

Inter-Society Color Council *News*

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efficiency was improved by uniformly recoating the interior of the sphere with BaSO₄ paint; baffles were added to insure reflected flux off the sample was reflected off the sphere at least twice before detection; finally, refinements were made to the sample beam specular port.

The second enhancement involved the use of a calibrated filter placed in the reference beam to improve the instrument's limiting optical density to enable transmittance measurements of optical density of 4.00.

The final enhancement was the implementation of Grum and Costa's method of accounting for the polarization sensitivity of the instrument (*Applied Opt.*, V.13, pp 2228-2232, 1974).

The second speaker was Mr. Mark Fairchild, Instructor with the Munsell Color Science Laboratory at Rochester Institute of Technology. The title of his paper is, "A Novel Method For the Determination of Color Matching Functions using a Visual Colorimeter with Laser Primaries". This research can be conveniently divided into two parts, instrumentation and statistical modeling of visual matching functions.

The visual colorimeter he described is a four channel device: The red primary is a helium-neon laser; the green and blue primaries are two spectral lines from an argon-ion laser; the spectral source is an interference filtered tungsten-halogen projector lamp. The three primaries plus the spectral source illuminate one half of a bipartite field. The other half of the field is illuminated with a daylight simulator. The three primaries are modulated by acousto-optic modulators controlled by the observer via a "mouse" interfaced to a personal computer. Observers made matches using the Maxwell method for five wavelengths and the simulated daylight.

From the visual results, color-matching functions for the entire visible spectrum were estimated using a statistical model developed by Mr. Fairchild. The model assumed that color-matching functions are a linear transform of cone sensitivities convolved with differences in the amount of macular pigment and amount of scattering in the crystalline lens. The five wavelengths were selected to provide estimates of the "amount" of macular pigmentation, the "amount" of lens scattering, and the elements in the linear transform. Nonlinear optimization was used to estimate the model parameters. Simulations using the Stiles 2 degree data verified the validity of the model. Results were shown for two observers.

Dr. Danny Rich, co-chair of IGI, led a discussion session on the concept of interest groups. Specifics addressed included: what expectations members had, and what format the IGI should adopt for next year's annual meeting. Several topics of interest were raised: CRT calibration, halftone colorimetry, and spectrophotometer geometries. The audience felt that the session should be predominantly contributed papers within the entire scope of this interest group.

The feedback from the participants was very positive. There were

INTEREST GROUP I (IGI) MEASUREMENT AND COLORIMETRY

The first meeting of this interest group was called to order by Dr. Roy S. Berns, co-chair. Dr. Berns reviewed the scope of this interest group: Under the new ISCC organization, Interest Group I is named "Measurement and Colorimetry". The technologies that are to be monitored by this group include all methods of quantifying the generation and modification of optical radiation. The processes of quantification include spectrophotometric, spectroradiometric, photometric, radiometric, colorimetric, and visual psychometric methods. Procedures and materials for calibration, verification, and diagnosis of quantification processes will be analyzed and reviewed.

Methods for data reduction and analysis will be tested and reviewed.

Annual meetings will involve contributed and invited paper presentations and panel discussions.

The philosophy of interest groups was reviewed (see ISCC News No. 310, A Letter from the President) and the aims and purpose of the Council were stressed in relation to IGI.

Two speakers were invited to present recent research appropriate to IGI's scope. The first speaker was Dr. Joanne Zwinkels, Research Officer with the Canadian National Research Council's Division of Physics (NRC). Her paper was titled, "The Optimization of a Research Spectrophotometer for High Accuracy Color Measurement". She discussed how NRC optimized a Perkin Elmer Lambda Nine spectrophotometer for hemispherical and specular measurements.

