

INTER-SOCIETY COLOR COUNCIL

NEWS LETTER

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NEW MEMBERS By letter ballot on July 26, 1955 the following applications for
individual membership were accepted:

Associate Individual Members

Miss Martha Crawford
233 East 60th Street
New York, New York

Mr. Henry F. Parker
Pittsburgh Plate Glass Company
Glass Division Research Laboratory
Creighton, Pennsylvania

Mr. John M. Stebbins
Time, Inc.
9 Rockefeller Plaza
New York 20, New York

Mr. Richard B. Stehle
Pine Road and Shady Lane
Philadelphia 11, Pennsylvania

Mr. Charles R. Stewart
College of Optometry
University of Houston
Houston 4, Texas

Mr. John E. Tyler
8031 LaJolla Shores Drive
LaJolla, California

Particular Interest:

The use of color architecturally
to produce an impulse to buy
merchandise.

The colorimetry of transparent
materials, color specifications
and color difference units.

Printing quality, photographic
quality and photographic print-
ing quality.

Measurement of color.

Color blindness and color
aptitude tests.

Fluorescence - apparent colors
of submerged objects.

Affiliate Individual Members

Mr. Stefan P. Boran
Chrysler Corporation - Dept. 444
12,800 Oakland Avenue
Highland Park 3, Michigan

Mr. Lynn R. Easley
217 Holly Street
Kingsport, Tennessee

Mr. Hans Hansen-Schmidt
Hainbundsstrasse 6/8
Gottingen, Germany

Mrs. Pearl K. McGown
Rose Cottage
West Boylston, Massachusetts

Mr. Rudolf F. Schaefer
Rudolf Schaefer Studio, Inc.
30 East 20th Street
New York, New York

Mr. Dudley J. Smart
7005 Orchard Street
Dearborn, Michigan

Particular Interest:

The use of color in every phase concerned with automobile interiors.

Sample presentation and small color differences.

German editions of American publications in the field of color and the production of durable color samples (standard color samples).

Color as practically applied to design and its influence on decoration.

The reality and function of color.

Those dealing with automotive styling both interior and exterior, specifically, the planning of well-balanced color programs in line with color trends, within the limitations of mass production.

Among the names above, we notice that of Mrs. Pearl K. McGown, whose book "Color in Hooked Rugs" was reviewed in the July issue. We wish to take this opportunity of welcoming Mrs. McGown to our membership, and, at the same time, of apologizing for having misspelled her name in the last issue. - Ed.

CIE MEETING Ed. Note: The following account of the CIE meeting, written
IN ZURICH at our request by Miss Dorothy Nickerson, will give you, we think, an excellent over-all picture of what went on. A forthcoming article in the Journal of the Optical Society of America, to be written by Dr. Deane B. Judd, will explain in greater detail some of the implications of the resolutions passed by Technical Committee 1.3.1, Colorimetry. On the other hand, for a picturesque account of what our delegates did when they were not attending meetings, we recommend the article by Dean Farnsworth which follows that by Miss Nickerson.

More than 400 delegates from 27 countries, including 36 delegates from the United States, attended the 13th meeting of the International Commission on Illumination (CIE) in Zurich, June 13-22, 1955. Dr. Ward Harrison (U.S.), who completed his four year term as president, is succeeded by Dr. J. M. T. Walsh (Great Britain). Mr. A. A. Brainerd (U.S.) is one of four vice-presidents elected to serve for the term ending in 1959 when the 14th session is scheduled to be held in Belgium.

The results of the work transacted will be published in a 3-volume Proceedings to be available early in 1956. Meanwhile, in a 30-page mimeograph report, the secretary of the U. S. National Committee, Mr. L. E. Barbrow, National Bureau of Standards, Washington, D. C., has listed some of the recommendations which were adopted tentatively. These recommendations become effective six months after their tentative approval unless objection is entered by any National Committee. The limiting date for comments or objections is October 1, 1955. A limited number of complete sets of approved Recommendations are available from Mr. Barbrow, as are a complete list of the papers and secretariat reports presented at Zurich, and preprints, at a nominal fee.

Committee 1.1.1, Basic Quantities, Units and Standards, reports 8 recommendations, the first of which asks that each National Committee, in its own country, make every effort to get the terms and units with the mutually agreed meanings generally adopted. Some of the other recommendations of this Committee are: 2. It is recommended that the word "luminance" (or some related word) should be used in all countries. 7.1. Luminance. (At a point of a surface and in a given direction.) The quotient of the luminous intensity in the given direction of an infinitesimal element of the surface containing the point under consideration, by the orthogonally projected area of the element on a plane perpendicular to the given direction. Symbol L or B ; Unit cd/m^2 . *Change also in luminous flux def. per R. proposal.*

Committee 1.1.2, Vocabulary, found the second draft presented at the 13th meeting acceptable in principle for publication, detailed suggestions from National Committees to be received before January 1, 1956. The second edition of the Vocabulary will consist of two volumes, one containing the terms and definitions in three official CIE languages (English, French, German), the other the equivalent terms (without definitions) in French, English, German, Italian, Spanish, Dutch, Russian, and eventually other languages. More than 500 terms are included in the vocabulary, which should be available in printed form within a year.

Committee 1.2, Photometry, recommended that photometric and colorimetric intercomparisons be made on tubular fluorescent lamps in order to determine the consistency of measurements made in different countries.

