MEMBERSHIP REQUEST FOR SLIDES

As most ISCC members are by now aware, the AIC will be having their 25th anniversary this year, at a meeting held jointly with the ISCC in Princeton, NJ. A special feature of the meeting will be a Silver Jubilee Banquet at which the main speaker will be Gunnar Tonquist who was actively involved in the discussions which led to the founding of the AIC in 1967 and has participated in many AIC meetings since then. Gunnar would also like to show slides of some of the many people who have participated in the AIC meetings over the years. He would like to borrow slides from the numerous amateur photographers who have attended meetings. Anyone who has suitable slides and who is willing to lend them should send them or give them to Gunnar, duly labeled with photographer and year, by the evening before the banquet at the latest, so that he can make a selection to include with his talk.

Alan R. Robertson, President AIC
Madden of Eastman Kodak Company wrapped up the session with their presentation on "State-of-the-Art Hardcopy/Softcopy Image Matching Techniques." Two types of hard-copy images, back-illuminated transparencies and reflection prints, both viewed with D50 simulators were matched to a CRT display with a D50 white point. The different displays were also equated for luminance level and surround conditions. The presentation outlined the techniques used to produce accurate colorimetric matches between the various displays. Monday afternoon was open for attendees to visit the sites of Colonial Williamsburg.

The meeting reconvened Monday evening with two presentations. Robert W.G. Hunt, City University, London, presented "Appearance Modelling," an overview of the mathematical formulation of his color appearance model. This model begins with the tristimulus values of a stimulus along with information about factors such as the color and luminance level of the adapting stimulus, the surround, and the background and can be used to calculate appearance metrics such as lightness, brightness, chroma, colorfulness, and hue. In the second presentation of the evening Mark D. Fairchild, Rochester Institute of Technology, discussed one aspect of color appearance modeling, "Chromatic Adaptation to Image Displays." A series of experiments was discussed that made measurements of the chromatic, spatial, and temporal properties of both sensory and cognitive mechanisms of chromatic adaptation.

Tuesday morning began with Robert P. Mason discussing "The Influence of Surface Properties on Image Interpretation." This talk provided a useful summary of the relationships between the diffuse reflection or emission of image displays that carry the image information and surface reflection that carries little information about the image and can be considered noise. These relationships are of critical importance when one is trying to correlate instrumental and visual evaluations of images presented in various media. Next, Warren L. Rhodes of Chromatech led a panel discussion titled "Device Independent Color — Achievable? Desirable?" The members of the panel were Mark Fairchild, Robert Hunt, Anthony Johnson, James McEleaney, Ricardo Motta, and Maureen Stone. The discussion consisted of the members of the panel commenting on questions raised by the conference participants. These questions spanned a range of topics from cognitive aspects of cross media reproduction, to gamut mapping to simply is device independent color desirable and achievable. The morning session wrapped up with Karl J. Heusberger, E.M.P.A., Switzerland, presenting "Color Transformations and Lookup Tables." Six mathematical models and a low-density lookup table were compared for accuracy of transformation from CIE tristimulus values to a CMY color space for printed material. The results showed that a "cellular" form of the Neugebauer equations provided the most accurate transformation while the matrix equations produced poor results and the lookup table produced poor-to-acceptable results.

The Tuesday afternoon session also had 3 presentations. Robert R. Buckley, Xerox Corporation, discussed "Color Data Interchange: Technology and Standards." This presentation was a review of current procedures for data compression to allow efficient storage and transmission of color images. Modern techniques are all traceable to the techniques developed for encoding color television broadcasts several decades ago. It is also interesting how image coding techniques closely mimic the encoding that is known to occur in the human visual system (i.e., high bandwidth achromatic channel and two low-bandwidth opponent chromatic channels). Michael H. Brill of Science Applications International Corporation gave a presentation on the "Trade-Offs in VDU Monitor Calibration." The assumptions that are often made when calibrating color CRT displays were discussed along with an analysis of the number of measurements required for calibration as a function of the number of assumptions made. Colorimetric calibration that is sufficiently accurate for practical applications can be made with very few measurements using a physics-based model of the CRT that includes terms for gain, offset, and the power relationship between electron-gun voltage and phosphor luminance. David L. Spooner, DuPont, wrapped up the day with a talk on "Measurement of the Transfer Function of Hardcopy Color Reproduction systems: A Metric for Comparison." Techniques were described whereby spectrophotometers mounted on automated xy positioning systems were used to perform exhaustive measurements of printed proof sheets. Between 7,000 and 15,000 colors were measured in order to generate reliable transformations between CMYK values and colorimetric coordinates.

The conference came to a close after the Wednesday morning session. R.S. Fisch and T.H. Brackley of 3M Company co-authored a presentation titled "Study of Colorimetric Changes that Occur in Transparent Color Images Reproduced by Ink on Paper." The authors could not be present at the conference, therefore this work was presented by Anthony Johnson. A series of colorimetric data was collected by reproducing Ektachrome transparencies on three different systems with various levels of original color luminance, toner in the black ink, black ink densities and gray component replacement. The results were expressed in terms of CIELAB lightness, chroma, and hue angle. It was clear from the data that the different scanner systems were producing substantially different output colorimetry for the same input. The final formal presentation was by J.A. Stephen Viggiano and Jeffrey Wang of the RIT Research Corporation on "A Comparison of Algorithms for Mapping Color Between Media of Differing Luminance Ranges." Original images such as photographic transparencies often have a larger luminance range than reproductions such as printed matter. This requires a technique for reducing the luminance range in the image while preserving the best possible appearance. The recommended technique was to reduce the luminance range using CIELAB L* while compressing chroma, C*, by a factor midway between unity and the L* ratio of the two media and keeping hue angle constant. Warren L. Rhodes summarized the meeting with a review of the presentations and Milton Pearson, the meeting organizer, officially closed what was certainly a successful Williamsburg conference.

