Inter-Society Color Council *News*

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WHAT'S HAPPENING OUT THERE?

I would like very much to hear from you about what's going on with your colorful life. News, anecdotes, personal items as well as more serious reports are all welcome. The deadline for the next issue is April 15.

Remember that the Annual Meeting Report issue deadline for me is June 15. That means that all delegation and project committee chairmen should have their reports in to their coordinator at the Annual Meeting. These reports are required in the By-Laws and serve as a way of letting the general membership know of your progress and of plans for future activities.

Mary Ellen Zuyus

ISCC ANNUAL MEETING

Plan to attend the 53rd Annual Meeting to be held April 8-10, 1984 at the Michigan Inn, Southfield, Michigan. See the last issue of the News for more information or contact the Arrangements Chairman, Bonnie K. Swenholt, Eastman Kodak Company, Building 69, 8th Floor, Kodak Park, Rochester, New York 14650 (716) 477-6072.

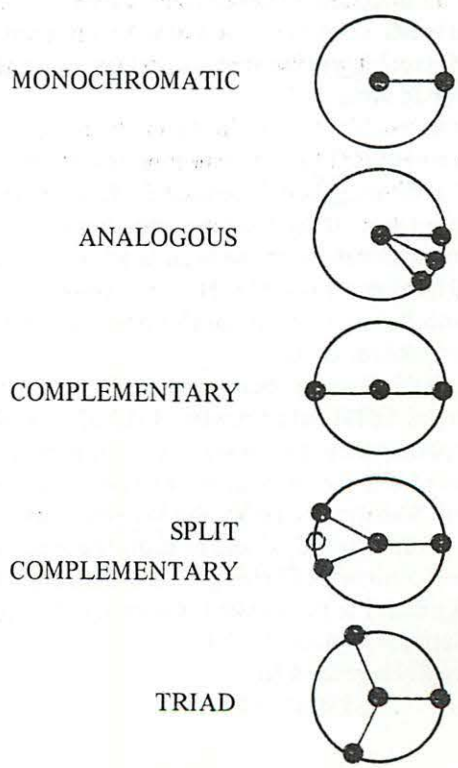
SECOND CALL FOR NOMINATIONS FOR THE GODLOVE AWARD

ISCC has the honor and opportunity of presenting biennially, in odd-numbered years, its Godlove Award. The Godlove Award Fund was established by Mrs. Margaret N. Godlove in memory of her husband Dr. I. H. Godlove. The fund was presented and accepted by the Inter-Society Color Council in 1956. The recipients of the Macbeth, Godlove and other ISCC awards are listed in your ISCC membership Directory.

The nominations list will be closed July 1, 1984. Please send all nominations to the Chairman for the 1985 Godlove Award Committee prior to that date. His address is: Milton Pearson, 16 Colleen Way, Pittsford, NY 14534. Nominations are governed by the rules listed in the By-Laws on pages 29-32, and should be carefully followed.

QUESTION ON COLOR SCHEMES

Perhaps my fellow ISCCers can help me with a work-in-progress on color planning. In a high school art class (Oklahoma, circa 1936) I was taught "color schemes" based on a 12-hue red-blue-yellow circuit, with five clearly-defined terms: "monochromatic," "analogous," "complementary," "split complementary," and "triad." This method and its scholiums seem to have been embedded in the pedagogy – I was taught it again and again. (Indeed, I was never taught anything else until, in art school, I was inflicted with an idiosyncratic system constructed on musical scales!) But . . . who originated this method? When and where did it first appear? Is it still formally taught? If not, has any widely-accepted schema replaced it?



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NEWS OF MEMBER BODIES

Colorimetry and Spectrophotometry

ASTM Committee E-12.02 on Colorimetry and Spectrophotometry has drafted a revision of ASTM Method E 308, now titled: "Standard Method for Color Computation in the CIE System."

This draft includes instructions for making color computations in the CIE system as well as tables of reference data now being published by the CIE that are needed to actually make the computations. The ASTM method contains spectral data for the CIE 1931 (2°) standard colorimetric observer and the CIE 1964 (10°) supplementary standard observer, as well as relative spectral power distributions for nine CIE illuminants, namely A (incandescent-lamp light), C (instrumental daylight), D_{50}, D_{55}, D_{65}, D_{75} (reconstituted daylight for correlated color temperatures of 5000, 5500, 6500 and 7500 kelvins), and three of twelve CIE F illumiants, namely F2, F7, and F11 (fluorescent-lamp light representative of cool white at 4200 K, broad-band daylight at 6500 K, and narrow-band white at 4000 K).

