "Color Selector" is amazingly accurate. It can even place white objects in their proper cast category. The trained colorist does not need the "Color Selector," except in case of subtle differences; but subtleties are all around us today and I, trained both as an artist and colorist, would no more be without my hand-made model than I would be without my spectacles.

Paul Hartley

*Ed. Note: The Editor has taken the liberty of inserting "hue" parenthetically after "color", in several places where Mr. Hartley uses "color" to mean what most of our readers would call "hue". Otherwise none of his wording has been changed.

HUNTER'S NEW WORK AND THE SIGNALLING MIRROR

Replying to a request by Taylor Duncan, who has for some time regularly sent us references to patents of color or optical interest, we received the following brief letter from Richard S. Hunter, which will explain itself. Mr. Hunter's present address is 5420 Brier Ridge Road (Franklin Park), Falls Church, Virginia. Hunter is well known to our readers, not only for his several color-determining instruments and his outstanding position in the field of gloss measurement, but for his important committee work for ASTM, ACerS and the OSA. The reference referred to is: R. S. Hunter (to the U.S.A. as represented by the Secretary of Commerce); U. S. Patent 2,557,108 (1951); Signalling Mirror. Hunter's note follows.

Taylor Duncan in his letter of August 20 has asked me to provide you with a better description of my U. S. Patent 2,557,108. This is an improved aiming device for heliographic signalling mirrors which are used in life boats and air-sea rescue equipment for survivors to attract attention to their positions by mirror flashes of sunlight. When a survivor looks through the aiming device, he sees a spot of light out in space indicating the direction in which his mirror is reflecting light. He can readily turn the mirror to place this spot on any rescue plane or ship which comes in sight.

Incidentally, I left the Gardner Laboratory August 1 to set up a new consulting, development and testing service to be known as Hunter Associates Laboratory. I will send you an announcement shortly.

Signed: Dick (R. S. Hunter)

MARGARET HAYDEN RORKE ON MEN'S COLOR

There came to our attention recently an interesting article, in the Daily News Record of Friday, August 1,

1952, by Margaret Hayden Rorke, Managing Director of our member-body, the Textile Color Card Assoc. of the U. S. Inc. It is essentially a plea for color courage, an argument for rejecting our former color conservatism of the Victoria and post-Albert period. She starts by pointing out that, according to history, all races and peoples have introduced color into their histories first through their textile arts. (This statement, though true in general, needs some qualification, for many peoples, after first applying color to their own skin and their weapons, used it next in their pottery industry. - Ed). Mrs. Rorke, who writes very well, proves herself an ingenious phrase-maker. She goes on to ask what the manufacturer and merchant are doing today to lead the men out of their "lethargic sartorial moods", to "revive Mr. America's color courage?" She states the belief that the stage is set for a color renaissance because of the recent revolutionary development of the new man-made textile fibers. Some of these new fibers dye readily, others with great difficulty, and only with new techniques. They are a challenge to the dyer's ingenuity. She inquires as to the reciprocal effect of the new fibers and colors on each other. How take advantage of the individual dyeing eccentricities of the new synthetics, and thus increase their color range? How combine them with the new weaves to yield a greater scope of color and utility? Mrs. Rorke then comments on the recent greater "acceptance and enjoyment of gayer colors and designs in all manner of men's sports wear and accessories." She speaks of a "reformation from dull, uninteresting colors," and of a psychological "reaction to many years of color poverty in men's clothing." But "for every color extrovert we have hundreds of introverts."

She then advises the merchandising world that, as the way to a man's heart is through a juicy steak, so the way to his color conversion is through a woman. So appeal to his wife or his best girl. But "Of course no woman wants to see her husband or best beau look like a Picasso portrait all the time; neither would she want him looking like a medieval friar." And she advises a middle-of-the-road course. She decries the breakdown in men's sartorial decorum. "Gone is the hat, gone is the dinner coat, gone is the white tie, and gone are many of the amenities." Along with the new materials we must open new vistas and a new color interest to "tempt man's conservatism to come out and enjoy . . . . a little more of the exhilaration of color."