The first enhancements concerned the instrument's integrating sphere: Stray light was reduced by realigning coupling optics; sphere

52 participants in attendance. *Reported by Roy S. Berns. (Editor's Note: This report should have been included in No. 314—I had it in time but in trying to meet my deadline—I held this over for this issue. This also applies to the report from the National Artists' Equity Association Member-Body.)*

INTEREST GROUP IV: COLOR EDUCATION

Monday, 9 May 1988 at 9 a.m. the meeting was opened with a presentation of the results of a questionnaire that had been sent out to those members of ISCC who teach courses on color: 75 questionnaires were sent out; 36 were returned. If anyone wishes a copy of this questionnaire please contact either Nancy Jo Howard or Evelyn Stephens.

Some of the problems that arose in dealing with the responses are listed below:

1. need wider distribution; need to go outside ISCC
2. need more information on subjects taught
3. need more detail on educational material; i.e., what is being used and how it is being used.

Fred Simon, Jim DeGros and Bill Thornton offered to form an ad hoc committee to work on gathering a complete list of people who teach color. One of the starting points would be working with education committees of other professional organizations, especially those affiliate with ISCC. This, in turn, could lead to an expansion of the use of both the speakers bureau and the bibliography. It could also be an important source of information for publishers and others producing color materials for educators; slides, books, lab exercises, etc.

Nancy Jo Howard provided a brief description of the bibliography project and the reason for the joint publication of this with AIC. Fred Simon offered to convert this extensive work from Apple PFS to MS DOS ASCII-readable. Jim offered funds to make 1000 discs available if in MS DOS. There is still a need for someone to work on children's books; and we hope that as this committee grows, periodicals will also be entered into the bibliography.

Evelyn Stephens discussed the shortening of individual speaker profiles to one page; ISCC has agreed to provide publishing funds. Stephen Bergen strongly recommended putting this into a D-base-like program for more flexible access. He felt that all data-sources should be done in this manner and there seemed to be general agreement. A suggestion was made about having a column in the ISCC newsletter that briefly profiles a few members of the speakers bureau. Then ISCC members will accumulate a collection of information on the bureau. A whole issue on the bureau was felt to be overkill. Stephens suggested that questions about interest in both the speakers bureau and the bibliography be included in the questionnaire that is sent to "Color Educators" so that appropriate information could be sent to them and/or additional information could be solicited.

Slide collection(s) were discussed next. Jacqui Welker and Nancy Jo have met and categorized Nancy Jo's collection. There was a general feeling that this should be expanded on: RIT, Hunter, Thornton, all have slides that they may be willing to share. Jacqui and Fred have some copies of some of Ralph Evan's sets. Possibly we could come up with sets of 20 slides on a topic accompanied by brief

descriptions, which could then be sold at cost. Eugene Allen described his recently completed audio tape and workbook on color, prepared for the American Chemical Society; this is available for \$600. There was a general feeling that those persons who are interested in this slide project would meet and agree on some sets of slides to be presented at the interest group meeting next year. The possibility of viewing these sets at the poster sessions next year with an accompanying reaction form was also mentioned. Obviously, a preparatory session before next April is needed. Again, contact Nancy Jo Howard or Evelyn Stephens.

Some general questions were raised about different types of equipment but were not really dealt with at this meeting. Perhaps a future meeting might address these questions: manufacturers could be invited to display their latest color measuring devices and to give both pros and cons of their use.

Many thanks to Cynthia Brewer for taking these minutes; a great deal of information would be lost without them. *Submitted by Nancy Jo Howard.*

PROJECT COMMITTEE REPORTS

Project 22: Materials for Instrument Calibration

Project Committee #22 met on May 8, 1988 during the annual meeting of the ISCC. At the meeting several items of interest were presented to the members attending. There were 15 people present, 4 active members, 10 information only members, and 1 observer.

The meeting was opened by Chairperson Danny Rich and the minutes of the last meeting read. The members present approved the minutes as read.