CIE computations are made by computing tristimulus values X,Y,Z from spectral data by obtaining triple products of specimen, source and observer and then using numerical integration (summation) over the prescribed wavelength range and for the prescribed wavelength interval. The CIE prescribes a wavelength range of 360 to 830 nm at one nanometer intervals, but it notes that for most practical purposes summation over a range of 380 to 780 nm at 5 nm intervals will suffice. The ASTM method uses this latter range and interval. The method also contains procedures for making computations for an even shorter wavelength range or for a larger wavelength interval such as 10 or 20 nm. In addition a table of weights (normalized spectral products of source and observer) is given for combinations of 9 sources, two observers, and two wavelength intervals, a total of 36 tabulations.

All this material is included in the method so that tristimulus values computed from the same specimen spectral data will agree exactly when the procedures set forth in the ASTM method are used. If different computation procedures are used the computational errors can be as large as the uncertainty of spectral measurement, and there is no reason to have an additional uncertainty in the result just because different computational procedures are used.

The method has just been submitted to letter ballot of the members of ASTM Subcommittee E-12.02 on Colorimetry and Spectrophotometry. If you are interested in participating in this kind of activity you may wish to become a member of the American Society for Testing and Materials. Meanwhile, if you wish to study the method and to provide comments on it, write to the Subcommittee Chairman at the Gardner/Neotec Instrument Division, Pacific Scientific Company, 2431 Linden Lane, Silver Spring, Maryland 20910.

Harry K. Hammond III
Chairman, ASTM E12.02

BOOK ANNOUNCEMENT

Please note the publication (in 1981) of 'Color Vision,' by Leo Hurvich. The publisher is Sinauer Associates Inc. A review of this book is planned for the next issue of the News.

BCRA CERAMIC COLOR STANDARDS

Sets of colored tiles have been used for verifying the performance of colorimeters for a number of years.

The British Ceramic Research Association (BCRA) of Stoke-on-Trent produced a large number of sets of 12 colored ceramic tiles in 1968. These have been widely used and well received, but recently the stock of tiles began to approach zero. At this point BCRA agreed to develop a new set of tiles with improved surface finish and improved diagnostic value rather than to remake tiles from the original formulations. The new set was developed in collaboration with the National Physical Laboratory (NPL). The Society of Dyers and Colourists (SDC) supported the work on selection of color-difference pairs.

The new set contains three neutral grays with flatter spectral curves than before at reflectance levels of approximately 5, 20, and 60 percent. There is also a complex gray of about 30 percent reflectance whose color differs from the non selective gray by about 3 CIELAB units. A pair of green tiles is included in the new set that exhibit a color difference of about 3 CIELAB units of the type frequently encountered when adjusting a color formulation.

The colors in the set are designated pale gray, mid gray, difference gray, deep gray, deep pink, red, orange, bright yellow, green, difference green, cyan, and deep blue.

BCRA made a total of 1500 sets of the new tiles under carefully controlled conditions so as to provide smooth, slightly convex, surfaces that will reproducibly fit the measuring port of an instrument. The glazes were evaluated for long-term stability and thermochromism. The color difference ranges of the replications of each color were kept to a minimum. Defects of color or surface in the sets of tiles were minimized by accepting only 50 to 60 percent of the tiles produced.

Two-hundred sets of tiles of each color were measured at BCRA on a 45°/0° colorimeter to evaluate the range of color differences. For the grays the two-sigma range of difference was 0.3 CIELAB unit. For chromatic colors it was no more than 0.5 unit, except for deep blue where the range was 0.8 unit. Each set of tiles is issued with the nominal color values; so for many purposes the set can be used without further calibration. Alternatively individually calibrated sets can be purchased.

Sets of calibrated or uncalibrated tiles can be obtained in the USA from Hemmendinger Color Laboratory, RD 1, Box 213, Pequest Bend, Belvidere, N.J. 07823, telephone 201-475-2123.

