INTER-SOCIETY COLOR COUNCIL

NEWS LETTER NO. 37

SEPTEMBER 1941

I. H. Godlove, Editor-in-chief
P. O. Box 386, Wilmington, Del.

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

NOTICE OF NOMINATIONS

In accordance with our Articles of Organization and Procedure, nominations must be sent all voting delegates not less than 30 days prior to that date in November on which ballots are forwarded to them. This is now your notice. Your nominating committee, Wm. D. Appel, Chairman, Woldemar Weyl and R. C. Gibbs, have submitted the following ballot for Officers and Counsellors for 1942-43:

For Chairman:	Deane B. Judd (OSA)
Vice-chairman:	Walter M. Scott (AATC&C, ASTM)
Secretary:	Dorothy Nickerson (OSA, IMG)
Treasurer:	Norman Macbeth (IES)
Councellors:	Ralph M. Evans (SMPE)
	Carl E. Foss (ASTM)
	Michael J. Zigler (APA)

Additional nominations may be made at the request of 10 accredited delegates, individual members and/or sustaining members, providing nominations are forwarded to the Secretary within 20 days after publication of this notice.

SEND FOR YOUR COPY OF ASTM-ISCC SYMPOSIUM

Enclosed with the present News Letter readers will find a vivid purplish red sheet which may be used as an order blank for reports of the color symposium presented at the Spring meeting of the ASTM. These reports are published by the ASTM in a booklet of 86 pages. Council delegates and members may purchase them at the price to ASTM members: $1.00 bound in cloth, 75 cents bound in paper (non-members, 25 cents additional). This is the first time that reports of a joint symposium have not been made available without cost to our members, but since the ASTM made them available to ASTM members only by purchase, we could do no differently. Most of you will wish to have a copy of these reports, and we urge you therefore to send your order promptly to the American Society for Testing Materials, 260 South Broad Street, Philadelphia, Pa. Mention your connection with the Inter-Society Color Council if you wish copies at the price quoted.

ISCC-NBS COLOR NAMES

In the recent September issue of the Journal of the Optical Society of America, there is a paper by Nickerson and Newhall which gives in Munsell terms the central notations for the ISCC-NBS color names. Because this report so closely concerns the Council work on this problem (being based on a Council committee report) the authors have made arrangements to supply the Council with enough copies so that each delegate and member may receive one. It will be forwarded to you as soon as available.

NEW YORK COLOR ASSOCIATES FORMED

Early this summer, a number of those in New York who have been attending the meetings of the Individual Member Group of the Council met to discuss future plans. They decided that the group should continue as an independent local group; and those present, in addition to support and advice, pledged financial assistance to cover the necessary expenses. The group name is New York Color Associates. Anyone desiring to receive announcements of the meetings should address Walter C. Granville, 432 West 45th Street, New York City. No formal organization is contemplated; the existence, the spark and the vitality of the group will depend on those who come to its meetings. The first meeting will be held on the evening of Thursday, November 6, 1941, when Dr. Katherine B. Blodgett will talk on Interference Films. Other meetings will be held on the Thursday evenings of January 15, March 19 and May 14, 1942, when it will be the pleasure of the group to hear lectures by other prominent speakers.

ANNUAL MEETINGS

The I. E. S. meets September 23-25, Atlanta, Georgia; The S. M. P. E. meets October 20-23, Hotel Pennsylvania, New York City; The O. S. A. meets October 24-25, Hotel Pennsylvania, New York City.

CONFERENCE ON PROTECTIVE AND BLACKOUT LIGHTING

In June during the Convention of the American Institute of Electrical Engineers at Toronto, Canada, a conference was held on Protective and Blackout Lighting. The subjects for discussion at this conference were: "Protective Lighting Practice in the United States," by H. E. Mahan, General Electric Company, Schenectady, N. Y.; "Protective Floodlighting Equipment," by Hoyt P. Steele, Benjamin Electric Mfg. Company, Des Plaines, Ill.; "Lighting in the Blackout of Combat Areas," by F. T. Groome, Holophane Company, Inc., Toronto; "Comparative Advantages and Economics of Various Systems of Distribution for Protective Floodlighting," by J. A. Summers, General Electric Company, Nela Park, Cleveland; "The Role Protective Lighting Plays in Combating Sabotage," by E. P. Coffey, Federal Bureau of Investigation, Washington, D. C.

LIGHTING SECRETS OF "FANTASIA"

In Illuminating Engineering, June 1941, there is a brief note regarding the lighting secrets of "Fantasia." The beautiful effects which Disney obtained in his recent productions were described by William A. Garrity, chief engineer of Walt Disney Productions, at the Southern California Section of the I. E. S. held on April 22 in the Walt Disney Studios at Burbank, Cal. At this meeting the section presented Mr. Disney with a citation earned for the light effects achieved in the Nutcracker Suite of Fantasia.

COLOR EXHIBIT AT STAMP COLLECTORS' MEETING

On August 20 the Baltimore Sun carried a story on Changing Color of Stamps, with a picture of William H. Beck standing before the very considerable color exhibit which he had arranged for the convention of the American Philatelic Society. Mr. Beck, an individual Council member well known to many of us, has combined two hobbies, that of stamp collecting and experimenting with color, to try to show philatelists that they need an absolute standard for describing colors. The display prepared by him was arranged on an educational basis and consisted to a considerable extent of exhibits borrowed from several laboratories whose members are associated with the Inter-Society Color Council. The exhibit was well planned; it filled a good-sized display room just off the main ballroom where the more usual stamp exhibits of the society were on display.

COLOR AND ITS OBJECTIVE MEASUREMENT

At the Midwestern Regional Conference of the I. E. S. held at Davenport, Iowa, in May, Professor John O. Kraehenbuehl, Associate Professor of Electrical Engineering, University of Illinois, presented a paper on "Color and its Objective Measurement."

BIBLIOGRAPHY ON CAMOUFLAGE

It has come to our attention that a list of references on camouflage, a subject now of interest to many, has been published by the Library of Congress Division of Bibliography. It was compiled by Grace H. Fuller, was dated November 13, 1940, and contains 158 references.

TECHNICAL PROBLEMS OF KODACHROME EXPOSURE

Dudley Haskell has discussed the problems indicated by this title in the November and December, 1940, issues of Camera Craft. He begins by pointing out some of the difficulties that arise when one attempts to determine the exposure time required to obtain a correct rendition of all of the colors and brightnesses in a variegated scene. The ordinary exposure meter responds with the average brightness of the scene and the interpretation dials assume a "medium" reflectance of 12 percent. Consequently bright colors in dark surroundings are overexposed and dark colors in light surroundings are underexposed. Previous methods of correcting these errors are discussed. The author studied the effects of normal, over and under exposure by means of charts of the 10 principal hues from the Munsell Book of Color. The following data were recorded on the selected colors: (1) The reflection of each color sample under measured and uniform light by means of an accurate photoelectric photometer; (2) the relative reflection through red, green and blue filters, from which "color coefficients" were calculated; (3) the transmission on normally exposed Kodachrome for each of the 253 standard colors. Also the same for one stop overexposure, two stops over and one and two stops under; (4) relative transmission through red, green and blue filters, from which "color coefficients" were calculated.

In a series of figures, tables and charts the author shows the relative effects of over, normal and under exposure in terms of percent transmissions of the transparencies compared with the original percent reflection of the samples. Table IV is of particular interest because it presents the relation of the transparencies of 60 Munsell colors obtained with normal exposure, overexposure and underexposure, to the reflectances of the original samples in "trichromatic coefficients." Unfortunately, these coefficients refer to a particular set of filters designated only by the manufacturer's numbers. There is no method given by which one can make a comparison of them to the standard ICI system. The author's data would be more useful if he had converted them to the ICI trichromatic coefficients or to the Judd uniform chromaticity scales. The author also estimates by appearance the relative accuracy of rendition of the hue, value and chroma of the same 10 hues. Tables are given which show the amount of "reflection foot candles" from the various color surfaces that is necessary to produce "normal" rendition.

FATIGUE OF TRUCK DRIVERS

There has been brought to our attention Public Health Bulletin No. 265, "Fatigue and Hours of Service of Interstate Truck Drivers," prepared by a staff of experts of the Division of Industrial Hygiene of the National Institute of Health, Washington, D.C., xxiii plus 286 pages. Following a 6-page foreword and 11-page résumé, there are 5 general sections

(introduction, the field study, results of tests, the coefficient of scoring, and discussion and conclusions), 7 special sections (medical findings, psycho-motor reactions, driving and glare tests, critical fusion frequency of flicker, eye movements and related phenomena, leucocyte counts, and blood chemistry) and 2 statistical appendices. 889 truck drivers engaged in interstate commerce were examined in a total of 1200 sessions at field stations set up in 3 cities. Each was given a medical examination and as many as possible of 22 special physiological and psychological tests. The drivers as a group were in good health; but the incidence of poor eyesight, bloodshot eyes, and certain non-visual conditions was higher than usual for healthy men of the same age group. Average efficiency fell off with increase in time of driving before test as judged by 7 functions, including 4 simple performance tests and ability to distinguish flicker. Men who had driven at all performed less efficiently than those who had not driven, as judged by aiming, resistance to glare and speed of eye-movement tests; white blood cell count was also higher for the former. No trends with hours of driving were found in the estimation of size of known objects, in the visual acuity, or in certain physiological functions. A method of scoring, designed to give a composite measure of general psycho-physiological efficiency, showed that there was progressive decrease in general and functional efficiency with increasing hours of time after last sleep before driving. This interesting bulletin was prepared for the U. S. Public Health Service and may be bought for 40 cents from the Superintendant of Documents, Washington, D. C.

COMPARASCOPE FOR COLOR MATCHING

The Editor recently had an opportunity to see the "Comparascope," an instrument for color matching sold by the Graphic Arts Research Corp., 420 Lexington Ave., New York, N. Y. The instrument is essentially a 10-inch-diameter integrating sphere of aluminum, painted white inside and finished in black crackle lacquer outside. Illumination is with two Mazda lamps projecting into the lower hemisphere near the sample stage. Viewing is at 10° to normal, through a lensless tube at a distance of 12" from the viewing (sample) stage. This is a divided horizontal 3"-diameter circle, held by spring action against a 2 1/4" aperture in the bottom of the sphere. Samples up to one inch in thickness can be accommodated. The sphere is demountable and made in two parts. Specular reflection control is obtained by means of two readily interchangeable caps, forming part of the sphere wall, one with the same white lining as the rest of the sphere inner surface, the other black lined. A 7-aperture revolving filter disc permits interposition of red, green, blue, two 7500°K. and two 2360°K. color-temperature filters for modifying the illumination. The reason for two of each sort is to obtain higher (unit) and lower (half) intensities. We understand that the assortment of filters has been recently changed by eliminating the use of two intensities, and leaving one aperture without filter; and that Wratten filters have been replaced by Corning glasses. A momentary switch is provided for convenience in operation and for longer lamp life. The price quoted on the literature we received was $105. This includes carrying case, filters, special ring separator to be placed on top of wet samples, cupped containers for holding pigments, powders, cereals, etc., spring clip for holding the color standard in place when the sphere is demounted, the above-described specular-reflection control caps, and an extra set of two lamps. The name is accurately descriptive, for no scales are provided; but for qualitative comparison of various types of samples with standards, the instrument recommends itself for its simple and adaptable construction. It provides standardized viewing and illuminating conditions, and is light and portable. It is useful for examining satins and crepes, flat-pigment and gloss enameled surfaces, swatches, tiles, rub-outs of wet paints and dry chips; and the sphere can be removed from its mount and used against walls and other immovable structural objects.