Committee 1.3.1, Colorimetry. The six recommendations of this committee, important to all workers in the technical field of colorimetry, are given below in full. As may be seen, they indicate that a change in the basis for evaluating light and color is expected. The 1931 standard observer color mixture functions based on a 2° field probably will be superseded by new functions obtained with a 10° field. The 1931 \bar{y} function, the same as the 1924 relative photopic luminous efficiency curve, will probably be changed for colorimetric purposes.

1. It is recommended that further studies of color mixture functions made for the use of the CIE Technical Committee on Colorimetry give chief attention to fields whose diameters subtend 10° .
2. While awaiting the final data, the various National Committees are requested to proceed with field tests of the preliminary data now available for 10 observers and the 10° -field. Note: The Secretariat will supply convenient computation forms embodying Mr. Stiles' corrected data, but these data are not at present recommended for industrial use.
3. It is recommended that any new colour-mixture function to be adopted shall be based in principle on the results of procedures yielding in every case a complete match of the two fields being compared.

4. It is recommended that the standard observer for colorimetry should represent average normal vision, adjusted as for an observer 30 years of age.
5. It is recommended that an examination be made of the suitability of light sources for reproduction of natural daylight, in particular for measurement of fluorescent materials and in this respect that consideration be given, for example, to the suitability of the Xenon high pressure lamp or source "C" supplemented by other sources.
6. When equations are used to represent relationships between stimuli, symbols of vector notation should be used instead of those for numerical relationships.

These equations are to take one of two forms:

$$(C) \hat{=} X(X) + Y(Y) + Z(Z) \quad \text{or} \\ \mathcal{L} = X(\mathcal{X}) \quad Y(\mathcal{Y}) \quad Z(\mathcal{Z})$$

where X, Y, Z are the tristimulus values of color (C) or \mathcal{L} . The unit vectors are indicated either by (X), (Y), (Z), in which case the sign " $\hat{=}$ ", pronounced "matches" should be used, or by Gothic script capital letters, \mathcal{X} , \mathcal{Y} , \mathcal{Z} , in which case the sign "=" pronounced "equal" should be used.

Committee 1.3.2, Color Rendition. Following a number of reports and brief summaries of work being done in several countries, there was discussion of each of 11 questions suggested in the secretariat report. While there was nothing new or startling, these discussions cleared up a number of points for those present. It seemed as if there were no phase of the work on which sufficient advance had been made to warrant action by the committee at this time. It was suggested that the selection of specific object colors to be used for the evaluation of color rendering was a worthwhile activity for the Secretariat. The question of using the Xenon lamp as a standard source of artificial daylight was referred to Com. 1.3.1.

Committee 1.3.3, Colors of Signal Lights, held many meetings in discussion of the secretariat report. Recommendations on 3, 4, 5, and 6-color signal systems were adopted as being applicable to signal lights used for all forms of transportation. Plans were made to acquire data on the recognition and discrimination of signal lights in the blue-green-white-purple region and also on the recognition of surface colors and the effect on them of age and dirt.

There were many other committees that met, a number in which color is one of many concerns, but the above are those of chief interest to I.S.C.C. members.

It is of interest to know that seven Technical Committee reports were compiled by U.S. Secretariat Directors: D.B.Judd, 1.3.1; F.C.Breckenridge, 1.3.3; E.H.Salter, 2.1.3; W.M.Potter, 3.1.1.1; H.A.Kliegle, 3.1.9.2; W.C.Fisher, 3.3.3; S.G.Hibben, 4.1.2; and that six of the papers were of U. S. origin:

H.R.Blackwell, Recent Studies of Visual Discrimination;
 C.L.Crouch, A Review of Visual Research in the U.S.A.;
 G.A.Fry, Disability Glare;
 S.K.Guth, Subjective Additivity of Sources of Brightness;
 L.S.Harrison, The Fundamentals of Museum Lighting;
 E.H.Salter, R.G.Slauer and A.W.Weeks, Electrical Measurements of Fluorescent Lamps.

So much space has been given to reporting on the technical results of the conference that little is left to tell of the generous hospitality shown by the Swiss to their many guests. There was a reception by the Mayor of Zurich at the Town Hall; a boat ride on Lake Zurich with supper at Rapperswil; inspection of indoor and outdoor

lighting installations; a visit to Oskar Reinhart Foundation in Winterthur; an official banquet at the Congress House, with entertainment followed by dancing (with two orchestras, -one typically Swiss, playing until 3 a.m.!); a Sunday excursion to Lucerne, and across the Lake to Burgenstock, 2000 feet above the lake by funicular, where we spent the afternoon, many going up the Hammetschwand lift for the last 550 feet to the peak where there was a commanding view of the lake and mountains; and an afternoon and evening excursion to Berne, capital of Switzerland. The host committee made sure that we would see something of their beautiful country, even though the sessions were long and full - there were many times when lunch had to be omitted, or a sandwich eaten on the run! (Dean Farnsworth saved several of us with a bar of chocolate at one session that overlapped into another!) All of these occasions encouraged personal contacts between delegates, and the very excellent simultaneous translations of the technical sessions made it possible for all to understand what was going on regardless of the language being spoken. If all delegates came away with a feeling of as much satisfaction at the increased understanding between delegates on matters of mutual technical interest as did this reporter, then this CIE meeting was of as much importance in setting the stage for future cooperation as it was for the many concrete accomplishments of its 1955 session.

