INTER-SOCIETY COLOR COUNCIL

NEWS LETTER No. 108

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News Letter Committee:	I. H. Godlove, Editor 127 Spring Garden Street Easton, Pennsylvania
Faber Birren I. H. Godlove Deane B. Judd Dorothy Nickerson	Dorothy Nickerson, Circulation Manager Cotton Branch, PMA, USDA Washington 25, D. C.
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NEW MEMBERS — We welcome to individual membership the following persons elected by a letter ballot of July 30.

Mr. Samuel L. Goldheim, 2603 Talbot Road, Baltimore 16, Md. Particular interest: Color control for uniformity and color matching in the printing and lithography industry. Colorimetric methods in the chemical laboratory.

Miss Beverly Milner, Dow Chemical Company, Midland, Michigan. Particular interest: Color measurement of dark samples, color measurement of monofilaments.

Mr. Shigeru Mita, Toshiba Central Library, Tokyo-Shibara Electric Company, 72 Horikawa-cho, Kawasaki near Yokohama, Japan. Particular interest: color rendering properties of fluorescent lamps, color filters and their applications, measurement of color and gloss, color conditioning, color adaptation.

Mr. Lennart H. Tysell, 729 Hillside Ave., Bethlehem, Pa. Particular interest: Color names and modern aesthetic theories regarding color and form problems; the use of color in product design, and in interiors such as color conditioning.

WILSON'S COMMITTEE FOR ANNUAL MEETING — At a meeting on June 14th Scott Wilson, New York delegate for the Industrial Designers Institute, was asked to head a committee to present after the dinner at the next annual meeting a production dramatizing the final use of color in the manufactured product. Mr. Wilson's committee will be made up of members of the various New York organizations associated with the Inter-Society Color Council, as well as various manufacturers, stylists, and lighting and color experts. A central theme for this production was discussed, and a tentative decision was made to call the production "Color Puts Its Best Foot Forward".

HONOR TO ROLAND DERBY — From a recent issue of the American Dyestuff Reporter we learn that Roland E. Derby, Sr. of Lowell, Massachusetts, is the winner of the 1953 Olney medal award for his outstanding work in the textile field. The medal will be presented at the

Annual Convention of the American Association of Textile Chemists and Colorists in Chicago on September 18. Both Mr. Derby and his son Roland, Jr., an ISCC delegate, are well known to many of our readers. We congratulate Mr. Derby for this well-earned honor.

THE DIN COLOR-SYSTEM The following review was written at the request of the editors by Dr. Henry Hemmendinger of Davidson and Hemmendinger, Color Consultants, with only slight editing in the fourth paragraph by our Editor for Science, Dr. Deane B. Judd.

The first volume of the new Journal, <u>Die Farbe</u>, closes with a discussion of the DIN Color-Card, the result of over a decade's work by M. Richter and his colleagues at the German Bureau of Standards. Although the folio of colors has not yet appeared here, it is possible to indicate its most important characteristics on the basis of the detailed published description.

The DIN Color-Card is a collection of colors, based on a new system of coordinates devised by M. Richter. In this system, colors are ordered according to the three DIN variables hue, saturation, and darkness (Farbton T, Sättigungsstufe S, and Dunkelstufe D), and it is claimed that the three scales have been divided into subjectively equivalent intervals. The division of the hue circle into twenty-four equal steps was based on the observations of 317 persons, who selected equal intervals out of a 120-part Ostwald circle. The dominant wavelengths thus chosen are used to define the twenty-four hues, at all saturation and darkness levels. The division of the saturation scale was based on the observations of seven trained observers, making judgments first for equality of saturation of colors of moderately high saturation, then making judgments for each hue in turn to establish equal steps between neutral and the previously chosen level of constant saturation. This linear division was smoothed, and extrapolated to higher saturations, with the aid of a projective transformation of CIE space, following (in part) one proposed by MacAdam. Finally, for the division of the darkness scale into equal parts, Richter first defines a "relative brightness value" $h = A/A_0$, where A is the CIE tristimulus value, and A_0 is the maximum possible Y value of a non-luminous sample of the same chromaticity. (This is done on the assumption that colors having equal values of this relative brightness are "equivalent" colors.) The darkness scale is then derived from a logarithmic function; specifically, darkness D is defined by $D = 10 - 6.1723 \log (40.7 h + 1)$.