THE DU PONT COLOR SELECTOR

There has come to our attention recently the Du Pont "Color Selector", a useful device for the selection of combinations and arrangements of colors for the interiors and exteriors of houses. For years houseowners, painters, decorators and architects have been handicapped by having to visualize colors for homes from small color chips. The Selector is designed to remedy this difficulty by the use of 9" x 12" hand-painted sheets. The Color Selector is divided into four parts. In the front pocket are 16 full-color pictures of rooms and houses with the wall areas transparent. These are designed to lay over a chosen color-sheet to see how the selected room or house will look when painted in the color of the selected sheet. The transparent overlays illustrate 3 living rooms, 2 dining rooms, 2 bedrooms, 3 kitchens, 2 bathrooms and 4 different house exteriors, an assortment permitting a wide variety of choices. There are 100 sheets painted with interior colors in 17 groups. The groups are: Off-white, ivory, cream, buff-tan, yellow, pink, yellow-green, green, blue-green, pastel blue, blue, light gray, gray, coral-orchid, colonial colors and regency colors; and three sheets of the same color except for differing by being glossy, semi-gloss and flat. The exterior colors are exhibited in two groups; 20 body colors and 17 trim colors. There is also a special shutter overlay which can be placed over any of the 17 trim-color sheets to see how the shutters will look on a white or buff-colored house. With the Selector, anyone can select a beautiful color for an interior from one of 1200 combinations (12 interior overlays x 100 color sheets). Obviously the user can give rein to his imagination by suggesting slight departures from the combinations shown.

1360 exterior pictures can be presented (340 combinations on 4 different houses). The method is to select a trim-color sheet from a spiral-bound group and place it beneath a chosen body-color sheet. Then the overlay most closely resembling the user's own house is placed over this group of two sheets. Besides these main features, there are a few pages giving "Some Facts about Color" and discussing "Paint Styling." In the latter section pictures of seven houses are shown in full color; these are a large cottage, a small cottage; French provincial; English half-timbered; Spanish, Italian or Mediterranean; Modern and Colonial houses. Color suggestions are given in each case for the roof, body, trim, sash, shutters and doors; and these are elaborated in 15 sections in the text. On the back of the exterior color sheets there are various suggestions for trim colors to employ as an alternative to the use of the given for both body and trim. Finally, there is included in a pocket a 60-page booklet on "How to use the Color Selector." Besides directions, this booklet lists the information the painter needs to produce the 100 interior colors in flat, semi-gloss or gloss finishes. The purposes and advantages of such an assembly may be summarized as follows: The customer is helped to choose colors more intelligently, to see in advance how the colors selected will go with his furnishings, and to learn in advance how the colors appear together in daylight and in artificial light (by viewing in these lights); while the dealer or painter is enabled to have better satisfied customers, save time and money usually wasted while the customer makes up his mind about color combinations, and make more sales. The Color Selector, issued by the Fabrics and Finishes Department of E. I. Du Pont de Nemours & Co., is a beautifully bound, loose-leaf book of hand-painted sheets.

THE PRACTICAL ART OF COLOR MATCHING

This is the title of a comprehensive set of articles by William H. Peacock appearing in Rayon Textile Monthly 21, 627-31,699-704, 760-2; 22, 36-9, 102-3 (Oct. 1940 to Feb. 1941). This series covers a variety of subjects from "mass-tone" and "bronze" to "the judging mood," and from photochemical action to eye fatigue and color memory. There are a number of figures, including an

elaborate red-yellow-blue "color-blending chart," eight tables, several spectrophotometric curves and 51 bibliographical references. The introduction states that the series is intended to help inventors, process engineers, research chemists, and students in textile and general technological schools to do their own color (dye) work. Part I deals with the "color properties of dye blends," being concerned mainly with the development of a "simple color chart," which is said to "roughly indicate the relationship of all possible colors to three primary hues...." Part II deals with the factors influencing the judging of color effects; and the 34 of these which are discussed are grouped under 22 headings. After these sections are appended three more entitled "Nomenclature," "The Judging Mood" and "The Essentials of the Art." Here we find: ".... the majority of professional colorists.... describe color with the three terms of 'shade' (as they persist in calling hue), 'tinctorial strength' and 'brightness,' and these adequately describe a color with reference to a standard." Apparently, the author does not like the replacement of the psychologist's term "hue" by "shade," though he has no qualms when he calls his three fundamental dyes (physical materials) the "three primary hues"; and he regards the colorists' usage as adequate, though they combine a physical or psycho-physical concept (strength) with two psychological ones, (shade and brightness) confusing the categories and obtaining a hybrid result. That the author is himself not free from this confusion the reviewer suspected slightly when he found the incorrect reference: "Psychophysics of Color-- by Laughlin & Godlove" instead of "Psychology of Color-- by Godlove & Laughlin," in the section on color memory. On reading Mr. Peacock's section, the reviewer was chagrined at his own apparent failure to make clear the interesting phenomena of color constancy even with the aid of Dr. Laughlin's excellent demonstrations. The suspicion was confirmed by: "Experience has shown also that if a colorist looks too long at dyeings closely similar in hue, he will find himself less and less able to perceive minute color differences between them." In the reviewer's experience, this is the opposite of the truth, an experience confirmed by Dr. Deane B. Judd, who has done much experimental work in this field. Some further confusion is found in the paragraph of the nomenclature section beginning: "Some other colorists regard grays as distinct among hues ..." Here the ISCC-NBS system of color names is recommended; but one of the three references is incorrect. It should be put later, where the number of colors discernible by trained colorists is the estimate of Archibald (1940), obtained on somewhat dubious grounds, rather than the estimate of Judd.

On the other hand, one finds some evidences that Peacock is an observing worker. One can agree with his remark (Sect. 4) that "lack of intensity is still one of the chief defects of the modern standardized light sources for visual color matching"; with his suggestion (Sect. 5) that more light energy be used for such materials as gloss lacquers, all black plastics and most cylindrical gloss black fabrics, leather and paper, by examining them in the direct rays of the sun, and his recommendation to the colorist to dress in neutral (unhued) clothing. In section 6, attention is correctly called to the difficulty of "trying to judge bright hues (colors) immediately after viewing a series of dark colors, or vice versa." But we are surprised to find (Sect. 2) that reliable dyestuff producers prefer to use only sunlight; and (Sect. 3) that "Southern windows also should be available to permit the viewing of colors in direct sunlight on occasion." Of course if one is certain that the sample has a spectral character the same as that of the standard (the lot is "unshaded"), a source yellower than daylight may be used if greater intensity is necessary. We do not find it profitable to say: "The so-called colored shadows are.... illusionary phenomena"; to us such phenomena seem capable of understanding without invoking such knowledge-opacifiers as "illusions." Nor are we much enlightened by such discussions as "Illusions when two primary colors are viewed together" in the section (7) entitled "Sensations (perceptions would be better--Ed.) produced by viewing colors in juxtaposition."

The facts given in Table VII for 16 color pairs might be allowed with profit to speak for themselves. We find in the text, for example, that if a red and a blue are viewed together, the red will seem yellower and the blue greener. This effect is explained as as if the red and blue "primaries" each have added to them some of the third ("other") primary. While this does describe the hue changes, it is a very incomplete description. Table VII is more complete, but again attempts description with a hybrid system, two psychological and one physical or psychophysical attributes. Our substitution of "third" for "other" three sentences back illustrates what is to us the author's ambiguity or error of statement. Other examples are: "infra-red and other short-wave radiation" (Sect. 14), "short-wave, heat-forming radiations" (Sect. 18), and the statement that "depth of hue, or the tinctorial strength and the numerous dichromatic changes are directly proportional to the thickness of the film deposited or solution used" (italics ours). Rood and Munsell used much better devices to explain simultaneous contrast; and Luckiesh is more successful in explaining dichroism. In the sections on dichroism and film thickness, the author might well have referred his readers to Ostwald's "Colour Science" or to Merwin (1917) for color changes with thickness of layer or particle size; and the section on "degree of dispersion" gives neither direct enlightenment nor these literature references. Incidentally, these closely related sections have serial numbers 9, 20 and 18, respectively, with such things as top-tone, fluorescence, pH, photolysis, and latent solubility sandwiched between; thus is illustrated lack of logical progression in the scheme of arrangement.

It is most regretable that Peacock chose to perpetuate the Brewster-Chevreul red-yellow-blue-primary theory among the practical men he is trying to help. It is particularly unfortunate that he leads them from primary through secondary to "major tertiary" colors, implying such monstrosities as "minor tertiaries." The proportions for Blue Black are given as 31.25 red, 31.25 yellow and 37.50 blue, or 93.75 neutral black and 6.25 blue. We looked in vain for the careful definition of the three primary dyes and conditions for their mixing which might justify the implied precision of statement to hundredths of a percent. For there are reds and reds, and precision to tenths or even whole percents would require not only the statement of the name of the red and its manufacturer, but also the lot number, the barrel number and the position in the barrel if it has been opened much. The errors of the Brewster theory have been pointed out too long ago and too often (by Rood, 1879; Church, 1887; Munsell, 1905) to need repetition here. We ought not to go so far as the following statement on page 33 of "Ink Secrets for Pressmen" (Ruxton Div. of International Printing Ink Corp., 1928): "When you see an article that starts out that way (there are three primary colors, Red, Yellow and Blue; secondaries, Orange, Green and Purple) you may rest assured that whoever wrote it has never done any laboratory work with color and has gotten most of his or her inspiration from an old article in an encyclopaedia, as both of the above statements are absolutely incorrect, if we treat the red, yellow and blue as representing hues which are commonly applied to these colors." There we are told (p. 35) that the pigment primaries as applied to process printing are really red-purple (magenta), yellow and blue-green. The proponents of the red-yellow-blue theory are wont to say that red, green and blue-violet may be all right as primary lights for the physicist, but that colorists, being practical men, must use red, yellow and blue pigments. Are we now to assume that the latter must be used by dyers, while other primary pigments (made from dyes) must be used by practical printers? To believe this is to deny a great mass of very practical experience with the light transmission and reflection of dyes and pigments.

In section 15, on "conditioning" to avoid color changes with varying moisture content of dyeings, the author calls attention to an important source of error. In section 16, on "ageing" (change of color to a final stationary state), he gives some very

practical suggestions. In section 16, on chemical stability, attention is properly called to the complexities and difficulties which beset the dyer and do much to prevent his intricate art from becoming a science. Further difficulties are called to the reader's attention in sections 18 to 21, inclusive; and a useful warning and recommendation are given in section 22. We can agree with the author's remark, in the section on The Judging Mood, that "occasionally colored materials have been rejected when right, and accepted when wrong, solely for emotional reasons," at least if we set up tolerance limits to define "right" and "wrong." These sections and some of the others where not marred by errors of the sort we have pointed out, constitute a useful contribution to the literature of the art of dyeing.

COLOR IN PAINTING THROUGH THE AGES

X.