Mark D. Fairchild
OBITUARY: KENNETH L. KELLY


Mr. Kelly was a research colorist who worked closely with Dr. Deane B. Judd at NBS. Together they published the ISCC-NBS Method of Designating Colors and a Dictionary of Color Names, NBS Circular 553, Nov. 1, 1955. Kelly later published A Universal Color Language, Color Engineering v 3, p 2-7 March-April 1965. After Judd’s death in 1972, Kelly was responsible for the publication of NBS Special Publication 440, (1976) COLOR - UNIVERSAL LANGUAGE AND DICTIONARY OF NAMES; this publication included the Circular 158 pages and the Universal Language (19 pages) with 10 color plates and a color photograph of the Munsell Color Solid on the soft cover. Nearly 20,000 copies were sold and distributed at a price of $3.25. His most recent scientific contributions were two book reviews in Color Research and Application. His review of Color in Our Daily Lives, by Deane B. Judd is in volume 2 (1977), page 98. The review of Chroma Cosmos S000 by Japan Color Research Institute is in volume 6 (1981), page 59.

Born in Baltimore, Maryland, November 19, 1910, Kelly obtained a B.S. in physics from Johns Hopkins University in 1934 and an M.Sc. from Philadelphia College of Pharmacy in 1935. Early in his career, Kelly worked for his father who was Director of the American Pharmaceutical Association. He came to NBS in 1936 as a Research Associate for this Association. One of his early papers was entitled Instructions for Determining the Color Names for Drugs and Chemicals, published as a Bulletin of the National Formulary Commission of the American Pharmaceutical Association, vol 8, 339 (1940).

In 1943, Kelly joined the NBS staff as a research chemist. From 1948, until his retirement he was employed as a physicist, first in the Photometry and Colorimetry Section of the Metrology Division and later in the Sensory Environmental Section of the Center for Building Technology.

Kelly was a charter member of the Color Marketing Group formed about 1962 and a member body of the Inter-Society Color Council (ISCC) since 1965. He was awarded a life membership in the Group in 1967 and served as a director in 1969. He was also a member of the American Association for the Advancement of Science, the Optical Society of America, and an honorary member of ISCC. He was a lifetime member of the Saint Andrew’s (Scottish) Society of Washington, DC. He was very proud of his Scotch heritage. He wrote a book, The McIver Family of North Carolina, that included the history of his Scottish ancestors and many of the McIver and Kelly cousins who have lived and who still live in North Carolina. The 285-page volume was published in 1964 by McIver Art and Publications, Inc., Washington, DC.

Kelly was a collector of firearms, an expert rifleman, and a member of the National Rifle Association. He was also a devout churchman and served as an elder in Bradley Hills Presbyterian Church, Bethesda, Maryland.

Kenneth is survived by his wife, Helen Whelchel. They were married July 15, 1956 in Union Presbyterian Church, Cameron, North Carolina. Everyone who met Kenneth marveled at his ability to surmount a major lifelong physical handicap. Those of us who had the privilege of working with him admired his genial, always pleasant personality. He was an inspiration to many another handicapped person.

Harry K. Hammond III
(Retired NBS)
(Founder's Note: COLOR-UNIVERSAL LANGUAGE AND DICTIONARY OF NAMES has long been out of print, but black and white photocopies can be obtained from the National Technical Information Service, Springfield, Virginia, Order No. PB 265225, price $26 + $3 postage and handling. 703-487-4650.)

THANKS FOR THE RECOMMENDATION!

The ISCC membership is always growing, but we don’t always know how new members learn about the benefits of ISCC membership.

The membership application now allows new members to tell us what person, publication, or event made them aware of ISCC. Therefore, we can now thank 31 existing members of ISCC for recruiting 67 new members. If you find your ISCC membership beneficial, please spread the word to colleagues who may also have an interest in color. (And if you don’t find the ISCC beneficial, please contact a Board member with your concerns and contributions!)

Although we know that ISCC members are a selfless, self-sacrificing bunch, there is a reward for members who help bring new members into the fold. Individual membership dues are waived for one year for members who add five or more new members to the ISCC rolls. The ISCC depends on the ideas and contributions of new and existing members to remain the leading professional organization to advance the knowledge of color.

Ann Campbell Laidlaw, ISCC Membership Secretary
CORRECTION In the previous issue of ISCC News, (336) there were a number of errors in the article on “Computation of Hue Difference, \( \Delta H^* \)” which should be noted. We are reprinting the article in its entirety, with corrections.

Editor

**COMPUTATION OF HUE DIFFERENCE, \( \Delta H^* \)**

At the meeting of ASTM Subcommittee E12.02 on Spectrophotometry and Colorimetry, this item was included on the agenda. Robert Sève recently published an article on this topic. He proposed a more straightforward means of calculating \( \Delta H^* \) and keeping track of its sign, positive or negative. ASTM E12.02 desires to call Sève’s proposal to the attention of individuals who compute \( \Delta H^* \) and to obtain their views on the preferred equation for its computation.

In CIE Publication 15.2, Colorimetry, 2nd edition, 1986, the defining equation for hue difference is given. Using CIELAB and omitting the subscripts \( ab \), the equation is:

\[
\Delta H^* = \left( (\Delta E^*)^2 - (\Delta L^*)^2 - (\Delta C^*)^2 \right)^{1/2}
\]

(1)

One might ask if there is a way to compute \( \Delta H^* \) directly rather than as a component difference of \( \Delta E^* \)? The answer is Yes, the CIE also gives the equation

\[
\Delta H^* = C^* \Delta h \left( \frac{\pi}{180} \right)
\]

(2)

where \( \Delta h \) is the hue angle. This equation is to be used for small color differences away from the achromatic axis.

