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INTER-SOCIETY COLOR COUNCIL

NEWS LETTER NO. 43

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ASA Z44 STANDARD

American War Standard for the Specification and Description of Color was approved on June 17, 1942 as ASA Standard Z44-1942. This is the final form of the standard referred to in News Letters Nos. 38, 39 and 40, which was discussed at some length at the February meeting of the Council. Printed copies of the standard may be obtained from the American Standards Association, 29 West 39th Street, New York City, at 25 cents each.

A standard is useful only if it is known and used; therefore ISCC delegates and members are urged to use and call attention to this standard. It is hoped that copies will be widely distributed. The ASA have no objection to having this standard reprinted by journals of our member bodies, provided that it is published in full, or that deletions are indicated and due credit given to the American Standards Association. It is preferable, of course, that permission be asked of the ASA so that they may be advised of republication. If anyone wishes to redistribute copies of the printed standard, he may purchase them in quantities of 250 at $25.00.

MUNSELL COLOR FOUNDATION

The Munsell Color Foundation is now established, papers of incorporation having been filed on September 15 in the State of Maryland. In accordance with the charter, the Board of Trustees consists of Blanche R. Bellamy, manager of the Munsell Company; Deane B. Judd, appointed by the Director of the National Bureau of Standards; Dorothy Nickerson, appointed by the Inter-Society Color Council; A. E. O. Munsell, representing the donor; L. A. Jones, nominated by the Optical Society of America; Arthur S. Allen, whose association with A. H. Munsell goes back as far as 1905; and I. H. Godlove, associated with the work since 1926, particularly with those phases which had to do with the establishment of the present Book of Color.

These trustees signed the charter and held their first meeting on September 15. One duty of the trustees is to keep the color public informed of the activities of the Foundation; and it is therefore to be expected that reports will be made regarding the policies of the Foundation as soon as these are established. The purpose of the Foundation, and the proposal for its establishment, were announced in News Letter No. 40.

STANDARD ILLUMINANTS FOR TEXTILE COLOR MATCHING

Following a request by the U. S. Army Quartermaster Depot in Philadelphia made last year to the American Association of Textile Chemists and Colorists, a tentative specification for standard illuminants in textile color matching has been developed by the AATCC Research Committee. The specification, as revised June 26, is reported in full in July number of the American Dyestuff Reporter, page 363. Because this specification is of considerable importance to

color, we give the full text. If any of our delegates or members have comments on this standard, they are invited to send the comments to the ISCC secretary, who will see that they reach Col. Scott's committee.

Title: AATCC Tentative Specification for Standard Illuminants in Textile Color Matching (Revised June 26, 1942).

1. Scope. This specification applies to artificial illuminants which are capable of furnishing standardized light sources for judging the color of textiles.

2. Selection of Illuminants. It is recognized that the colors of textiles in ordinary use may be observed in daylight under widely different conditions. Daylight color ranges from the reddish color of horizon sunlight at a color temperature of about 2300°K. through noon sunlight at about 4800°K, to average daylight at 6700° to 7500°K, and from there to blue sky which may range in color temperature anywhere from 10,000° to 25,000°K or higher. If textile colors match under lamps representing two widely different phases of daylight then it may be assumed that they will usually be a match under other daylight conditions. Two types of artificial illumination are therefore considered sufficient to satisfy the purposes of this specification: One illuminant to be representative of the lower range of color temperature, and the other to be representative of a range that represents preferred conditions for daylight inspection.

3. Specification of Illuminants. The artificial light units shall be capable of supplying diffused illumination uniformly over an area large enough so that the textile specimens whose colors are to be matched or graded may be moved about freely. The angular field subtended by the source of light at the sample shall be small. The illumination on the working plane shall be 60 to 80 footcandles for grading of white and light materials (daylight reflectance greater than 40 percent, or samples lighter than Munsell 7/); the illumination shall exceed 100 footcandles for materials of intermediate lightness (daylight reflectance between 6 and 40 percent, or samples between Munsell 3/and 7/), and the illumination shall exceed 150 footcandles for dark materials (daylight reflectance less than 6 percent, or samples darker than Munsell 3/).

4. One illuminant shall be in general comparable to I. C. I. (International Commission on Illumination) Illuminant A, which is a tungsten lamp operated at 2848°K. But since horizon sunlight at 2300°K is also in the low range of color temperature yet is enough redder so that it is preferred by many for textile color matching, the tolerance allowed for the illuminant to represent the low range of color temperature is 2300°K to 2900°K in order to allow a wide latitude that will include the use of either. For check comparisons between laboratories the tolerance shall be limited to ±25°K.

5. One illuminant shall be in general comparable to I. C. I. Illuminant C, a tungsten lamp operated at 2848°K with a specially prepared liquid filter that raises the color temperature to about 6700°K, and gives a color which approximates that of average daylight. But since this standard is lower in color temperature than is preferred in most daylight inspection work, and since there is very general agreement that 7500° comes nearer to the preferred illuminant (moderately overcast sky from the north), the tolerance allowed for this illuminant is 6500°K to 7500°K. For check comparisons between laboratories, the tolerance shall be limited to ±100°K. This specification can be satisfied by a tungsten filament lamp of suitable wattage, plus a glass filter equal to or better than Corning No. 590, the filter to be of a

thickness that will give the required color temperature. The energy curve of the illuminant, if it differs from I. C. I. Illuminant C must be reasonably similar to it, and in order to satisfy this requirement the ratio of spectral transmission of the filter at wavelength 670 mμ to that of 700 mμ shall be 0.9 or more.