End of Fourth Millenium. Protodynastic (Thinite) Egypt. An important relic of the period we have just been discussing (article IX) is the slate shield-shaped palette of King Narmer from the temple of Hierakonapolis, the old capital of Upper Egypt. The king is shown on one side wearing the White Crown of Upper Egypt, and on the other wearing the Red Crown of Lower Egypt. On the former side, the god Horus, incarnate as a hawk, brings captives before the king, who wields a pear-shaped stone mace and grasps the hair of a conquered enemy. This became the conventional representation in art of all victories. On the other side, the entwined necks of two animals form a circle. In this circular area no doubt was mixed the paint used to adorn the face of the divine statue of the god, the palette itself being a votive offering to commemorate a victory. During the time of the first two dynasties, the Egyptians cultivated grain and domesticated animals; they lived in brick houses; they mined and smelted copper and wove very fine linen; they developed extraordinary skill in fabricating small objects of stone; they had a beautiful pottery; they made ornaments of ivory, copper, gold and semi-precious stones; and they had begun to invent a system of writing.

There are few remains of painting from this period; but the reliefs tell us something of the drawing. For the Proto-dynastic Egyptian, there was no essential difference between painting and relief; both were often treated as outlines filled in with colors. In relief, the effect of modeling was often lost by using saturated colors, as strong red, for outlines, without regard for light and shade; thus it was a flat drawing raised above the background, which was cut away from the painted outline. The earliest reliefs represent animals, often in processions. In these and in the Narmer and other paletts, we may see that the later Egyptian art conventions were already in making: the composite "memory picture" of the human form, with the eye in front view in a profile face, the shoulders turned forward while the limbs are in profile by a curious twist of the waist-line; the division into registers, one above another. But there is also seen vivid action in running figures, advance in treatment of anatomy, and the power of imagination in the design of long-necked animals. As compared to the First Dynasty, however, there was some falling off in the Second Dynasty.

Early Minoan (Cretan) Civilization. The fusion of Asiatic and Egyptian elements onto the neolithic substratum of Crete has been mentioned. The forms of Early Minoan stone vases, the technique and esthetic elements in the use of variagated semi-precious stones, some religious customs, the wearing of amulets, Gerzean statuettes, the use of depilatory tweezers and stone unguent paletts, as well as multi-compartment paint-pots hollowed out of stone, were all Egyptian elements used on the great Cretan plain facing Africa. But the paint-pots were also used in Sumeria; and many other elements

were also Asiatic. The copper-smith cast axe-heads with a hole through them for hafting in the Sumerian manner. Artists treated rosettes and similar figures in the Asiatic, not the Egyptian style. The distinctive Minoan technique of glaze paint had been used by the Tell Halaf potters of North Syria. Engraved bead and button seals, not carved amulets, were used as in Syria and Iran. In religion, the famed cult of the Double Axe was forshadowed by Tell Halaf amulets. Striking Minoan pot-forms, the pyxis with cylindrical neck and string-hole lid and the so-called "tea pot" with curious spout, had Asiatic parallels. But all these and the native elements were blended and welded to a remarkable European civilization which survived not only revolutions but a series of disastrous earthquakes.

Minoan culture is divided into three parts, called Early, Middle and Late; and each of these into divisions marked by Roman numerals. Early Minoan I includes from two to four centuries ending about 2750 B. C. Minoan pottery generally is extremely varied both in form and decoration. At the start of the Minoan, the old neolithic darkware pottery tradition continued, but was refined toward the production of a ware called "bucchero," which was decorated with incised or impressed patterns. Besides this gray to black ware, there was a fine buff or light brown ware, at first coated with a lustrous glaze paint or varnish to make the surface resemble the old self-colored burnished wares; and upon this patterns were drawn in white paint. Alternately, the glaze was used to produce the reverse effect of dark patterns on a light ground. The slip-paint technique culminated in the "Vasiliki ware" described in a later section.

Cycladic Cultures. Another bridge from Asia to Europe is formed by the Cyclades islands scattered across the Aegean Sea. They were not attractive to mesolithic food-gatherers or to peasant-farmers; but their copper, obsidian, marble and emory made them attractive to merchant mariners. They were eventually settled by colonists from western Anatolia; and their pottery is of the Anatolian plain-ware family. The only well-exavated site, on Melos, was that of three successive towns, all later than the period we are now considering. But we have some information from many tombs, where were found the products of smiths, jewelers, lapidaries and potters. The Early Cycladic I and II pottery was a dark or mud-colored clay ware, with incised designs usually in straight lines, as in triangles, or in running spirals. Pot forms included a curious "frying pan" shape and globular or cylindrical pyxides. An interesting specialty was a decorated bone tube designed to carry pigments. In the Cyclades, the Mother Goddess statuettes took the form of marble idols.

The Near East. At Ras Shamra in North Syria near the coast opposite the island of Cyprus, a region where later there were Semitic Canaanites (whose religious cult practices, sacrifices, heroes and proverbs the Hebrews took over), were found large buildings of unbaked brick, and polychrome painted pottery with geometric designs similar to the pottery of Jemdet Nasr, in Mesopotamia, already described. Rather similar ware, resembling that of Susa II, was found in the Second Copper Age layers at Nuze in Iraq. The beautiful Susian ware has also been described. A hundred miles further north in Iraq, near Mosul, was Tepe Gawra, whose earlier layers with beautiful buildings and painted pottery have been described too. Of this Copper Age city, Professor E. A. Speiser of the University of Pennsylvania, said it "enjoyed something that was more precious (than wealth); its builders displayed faultless taste and an unerring sense of balance.... The glory of this age.... is the consumate mastery of architectural design." The township was built around four temples, each showing variations in design, but the whole in harmony with a preconceived plan, with spacious approaches and courtyards. The following generation failed to uphold this artistic standard; but still later there was a reaction for the better. In the temples, the

true arch was first used at least five centuries before its use in Sumer and at least 25 centuries before the Romans. Stamp seals for sealing property were popular; beads, the best of black translucent obsidian, were ubiquitous; but the best works of the artist were the intrically carved ivory plaques. Painted pottery was no longer in vogue; the ware was undecorated. Apparently there was now a new race at Gawra, and the period was one of migrations. During the transition to the Early Bronze Age, a new ware, including chalice types, appeared. Late in the period with which we have been dealing in this issue, Gawra had a time of great industrial activity and concentration of wealth, similar to that revealed in the Royal Tombs of Ur; but architecture was then "solid but unattractive" (Speiser). The streets were then narrow, the drainage system inadequate. Everything was of metal: knives, sickles, lance butts, spear heads, axes, bowls, frying pans, delicate vanity sets, anklets, braclets, hair ornaments, pins and needles. The pottery was technically excellent, with the firmness and smoothness of polished stone, but painted decoration was uncommon. There were terra cotta figurines of animals, one of a horse, chariots and also the covered wagon, later familiar in Trans-Caucasia and our own West; and even very modern-looking dice. Toward the end (3000 B.C.) of the period we are here discussing, belongs a temple at Tell Brak in northern Syria called the "Temple of a Thousand Eyes" because of its alabaster white "eye idols." It bears similarities to shrines in Sumer, 800 miles away. Notable here was a magnificent frieze of three panels composed of outer bands of heavy gold foil encasing blue limestone, white marble and green corrugated shale. The panels were held to a wooden background with copper holdfasts, the gold borders with gold-headed and silver-stemmed nails. Around the panels were mosaics of clay cones painted in "bright colors" and surrounded by large stone rosettes with alternate petals of white marble and dark green shale and a central corolla of red limestone. The whole must have formed a colorful and beautiful ensemble. To this period too belongs the Early Copper Age site at Tell Duweir, identified as the Bibical Lachish, in Palestine. In a cave-dwelling settlement here the pottery was a characteristic red ware, which was at its best at first and showed progressive degeneration, the ledge-handles, for example, finally becoming, during the third millenium, mere vestigial traces. Degeneration of this sort in pottery forms is a very frequently encountered phenomenon. Here was found on a pottery fragment dating from a much later period, a very early form of the Phoenician-Hebrew script; and from the time of Nebuchadnezzar (600 B.C.), a series of letters in ink from a commander to the governor of Lachish, one dealing with smoke signals.

ART OF COLOR AND DESIGN — Maitland Graves; The Art of Color and Design; McGraw-Hill Book Company; 1941, 292 pp.; $3.50. The author of this book bases his thesis upon the statement that design principles and terminology need to be clarified and integrated so that on this neutral ground of reason the conservative and the radical artist may meet and exchange mutually helpful ideas. He asserts that pictorial structure is subject to natural forces as potent as gravity, and says of his book that "its purpose is an orderly, clear, and simple analysis of the elements and principles upon which all visual art is built." The plan of study is in three parts: The elements of design (pp. 3-11) -- line, direction, shape, proportion, texture, value, color; the principles of design (pp 15-78) -- repetition, harmony, gradation, contrast, unity; analysis of design elements (pp. 81-274) -- line, direction, proportion, value, color. The book is well printed, on fine paper, and profusely illustrated, with 8 pages in color.

Mr. Graves goes at the study of color much as an engineer might. He has worked out an illustrated table of value keys from which the student may learn where to start in working out a composition. Thirty different Value Chords are illustrated, each

developed from the same principles, the term value chord being used to specify a value combination in which values and intervals (or value rhythm) is planned according to design principles. As a musical notation is necessary to a musician, so is a color notation necessary to the graphic artist, it is pointed out; and the Munsell notation is used thereafter to clarify the discussion of color organization. Color chords are developed and described, and while it is probable that many an artist and art teacher will feel the presentation "too technical", Mr. Graves does the art-educational field a service by not omitting, as do so many books on color, all but elementary discussions. He assumes that the artist in pigment is not one ~~with~~ less capable of clarifying his thinking by hard mental problems in color notation and planning than is his brother artist, the musician, who would never think of omitting the hard work of learning a musical notation, of reading music, and practicing by the hour on scales that will allow his fingers to become adept and quick. It is of interest to note that while Mr. Graves teaches at Pratt Institute, he does not teach color or design. Sometimes it takes one who looks on from another field to point out new paths for thinking. While there are some statements that might be questioned, and probably will be, they are, in the opinion of the reviewer, of minor importance when one considers the broad purpose of the book.

BIBLIOGRAPHY

E. Q. Adams; J. Opt. Soc. Amer. 30, 657 (1940); X-Z planes in the 1931 ICI system of colorimetry

Anon.; Paper Trade J. 111, TAPPI Sect., 37-8 (151-152); Tech. Assoc. Papers 23, 489-90 (1940); TAPPI survey of color instruments used in the pulp and paper industry (1940 ISCC-TAPPI symposium).