In his recent Note in Color Res. Appl. Vol 16 (3), 217-218 (June, 1991), Sève derives and proposes the use of the precursor to eq. (2), which the CIE did not publish:

\[
\Delta H^* = 2(C_1^*C_2^*)^{1/2} \sin(\Delta h/2)
\]

(3)

Equation (3) reduces to eq. (2) for \( C_1^* \) approximately equal to \( C_2^* \) and \( \Delta h \) small.

Note that eqs. (2) and (3) automatically preserve the correct sign of \( \Delta H^* \) whereas it is lost when eq. (1) is used; it must be restored by following Note 4 in CIE 15.2. Sève gives two numerical examples of the use of eq. (3).

Billmeyer computed the results with all three equations. He found that the differences in the results are negligible - no more than 1 in the fourth decimal place.

Do any ISCC readers compute \( \Delta H^* \)? ASTM Committee E12.02 on Appearance would like to know whether you use eq. (1) or (2), and whether you would find eq. (3) useful. Please send your comments to the ISCC editor. His address is on the back page of the News.

If there is strong support for eq. (3) ASTM will ask USNC/CIE to request that it be added to Publication 15.2. ASTM is a Member Body of ISCC and a Constituent Society of USNC, and so it would be quite appropriate to make such a request.

Fred W. Billmeyer, Jr.
Harry K. Hammond III

UNIVERSITY CORNER

Editors Note: We welcome items of interest from ALL educational institutions, for this column!

INTERROGATION TESTING

The ISCC/TAGA 1992 Williamsburg Conference

Wow! What an experience! The Williamsburg Conference is a one-of-a-kind event! The weather was much nicer in Williamsburg than in Rochester, the food was excellent and the historic attractions and scenic grounds were a treat. But these were just icing on the cake! The ISCC/TAGA conference was educational and entertaining.

As an Imaging Science Ph.D. candidate at the Rochester Institute of Technology with a dissertation addressing appearance models in cross-media applications, this conference was very appropriate. This was the first time I had the privilege of participating in the Williamsburg conference. However, I have been to the ISCC meetings held in Cleveland and New York and was therefore acquainted with several of the participants and much of the procedure.

Since I am just beginning my work concerning cross-media image comparison, my hope for the conference was to walk away with an understanding of the current knowledge and concerns. The focus of the talks was on comparing images presented in different media. The information exchange of the talks gave a good scope of the present technology for cross-media image comparison.

My background education (BS Imaging Science, MS Color Science at RIT) and my work with the Munsell Color Science Laboratory, MCSL, has kept me well up-to-date on the current technologies. This was not a great surprise to me but it was nice to reaffirm that our work at MCSL is very current and active. The recognition of the quality of education I have received was more pronounced by a first-year color
A student, Tim Kohler, who also came along with the MCSL group. Tim had just completed one of the introductory courses in color for which I was the teaching assistant. During the second day of the conference, Tim leaned over and said to me, “I know this stuff - we just learned it!” I have to admit - I felt proud!

Aside from the technology, there were many different viewpoints and interests concerning the cross-media topic. The conference overall was very interactive throughout the talks and during the breaks. From this student’s viewpoint, the interaction between and with the participants and the conflicts of interest were the heart of the conference.

One of the most interesting aspects of the Williamsburg conference was the struggle to get over some of the bureaucratic boundaries of industry and the desire to overcome these barriers for knowledge’s sake. The conflict between barriers and desires is not going to get any easier. The competition between companies trying to stay ahead of the game by keeping technology secret is quite understandable. Companies do not seem to be appropriately protected by patent laws. However, I can see that the advancement of the technology is becoming stagnant by companies feeling that in order to stay afloat, they can not share information.

In my opinion, one of two things will happen. Companies will continue to hold onto information, barely stay afloat and technology will advance at a snail’s pace. Or, a few companies will expose virtually all information resulting in a technological explosion in which the companies who share knowledge will quickly advance but most other companies will fail or become product suppliers. As a student these issues impact my current work and will greatly influence my career options when I finish my degree. The clearly visible conflict which arose at the Williamsburg conference is opening my eyes to the issues that control science which are not scientific.

Despite the constraining holds of management, the knowledge and science surrounding the conference topic is expanding. It was an inspiration to see that there is some really good work being done, especially in the areas of psychophysics and experimental design.

The panel discussion “Device Independent Color-Achievable? Desirable?” was a new segment of the conference. Unfortunately, the discussion really didn’t get rolling until the allotted time was gone. It did become evident that there were some very strong opinions and interests for device independent color. Some felt device independence was essential and some thought it to be unachievable and, therefore, unnecessary. From an academic view, device independence seems very desirable and relatively achievable. The debate showed that from an industrial standpoint, this may not be so.

I am glad I was able to participate in this conference. Two thumbs up to Milt and his crew for pulling together this event.

Amy D. North - R.I.T.

NEW MEMBERS

We are pleased to list the latest members to the ISCC.

Welcome!