COLORIMETRY AND SPECTROPHOTOMETRY

Through the courtesy of Dr. D. B. Judd, we received notice of a "practical colorimetry course" of four weeks to be conducted by Professor W. D. Wright, outstanding British authority and author on visual research. The course, on colorimetry and spectrophotometry, will be given three times, beginning on the three Mondays, November 3, 1952, and February 2 and May 4, 1953. It will be given at the Technical Optics Section of the Physics Department of the Imperial College of Science and Technology, South Kensington, London S.W.7. A leaflet details the syllabus of the course. In a letter of July 24 to Dr. Judd, Prof. Wright says: "My American trip has had such a stimulating effect on me that I'm going to run a practical colorimetry course, and thought you might like to see the syllabus."

NEW FRENCH PUBLICATION ON OPTICS

Dr. Judd also enclosed a memorandum regarding a new bimonthly publication of which he was informed by Dr. Yves le Grand, who visited him recently. He says that the first issue (Jan. 1952) included a paper by Mary Lord on eye movements which summarizes results reported in detail elsewhere. The new organ is Annales d'Optique oculaire (Optique physiologique, optométrie, lunetterie), published by Editions de la Revue d'Optique, 3 Boulevard Pasteur, Paris 15, France.

Annual subscription: 1200 francs. It is stated to be a non-mathematical journal intended for physiologists, optometrists and spectacle-lens makers, and generally for all people interested in visual problems. There will be one issue every two months, starting with January, 1952.

COLOR CHANGE IN LIGHT-FASTNESS TESTING: BRITISH vs. AMERICAN

The Editor has been asked by the AATCC Committee on Colorfastness to Light to discuss the conclusions of a recent paper by R. H. Ricketts which led to conclusions not agreeing with two papers of the Editor's in comparative studies of the uniformity of grading of the American, British and German Standards. The respective papers may be found in J. Soc. Dyers & Col. 68, 200-203 (June, 1952), Amer. Dyestuff Reptr. 39, 215-21 (April 3, 1950) and Amer. Dyestuff Reptr. 40, 114-8 (Feb. 19, 1951). The chief conclusions of the Editor were that the eight American standards, when each exposed for its "standard" number of hours, yielded a magnitude of fading roughly constant; the European standards were extremely inconstant in degree of fading, and #4 in particular was found badly out of line. The "standard" number of hours exposure for the successive standards doubles that of the preceding (more fugitive) standard. Particular fadings are compared visually and rated with respect to position of the magnitude of fading on the standard. When using the Fade-Ometer as a substitute for the sun as source of light, the errors due to voltage and humidity fluctuations are most completely eliminated. Much work by others and some recent work by the Editor will show that serious and erratic errors can result from other causes. Mr. Ricketts, using a light-integrating meter to measure the exposures, and the Adams method (also used by the Editor) to translate the fading results to magnitudes of color change, also found British #4 out of line. But starting with the axiom that the British standards are visually well graded or "stepped" he concludes that the Adams method is seriously in error. Now it is true that the Adams diagram yields, for constant dyer's brightness or Munsell chroma, an egg-shaped contour instead of the desired circle about the neutral point, with the neutral-to-purple-blue radius only about 72% as long as the neutral-to-yellow axis. The Editor published a paper on a modified Adams method yielding a much nearer circular chroma diagram. But since all of the light-fastness standards are nearly purple-blues, the errors in the unmodified Adams method tend to cancel and cannot be very serious. This is in part confirmed by data given below.

Besides the Adams method, Ricketts used the Godlove general equation for color-differences, and found it an improvement over the Adams method, but still not yielding the even steps between members of the fastness scale. In an attempt to prove the constant visual difference between steps, he prepared a scale of even steps with dyeings of Alizarine Fast Gray G (S), then judged the positions of the standards on this scale. No statement of the reflectance of the background is given.