L. E. Barbrow; J. Res. Nat. Bur. Stand. 25, 703-10 (1940); photometric procedure using barrier-layer photo-cells

C. H. Bayley; Laundry Dry Cleaning J. Can. 20, No. 8, 18, 20 (1940); color changes in dyed acetate-rayon fabrics

A. Bostrom; Nord. Tid. Fot. 22, 155-7 (1938); Chem. Zentr 1939, I, 2123; some points of view regarding the harmonizing of the three-color filter

C. J. Brasefield; Phys. Rev. 58, 436-8 (1940); effect of an activator on the obsorption spectrum of zinc sulfide powders

C. H. R. Chesney, Lt.-Col. (with 4 chapters by J. Huddlestone); "The Art of Camouflage"; pp. 252 plus 12 plates; Robert Hale, Ltd., London; (correction: error in name in News Letter No. 36); review by J. G. Kerr in Nature 147, 758-60 (June 21, 1941)

M. N. Davis, Paper Trade J. 111, TAPPI Sect., 40-44 (184-188); Tech. Assoc. Papers 23, 500-505 (1940); use of color measuring instruments in the manufacture of uncoated paper (1940 ISCC-TAPPI symposium)

H. R. De Silva, P. Robinson & W. J. Frisbee, Jr.; Psychol. Bull. 38, 313-21 (June, 1941); army motor transport personnel (includes 3 recent and 12 other references to papers on the relation of night blindness and vision to driving)

S. R. Detwiler; J. Opt. Soc. Amer. 30, 42-50 (Feb., 1940); comparative anatomical studies of the eye with special reference to the photoreceptors

H. W. Dietert & J. Schuch; J. Opt. Soc. Amer. 31, 54-7 (1941); new projection comparator-densitometer

R. Donaldson; J. Sci. Instr. 16, 114 (1939); spectrophotometry of reflecting materials

M. J. Dorcas; Amer. Dyestuff Rptr. 29, P 110-6 (1940); three-phase light sources (for light-fastness testing and color matching)

F. H. Dotterweich & W. J. Huff; Ind. Eng. Chem., Anal. Ed. 12, 277-9 (1940); dye adsorption by colloidal ferric oxide

D. L. Drabkin; Proc. VII Conference Spectros. 1939, pp. 85-90; ultraviolet photoelectric spectrophotometer

A. Dresler; Das Licht 10, No. 4, 79 (1940); annual fluctuation of brightness sensitivity

A. Dresler & H. G. Fruhling; Das Licht 8, 238-41 (1938); a photoelectric three-color apparatus

A. F. Dufton; J. Sci. Instr. 17, 226-7 (1940); daylight factor computation scales

W. M. Dunagan; Iowa State Coll. (Eng. Exper. Stat.) Bull. No. 139; vol. 36, pp. 39 (1938); color analysis of Portland cement concrete (use of the Razed-Mulder Color Analyzer)

D. R. Duncan; Proc. Phys. Soc. (London) 52, 390-401 (1940) (see also ref. in News Letter No. 31); colour of pigment mixtures (calculation)

S. Q. Duntley; J. Opt. Soc. Amer. 30, 656 (1940); importance of optically clean absorption cells in the determination of concentration of dye solutions (errors involved)

S. Q. Duntley; J. Opt. Soc. Amer. 31, 460 (1941); use of modulated lamps in photometry

S. Q. Duntley; J. Opt. Soc. Amer. 31, 463 (1941); optical properties of turbid media

S. Q. Duntley & A. C. Hardy; J. Opt. Soc. Amer. 30, 271 (1941); experimental determination of the faithfulness of a three-color reproduction

S. Q. Duntley & J. E. Tyler; J. Opt. Soc. Amer. 31, 461 (1941); modulated-lamp densitometer

C. T. Eber; Amer. J. Ophthal. 23, 447-9 (1940); simultaneous color contrast

F. W. Edridge-Green; Chem. & Ind. 59, 567-71 (1940); vision and color-vision

H. Eichler; Z. anal. Chem. 119, 91-4 (1940); reactions of dyes with ferrous hydroxide (analytical)

H. Eichler; Angew. Chem. 53, 234-5 (1940); causes of acid- and alkali-fading of organic dyes and their remedies

E. Elvegard & G. Sjostedt; Illum. Eng. (N.Y.) 35, 333-42 (1940); calculation of illumination from sun and sky

L. F. Epstein, F. Karush & E. Rabinowitch; J. Opt. Soc. Amer. 31, 77-84 (1941); spectrophotometric study of thionine

C. H. Evans; J. Opt. Soc. Amer. 30, 118-26 (1940); intensity-scale monochromatic sensitometer

O. L. Evenson; J. Assoc. Offic. Agr. Chem. 22, 773-7 (1939); effect of light on (fading of) erythrosin and bromo-acid (tetrabromofluorescene)

H. J. Eysenck; Nature 146, 620 (Nov. 9, 1940); psychology and camouflage (short letter)

H. W. Farwell; J. Opt. Soc. Amer. 28, 460-1 (1938); scattered light from Polaroid plates

S. W. Fernberger et al (Emergency Comm. in Psychol.; Natl. Res. Council); Psychol. Bull. 38, 432-68 (June 1941); perception (includes 313 references, of which many deal with vision); see News Letter No. 36

J. B. Feldman; Industr. Med. 9, 158-61 (1940); dark adaptation: its place in accident prevention

C. E. Ferree & G. Rand; Amer. J. Ophthal. 22, 655-60 (1939); testing fitness for night flying

C. E. Ferree & G. Rand; Arch. Ophthal. (Chicago) 24, 292-315 (1940); a more nearly absolute method of testing and rating vision

F. Fischer & B. Gudden; S. B. phys-med. Soz. Erlangen 1939, 378-84; visual sensitivity in infra-red light

H. Fletcher & M. H. Houston; Text. Research 11, 4-11 (1940); effect of light and heat on color and deterioration of viscose, acetate and cuprammonium fabrics

G. Flick; Soldatentum 6, 157-61, 211-20 (1939); influence of various depth factors on distance measurement

K. Flocks; U. S. Pat. 2,232,023; fine glass rods embedded in paint for traffic control lanes to make it visible at night by reflection

Flynn & Richardson to Waldrich Co.; U. S. Pat. 2,214,365 (1940); method of photographically dye-printing by successive light exposures

W. J. Foote; Paper Trade J. 108, TAPPI Sect. No. 15, 31-8 (1939); Tech. Assoc. Papers 23, 505-12 (1939); optical scattering and absorption coefficients of dyed hand sheets and the application of the I.C.I. system of color specification to these

W. J. Foote: Paper Trade J. 111, TAPPI Sect. 31-38 (158-65) Tech. Assoc. Pap. 23, 505-512 (1940); spectrophotometry on coated papers (1940 ISCC-TAPPI Symposium)

W. E. Forsythe; J. Appl. Physics 11, 408-20 (1940); optical pyrometry

W. E. Forsythe, B. T. Barnes & A. L. Shrider; J. Opt. Soc. Amer. 28, 241-8 (1938); photometry of colored light sources

C. E. Foss; J. Opt. Soc. Amer. 28, 386-9 (1938); application of spectrophotometric data in the printing-ink industry (1938 ISCC Symposium)

C. E. Foss & N. Macbeth, Jr.; Rayon Text. Monthly 19, 255-6, 322-3 (1938); color-matching lamps

J. Franck & R. Livingston; J. Chem. Physics 9, 184-90 (Feb. 1941); fluorescence, phosphorescence and photochemistry of dyestuffs

S. I. Freiman; Vestn. Oftal. 16, 262 ff. (1940); physiologic norms of depth perception for distance

D. K. Froman & W. D. McFarlane; Can. J. Research 18, B, 240-5 (1940); photoelectric colorimeter-fluorimeter

G. A. Fry; J. Opt. Soc. Amer. 30, 652 (1940); factors contributing to the discrepancy between subjective and skiascopic determinations of the refraction of the eye

E. Freyer; Oil & Soap 17, 222-6 (Oct. 1940); evaluation of oil-meal color by the methods of photometry

H. P. Gage; Trans. Ill. Eng. Soc. 34, 316- (1939); spectral distribution of solar radiant energy

H. P. Gage; J. Soc. Mot. Pict. Eng. 35, 361-87 (1940); color theories and the Inter-Society Color Council

D. M. Gallagher; Photo Technique, April 1941, p. 53-6; precision densitometer

W. A. Gardner; J. Opt. Soc. Amer. 31, 94-8 (Feb. 1941); photographic analysis of some unexplored visual phenomena

B. Gaspar; Brit. Patents 517,559; 519,790; 520,527; 520,529; 522,611; 529,117 (all 1940); various photographic processes

General Electric Co., J. Sci. Instr. 17, 123-4 (1940); diffuse reflection meter

General Printing Ink Corp. (N.Y. City): "The Psychology of Color" and "The Symbolism of Color" (folders); see Amer. Ink Maker 19, No. 5, 35 (May 1941)

R. J. Gettens & F. W. Sterner; Amer. Paint J. 25, 16-23, 67-9 (1941); comparison of effect of sunlight and of carbon-arc light on artists' oil paints

K. S. Gibson; Paper Trade J. 111, TAPPI Sect. 33-7 (135-139); Tech. Assoc. Pap. 23, 475-479 (1940); survey of spectrophotometers (1940 ISCC-TAPPI Symposium)

K. S. Gibson; J. Opt. Soc. Amer. 30, 88 (1940); approximate spectral energy distribution of skylight

K. S. Gibson; J. Opt. Soc. Amer. 30, 51-61 (1940); spectral luminosity factors

K. S. Gibson -- see N. D. Golden

K. S. Gibson, G. W. Haupt & H. J. Keegan; Signal Sect., Proc. Assoc. Amer. Railroads 36, 136 (1939); standardization of railway signal glasses (reports of measurements)

K. S. Gibson & E. F. Hickson; "Measurement and Specification of the Color Designated as National School Bus Chrome"; 1939. Copies obtainable from Frank W. Cyr, Teacher's College, Columbia University, New York, N. Y.

K. S. Gibson & H. J. Keegan; J. Opt. Soc. Amer. 28, 180 (1938); magnitude of the error resulting from fluorescence in spectrophotometric measurements

K. S. Gibson & H. J. Keegan; J. Opt. Soc. Amer. 28, 372-85 (1938); calibration and operation of the General Electric recording spectrophotometer of the National Bureau of Standards (1938 ISCC Symposium)

K. S. Gibson & D. Nickerson; J. Opt. Soc. Amer. 30, 591-608 (1940); analysis of the Munsell Color System based on measurements made in 1919 and 1926 (one of series of papers on the system)

K. S. Gibson & H. J. Keegan; J. Opt. Amer. 31, 462 (1941); use of didymium glasses for wavelength calibration of recording spectrophotometers

K. S. Gibson, R. P. Teele & H. J. Keegan; J. Opt. Soc. Amer. 28, 178 (1938); 29, 144 (1939); new (and improved) luminosity filter

R. E. Gibson & O. H. Loeffler; J. Amer. Chem. Soc. 62, 1324-34 (1940); effects of pressure, temperature and chemical composition on the absorption of light by mixtures of aromatic amines and nitro-compounds

A. E. Gillam; J. Roy. Coll. Sci. 10, 21-34 (1940); absorption spectra as an aid to research in organic and biological chemistry (lecture)

A. S. Giordano, M. N. States & C. Sheard; Amer. J. Clin. Path., Tech. Suppl. 4, 122-9 (1940); improvements in the photelometer and its accesories

J. H. Gisoff & W. de Groot; Philips' Tech. Rev. 3, 244-50 (1938); Chem. Zentr. 1939, I, 2135; fluorescence and phosphorescence (review)

J. J. Glenn & J. T. Killian; J. Opt. Soc. Amer. 30, 609-16 (1940); trichromatic analysis of the Munsell Book of Color (one of series on the system)

E. A. Glennie & J. H. Parsons; Nature 146, 366 (1940); night-shining eyes: observation (Glennie); explanation and conditions for (Parsons)

G. H. Gliddon; J. Opt. Soc. Amer. 30, 142-4 (1940); aniseikonia (two eye images unequal in size or shape)

I. H. Godlove; J. Opt. Soc. Amer. 30, 89-90 (1940); some problems and methods of dyestuff automatic spectrophotometry

I. H. Godlove; J. Opt. Soc. Amer. 30, 271-2 (1940); application to dyes of the ISCC method of specification of filters

I. H. Godlove; J. Opt. Soc. Amer. 30, 656-7 (1940); extreme case of the performance of the eye versus that of the spectrophotometer

I. H. Godlove; J. Opt. Soc. Amer. 30, 658 (1940); change of color with change of particle size

I. H. Godlove; Symposium on Color publ. by Amer. Soc. Test. Mat. (Philadelphia); pp. 37-46, color standards for opaque materials (1941 ISCC-ASTM Symposium)

