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INTER-SOCIETY COLOR COUNCIL

NEWS LETTER NO. 52

MARCH, 1944

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Easton, Pennsylvania

Charles Bittinger, Editor for Art
C. E. Foss, Editor for Industry
D. B. Judd, Editor for Science

1943 REPORT

Each year the retiring chairman of the ISCC submits a report which chairmen of member-body delegates are invited to incorporate in reports that they are requested to make each year to their member associations regarding Council activities. Dr. Judd's report of 1943 activities follows:

The year 1943 marked the return of the Council's annual meeting to an association with the winter meeting of the Optical Society of America. As in former years this association proved to be most happy. The subject of the Technical Session, which was formally arranged by the Council for the OSA program, was Color Blindness and Color Blindness Tests. The majority of the papers of this session have been published in the Journal of the Optical Society, and it is anticipated that they will be put under a single cover and mailed to Council delegates and members within a few weeks.

Our Discussion Session last year was marked by a very lively exchange of views on Color Harmony with delegates of the American Artists Professional League presenting most ably the artists' view. This continued willingness of the artist to exchange views is most gratifying and valuable; and it is to be hoped that we will hear more from them this year through their chairman, Mr. Conrow, who this year becomes a member of our Executive Committee.

Our News Letter Editor, Dr. Godlove, has continued to improve our bi-monthly periodical, and as usual, deserves our best thanks for a good job well done under considerable time pressure. He has been materially assisted by our Secretary, Miss Nickerson.

Committee work has necessarily been limited to projects useful to the war effort. The Color Aptitude Test Committee has completed its study of the preliminary material, and has written the specifications for a new and improved test under the co-chairmanship of Mr. Foss and Dr. Dimmick. A committee on ways and means to produce a supply of material adequate for trials of the new test has actually produced this material. This committee consisted of Messrs. Foss, Granville, and Macbeth. A very convincing vote of confidence in the Council's color-aptitude-test work was received from Cheney Brothers and took the form of a check for a substantial sum toward reimbursing members of the committee for their expenses in development of the test.

The subcommittee on color blindness has extended its interests to include not only the single-judgment form of red-green discrimination tests requested by the Navy Department, but also an anomaloscope form of test and a form of pseudo-isochromatic charts which it is believed can be made cheat-proof.

Finally, some much-needed technical work relating to the specification of color tolerances has been encouraged by the chairman of our program committee, Miss Nickerson, who arranged the 1944 discussion session co-sponsored by two of our member bodies, The American Association of Textile Chemists & Colorists and the Federation of Paint and Varnish Production Clubs.

NEW INDIVIDUAL MEMBERS

We welcome to the Council three new individual members: Dorothy Dalton Richmond, who is associated with Walter Granville at the Research Laboratories of the Interchemical Corporation, particularly interested in spectrophotometric problems; Lucille Knoche, color technician at Montgomery Ward, a member of the Chicago local color group, interested in industrial applications of color, particularly in relation to control in color of problems for a large mail-order house, including color programs for merchandising, color nomenclature, co-ordination, photography and reproduction; and Frank J. O'Neill of Pacific Mills (Lawrence, Mass.), interested in color problems relating to textiles, particularly in spectrophotometric and physical problems, and a member of both the AATCC and the OSA.

COLOR NOTES

Noting the frequency of women among our new members prompts us to record one of the first known uses of rouge on the human body. It was that on the "Red Lady of Pavilon" discovered in 1822 in Paviland Cave, South Wales, which dates to Aurignacian times. The only error in the record was that the "lady" later proved to be a man. It reminds us of the time of the first discovery of Peking Man. A famous French savant went out to China and was feted. He asked: "Well, what's the latest from the front? Is the tooth that of a man or a carnivore?" At once the discoverer, Davidson Black replied: "About half-way between. She is a lady."

RECENT MEETING

The Annual Meeting of the Council was held at the Pennsylvania Hotel on March 1. It opened with a discussion session on Small Color Differences, at which prepared discussion relating to textile and paint problems and a summary of information dealing with the expression of small color differences was followed by discussion by delegates of several member-bodies, the AATCC, the FPVPC, the IES and the Amer. Ceram. Soc., after which the meeting was opened for general discussion. The session was co-sponsored by the American Association of Textile Chemists and Colorists and the Federation of Paint and Varnish Production Clubs, two of the Council member-bodies much concerned with procurement problems that involve small color differences. Through the cooperation of the AATCC and Mr. N. A. Johnson, editor of the American Dyestuff Reporter, a stenographic report of this meeting was taken and will be published. The Executive Committee has authorized the purchase of reprints for distribution to all Council delegates and members. Minutes of the annual business meeting will be mailed to delegates and members within a few weeks.

The meetings were well attended, there being 18 out of a possible 42 voting delegates present at the business session, 35 other delegates and members present at some time during the meetings and 35 registered guests. Only one member-body failed to have a representative present.