VITAMIN-A AND COLOR BLINDNESS

The following letter, dated July 20, 1942, was written to us at the Editors' request by Professor Forrest L. Dimmick, Chairman of the Problems Committee. This letter is reproduced practically in full, with only minor editing. Dr. Dimmick wrote: The experimental evidence concerning the effect of Vitamin A on color blindness is still inconclusive. The positive claims made in various newspaper articles during the past year exceed the facts and cannot be taken at face value. The work upon which they are based was first reported at a meeting of the Western Psychological Association on June 13, 1941. The syndicated newspaper article signed by G. B. Lal, International News Service Science Editor, received in June, may be a report of this first paper or may be based on a later report of the same material. In either case there are certain discrepancies.

Before any of this work came to my notice, we had undertaken a similar investigation in colaboration with Professor G. M. Lawson of the University of Virginia School of Medicine. In the fall of 1941, I had sent him sets of the three forms of the ISCC Color Aptitude Test for trial. On January 20, 1942, he wrote: "Together with the Navy Department, we have been using your tests ... to find out whether Vitamin A has any effect on the color vision of the individuals showing slight degrees of color blindness. We have now given preliminary tests to about 10 individuals and have checked up at the end of 10 days after vitamin administration. We find no appreciable change in the ability of the student to discriminate between shades. We are continuing this research, however, in the hope that some of our subjects may show such improvement."

At about the same time there came to me several students who had been rejected by one of the armed services because of color blindness, for further testing and for information concerning their color deficiencies. I at once enlisted them as subjects in a study parallel and supplementary to Dr. Lawson's. On January 28, 1942, he wrote to me: "Since my last letter to you, we have had an opportunity of observing the continued administration of large doses of Vitamin A in color-blind individuals. There is undoubtedly some slight improvement in color vision during the second week of administration and, in occasional subjects, in the first week. One individual, who has taken Vitamin A over a period of three weeks, has improved practically one hundred percent in his ability to distinguish color, and the other day he passed successfully the Naval Reserve test for color vision, whereas a month ago he had failed in this test. He missed 19 out of 35 charts in the Stilling's test (20th ed.) at the time of his first examination, and missed only 6 1/2 relatively unimportant charts following continued vitamin administration. This observation, together with others during the first week of vitamin administration, encouraged us to continue this work."

A short time later he described his dosage and said: "Our own dosage has been of the Parke-Davis preparation in capsule form, 10,000 units to the capsule. We have been giving this four times a day -- once after each meal and once at bed time, a total of 40,000 units daily. This has been continued for at least three weeks. We now have a series of five individuals, all of whom show increased scores on the ISCC anomalous color test. After one week of vitamin treatment the score increased at

least 10 percent, and some individuals have attained a rating of 80 percent on this method of scoring. This has been accompanied by a greater ability to perform with the Stilling's charts..... "We have, among our test group, a pair of identical twins with both deuteranopic and protanopic tendencies. There has been little improvement in either of these two, but with those who present milder degrees of deuteranopia the results are possibly significant. We have had one individual who was making satisfactory progress and then suddenly lapsed to his former state. On questioning him he stated that he had been using alcoholic beverages to a very considerable extent during the week-end dances on Friday, Saturday and Sunday, and had evidently lost a good deal of Vitamin A because of this fact."

The last discussion of his data is dated April 14, 1942: "Only two of our twenty odd students showed a lasting improvement on Vitamin A with the dosages which we have been using. I see in the Popular Press that two California investigators have found that Vitamin A was an excellent cure for color blindness. I would like to see the original article to see whether the newspaper conclusions were in any way similar to those actually attained. It seems to me that any improvement which might be noted should be of a temporary character only, and that there naturally would be a variation in the response, if any, to this vitamin. This response should give a better rating on any exact test such as the one we are using, but obviously cannot hope to cure color-blindness nor accomplish more than a partial amelioration of the condition."

Dr. Lawson has promised to send me a summary of his results when he has had time to assemble them. Upon receipt of the last letter quoted, I looked up the abstract of the Loken & Dunlap report which is given in the Psychological Bulletin 1941, 38, p. 734, and wrote to Dr. Loken describing briefly what we had been doing and asking him for further details about his work. In his reply of April 21, 1942, he said: "The abstracted accounts of our work here at the University of California at *Los* Angeles are, to say the least, misleading. We have used the word 'cure' to indicate simply a change on color-vision tests from a deficient score before Vitamin A dosage to a score on the test which would class the individual as 'normal' following the Vitamin A dosage. This, I heartily agree, does not constitute a 'cure' in any sense of the word." Later, May 5, 1942, Dr. Loken amplified this as follows: "Evidently I neglected to tell you that we have increased our dosage to 75,000 units minimum per day which would be comparable to the amount of vitamin that you say you are administering. We soon found that 25,000 units a day was not a heavy enough dosage although it did result in slight improvements. As you have found, Vitamin A does not show the immediately significant changes in Ishihara test scores but it does show up immediately, if at all, on yarn-sorting tests or other 'practical' color-vision tests. We have had eventual success in reducing Ishihara or Stilling error scores by longer and heavier periods of dosage. We are not particularly interested in changes on the Ishihara or Stilling since these tests are, after all, only theoretical tests of color vision and should not be used as criteria of color-vision deficiency."