The resulting system is fully described in the draft of German Standard DIN 6164, which appears in the same number of <u>Die Farbe</u>. While it is of course necessary to specify the three variables T, S, and D for the full description of a color, the two variables T and S suffice to specify the chromaticity (Farbart), which thereby assumes special significance. The DIN hue T is specified by numbers 1 to 24; saturation S by numbers which run at least from 1 to 7, and for some hues to as high as 15; and darkness D, as defined above, by numbers from 0 to 10. The three coordinates are given in the sequence T - S - D. The published standard DIN 6164 tabulates a non-standard form of chromaticity coordinates, x,y of all possible colors having digital values of T and S, together with the Y value corresponding to D = 0. The tabulated data are also shown graphically, in the same non-standard form at CIE coordinates. All data are given for CIE source C.

Since the limiting value of Y for a non-luminous sample is basic to the DIN system of coordinates, it should be pointed out that the chromaticity coordinates given in this table are different from the standard values used internationally, and, indeed, in Germany. (See DIN 5033, pages 174-175 of the same issue). They differ by reason of the fact that the tristimulus scales (X,Y,Z) have been adjusted by constant multipliers to make CIE source C plot at the center of the Maxwell triangle. If no attention is paid to this non-standard convention, many of the DIN colors would seem according to the data in "The Science of Color" to be impossible ones. For instance, DIN chromaticity 11 - 6 is shown as having a maximum Y value of 0.40, whereas the data derived by MacAdam indicate a maximum Y value of about 0.38 for this chromaticity.

The actual color samples of the DIN color-card, as it is now being issued, consist of gelatin filters. In each of the twenty-four hues, there is one filter for each saturation from 1 to 7, all at darkness 1.5. It is intended that any darker colors be obtained by the use of suitable optical means of reducing the transmitted energy. The system will subsequently be extended, where feasible, to higher saturations.

It is stated, in the draft of the proposed standard, that it is intended that the DIN color-card serve as the basis of color standardization in the designation of object colors in all technologies. It is emphasized that the determination of DIN coordinates is to be carried out either by determination of CIE coordinates, and conversion according to DIN 6164, or by a visual observation of the equality of two colors. (Interpolation between neighboring colors is not recommended, since it is not sufficiently precise.) The observation that an object color is equal to a particular combination of DIN colors is to be made only on the basis of the observation of the color as a "free color" (freiefarbe), as, for instance, in a Maxwellian view, and is to be independent of geometrical characteristics of the surface. It is required, therefore, that the use of the gelatin filters be carried out only with the aid of appropriately designed viewing devices.

In the articles describing the system and its applications, it is suggested that the new arrangement may solve many of the outstanding problems in color and color-difference specification. For instance, H. Weise, writing on color tolerances, proposes a formula for color-difference specification based on the DIN units, and closes with the suggestion that the failure of industry to employ explicit color tolerances may be due in large part to the unavailability of a sufficiently generally usable system, and that this circumstance is basically changed by the advent of the DIN color-card. It appears to this reviewer, however, that the placing of such high hopes on the new system is not justified. Dr. Richter, in his introductory article, has remarked on the types of compromises which were accepted in the definition of the new coordinates. With reference, for instance, to the failure of the DIN system to allow for the recognized variation of dominant wavelength for constant subjectively perceived hue, he points out that this does not seem sufficiently serious to be included in the system, especially in view of the magnitude of individual observers' variations. As a result, two examples which, according to the Munsell renotation, are of the same chroma and hue, and differ by one step in value, may in the DIN system differ not only by one step in darkness, but also by almost one step in hue and in saturation. Thus 5R 2/6 and 5R 3/6 are described in the T-S-D coordinates as 9.1 - 4.2 - 6.6 and 8.3 - 3.4 - 5.3 respectively. Similarly, it is pointed out by W. Budde, in the comparison of the DIN with other color systems, that in the Munsell system the curves of equal chroma are of different sizes in the planes of constant value, whereas it is cited as an advantage of the DIN system that its saturation coordinate is dependent only on trichromatic coordinates, independent of darkness. This leads to the circumstance whereby, for instance, renotated Munsell colors 5BG 4/6 and 5BG 3/6 are described in the T-S-D coordinates as 19.5 -5- 4.4 and 19.4 -6 - 5.6, respectively. Thus samples differing in the Munsell renotation by one step in value differ in the DIN system by about one step in darkness and one step in saturation. Surely, if there is any validity in the subjective constancy of coordinates in the Munsell renotation, discrepancies of this sort would make it difficult, if not impossible, to devise a color-difference formula in the simplified coordinates which are valid within a factor of 1.5 or 2. Since existing color-difference formulas are useful at least within this uncertainty, it does not appear that the compromises adopted in the DIN system provide the most promising path for the desired improvements in color-difference characterization.