Harry K. Hammond III

MEETINGS

SUMMARY OF 1984 WILLIAMSBURG CONFERENCE

The 1984 ISCC-GATF Williamsburg Conference on Color and Imaging was a smashing success thanks to Richard and Marjorie Ingalls and Bonnie Swenholt, the Arrangements Chairperson. We were honored by the presence of such distinghished personalities in the field of color as Dr. Fred W. Billmeyer, Jr., Dr. Robert Hunt, Miss Dorothy Nickerson, Dr. Gunnar Tonnqvist and Dr. David Wright. The speakers, each of whom were experts in their own fields, provided us with new insights in the areas of photographic, graphic arts and video display imaging.

Professor W. David Wright opened the conference by sharing with us his historical view of color and imaging. He began by quoting from the Bible, Genesis Chapter 1. 'Let there be light.' Without light, there would be no color. Genesis also refers to the presence of two lights; the light of day which Wright cited as a reference to photopic vision and the light of night, cited as a reference to scotopic vision. He also found a biblical reference directly related to the topic of this conference, 'Man is our image;' implying that images are likenesses. Wright reminded us of one last example where color played an important role in the beginning of creation. 'Would Eve have tempted Adam with a black and white apple?'

Then Wright used illustrations to take us on a world historical excursion through color imaging from early man to the present.

Early man used such natural objects as twigs and bison hair to impart color. In 3500 BC, the Egyptians made jewelry to bring art into their homes and tombs as an art form to honor the dead. Romans used floor mosaics and pottery to color their lives. In 500 AD the Indians painted their cave dwellings. In the 11th century an English cathedral donated by fishermen was built with stained glass windows indicating use of color imaging as a memorial as well as for religious purposes. In 1200 AD the Armenians produced manuscripts with colored lettering and small image detail. Color imaging was used in the American revolution to produce many printed copies of political propaganda. Miniature color images have also appeared in paintings, such as in the mirror of Van Eyck's masterpiece with the girl in the green velvet dress of 500 years ago. The use of color has been very important on maps for many years. Equally impressive as color images are black and white images such as Michelangelo's Madonna. Wright also cited Dr. Land's invention of the ultraviolet medical translating electron microscope utilizing false color imaging as a dianostic tool to provide optimum discrimination.

Today photography, cinematography (wide screen and 3D) and holograms use color as a vital element for information interpretation. In closing Dr. Wright reminded us that although computer systems can produce a pallet of 16.8 million colors, the eye cannot distinguish them all. Computer color graphics is a remarkable technology; but, in the end 'we want a picture not a floppy disc.'

Next Franc Grum shared his dream which has finally become reality in the form of the Munsell Color Science Laboratory at the Rochester Institute of Technology. This laboratory owes its existence to Richard S. Hunter who endowed the professorship in color science and appearance technology. The mission of this laboratory is 'to further the scientific and practical advancement of color knowledge with emphasis on standardization, nomenclature and specification of color and to promote application of these results to color problems in art, science and industry.' There are four major laboratory objectives. The first is the establishment of undergraduate and graduate (M.S. and Ph.D) color science programs. The second is research and development in color science and appearance technology. The third is to establish a sound standardization laboratory to work in conjunction with the National Bureau of Standards and other standardizing bodies. Finally, a close liaison with industry will be established to insure the success of the first three objectives. Franc reviewed with us his range of ancient to state-of-the-art equipment for color measurement that he has collected over the last ten short months. They include spectrophotometers, colorimeters, densitometers and spectroradiometers, one of which was custom built. He also described their DEC LSI computer with 1.25 MB of memory. Their standards acitivity involves defining the important parameters and finding artifacts in the calibration of spectrophotometers and other photometric and radiometric scaled instruments. Franc concluded by assuring us that his program would jump into an area of research of new interest to the color science community, namely electronic imaging and in particular, self-luminous displays.

Ed Giorgianni of Eastman Kodak Company and Ken McCarthy of Polaroid Corporation shared two different aspects of photographic imaging with us. First, Ed described the Mark II Color Product Simulator, an electronic photographic imaging device, used to investigate color reproduction characteristics. The simulator provides the user with controlled conditions under which to study the impact of spectral sensitivities, dye sets and color correction mechanisms. Photographic images on reflection print or transparency material can be produced in the following manner. Data are derived from scanning a color negative film to recover its exposure information, those data are manipulated with a digital processor as any photographic system would and output in the form of dye amounts on the print material. The advantage of such a device is that it provides powerful computer-modeling capability to produce color pictures that can be used for subjective evaluations. Thus new films do not have to be precisely built each time it is of interest to evaluate the effect of new spectral sensitivities, image dyes or color correction mechanisms. Color slides produced on the simulator were used to graphically demonstrate how it could be used to study color effects of over and under exposure and tone scale and dye set changes.