MILEAGE AWARD

If we had a mileage award for the individual who travelled the greatest distance to attend an ISCC meeting, this year it would have gone to Albert H. King of the Art Center School in Los Angeles, California. Mr. King has been an individual member since 1941; and it was a real pleasure for many delegates and members to meet him and see exhibits of some of the

color work he has been doing. There were also other members who came from a considerable distance. Mr. C. R. Conquergood, individual member since 1933, came from Toronto, and Egbert Jacobson, member since early 1940, came from Chicago.

EARLY INDIVIDUAL MEMBERS

In looking up the date when Mr. Conquergood's membership in the Council began, we were reminded that individuals who associated themselves with the Council in the early days before the present Articles of Organization and Procedure were adopted, were known as "cooperating associates." Perhaps it would interest some of our readers to know the names of those associates and the dates of their admission to the Council. Those who are still associated with the Council include:

Dorothy Nickerson	March 22, 1932
M. G. Mellon	December 9, 1932
Chas. R. Conquergood	February 14, 1933
Faber Birren	March 3, 1933
Diamond Decorative Leaf Co.	March 20, 1933
Proctor & Gamble Co.	June 15, 1933
LeGrand H. Hardy	November 2, 1933
Vincent C. Vesce	January 10, 1934
Elizabeth Burris-Meyer	January 12, 1934
Walter C. Granville	June 9, 1934

WASHINGTON AND BALTIMORE COLORISTS

Two meetings of this group are scheduled for the remainder of the season, one for dinner at 6:30 on Monday, March 27 at the Y.W.C.A., 614 E. Street, N. W., the other for dinner on Monday, May 15, at the Fairfax Hotel, 2100 Massachusetts Avenue, Washington. On March 27 the discussion will concern "pH" in relation to color; one talk will be by Dr. Walter J. Hamer on the application of pH measurement to textiles, paper, leather, chemical solutions, paints, biological solutions, etc.; and another talk by Mrs. Elizabeth E. Sager on the use of the Beckman spectrophotometer in some of these applications. On May 15 a Birdseye dinner will be served and Mr. Howard R. Smith, Research Laboratory of the National Canners Association and member of the color group, will talk on Color in Foods.

Any Council member who is interested is welcome at either of these meetings. Reservations may be made through Mr. Harry J. Keegan, National Bureau of Standards, chairman of the program committee.

COMMITTEES FOR 1944-45

All council committees die with the retirement of the Chairman who appoints them. This year therefore all ISCC committees are newly established. The following list of appointments, submitted by Dr. Zigler to the Executive Committee, has been approved. If your name appears on this list, please take it as your notice of appointment.

Finance Committee. Norman Macbeth, Chairman
Margaret Hayden Rorke M. Rea Paul

News Letter Committee. I. H. Godlove, Chairman
Carl E. Foss Charles Bittinger
H. P. Gage Deane B. Judd
Faber Birren Dorothy Nickerson

Membership Committee. Carl E. Foss, Chairman

(Since duties of the membership committee are confined to the search for new member-bodies, the members of the Executive Committee - the four officers and three counsellors - constitute the members of the membership committee)

Problems Committee. M. J. Zigler, Acting Chairman

Subcommittee on Problem 10, Color-aptitude Test.

Forrest L. Dimmick and Carl E. Foss, Co-chairmen

I. A. Balinkin	Deane B. Judd	J. H. Parsons
C. Z. Draves	Norman Macbeth	A. H. Taylor
J. P. Guilford	Elsie Murray	Louise Sloan Rowland
LeGrand Hardy	Dorothy Nickerson	M. J. Zigler
Harry Helson		

Subcommittee on Problem 11, Color Blindness

Deane B. Judd and Le Grand H. Hardy, Co-chairmen

Forrest L. Dimmick	Elsie Murray
Dean Farnsworth	Dorothy Nickerson
Carl E. Foss	Gertrude Rand
Walter Granville	Louise Sloan Rowland

Subcommittee on Problem 11, Policy regarding Color-blind Test

Le Grand H. Hardy, Chairman

Forrest L. Dimmick Carl E. Foss Deane B. Judd

Army Air Corps representative, Col. L. E. Griffis

Navy, Surgeon General's Office representative, Lt. A. P. Webster

C. A. A. representative, Dr. A. J. Herbolsheimer

Subcommittee on Problem 6, Color Terms

Sidney M. Newhall, Chairman

(Representatives to be appointed from each member-body concerned).

MR. CONROW HONORED

The following item is taken from the American Artists Professional League pages of the Art Digest, January 15, 1944. We take pleasure in adding that Mr. Conrow this year becomes a member of the ISCC Executive Committee. We may add that further biographical data about Major Conrow may be found in the publication mentioned in the next section.

The Board of the League takes personal pride in an honor which has just been conferred on its distinguished member and Secretary Wilford S. Conrow, and because of his absence on a commission in Atlanta, makes so bold as to publish it.