Taken as a sampling of color space, the gelatin filters of the DIN system represent a notable contribution, especially in view of the small tolerances permitted in their manufacture. Their availability will permit an increased flexibility in the experimentation with additive color-mixing systems; such experimentation can at this time perhaps most usefully be carried out in terms of the stated CIE coordinates of the samples. It is, however, not apparent that the new system of coordinates indeed realizes the equidistance of subdivision which is claimed for it.

HUNTERLAB BULLETIN — A brochure or catalog of services of a different sort has been received from the Hunter Associates Laboratory, 5421 Brier Ridge Road, Falls Church, Virginia. This new laboratory, Richard S. Hunter, Director, is a firm of optical engineers specializing in instruments and tests for the appearance properties of materials (color, gloss, reflectance, opacity, turbidity, haze). It contains a number of photographs and drawings describing this laboratory in the outskirts of Washington, D. C. and illustrating its varied services. Examples are given showing how customers were shown how to use their present equipment to obtain results both more rapidly and more accurately than before a visit from a Hunterlab engineer. Examples are shown of a simple test for opacity and of design of new light-measuring instruments specially adapted for specific problems. Though the laboratory deals primarily with instruments to replace the human eye, a page is devoted to detailing the remarkable sensitivities of the eye. Two very instructive tables are included. One deals with applications of photometric measurements to non-appearance variables. Another gives a new classification of appearance variables, with examples, detailing the attributes which are measured. This bulletin accompanied Hunterlab Circular Letter No. 1, the number suggesting that others will follow. The letter also eulogizes the human eye but points out that electronic devices may supplement or surpass the eye in specific applications; the letter also lists two publications. This interesting bulletin may be obtained by writing to Hunter Associates Laboratory at the address given above.

"CALIFORNIA" COLORS — In our preceding (July) issue, we reported some correspondence passed on to us by Margaret Hayden Rorke, Managing Director of the TCCA, relative to the California State Colors, and below in this issue we include more from the same source. In view of this it may not be amiss to remind ourselves that "California color" was a shade popular in the early nineteenth century, and dyed in three strengths, appearing Light, Medium and Dark. The medium shade is described in the ISCC-NBS system as a "moderate brown", of Munsell notation 7YR 4.1/4.0. California green, of the same century, was a "dark grayish yellow," bordering on an olive. The Plochere system defines also California gold and California poppy. These colors, of course, have never been official.

CALIFORNIA STATE COLORS — In our preceding issue, we reported some correspondence, as stated above, on the official colors of the State of California. Supplementing the data given there, we may add further data taken from a mass of correspondence between Mrs. Rorke and the office of the Secretary of State (of California). For the official colors Yale Blue (C. No. 70086) and U. S. Army Golden Yellow (C. No. 65001) we have: Munsell Book Notations: 7.2 PB 2.9/9.1 and 1Y 7.3/11; Munsell Renotations: 7.3 PB 2.9/8.8 and 2.0Y 7.1/11.3; corresponding ISCC-NBS descriptions: deep purplish blue and vivid yellow, respectively.