I. H. Godlove & E. R. Laughlin; Paper Trade J. 111, TAPPI Sect., 36-43 (216-223); Tech. Assoc. Pap. 23, 518-525 (1940); psychology of color

N. D. Golden; J. Soc. Mot. Pict. Eng. 31, 553 (1938); citation on the work of Kasson Stanford Gibson (inspectrophotometry and colorimetry)

R. Goodacre; Chem. & Ind. 59, 653 (1940); vision and color vision

C. F. Goodeve & J. A. Kitchener; Trans. Farad. Soc. 34, 570-9 (1938); photo-sensitization by titanium dioxide (action on dyes) (also pp. 902-12, mechanism of photo-sensitization by solids)

F. Gottsch; Symposium on Color publ. by Amer. Soc. Test. Mat. (Philadelphia); pp. 14-7; "Alice in Wonderland" discussion of Judd's "Introduction to Color" (1941 ISCC-ASTM Symposium)

F. J. Gowen; Natl. Paint Bull. 4, 12-3 (1940); technical data for the paint chemist relating to wavelength and Angstrom units

J. H. Graff; Paper Trade J. 112, TAPPI Sect., 23 (1941); daylight fluorescence lamp for fiber analysis

J. Grant; Text. Colorist 62, 9-11 (1940); some recent advances in fluorescence analysis as an aid to the textile colorist

W. C. Granville; Amer. Ink Maker 19, 35, 43 (June 1941); application of spectrophotometry to printing inks (address before New York Printing Ink Production Club)

A. G. Green; U. S. Pat. 2,222,225 (1940); stimulation of growth of plants by use of a fluorescent dye

W. F. Grether; J. comp. Psychol. 29, 179-86 (1940); chimpanzee color vision, II, color-mixture proportions; pp. 187-92, ditto, III, spectral limits

R. N. Griesheimer; Paper Trade J. 111, No. 13, TAPPI Sect. 36-41 (166-171); Tech. Assoc. Pap. 23, 494-9 (1940); "card-index" and other methods used (with instrumental measurements) in controlling the color of beater furnaces (1940 ISCC-TAPPI Symposium)

H. D. Griffith & A. M. Fraser; J. Sci. Instr. 18, 9-10 (Jan. 1941); fluorescent medium for use on surface plates (for estimating smoothness)

J. Guild; J. Sci. Instr. 17, 178-82; optical smoothness meter

J. P. Guilford; J. Opt. Soc. Amer. 30, 455-9 (1940); color preferences

H. M. Haendler & G. McP. Smith; J. Amer. Chem. Soc. 62, 1669-72 (1940); absorption spectra of coppered azo dyes

Ham & Barnes to Amer. Cyanamid Co.; U. S. Pat. 2,209,917 (1940); light-sensitive coated paper containing the light-sensitive blueprint coating, etc.

A. C. Hardy; J. Opt. Soc. Amer. 28, 360-4 (1938); history of the design of the recording spectrophotometer (1938 ISCC Symposium)

LeG. Hardy; Ill. Eng. 36, 295-312 (1941); the bases of color vision (1940 ISCC-IES Symposium)

W. E. Harper, M. B. Robinson & J. N. Bowtell; Trans. Ill. Eng. Soc. (London) 5, 57-72 (1940); photometric properties of some luminescent materials

T. W. Harrell & R. D. Churchill; Psychol Bull. 38, 331-53 (June 1941): classification of military personnel (includes 10 bibliographical references on visual factors)

L. Harris & J. A. Kyger; J. Opt. Soc. Amer. 30, 505 (1940); uninterrupted measurements with a rotating sector (research note)

G. R. Harrison; J. Opt. Soc. Amer. 29, 143-4 (1939); high-speed device for absorption spectrophotometry

G. R. Harrison & E. P. Bentley; J. Opt. Soc. Amer. 30, 290-4 (1940); high-speed recording spectrophotometer

T. R. Harrison to Brown Instrument Co.; U. S. Pats. 2,216,472, measuring and control apparatus (possible means for controlling light intensity) and 2,219,775 (1940), photometric apparatus for measuring the illumination from an unknown source of light

V. G. W. Harrisonl; Paper Maker 99, TS 28-32, 33-9, 41-8; 100 TS 49-56, 57-64, 65-75 (1940); World's Paper Trade Rev. 113, TS 19-31, 36-47, 53-62, 66-72, 74-9; 114, TS 82-8 (1940); measurement of opacity of paper: theoretical survey

H. K. Hartline; J. Opt. Soc. Amer. 30, 239-47 (1940); nerve messages in the fibers of the visual pathway

D. Haskell, Camera Craft 47, 550-612 (1940); technical problems of Kodachrome exposure (extensive experimental study of application of Munsell system to color photography in connection with problems of exposure time)

R. S. Hatch; Paper Trade J. 111, TAPPI Sect., No. 12, 35-8 (155-158); Tech. Assoc. Papers 23, 491-3 (1940); measurement of the color of (paper) pulps (1940 ISCC-TAPPI Symposium)

E. A. Hauser & M. B. Leggett; J. Amer. Chem. Soc. 62, 1811-4 (1940); color reactions of clays with amines

R. Havemann; Z. physik. Chem. 188, 182-90 (April 1941); nomenclature of optical procedures for carrying out colorimetric analyses

Jannett C. Hay & H. E. Roaf; J. Physiol 98, 380-96 (1940); the "blue-green" region of the spectrum (100 subjects found the mid-position 492.8 mu and the width 6.047 mu, while they found yellow at 585.3 mu and width 0.67 mu, with stated probable errors; the mid blue-green is very close to the complement of Dimmick and Hubbard's "unique red," as given in News Letter No. 26; the latter got 582 mu for the yellow, as given in N. L. No. 25)

H. L. Hazen, G. S. Brown & W. R. Hedeman; J. Franklin Inst. 230, 19-44, 183-205 (1940); cinema integraph: construction and application

S. Hecht & J. Mandelbaum; J. Amer. Med. Assoc. 112, 1910 (1940); relation between vitamin A and dark adaptation

S. Hecht & E. U. Mintz; J. Opt. Soc. Amer. 28, 177 (1938); intensity and visibility of wires

S. Hecht & S. Shlaer; J. Opt. Soc. Amer. 28, 269 (1938); adaptometer for measuring human dark adaptation

P. M. Heertjes & H. I. Waterman; Bull. Soc. Chim. (v) 7, 187-91 (1940); absorption spectra of anthracene and hydroanthracenes

Hefti to Aktiengesell. Cilander; U. S. Pat. 2,217,114 (1940); variegated pattern by local parchmentizing

H. Helson; Psychol Bull. 35, 672 (1938); color constancy, conversion, contrast and adaptation

R. C. Herman; J. Opt. Soc. Amer. 30, 316 (1940); note on the measurement of pupillary diameters

J. E. Hernandez; J. exp. Psychol. 26, 337-44 (1940); perception of yellow light through red and green stimulations as determined by the conditioned galvanic response

A. Hilger Ltd.; Silk & Rayon 14, 806 (1940); 15, 31, 66 (1941); J. Sci. Instr. 18, 10-1 (1941); photometric colour comparator and amplifier

W. H. Hill to Amer. Cyanamid Co.; U. S. Pat. 2,220,041 (1940); light screens to block out short light wave radiations (among other uses for homocyclic alcohol vanadate)

W. S. Hill; Ann. Acad. Brasil Sci. 12, 261-8 (1940); absorption of fluorescent light by fluorescent liquids (analytical detection)

C. F. Hiskey & V. W. Meloche; J. Amer. Chem. Soc. 62, 1819-24 (1940); color phenomena associated with quinquivalent molybdenum solutions: I. absorption spectra in solutions of various hydrocholoric acid concentrations

J. G. Holmes; Proc. Phys. Soc. 52, 359-70 (1940); application of uniform chromaticity scales

A. H. Holway & M. J. Zigler; J. Opt. Soc. Amer. 30, 270 (1940); the Komplextheorie (of G. E. Muller) of visual sensation

Hopff to Genl. Aniline & Film Corp.; U. S. Pat. 2,241,201 (1941); fluorescent agents for oils

Hopf & Eichel to Genl. Aniline & Film Corp.; U. S. Pat. 2,198,967 (1940); products for imparting fluorescence to oils

Hopff & Schoenherr to Genl. Aniline & Film Corp.; U.S. Pats. 2,198,050, products giving vivid yellow-green fluorescence in hydrocarbon solutions; and 2,205,408 (1940), hydrocarbon oil containing fluorescent condensation product

Horning to E. I. duPont de Nemours & Co.; U. S. Pat. 2,212,917 (1940); process for rendering a colored pigment stable

F. C. Houghten, H. T. Olson & J. Suciu, Jr.; Heating, Piping and Air Conditioning, Nov. 1940, p. 678 (another reference given in News Letter No. 34); sensation of warmth as affected by the color of the environment

R. S. Hunter; J. Opt. Soc. Amer. 28, 51 (1938); precision and accuracy of apparent reflectance measurements with a photoelectric illumination meter

R. S. Hunter; J. Opt. Soc. Amer. 28, 51 (1938); development of filters for tri-stimulus and luminosity measurements with barrier-layer photo-cells

R. S. Hunter; J. Opt. Soc. Amer. 28, 179 (1938); further study of the use of filters and barrier-layer photo-cells for tristimulus colorimetry

R. S. Hunter; J. Opt. Soc. Amer. 30, 89 (1940); sources of error in operation of the multipurpose reflectometer

R. S. Hunter; J. Opt. Soc. Amer. 30, 272 (1940); applications and accuracy of three-filter photoelectric colorimetry

R. S. Hunter; Bur. Stand. J. Res. 25, 581-618; J. Opt. Soc. Amer. 30, 536-59 (1940); multipurpose photoelectric reflectometer

R. S. Hunter; J. Opt. Soc. Amer. 31, 463 (1941); permissible short cuts in the photo-electric tristimulus measurement of color difference

R. S. Hunter; Symposium on Color; publ. by the Amer. Soc. Test. Mat.(Philadelphia); pp. 61-79; photoelectric tri-stimulus colorimetry (1941 ISCC-ASTM Symposium)

H. Huttner; Industr. Psychotech. 17, 34-9 (1940); psychotechnics of signalling: noticeability of signals on various backgrounds

I. G. Farbenind. A.-G.; Brit. Pat. 493,775 (1938); process for preparing polarizing screens

I. G. Farbenind. A.-G.; Brit. Pat. 522,028 (1938 and 1940); photoelectric color-measuring apparatus

I. G. Farbenind. A.-G.; Brit. Pat. 513,244 (1939); production of an azo-dye colored picture

I. G. Farbenind. A.-G.; French Pat. 841,664 (1939); process for decreasing the detrimental effect of TiO_2 on the light-fastness of dyed fabrics and paper

Imperial Chemical Industries, Ltd.; Text. Manufacturer 66, 284-5 (1940); application of fiber-identification solutions: "Shirlastain."