Dorothy Nickerson

EXTRACURRICULAR ACTIVITIES AT EUROPEAN COLOR MEETINGS

While the News Letter is being filled with technical details on the European Kongresses, can we take a moment to recollect the excitement we all had in experiencing the Continental way of living? To remember the courtesy, the vigor, the simplicity, the patience with our blunders, and some of the color of the culture?

Four Englishmen and one American arrived in a drizzling rain in Interlaken and were met with a cordial welcome that couldn't have been finer if they had been kings. A simple but "proper" tea, champagne cocktails on the house before dinner, and such cheap but good wines between courses! The charming hostess of the Carlton Hotel determined that the bachelor group would remember the Bernese Oberland for its good times and good conversation--and we will, always. Snow-topped mountains, a real glacier, great falls, and charming hillside villages. Surely everyone else met similar hospitality in Holland, Germany and Switzerland.

And we got the most work done outside of meeting halls. There was a little sidewalk cafe in Zurich where Dr. Kruithof outlined the European solution to direct current fluorescents on naval vessels. Hans Wendt came to meet me in Heidelberg (on the trip to Ailmorbach Church with its marvelous murals and 5,200 organ pipes) to go over an electrical shutter he designed for us at the laboratory last year. Sharp and good-humored exchange of opinions on scientific papers ("What did you mean by that?"), for which there was never enough time in meetings. Plans for trading seeds of native Alpine-type plants with the delightful Sanders of South *Canada* Africa and Perry in London. A solid night of playing "GO" with Heidelberg students - German and Japanese. In the middle of a rainy night on the Zurich Sea we met the man who proudly set the swimming championship from New London to Fisher's Island 40 years ago. There was the pleasure of meeting old friends - Thompson, LeGrand, Holmes, Plaza, Wright, Ishak, and dozens of others whom we had not seen for years. The pleasure of making new ones.

Things to remember: The romantic glory of Heidelberg Castle. The magnificent Wagnerian mountain peaks that hung in the sky. The enthusiasm of the Swiss villager. The pleasure in living that comes with simple living, cleanliness, efficiency, and quality of workmanship, whether it be woodcarving or serving a lunch.

Learning how the people live and think and the things we can get from them to make our living happy. The way they serve tea, the way they drink; the boys and men that wore flowers in their hats, the colorful costumes the girls wore to church. The devotion of the Swiss to their country - so proud of their white cross on a red square that they displayed it everywhere. Their obstinacy in defending their peace and freedom. The gusto of German recreation. The simplicity and quality of the food. And always such courtesy.

Dean Farnsworth

AMERICAN INSTITUTE OF
DECORATORS TOURS EUROPE

Ed. Note: This year AID combined its annual conference with a tour of Europe. We wish to thank Miss Gladys Miller, chairman of AID delegates, for the following account of this tour, written at our request. We found this report to be most enjoyable reading, and feel sure that you will agree.

April 22, 1955 the good Greek ship Olympia pulled out of the New York harbor with 420 members of the American Institute of Decorators, their families, friends and business associates. One week later we had our first port of call, Lisbon, Portugal. Should you ask anyone on the trip which place he enjoyed most, you will find Lisbon tops the list. The city is so clean and orderly. By law, the buildings must be painted every two years and the owners must choose one of five authorized pastel colors. Many of the facades of buildings are covered with decorated tiles. But you are not always looking up because the sidewalks are fascinating with the bricks and stones or tiles laid in a large scale fascinating pattern. All who saw the Pink Palace or the Decorative Arts Museum, or went to some local cafe at night, left Lisbon mentally promising themselves it was a must to plan a return.

Our next port of call was Naples where all but 40 debarked to visit colorful Capri or Pompeii and the Alinari Drive. I was among the 40 who had a 45-minute taxi trip around Naples and then two more days on ship to Athens, Greece. We arrived at night in time to see the Acropolis by moonlight. The next morning we took the regular tour to the Parthenon. Looking through the tall weather-worn, off-white columns to the brilliant blue Grecian sky is a never-to-be-forgotten experience.

Soon we were flying to Rome where four packed full days left us speechless. Naturally every gallery, each cathedral had evidence of rich color interest and usage. Perhaps the Pompeian and Etruscan reds and the clear blues of late Greece and early Roman times impressed us more than the others.

On the bus trip from Florence to Venice we went through Padua, where there was a new housing project being built. Each house was an entity, standing tall, narrow, three stories high. Each was built of plaster painted a pastel blue, pink, yellow, lime. From a distance, against the sharp blue of the summer sky, these houses resembled a dream sketch in some fairy book for children.

Venice was filled with both old and new color expressions. Those who were fortunate to go raved about one of the graphic arts exhibited. Jack Larsen said that it held a wealth of new pattern and fresh color combinations.

It was a shock to go from colorful Venice to Germany and see the drab-gray muddy colors in both the old and new. Climate must affect people's taste and individual expression in terms of color.

The Mayor of Paris held a reception for our party at the Hotel de Ville, where we

were able to see some of the wonderful originals of that master of 20th Century color, Delacroix. No trip to Paris is complete without a visit to Cluny Museum which looks so crisp and clean after the war renovation. We were thrilled with the color from the stained glass windows on the Chapel of Saint Chapelle. The Louvre has improved its presentation of the Decorative Arts. Anyone could spend months there profitably.