The annual report of the proceedings of the Scientific Section of the National Paint, Varnish and Lacquer Association, Inc., which is the endowed Pure Science Research laboratories that serves the industry in America, is dedicated for the first time to one outside its official personnel. This dedication, with his portrait, is to Major Conrow. Its citation reads:

"To Wilford S. Conrow,

Secretary of the American Artists Professional League Who in our laboratories studied the use of Many Filters for the Selection of Pigments having infrared Reflecting or Absorbing Properties, and Who as an Officer in World War I Utilized such Products in Camouflage Paints in France."

The League joins in this merited recognition. Mr. Conrow's long and unselfish work to achieve brilliant and permanent colors for the artists of America is too well known to need reciting here, but this should be added to his other achievements in the world of color.

WHO'S WHO (IN COLOR) IN THE EAST

Biographical data concerning the following persons in the color field may be found in "Who's Who in the East," the first volume (1942-3) of which was recently published by Larkin, Roosevelt & Larkin, Ltd., Boston. The states covered are the New England states, New York, Pennsylvania, New Jersey, Maryland and Delaware. We include all names found here and in the ISCC delegate-and-member list and its "Who's Who in Color" as well as a few who have written on color or are well known for other reasons.

F. G. Ackerson	A. Ames Jr.	W. D. Appel
J. W. Ayers	Comdr. C. Bittinger	E. M. Blake
F. G. Brickwedde	Mrs. Elizabeth Burris-Meyer	W. S. Calcott
Mrs. Marie S. Carrington	Mrs. Janet H. Clark	T. M. Cleland
W. W. Coblentz	W. S. Conrow	E. C. Crittenden
W. J. Crozier	S. R. Detwiler	C. E. Ferree (deceased)
P. D. Foote	N. Bel Geddes	R. C. Gibbs
I. H. Godlove	Mrs. Mary E. H. Greenewalt	P. C. Goldmark
Selig Hecht	E. O. Hulburt	T. F. Karwoski
H. L. Logan	S. H. Kress	R. G. Macdonald
L. D. Mannes	Mabel F. Martin	C. E. K. Mees
Walter Miles	Elsie Murray	Dorothy Nickerson
Mrs. Ethel Paxon	A. U. Pope	Gertrude Rand
Joseph Razek	J. J. Rorimer	Campbell Robertson
R. E. Rose	H. S. Saint-Gaudens	A. Taub
W. F. Talbot	L. B. Tuckerman	A. G. Worthing
J. Scott Williams	V. K. Zworykin	

While we have included in this list taken from the book a great art collector, an inventor of the Kodachrome process, a color-editor, an inventress of a color-organ and a professor of art, only two or three artists among the many included have been listed. Noting the number of women in this list, we recall the remark of Goldsmith (She Stoops to Conquer, Act III): "They say that women and music should never be dated." He said nothing about that other stimulant, coffee.

SO SAID THE PAINTERS

An artist's career always begins tomorrow (Whistler). Nothing so resembles a daub as a masterpiece (Gauguin). Lord, grant that I may always desire more than I can accomplish (Michelangelo). Only God Almighty makes painters (Sir Godfrey Kneller). A room hung with pictures is a room hung with thoughts (Sir Joshua Reynolds). Every time I paint a portrait I lose a friend (Sargent). Good painting is like good cooking; it can be tasted but not explained (Vlaminck). Criticism comes easier than craftsmanship (Zeuxis, 5th century B. C.) I mix them with my brains, sir (so said John Opie, when asked with what he mixed his pigments). The fellow mixes blood with his colors (said of Rubens by Guido Reni).

We add the remark of an artist in the list of the preceding section: What garlic is to salad, insanity is to art (Homer Saint-Gaudens).

BRITISH COLOUR GROUP

The fourth annual general meeting of the Physical Society Colour Group was announced for March 8, 1944, in the Physics Department of the Imperial College, London. The agenda reports four science meetings held during the past year, with attendance averaging about 40 members and visitors. One session was held jointly with the Technical Section of the Paper Makers' Association. At the close of 1943 there were 157 members, an increase of 8 during the year. Of these members, 69 were members of the Physical Society, 70 were members of other participating bodies, 15 were members of six firms subscribing for sustaining membership and 3 were other individual members.

The subcommittee on Colour Blindness in Industry is preparing a report for publication, and the subcommittee on Colour Terminology will shortly prepare its report. Mr. J. Guild is nominated for chairman during 1944-45, and Dr. W. D. Wright as honorary secretary.