In the original paper the results of the experiment were summarized as follows: "After the vitamin dosage the retest scores for the Vitamin A group had dropped from an average of 11 errors per subject (on the Nela test) to less than 5 errors per subject, while the control group average error scores changed only from 10.5 to 10 errors per subject. There was, in other words, an average drop in error scores for the subjects in Group A of 6 errors, and a drop of only 1/2 error for the control group, Group B. In terms of total scores the experimental group dropped 50 errors and the control group only 5 errors; ten times as large a drop in Group A as in Group B. This would seem to rule out effectively the possibility of practice

effect as an explanation of the changes observed. The picture is further sustained by examination of the individual cases. Every subject in the experimental group made a significantly lower error score at the retest, and in no case were the changes in error scores significant for the members of the control group."

The experiment at Hobart was not so pretentious as that at U. C. L. A. We had only 3 subjects who continued through the full course of the experiment and 3 who served for shorter times. All were well motivated since they hoped to overcome their deficiencies enough to be accepted for aviation or naval service. On the advice of medical authorities, we began with doses of two Upjohn Vitamin A capsules of 25,000 units each, four times a day.... Later the dose was reduced to 100,000 units per day. Subjects were tested once a week over a period of six weeks with the ISCC Intermediate form test, the single-judgment test, and the Ishihara test. All subjects were not equally "color blind" but all "failed" the Ishihara test. On that test, 3 gave the responses prescribed as typical of color blindness. The other 3 could read many of the charts "normal" as well as "color blind." In the course of the tests, all subjects showed an apparent "improvement" in their scores on the ISCC tests. This "improvement" is not entirely consistent, however, nor is its interpretation unequivocal. Only one subject approached "normal" scores on the two ISCC tests, but he did not show corresponding improvement on Ishihara. This subject made almost as much improvement after a week of the vitamin treatment as at the end of 6 weeks. He retained his improved color-matching ability after a lapse of 6 weeks. Nevertheless, he is still ineligible for the Air Forces.

Another subject showed an overall improvement in both ISCC tests, some weeks more and some weeks less, but after 6 weeks without Vitamin A had lost more than he gained. Early in the treatment he became able to read many Ishihara charts "normal" and did not lose this ability afterwards. Two other subjects showed the same course of "improvement" at mere color-deficient level, and remained typically "color blind" according to Ishihara. The two remaining subjects were studied over shorter periods during which they showed some improvement on all tests.

From this summary of the material that is available you can see why I said at the beginning that the evidence is "inconclusive." Nevertheless it seems valuable to assemble the facts for the information of members of the ISCC, without drawing prejudicial conclusions as to what further experiments may show. Some of the optimistic guesses that have been made may prove to be in the right direction, but at present they are only guesses.

Sincerely yours,

(S) Forrest L. Dimmick

It may be added that a note from the Secretary on the Loken test is in essential agreement with Dr. Dimmick's report and was taken from the August Modern Medicine through the Daily Digest 82, No. 33, 2 (Aug. 15, 1941).

GLENN COLORULE

In connection with the problem of individual variations in color matching of textiles and the importance of standard illumination in such matching, one of our members, J. J. Glenn (now Lt. Glenn of the U.S. Navy) dyed two series of samples which illustrate by exaggeration the extent of disagreement possible for different observers and different illuminants. One of the series was dyed with a combination of orange and blue dyes and the other

with a combination of yellow and violet dyes. Mr. Glenn discussed this material at our tenth annual meeting, giving ICI data for the two series. Many people asked for samples of the two series and as a result, the Glen Colorule has been developed. Copies may be purchased from the Research Laboratory of Sidney Blumenthal & Co. Inc., Shelton, Conn., at $2.00 each, with requests addressed to Mr. Jackson A. Woodruff.

The Glenn Colorule is constructed like a slide rule, 15 inches long and 2 1/2 inches wide. It may be used for testing differences in color matches between observers under constant illumination, or it may be used by a single observer for checking on the color of light sources. The device can be made very useful by anyone who has problems of color matching. Nothing about the Colorule has been published, but readers might refer to two articles by W. Garner in the Journal of the Society of Dyers and Colourists, in which Mr. Garner discusses a test that appears to be very much like the series developed in this country by Mr. Glenn. The Garner articles appeared in 1935 (vol. 51, p. 244) and in 1942 (vol. 58, p. 65).

The Editor may add the note that he has tested some fifty odd persons in his laboratory, all of them constantly dealing with color matching. With a constant daylight source, he found variations from a match of sample "3" to sample "D" to a match of "15" to "0." (One total series runs from "1" to "24," while the other runs from "A" to "X.") There was considerable difficulty convincing some persons finding a match at one end of this range that the stated matches at other portions of the range were really seen as such. The Editor has heard reports from one or two persons that the position of match follows an age variation; but this was not found to be the case in his laboratory, since the exceptions were numerous and striking. A somewhat better description of the variation in the test is to say that it followed a compound change from 3 vs. D for the younger and blue-eyed persons to 15 vs. 0 for the older and brown-eyed persons in daylight. In tungsten-filament light, all matches moved toward the larger numbers by 3 to 8 steps, less for the latter group than for the former group.