In England we were intrigued with what Mr. Wilson is doing with his associates at the British Color Council and the excellence of the color, design and merchandise information available at the Council of Industrial Design. Their filing system leaves one breathless. Everything is in its place. The information you need is at hand.

Our AID party was scrabbled in each city. We would find new friends in each hotel. Each night we would compare notes. No one could see all, so we shared our experiences.

We came home with a wealth of old and new impressions which will in due time affect our work. It takes time for an impression to evolve into a usable expression.

This expression will, I assume, be colorful. Thousands of colored photographs were taken. We hope to have an exhibit and perhaps some type of interchange of 2 x 2 slides and stereos.

The trip was strenuous but it gave everyone who went on it experiences and memories no one will forget.

Gladys Miller

COLOR SPECIFICATION REPORT - PROBLEM 7 With this issue of the News Letter ISCC delegates and members will receive a copy of the report of Subcommittee on Problem 7, Survey of Color Specifications, Walter C.

Granville, chairman, which was submitted at the last annual meeting. Through the cooperation of Francis Scofield, and as noted in page 1 of the 1955 ISCC Annual Report, it has been published by the National Paint, Varnish and Lacquer Association and distributed to its members as Technical Bulletin No. 3, July 6, 1955. The body of the enclosed report represents an over-run of the NPVLA bulletin, supplied without charge for distribution to Council members.

This report was submitted in completion of the work of Subcommittee on Problem 7, the committee having thereupon been dismissed at its own request. The information in it should be useful to many of our member-bodies. They are welcome to publish the report (as they are, in fact, any of the ISCC committee reports) either in full or in summary form in journals of their own. Certain of the information will go out of date as time passes, and certain new items no doubt will need to be added. If there is sufficient need to do so, a committee will be formed to keep this report up to date. Meanwhile, if there are corrections or new items to be added, please advise either ISCC Secretary Ralph M. Evans, or the chairman of the outgoing committee, Walter C. Granville.

Our thanks go to the chairman and members of this committee for their work over several years in getting this information together, and to Francis Scofield and the National Paint, Varnish and Lacquer Association for providing us with copies of the full report for distribution to all members of ISCC.

Dorothy Nickerson, President

**TCCA ANNUAL
MEETING**

John M. Hughlett, Vice President of J. P. Stevens & Co., Inc., was elected president of the Textile Color Card Association at a luncheon meeting of the organization's board of directors on May 19.

Mr. Hughlett, who has been a director of the Association for the past two years, succeeds Roy E. Tilles, who served as president since 1946. Mr. Tilles is also retiring from the presidency of the Gotham Hosiery Co., Inc. The following officers were re-elected: 1st vice president, Armand Schwab, president, Armand Schwab & Co., Inc.; 2nd vice president, John F. Warner, vice president, D. B. Fuller & Co., Inc.; secretary, Estelle M. Tennis and treasurer, Henry C. Van Brederode, vice president, N. Erlanger Blumgart & Co. Miss Tennis was also re-elected executive secretary.

At the 40th annual business meeting of the Association held at its headquarters, 200 Madison Avenue, New York, immediately preceding the board meeting, four new directors were elected and five directors were re-elected. At this meeting, Estelle M. Tennis, executive secretary, reviewed the activities of the Association for the fiscal year of 1954. The constantly widening scope of the organization's color service, she stated, was illustrated by the many different fields of industry represented by the new members enrolled in 1954. The wide geographical distribution of the Association's members was also noted by Miss Tennis. About one-third are located in 30 different foreign countries. During 1954, the Association issued a total of 21,837 regular season color cards, advance editions and standard cards, an increase of over 1,000 over the previous year. These embraced woolen and worsted, man-made fibers and silk, millinery, glove, hosiery and special Shoe Guild cards. Nine hundred twenty-four sets of large fabric swatches and hosiery lengths were also supplied to members, and 7,500 individual color samples.

**TEST OF
HUE MEMORY**

A new test of hue memory, developed by Robert W. Burnham and Joyce R. Clark, promises to fill an important gap in the battery of tests available to industry for judging color skill. The test is described fully in an article by Burnham and Clark which recently appeared in the Journal of Applied Psychology (Volume 39, page 164).

The authors point out that there are many activities and judgments which depend on color memory. All color comparisons where the colors are not closely juxtaposed involve a memory element. The same is true in cases where the sample and standard are not both present at once but follow each other in time. The artist who looks back and forth from his landscape to the canvas relies on color memory. So does the housewife who goes to buy curtains which will match the trim of her kitchen, and also the photographer who is trying to decide how well his color print matches the original scene.

The test instrument is available from the Munsell Color Company, 10 East Franklin Street, Baltimore, Maryland. It consists of a wheel with two concentric series of chips; the outer circle contains the comparison chips and the inner circle the test chips. The person being tested is first shown one of the test chips for 5 seconds through a sliding panel in the cover of the instrument, and is then asked to fixate on the black cover for 5 more seconds. During this adaptation time, the tester sets the wheel in motion and slides the panel so that the comparison chips are visible, one at a time, as they pass the aperture in the panel. The testee, by rotating the wheel slowly, then selects the comparison chip which most closely resembles his memory of the test chip. The comparison chips consist of the 43 odd-numbered hues of the Farnsworth-Munsell hue series, arranged in spectral order to form a closed hue circuit. The chips all have approximately the same value and chroma, and are spaced at intervals of about 2.2 Munsell hue steps. The test chips are duplicates of 20 of these, equally spaced in hue.