R. Ingles; Paint Manuf. 10, 68 (1940); camouflage problem

G. E. Inman; Trans. Ill. Eng. Soc. 34, 65 (1939); characteristics of fluorescent lamps

Institute of Paper Chemistry Staff; Paper Trade ~~J. 112, 13-22 (1941)~~; instrumentation studies, XXXVII: study of photoelectric instruments for the measurement of color: reflectance and transmittance: part VI the Higgins Reflection Meter

Interchemical Corp. (N.Y.); Brit. Pats. 522,941 (1938) and 523,090 (1938 and 1940); printing pigmented lacquers on fabrics

Interchemical Corp. (N.Y.) ; Brit. Pat. 524,803 (1938 and 1940); application of dye emulsions in printing

Isermann, Orelup & Ohlsson; U. S. Pat. 2,102,712 (1937); filter for ultra-violet and violet (sunburn preventative)

W. Jablonski; Ophthalmologica 98, 56 (1939); investigation of the vision of ametropes

S. Jacobsohn, H. E. Bent & A. J. Harrison; Rev. Sci. Instr. 11, 220-6 (1940); precision photoelectric spectrophotometer designed for chemical problems for use in the range 450 to 820 millimicrons

Jennings & Middleton to Du Pont Film Mfg. Corp.; U. S. Pats. 2,133,937 (1938); 2,184,303 (1939); 2,200,924 (1940)

L. A. Jones; J. Opt. Soc. Amer. 31, 461 (1941); report of the Optical Society of America Committee on Colorimetry

R. C. Jones; J. Opt. Soc. Amer. 29, 531-4 (1939); the Koremetron; an instrument for measuring pupillary diameters

R. N. Jones; J. Amer. Chem. Soc. 63, 151-5 (1941); absorption spectra of 1:2-benzanthracene derivatives

R. N. Jones; J. Amer. Chem. Soc. 63, 313-4; absorption spectra of alkyl chrysenes

D. B. Judd; J. Opt. Soc. Amer. 28, 52-6 (1938); uniform tolerances for surface-color specification

D. B. Judd; Bull. Amer. Ceram. Soc. 17, 379 (1938); the Inter-Society Color Council

D. B. Judd; Rev. Sci. Instr. 9, 301 (1938); review of Vernon W. Grant's "Psychological Optics"

D. B. Judd; J. Opt. Soc. Amer. 28, 390-7 (1938); designation of filters for theatrical lighting

D. B. Judd; J. Opt. Soc. Amer. 30, 296 (1940); erratum: hue, saturation and lightness of surface colors with chromatic illumination

D. B. Judd; J. Opt. Soc. Amer. 30, 574 (1940); Munsell Color System (foreword to series of papers on the system)

D. B. Judd; Paper Trade J. 111, TAPPI Sect. 35-40 (201-6); Tech. Assoc. Pap. 23, 512-518 (1940); systematic color designations for paper (ISCC-NBS method)

D. B. Judd; J. Opt. Soc. Amer. 31, 462-3 (1941); whiteness of light surface colors

D. B. Judd; Ill. Eng. 36, 336-72 (1941); color systems and their inter-relations (1940 ISCC-IES Symposium)

D. B. Judd; Symposium on Color, publ. by Amer. Soc. Test Mat. (Philadelphia); pp 1-17; introduction to color (1941 ISCC-ASTM Symposium)

D. B. Judd; W. N. Harrison & B. J. Sweo; J. Amer. Ceram. Soc. 21, 16 (1938); optical specification of vitreous enamels

D. B. Judd & K. L. Kelly; Bur. Stand. J. Res. 23, 355-85 (1939); method of designating colors

D. B. Judd & L. C. Lewis; Paper Trade J. 111, TAPPI Sect. 31-33 (133-135); Tech. Assoc. Pap. 23, 473-475 (1940); introductory dialogue to a symposium on Spectrophotometry in the Pulp and Paper Industry (1940 ISCC-TAPPI Symposium)

R. Kahl; Monatsh. Text.-Ind. 54, 286-9 (1939); dyeing textiles field gray and aviation gray

H. Kalmus; Nature 147, 455 (Apr. 12, 1941); relation between colour and permeability of insect cuticles

F. Karush; J. Opt. Soc. Amer. 31, 73-6 (1941); measurement of fast reactions by absorption spectrophotometry

F. Kavanagh; Ind. Eng. Chem., Anal. Ed. 13, 108-11 (1941); photoelectric fluorimeter

J. G. Kerr; review of Chesney's "The Art of Camouflage"; see under Chesney, this issue

W. A. Kerr; Proc. VII Conf. on Spectroscopy 1939; pp. 68-72; rapid spectrum-line photometer

A. I. Kiprianov & V. E. Petrun'kin; J. Gen. Chem. (U.S.S.R.) 10, 613-9 (1940); effect of solvent upon the color of organic dyes

Klopfer; Germ. Pat. 685,804 (1939); prevention of discoloration etc. of iodine solutions in oils

O. H. Knoll & R. G. Weigel; Licht 8, 39-41, 65-6 (1938); through Chem. Abstr. 34, 5736 (1940); comparison of the spectral sensitivity of selenium barrier-layer photoelectric cells with that of the eye: new filter films

G. W. Knox; J. Psychol. 8, 13-21 (1939); a contradiction to the Ladd-Franklin theory of blackness

H. W. Knudson, V. H. Meloche & C. Juday; Ind. Eng. Chem., Anal. Ed. 12, 715-8 (1940); colorimetric analysis of a two-component system (applied to metals by forming lakes)

Köberle & Schlichting; Germ. Pat. 703,500 (1941), products imparting greenish fluorescence to mineral oils; Germ Pat. 683,317 (1939), fluorescent material; U. S. Pat. 2,223,453 (1940), fluorescent coloring materials for gasoline; U. S. Pat. 2,187,819 (assigned to Genl. Aniline Works) (1940), products remarkable for the fluorescence of their solutions in oils, waxes, etc.

Kodak Ltd.; Brit. Pats. 515,789 (1939); 519,062 (addn. to 515,372); 519,695; 524,500; 527,493 (1940); 531,246 (1941); various photographic processes

Kodak Ltd. & Eastman Kodak Co.; Brit. Pats. 524,556-7-8 (1940); photographic processes

Kodak-Pathe; French Pat. 843,811 (1940); light filter (to absorb red and infra-red)

J. H. Korb; Nav. med. Bull. (Washington) 37, 392-9 (1939); perception time and night blindness

D. L. Kraus & G. C. Nutting; J. Chem. Physics 9, 133-45 (1941); absorption spectra of chrome alums (in the red) at low temperatures

S. V. Kravkov; C. R. Doklady; Acad. Sci. U. R. S. S. 22, 64-6 (1939); critical frequency of flicker and indirect stimuli

S. V. Kravkov; Acta Ophthalmologica 17, 324 (1939); influence of the loudness of the indirect sound stimulus on the color sensitivity of the eye (incorrect ref. on p. 10 of News Letter No. 35)

S. V. Kravkov; Acta Ophthalmologica 17, 425-41 (1939); influence of odors upon color vision

S. V. Kravkov; Vestn. Oftal. 14, 61-3 (1939); effect of caffein on color sensitivity (see also p. 8, News Letter No. 31)

S. V. Kravkov; Acta Medica U. R. S. S. 2, 3, 461 (1939); some new findings on color vision (incomplete ref. on p. 10 of News Letter No. 35)

S. V. Kravkov; Contributions to Physiological Optics, Collected; Comm. Acad. Sci. URSS, vol. I (1941); dependence of our color sense on the sympathetic "vegitativen") nervous system

S. V. Kravkov; J. Opt. Soc. Amer. 31, 335-7 (April 1941); color vision and the automatic nervous system

R. Kretzmann; Ann. Physik 37, 303-25 (1940); optical constants of metals in thick layers in the visible and near infra-red

D. Krüger; Zellstoff U. Papier 18, 241-4 (1938); spectral absorption curves of dyed sheet celluloid (comparison with dye solutions)

D. Krüger & H. Rudlow; Ber. 71 B 707-12 (1938); spectrophotometry of direct dyeings on regenerated cellulose sheets

L. M. Kul'berg; Zavodskaya Lab. 9, 372-81 (1940); microcolorimetry and micronephelometry

J. B. H. Kuper; Phys. Rev. 53, (ii), 920 (1938); electronic absorption photometer

J. M. Lahy; Travail hum. 7, 353-400 (1939); visual tests for automobile drivers; night vision, glare and field of vision

Lakeland Corp.; Germ. Pat. 685,510 (1939); process to prevent solutions of chlorophyll becoming turbid

J. W. Lang to Du Pont Co.; U. S. Pat. 2,145,398 (1939); preparation of pigment of tinctorial strength greater than that of mechanical mixture by mixing constituents before azo-coupling

B. Lange; Chem. Fabrik 1940, 357-8; new photoelectric fluorescence colorimeter

G. O. Langstroth, W. W. Brown & K. B. Newbound; Canadian J. Res. A 18, 186-92 (1940); application in spectrophotometry of collimated light beams

Lantz to Soc. Anon. Mat. Color. & Prod. Chim. de St. Denis; U. S. Pat. 2,206,611 (1940); mixture (of azo dyes) applied to fibers which develops color by action of moisture and light

E. R. Laughlin; Text. Colorist 62, 667-73 (1940); Paper Trade J. 111, No. 22, 125-31 (1940); influence of dyestuffs on the opacity of paper

E. R. Laughlin & H. A. Lips; Paper Ind. Paper World 22, 557-62 (1940); spectrophotometric study of bleaching of dyed paper

J. Laurence; J. Opt. Soc. Amer. 31, 9-13 (Jan. 1941); reflection characteristics with polarized light (of printed matter and cloth under natural and polarized light)

J. Laurence; J. Dec. Art 61, 722-31 (1941); standardization of color

E. Lax & R. Rompe; Licht 8, 63-5, 86-90 (1938); Chem. Zentr. 1939, I, 337; light sources for research on photoluminescence

C. G. Lemon; Brit. Pat. 528,967 (1940); colour comparator with electrical amplifying sound-reproducing device for receiving alternating current response of a photoelectric cell when off match, and yielding inaudibility when there is match

Leuch to E. Dietzgen Co.; U. S. Pats. 2,198,827 and 2,215,739 (1940); diazotype printing

Leuch to S., C. & P. Harding Ltd.; Brit. Pat. 521,492 (1940); light-sensitive layers for use in diazotype photography

H. W. Leverenz; J. Opt. Soc. Amer. 30, 309-14 (1940); optimum efficiency conditions for white luminescent screens in kinescopes

G. N. Lewis, T. T. Magel & D. Lipkin; J. Amer. Chem. Soc. 62, 2973-80 (1940); absorption and re-emission of light by cis and trans stilbenes and the efficiency of their photochemical isomerization

Lieber & Mikeska to Standard Oil Development Co.; U. S. Pat. 2,209,463 (1940); stabilization of color of petroleum wax compositions

P. Lineback; Anat. Rec. 38, 193-201 (1938); some observations on the mechanisms of double vision

G. A. Litinskii; Vestn. Oftal. 12, 532 (1938); monocular depth perception and the method of its determination

G. A. Litinskii; Vestn. Oftal. 13, 850 (1938); the rapidity of depth perception

P. C. Livingston; Trans. Ophthal. Soc. U. K. 57, 434-47 (1938); debatable ground in the matter of the monocular and uniocular pilot of aircraft

P. C. Livingston; Brit. J. Ophthal. 23, 540-4 (1939); analysis of the judgement of relative position (preliminary communication)

H. Lloyd & E. M. Guenault; J. Sci. Instr. 17, 103-11 (1940); recording microphotometer

H. L. Logan; Trans. Ill. Eng. Soc. 34, 881 (1939); specification points of brightness

J. Lotchius; J. Soc. Dyers Col. 56, 433-5 (1940); colorimetric determination of indigo

A. N. Lowan & G. Blanch; J. Opt. Soc. Amer. 30, 70-81 (1940); tables of Planck's radiation and photon functions

M. Luckiesh & F. K. Moss; J. Frank. Inst. 227, 87 (1939); quantitative relationship between visibility and type-size

M. Luckiesh & F. K. Moss; Amer. J. Ophthal. 22, 616 (1939); frequency of blinking as a clinical criterion of ease of seeing