Ken McCarthy then described Polaroid's first 35mm instant slide film system based on the principle of additive color mixture. The major emphasis of this talk was on the daylight balanced color slide film ASA40 available in 12 or 36 exposure rolls, although two black and white films were also designed based on the same principles. Real time demonstrations were carried out to illustrate how fast the exposing, mounting and viewing process took place. After exposing and rewinding the film, it was placed in the autoprocessor where the exposed silver grains developed in place and the unexposed grains traveled to a receiving layer coated with processing fluid. After processing, the emulsion layers were removed and the film was mounted and projected for all to see. This entire process took place over a short time period of about 5 minutes for 12 exposures. The high film gamma of approximately 2.0 provided high color saturation. Other film characteristics cited were a high base density of .70, good color fidelity and reciprocity, and high grain in dark areas. Suggested uses for this film were in the photography of CRT displays, flowers, detail in belts and jewelry, micrographs and metallurgy.

The graphic arts world's contribution to color and imaging is in the area of printing. First Dick Warner, representing GATF, spoke to us on state-of-the-art color proofing systems. Dick reminded us of the importance of proofing as a communication tool, for quality control and for customer acceptance. One of the most difficult problems in the field is communicating color and how it should be evaluated to workers on the press. Offpress proofing methods were discussed. The overlay system was described as a fast economical multiple film system with precoated colorants relying on dry physical development. The surprint system was described as more expensive, involving lamination onto a substrate and having adjustable optical dot gain. Dick also mentioned electronic proofing systems providing soft proofs through video image processing where algorithms, although additive in nature, adequately simulated subtractive color print systems. The third proofing system discussed was press proofing which is prevalent in the publication industry in spite of the fact that it is a difficult process, costly and subject to much variation. Such prepress proofing systems adhere to SWOP specifications and not standards. Dick also provided some insight into how these proofing systems could be compared in terms of optical, mechanical and total dot grain, optical density, hue error and grayness. Metamerism and controlled viewing conditions were cited as two problems faced by these proofing systems. Dick brought examples along to illustrate visual differences among the final results of these proofing systems. Dick closed by saying that color proofing is not based as much on technical evaluation as it is on judgment and arbitration of the whole printing process.

Our second speaker in the area of color printing was Dr. Annette Jaffe of IBM. Her topic was "Color Hard-Copy Printing Based on Nonimpact Technologies," with an emphasis on ink-jet printing. Annette reminded us of why people like color hard copy: It portrays more information with less complexity for emphasis, impact, and differentiation, as in map design. Color is so important to people today that very few black and white TV sets are sold. Color also helps in computer-aided design and manufacture (CAD/CAM). Important features of color hard-copy systems are the use of subtractive ink dot size and the accuracy with which a dot can be placed. Annette concentrated on two different types of ink-jet technologies: continuous and impulse. The Hertz Continuous System involves probing ink through a small nozzle to make small drops which are charged before being laid. The uncharged dots go onto the paper, and the charged dots are pulled away by vacuum. The Raster Scan Continuous Method charges drops at different rates, which deflects them to different spots on the paper, and the uncharged drops are discarded. Annette cited high-color quality and resolution, low-copy cost, and longest time in existence as advantages for the continuous ink-jet methods. Complex hardware and difficulty in putting ink in the desired place on the paper were cited as major disadvantages. Impulse ink-jet printing was described as drop on demand. A transducer is used to move a drop out of a mechanisms only when it is wanted. Such a result can be obtained by electromechanical, electrothermal or photothermal means. The advantages of impulse ink jet printing cited by Annette were versatile hardware configuration, good color quality, and high resolution. The only major disadvantage she saw was the immature state of this technology. Annette elaborated on the necessary ink and paper requirements to optimize the ink-paper interaction. Annette pointed out that the Japanese, unlike the Americans, are now in the business of making paper specifically for ink-jet applications. In closing, Annette shared some information on Seiko's new Thermal Transfer Color Printer and Sony's Video Recorder and Color Printer Unit.