MORE ON VITAMINS

The following abstract is from Lancet 241, 787-91 (1941) through Psychol. Abstracts 16, No. 6, ref. 2196 (June 1942): S. Yudkin; Vitamin A and Dark Adaptation: Effect of Alcohol, Benzedrine, and Vitamin C. In a subject with night-blindness due to Vitamin A deficiency a single dose of the vitamin may produce no improvement, an improvement lasting a few hours, or one lasting several days or weeks..... The dose of Vitamin A required to produce prolonged improvement is usually between 300,000 and 2,000,000 IU. This dose is not related to the initial degree of night blindness..... There is no standard level of blood Vitamin A which would indicate whether a subject is deficient in Vitamin A or not. In any individual there is a critical level of blood Vitamin A. Below this level, the lower the blood Vitamin A, the higher the final rod threshold. Alcohol and benzedrine both produce transient improvement in dark adaptation without any corresponding rise in blood vitamin A. The resulting improvement may be beyond that possible with Vitamin A. Vitamin C has not been found to improve any subject treated even if originally deficient in this vitamin. 29 references.

FROM ENGLAND

Under date of August 20 the Council secretary has received from Mr. H. D. Murray, Honorable Secretary of the Physical Society Colour Group, a letter acknowledging receipt of recent copies of the News Letter. Mr. Murray tells us that their group is extremely interested to hear of our Council activities and that they look forward in particular to hearing further of the ISCC work on color blindness. They have themselves recently set up a small subcommittee to deal with this problem, especially as it relates to industrial needs.

Mr. Murray notes a movement in their country to employ scientific workers to a somewhat greater extent as groups rather than as individuals. This is in order to permit the interchange of ideas and the discussion of problems which are not possible when individuals are bound to official secrecy. They have recently taken steps to bring this point of view more clearly before the Government Departments involved, and they are hoping that more efficient utilization of the services of workers in the field of color physics will result. This is a point that workers in our own country also feel should be righted.

Another letter, under date of August 25, has come from England from Gerald S. Fawcett of Tintometer Limited, the company established by Lovibond. Their Colour Laboratory is at Milford, Salisbury, England. Mr. Fawcett, who has been an individual member of the ISCC since 1939, thinks it quite possible that fellow members of the ISCC may be visiting England, either with the Forces or in connection with war activities, and that if so he would be very glad if the secretary would put him in touch with such members. If his organization can offer hospitality (such as is possible to offer in war time) they would be pleased to do so. This is a very cordial invitation, one that is sincerely appreciated as an expression of the good will that exists between us as devotees of color and as allies in a war that is being fought to preserve for the world the opportunity for the free exchange of evidences of such good and all that it implies. We urge any member who may find himself in England to take advantage of this invitation if he is able to do so; and take this opportunity of thanking Mr. Fawcett for his very kind offer.

EARLY PATENT ON CAMOUFLAGE

No doubt many of our readers will be interested in an early camouflage patent which came to our attention. This is British Patent 101,894 issued to J. Inglis in 1916. The invention comprises an improvement of the cuprammonium process of rot-proofing of canvas such that production of variegated colors is combined with the proofing. Broken and irregular patterns are produced by means of folding, dipping in two different solutions successively, opening out and drying. Examples of the substances used are a chromate and tri-hydroxy benzoic acid.

O. W. PINEO

It is our sad duty to report the untimely death of Dr. Orrin W. Pineo, ISCC individual member well-known to many of us. His papers and patents on spectrophotometry have been reported in past issues of this News Letter. His death from heart disease occurred on September 5, 1942, just after he had traveled to take an attractive new position.

ISCC-NBS COLOR NAMES

In the bibliography two articles by Biefeld and Griffing are listed. We note these particularly because they concern a very practical use for the ISCC-NBS color names. The authors report that at Purdue ISCC-NBS designations were applied to colored materials encountered in chemistry courses on qualitative inorganic analysis. They suggest that these color names should be helpful to teachers and students of qualitative analysis since they are more satisfactory than the type of name commonly appearing in the present-day text books. The first article is in J. Chem. Education 19, 282-6 (June 1942). In the second article (J. Chem. Educ. 19, 307-12; July 1942) are four tables giving the ISCC-NBS names of precipitates, reagents, stock chemicals and solutions, in the first table along with "common names." The latter in general agree well with the ISCC-NBS names, but there are one or two exceptions. (These names, by the way, are a part of the ASA War Standard Z44 for the Specification and Description of Color.)

VISION: A SYMPOSIUM, PAPERS AND BOOKS

Four recent books to which especial attention should be called are concerned with vision: (1) Edwin G. Boring's Sensation and Perception on the History of Experimental Psychology, 1942, D. Appleton Century Co., New York, 644 pp.; (2) Stephen L. Polyak's The Retina, Chicago, the University Press, 1941, x + 607 pp., 100 pls.; (3) Gordon L. Walls' The Vertebrate Eye and its Adaptive Radiation, 1942, Bloomfield Hills (Mich.), Cranbrook Institute of Science; and (4) Visual Mechanisms, 1942, which is published as Biological Symposia, Vol. VII, by the Jacques Cattell Press, Lancaster, Pa., a series of 12 contributions by experts in various fields who approach the subject from widely different points of view: Hecht, Krause, Wald, Gellhorn, Bartley, Case; Marshall and Talbert; von Bonin, Garol and McCulloch; Polyak, Walls, Klüver, and Lashley.