Dr. Roy Berns of the Munsell Color Lab at RIT reported on recent work. They presented their work on goniophotometry of white standards at the CIE and OSA meetings last year. They will be trying to model the geometric properties of instruments in order to provide a correction scheme for instrumental differences. His lab has now set up to provide 450/00 reflectance factor calibration over the wavelength range of 380 nm to 700 nm. They are also looking at other ways to prepare PTFE standards. Part of this effort will be to characterize the translucency of a PTFE standard. They would like to know if translucency is strictly a property of the material or also of the instrumental geometry. They will analyze PTFE standards as a function of various illuminating and viewing geometries at 3 densities of pressing.

The National Bureau of Standards (NBS) reported that the research is finished on colored fluorescent standards for research grade spectrofluorimeters. The new standard reference material (SRM) will be number 1931. It consists of four cuvette sized solid slabs of PTFE and fluorescent pigment, using a 600/300 orientation. The set also includes a "blank" consisting of an unpigmented PTFE slab. The Holmium Oxide wavelength standard was very popular and they have sold out all of the first batch. SRM 1920, the reflection standard for NIR (near infra-red) wavelength calibration has also been quite successful. D. Rich reported that one NIR instrument manufacturer reported replacing the quartz window with polystyrene and is selling an equivalent standard. The plastic window adds one additional wavelength peak near 2500 nm. The NBS PTFE gray scaler is still in the research phase. The standards need to be neutral from 250 nm to

2500 nm and uniform in both x and y (and possibly z) dimensions. It was indicated that the NBS is always looking for user input for additional SRMs that may be needed. H. Hemmendinger commented that the gray scale is needed but that users should be warned that specular/matte calibrations are not equivalent. The quality of the sphere wall at the specular area affects the quality of the measurements. He indicated that he has developed a method using specular component excluded calibrated samples and a calibrated mirror to characterize the specular component included characteristics of an instrument. The magnitude of the errors can be 0.1% to 0.5% reflectance factor. The white scaling corrects at the top of the scale but not at the bottom of the scale. It was pointed out that education of users is very important, both on this factor and other geometric factors. A recent 3-way inter-comparison among NBS, NPL and NRC on spectral transmittance will be published in the journal *Metrologia*. The inter-comparison used the 0.01% to 92% transmittance MAP standards supplied by the NBS. A similar test is currently underway with the Hungarian National Office of Measures, Budapest, Hungary.

The National Research Council (NRC) of Canada reported that they are still working on the role of supplying SRMs but currently do NOT supply SRMs. They have been active on their construction of a reference spectrophotometer. It is currently being tested for regular transmittance. It is a single beam design, with a 37 x 30 mm beam size and a 1.90 maximum convergence angle. The wavelength scale is currently accurate to ± 0.02 nm using a modified Cary 14 monochromator. They are currently optimizing the signal to noise ratio and evaluating the photometric scale correction.

The Hemmendinger Color Laboratory showed a sample holder for opal glass and PTFE standards. Henry Hemmendinger also reported that he has available duplicates of the SRM 2101-2105 filters that are no longer available from the NBS. He also has the Series II BCRA tiles. Henry believes the BCRA tiles to be the best prepared tiles available today. Their sales are very good. He sold 60 sets of the twelve tiles in 1987, some calibrated, some not. They are becoming the material of choice for instrument verification and diagnostic testing. It is the best way to relate the performance and reproducibility of different laboratories.

There was a request for an SRM for diffuse transmittance. The NBS indicated that they had thought about this but were not sure how to create such an SRM. There was some discussion about the correct geometric conditions to make diffuse transmittance measurements.

Chairperson Rich indicated that he had a revised draft of the committee publication, *Guide to Material Standards and Their Use in Instrument Calibration* available for review. Any active members willing to examine it and send comments back to chairperson Rich were welcome to take a copy with them. He stated that he would like to have the final draft ready for the ISCC board to review in October.

Mr. Rich also reviewed the new ISCC structure for Project Committees. He reminded the group that ALL committees now had to have short term objectives and that when those objectives are accomplished the committee will be disbanded. The objective of this committee is the revision of the Guide. When that document is re-approved Project Committee #22 will be terminated. Anyone wishing to have a project committee address other items of interest should approach Mr. Rich or one of the ISCC board members or Interest Group Chairpersons. The meeting was adjourned by Mr. Rich.