M. Luckiesh & F. K. Moss; J. Opt. Soc. Amer. 30, 62-9 (1940); suprathreshold visibility

M. Luckiesh & F. K. Moss; J. Frank. Inst. 231, 323-43 (April 1941); visibility and seeing

M. Luckiesh & A. H. Taylor; Ill. Eng. 35, 169-72 (1940); Amer. Dyestuff Rptr. 29, 543-6 (1940); factors affecting the fading of dyed textiles by radiant energy (first. ref. only and abstract in News Letter No. 31)

M. Luckiesh & A. H. Taylor; Genl. Elec. Rev. 43, 410-2 (1940); cool light (energy per foot-candle for light sources)

M. Luckiesh, A. H. Taylor & G. P. Kerr; Genl. Elec. Rev. 41, 89-93 (1938); artificial white light

E. M. Ludlum; Paint Manufacture 10, 240-3 (1940); spectrophotometry

E. Ludvigh; Nature 141, 1141-2 (1938); scotopic luminosity curve and the absorption spectrum of visual purple

Y. Y. Lur'e & E. M. Tal; Zavodskaya Lab. 9, 702-14 (1940); use of photocolorimetry in volumetric analysis

D. L. MacAdam; J. Opt. Soc. Amer. 28, 103-11 (1938); photometric relationships between complementary colors

D. L. MacAdam; J. Opt. Soc. Amer. 28, 163-6 (1938); selected ordinates for luminosity computations with black-body illuminants between 2000°K. and 4000°K.

D. L. MacAdam; J. Opt. Soc. Amer. 30, 657 (1940); noticeability of color difference in daylight

McCurry; U. S. Pat. 2,214,749 (1940); stabilization of color, etc., of motor fuel containing anti-detonants

R. A. McFarland & J. N. Evans; Amer. J. Physiol. 127, 37-50 (1939); alterations in dark adaptation under reduced oxygen tension

R. A. McFarland & W. H. Forbes; J. Gen. Physiol. 24, 69 (1940-41); effects of variations in the concentration of oxygen and of glucose on dark adaptation

R. A. McFarland & M. H. Halperin; J. Gen. Physiol. 23, 613-30 (1940); relation between foveal visual acuity and illumination under reduced oxygen tension

R. C. Machler; Proc. VII Conf. Spectroscopy, 65-7 (1939); recording spectrophotometer

D. Mach; Amer. J. Physiol. 126, 573-4 (1939); comparison of effects of cobra venom and opiates on vision

W. M. McKeon & W. D. Wright; Proc. Phys. Soc. (London) 52, 464-79 (1940); characteristics of protanomalous vision

P. B. MacLeod; J. Exp. Psychol. 27, 1-22 (1940); brightness- constancy in unrecognized shadows

E. M. McMullen, E. J. Ritchie & R. L. Bullard; Official Digest, Paint & Varnish Prod. Clubs, No. 187, p. 272 (1939); determination of hiding power by the spectrophotometer

H. G. MacPherson; J. Opt. Soc. Amer. 30, 189-94 (1940); carbon arc as a radiation standard

J. T. M. Malpica & W. R. Fanter; Genl. Elec. Rev. 43, 384-5 (1940); new transmission photometer

R. S. Manly, J. F. Bouner & H. C. Hodge; J. Phys. Chem. 44, 745-51 (1940); light scattering in normal human dentine; calculation of absorption and scattering coefficients

A. Marriage; Phot. J. 80, 364-74 (1940); comparison of masking methods for subtractive color processes

Martin to Celanese Corp. of Amer.; U. S. Pat. 2,177,903 (1939); improvement of light fastness of organic esters of cellulose

L. C. Martin; Nature 146, 288-92 (1941); development of ultraviolet and electron microscopy

M. Martinet; Bull. Soc. chim. (5) 5, 1033-42 (1938); structural definition of auxochrome and chromophore

K. R. May; J. Sci. Instr. 17, 231 (1940); apparatus for coating surfaces with magesium oxide

L. C. Mead; Psychol. Bull. 37, 501-2 (1940); visual brightness discrimination in the cat as a function of illumination

Medical Research Council (England); reports of the committee upon the Physiology of Vision; Special Report Series, No. 185; colour vision requirements in the Royal Navy

M. G. Mellon; Proc. VII Conf. on Spectros. 1939, p. 101-6; spectrophotometry in analytical chemical research

Merckx to Gevaert Photo-Producten N. V.; Brit. Pat. 521,550 (1940); production of colored photographic images

E. E. Metcalfe; Nav. Med. Bull. (Washington) 38, 231-9 (1940); new method for determining night blindness

H. Meyer; Brit. Pat. 522, 672 (1939 and 1940); application of methyl umbelliferone to correct yellowish white by means of fluorescence

J. L. Michaelson; J. Opt. Soc. Amer. 28, 365-71 (1938); construction of the General Electric recording spectrophotometer (1938 ISCC Symposium)

J. L. Michaelson & W. R. Fanter; J. Opt. Soc. Amer. 30, 656 (1940); calibration data on General Electric recording spectrophotometer

H. Mills; J. Oil & Col. Chemists Assoc. 23, 245-75 (1940); critical examination of hiding-power concepts (of pigments)

H. E. Millson; Amer. Dyestuff Rptr. 27, P 47-50 (1938); queer forms of light (fluorescence, etc.)

H. E. Millson; Tech. Service Bull. No. 571, Calco. Chem. Div., Amer. Cyanamid Corp.; Amer. Dyestuff Rptr. 29, 579-82 (1940); the phenomenon of fluorescence (application and fading of fluorescent dyes)

Millson to Calco Chem. Co.; U. S. Pat. 2,169,657 (1939); floor covering containing a fluorescent dye

S. C. Mitra & A. Datta; Indian J. Psychol. 14, 91-4 (1939); influence of color on the estimation of area

P. Moon; J. Opt. Soc. Amer. 29, 108-16 (1939); basic principles in illumination calculations

P. Moon; J. Opt. Soc. Amer. 30, 195-205 (1940); on interreflections

P. Moon; J. Frank. Inst. 230, 583-617 (1940); proposed standard solar-radiation curves for engineering use

P. Moon; J. Math. Phys. 19, 1 (1940); a table of Fresnel reflection

P. Moon; J. Opt. Soc. Amer. 31, 317-24 (1941); optical reflection factors of acoustical materials

P. Moon; J. Opt. Soc. Amer. 31, 374-82 (1941); interreflections in rooms

P. Moon; J. Opt. Soc. Amer. 31, 301-8 (1941); interreflections in lightwells

P. Moon; J. Opt. Soc. Amer. 31, 223 (1941); interreflections in finite cylinders

P. Moon; Ill. Eng. 36, 313-35 (1941); color determination (1940 ISCC-IES Symposium)

P. Moon & J. Laurence; J. Opt. Soc. Amer. 31, 130-9 (1941); construction and test of a goniophotometer

P. Moon & D. P. Severance; Trans. Ill. Eng. Soc. 34, 801 (1939); design of photo-electric flicker photometers

Moran & Kozacik to Socony-Vacuum Oil Co.; U. S. Pat. 2,151,300 (1939); retarding staining of tin-coated containers for lubricating oil

Morand; Arch. med. pharm. navales 129, 96-111 (1939); artificial color standards in the biochemical laboratory

R. Morse-Peckham; Clin. Res. Rep., Opt. Res. Inst. 1940, No. 6; the principles of binocular fusion and stereoscopic vision

R. A. Morton & W. T. Earlam; J. Chem. Soc. 1941, 159-69; absorption spectra in relation to quinones: 1,4-naphthoquinone, anthraquinone and their derivatives

E. E. Murray & M. P. Hanson; J. Chem. Education 17, 430-1 (1940); coloring snapshots with organic dyes

H. D. Murray and the Editor; Chem. & Ind. 59, 626 (1940); vision and colour-vision (discussion of color charts published Aug. 10 by Edridge-Green

R. J. Myers; Ind. Eng. Chem., Anal. Ed. 12, 678-81 (1940); simplified distinctness-of-image glossmeter

National Bureau of Standards; Letter Circular LC-525 (1938); color harmony: an annotated bibliography

National Bureau of Standards; Letter Circular LC-526 (1938); color charts; a descriptive list

National Bureau of Standards; Letter Circular LC-550 (1939); fluorescence and phosphorescence

National Bureau of Standards; Letter Circular LC-581 (Superseding LC-352) (1940); color of illuminant and efficiency of the worker

National Research Council, Emergency Committee in Psychology; - see S. W. Fernberger, News Letter No. 37

Neonelectric Co. & Scharff; Brit. Pat. 524,427 (1940); production of fluorescent powdered coating on glass

R. R. Newell; Radiology 32, 270-4 (1939); language of engineers and radiologists (units and terminology of light and X-radiation)

S. M. Newhall; J. Opt. Soc. Amer. 28, 177-8 (1938); colorimetry of the Purkinje and Hering images

S. M. Newhall; Psychol. Bull. 37, 500 (1940); measurement of simultaneous contrast

S. M. Newhall; J. Opt. Soc. Amer. 30, 617-45 (1940); preliminary report of the O. S. A. Subcommittee on the Spacing of the Munsell Colors (one of series of papers on the system)

S. M. Newhall; J. Opt. Soc. Amer. 30, 271; Psychol. Record 4, 198-212 (Feb. 1941); warmth and coolness of colors

D. G. Nicholson & A. R. Matheson; Paint, Oil Chem. Rev. 102, 189 (1940); bleaching of lead pigments after darkening by exposure to hydrogen sulfide

D. Nickerson; U. S. Dept. Agric., Bur. of Agric. Economics, publ.; 1938, 1-17; use of ICI tristimulus values in disk colorimetry

D. Nickerson; J. Opt. Soc. Amer. 30, 575-86 (1940); history of the Munsell Color System and its scientific application (one of series of papers on the system)

D. Nickerson; J. Opt. Soc. Amer. 29, 1-9 (1939); artificial daylighting for color grading of agricultural products

D. Nickerson; Trans. Ill. Eng. Soc. 34, 1233-53 (1939); artificial daylighting studies

D. Nickerson; U. S. Dept. Agric., Agricultural Marketing Service (1940): computational tables for use in studies of artificial daylighting

D. Nickerson; Amer. Dyestuff Rptr. 29, 392-6 (1940); standardization of color names

D. Nickerson; Ill. Eng. 36, 373-99 (1941); the illuminant in color matching and discrimination: how good a duplicate is one illuminant for another (1940 ISCC-IES Symposium)

D. Nickerson & W. C. Granville; J. Opt. Soc. Amer. 30, 159-162 (1940); hue sensibility to dominant wave-length change and the relation between saturation and colorimetric purity

Norman to E. N. Mason & Sons. Ltd.; Brit. Pat. 520,304 (1940); light-sensitive papers produced by diazo-coupling

W. F. O'Connor & P. J. Drumm; Nature 147, 58-9 (Jan. 11, 1941); pigments of Iris pseudacorus

T. Ogawa; Japan. J. Psychol. 13, 307-34 (1938); 14, 244-50 (1939); the phenomenal displacement of the path of visual movement