In this connection we note also a review, by Professor Selig Hecht, of the symposium on Visual Mechanisms held on September 24, 1941, at the University of Chicago (Nature 149, 40-2; 1942). The eight papers of the symposium, including ones by Hecht himself and by Professor H. Klüver, the editor of the fourth book listed above, were included in this book along with the following papers: (1) Visual Systems and the Vitamins A, by Dr. George Wald; (2) Recent Evidence for Neural Mechanisms in Vision Leading to a General Theory of Sensory Acuity, by Drs. W. H. Marshall and S. A. Talbot; (3) The Functional Organization of the Occipital Lobe, by Drs. G. V. Bonin, H. W. Garol and W. S. McMulloch; and (4) The Visual Cells and their History, by Dr. G. L. Walls. Much of the substance of Hecht's paper, Energy Relations in Vision, appeared in the Journal of the Optical Society of America (vol.32, pp. 42-9; Jan. 1942) and was heard by many of our readers on the occasion of the presentation of the Ives medal for 1941 to Dr. Hecht. In measurements on the minimum energy for vision, it was found that only one light quantum need be absorbed by each 5 - 14 retinal rods. Independent statistical investigation of the relation between the intensity of a light flash and the frequency with which it is seen, yielded 5 - 7 for the number of critical events involved in threshold vision. Biological variation does not alter these values essentially. These results bear on the nature of the fluctuations shown by an organism in response to a stimulus. It is usually assumed that the stimulus is constant and the organism variable. But Hecht's results show that at the threshold it is the stimulus which is variable and the nature of its variability determines the fluctuations encountered between response and stimulus.

Professor A. C. Krause's paper, The Photochemistry of Visual Purple, deals with the photochemical relations of that substance, provisual red, visual red, visual yellow, indicator yellow and other substances. Dr. Krause has prepared enough visual purple to apply the ordinary chemical procedures. The connection of Dr. E. Gellhorn's paper, Anoxia in Relation to the Visual System, to color is less direct; and for an abstract one may turn to Hecht's review. Professor Klüver summarized his experiments with Rhesus monkeys before and after removal of the striate cortex, in a paper entitled Functional Significance of the Geniculo-striate System. Dark-adapted monkeys without any geniculo-striate system are still able to discriminate the brighter of two stimuli. The just recognizable brightness fraction for them is 0.23 - 0.29, and the same differential fraction is obtained for area discrimination of equally bright surfaces, and for distances (squared) of otherwise equal lights. This indicates that it is the total luminous flux which is recognized, rather than its distribution in space. Total light difference is distinguished whether it is achieved by variations of distance, area or brightness. Form perception is lost. This refers to dim vision, and is confirmed by the luminosity function which is similar to the human scotopic luminosity curve. When

light adapted, the animals loose differential response. In normal monkeys, recognition of differences in brightness or area or color are not seriously affected by the method of presentation of stimuli. "It is as if these properties remain relatively constant despite marked changes in stimulus constellation, and thus provide the animal with a stable visual world. The removal of the geniculo-striate system seems to eliminate these constancies irretrievably." (Hecht). Dr. T. J. Case's paper was entitled Alpha Waves in Relation to Structures Involved in Vision. The most interesting conclusion of Dr. S. H. Bartley's paper, Visual Sensation and its Dependence on the Neurophysiology of the Optic Pathway, was that a strong repeated stimulus may force the cortex to set up a rhythm in tune with the stimulus. This sort of resonance effect has recently come to be known as the "Bartley effect" (1938, 1939): there is a certain optimum frequency (about 9 - 10 cycles/sec.) of flashes giving an average subjective brightness much greater than that produced by the same luminance when continous.

Professor Polyak's paper, Anatomy of the Retina, was a summary of material since published in the book referred to above (2). The essential point is that the complex structure of the retina agrees with the complex nature of the visual process; and the nature of these mechanisms is described in detail. Professor Lashley in his paper Mechanisms of Vision and the Cerebral Cortex proposed a new theory of cerebral organization; and again for lack of space we must refer the readers to Hecht's review. The problem considered is that while nerve impulses are transmitted over definite pathways, behavior seems to be determined by masses of excitation within general fields of activity without regard to particular nerve cells.

COLOR HARMONY INDEX AND MANUAL

With a letter of July 28, 1942, we received announcement of the "Color Harmony Index" and "Color Harmony Manual" published by the Color Laboratories Division of the Container Corporation of America. These were arranged according to the theories of Wilhelm Ostwald by Egbert G. Jacobson, Art Director and a well-known member of the Council. It is stated that the colors were developed by Carl E. Foss, ISCC officer and associate editor, from colorimetric specification in accordance with standard procedures through the use of spectrophotometric measurements.

The Index contains 680 color-chips of cellulose acetate, each marked with Ostwald notations. On one side the colors are dull; on the other, as seen through the transparent acetate, they are glossy as if mixed with varnish, an advantage in matching inks or paint. The index comes in a black leather case in which is also a 24-page illustrated book briefly describing the Ostwald theory; and two large work-charts for use in discovering harmonious combinations of colors. The colors are conveniently carried in a press-the-button 28-inch case, arranged with complements adjacent on 14 celluloid cards in 6 compartments in such a way as to be rapidly located by means of the tabs. The price of the complete outfit is $325.00.