COLOR TERMINOLOGY

We have received from Lieutenant Dean Farnsworth a letter, dated March 13, covering two subjects in two parts which we accordingly reproduce in two sections. Lt. Farnsworth's communications are always interesting; and we hope to receive more of them. About the first subject he says:

The study of color vision is overburdened with a nomenclature which is cumbersome and misleading. For example, when I want to speak of "the red-blind class of anomaly," I must say "protanopes and protanomalous individuals," whereas I should be able to have one short term to express the one class of confusions. There is not even a noun to describe the anomalous individual in a given class. Therefore, I once proposed informally to Dr. Judd that we arbitrarily choose a name which means red-blue-green blind etc. confusers, of whatever degree. I proposed "deuters," "proters," "tritans," etc., as new terms which would be designed to have no historical connotations. For etymological reasons he countered with "deuteran," etc. I have a letter from Dr. Hecht which suggests "deuteronome," "protanome," and "tritanome," but he would retain "protanope," etc., for dichromats. This is only one step of benefit, because I would still have to use "protanome and protanopes" instead of one single term for red-bluegreen confusers. The only way I know to make any progress in this is to throw it at the News Letter, and let it be thrashed out in public.

TWO NEEDS OF 1922 (VIEWED IN 1944)

Lt. Farnsworth's letter continues as follows: In looking over Troland's milestone of 1922, "The Present Status of Visual Science," I was struck with the fact that he found two great needs in the science of color as then constituted. I also find that one of these great needs has been met through the successful operation of the Inter-Society Color Council and the other by the News Letter. I suggest that on some anniversary of the Council you bring it to our attention. We quote from pages 9 and 10 of his paper, published in the Bulletin of the National Research Council, vol. 5, part 2, Dec. 1922,

"The field of visual research is certainly one which is ripe for coordination of ideas and investigations. Unlike the case in some other departments of science, our visual conceptions and theories are sufficiently well formed to make possible a semi-coherent view of the whole field of investigation, and yet at the same time are sufficiently vague and inconsistent to permit unguided individual minds to go sadly astray." -- met by the I-S.C.C., says Farnsworth.

"Another factor which is concerned in the relatively slow progress which has been

made by visual optics, is apparent in the diffuseness of the literature dealing with this subject. One hundred and eighty-eight articles published in 1920 dealing with vision were distributed in fifty-eight different periodicals. These periodicals belonged to such diverse fields as: Physics, physiology, biology, psychology, ophthalmology, zoology, engineering, pathology, surgery, philosophy and general optics. That the acquaintance of specialists in each of these several fields is in general limited to publications in their own journals is indicated by the fact that the various reviews of visual literatures which are published annually appear to cover little beyond the journals belonging in the reviewer's own natural fields, the selection of articles thus obtained being practically always a small fraction of the total." -- met by the News Letter bibliography, says our correspondent.

LOVIBOND DATA

In reply to a recent letter, Mr. G. S. Fawcett, Managing Director of Tintometer, Ltd., at Milford, Salisbury, England, indicates that while export of their apparatus is at present subject to control and restriction, and therefore not available for U. S. purchase at present, they have made available graphs of the Lovibond-Schofield system for Illuminant C on sheets 24" x 12", at £ 3.3.0 d per pair, plus 20%, postage and packing extra. They also include the following references to the Lovibond-Schofield system:

R. K. Schofield; J. Sci. Instr. 16, 74-80 (1939); the Lovibond-Schofield system of colorimetry.

G. S. Fawcett & Hewitt; J. Soc. Chem. Ind. 58, 342 (1939); a means of measuring turbidity and fluorescence

R. K. Schofield; Paint Technology 5, 117 (1940); the specification of colour

(Other references can be furnished, if desired. - Ed. note)

We are glad to have this information from Mr. Fawcett and to share it with other Council delegates and members.

COLOR EYE-Q

Recently received is an advertising folder for 100 copies of the "Color Eye-Q" to be printed under the title of "Color Analysis and Coordination," a limited edition (8 3/4 x 12") for educators now in preparation, at $5.00 per copy. The notice came from G. E. Ivan, Art Department of Kilgore College, Kilgore, Texas, and states that there will be 112 removable test strips, 30 skin colors, 36 hair colors, 46 eye colors, to analyze the colors of your skin, hair and eyes, respectively; and 100 color chips of fabric and cosmetic colors. It further states that the "Color Eye-Q" has been designed to furnish the art educator with an opening wedge to awaken the interest of the student in developing color sensitiveness, and the author believes that in natural course this will lead to art appreciation. We know nothing of this project other than the information of this notice, but pass it along as a matter of interest.

NOTE ON EYES

A gray eye is a sly eye
  And roguish is a brown one;
Turn full upon me thy eye, --
  Ah, how its wavelets drown one!
A blue eye is a true eye;
  Mysterious is a dark one,
Which flashes like a spark-sun!
  A black eye is the best one.

(W. R. Alger; Oriental Poetry; Mirtsa Schaffy on Eyes.)

ASTM COLOR STANDARD

The American Society for Testing Materials has issued (August 24, 1943) an Emergency Method of Test for Color of U. S. Army Motor Fuel (All-Purpose) by means of an A.S.T.M. Color Standard. The standard consists of an aqueous solution of inorganic salts in a 4-oz. sample bottle and is intended to permit a rapid test of whether a motor fuel conforms to the color requirement prescribed in Motor Fuel (All-Purpose) U. S. Army Specification No. 2-103. The luminous transmission and chromaticity coordinates (x,y,z) for I.C.I. Standard Illuminant C are specified. Both standard and description of the method (ES-32) may be procured from the Society Headquarters, 260 S. Broad St., Philadelphia, Pa. A charge of 85¢ is made for the standard.