K. N. Ogle; Arch. Ophthal. 22, 1046-67 (1939); relative sizes of ocular images of the two eyes in asymmetric convergence

K. N. Ogle; J. Opt. Soc. Amer. 30, 145-51 (1940); induced size effect

Y. Ohyagi; Bull. Chem. Soc. Japan 15, 186-95 (1940); absorption spectra of polynuclear complex salts

M. S. Oldham & W. Kunerth; J. Opt. Soc. Amer. 31, 102-4 (Feb. 1941); effect of the size of the particle on the intensity of fluorescence of a phosphor

J. W. Orelup; U. S. Pat. 2,147,713 (1939); fluorescent coloring material for lubricating oils

G. Palmer; J. Soc. Dyers Col. 56, 510-1 (1940); industrial camouflage

Papierfabrik Spechthausen A.-G.; Germ. Pat. 672,211 (1939); safety paper

A. E. Parker; Symposium on Color publ. by Amer. Soc. Test. Mat. (Philadelphia); pp. 47-60, spectrophotometry and color evaluation (1941 ISCC-ASTM Symposium)

J. H. Parsons; - see Glennie, News Letter No. 37

J. L. Parsons; Tech. Assoc. Pap. 23, 473; Paper Trade J. 111, TAPPI Sect. 31 (133) (1940); introduction to a symposium on spectrophotometry in the pulp and paper industries (1940 ISCC-TAPPI symposium)

W. H. Peacock; Rayon Text. Monthly 21, 627-31, 699-704, 760-2; 22, 36-9, 102-3 (Oct. 1940 to Feb. 1941); the practical art of color matching (for review see this issue)

W. Peddie; Nature 146, 717-8 (1940); colour vision and chromaticity scales; criticism by W. D. Wright, p. 718

T. B. Perkins; J. Opt. Soc. Amer. 30, 295-6 (1940); production color analysis of kinescope screens

J. W. Perry; Proc. Phys. Soc. (London); 53, 272-87 (1941); colour, its measurement, discrimination and specification

L. B. Pett & M. K. Lipkind; Canad. J. Research 19, 99-108 (April 1941); factors affecting the Pett visual (recovery) test for Vitamin A deficiency

O. Petzold & V. Demant; Paint Manuf. 10, 134-5 (1940); fluorescence and the blackout; -- see also Demant & Petzold

O. Petzold & V. Demant; Paint Manuf. 10, 174-6, 186 (1940); formulation of fluorescent paint (fluorescence of resins, plasticizers, solvents and pigments); -- see also Demant & Petzold

A. H. Pfund; J. Opt. Soc. Amer. 29, 291-3 (1939); dispersion and transmission of methyl methacrylate polymer ("Lucite")

A. H. Pfund; J. Opt. Soc. Amer. 29, 141 (1939); colors of mosaic powder films

B. R. Philip; J. exp. Psychol. 27, 125-35 (1940); intra-serial effects in the discrimination of color mass by the ranking method

R. Pies & H. Wendt; Klin. Wschr.; 19, 419-20 (1940); dark adaptation in healthy, properly nourished people

O. W. Pineo to Calco. Chem. Co., Inc.; U. S. Pat. 2,107,836 (1938); spectrophotometer

O. W. Pineo to Amer. Cyanamid Co.; U. S. Pat. 2,206,575 (1940); spectrophotometer

O. W. Pineo to Amer. Cyanamid Co.; U. S. Pat. 2,211,628 (1940); absorption spectrophotometer

O. W. Pineo; J. Opt. Soc. Amer. 30, 276-89 (1940); residual photometric errors in the commercial recording spectrophotometer

J. Pinte & R. Toussaint; Rev. gen. Mat. Col. 42, 282-4 (1938); "T. C. B. T." daylight lamp: application

M. H. Pirenne & S. Hecht; J. Opt. Soc. Amer. 30, 270-1 (1940); spectral sensitivity of the long-eared owl

H. J. Plenderleith; Nature 147, 165-6 (1941); application of modern physics (including color measurement) in the examination of paintings

A. Porai-Koschitz & C. Moerder; Compt. rend. Acad. Sci. URSS 28, 139-43 (1940); second-order colors (anomalous shift of absorption bands)

E. Powell (Ed.); Research Quart. Amer. phys. Educ. Assoc. (Suppl.) 9, No. 1, 30-6 (1938); smoking and its effects upon visual accomodation

J. S. Preston; Trans. Ill. Eng. Soc. (London); 5, 109-16 (1940); standard photometric observer: relative luminosity curve

J. S. Preston; Nature 147, 298 (March 8, 1941); zinc oxide smoke (shape and size of needle particles -- used in photometric standards -- by electron microscope photographs)

J. S. Preston; J. Sci. Instr. 18, 57-9 (1941); photoelectric measurement of the average intensity of fluctuating light sources

I. G. Priest & F. G. Brickwedde; J. Opt. Soc. Amer. 28, 133-9 (1938); Bur. Stand. J. Res. 20, 673-82 (1938); minimum perceptible colorimetric purity as a function of dominant wavelength

V. K. Prokof'ev & N. N. Sorokina; Zavodskaya Lab. 9, 417-25 (1940); use of photometry in quantitative spectral analysis

E. Putseiko; J. Tech. Phys. (U. S. S. R.) 7, 1337-45 (1937); through Chem. Abstr. 34, 5342 (1940); light measurements with selenium photoelectric cells of the rectifer type

W. J. Quinn; Natl. Paint, Varnish & Lacquer Assoc., Sci. Sect. Circ. 588, 122-4 (1939); permanent color standards (brief address)

E. Rabinowitch & L. F. Epstein; J. Amer. Chem. Soc. 63, 69-78 (1941); polymerization of dyes in solution; thionine and methylene blue

J. T. Randall & M. H. F. Wilkins; Nature 143, 978-9 (1939); luminescence and photoconductivity of solids

Rathbun to Texas Co.; U. S. Pat. 2,208,105 (1940); stabilization of color of gasoline

N. S. Rassudova & L. F. Dreving; Prom. Org. Chim. 7, 225-7 (1940); yellowing of linseed oil paint containing titanium dioxide

F. I. G. Rawlins; Tech. Studies Field Fine Arts 9, 3-10 (1940); tintometric comparison of artists' pigments (the same samples as those studied spectrophotometrically by Barns, 1939)

G. H. S. Razram & H. C. Brown; Psychol. Bull. 38, 322-30 (June 1941); aviation (includes 4 recent and 13 other bibliographical references to visual factors with discussion)

AMERICAN SOCIETY FOR TESTING MATERIALS

A SYMPOSIUM ON COLOR—

Its Specification and Use in Evaluating the Appearance of Materials

SPONSORED jointly by two organizations—the American Society for Testing Materials and the Inter-Society Color Council—each of which has carried out important standardization, research and testing activities in this field, the published Symposium on Color comprises six extensive technical papers with oral and written discussion submitted by interested technologists. It will be noted that the papers cover practically all phases of color and stress those aspects which should be of primary interest to the specifier of appearance attributes of color.

The joint committee in charge of the technical symposium included M. Rea Paul, *chairman*, and the following members: A. G. Ashcroft, W. E. Emley, C. E. Foss, W. R. Fuller, H. A. Gardner, D. B. Judd, R. S. Hunter, Paul Rapp and W. M. Scott.

THE FOLLOWING LIST OF PAPERS WILL INDICATE THE GENERAL CONTENT OF THE SYMPOSIUM:

Introduction to Color—DEANE B. JUDD, *Physicist, National Bureau of Standards.*

Describes attributes of color, modes of appearance of object colors, usefulness of the color solids;—gives technical definition of color, color specification by combinations of lights and by material standards Draws a distinction between the psychological definition of color and the technical definition.

Color Specifications of Transparent Materials—FRANCIS SCOFIELD, *Chemist, National Paint, Varnish and Lacquer Association.*

Discusses the problem of designating one color out of a family of similar colors; covers the nature and color characteristics of standards and describes attempts to set up color standards for mineral and vegetable oils, varnishes, resins, and other transparent materials. The many sets of standards, including the Lovibond glasses, the A.S.T.M. oil colorimeter, the U. S. rosin standards, are reviewed and their merits and defects pointed out.

Hiding Power and Opacity—R. H. SAWYER, *Research Division Head, Krebs Pigment and Color Corporation.*

In general, practical relations between optical properties and such factors as refractive index, particle size, film thickness, and particle concentration have been developed empirically with empirical methods for measurement, and have not been reduced to either simple or complex equations. Many useful testing methods have been developed. Several of these have achieved the status of recognized standard testing methods. This paper deals chiefly with discussion of the most significant theoretical and empirical relations which have been developed and of those practical testing methods which have attained widest recognition.

Color Standards for Opaque Materials—I. H. Godlove, *Physicist and Chemist, E. I. du Pont de Nemours and Co.*

After pointing out that color of an opaque object depends on three sets of factors and briefly covering certain methods of specifying color, the author discusses in detail various color standards pointing out that the material standards vary from haphazard and variable traditional objects, which lead to unprecise color names such as emerald-green or lemon-yellow, to groups of standards such as the Ostwald and Munsell systems. There is brief reference to methods and systems of designating color, and appropriate reference is made to color dictionaries including the Maerz and Paul "Dictionary of Color." Finally, reference is made to a number of special standards including Air Corps, Army, and some of the A.S.T.M. standards.

Spectrophotometry and Color Evaluation—A. E. Parker, *Physicist, Electrical Testing Laboratories.*

Spectrophotometry, which is the measurement of light emitted, transmitted or reflected as a function of wave length, while not a new field has been relatively inactive until recent years when the development of recording spectrophotometers imparted a tremendous impetus. Reference is made to a number of non-recording spectrophotometers with various circuits and explanatory diagrams, but most of the paper refers to recording type with detailed descriptions, working diagrams, and related data. The author lists various fields where the application of these instruments is very important.

Photoelectric Tristimulus Colorimetry—R. S. Hunter, *Junior Physicist, National Bureau of Standards.*

The statement is made that photoelectric tristimulus colorimetry is direct and rapid because the result of integration with respect to wave length is found automatically by the use of specially chosen source-filter-photocell combinations. The author includes a short discussion of two experimental methods much confused, namely, the photoelectric tristimulus colorimetry method and the photoelectric abridged spectrophotometry method. Instruments for the former are described with applicable equations and finally the applications are covered under such headings as I.C.I. values; for uniform-chromaticity-scale coordinates; and for amount of color difference and whiteness. There is detailed discussion of errors in the method.

Intensified interest in this whole subject of color, its measurement and standardization, makes this Symposium a timely one. Color is significant with respect to numerous materials including paper products, paints (including pigments), cosmetics, foodstuffs, potable liquids, textile materials, oils, gasoline, glass, plastics, chemical analysis, etc. ***All technologists and others concerned with color in these and other fields should find the symposium an interesting and informative publication. Reviewed as it has been by a committee of outstanding authorities, information and data presented are considered authoritative.***

86 pages, cloth or heavy paper binding, 6 by 9 inches.
Prices: Cloth, $1.25; paper cover, $1.00. To A.S.T.M. members, cloth, $1.00; paper, 75 cents.

USE BLANK TO ORDER COPIES

American Society for Testing Materials
260 S. Broad Street, Philadelphia, Pa.

Gentlemen:

Kindly send me ..... copies of the publication "Symposium on Color—Its Specification and Use in Evaluating the Appearance of Materials," postage prepaid. *Cloth*, ☐; *paper*, ☐.

Enclosed find $..... *in payment*
(*or*)
☐ *Please send bill when shipment is made.*

Name .....

Address .....

.....