There were many papers presented, relating to the type of computers playing an integral part in producing colored images. The first of these was written by R. E. Maurer but presented by Charles Rinehart of Eastman Kodak Company. Chuck described a customized-color computer printing analysis. A printed multiple-patch color test target is scanned with the Macbeth MS-4045, a pulsed-xenon spectrophotometer which makes sixteen measurements of each patch. Press performance and prepress requirements for various copy types and lithographic printing conditions are then derived by a computer. Analysis results were presented graphically and in tabular form. Prepress preparation, ink/press performance, and color measurements were the three categories of information tion provided by the computer analysis. It was pointed out that this technique could easily be adapted to other printing systems such as flexography, gravure, screenless, ink-jet, and electrophotography.

The second computer-related imaging topic was entitled colorimetric graphics, given by Dick Ingalls of Target Color Technology. Dick began by enchanting us with his own clever poetic thoughts on light and color and how they relate to colorimetry. Dick then described the Ingalls method of producing target colors on photosensitive material. If it is desired to match a color that is within the gamut of the photosensitive medium, then this computer-based system can produce a target color match for one or more viewing conditions. This system can also produce matches to samples that exist as coordinates in color space but do not exist physically. Colors are produced by using various red, green and blue filter combinations to expose the paper on the xy table. Dick's slide graphically illustrated that, once the system is properly calibrated on a series of gray samples, then, any color can be accurately produced via the computer-based algorithms which his wife, Marjorie, developed. Dick showed many examples of uses for this colorimetric graphics system. Among them were the production of small color-difference samples, falling between any two given colored samples. Its ability to compose art, signs and other graphics from any palette of colors make it an attractive alternative to silk screening. It was also suggested for use in map-making. Dick showed how the system was used to simulate textiles, floor tiles, printing inks and other products which are metameric to the photographic media. The system can produce faster results, especially in prepress color proofing. Many of these colorful examples were on display throughout the conference.

Marvin Genshaw, of Miles Laboratories, shared with us the application of computer-colorant forumulation of inks for printing color charts by letterpress. Such colorant formulation techniques have been used commonly in the paint, plastic and textile industries for years, but their application to printing was new. Marvin stated that their goal was to improve color-matching between reagent strips, used for medical testing, and color charts. The chemically-treated reagent strip changes color on exposure to such chemicals as those found in blood or urine. The color chart is used to relate the reagent strip color to the concentration of chemical present in a semiquantitative manner. Until now, trial and error was used to formulate inks. Marvin described an initial experiment to determine the ink thickness necessary to match printed color charts. Their ten colored inks on white ink base were mixed, based on the computer ink formulations of Eugene Allen and Brockes' interpolation method, and standard rollouts were prepared. These rollouts provided close color matches to the reagent strips by minimizing the color difference under four different illuminants.

Donald Greenberg and his graduate student, Gary Meyer, from Cornell University, gave a fascinating presentation of the images they can create via computer graphics. First, Gary described and illustrated the kinds of dynamic images that could be produced via vector graphic devices. They included two- and three-dimensional plots in any color space made available by the software. A display of the cone of realizable colors with the zoom and pan features made it obvious that such a device could serve as an excellent color-science teaching tool. Color-raster graphics devices, providing output to NTSC monitors, film and video recorders, were also shown. Video painting programs were illustrated to give the user a palette from which to choose colors for images. Examples of such a device's ability to reproduce any given set of colors were the Optical Society of American Uniform Color Scales at a constant L* value and 3D views of the Munsell Book of Color in all possible orientations. Then, Don discussed how the system could be used to model synthetic objects into an environment. He illustrated the capability of computer graphics to model entire objects and the reflected light off them to create objects that never existed. This is accomplished by understanding how the ambient, diffuse and specular portions of light are reflected off a model and finding the necessary red, green and blue signals to produce that reflective spectral power distribution. Thus, by successfully modelling an object's color and true reflections, relative to where the observer is in terms of spatial distribution, surface roughness, slope and microfacet distribution, they simulated shiny metallic objects made of copper and silver.

Don concluded by saying that such a powerful computer graphics system is expensive; but, hopefully in the future, the cost will come down and the resolution power should increase.