Dr. Harold Boll
Kodak Electronic Prints Systems
164 Lexington Road
Billerica MA 01890
USA

Mr. Mark Gorzynski
Tektronix Inc.
M/S 50-662
PO Box 500
Beaverton OR 97077
USA

Mr. Naoya Katoh
RIT
496 Kimball Drive
Rochester NY 14623
USA

Ms. Catherine Lambrecht
Laurel Industries
280 Laurel Avenue
Highland Park IL 60035
USA

Mr. Floyd Moss
Diehls Interiors
145 Travalini Court
El Sobrante CA 94803
USA

Ms. Robin K. Patrick
BASF
28701 Telegraph
PO Box 5009
Southfield MI 48086-5009
USA

Mr. Mark E. Ulrich
MacBeth Div Kollmorgen
Instrument Corp
PO Box 230
Newburgh NY 12551-0230
USA

Mr. Eric Walowit
EWA
7555 Rosewood Drive
Springboro OH 45066
USA

ATTENTION ISCC MEMBERS:
Information Request for Membership Directory

If, since the last Directory was published, you have changed or added to your name, address, telephone or fax number, please mail your changes immediately (no telephone calls please) to:

Membership Secretary: Ms Ann Laidlaw, c/o SheLyn, Inc., 1108 Grecade Street, Greensboro, NC 27408-8725
The following were extracted from NIST Update. NIST Update is a guide to activities at the National Institute of Standards and Technology.

NIST STUDIES OF PRESSED POWDER REFLECTANCE FACTOR REPRODUCIBILITY

NIST The Spectroscopy Group of the Radiometric Physics Division is currently collecting data on the 45/0 reflectance factor reproducibility of polytetrafluoroethylene (PTFE) powder pressed in ten laboratories. NIST has endeavored to eliminate all the variables except those of pressing by supplying the powder, the press and the holders for the pressed powder to be returned to NIST. They are now in the process of making the 45/0 reflectance factor measurements and analyzing the data. A preliminary report is expected at the ISCC and ASTM meetings in Princeton in June (See Calendar).

A reproducibility study was conducted some years ago on the 6 degree/hemispherical reflectance factor of PTFE. The results of this investigation were published as "Laboratory intercomparison study of pressed PTFE powder reflectance standards", V. R. Weidner, J. J. Hsia and B. Adams. Applied Optics 45, 2225-2230, July 15, 1985. The data in this report are not intended to be used as reference data for the absolute reflectance factor of pressed PTFE powder. For this purpose use the data published in "Reflectance Properties of Pressed PTFE Powder", V. R. Weidner and J. J. Hsia, J. Opt. Soc. Am. 71, 856-861 (1981).

Harry K. Hammond, III

WORKSHOP CALLED FOR NEW LIGHTING PRODUCTS PROGRAM

Lighting experts, manufacturers, and others interested in the development of technical requirements for a program to evaluate and accredit laboratories that test lighting products and systems are invited to a public workshop May 14, 1992 at the Crystal City Marriott Hotel, Arlington, VA. The new energy efficiency of electric lighting products accreditation program was established under the NIST National Voluntary Laboratory Accreditation Program (NVLAP) at the request of the National Electrical Manufacturers association. Laboratories will be accredited to test such products as indoor and outdoor luminaries, lamps, ballasts, and systems using test methods and performance criteria developed by standards organizations.

For information and registration, contact Lawrence S. Galowin, Room A146, Bldg. 411, NIST, Gaithersburg, MD 20899.
Telephone 301 975-4016; FAX 301 926 2884.

NEWS FROM MEMBER BODIES

HUMAN FACTORS SOCIETY PLANS FOR 36TH ANNUAL MEETING

Santa Monica, CA - The Human Factors Society, an ISCC Member Body, is finalizing the technical program for its 1992 Annual Meeting, which will be held October 12-16 at the Westin Peachtree Plaza Hotel in Atlanta. Among the festivities to be held include the Annual Awards Banquet, which will take place on Wednesday evening, October 14, and which will honor the recipients of nine Society awards for distinguished research and service in the field.

The meeting, whose theme is "Innovations for Interactions," will feature more than 100 technical sessions on a broad range of ergonomics-related topics, including aerospace systems, aging, biomechanics, communications, computer systems, consumer products, education, forensics, organizational design/management, safety, system development, test and evaluation, training, transportation, and visual performance. Hands-on workshops geared toward professionals at all levels will be offered on Monday, October 12, and Friday, October 16.

Exhibits are invited, and registration and housing information, along with a preliminary program, will be available in early August. Contact the Human Factors Society, P.O. Box 1369, Santa Monica, CA 90406-1369; 310 394-1811; FAX 310 394-2410.

The Human Factors Society is a multidisciplinary professional organization of almost 5000 persons in the United States and throughout the world. Its members include psychologists, engineers, designers, and scientists, all of whom have a common interest in designing systems and equipment to be safe and effective for the people who operate and maintain them.
THE AMERICAN SOCIETY FOR PHOTOGRAMMETRY AND REMOTE SENSING

ASPRS

The American Society for Photogrammetry and Remote Sensing (ASPRS), founded in 1934, has given increasing service to the scientific community and to the nation through development of photogrammetry, remote sensing and geographic information systems. The ASPRS defines photogrammetry and remote sensing as "the art, science, and technology of obtaining reliable information about physical objects and the environment, through the process of recording, measuring, and interpreting imagery and digital representations of energy patterns derived from non-contact sensor systems." Within this definition, photogrammetry includes the acquisition of imagery from conventional photographic systems, as well as from sensors using other portions of the electromagnetic spectrum. Both the quantitative (metric) and qualitative (interpretive) aspects of image analysis are included. Thus, modern photogrammetry is considered to embrace all the elements of image acquisition, mensuration, and interpretation. A new development is the great increase of interest in geographic information systems (GIS), for which a new division was established in November 1988.