Project Committee #27: Indices of Metamerism

During the past year the Committee has been engaged in analysis of its visual experiment. The visual experiment, conducted several years ago, assessed several metameric pairs at each of three color centers: beige, green and blue. In subsequent years, the committee scaled the visual rating to a "degree of metamerism" scale. This year the arbitrary scale resulting from the visual assessment was compared to 22 differing methods of calculation of index of metamerism.

The various methods of calculation included the CIE Index of Metamerism, a method proposed by Simon, the Allen Standard Deviate Observer method, the Nayatani Standard Deviate Observer method, and the Nimeroff Index. Thornton's DM and a method based on calculating a correlation coefficient between the spectral data of standard specimen and trial specimen were also applied.

Variations within a given method of calculation were obtained first by weighting the Nimeroff Index and the correlation coefficient method by the color-matching functions, and secondly, by utilizing various methods of correction. These methods correct the reflectances of the specimens, which are parametric to the standard distributions, to truly metameric reflectance functions. Among the methods of correction utilized were an additive correction, a multiplicative correction, and a spectral correction.

A total score was calculated for each method by adding the score of the individual color centers together.

For the purposes of analysis, the methods were divided into two major categories by calculation type. The two categories were Special Indices of Metamerism, which are calculated for some special and definable sets of viewing conditions, and General Indices of Metamerism, which characterize the degree of metamerism between the members of the pair generally, for no particular sets of viewing conditions.

Of the eight variants calculated, the best of the Special Indices was a CIE Index of Metamerism with a spectral correction. Of fourteen General Indices calculated, the best was Thornton's DM without any correction applied. Applying the spectral correction to General Indices deteriorated the results in all cases.

The committee will continue to analyze the results of this visual experiment over the forthcoming year.

Project #44: Regular Rhombohedral Sampling of Visually Uniform Color Space

As stated in the Scope and Objectives approved by the Board of Directors, the objectives are:

1. To design and perform a limited experiment to verify the chromatic crispening effect.
2. To analyze existing data to verify the chromatic enhancement of lightness effect.
3. To design and perform a limited experiment to verify the uniform step sizes of an existing system.

The committee began the year by measuring a copy of the OSA Uniform Color Scales and comparing the colorimetric values with those of their published aim points. These results were stated both in CIELAB notation and in OSA (L,j,g) notation. The tables expressed in CIELAB notation show scales which run from red to green, from blue to yellow and from dark to light. Copies of these tables are available from the Chairman to any persons having an interest in them.

This year the committee performed limited work on its first objective. Sanders and Wyszecski have reported that changing the neutral background, either lighter or darker, from the background for which the samples have been made uniform will increase the chromaticness difference of sample pairs. They described this difference in an equation in an article in *J. Opt. Soc. Am.* in 1958. To determine whether the way in which this equation has been implemented in the OSA Uniform Color Scales is correct, about 20 observers visually scaled a limited number of adjacent color pairs from the OSA atlas against backgrounds of differing lightness. These data will be analyzed over the the next year to determine the results.

THE COLOR ASSOCIATION OF THE U.S. (CAUS)—ANNUAL REPORT FOR 1988

As the Color Association approaches its 75th year, it is a pleasure to submit the following report.

This past year marked a steady rise in membership. The growing numbers, and the diversity among applicants, are reflections, perhaps, of the Association's directors outreaching through extensive travel.

Associate director Margaret Walch traveled around the country, giving presentations at San Francisco's Western Merchandising Mart, Dallas' National Home Builders' Convention, the International Furnishings Design Association's national meeting in Boca Raton, Boston's Design Center, and at Philadelphia College of Textiles and Science. Additionally, she spoke at New York City meetings of Eastern Lamp & Lighting Association, the American Paper Institute and ASID.