An important distinction between the American and British standards lies in the nature of the colors themselves and in the method of preparing them. The American set of eight was prepared entirely from varying proportions of two dyes, one very fast, one more fugitive. The British set was prepared from eight different dyes. The Editor found the chromas of British numbers 2 to 6 to be 11.0, 12.0, 6.2, 7.8, 6.0; and Ricketts stated that #1-#3 were very bright and #4 the dullest. Moreover, #4 fades redder, while the others fade greener (by larger amounts). The reflectance or lightness change of all is very small, while the chroma change of #4 appears to be only one-third or one-fourth that of its neighboring standards. The dullness of #4 compared with the brightness of numbers 1 to 3, means a much

"flatter" spectral reflectance curve for #4; and this will lead both to greater variations in the effects of different lights (north sunlight, average daylight, etc.) and in effects of background and visual judgments of color change, than is the case with the American standards, all of similar but gradually differing nature. These matters will be made clearer below.

To illustrate both the great variations in visual judgments from person to person, and the variations in the methods of translating instrumental measurements to visual differences, the Editor had 15 observers judge (by the "ratio" method) the magnitudes of color difference in a pair of blues, which may be considered a "fading", and a pair of yellows, another "fading". Also, five methods were applied to reduce measurements to visual magnitudes. The ratio of "fading" (color difference) in the blue pair to the "fading" in the yellow pair was judged visually to average about 2.1, varying for different observers from unity to three. An interesting point was the following. All those observers who called the blue fading: yellow fading ratio unity were chemists who stated that they thought in terms of concentration-change of the dyes. (The ratio of the latter changes was in fact unity.) One chemist asked: "Do you want these judged as the consumer does (that is estimate of visual change), or do you want me to judge as a chemist?" The ratio by calculation from measurements varied from about unity by the Nickerson "Index of Fading" to 3.2 by use of the Nickerson equation applied to the Adams method. The Judd (NBS) ratio would be nearly the same. The Godlove modification of the Adams method yielded the ratio 2.9, the Davidson method (using "MacAdam ellipses") 1.5, and the Godlove general color-difference equation 2.4. Translation or interpretation of the same measurements thus varies by a factor of three as the visual judgments did (unless we throw out the chemists' judgments of dye concentration-change).

More light is thrown on the whole question by work reported in a recent DuPont Bulletin and in some unreported work by the Editor. Both dealt with the heat or temperature effect in fastness testing, an effect which is superimposed on voltage and humidity variations to increase errors and make results more erratic.

In the Editor's work a violet and a red dyeing of similar chemical nature were exposed side by side with the American standards #4 to #7 because of a disagreement on rating between the seller of the dye and his customer. Three methods were used to translate the measurements, the Adams (Nickerson), the Adams-Godlove and the Davidson. The whole process of exposure, measurement and calculation was repeated; and the "fading" (total minus heat effect) was separately computed from the total color change (due to light plus heat), both for 20 and for 40 hours exposure.

The following conclusions resulted from this work:

(1) Spectrophotometric ratings agreed excellently with the visual ratings (almost perfectly at 20 hours, within 0.1-0.45 steps at 40 hours), and both agreed with the customer's claim on the red, with the manufacturer's on the violet.

(2) "Spectro" ratings at 20 hours agreed with "spectro" ratings at 40 hours for the red and violet within less than half a step.

(3) Checks by the Adams-Godlove method were better than by the other two methods (this was used in obtaining conclusions (1) and (2), and independent checks on the whole were good.

(4) The effect of temperature variation was isolated by determining both (a) the

"fading", defined as the total color change due to light and heat minus the heat effect (on the covered portion); and (b) the total color change due to light and heat. The difference is the heat effect. The heat effect was in some cases 40% or more of the total color change. Moreover, in some cases it opposed the effect of light, so that the "total" effect was less than the "fading".