The aims of the ASPRS are (1) to advance scientific knowledge in the various disciplines of photogrammetry and remote sensing (including but not limited to aerial surveying and mapping, photointerpretation, and spatial information management); (2) to provide a means for disseminating information on photogrammetry and its related sciences; (3) to encourage the exchange of ideas; (4) to stimulate student interest; (5) to improve standards; and (6) to uphold ethical principles. Publications of the Society include the journal, Photogrammetric Engineering & Remote Sensing (published monthly and containing the Society Newsletter), and the basic manuals of the science—the Manual of Photogrammetry, the Manual of Remote Sensing, and The Multilingual Dictionary of Remote Sensing and Photogrammetry. In addition, the Society publishes Technical Paper Volumes from technical meetings, Proceedings from workshops and symposia, a complete index to the Journal, and indexes to the Technical Paper Volumes. The Society also disseminates information through its local and national meetings, including the Annual and Fall Conventions. The organization of ASPRS now includes five technical divisions: Remote Sensing Applications, Primary Data Acquisition, Professional Practice, Photogrammetric Applications, and Geographic Information Systems.

Much of remote sensing interacts with color technology. For example, multispectral cameras and scanners acquire information from multiple spectral bands. Besides being important to the design of the camera and scanning devices themselves, color technology enters into the rendering of the spectral bands into easily interpreted hardcopy and video images. Whenever we see vegetation as red in a color photograph coded from a multispectral image including infrared, we are seeing a choice that was made in color-coding the infrared components.

Machine-vision aspects of color enter into remote sensing through the automatic classification of multispectral imagery according to such parameters as vegetation type, vegetation health, and geological composition of the terrain.

These applications are discussed at some length in the Manual of Remote Sensing. The agricultural applications are also the subject of a biennial ASPRS workshop on Color Aerial Photography and Videography in the Plant Sciences. The next of these workshops will be held in 1993. Information can be obtained from the Society headquarters (address: 5410 Grosvenor Lane, Suite 210, Bethesda, MD 20814-2160; telephone 301-493-0290).

Michael H. Brill
Science Applications International Corp.
1710 Goodridge Dr., 1-11-1
McLean, VA 22102

ASTM ACTIVITY NEWS

ASTM

The March issue of ASTM Standardization News reported some interesting statistics on membership and technical committee activity. As of December 31, 1991, there were 2,110 organizational memberships and 29,171 individual memberships.

There were 132 technical committees, of which E-12 on Appearance is one, having a total of 2,063 subcommittees. Membership outside the United States totaled 4,127, spread over 91 countries: Five members from Canada, also two from India and one each from Germany, Italy and the Netherlands. Other committees have even more international flavor. For example Committee E-17 on Pavement Management Technologies. This committee is considering an international experiment to compare and harmonize skid resistance and texture measurement. The objective is to compare the many different pavement friction measurement methods used in countries around the world and to make recommendations for harmonizing them.

Harry K. Hammond III
COLOR RESEARCH & APPLICATION

In This Issue, June 1992

This issue begins with Rolf Kuehni talking about George Seurat, the French painter. Seurat was the acknowledged leader of the neo-impressionists. He is known to have a relatively extensive scientific knowledge of his time (he died in 1891) and carefully developed a well thought-out program for his work.

In the last issue William A. Thornton began a three-part article, "Towards a More Accurate and Extensible Colorimetry." The instrumentation and visual experiments were described and the data given. Now Dr. Thornton continues the article with "Part II. Discussion." Many color scientists, Judd, Stiles, MacAdam, and Wyszecki to name a few, have described difficulties in traditional colorimetry. The errors encountered when the traditional colorimetric calculations are used to reduce visual data to tristimulus values or chromaticity or luminance as a correlate of perceived brightness are discussed in this section. Also included are topics such as the transformation of primaries and visual tests of the Grassmann proportionality and additivity assumptions. In a third section, still to come, Dr. Thornton suggests a potential solutions to the problems highlighted in this part.

When are two lights equal? This is an important question in vision research. One possible criterion of equality is to judge whether the two stimuli have equal brightness by direct comparison. A second method is to adjust the lights to produce minimum flicker, when alternating between a standard and the test. Historically determination of the spectral sensitivity of normal observers was done by flicker photometry, but then applied to specify illumination for visual tasks that did not involve temporal resolution such as acuity tasks. Recent electrophysiological and psychophysical analyses of the visual pathway have revealed the existence of two parallel pathways, i.e., separate channels for acuity and flicker. In "Comparison of Spectral Sensitivity Using Hetero-chromatic Flicker Photometry and An Acuity Criterion," Carl Ingling, Jr., Scott S. Grigsby, and Regina C. Long assess the validity of flicker photometry for central foveal tasks in which the criterion is resolution.

Different light sources can result in the appearance of colors being very different. The color rendering index (CRI) is a method for assessing the degree to which a test illuminant renders colors similar to a reference illuminant (usually daylight). The CRI is the spectral quality index which is used by lighting engineers, interior designers, and architects to characterize particular lamps or light sources. Often the correlated color temperature and the CRI are the only spectral data supplied by the lamp manufacturer. However, lighting in many interiors consists of mixing two or more components, usually daylight and the supplementary artificial lights. Throughout the interior and as time of day changes, the character of this mixed illumination varies. In "The Color Rendering of Supplementary Artificial Lighting" J. J. Embrecht describes the general principles leading to the determination of the CRI distribution in an interior with a combination of light sources.