Managing director Dolores Ware's peregrinations included six shows at New York City's Javits Center (NY Fabric, Kids, International Boutique, Gift, NAMS, & Decortex) as well as Los Angeles' MAGIC and Madison Square Garden's TAG Shows.

William C. Segal (CAUS President) and Marielle Bancou (executive director) travelled around the world in 1988, both in Japan and Europe. In Tokyo, they visited Mr. Unagami, who is the chief of Japan's prestigious "Planning Color Center" and who also heads an avant-garde art gallery and publishing firm of rare books. At the Unagami Gallery they met with the painter Ayo (specialist in rainbow-inspired pictures). Ayo was planning his Paris Eiffel Tower project: 300 yards of rainbow fabric was to be used as a banner ornament for three days, hanging from the top of the Tower. In Europe, CAUS continued to maintain close contacts with CFC (Centre Francais de la Couleur) staff, Michel Indergand and Philippe Fagot as well as with specialists on color in various fields: Professor Michel Pastoureau, Jean Philippe Lenclos and Michel Albert-Vanel.

In South America, we also continued to collaborate with Candida Bothelo and the architects and designers group from Brazil. CAUS sent its representative, Bill Bonnell, to their Annual International Seminar.

The Association in turn received visits from student groups in fashion, interior design, marketing, and merchandising from many colleges and universities, including Centennial College (Canada), Lindenwood College (Missouri), Iowa State University, Columbia Basin College (Washington), Arizona State University, Delgado Community College (Louisiana), and the Fashion Institute of Houston. Under the Fashion Institute of Technology's internship program, Emily Wong participated in a variety of Association color activities.

Publishing efforts of the Association continue in various forms. The Board of Directors voted a substantial financial grant to Augustine Hope and Margaret Walch for research material and for the support of the soon-to-be-published 400-page *Color Compendium*. This reference work should attract worldwide attention not only among colorists but also among the public at large. This book includes a special focus on the coming century of color.

In addition to publishing six custom-dyed fabric forecasts of seasonal fashion reports in women's, men's and children's charts and one interior/environmental silk-screened chart, the CAUS Newsletter, now in its seventh year, addressed a wide range of color news items, including color developments in the carpet and laminate industries, color usage in advertising, cosmetic, computer, and industrial workplaces.

Finally, and not least importantly, the Association looks forward with great pleasure to co-sponsoring with ISCC a conference in New York City in 1991. *Report prepared and submitted by Marielle Bancou, executive director.*

NATIONAL ARTISTS EQUITY ASSOCIATION (NAEA)—1988 ANNUAL REPORT

To quote from our current brochure, "National Artists Equity Association is a non-profit, aesthetically non-partisan, national organization for professional visual artists. Since 1947, when it was founded by visual artists as a means of working collectively to address the concerns of the profession, National AEA has been the only national organization whose primary purposes are to work for improved economic conditions for artists and for the expansion and protection of artists' rights. National AEA operates at the federal, state and local levels through its national headquarters in Washington, D.C., its chapter organizations and its member-at-large. The organization is governed by an all-artist, volunteer, National Board of Directors. Members of National AEA reside in 44 states, and there are twelve chapter organizations and organizing committees operating in seven states."

"The heart of NAEA is advocacy, and our program is currently focused on four areas. The first of these is the Visual Artists' Rights Act, a bill pending in Congress to amend the U.S. Copyright Law, establishing new federal protection for visual artists including resale royalty rights, moral rights, and the elimination of the copyright notice requirement (c 1988).

The second program is the effort to make the voluntary toxic art materials labeling program a federal law. A bill is pending in Congress. The third area is taxes. Current tax law does not encourage activity in the visual arts... Fourth, NAEA is active in the National Art Space Development Network, which is a computer network created to assist artists in the development and maintenance of affordable living and working space."

During 1987 NAEA mustered support behind Senator Edward M. Kennedy's (D-MA) Visual Artists' Rights Act, S. 1619. A hearing was held on December 3 to an overflow audience. Prominent New York artists Robert Mangold and Jenny Holzer expressed their enthusiastic support of this bill citing personal examples to justify a need for such copyright legislation.