We have received also copy of the Bear Flag Act, Senate Bill No. 1014, which becomes effective September 10, 1953, defining the colors of the State Flag of California. On pp. 3-4 the colors are given as: White, C. No. 70001 (white field, front of bear's eye, bear's claws); Old Glory Red C. No. 70180 (red stripe, the star, bear's tongue); Irish Green, C. No. 70168 (grass plot); Maple Sugar, C. No. 70129 (brown of the bear); and Seal, C. No. 70108 (dark brown of the bear outline, paws, shading, fur undulations, iris of the eye, 12 grass tufts, and the letters of "California Republic"). This material was also the basis of correspondence from the Business Division of the Los Angeles City Board of Education, which asked for specifications of the five colors.

COLOR TESTS FOR PLANT NUTRIENTS Through the courtesy of Mr. A. J. Fawcett, Director, The Tintometer Limited, Salisbury, England, we have received copy of "Chemical Tissue Tests for Determining the Mineral Status of Plants in the Field," just published by Tintometer Ltd. The author is Dr. D. J. D. Nicholas of the Long Ashton Research Station, Bristol University, who is at present on leave from the University of Bristol on a fellowship, the Investigation of Micronutrient Elements, at The McCollum-Pratt Institute, a department of The Johns Hopkins University, Baltimore.

The higher plants require for subsistence and growth not only the so-called macronutrients, in fairly large amounts, but also certain micronutrient trace elements, which although present in small quantity are equally essential. Normally the macronutrients include potassium, magnesium, calcium, phosphorous, nitrogen and sulfur; the micronutrients iron, zinc, copper, manganese, molybdenum and boron. When plants fail to thrive because of a mineral deficiency or excess, they often show characteristic symptoms which can be identified (see T. Wallace; The Diagnosis of Mineral Deficiencies in Plants; a Colour Atlas and Guide; 2nd Ed., H. M. S. O., London; 1951). In the field it is convenient to use a tissue test method to supplement the visual diagnosis of mineral disorders. The chemical methods are especially useful when visual symptoms are ambiguous or complicated by other environmental factors. The quick chemical tests are simple and speedy in operation as compared with ash analysis, but are of course less precise. Chemical tissue tests originated in America as qualitative methods to determine mineral deficiencies (papers by Carolus, Emmert, Harrington and Thornton, Corner and Frazer, from 1934 on, are listed in the booklet's bibliography). The tests were further developed at the Long Ashton Laboratory; and a number of techniques are now available for determining quantitatively the mineral elements in fresh plant tissues. These include particularly (a) the "diffusion method for field work (papers of Dr. Nicholas) and (b) macerator methods for laboratory testing (also Nicholas et al). The booklet under review is concerned solely with the field method.

The plan and execution of this little book is a model of conciseness and lucidity and in the reviewer's humble opinion, exactly what he would like to have at hand for practical field work. The first six pages give notes on necessary apparatus, including a portable field kit and notes on the Lovibond Comparator and miniature black Nessler tubes with pictures. Then follows an introduction, from which we have freely borrowed some of our lines above. Next are a note delineating the Long Ashton Field Method and four pages on the technique of field tissue tests. Sixteen pages are then devoted to the specific tests for nitrate nitrogen, phosphate, potassium, and so on, including a general test for heavy metals. In general the order of presentation for each test is: reagents, procedure, color (or turbidity) range, and the effective concentration range. The color names are of the type familiar to layman; for example, for the magnesium test the statement is Colour range: Maximum, salmon pink; minimum, straw yellow; for the potassium test, we read: Turbidity range: Maximum, canary yellow; minimum, clear reddish brown solution. Following the tests is a brief note on "Conclusions," a 20-reference bibliography, a table of (mixed indicator) liquid color standards for the determination, and an excellent 3-page detailed summarizing table of the chemical tests.

The price of this excellent little book is given on the title page as 8/6. It may be obtained from the Colour Laboratory, The Tintometer Ltd., Salisbury, England.

I.H.G.