The investigators tested a group of 130 individuals of normal color vision, and then retested 80. The test-retest correlation coefficient was found to be 0.64, which indicated an adequate degree of reliability. They also determined that the test items were homogeneous, no one match being exceptionally difficult or exceptionally easy.

It is significant that the authors found low correlation between the scores on the new test, on the ISCC Color Aptitude Test, and on Woods' Color Aptitude Test. This indicated that the three tests were measuring different aspects of color behavior. They conclude that "it may well be that a general aptitude for color work is a function of such specific factors which can only be adequately sampled with a battery of tests." One of these would, of course, be a reliable test for color vision.

One interesting point: The authors compared the scores of 20 people with considerable training in technical color work with those of 20 people with little or no such training, but of roughly comparable intelligence. The average scores of these two groups were not significantly different. This suggests that "immediate memory for hue dissociated from configuration or other visual factors is not much affected by specific training in color."

E. A.

MR. WOLFE COMMENTS

Ed. note: We received the following letter from Mr. Henderson Wolfe, of the Color Farm, New Preston, Connecticut:

If art and physics ever do walk "hand in hand" as our late colleague Dr. Ives used to hope they would, it will be because physicists of the calibre of Deane B. Judd have the courage to plunge boldly into the field of esthetics.

Art critics, with lifetimes of controversy to strengthen them, as well as 5000 years of art history to back them up, may be skeptical of Dr. Judd's "Classic Laws" of color harmony. They, however, would be just as ready to evoke laws of their own, and probably with far less reason.

We can be sure of this much. If, and when, a field theory of color makes clear color relationships, we'll be lucky to have the Munsell Book of Color at our fingertips.

Sincerely

Henderson Wolfe

CANADIAN COLOR COURSES

We have been informed of two color courses given by ISCC member W. E. Carswell at the University of Toronto. The first is in the School of Architecture, and covers the "use of modern colour knowledge to obtain any required emotional or optical effect and to understand colour schemes in interior decoration" (quote from the college catalog). The other is an evening course, given whenever there are 30 registrants. This is a series of 10 lectures, some of which bear such provocative titles as "What did our forefathers know about colour and how are modern scientists adding to this knowledge?" "Why does colour affect each of us in a different way?" and "Can you decorate a room around a curtain or a picture?"

GOETHE'S IDEAS ON COLOR STUDIED

In the April issue of the Journal of the Optical Society of America, page 293, you will find an article which is interesting from several points of view. For one thing, the research was inspired by Goethe's writings, and was carried out by a British Group

known as the Goethean Science Foundation, about which we shall have more to say later. For another, the work, although painstaking and thorough, was done with the most modest of equipment. Again, although the paper is not theoretical in nature, the experimental results touch on some very important aspects of the theory of vision. The authors are M. H. Wilson and R. W. Brocklebank, and the title is "Complementary Hues of After-Images."

The authors begin by pointing out that according to physicists the complementary color to yellow is a definite blue. However, the older notion has it that the complementary to yellow is violet. This idea was originally established by Goethe by the principle of successive or simultaneous contrast and published in his book "Entwurf einer Farbenlehre." It still persists among many people who are primarily concerned with the aesthetics rather than the science of color. In the same way, there are other cases where the physicist and practical colorist differ in their ideas of complementary colors.

The authors explain that there is a fundamental reason for these discrepancies. To the physicist, two colors are complementary if they produce white or gray by additive mixture (as, for example, by combination on the color wheel). To Goethe, on the other hand, two colors are complementary if they produce the maximum of contrast. Since the phenomenon of contrast is caused by after-image effects, and since these are physiological in nature, Goethe called these colors "physiological complementaries." In a section dealing with previous work on this subject, the writers cite among other investigations a very striking one by Edridge-Green and Porter. These latter workers found that when the spectrum of white light is divided into two halves, the after-image of the mixture of colors of the one-half (the after-image complementary) is not identical with the color of the mixture of the other half.

A careful study of after-image effects would therefore help to establish the after-image complementaries, and show their relationship to the complementaries by additive mixture. The authors studied after-images by a very simple method, that of disk colorimetry. The rotating color disks used for matching the hues of the after-images were six inches in diameter, and superimposed on these were three-inch disks of black and white to provide a gray of variable lightness. The investigator would gaze at an area of color three inches in diameter for approximately 15-20 seconds, and would then transfer his gaze to the gray central area of the rotating disks. By varying the proportions of the colored disks, the after-image of the original color could be matched.

One of the striking results of this work is that the difference between the two kinds of complementary colors is related to another, more familiar phenomenon. This is the discrepancy between constant dominant wavelength and constant hue. When a colored light is mixed additively with a white light in varying proportions, the resulting series of colors will all have the same dominant wavelength, but will most often be perceived as of different hue; this is expressed by the curvature of the lines of constant Munsell hue on the chromaticity diagram. Recognizing the importance of this phenomenon to their problem, the authors independently determined the changes in hue which occur when colors are desaturated by mixing with white or with their complementaries by additive mixture. They did this by the very simple method of matching the hue of a desaturated color with the hue of one of the starting colors before desaturation, by the spinning disk method. This enabled them to plot a chromaticity diagram showing lines of constant hue which is remarkably similar to the corresponding chromaticity diagram of constant Munsell hues.