(5) The heat (temperature) effect was erratic. Although the check determinations of "fading" at 20 hours were excellent, and good (all but one) at 40 hours, checks of the total color change both at 20 hours and 40 hours were rather poor. This result and that of item 2 show that serious errors can enter due to temperature variation if not very carefully controlled.

(6) The red dyeing "faded" darker, while the main effect on the violet was chromaticity (shade plus brightness) change. The temperature effect was greatest for the red and in the opposite direction from its effect on the violet.

(7) The unmodified Adams method rates the violet much too low, and the Davidson method rates the red much too high. The Godlove modification of the Adams method was satisfactory, as stated in conclusions (1) and (2).

In justice to the Davidson method, it should be remarked that statistical analysis of results obtained for Alexander Smith & Sons Carpet Co., showed the Davidson method the best in reproducing their judgments of match, with the Adams-Godlove method second of several. But also, the Editor in certain instances finds the Davidson method badly overweighting chromaticity-change as compared with lightness-darkness-change, while his own method may overweight in the opposite direction.

Returning to the question of the British versus American standards, it seems almost obvious that a set of standards prepared in the American way with gradually changing chemical nature and color attributes, would, if properly prepared, be more uniformly graded than a set from dyes all different, with abruptly varying color attributes. That serious errors may result in visual judgments of "apparent strength", has been proved both in work by Imperial Chemical Industries workers and by the Editor. And strength is used by chemists to judge dye concentration and thence degree of fading.

I.H.G.

TEXTILE AND DYE COLORS

An interesting historical summary of the development of textile coloring, by P. Whiston, may be found in the Journal of the Textile Institute 39, P 193-9 (1948), "Design and colour in textiles." The Editor can recommend the article in spite of what seems to him several minor errors of fact or judgment. Since it necessarily deals with the use of natural dyes throughout most of history (and pre-history), it may be supplemented by two articles in the Journal of Chemical Education: one by M. Bender is in 24, 2-10 (Jan. 1947), and the other, by C. Decelles in 26, 583-7 (Nov., 1949); also by the little book, "Ancient and Medieval Dyes," by W. F. Leggett (Chemical Publ. Co., Brooklyn).

Whiston starts with paintings in the Azilian caves, badly underdated, then jumps to Egyptian textiles of "2000-3000 years ago," though next stating that there exists an Egyptian mummy cloth with 500 ends per inch dating 2500 B.C. (4500 years ago). It is stated that some Egyptian textiles have been sealed up "many hundreds of years B.C."; we may actually speak of thousands, but add that the atmosphere was extremely dry. The Egyptians of 2000-1000 B.C. decorated plain woven linen fabrics

with rough embroidered or hand-painted religious or symbolic motifs (lotus flower, papyrus reed), the colors being red and blue, later green. But they were familiar with the use of madder and mordants for dyeing. The "dyers' root," madder, was first used in India, but was also known to the Persians and Egyptians, and grew in the Near East, the Caucasus and Europe. Its name in several languages indicates that its dyes yielded mainly reds. Madder-dyed cloth has been found in Pre-dynastic Egyptian tombs, dating before 3000 B.C. Alexander used madder for a sort of camouflage, dyeing red different spots on each soldier's garments. The spots were mistaken for the blood stains of weakened warriors, and made the Persians careless enough to lose the battle to greatly smaller numbers.

The Assyrians and Babylonians developed cotton and silk cloths, often highly embroidered. The coloring was more "lively and colorful," but the range of hues still small. It should be mentioned that probably before all these sources were orange to reddish brown colorations due to iron compounds in the water of springs, an effect originally observed when washing garments in the spring water. Other mineral dyes or pigments were ochers, greens and blues from powdered malachite and azurite, and carbon blacks, mostly soot.