A COLOR FARM Recently we received an article which, with photographs covered nearly the whole front page of the Magazine Section of the Sunday Republican of Waterbury, Conn. Its title was: What's a Color Farm? - Ask Henderson Wolfe. That we shall have to do, for reporter John Dicorpo failed to tell us, though all of color-farmer Wolfe's remarks, as judged by direct and indirect quotes, seemed interesting and very sensible. We were given the following biographical data: Henderson M. Wolfe, Jr. of New Preston, Conn., was graduated from Harvard, where he was a classmate of ISCC delegate Scott Wilson, and taught at Harvard, Bryn Mawr and the University of Virginia. Finding that "the only way one can teach color at either the high school or college level is to teach art in the accepted sense, he took a job at 22 at the University of Virginia," presumably teaching art and color simultaneously. He now hopes to have color taught in high schools as a part of the work of art classes, but somewhat despairs of the neglect of the subject in high schools. Accordingly, he is presently thinking in long-range terms and preparing material and methods for a college course in color.

The reporter states that Mr. Wolfe painted 400 portraits while in the army during World War II, and completed a huge mural at Havana; but also that Wolfe "operates by a mathematical system, notes the values and intensities of the materials he uses, so that every color he creates can be reproduced by any chemist." Though only 47, he has worked with color for 30 years. His home and studio is pictured as a very interesting converted old mill near New Preston.

I.H.G.

T.C.C.A. ANNUAL MEETING At the 38th annual meeting of the Textile Color Card Association of the U. S., Inc., held at its headquarters, 200 Madison Ave., New York City, two new directors were elected and nine reelected for 1953-54. Immediately thereafter the Board of Directors elected the following officers: President, Roy E. Tilles, Sr., President, Gotham Hosiery Co., Inc.; 1st Vice-pres. Armand Schwab, President, Armand Schwab & Co., Inc.; 2nd Vice-pres., John F. Warner, Vice-pres., D. B. Fuller & Co., Inc.; Treasurer, Henry C. Van Brederode, Vice-pres., Celanese Corp, of America; Secretary and Managing Director, Margaret Hayden Rorke. The new directors elected were John M. Hughlett, Vice-pres., J. P. Stevens & Co. and Newton J. Rice, President, Wear-Right Gloves, Inc. Reelected directors included the first four named officers and J. Diephuis, W. J. Fullerton. H. A. Hafner, W. R. MacIntyre and R. A. Ramsdell.

In her annual report, Managing Director Rorke, reviewing the widely diversified activities of the Association, mentioned that it had gained 124 new members, 57 of whom are foreign. In 1952, thirty thousand color cards were issued. The outstanding new activity was the issuing, in cooperation with the Decorative Fabrics Institute, of an Upholstery and Drapery Fabric Color Card, logically following the Carpet and Rug Color Card, issued earlier in 1952. The Second Edition of the U. S. Army Card for Official Colors for Arms and Services was also promulgated in 1952. Work in cooperation with the State of California has been mentioned elsewhere in this issue.

The only 1953 color card issued by the TCCA which we have not reviewed in the News Letter is the 1953 Fall Millinery Color Card. This features 22 colors in which the pink-rose-red range receives strong emphasis, perhaps influenced by First Lady Pink, which we have described in these pages. With the exception of this color, Regal Purple and five shades repeated from earlier collections (Icing Blue, Greysmoke, Fire Red, Continental Green and Light Coffee) all of the colors are taken from the 1953 Fall Cards for Woolens and for Man-made Fibers and Silk. Other colors in the pink to red family include Grape Pink, Red Chianti and Fire Red. In the "neutral gamme of beige and brown" are Ivory Sand, Twilite Beige and Light Coffee. Yellowish greens include Paris Moss and Glitter Green, while Continental Green is a "dark pine" shade. In the violine range is Regal Purple from the 1937 coronation colors. Blues include Sundown Blue, Icing Blue, Ocean Blue, and Scarab Blue; and neutrals, Gray Opal and Greysmoke. Completing the list are Porcelain Yellow, Charm Gold, Coral Glint, Copper Lacquer and Inca Copper, and of course black, brown and navy.

STATUS OF COLOR TELEVISION Through the courtesy of E. Taylor Duncan, who also supplied many of the bibliographic and patent references in this issue, we received an AP report from The Louisville Times of July 24 headed "Color TV Rivals End Fight; C.B.S. Accepts R.C.A. System.