PAINT-COLOR TERMINOLOGY

In a paper by E. R. Wells, "Colour control in paint works, J. Oil & Colour Chem. Assoc. 26, 169-84 (1943), the author suggests the following terminology for the description of composite changes of the other attributes in colors of a single hue. The eight terms are shown graphically at the termini of arrows pointing in eight directions from the point representing the given color, which is shown on a triangle whose corners are "white," "black," and "colour." In this way the following definitions are implied; but they are also stated explicitly in the following terms:

Term	Definition
Whiter:	of higher brightness and lower saturation
Lighter:	of higher brightness
Cleaner:	of higher brightness and saturation
Richer:	of higher saturation
Stronger:	of higher saturation
Fuller:	of higher saturation
Purer:	of higher saturation
Deeper:	of high* saturation and lower brightness
Darker:	of lower brightness
Dirtier:	of lower brightness and saturation
Duller:	of lower brightness and saturation
Greyer:	of lower saturation
Weaker:	of lower saturation

*Probably "high" is a misprint for "higher"

DISTRIBUTION OF 1943 MATERIAL

It has been our custom to report annually on the progress of the News Letter, including some simple statistics. During 1943, in spite of the press of wartime activities, six numbers were issued as in several recent years; and these appeared very nearly on regular schedule. Of the total of 82 pages of single-spaced typing, the distribution was as follows:

Strictly "news"	26.5 %
Bibliography	23.3
"Feature" articles	4.8
Reviews of current literature	32.2
Verses and humorous color notes	0.5
History of color	11.6
Index	1.2
	100.1 %

The chief changes from 1942 were the jump in the percentage of reviews from 8% to 32%, a change we predicted or promised in the last annual meeting; also the introduction of the serial "History of Color." If the latter be included with the other "feature" articles, it leaves the total percentage of these nearly unchanged at 15-16 %. Bibliography has dropped, as might be expected, from about one-third of the total to less than one-fourth.

The only change from the 1943 program now contemplated, subject to your approval, was indicated in the preceding (January, 1944) issue. In this number, we attempted to relieve the weightier and more drab material with accents of lighter and more colorful notes in verse and prose quoted from the literature; following the implied advice of Montaigne, if this section was nonsense, it was not solemn nonsense. We would be glad to know whether you would like us to be more solemn about our news editing. (We may say that, for certain reasons, there was more gayety in the last issue than we now plan for the future.)

INTERACTION OF DYES IN SOLUTION

A paper of considerable interest both in the spectrophotometry of dyestuffs and in the art of dyeing was very recently received in this country; it is "The absorption by cellulose of mixtures of direct-cotton dyes." by S. M. Neale and W. A. Stringfellow (J. Soc. Dyers Col. 59, 241-5; Nov. 1943). It has been almost universally assumed, when dyes of similar type are mixed in dilute solution, that there is no interaction and consequently that the absorption spectra are additive. The use of the spectrophotometer for analysis of such mixtures depends upon this assumption.

The authors find that in a number of mixtures of direct-cotton dyes, the spectra are not additive, with obvious interaction being indicated. In general, the component absorbing a shorter wave-length shows an enhanced light absorption in the mixture, while absorption at the longer-wave absorption-peak is decreased and the peak shifted toward still longer wave-lengths.

The bearing of these results not only on analysis (as mentioned above) but on "dyeing to shade" by formula, and on the "levelness" of mixture dyeings will be at once obvious to most of our readers. Hence the findings are of greatest practical importance. Dyers try to use in mixtures dyes which "exhaust" onto the yarn at about the same rate, otherwise the color of the dyeing will vary with time of dyeing. Obviously, if there is interaction, studies of individual dyeing rates may have no meaning when several components are mixed. The authors find that if the aqueous solvent includes 25 percent of pyridine, the interaction is prevented. Doubtless other solvents, especially those of lower dielectric constant than water, will also prevent the interaction.

The authors suggest that the molecules of two different dyes in mixed solution are at least partially associated together, probably through the operation of resonance bonds or "residual-valency" forces similar to those which they believe responsible for anchoring the dye on the hydroxyl groups of cellulose. The electronic oscillation is then able to extend across the adjacent co-resonant molecules, so that frequency of vibration is decreased, and consequently the absorption is at longer wave-lengths. As a matter of fact, the mixtures show depressed absorption on cellulose below what may be expected of the individual components; and this seems to be clearly due to mutual saturation of "residual-valency" forces by the dyes before interaction with cotton cellulose can occur. Measurements of rate of diffusion of mixed dyes through membranes also indicate the presence of larger molecules. It is found that the fractional depression of the rate of absorption of a given component and the relative

absorption of two components is not greatly affected even by large variations in the concentration of added salt. It is the sensitivity to salt which distinguishes a cotton dye from a wool dye. In general, the molecules of the latter are completely or nearly dispersed in hot solutions even in the presence of salt, while those of the former are aggregated by salt to larger particles which tend to be broken down by boiling the solution.