Indigo dye from India has been known for over 4000 years. Greeks and Romans used it also as a paint and as a cosmetic. The Romans, and especially the Grecian women, were fond of saffron yellow for their garments. A different dye from the safflower plant was used by the Egyptians to obtain a brilliant scarlet on linen, and by the Chinese to obtain rose, scarlet, purple and violet colors on silk. An early yellow dye was weld. It was popular with the Romans, who restricted its use to bridal garments and those of the Vestal Virgins. Woad was a poor substitute for indigo which originated in southern Europe and spread to Great Britain. Caesar spoke of the use of woad by the ancient Britons to paint their bodies in frightful aspect when going into battle. Britain is a Latinized form of Brythen, a Keltic word meaning "painted men". The name of the older aboriginal Kelts in Britain was the Picts, or painted people. Leggett says that woad was known from the "early Stone Age", and yielded blue, black and green colors.

The so-called Tyrian purple was first extracted from the shellfish in Crete about 1600 B.C. It was later extracted from Murex trunculus, found along the Phoenician coast near Sidon and Tyre; and from the larger mollusk M. brandaris at Tarentum in Italy. It was used to produce a great variety of hues, chiefly purple and crimson; other colors were obtained by using the Murex dye mixed with different plant dyes or other materials. The scarlet dye kermes was obtained from an oriental shield louse, species of the genus Coccus. Its first use is generally also ascribed to the Phoenicians; and it was mentioned by Moses and other Hebrew writers. Kermes was known to Homer; and Dioscorides said that it was collected in Galatia, Armenia and Asia Minor. Galatia was the portion of Asia Minor invaded by the Gauls from Europe. Cochineal scarlet was not obtained (from Mexico) until A.D. 1518.

Textile decoration up till about 100 B.C. was either by embroidery or by painting. Then a primitive "draw loom," prototype of the modern Jacquard, was introduced and gave considerable stimulation to the decoration of textiles. There were few contributions to this field by the Greeks and Romans; and the next advances in types of decoration were copper-plate and machine printing in the 18th century A.D. The Greeks stressed simplicity of design and materials. Important Greek motifs were the acanthus leaf and the leaves of ivy and the vine. The Romans made much use of gold and purple color. In Persia, much used motifs included the circle (a Zoroastrian symbol), the "tree of life," the pine or Paisley motif (from the cypress tree bending in the wind); and later (and in Italy) the pineapple and pomegranate.

Further advances were made by the Copts of Egypt about A.D. 200-300, who added "swivel" weaving (mechanical embroidering) and "tissue figuring" colored wool weft figures on linen warps). The Copts may have originated elementary velvet and pile fabrics. They employed the Christian symbols and very "subdued" colors.

Under the emperor Justinian at Byzantium an effort was made to stimulate silk production; and many beautiful brocades, damasks and velvets were perfected, especially for church hangings and priests' robes. Important motifs were the Christian symbols, the lily (the Virgin), the fish (Jesus born under Pisces), and the serpent (knowledge). Due to Persian influence, the list included also griffins, dogs, unicorns, leopards, elephants, and so on. In general the colors were "subdued," but they were dominated by rich reds, violets and blues.

The Moslem cultures on Northern Africa, and southern and southwestern Europe had an important influence only on architecture, little on textile decoration. Moslem decoration was mostly geometric in nature, depending on purity of line and simplicity of form. It incorporated Arabic lettering and banned representation of humans and animals; also silk (as being too luxurious). Its main center was at Palermo in Sicily.

In France, the Low Countries and Great Britain the demand for textiles was stimulated by the Crusaders who came into contact with the luxurious fabrics of the East, and obtained as booty rich brocades, velvets and damasks. In the 14th century, this demand was met by the Italian artists, who employed a rich variety of motifs. Sericulture was developed in Lombardy; and the use of silk led to finer and more elaborate weaving and embroidery. The birds and animals of Byzantium and Persia, the fanciful birds and dragons of China, the waving bands and ribbons of Islam, and the heraldic devices of Gothic origin were all employed; and the designs were marked by action and vitality. In this century, there were 200 dye works in Florence, and 30,000 registered weavers in Lucca.

The 15th century turned away from the East for inspiration and copied the great painters. More colorful designs were used, as we know from the garments in the pictures of the masters. Printing had started on the Rhine, using wood blocks, black pigment, gold and silver.