The Manual contains the same number and kind of color chips arranged in 12 book-charts with removable chips, as in the Index, contained in a strong linen-covered box along with a text-book of explanation illustrated with diagrams. The arrangement is convenient for work in interior decoration; package, poster and fashion design; and printing, department stores and window display. The price of the set of 13 books is $50.00.

ORIGINS OF GRAPHIC ART

In a letter to Nature (149, 637; June 6, 1942), Julian S. Huxley noted that a young gorilla in Regent's Park in a cage with white tiled walls, illuminated by a single powerful electric light, when he stood in a position producing a well-defined shadow, stopped, looked at the shadow, and proceeded to trace its outline with his forefinger. An independent observer agreed that the action was deliberate. The gorilla repeated the action twice. Huxley cites the several suggestions which have been made for the origin of human graphic art; and to these he adds the possibility of tracing the shadows cast by a low sun against a more or less vertical cliff or wall. Our readers may recall that in an early number of our series "Color in Painting through the Ages," the Editor repeated a legend of the origin of painting. According to this, a girl, wishing to preserve the outline of her lover always before her, traced the outline of his shadow.

Huxley's letter brought forth another, by J. L. Bowen (Nature 149, 733; June 27, 1942). The correspondent was reminded of observations of rhesus monkeys at a hill station near Bombay. He stated that he frequently saw them trace the outline of one of their hands in the dust, using a twig held almost as one would hold a pencil. Other monkeys inspected the traced outlines with a show of interest, walking round and round the spot with what seemed to be an anxious moment. One of the possibilities listed by Huxley was the tracing of the outline of the hand.

BLACKOUT INFORMATION AND BRIGHTNESS METERS

We have received, through the courtesy of Dr. A. Hadley Taylor, the useful form sheet entitled "Black-out Information," published by the Nela Park (Cleveland) Engineering Department of General Electric Co. This is an alignment chart for computing minimum perceptible brightness data. The conditions for which it is intended are diffuse test area on a dark field, dark-adapted observers, laboratory conditions and use of "white light" only. It is form LS-142, dated Jan. 1942. It states that the data is based on the compilation of P. J. Bouma, Philips Tech. Rev. 4, No. 1 (Jan. 1941). It enables one to find rapidly the threshold brightness of a given circular area and observational distance, the threshold value of lumens diffusely emitted by the area, and from these and reflectance the incident footcandles and incident lumens. Instructions are given on the reverse side.

Along with this calculation form we received Dr. Taylor's paper "Brightness and Brightness Meters," Illum. Engin. 37, No. 1, 19-30 (Jan. 1942). This illustrates, describes and discusses the Luckiesh-Taylor and Luckiesh-Holladay brightness meters (ranges 0.002 - 50,000 and 0.01 - 75,000 footlamberts, respectively) and the Taylor models A and B low-brightness meters (0.00000|- 0.1 and 0.0005 - 0.3 footlamberts, respectively). This paper also includes tables of measured brightness data for various sources and landscape features, including moonlight and starlight illuminations, and allowable blackout brightnesses in four European countries. Another table shows the influence of the Purkinje effect on the luminous efficiency of three different lamp sources.

COLOR AND MOOD

We have received reprint of an interesting paper by H. S. Odbert, T. F. Karwoski and A. B. Eckerson, Studies in Synesthetic Thinking: I. Musical and Verbal Associations of Color and Mood; J. Gen. Psychol. 26, 153-73 (1942). The paper analyzes the relation between the mood of music and the colors suggested by that music. 243 subjects reported the mood of 10 musical selections; and upon hearing the selections again they stated what colors they associated with each. For some subjects the color

experiences were quite direct and vivid; for others the judgments were forced (the "direct" experiences were "seeing," "thinking" and "feeling" colors). Instead of single words to describe moods, 8 word groups (A to H) were used to describe moods. For example, group F, of which gay is typical, also included merry, joyous, happy, cheerful and bright. These are the groups of K. Hevner (Amer. J. Psychol. 48, 246-68; 1936; 49, 419-34; 1937). The word groups form a circle; for example, the group including gay lies between the groups including playful and exciting and opposite the group including sad. It was found that subjects who are forced to relate colors to music give responses very similar to those of subjects who react readily to music with vivid visual imagery. Subjects who disagree on the mood of a selection tend to report different colors for the selection. The colors named with a selection are systematically related to the named mood of the selection. When the mood-names are given in Hevner's circular arrangement, the related colors form a color circle, in spectral order. This relation is shown in the following circles (developed linearly to save space):

R	O	Y	G	B	P(Bk)	R
Exciting	Gay	Playful	Leisurely	Tender	Sad Solemn	Vigorous Exciting

The initial letters are used to indicate the hues, P standing for purple, and Bk for black, which was heavily concentrated at sad. R. T. Ross (1938), by a quite different method, arrived at very similar conclusions, except that the hues Y to B to P were moved to the right, so that B fell between sad and solemn, V at solemn, and P at vigorous. Luckiesh in his "Color and Colors" obtained very similar circles too; and, it may be added, so did your Editor in unpublished experiments a dozen years ago.

In the same mail as the foregoing we received also T. F. Karwoski and H. Warrener's "Studies in the Peripheral Retina: II. The Purkinje Afterimage on the Near Foveal Area of the Retina. This paper takes up the question of whether the Purkinje afterimage can be seen on the fovea, which was not dealt with in Karwoski and Crook's (1937) paper on the Purkinje afterimage.