Certain considerations not discussed by the authors make it probable that in general more interaction should be expected of green and blue dyes than of red, orange and yellow dyes. According to the theory of London (1930), the type of interaction here involved is due to the so-called "van der Waals" or cohesional forces, which are universal and additive in nature, unlike the stronger electrical forces. According to London, those properties which make a substance strongly colored are exactly those which should also cause aggregation. For the mutual potential energy of two identical molecules (or ions) possessing a single long-wave electronic absorption band of wavelength λ, is approximately equal to $f^2 \lambda^3$, where f is a measure of excitation probability (so-called "oscillator strength" or "number of absorption electrons"). Large values of λ and f make a dye strongly colored, the latter introducing "depth" in the way we have discussed in earlier issues of this News Letter. Since λ enters as the third power, it is obvious that in general the attractive forces between ions of blue-greens, absorbing at 650 mu, will be much greater than those between yellows absorbing at 425 mu. Least interaction and least aggregation should be expected of colorless molecules (in the case of those with structures like the dyes.) In fact Valko (1941) found that the colorless leuco-derivatives of certain vat dyes averaged only 3 dye ions per particles or dye micelle, whereas the particles of suspensions of the vat dyes themselves contained several million dye molecules. In the literature there is recorded much general evidence of the same nature which appears to hang together very well when interpreted in terms of the theory of London and the ideas of the present authors.

TCCA OF US ACTIVITIES

At the request of the Quartermaster General of the U.S. Army, the Textile Color Card Association has issued a supplement to the U. S. Army Color Card showing the Official Colors for Arms and Services, originally brought out by the Association in 1930. This supplement portrays three new officially adopted colors: U.S. Army Brick Red, authorized for the Transportation Corps; U.S. Army Mosstone, adopted for the Women's Army Corps; U.S. Army Golden Yellow, and U.S. Army Old Gold. These colors, together with the 19 shown in the original card, exemplify colors for 28 Arms and Services, and comprise the official colors used for various purposes of identification on uniforms and equipment, as shoulder sleeve insignia and corded braids on garrison caps. The Quartermaster General's office has distributed a large number of the Army Color Cards and Supplement to its various depots throughout the country. According to Mrs. Margaret Hayden Rorke, Managing Director of the Association, firms making Army clothing and equipment also make wide use of the cards, and may secure them from the Association at 200 Madison Avenue, New York 16, N. Y.

The Association has also recently announced three new 1944 Fall Colors for Men's Felt Hat Bodies. The number of colors has been limited to three as a wartime conservation measure. The colors have been chosen for their fashion value and for their adaptability for dyeing on fur felt stock and wool felt stock. The colors, which include Hickory Brown, a "clear medium tone," Poplar Green, a rich deep green, and Blue Ash, a "soft grayed blue," are as usual shown in large swatches of fur felt, with samples of the matching hat band. Leading firms in the industry, represented in the Association's committee, cooperated in the selection of the colors.

NEW AFTER-IMAGE STUDY TECHNIQUE

We have received reprint of a paper by T. F. Karwoski and W. B. Perry (J. Genl. Psychol. 29, 63-85; 1943) which opens up new possibilities for research in afterimages. These depend upon the peculiar afterimage effects obtained by the use of a long narrow slit stimulus in motion. The long slit cuts across retinal sensitivity gradients and the movement spreads out the afterimages in space, making it possible to measure the interval between stimulus and afterimage. The moving stimulus also seems to reveal processes of interaction in afterimages which are too fleeting to be detected with stationary stimulation. Differences between the effects with long and with short slits are mentioned below.

Three experienced observers reported the appearance of the first (Hering) and second (Purkinje) afterimages as the white-light image of a 3 x 300 mm. slit moved across the fixation point on a 500 x 400 mm. white gloss screen in a black-velvet-lined dark room. Immediately after light-adaptation all lights were extinguished but the stimulus light, which moved at the rate of 1 cm. in .038 sec. Observers see the moving slit followed by two afterimages. Both show a peculiarity in that they bulge laterally near the fixation point, which is a 1 mm. point of light; the first is not very pronounced, but the Purkinje afterimage, following the slit by a considerable distance, is very conspicuous and is bluish. It appears to be seen wherever there exists a sensitivity gradient from center to periphery of the retina while the retina is becoming dark-adapted. The purpose of the article is to explain the bulge. The size of the bulge is about $3^{\circ}16'$ vertically and somewhat less horizontally. Since this is about the size of the relatively rod-free area, the inference was that the bulge represents the relatively longer lag of the afterimage due to the sensitivity decrement in the central part of the retina. Three sets of experiments were performed to determine the cause of the afterimage latency. From the equality of the intensity-retinal angle curves for the bulge for pre-light adapted and for pre-dark adapted eyes, the authors reason that the law of constancy $IA = C$ holds, where I is intensity, A is time of dark adaptation and C is a constant.