In the 17th century, textile centers flourished at Avignon and Lyons in France. The famous "Book of Hours," done at the instigation of the wife of Louis XII, and representing flowers, shrubs, trees, insects, etc., led to the use of more detail and finer drawing. Later, following the development of the lace industry, there were imitation lace effects, along with striped effects and small flower motifs.

Under Louis XIV came the daintiness of Watteau and Fragonard. Delicate bouquets of flowers, copies of Dresden china, shepherds and shepherdesses in pastoral scenes, and imitations of Far Eastern scenes and motifs, became the textile mode. The opening of the sea routes to the Far East, especially to India, led to the importation of cotton cloths and delicate floral designs, the fabrics new to Europe, which had used linen, wool and silk. To compete with the East, mordant dyeing was developed in Europe toward the end of the 17th century. The importation of Far Eastern calicos was forbidden in England and France. But by the middle of the 18th century print works flourished in London and the north of England, while the famous Oberkampf had his works at Jouy near Paris. Copper plates were used to print "in monochrome" (usually red, blue or purple), small "sprigs" of other colors being added with wood blocks or by hand.

At the end of the 18th century, Indian styles were still in high fashion. Then came the Industrial Revolution, Jacquard power looms, dye-chemistry development, and discharge printing. The colors available were almost unlimited. In the 19th and 20th centuries came mass production, tending to ignore the artist; but after 1900 the artists came into their own again. Witness the names of Paul Poiret, Raoul Dufy, Paul Rodier, Rex Whistler, Graham Sutherland, John Farleigh; Pablo Picasso, Salvatore Dali, and many others.

I.H.G.

COMPARISON OF VISUAL ACUITY MEASUREMENTS

We have received copy of the interesting paper, Comparison of Three Types of Test Target for the Measurement of Visual Acuity, by Louise L. Sloan (Mrs. W. M. Rowland), W. M. Rowland and Adelaide Altman, all of the Wilmer Ophthalmological Institute of the Johns Hopkins University and Hospital, Baltimore (Quart. Rev. Ophthalm. 8, 4-16; March, 1952). The article is the third of a series concerned with the development of a simple and reliable test of visual acuity suitable for use in industry or by the military services in the selection and classification of personnel. For stated reasons, three types of test objects were studied: Checkerboard, Landolt-ring and letter types, the last being a group of 10 specially selected letters, having as a group vertical, horizontal, oblique and curved contours. A total of 219 eyes of subjects of ages 14-40, free of ocular disease, was examined. It was found that, for use in routine mass testing, the Landolt-ring test and the letter-group test may be considered essentially equivalent. Acuities measured with the checkerboard target of the Bausch & Lomb Ortho-Rater were significantly different from acuities measured by the other two methods. Analysis of photographic studies of the effects of blurring of the image on the appearances of each type of test object, suggested that auxiliary cues are an important aid in recognition of the out-of-focus checkerboard target.

From the same source and in the same issue of the same journal (pp.1-3) is an article by Adelaide Altman and Wm. M. Rowland, Measures of Acuity with Optical Simulation of Distance. Here, in one method, the Ortho-Rater was used to test 157 eyes, but distance was simulated optically by the use of lenses. Some instruments utilizing this principle use up only one sixth of the space needed for the single 20-foot eye-lane ordinarily required to test one individual; but there is danger that some subjects, aware of the actual nearness of the test targets, may accommodate, not for their optical distance, but for some much closer distance. This effect would lower measured acuities. The visual acuities of the subjects tested ranged from 20/200 to 2/13; they were all free of ocular disease. Acuities were measured with letter-test targets at true distance and with the Ortho-Rater at a simulated distance. The correlation figure of 0.935 between the acuity scores for true and simulated distance indicates that they are about as closely related as are two successive measures under identical experimental conditions. The means and standard deviations are not significantly different. It is concluded that tests of visual acuity, in which distance is simulated optically, give essentially the same results as tests at true distance, provided that illumination, contrast, and other experimental variables are the same.