They then proceeded to show how the curvatures of the hue lines on the chromaticity diagram are related to the after-image phenomena. Many of the constant hue lines do not show pronounced curvature and are almost straight (in fact, in the authors' diagram some of these lines are exactly straight). In those regions of the diagram where a straight line passes from one end through the neutral point to the other end, the complementaries by additive mixture are identical with the after-image pairs. Where the lines are curved, the two kinds of complementaries are different. However, it is always true that if you start with a saturated color of any hue and progress up the constant hue line through the neutral point, you will always pass smoothly into the constant hue line of the after-image. Thus, as the authors state, the after-image relationship appears to have a considerable degree of objectivity.

One conclusion, of possible practical interest, drawn by the writers is the following: "If a hue circle is so arranged that its diameters represent after-image pairs, it is possible to have a spacing which is visually more uniform than if its diameters represent additive complementaries. From the point of view of the artist and the designer, such a hue circle appears much more balanced and more in conformity with the aesthetic characteristics of the colors. Since the hue change is a phenomenon which is readily observed whenever blue or orange light is mixed with colorless light, it is no disadvantage to have to take it into account."

As mentioned previously, this is not a theoretical paper, and the authors advance no reason for the phenomena observed. However, we were struck by Fig. 7 of the paper, which shows the change of hue with decrease in saturation for any originally highly saturated color. Now this plot, as the authors observe, shows some similarity to a corresponding plot obtained by Purdy for changes of hue with increase in luminance. The interesting thing is that in a paper which has just appeared (J. Opt. Soc. Amer. 45, 602; 1955) by L. M. Hurvich and D. Jameson, Purdy's results are explained in terms of the Hering opponent-colors theory. In fact, Hurvich and Jameson show a series of hue lines calculated by theory which agree remarkably with Purdy's experimentally derived lines. It is possible that a similar application of the opponent-colors theory would explain some of the very interesting results found in the paper by Wilson and Brocklebank, and might go a long way to elucidate the curvature of the constant-hue lines on the chromaticity diagram.

E. A.

Marginal comment by Dr. Deane B. Judd: The authors do not mention Schrödinger's unsuccessful attempt (Annalen der Physik, 63, 515; 1920) to derive the lines of constant hue on the chromaticity diagram from the suggestion that they are geodesics (shortest lines); nor do they mention Fry's rather successful attempt (J. Opt. Soc. Amer. 35, 141; 1945) to derive them from a theoretical determination of the variation of hue spacing with saturation. It is worth pointing out, however, that hue-constancy judgments are much more directly related to after images than they are to the basis of the two theoretical studies just mentioned. For how can an observer look from one color to another to make a hue comparison without projecting an after image of the one on the other?

THE GOETHEAN
SCIENCE FOUNDATION

After reading the paper reviewed in the preceding article, ISCC President Dorothy Nickerson, struck by the unusual affiliation of the authors, wrote Dr. W. D. Wright in London to ask if he could tell something of the Goethean Science Foundation and the authors of the paper. Subsequently, Miss Nickerson received a very interesting reply from one of the authors, which we reproduce here:

Dear Miss Nickerson:

Prof. Wright tells me that you would like to know what the Goethean Science Foundation is and also something about the authors of the paper on after-image hues...

The Goethean Science Foundation is so far a very modest affair. It consists of a group of three or four friends who are trying to follow up, in a modern sense, some of the lines of thought which are fundamental to Goethe's studies of the Metamorphosis of Plants, and to his "Farbenlehre" which is all too often considered to be obsolete.

My Colleagues George Adams and Olive Whicher have for years been working on the application of the principles of Projective Geometry to the characteristic forms of crystal-space and subsequently, of plant-space. Their work is summarized in a book published two years ago, of which I enclose a leaflet.

My own work in colour started with this study of after-image hues in 1948. I had for a long time been vaguely aware of this discrepancy concerning the complementary hue to yellow, and so this seemed the natural direction of work for me when we formed our little research group in 1947-8. Incidentally, I have no academic qualifications as a physicist, but only a life-long interest as an amateur in such things as colour-photography, stage-lighting and water-colour painting. In 1947, it was possible to ask my friends to join me in a more or less whole-time research undertaking, though on rather slender private finances, and we were able to convert some disused cow-stables and an old army hut into our laboratories and work rooms. (These are in the grounds of a Home for Backward Children of which I am at the same time co-founder and director.) Mr. R. W. Brocklebank worked as my assistant for two years and repeated all my own observations as well as supervising those of several other observers. Since helping to prepare the report he has left us to take up other work.

Our "Foundation" is a registered Charitable Trust for the purpose of scientific research, and its work is dependent upon voluntary financial contributions. Our experimental work has to be done with equipment that is mostly old, second-hand or home made.

I hope that I am telling you the sort of things you want to know, and not troubling you with personal irrelevancies, but our set-up is an unorthodox one and has no convenient description, except that we are a free-lance venture. Also we are connected with the Rudolf Steiner movement, if that means anything to you.

If you think that you want to know anything more, de please write. I very much hope that there will be a chance to meet you next time you come to England.