"The long fight over color television was formally ended as the Columbia Broadcasting System said it would go along with the proposed new compatible system."

C.B.S. said it would start sending out some color programs to affiliated stations on an experiemental basis September 15 under standards proposed to the Federal Communications Commission by an industry-wide group known as the National Television System Committee. Regular color telecasts for the public must await the F.C.C. action on the new system.

In effect, C.B.S. joined hands with its archrival, Radio Corporation of America, which petitioned the F.C.C. a month ago to approve the compatible standards developed by the N.T.S.C. The committee filed its own petition today. With this system, color telecasts can be received in black and white on present-type sets, as well as in color on color sets. The move wrote finis for C.B.S.'s own incompatible color system. This was adopted by the F.C.C. in 1950 and was on the air on a limited basis several weeks in late summer of 1951 until imposition of a federal ban, since lifted, on manufacture of color sets. With the C.B.S. system, color telecasts could not be received in any form on present-type sets without major modification.

The F.C.C. has promised early consideration of the proposed new color-TV method, but has set no date for hearings or for formal action that would be necessary before regular color telecasts for the public could begin.

Most set manufacturers have either pilot models or complete production plans for color sets. But, depending upon when and if the F.C.C. approves the new system, the first color sets may not appear until the fall of 1954. And prices are expected to be about three times higher than the cost of present black-white sets."

MORE ON COLOR TELEVISION AND COLOR MATCHING — Also supplied by Taylor Duncan were the following notes taken from the July 7 and July 14 issues of the Official Gazette, U.S. Patent Office.

"The following three patents are owned by George Valensi. They relate to color television systems of the type in which a brightness signal and a coded color signal are transmitted to characterize every elemental area of the picture being scanned at a given instant. In each system, the transmitter includes a coding device and the receiver includes a decoding device: U. S. Patent 2,375,966 (May 15, 1945); System of television in colors; U. S. Patent 2,492,926 (December 27, 1949); Color television system; U. S. Patent 2,606,962 (August 12, 1952); Color television receiver. Correspondence should be addressed to Michael S. Striker, 511 Fifth Avenue, New York 17, New York."

In the register of patents available for licensing or sale, Mr. Duncan found the following:

"The General Electric Company offers the following patent for non-exclusive licensing, upon reasonable terms, to domestic manufacturers: U. S. Patent 2,602,368 (July 8, 1952); Color matching apparatus; Apparatus for matching colors through the medium of their spectrophotometric curves for quickly determining the relative amounts of different color elements, such as pigments and dyes, which are necessary to produce a desired color shade when mixed together.

Applications for license may be addressed to the Manager, Patent Services Department, General Electric Company, 1 River Road, Schenectady, New York."

GARDNER ITEMS — Among the many bulletins and leaflets received from Gardner Laboratories, Inc., Bethesda 14, Md., the following have reference to paint or color and may be obtained from this Laboratory: Bull. No. 129, Scratch Test Apparatus for Paints, Lacquers and Varnishes; Flow Master, a pen with felt tip using inks in ten colors (black, red, blue, green, purple, orange, yellow, brown, white and silver); Bull. No. 139, Stewart's Scientific Dictionary. Also received were two reprints from <u>Chemical Processing</u>. One was headed "Matching paint colors is no snap but color instrument can spot hairline differences," and gave the (2-page) story of use of the Gardner-Hunter Color Difference Meter by the Cleveland plant of Sherwin-Williams. The other reprint was headed "Entire Web Width Checked for Gloss as Supercalender Polishes Paper," and gave by four photographs and a brief write-up the story of the control of gloss of machine-coated paper stock in the S. D. Warren Co. Plant at Cumberland Mills, Maine.