In addition to the rod-cone gradient the authors believe that certain complicated factors play a role in the bulge formation. These introduce interaction effects between retinal areas with the result that the specific rod-cone responses are modified or masked. The authors also suggest the possibility of Gestaltian factors. With moderate dark-adaptation the afterimage is bluish and purplish in hue regardless of the wavelength and intensity of the stimulus; with short slits brightness and hue are more definitely determined by the stimulus. Afterimages of short slits are typically sensory; with long slits there is a larger measure of perceptual elaboration. Finally, since the bulge is not seen by some people, the authors suggest the feasibility of using the afterimage bulge as a quick test of foveal night vision. The title of this interesting paper is: Studies in the peripheral retina: III, the Purkinje afterimage bulge.

OUTLINE HISTORY OF COLOR (CONT.)

1350 B.C. The Hittites, without flat painting, left reliefs painted in color.

1250 B.C. Pictures in the tomb of Egyptian Queen Nefertari show modelling by shading. Some Assyrian wall paintings, though not common, were executed in red, blue, white and black; glazed bricks were used in many colors.

1000 B.C.(?) The Phoenicians, at the time when David was King of the Jews, used red, blue, black and white in painting.

875 B. C. Assyrian painted reliefs were in red, black and ocher yellow; frescoes and stucco paintings were executed in the palace at Nimrud; bricks were glazed in ultramarine blue, red, yellow, brown, black and white.

720 B. C. The ziggurat ("Tower of Babel") at Khorsabad had the stories painted successively white, black, red and blue; there were glazed bricks of yellow and creamy white on sky blue ground; Assyrian relief successfully combined figures with landscape.

7th cent. B.C. Around the eastern end of the Mediterranean Sea, painting flourished. Painting with color was said in Greek legend to have been "invented" by Ekphantos of Corinth; Eucheir, legendary relative of Daedalus, was credited by Aristotle with the invention of painting; Boutades of Corinth painted temple metopes; the "monochrome painters" (of outline drawings in flat color) flourished; Philokles, an Egyptian; Kleanthes of Corinth; Kraton of Sikyon; Aridikes of Corinth; Telephanes of Sikyon. Etruscan tomb paintings were in red, yellow and black on a white ground. Contrasting colors, as red on yellow, were much used; or one leg of an animal was red, another yellow.

600 B.C. The walls on the "Procession Street" of Babylon were covered with richly colored glazed tiles; the city gate was richly enameled; tiles from the palace were yellow, blue, white and black. Green was rare; blue was used for backgrounds.

7th-6th cent. B.C. Timonidas signed a colored terra-cotta votive plaque.

Early 6th cent. B.C. Eumaros of Athens was said to have been the first to distinguish the sexes by color.

550 B.C. "Black-figured" vases were signed by Klitias, Exekias and Amasis and other painters.

c. 540 B.C. Pythagoras; see News Letter No. 48 (July 1943)

520 B.C. The "red-figured" Greek vase painters, Kimon of Kleonai, Epiktetos and Nikosthenes flourished.

510-480 B.C. The "Big Four" red-figured-vase painters (Euphroniis, Douris, Hieron and Brygos) flourished.

500 B.C. (?) The enameled "Archers' Frieze" from the throne room of Persian Darius I, showed black and white archers with garments of citron-yellow and purple or white and purple on a turquoise-blue ground with a yellow and white decorative frieze; orange and brown was also used, but no red. Oriental fabulous monsters were shown in various colors.

6th to 2nd cent. B.C. Etruscan tomb fresco paintings at Corneto, richly and gayly painted in red, blue, yellow and black. Plaques were in purplish red, brown, black and creamy white. Love of realism and nature were combined with conventional colors, as a blue horse with red tail and mane. Sarcophagi were in brownish red, yellow, blue, black, white, green and lavender, vividly painted.

----? Alcmaeon of Crotona; see News Letter No. 48 (July 1943)

480 B.C. Etruscan tomb paintings of sporting scenes used dark silhouettes on light grounds, the colors then including some green and gray.

465 B.C. The painters Hermonax and the "Penthesileai Master" flourished.

c. 460 B.C. Polygnotos, great "four-color" painter, flourished.

450 B.C. Etruscan themes became more gloomy; the dominant color, brownish-red

440-430 B.C. Anaxagoras, Empedocles and Hippocrates; see News Letter No. 48 (July 1943)

430 B.C. The painters Agatharchos and Apollodoros flourished.

c. 424 B.C. Aristophanes in the "Clouds" mentioned the use of the burning-glass (convex lens of rock crystal) to destroy writing on a wax tablet.

400 B.C. The painters Zeusis and Parrhasios flourished; of Demokritos, see News Letter No. 48 (July 1943).

4th cent. B.C. Plato, Aristotle, Theophrastos and Apelles; see News Letter No. 48 (July 1943).