In the Munsell Color System value is a visually uniform scale of lightness. In the early 1940s after measuring the luminance factor of the colored chips in the 1929 Munsell Book of Color, a subcommittee of the Optical Society of America adopted a fifth order polynomial to calculate CIE Y from Munsell value. The problem arises because usually Y is known and Munsell V is desired, not the reverse, and a fifth order polynomial can not be solved algebraically. Although other methods have been proposed, in "Munsell Value as Explicit Functions of CIE Luminance Factor," Calvin S. McCamy proposes a very accurate, although not mathematically exact, solution to the fifth order polynomial. This solution is used in the latest revision of the ASTM Standard Method of Specifying Color by the Munsell System.

In the last issue Yoshinobu Nayatani and his co-workers (Gomi, Kamei, Sobagaki, and Hashimoto) extended the Nayatani model to make it possible to estimate the Helmholtz-Kohlrausch effect on chromatic object colors with any Munsell Value. This led to the idea of the L/Y ratios for chromatic object colors are closely related to the luminance ratios for equally bright chromatic luminous colors, the so-called brightness/luminance-ratio effect. The only problems left from the previous article was a very complex computational procedure needed to derive the L/Y ratios from the colorimetric values x, y, Y of chromatic object colors. Instead it would be very convenient to have a simple multiple regression equation to predict the L/Y ratios of chromatic object colors directly from their chromaticity coordinates, x and y. In "Estimation Equations for Practical Use on Luminance-Reflectance (L/Y) Ratios in the Whole Chromaticity Gamut," Yoshinobu Nayatani, Masamori Ihara, Hiroaki Sobagaki, and Kenjiro Hashimoto present such equations and discuss the shape of contour lines on constant B/L ratios.

The Industrial Notes section includes "A Contribution To the Study of Color of Fabrics" by T. Z. N. Sokkar, M. A. Kabeel, W. A. Ramadan, and A. A. Hanza. In this article Dr. Sokkar and his co-authors predict the color of absorbing-scattering substrates taking into account the effect of optical anisotropy of fibers and definite values of the indices of refraction in the visible spectral region. They discuss five main fibers - cotton, polyester, nylon, acrylic, and wool. The spectral curves for dyed nylon fibers are calculated theoretically and compared to those measured experimentally.
THE 1993 ISCC GODLOVE AWARD

The Godlove Award is the most prestigious award bestowed by the Inter-Society Color Council to honor long-term contributions in the field of color. The Godlove Award was established in 1955 in memory of Dr. I. H. Godlove and is presented biannually, in odd numbered years, with the next award scheduled for presentation at the 1993 Inter-Society Color Council Annual Meeting.

Nominations for the 1993 Godlove Award are now being solicited.

Candidates will be judged by their contribution to any field of interest related to color whether or not it is represented by an Inter-Society Color Council Member-Body. The candidate’s contribution may be direct, it may be in the active practical stimulation of the application of color, or it may be an outstanding dissemination of knowledge of color by writing or lecturing, based on original contributions by the nominee. Candidates need not have been active in the affairs of the Inter-Society Color Council but they must either be a current or former member of the ISCC. All candidates must have at least five (5) years of experience in their particular field of color.

A Godlove Award Nomination Form is enclosed with this mailing of the ISCC Newsletter. The past and present membership of the ISCC boasts a number of individuals deserving of such recognition but such an award requires your participation in the process. Please take the time to consider and to nominate a worthy candidate for this honor.

Feel free to copy the enclosed nomination form, if necessary. Requests for additional nomination forms may be directed to:

Michael H. Brill
Godlove Award Committee Chairman
Science Applications International Corporation
1710 Goodridge Drive, 1-11-1
McLean, Virginia 22102
703 734 4027
FAX: 703 821 3576
E-mail: bsa@mcl.saic.com
## CALENDAR

Please send information on Member Body and other organization meetings involving color with dates, places, and information source to:

Harry K. Hammond, III
BVK-Gardner, Inc.
2435 Linden Lane
Silver Spring, MD 20910
(301) 495-7150  FAX (301) 585-4067

### 1992

**IS&T IMAGING '92, May 10-15**

**AATCC SPRING MEETING, May 12-14**

**SID ’92, May 17-22**

**CORM ’92, May 19-20**

**CIE DIVISION 1 & 6, Jun. 18-20**
Nassau Inn, Princeton, New Jersey. Information: Dr. Jack Hsiu, (301) 975-2342.

**ISCC - ANNUAL MEETING, Jun. 21-24**

**AIC INTERIM SYMPOSIUM, Jun. 23-24**

**ASTM COMMITTEE E-12 ON APPEARANCE, Jun. 24-26**

**ASTM COMMITTEE D-1 ON PAINT, Jun. 28-Jul 1**
Minneapolis Marriott Center City, Minneapolis, Minnesota. Information: Scott Orthey, (215) 299-5507.

**IESNA ANNUAL CONFERENCE, Aug. 2-6**

### XVII ISPRS CONGRESS, Aug. 4-13

### 3rd International Conference on Visual Search, Aug. 24-27
University of Nottingham, Nottingham, England.

### European Conference on Visual Perception, Aug. 30-Sep. 3
Information: Dave Burr, Instituto di Neurofisiologia, Via @. Zeno 51, Pisa 56100, Italy.

**WWDU '92, Sep. 1-4**

**SPE RETEC, Sep. 15-16**

**CMG - CONFERENCE, Sep. 20-22**
Color Marketing Group International Color Directions Conference, Clarion Plaza, Orlando, Florida.

**OSA - ANNUAL MEETING, Sep. 20-25**

**ISEP, Sep. 21-22**
International Symposium on Electronic Photography, Sponsored by the Society for Imaging Science and Technology and German Society of Photography, Cologne, Germany. Information: (703) 642-9090.