A.S.T.M. REPORT — We recently received copy of A.S.T.M. Report of Committee E-12 on Appearance, which held two meetings in 1952-53 at New York on June 25, 1952, and at Detroit, March 3-4, 1953. The report includes the Proposed Tentative Method of Test for 45-Deg., 0-Deg. Directional Reflectance of Opaque Specimens (4 pages). The report of the committee, of which M. Rea Paul is chairman and Daniel Smith secretary, also includes brief statements of the activities of four subcommittees, namely: I on Definitions, R. S. Hunter, chairman; II on Color and Spectral Characteristics, Dorothy Nickerson, ch.;

III on Gloss and Geometric Characteristics, H. K. Hammond, III, ch.; and IV on Pictorial Representation, R. M. Evans, ch. Since the ASTM annual meeting in June it has been announced that W. E. K. Middleton has been appointed chairman of Sub-II, Color, to replace Miss Nickerson, who resigned, effective June 1953.

SKY-BLUE SCARLET A COLOR NAME

Hearing a youth use the term sky-blue pink rather startled us, and recalled the use of "sky-blue scarlet" by Robert Louis Stevenson in his unfinished novel St. Ives. Being interested at the present in color names, and recalling Stevenson's interest in them, we jotted down a few of his. The references are to Scribners' 1905 edition of St. Ives. The story is that of a French prisoner of war in England in 1813. Our hero mentions (page 4) that he was forced to wear a jacket, waistcoat and trousers of a sulphur or mustard yellow, and a shirt of blue-and-white striped cotton. This costume was conspicuous, cheap and "pointed us out to laughter." On p. 79, our hero complained of having to wear "a misfitting sulphur-yellow suit, and half a week's beard." On p. 36, in describing a man, it is said that he "had a face of a mulberry color."

On p. 184, a certain lad Rowley, to become a body servant to the hero, Viscount Anne de Keroual de St. Ives, was required to take an oath which included "Strike me blue . . . . . and strike me sky-blue-scarlet if I do not maintain, uphold, love, honour and obey . . . . ." And Rowley, on being reproved on p. 337, exclaims: "But I'll never do it again, strike me sky-blue-scarlet!" On p. 227 the Viscount bought a chaise whose "body was painted a dark claret, and the wheels an invisible green." Invisible green is described in the ISCC-NBS system as a blackish to dark bluish green. On p. 430, a new chaise, a duplicate of the old one except for a missing bullet hole, was ordered painted in claret and invisible green.

On p. 242, a girl was described as "pretty as an angel, just plump enough to damn a saint, and dressed in various shades of blue from her stockings to her saucy cap, in a kind of taking gamut. . . . . . ."

On p. 264, St. Ives speaks of his change from prisoner's uniform, "From a suit of sulphur yellow to fine linen, a well-fitting mouse-colored great coat furred in black. . . . . . ." On p. 320, a notice about the escape of St. Ives from prison says that "he wore a fashionable suit of pearl-grey, and boots with fawn-coloured tops." On p. 340-41 is described his suit for a ball which he attended with great daring: olive-green coat with gilt buttons and facings of watered silk, olive-green pantaloons, white waistcoat sprigged with blue and green forget-me-nots. On p. 344, a girl presented St. Ives to her mother ". . . . . a moustachioed lady in stiff black silk, surmounted with a black cap and coquelicot trimmings." "Coquelicot," besides being the name of the corn poppy and a poppy-like mallow of Dixie land, is a synonym of "poppy red," a strong reddish orange. On p. 349, a man is described as a "red-headed, loose-legged scoundrel in cinder-grey." On p. 363, an aeronaut's balloon is described as "striped alternately with liver-colour and pale blue." Finally, on p. 413, a young man is described as a "hay-coloured youth." One may safely say that author Stevenson was quite color conscious.

I.H.G.

MIDDLETON PAPER

Another interesting paper from the pen of that versatile and prolific author, W. E. K. Middleton, is from Ecology 34, No. 2, 416-21 (April, 1953), Spherical Illumination as an Ecological Parameter, and an Improved Integrator. It is pointed out that light falls on the leaf or stem of a plant from all directions, some directly from the sun, some from the sky, and some after reflection from other objects; thus "It seems clear that any technique of measuring illumination which neglects this simple fact cannot give a result which represents the energy incident on a blade of grass or a pine needle." Dr. Middleton then notes that most commercial physical illuminometers emphasize the light incident in directions normal to the surface, the light rarely coming from a surface approaching a complete hemisphere. He then considers the mathematical definition of spherical illumination, the measurement of spherical illumination and integrating spherical illumination. He describes an improved integrating spherical illuminometer and its mode of operation and calibration, and concludes with a note on the performance of two of the new instruments operated at the Forest Research Station of the Department of Resources and Development, Petawawa, Ontario.