Tom Lippert of Virginia Polytechnic Institute described a new application of video display imagery to quantifiable aspects of visual performance. An 0.5 mm distant high-resolution digital shadow-mask display under low ambient illumination was used to study the numeral string reading speed (RS) of ten normal trichromats. A factorial design of eight chrominance contrast levels and seven luminance contrast levels, yellow-green and red dot matrix numerals, were presented against spatially uniform background chromaticities. It was found that chrominance contrast enhanced readability at low luminance contrast levels. RS varied as a function of chrominance contrast and was positively correlated with luminance contrast for the achromatic and yellow-green numerals. Red and purple backgrounds were exceptions, because high performance resulted without luminance contrast. It was also of interest to determine how the color difference for all stimulus combinations related to readability. The convergent (point origin) geometrical nature of the 1970 CIE L*, a*, b* and L*, u*, v* color spaces resulted in a poor correlation between color difference (ΔE) and readability (R_S). Use of the nonconvergent, plane-origin Y, u′, v′ color space led to a higher correlation ($R^2 = .86$) between color difference and reading speed, especially when the red and purple stimuli were removed from the set. Tom closed by saying that the lower correlation may indicate that luminance is not the right metric for this kind of work.

Jim Kassner appealed to all the chemists in the audience with his talk on leuco colorformers as a significant part of modern imaging systems. Jim described leuco colorants as those which shift from colorless to colored and are easy to control. Also, the chemistry which triggers them is simple. In the past, leuco dyes have played an important role in synthetic schemes as a convenient point for isolation. They have also been utilized for vat dyeing. More recently, Jim described their use in carbonless duplicating systems, thermographic and electrolytic printing, color palette formulation, and for photoresists.

Finally, Milt Pearson addressed a topic that should stand in a class all by itself. He discussed the major difference between the color-matching/formulation community and the image reproduction community. He began by defining ΔE as the color difference in CIE L*, a*, b* color space between the original and the match to it or reproduction of it. The color-matching world is free to choose one set of colorants and determine the correct formulation for a spectrophotometric match to some original where ΔE is small and metamerism is minimal. If it is desired to match a new color, a *different* set of colorants can be chosen to insure as close a match as possible. In the image reproduction work of concern to the photographic video display and graphic arts world, all colors must be matched with only one set of colorants. The spectrophotometric curve of the reproduction may not be a close match to that of the original. The result is large ΔE values and a reproduction that is metameric to the original. Since we don't know how to scale ΔE for acceptability, it is difficult to evaluate the meaning of these large ΔE values. Milt described an experiment where he photographed the Macbeth Color Checker and printed it to a specific gray balance. He then measured the reflection print, using a spectrophotometer with 0°/45° geometry and calculated CIE L*, a*, b* coordinates for the CIE 1931 2° Standard Observer and Illuminant D_{65}. The ΔE averaged over all 24 colors was 16.9. He then described how much spread there would be in the ΔE value if the CIE 1964 10° Observer (δΔE = 1.4), diffuse/0° measurement geometry (δΔE = 3.2) or an illuminant 400°K away from D_{65}(δΔE = 3.1) were used in the calculations. Milt pointed out that the overall ΔE was five to eight times larger than any of the computational changes. In discussing the use of standard observers other than 2°, Milt shared some very creative pictures that helped us gain a perspective for what a 10', 24', 2° and 10° observer really means when viewing scenes. This presentation generated much discussion. Fred Billmeyer was quick to point out that the CIE L*, a*, b* equations were derived, based on Munsell spacings where ΔE values are relatively large. Thus, its use for image reproduction work is appropriate. Wright pointed out that the CIE 1931 2° Observer is valid from ½° to 4°; and, for any smaller degrees than that range, color discrimination is reduced and small-field tritanopea becomes a problem.

The conference ended with a discussion period carried out by three panelists who are world-reknown in the field of color science: Robert Hunt, David Wright, and Gunnar Tonnquist. Hunt, acting as the spokesman, posed four questions that seemed to be surfacing as issues throughout the entire conference. The first question asked if all processes are either additive or subtractive, or can some processes be a little bit of both? Wright pointed out that, until this conference where he saw the introduction of Polaroid's new instant slide film, he would have said that all photographic processes were subtractive. Hunt answered that, on a fundamental level, all processes are additive with respect to how the eye perceives them, but some processes result from subtractive colorants. Someone from the audience pointed out that any process using fluorescent pigments can be thought of as both additive and subtractive.