**TRIMAGING THE FUTURE, Sep. 21-25**

**AATCC - CONFERENCE AND EXHIBITION, Oct. 4-7**
American Association of Textile Chemists and Colorists, Hyatt Regency, Atlanta, Georgia. Information: AATCC, (919) 549-8141.

**USNOCIE ANNUAL MEETING, Oct. 11-13**
The United States National Committee of the CIE Annual Meeting, Embassy Suites Resort, Scottsdale, Arizona. Information: Dr. Ian Lewis (602) 991-9260, FAX (602) 991-0375.
FSCT, Oct. 21-23
Federation of Societies for Coatings Technology, 70th Annual Meeting and 57th Paint Industries Show, McCormick Place, Chicago, Illinois. Information: (215) 545-1507.

IS&T 8th INTERNATIONAL CONGRESS, Oct. 25-30

GIS/LIS Conference, Nov. 6-12
Geographic Information Systems and Land Information Systems Conference sponsored by the American Society of Photogrametry and Remote Sensing and several other organizations, San Jose Convention Center, San Jose, California. Information: Denise Cranwell, (301) 493-0200.

IS&T F/W SYMPOSIUM III, Nov. 8-13
The Society for Imaging Science & Technology, Maui Westin Hotel, Maui, Hawaii. Information: (703) 642-9090.

ASTM COMMITTEE D-20 ON PLASTICS, Nov. 15-19

OPTICON, Nov. 15-20
Optical Society of America OPTICON '92, Boston, Massachusetts. Information: Optical Society, (202) 223-8130.

AATCC FALL MEETING, Nov. 17-19

LONG RANGE CALENDAR
1993

ASTM COMMITTEE D-1 ON PAINT, Jan. 17-20

ASTM COMMITTEE E-12 ON APPEARANCE, Jan. 17-20

ASTM COMMITTEE D-20 ON PLASTICS, Mar. 1-4
Atlanta, Georgia. Information: Katharine Schaff, (215) 299-5529.

LUX EUROPA 1993, Apr. 4-7
Chartered Institution of Building Services Engineers, Edinburgh, Scotland. Information: CIBSE, Delta House, 222 Balham High Rd., London SW12 9BS.

TAGA ANNUAL CONFERENCE, May 2-5

AIC-7TH CONGRESS, Jun. 14-18

ASTM COMMITTEE E-12 ON APPEARANCE,
Jun. 23-25
Atlanta, Georgia Information: Bode Buckley, (215) 299-5599.

ASTM COMMITTEE D-1 ON PAINT, Jun. 27-30

IESNA ANNUAL CONFERENCE, Aug. 8-12

AATCC - CONFERENCE AND EXHIBITION, Oct. 3-6
American Association of Textile Chemists and Colorists, Montreal, Quebec, Canada. Information: AATCC, (919) 549-8141.

ASTM COMMITTEE D-20 ON PLASTICS, Nov. 15-18
Fort Worth, Texas. Information: Katherine Schaff, (215) 299-5529.

1994

ASTM COMMITTEE D-1 ON PAINT, Jan. 23-26

ASTM COMMITTEE E-12 ON APPEARANCE, Jan. 23-26

TAGA ANNUAL CONFERENCE, May 1-4

ASTM COMMITTEE D-1 ON PAINT, Jun. 25-29

ASTM COMMITTEE E-12 ON APPEARANCE, Jun. 19-23

IESNA ANNUAL CONFERENCE, Aug. 7-11
1995

ASTM COMMITTEE E-12 ON APPEARANCE, Jan. 22-26

TAGA ANNUAL CONFERENCE, Apr. 2-5

CIE, Sept.
New Delhi, India

AATCC - CONFERENCE & EXHIBITION, Oct. 8-11
American Association of Textile Chemists and Colorists, Hyatt Regency, Atlanta, Georgia. Information: AATCC, (919) 549-8141.

1996

TAGA ANNUAL CONFERENCE, May 5-8
Technical Association of the Graphic Arts Annual Technical Conference, St. Louis, Missouri or Dallas, Texas. Information: Karen Lawrence, (716) 272-0557.

AATCC - CONFERENCE & EXHIBITION, Oct. 8-11

1997

TAGA ANNUAL CONFERENCE, May 4-7
Technical Association of the Graphic Arts Annual Technical Conference, Montreal or Quebec City, Canada. Information: Karen Lawrence, (716) 272-0557.

AATCC - CONFERENCE & EXHIBITION, Sep. 28- Oct. 1
American Association of Textile Chemists and Colorists, Marriott Marquis, Atlanta, Georgia. Information: AATCC, (919) 549-8141.

1998

TAGA ANNUAL CONFERENCE, May 3-6
INTER-SOCIETY COLOR COUNCIL APPLICATION FOR INDIVIDUAL MEMBERSHIP

Name ____________________________________________________ Date __________________

☐ Dr. ☐ Mr. ☐ Ms.

Company/Affiliation ____________________________________________

Street _______________________________________________________

City, State, Zip ________________________________________________

Telephone (___) ____________________________ ☐ Home

Fax (___) ____________________________ ☐ Business

_____________________________________________________________

Signature

My chief interests in color are:

☐ education ☐ art

☐ industry ☐ science

Name other interests ___________________________________________

My work relates to the following products and services:

________________________________________________________________________

________________________________________________________________________

My present and past business, professional or educational connections with color are:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

My particular interests in color are:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

I belong to the following national organizations or associations:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

I learned about ISCC from: ☐ ISCC Newsletter ☐ Other source: ______________________

Please tell us the individual or organization that interested you in ISCC

ISCC dues are shown on the reverse side. Applications for membership dated prior to July 1 should be accompanied by full annual dues; those dated July 1 and later should be accompanied by 50% of annual dues. You have the option of subscribing to Color Research & Application at special membership rates. If you wish to do so, please add $70.00 (US) or $100.00 (overseas) to the amount of your check.