THE COLOR BLIND POET

A very long time ago, the Editors received from Kenneth L. Kelly, delegate from the N. F. and the U. S. P. and erstwhile ISCC entertainer, a letter from a friend of his which contained the following poem, which we reproduce along with Mr. Kelly's interesting remarks.

THE COLOR BLIND POET TO HIS LOVE

The leaves, my love, are gold and red,
As are your lovely eyes;
And the deep azure of your hair
Is fairer than the skies.

Your lips are like the driven snow,
Your cheeks are like the sea,
But, oh, my love, you cannot know
The way you look to me.

Mr. Kelly says that his friend sent him the poem because of Kelly's known interest in color. Mr. Kelly's remarks follow: The anomalous author, having presumably translated "color blindness" literally and without benefit of Dr. Judd's treatise on Color Blindness and Anomalies of Vision (J. Soc. Motion Pict. Engin., 1936), has attempted to confuse certain colorful phrases in his description of his lady love. But here science and supposition differ. In the first line of the second stanza, he likens her lips to the "driven snow," forgetting that the color blind usually have

good value perception. This is the only case where his poetic description has differed in value from the anatomical part in question. If for this duet is substituted "winnowed grain" making this line read: "Your lips are like the winnowed Grain," the dissimilarity would still be preserved but the value of the grain and certain lips-lipstick combinations could be the same. However, considering that the poem was penned by a normal color-blind poet in love, it is remarkable that this licentiate made only one unconscious error. Would that other "normal" poets did as well!

But, we ask Mr. Kelly, do you think there is some chance that the poet's "driven snow" was meant to tell the lady that her lips were cold to him?

COLOR BLINDNESS TESTS

Two recent papers by Miss Elsie Murray and discussion of one of them by Knight Dunlap and R. K. Loken deal with a subject which is timely because of its "paramount importance to aviator, night flyer or worker, to the fabricator or detector of camouflage, as well as to the ordinary industrialist" (Murray). In the first paper, "Color Blindness: Current Tests and the Scientific Charting of Cases," Psychol. Bull. 39, 165-72 (March 1942), she makes a critical analysis and review of the various test devices and methods in use for diagnosing forms of "color blindness" (including color weakness). Stilling (-Hertel's), Edridge-Green's, Schaaf's, Ishihara's, Rabkin's, Murray's and American Optical Company's tests and Mary Collins' color filters are duscussed critically. A section deals with devices to measure individual variations in color deficiency and efficiency, including ISCC tests. Another section deals with the handicap to the worker of the "old hard-and-fast categories of color blindness." Here are made suggestions that are pressed more forcibly in the second article, "Color Blindness and Borderline Cases," (Science 96, 133-5; Aug. 7, 1942). Here we read: ".... the laboratory worker suggests that the psychologist .... scrap the non-descriptive and misleading rubrics of protanopia and deuteranopia and their derivatives, foisted on us in 1897 by the hasty generalizations and faulty experimental procedures of von Kries; disavowed in 1932 by .... Houstoun, and the source today of endless confusion and distortion of experimental observations. The old term 'color blind' may well go with them."

Dunlap and Loken (Science 96, 251-2; Sept. 11, 1942) laud Murray's paper as "an excellent exposé of the present confusion," but state the opinion that "the revelation is not sufficiently comprehensive." They cite the paradoxical situation arising from test-charts, composed of color spots, which the "color blind" can read but the "normal" cannot. They stress the contrasts necessary for reading the charts, and attribute the paradoxical result to contrasts perceived (wholly?) as brightness differences. Their conclusion is that many chart tests are "not only unfair" but "unsafe."

BIRREN ARTICLES

We have received three recent articles by Faber Birren, industrial color consultant and indefatigable worker and writer. They are written in his usual lucid style and are full of practical suggestions. The titles are: (1) "Color: the Constant Reminder" (in Safety); (2) "Color for Production" (The Architectural Forum); and (3) "Color Conditioning in Modern Industry" (Dun's Review). They are all in the July, 1942, issues. Our available space does not permit detailed review of these articles. They are full of practical suggestions for securing good visibility, safety through color, relief of eye strain, beauty through adequate functional utility ("Forget about beauty," he says). Pay attention to the effect of color on utility and function, to the various color contrasts; stimulate the favorable moods with the

proper hues, secure proper illumination. Each article, especially the second, is illustrated with photographs. We have some question as to whether "White is the only color to maintain its brightness under dim light -- medium and deep tones tend to melt together"; but we are sure a reading of any or all of these articles will repay any reader.

SOIL COLOR NAMES AND STANDARDS

We have received a paper by Dorothy Nickerson, "Color Standards and Color Names for Soils," Proc. Soil Sci. Soc. Amer. 6, 392-3 (1941), which explains the application of the ISCC-NBS color names to soil colors. Many of our readers have received the charts sold to accompany USDA Misc. Publ. No. 425, Preliminary Color Standards and Color Names for Soils, by Rice, Nickerson, O'Neal and Thorp; and they have been described in these columns. The present article is in effect a digest of Publ. No. 425, and gives a simple explanation of the system of color names and this special application. It is accompanied by an insert leaf suggesting a method of desk use of the charts.

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COLOR IN PAINTING THROUGH THE AGES XIV.