The second question posed by Hunt was: How can adequate comparisons be made between reflection print systems and luminous displays? Hunt spoke about his early attempts at placing a white border around the colors displayed on the TV monitor in order to create the same impression of those colors in a reflection print system. Tonnquist mentioned the need for a color order system specifically for comparing self-luminous displays. Wright pointed out that video display units are being used today to aid in textile design. He reminded us that, in making such comparisons, viewing illuminant is very important. Wright also mentioned that white level and surround are important attributes of what we see in video display units and reflection prints. However, in viewing self-luminous displays, brightness and colorfulness are important; whereas, for reflection print systems, it is lightness and chroma. Milt Pearson cited some early work done by John Ewell where an appropriate surround was used for colors displayed on a transparent viewer, and the luminance levels were adjusted until the appearance matched that of the reflecting objects. Paul McManus of Tektronix mentioned some work that he has done trying to match colors produced on a CRT, where a white surround was necessary, to samples from the Munsell Book of Color. Hunt pointed out that CIE colorimetry with minor adjustments would probably be adequate to describe color pictures on a CRT; but, for alpha numerics on a black CRT screen, an alternative to CIE must be found.

The third question dealt with naming the appropriate observer field size for video display units. Again, Wright reminded us that the CIE 1931 2° Observer is adequate for field sizes ranging from ½° to 4°. Field sizes, such as the 10' and 24' illustrated by Pearson, introduce an increase in the occurrence of small field tritanopea. Small or large field sizes, in Wright's opinion, may be necessary for certain isolated situations. Tonnquist expressed the need for picking one field size and adhering to that one so that meaningful intercomparisons could be made. Hunt commented that the 2° Observer is appropriate for reflection print color reproduction work, but we must not forget that it represents an average from which real observers may deviate. Some observer smaller than 2° may be necessary for CRT work if a method is found to correct for small field tritanopea.

The final question was: To what extent do color deficient people have trouble seeing video display units? Hunt felt that trichromats should have no difficulty seeing CRT displays, but dichromats would. If CRT color is for decorative purposes, then it won't be as important for the dichromats to see it. However, if CRT color information is vital, then the dichromats representing about 2% of the population, will have discrimination problems. Wright cited Dick Warner's paper on color-proofing systems and reminded us all of the importance of testing people in charge of visual color-matching for color deficiencies.

That concludes the summary of the 1984 Williamsburg Conference on color and imaging. Once again, hats off to the people responsible for making it a success – Dick and Marjorie Ingalls, and Bonnie Swenholt.

Paula J. Alessi

Color Meetings in People's Republic of China

A recent symposium on whiteness was held in Beijing, China and drew nearly 60 participants with a wide variety of interests. The symposium was organized by the China Standardization Association and chaired by Prof. T. H. Dong, Optical Instruments Department of Zhejiang University. Prof. Dong is a member of ISCC. More than thirty papers were presented.

The Second Conference of the Color Optics Committee of the Optical Society of China was held December 2-5, 1983 in Qingdao, China. Prof. Y. X. Shu of Shandong Textile Engineering College chaired the conference which included more than sixty papers about color and colorimetry. Prof. Dong is the liaison between ISCC and the Color Optics Committee.

ASTM Plans May 1984 Symposium on Evaluation of Appearance

Recent developments in how to measure or specify the appearance attributes of materials will be the focus of a 23 May 1984 ASTM Symposium on Review and Evaluation of Appearance: Methods and Techniques. The symposium, to be held at the Queen Elizabeth Hotel, Montreal, Canada, is sponsored by ASTM Committee E-12 on Appearance of Materials. There is no fee to attend.

The sixteen presentations featured will be of special interest to researchers, quality control personnel, buyers, sellers and standards writers. Topics to be covered include: modes of appearance; psychometric scaling of gloss; color graphics systems; color in foods; optical properties of china-made colored glass plates; appearance specifications for escalator treads; lightfastness testing; and visual color technology for industrial applications.

The symposium is scheduled in conjunction with the 20-25 May 1984 ASTM Committee Meetings Week. Committee E-12 will hold standards-writing meetings on 20-21 May. These meetings are open to all interested persons, free of charge.

For more information, or to receive a copy of the program booklet, contact the Symposium Chairman, J. J. Rennilson, Retro-Tech, P. O. Box 3103, La Mesa, California 92041, 619/698-1263; or Robert Morgan, ASTM Standards Development Division, 1916 Race Street, Philadelphia, Pennsylvania 19103, 215/299-5505.