This application and remittance should be sent to

Ms. Ann C. Laidlaw, Membership Committee, c/o SheLyn, Inc., 1108 Gre cade Street, Greensboro, NC 27408

Telephone: (919) 274-1963
EXCERPT FROM THE BY-LAWS OF THE INTER-SOCIETY COLOR COUNCIL, INC.

Constitution, Article II — Aims and Purposes
The Council shall operate solely and exclusively as a non-profit organization with the aims and purposes:

A. To stimulate and coordinate the work being done by the various members leading to the description and specification of color by these members.
B. To promote the practical application of this work to the color problems arising in science, art, and industry, for the benefit of the public at large.
C. To promote communications between technically oriented specialists in color and creative workers in art, design, and education, so as to facilitate more effective use of color by the public through dissemination of information about color in both scientific and artistic applications.
D. To promote educational activities and the interchange of ideas on the subject of color and appearance among its members and the public generally.
E. To cooperate with other organizations, both public and private, to accomplish these objectives for the direct and indirect enjoyment and benefit of the public at large.

Council Activities
The ISCC is the principal professional society on the field of color in the United States, encompassing the arts, sciences and industry, pursuant to the Aims and Purposes described above. Other national organizations with an interest in color are Member-Bodies of the Council and appoint delegations to participate in the Council's work. Individual members are the largest single group. The Annual Meeting, usually held in April, includes meetings of the Project Committees and sessions of four Interest Group: Measurement & Colorimetry; Vision & Color Appearance; Art, Design & Psychology; and Color Education. There is also a main program devoted to a specific aspect of color plus a Poster Paper session. Joint programs with one of the Council's Member-Bodies are interesting and educational.

In most years there is a separate topical Williamsburg Conference, often in February, where a single color subject is explored in depth with participants from all over the world providing state-of-the-art information. Attendance at these conferences is usually smaller than at Annual Meetings, reflecting their topical nature and permitting interaction between speakers and participants.

The ISCC is the U.S. Member of the Association Internationale de la Coulour (AIC), which holds general meetings quadrennially and topical meetings annually. Color Research & Application, published bimonthly in English, is the principal international journal in this field; it is endorsed by ISCC. It reports recent research and opinions of colorists, review books and reports on national and international color meetings. Membership in ISCC permits subscription at more than a 50% discount.

The ISCC News, a bimonthly newsletter, reports the color activities of the Council, its members, Member-Bodies and international color organizations. Members receive the ISCC News at no cost. Member-Bodies and Sustaining Members receive 10 copies of the ISCC News.

Categories of Membership

<table>
<thead>
<tr>
<th>Individual Member. Any person interested in color and desirous of participating in the activities of the Council.</th>
<th>Annual Dues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Member. Full time students.</td>
<td>$10.00</td>
</tr>
<tr>
<td>Member-Body. Any non-profit national organization interested in color and desirous of participating in the activities of the Council.</td>
<td>$100.00</td>
</tr>
<tr>
<td>Sustaining Member. Any organization not eligible as a Member-Body, or any individual, interested in color and wishing to support the work of the Council. Receives 10 copies of ISCC News.</td>
<td>$250.00</td>
</tr>
<tr>
<td>Retired. Treasurer must be notified, in writing, of retirement before dues have been billed.</td>
<td>$10.00</td>
</tr>
<tr>
<td>Library Subscriptions. Receives all ISCC mailings, including ISCC News.</td>
<td>$40.00</td>
</tr>
<tr>
<td>Overseas Member. A surcharge of $20 is added to $30 dues to cover additional mailing costs.</td>
<td>$50.00</td>
</tr>
</tbody>
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Revised 10/91
DOES YOUR WORK INVOLVE COLOR MATCHING?

ATTEND THE ISCC ANNUAL MEETING

JUNE 21-24, 1992
PRINCETON, NJ

THEME: COLOR MATCHING
NEWSLETTER EDITOR Michael A. Hammel

Send photo material (black and white if possible) to:
Editor, ISCC News • 98 Grand View Drive • Fairport, NY 14450 • Tel. (716) 223-1823

If at all possible, please send all other materials ON DISKETTE as follows:

MSDOS–ASCII, Q&A, Word Star, Word Perfect (5.25"–1.2 Meg, or 360K) (3.5"–1.44 Meg, or 730K).

Macintosh–Word, Macwrite, MS Works (3.5"–1.44 Meg, 800K, or 400K)

For hard copy transmission, FAX to (716) 425-2411.
Or send to: Dr. Ellen Carter • 2509 N. Utah St. • Arlington, VA 22207

Please note: the deadline for submission of material is the 1st of even numbered months.

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American College of Prosthodontists (ACP)
American Psychological Association (APA)
American Society for Testing and Materials (ASTM)
American Society of Interior Designers (ASID)
American Society for Photogrammetry and Remote Sensing (ASPRS)
The Color Association of the United States, Inc. (CAUS)
Color Marketing Group (CMG)
Detroit Colour Council (DCC)
Dry Color Manufacturers Association (DCMA)
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Gemological Institute of America (GIA)

Graphic Arts Technical Foundation (GATF)
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National Artists Equity Association (NAEA)
National Association of Printing Ink Manufacturers (NAPIM)
National Paint and Coatings Association, Inc. (NPCA)
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Society of Motion Picture and Television Engineers (SMPTE)
Society of Plastics Engineers, Color & Appearance Division
Society for Imaging Science and Technology (IS&T)
Technical Association of the Graphic Arts (TAGA)
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