Egypt: Fifth and Sixth Dynasties. The prosperous Egyptian Fourth Dynasty, that of the building of pyramid tombs, was ended, sometime around 2700 B.C., by an usurper from Heliopolis, the high-priest of the sun-god Re. He was succeeded by five relatives. The worship of Re increased, but otherwise the civilization of the Old Kingdom continued. Whereas in Sumeria the ruler was a magistrate who performed priestly rites, in Egypt the priests now assumed kingly power. The building of pyramids, as those of Abusir, continued, as did copper and turquoise mining; and so also did the peace and prosperity of the era. During the period which extended to the fall of Memphis about 2400 B.C., the only kings of importance were two called Pepi, of whom the first ruled about 50 years. Copper implements became commoner. While architecture maintained its standards, the effect of religious influences was to formalize art during the Fifth Dynasty; and it became still more stereotyped in the Sixth. The lifelike perfection of portrait statues attained in the Fourth Dynasty was never again reached. Painting was still subservient to architecture. The common ceiling decoration of temples and tombs was of stars of gold on a ground of "midnight blue." Paintings and reliefs on the walls of the tombs were designed to cater to the deceased one's wants in after life. The scenes were those of daily life: animal and hunting scenes, men cleaning fish, making ropes or papyrus boats. The designs were arranged in levels or registers one above another. Frequently landscape extended from the Nile below to the desert above. The colors were arranged in conventional washes of solid areas filling in the outline drawing; they included red, black, white, green, blue and yellow. The art of the period was marked by balance, rhythm, action, forcefulness and sincerity, in spite of rigid conventions. A curious tradition was the painting of the dead master as of colossal size in contrast to his wife and servants. In a typical scene of fighting boatmen, a low relief from a Fifth Dynasty chapel, the boat is bright green, the figures red, while traces of blue remain on the water and the lotus flowers. In the well-known reliefs from the tomb of Ti, he and his wife -- much smaller than he -- are seen against a background of yellow and green rushes and reeds. His skin is a terra-cotta red, his wife's yellow. Black is used for hair and details, white for garments; and green, blue and yellow for necklaces and armlets.

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Asia Minor. In Troy I and Thermi I (see News Letter No. 36) metal, especially in the form of copper pins and trinkets, was common; and special smiths were available to work it. A bronze pin with as much as 13% tin was found in Thermi II; and a bronze bracelet in the fourth city. The metal axes showed that the smiths were of an

Asiatic, not the Egyptian school. But pot-making was not sufficiently industrialized for the use of the wheel. The black to brown or brick-red self-colored burnished vases, of gourd or leather shapes, continued. But in Thermi III the previously characteristic tubular lugs on bowls had become extended to form "horned lugs," and tripod legs had become models of human feet. In Syria at Ras Shamra, the polychrome pottery was succeeded by a poor unpainted Canaanite ware which remained current until near the end of the third millenium. At Nuzi in Iraq, the graceful hand-made painted pottery of the fourth millenium (News Letter No. 37) was replaced late in that millenium by new types evolved on a rudimentary potter's wheel; and in the period we are now discussing, the "Sargonic period" (see below), well-turned unpainted pottery was found along with cylinder seals and cuneiform tablets. The use of copper began in the sixth level, and of bronze in the ninth. In the Tigris-Euphrates country, the second dynasties of Ur, Kish and Erech had been succeeded by various others of no special interest to our story. These lasted until about the middle of the 27th century B.C., when there arose in Kish a man who ultimately established the first great empire of the ancient world. This man was Sargon. He transferred his capital to Agade, brought under his rule all the Sumerian cities and the Elamite country to the southeast, and then extended his power from the Persian Gulf to the Mediterranean Sea; he also established relations with Cyprus, Crete and the southwest coast of Asia Minor. Sargon and his successors ruled for about 180 years. Power then passed to the fourth and fifth dynasties at Erech and the third at Ur, with an interval when a steppe-folk held sway. Then, near the middle of the third millenium B.C., the whole ancient world was in turmoil. Negroes from the south attacked Egypt. The steppe-folk overran Mesopotamia. Troy I was destroyed, while perhaps a similar people destroyed the settlement at Anau and later Alisar in Central Anatolia. Peake and Fleure, in volume IV of their "Corridors of Time," held that late in the fourth millenium three groups of grain-growers had migrated from various parts of Anatolia to Europe, and that one of them brought painted pottery to the rich Black Earth lands west of the Dnieper river and to the Alt river basin of Hungary, establishing there cultures which we shall describe. According to Peake and Fleure, at the time of the general disturbances the painted pottery settlements were abandoned. But other British authorities, writing more than a decade later, dated the beginning of these cultures at about the time now under discussion (a century or two after the start of the third millenium B.C.) Beside the intruding steppe-folk, the people of Kish and Ur included mainly a long - and high-headed type, with prominent eyebrow ridges and broad nose and cheek bones, known as the "Eur-·african type" (not negroid), and secondly, a long - but not high-headed type without eyebrow ridges and more rounded contour, known as the "Brown Race." At Kish, but not as far south as Ur, was a third type, the "Armenoids," with round, high head, eyebrow ridges and strong jaws. Culturally and linguistically, the division was chiefly into Sumerian and Semitic types. The contacts, ultimate fusion and great achievements of these peoples were, we believe, a fine example of the favorable influence of that hybrid vigor which has formed a main thesis of these articles.

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