I.H.G.

DONALDSON SIX-STIMULUS COLORIMETER

One of the most interesting instrumental developments of recent years in the field of colorimetry involves a colorimeter and method described by R. Donaldson, of the National Physical Laboratory, Teddington, in the Proceedings of the Physical Society 59, 554-60 (1947). We understand that the National Bureau of Standards has one of the instruments on order or applied for by the Photometry and Colorimetry Section. The interesting feature of this instrument is that it nearly eliminates the problem of metameric colors and observer differences. The instrument is a modification of the ordinary trichromatic colorimeter, in which the three matching stimuli of the ordinary instrument (red, green and blue) have been increased to six by the addition of an orange, yellow-green and blue-green. The spectral energy distribution of the color being measured is first approximately matched by means of a mixture of all six stimuli. This is accomplished as follows. To set the red stimulus, a red filter of the same nature as the instrument filter is held at the eye and the red control is varied until there is a brightness match in the field. The process is repeated for the other filters in turn. Because of slight overlap of filters, the whole process is repeated a second time. There is then an approximate energy match. To get an exact match, three controls only, red (or orange), green and blue, are adjusted in the usual way. The small adjustment necessary does not disturb the energy match appreciably. At the matching point, the observer is required only to discriminate between two colors of nearly constant energy distribution. Hence, personal observer variations are nearly eliminated.

Other mechanical features of the instrument are much like the well-known 1935 Donaldson colorimeter (apertures with sliding shutters, integrating sphere, photometric cube, and so on). In the present instrument a wide (15°) field can be used because the removal of the energy differences between the matched colors allows freedom of choice of field size; the Purkinje effect is nearly absent and one does not have to have the field size for which the C.I.E. response data apply when there are no appreciable energy differences in the matched stimuli. Use of Lummer-Brodhun contrast patches in the field assured great sensitivity; and the instrument is adapted to the determination of extremely dark colors. As compared with the usual instrument, more time is required for calculation in transforming results; but the observational work is reduced, hence the time of complete determination is about as before.

I.H.G.

MEDICAL RESEARCH LABORATORY REPORTS

We have received copies of two more of the long series of reports on vision as it relates to naval affairs coming from the Medical Research Laboratory at the U. S. Submarine Base, New London, Conn. The first of these is by Marion P. Willis and Lt. Cmdr. Dean Farnsworth, "Comparative Evaluation of Anomaloscopes."

"This study examined six anomaloscopes, each chosen either because it was a classical instrument or because it exhibited special features in the presentation of stimuli. A selected sample of one hundred forty individuals was tested on all instruments and on a battery of color vision tests of progressive stringency.

"The results were interpreted according to classical methods and also by specially devised analytical methods. From this interpretation conclusions were derived concerning the relative diagnostic value of the instruments, the theoretical significance of anomaloscope scores, the distribution of anomalous trichromatism, and the relation of anomalous trichromatism to dichromatism and to normal color vision. A combination score is proposed which reduces range and deviation to one figure and which gives an estimate of degree of color deficiency. This scoring method can be used with a comparative scaling technique that can be applied to all anomaloscopes to give comparable scores."

The second of the reports dates 2 February, 1953, is by Lt. Cmdr. Dean Farnsworth and Beverly Hillman, "A Comparison of Specifications for Dark Adaptation Red."

"The current specifications for red goggles, red compartment lighting fixtures, and red panel illumination for dark adaptation purposes are discussed and evaluated.

A specification which computes rod and cone stimulation factors is found to be most effective in obtaining only those reds which allow the speediest subsequent dark adaptation.

Common standards for measuring the spectral quality of the filter materials are recommended, and a computation form is proposed which incorporates rod and cone stimulation factor limits based on the most recent luminosity-energy data."

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