Yours sincerely,

Michael Wilson

On speaking to Miss Nickerson, we learned that she actually did meet Mr. Wilson, not in England but at the Heidelberg meeting, and that to her it was a most satisfying personal encounter. She found that Mr. Wilson had become interested in working with backward children right after the war and to such an extent that after working in this field on the continent for a time he went back to England where he devoted his own resources to the establishment of the Home of which his letter speaks. Mr. Wilson has been a member of the British Colour Group for some time, in fact it was to this group that he first reported his studies on color. Yet it

was not until Heidelberg when Miss Nickerson questioned him about this primary interest that his British friends learned of it. Miss Nickerson's comment, in telling us about it, was that while she had always felt that the group working in color contained an unusually high percentage of very fine personalities, she rated Mr. Michael Wilson as tops, and would look back at her meeting with him as one of the high spots of the Heidelberg meeting.

E.A.

THE AMERICAN ASSOCIATION
OF TEXTILE
CHEMISTS AND COLORISTS

Ed. note: Some months ago we sat in on a meeting of the AATCC Color Committee, under the chairmanship of Frank J. O'Neil. This Committee consists largely of the AATCC delegates to ISCC. At the meeting, we were impressed with Mr. O'Neil's drive and enthusiasm, qualities which were shared by the other members present. It is therefore understandable that we were quite pleased to learn that Mr. O'Neil had consented to do an article on AATCC for us, this to be the second in the series of articles on our Member-Bodies. By our request, Mr. O'Neil included a sizable section on the functions and activities of the Color Committee. Outside of this, there are several things in the article which are quite interesting: for example, the yearly contest between sections and the independent research group sponsored by the organization.

AATCC was founded in 1921 and became a member of ISCC in 1935. The association has approximately 7,000 members and is divided geographically into 14 sections, each with its own elected officers. Sectional meetings are held at the discretion of the sections, usually bimonthly. A national meeting is held once a year.

The over-all operation is handled by a national council consisting of representatives from each section and other elected officers. The meetings of the council are directed by a president and are held every three months. Both national and sectional officers are elected each year. A central office is maintained at Lowell, Mass., where a national secretary and assistants carry out executive functions. There are several classes of membership, viz., sustaining, corporate, junior, senior and associate. Exchange of information, both personal as well as technical, is maintained through the association journal, the American Dyestuff Reporter. Reference information is supplied in the association's Technical Manual and Year Book.

The original purpose of the association was to provide an opportunity for an exchange of ideas among dyers and colorists. This purpose, although retained to the present day, has been greatly expanded. There is being supplied at present, at a constantly increasing rate, many practical as well as scientific papers covering all phases of dye and chemical preparation and application as related to textiles. A popular activity of the association is the holding of a national contest once a year. Each section may participate by preparing a technical report on some activity carried out by the section within the previous year or two. Many excellent papers have been contributed.

There have been developed many test procedures both to regulate the quality of textiles in processing as well as protect the ultimate consumer. Perhaps the most dramatic of this type of work relates to the development of tests for use in protection against inflammable clothing. In this connection, the association played a prominent role in the enactment into law by the U. S. Congress of the "Flammable Fabrics Act." Perhaps a most important activity, supported jointly with funds

supplied by the British Society of Dyers and Colourists and AATCC, was the development and present publication of the "Colour Index." This index, a greatly expanded version of a publication of many years back, includes three volumes and contains all the pertinent information about dyes such as chemical structure, color names, fastness properties, dyeing properties, etc.

The technical activities of the association are directed by an Executive Committee on Research which receives its authority from the national council. This committee sets policy and authorizes various research activities. A technical committee on research acts as an advisory committee to ECR and also performs the function of reviewing and acting on all proposed test methods.

The research work, setting of standards, and establishment of test methods is carried out in two separate but related ways: 1) by an organized group under a director of research employed by the association and supported with Corporate Membership Funds and 2) through the activity of over 30 active research committees. The research group consists of a director, two technical managers, four laboratory technicians, two office aids and a research associate. The research committees perform the actual work of developing test methods taking advantage of the association's own research facilities whenever desirable. The membership of these committees comprises the leading technical representatives of the dye and textile industry, as well as representatives from leading apparel stores, and is entirely voluntary.

In addition to maintaining close technical association with many organizations and technical societies in the United States and abroad, the association is an active member of the International Standards Organization and holds the joint secretariat with the British Society of Dyers and Colourists in the development of international colorfastness standards. It is the sole secretariat of ISO for Shrinkage in Laundering test procedures. The association has established over 75 standard test methods covering most of the textile needs. A list of these standards appears in the association's Technical Manual and Year Book.

The AATCC Technical Manual and Year Book contains organizational information, committee reports, test methods, a list of dyestuffs and textile chemical specialties, a buyer's guide and a membership list. It is a tremendously informative volume and is in constant use.

The association has for sale at its research headquarters at Lowell Textile Institute laboratory test equipment and materials for use in carrying out one or more of the AATCC Standard Tests.

The AATCC Color Committee has been in operation since 1930 and has maintained close contact with ISCC from its beginning. Generally, the purpose of this committee is to keep the association up to date on the latest developments both practical and technical in the field of color. It acts as a reference committee where questions regarding specific technical problems related to color may be cleared up. It participates in joint activity with other technical associations on problems where there is mutual interest.

A very important activity of this committee was the maintenance of a yearly bibliography on color which started in 1930 and continued through 1945. Another was the participation of the Color Committee in a cooperative study related to color matching. This particular investigation was begun by ISCC at the request of the AATCC

Color Committee. It became known as ISCC Problem 13 - "Studies of the Illuminant in Textile Color Matching." Because of the enormous amount of technical information collected during the investigation, the results were given wide publication.