The World of Color

A two-day conference and exhibition having the above title has been organized by Mr. C. J. Hawkyard, to take place at the University of Manchester, Institute of Science and Technology, April 5-6, 1984. On the first day, under the theme, "Colour and the User," the following 6 papers will be presented:

Perceptual Colour Attributes, Dr. R. W. G. Hunt, The City University, London.

Colour and Environmental Design, Prof. W. Spillman, Dept. of Architecture, Winterthur Polytechnic, Switzerland.

The Natural Colour System, Mr. A. Svedmyr, Scandinavian Colour Institute, Stockholm.

The Munsell System, Mr. D. G. Chamberlin, The Tintometer Ltd, Salisbury.

The Visual Colour System, Mr. W. Coppock, Applied Colour Systems, Princeton, USA.

Colour and the Designer, Mr. A. Roylance, Weston Hyde Products, Manchester.

On the second day the following seven papers will be presented under the theme "Colour Measurement:"

Colour – The Physicists View, Dr. A. W. S. Tarrant, University of Surrey.

The New Ceramic Standards, Mr. F. Malkin, British Ceramic Research Association, Stoke-on-Trent.

Colorimeters or Spectrophotometers?, Dr. J. Ferguson.

On-Line Colour Measurement, Mr. C. S. McCamy, Macbeth, USA.

Dealing with Special Measurement Problems, Mr. S. Douglas, Pacific Scientific, Maidenhead.

Fluorescence Measurement, Mrs. R. Mckinnon, National Physical Laboratory, Teddington.

Recent Advances in Colour Difference Quantification, Mr. K. McLaren, ICS Ltd, Newbury.

The conference fee of £160 includes the cost of reproducing the papers and posting them to the attendees after the conference. It may be possible for persons unable to attend the conference to purchase a set of papers. If interested, address your request to UMIST, PO Box 88, Manchester M60 1QD, ENGLAND.

Harry K. Hammond III

CALENDAR

AMERICAN CERAMIC SOCIETY
Annual Meeting, April 29-May 3, 1984, Pittsburgh, PA

ASTM
Symposium on Review and Evaluation of Appearance, May 23, 1984 – Montreal, Canada

AMERIAN SOCIETY OF INTERIOR DESIGNERS
National Conference, August 16-19, 1984, Chicago

COLOR MARKETING GROUP
Spring National Meeting, May 9-11, 1984 – Nashville

FEDERATION OF SOCIETIES FOR COATINGS TECHNOLOGY
Annual Meeting, October 24-26, 1984, Chicago, IL

ISCC 1984 ANNUAL MEETING
April 8-10,– Michigan Inn, Southfield, Michigan

OPTICAL SOCIETY OF AMERICA
Annual Meeting, October 29-November 2, 1984, San Diego, CA

SOCIETY FOR INFORMATION DISPLAY
International Symposium, June 5-7, 1984 – San Francisco, CA

SOCIETY OF PHOTOGRAPHIC SCIENTISTS AND ENGINEERS
Annual Conference, May 20-24, 1984 – Boston, MA
Electronic Imaging 84, September 11-13, 1984 – Boston MA

PANTONE, INC. COLORS NEWSLETTER

A very generous donation of paper and color printing from Pantone, Inc. has restored the color spectrum to the front page of the NewsLetter. The ISCC Board of Directors wishes to express its thanks to Pantone, Inc. for this tangible expression of support and help.

1. Any person interested in color and desirous of participating in the activities of the Council for the furtherance of its aims and pusposes . . . . shall be eligible for individual membership (By-Laws, Article I, Section 2). Application forms for individual membership may be obtained from the Secretary (address given above).

2. The Council promotes color education by its association with the Cooper-Hewitt Museum. It recommends that intended gifts of historical significance, past or present, related to the artistic or scientific usage of color be brought to the attention of Cooper-Hewitt Museum, 9 East 90th Street, New York 10028.

Deadlines for submitting items to be included in the Newsletter are: February 15, April 15, June 15, August 15, October 15, and December 15; in other words, the fifteenth of the even-numbered months.

Send newsletter items to:
Ms. Mary Ellen Zuyus
Hunter Associates Laboratory, Inc.
11495 Sunset Hills Road
Reston, VA 22090

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