4th cent. B.C. According to H. L. Taylor (1924), a pair of round spherical lenses was found in 1902 in a sarcophagus dating to the 4th century B.C. in the ruins of Carthage.

3rd cent. B.C. Euclid, Herophilus, Strato and Erasistratus; see News Letter No. 48 (July 1943).

3rd cent. B.C. Etruscan painting declined. Archimedes (287-212 B.C.) was reputed to have used an optical device in the defense of Syracuse, a Carthaginian colony. He published a book on "a ring seen under water." Probably before then there had already been noted certain phenomena of refraction: the apparent bending of an oar at the point where it met the water, and the apparent elevation of a coin in a basin by filling the basin with water. In the Greek Classical period, buildings of the Doric and Ionian orders (rarely the Corinthian order) were polychromed. The colors were a stron blue, red, green, and some reserved white. In palaces and homes, paintings alternated with tapestries between columns. Landscape as such remained to be developed.

c. 240 B.C. Nealkes, painter of genre scenes, flourished.

3rd-2nd cent. B.C. In the Hellenistic world, schools of painting flourished at Alexandria, Pergamos and Rhodes. Alexandria developed the illusionistic (impressionistic) method and rendered contours by means of color contrast. In Italy, Roman painting followed the Hellenistic, but developed illusionism and the third dimension (depth) more. Pompeiian wall decoration developed in four styles, the first ones dominated by architectural features painted on the walls in perspective, this framework enclosing a large painting. The colors were brilliant and daring: reds, black, creamy white in borders, ocher yellow, dark copper blue, burnt ocher, rose purple, and greens. A Pompeiian fresco of a general decorating a trophy is in purple, green and a grayish blue-green. A noted painting copying a Greek original is of "Herakles and Omphale" in greenish blue, crimson and yellow. A mosaic is in green, red, brown, black, white and yellow.

c. 200 B.C. Roman paintings in the temple of Ardea were painted by the Greek Lykon.

2nd cent. B. C. Demetrios, landscape painter, flourished. The use of Tyrian purple was mentioned by Julius Pollux.

200-80 B.C. Period of the First Style of Hellenistic wall decoration.

100 B.C. Time of the famous Alexander Mosaic, from the floor of the House of the Faun, Pompeii.

80 B.C. There began the Second Style of Hellenistic wall decoration, the use of the brush to produce the illusion of buildings in perspective. In Italy, there was added on to Hellenistic painting the use of polychromy in rich red, green, light brown, black, yellow and light gray.

60-50 B.C. Lucretius and Hero; see News Letter No. 48 (July 1943).

30 B.C. The painter Timomachus flourished at Byzantium.

30-60 A.D. Celsus, Kleomedes and Pliny; see News Letter No. 48; Seneca mentioned the use by engravers of balls of rock-crystal or glass or hollow balls filled with water as lenses. He observed the analysis of white light into the continuous spectrum of rainbow colors by transmission through a prism, and regarded the colors as "fictitious," as also the iridescent appearance of the feathers on a pigeon's neck.

BIBLIOGRAPHY

W. F. Elvidge; Quart J. Pharm. Pharmacol. 15, 209-17 (1942); absorption spectrophotometry in pharmaceutical analysis, IV.

H. A. Endres; Off. Digest Fed. Paint Var. Prod. Clubs, No. 227, 202-16 (1943); optical properties of pigments in the visual and near infra-red.

C. Fader; Amer. Paint J. 26, 22 (Apr. 27); 29, 10 (Apr. 19); 31, 9 (May 3, 1943); 27, No. 35, 9 (May 31, 1943); this colorful world (notes and cartoons on interesting color uses)

D. Farnsworth; J. Opt. Soc. Amer. 33, 350 (1943); description of a subject congenitally deficient in violet-yellow vision

D. Farnsworth; J. Opt. Soc. Amer. 33, 568-78 (1943); the Farnsworth-Munsell 100-Hue and Dichotomous tests for color vision

C.E. Ferree & G. Rand; Illum. Engin. 37, 579-95 (1942); wartime and blackout lighting in relation to the eye

C. E. Ferree & G. Rand; Arch. Ophthal. (Chicago) 29, 461-78 (1943); eye as a factor in wartime lighting

A. Fiala; Text. Colorist 64, 555-6 (1942); the love of color among primitive arctic peoples (sources of dyes)

H. F. Fick & H. H. Sommer; J. Dairy Sci. 26, 591-607 (1943); factors affecting the color and clarity of casein plastics

H. Fischach & S. H. Newburger; J. Assoc. Off. Agri. Chem., Feb. 1943; spectrophotometric study of the green color in peas; in okra

W. E. Forsythe; J. Phot. Soc. Amer. 8, 374-84, 442 (1942); spectral characteristics of photographic light sources

R. M. Fridlyand; Optiko-Mekhan. Prom. 11, 14-5 (1941); Chem. Zentr. 1942, I, 2165; light filter (s) of glass for the isolation of narrow spectral regions