The committee cooperated with ISCC both for the 1939 and 1949 list of color terms prepared by the ISCC Problem 2 Committee. A current study being carried on by ISCC at the request of the AATCC Color Committee is Problem 16 - "Standard Methods for Mounting Textile Samples for Colorimetric Measurements."

The Color Committee has taken a prominent part in several investigations of the evaluation of small color differences. In this connection, a project in progress at present involves the spectrophotometric measurement and visual evaluation of 200 Porcelain Enamel Institute Panels loaned by the National Bureau of Standards. The chief purpose of the study is to evaluate the accuracy and speed of application of the various color-difference formulas.

Frank J. O'Neil

TWYEFFORTIANA Periodic letters and newspaper stories sent to us by ISCC Member Raymond Godfrey Twyeffort proclaim that this enthusiastic apostle of more color in men's attire is still pursuing his missionary work with zeal. Mr. Twyeffort informs us that the following United Press Radio release, written by Fred Danzig, has recently been sent to 1500 radio stations and newspapers:

Raymond Godfrey Twyeffort has added a new slogan to his men's wear wardrobe. Twyeffort, who bills himself as the "dean of the top flight fashion experts of the world and national fashion analyst," runs an elegant custom tailor shop on New York's Fifth Avenue. His big slogan, until recently, was "You don't play leap frog in a cutaway." This was part of his campaign to get Americans to dress with more dignity and behave likewise. Now Raymond Godfrey Twyeffort is worried because the men's wear industry has not been very aggressive in meeting the competition of the machine age. So he has adopted for a slogan these words: "Let's dress dad up again."

In surveying the American scene, Twyeffort finds that the 1955-model cars are being run by persons who have "Model T personalities when it comes to their clothes." Says Twyeffort, "What is there left for the unselfish fathers of the 30,000,000 American families after paying taxes and meeting the monthly bills?" He adds, "No wonder dad is today a frustrated martyr and a shoddy national liability - the forgotten man."

Here's where the "dress dad up again" slogan comes in. Says Twyeffort, "It's up to the 30,000,000 families to bring dad down to the stores and outfit him for autumn... get him some new hats...with the high crowns and narrow brims...several expressive pastel shirts...some expressive neckwear, and a new pair of shoes - footwear's having a bad year - a new pair of shoes so he can walk with a firmer gait. Dad", says Twyeffort, "will then reflect the great prosperity of today, and what's more, his morale will be lifted. Let's make every day father's day - on earth and in Heaven."

Then, taking a deep breath, Twyeffort says, "Man is a spiritual being, not a materialistic mechanism, and the sooner he is reinstated as an individual man - as master of the machine age - the better for mankind." Twyeffort, who also refers to himself as a "color nut," wants to see a lot of color in men's wear - to match those shiny motor cars.

As a parting shot, he says, "Color is male. Let's wear it. Here come the peacocks ...goodby penguins and mousy men in charcoal gray." That's another one of his slogans.

SPECTACLES FOR
CONVERTING TUNGSTEN
LIGHT TO DAYLIGHT

The following letter to ISCC, brought to our attention by Secretary Ralph Evans, tells about a new method for achieving daylight illumination:

"I suppose that it will interest you to learn that the Vezelinstituut T.N.O. of Delft (Dutch Fiber Institution for Technical-Physical Research), member of our society, has recently developed a pair of spectacles which enables a color observer to inspect colors under artificial light as if they were illuminated by daylight. I am sending you a copy of a pamphlet, giving a minute explanation of this apparatus. Should you, however, want still further information or a sample for inspection, please apply directly to the above gentlemen (Mijnbouwstraat 16a, Delft), referring to our society.

Yours truly,

Nederlandse Vereniging voor Kleurenstudie
(Dutch Society for Color Study)
E. Rijgersberg, Secretary."

The pamphlet referred to in the letter show spectral curves for light as seen through the spectacles compared with Source C, and the agreement seems to be fairly good.

NEW GARDNER
BULLETIN

A new Gardner Laboratory Bulletin No. 161 gives complete and up-to-date information on the Gardner Automatic Photometric Unit and Precision Exposure Heads. The apparatus is designed to make automatic measurement of gloss, haze, transmittance, goniphotometry, reflectance and color, all in accordance with ASTM and Federal Specifications. A copy of this bulletin may be obtained by writing to the Gardner Laboratory, 4723 Elm Street, Bethesda 14, Maryland.

COLOR AIDS THE
FISHERMAN

We read in "Dyelines and Bylines," an informal journal published by American Cyanamid Company, that the color sensitivity of the eye of fish was intensively studied in Britain recently, with the object of obtaining the most useful dyes for coloring nylon casts. In this research, four pools were prepared, two reproducing stream conditions, while the other two had the characteristics of lakes. One of each type was stocked with trout and salmon-parr while the other two were supplied with dace, perch and chub. The tests were aimed at discovering the size of natural nylon cast which would be least likely to scare the fish; then the effects of dyeing the various diameters of line were studied. The tests showed that blue was the most satisfactory tint, followed by green, yellow, natural, with red as the worst.

AMOEBAS HAVE
COLORED TAILS

Again in "Dyelines and Bylines" we read that a British scientist advises that the tiny organism, the amoeba, is not formless after all. It has a tail, he says, and a red tail at that. The scientist says the red pigmentation of the amoeba is distributed diffusely throughout the one-celled organism when it is resting, but as soon as it starts to move, all the pigmentation concentrates in a wrinkled rear area designated as the tail.