A useful recent review of the extensive literature on measurement of acuity may be found in a paper by L. L. Sloan, Arch. Ophthalm. 45, 704 (June, 1951).

I.H.G.

HOW CONSPICUOUS ARE ORANGE SURFACE COLORS?

This question was answered by Dr. W. E. Knowles Middleton in one of the latest of his long and varied series of researches of color interest (Illum. Engin. 47, 95-8; Feb., 1952). A

paint known as International Orange or Aviation Orange, about Munsell 0.5YR 4.3/14, has been widely used for marking obstructions at airports, and for other purposes. The question arose whether, considering atmospheric absorption, this orange-chrome color is the most conspicuous when seen against practical backgrounds. Accordingly, six colors were studied. Five of them formed a series ranging from bright yellow to a deep reddish orange; including Aviation orange as number 3; the sixth was similar to No. 3 but of lower saturation, to correspond to a weathered surface of Aviation-orange paint. A table gives the reflectances, chromaticity coordinates and Munsell notations of the six colors. No. 1 was painted with medium chrome yellow, the others with Aviation Orange (No. 3) combined with other pigments as follows: with medium chrome yellow (No. 2), with toluidine red (Nos. 4 and 5) and with light chrome yellow (No. 6). Nos. 1 to 5 formed a series of decreasing reflectance; No. 6 was slightly lighter than No. 4.

The conspicuity of the colors was determined by assigning scores based on the order of conspicuity, with "not visible" receiving zero score. Eight-foot square panels were viewed at a distance of $6\frac{1}{4}$ miles, yielding an angular subtense of 0.85 minutes of arc, or 6 minutes as seen through seven-power binoculars. For a forest background (reflectance less than .10), the panels were viewed both without visual aid and with 7 x 56 binoculars. For snow background (reflectance about .80) and grass background, the conspicuity is reported for vision through binoculars only. For viewing against snow, 6-foot square panels were viewed at $4\frac{1}{4}$ miles, yielding a slightly greater subtense than that previously mentioned. Under each of the four conditions, viewing was both with sun shining on the panels and for sun not shining on them.

The chief conclusion was that Aviation Orange is the most conspicuous color among those studied when the whole range of natural backgrounds is taken into account, although a somewhat yellower and lighter color is certainly more conspicuous against a dark forest. This fact had been predicted on theoretical grounds. "An aircraft operating regularly over uninhabited country may well have the upper surfaces of its wings painted in aviation orange in order to maximize the chances of finding it if it should be forced to land." A second conclusion was that it is highly essential to keep the Aviation Orange surface clean and fresh; that is, to maintain its high chroma. Good reasons were stated for avoiding the use of yellow as a color for aircraft, life rafts, and other objects which have to be seen from a great distance. It was mentioned that a yellow approximating Munsell 5Y 8.5/14 was frequently named white at a subtense of one minute of arc, while a bright orange was always named correctly.

I.H.G.

COLOR AND INSTRUMENTATION BY RHAEL

With this News Letter members of the ISCC will receive a booklet, Color and Instrumentation, by Edward W. Rhael of the Sandoz Chemical Works, Inc. When the booklet first came out it was brought to Miss Nickerson's attention by Dr. Judd. His comment was that this report says in a very direct, concise way what needs saying in this field, and that if copies could be obtained from Sandoz the report should be valuable for general distribution to ISCC members.

The question of such distribution was raised in a recent Executive Committee meeting. Several members already had seen the report, some had obtained copies for circulation to members of their own staffs, and all approved making a request for Council distribution.

Mr. Rhael is to be congratulated on a fine piece of work. The courtesy and generosity of the Sandoz Chemical Works is hereby acknowledged with our thanks for supplying the nearly 500 copies that are necessary for ISCC distribution. It was particularly generous of them since a reprinting of the booklet was necessary to supply these copies to us.

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