ISCC president Joy Turner Luke, chairwoman of the NAEA Materials Research Committee, continued her highly active involve-

ment in leading the fight for rationality in the battle being waged from all sides—politicians, artists, educators, art materials manufacturers, lawyers, lobbyists, retailers, medical people, trade associations, the general public—concerned with potential health hazards of artists' materials. Joy represents NAEA for the Art and Craft Materials Institute, the group that certifies that art material meet high health and quality standards. As chair of ASTM Subcommittee D01.57 she has led in the development and ongoing revision of ASTM D4236, a standard which defines voluntary chromic labeling on art materials. A national bill is to be introduced before Congress mandating that the Consumer Product Safety Commission regulate labeling and health hazards based upon the provisions of ASTM D4236. Some of the provisions of the 1986 Tax Reform Act were among the most headache producing issues to artists in 1987. Artists, such as painters, sculptors, photographers, graphic artists, etc., are now required to allocate every expense incurred in producing artwork to each specific work produced during that year. Furthermore, such expenses can be deducted only from income received from a specific work in the year in which it is sold. The lobbying activities of NAEA include an information and letter writing campaign to members of Congress in an attempt to get current tax legislation changed to what it was before the 1986 Tax Reform Act was enacted. It has recently been announced that the Joint Congressional Committee on taxation has drafted a Technical Corrections Act that has changed some of these provisions to benefit artists. *Hilton Brown*

ANNOTATED BIBLIOGRAPHY COLOR ORDER SYSTEMS

A descriptive review of color order systems and standards that are in the Faber Birren Collection of Books on Color at Yale University in New Haven, Connecticut, has been reprinted in a third edition. This runs to ten pages and is considered to be perhaps the largest group of such works ever assembled in one source. The range is from 1776 to 1987 and has representation from America, England, France, Germany, Sweden, Switzerland and Japan.

Copies will be sent for the cost of mailing only. To obtain such a copy, send your request and \$1.00 to Faber Birren, 77 Prospect Street, Stamford, CT, 06902.

DISTINGUISHED SERVICE AWARDS PRESENTED BY THE ART AND CRAFT MATERIALS INSTITUTE, INC.

At a luncheon following its Annual Meeting on June 3, 1988 at the Marriott Marquis in New York City, The Art and Craft Materials Institute, Inc. (ACMI) presented several Distinguished Service Awards as part of a new awards program. ACMI is a non-profit trade association of art and craft materials manufacturers who sponsor a certification program to ensure their products are non-toxic or properly labeled. The Institute has been certifying the non-toxicity and quality of children's art materials for nearly fifty years. In 1982 the program was expanded to include adult art materials, which are certified to be non-toxic or to bear the proper health labeling and safe use instructions.

One of these awards was presented to Joy Turner Luke, artist and owner of Studio 231 in Sperryville, Virginia and ISCC President. Mrs.

Luke is extremely active in the National Artists Equity Association and as Chairperson of the Artists Materials Subcommittee of the American Society for Testing and Materials (ASTM), which writes and publishes quality and safety standards for numerous industries. She was the driving force behind the development of ASTM D-4236, the art materials chronic hazard labeling standard, which has become the cornerstone of the Institute's certification program. Mrs. Luke has worked tirelessly for her fellow artists, and the entire art materials industry has benefited.

The Distinguished Service Awards consist of a mahogany plaque and a piece of original ceramic artwork, designed and produced by George Debikey, artist and chemist for American Art Clay Co., a founding member of ACMI. The Institute plans to distribute additional awards in the future. *Submitted by Fred Billmeyer.*

FROM THE COLOUR GROUP (GREAT BRITAIN) Newsletter-Summer 1988

All correspondence concerning the Colour Group should be addressed to the Secretary (Mrs. J.A.F. Taylor) at: The National Physical Laboratory, Dept. of Quantum Metrology, Teddington, Middlesex, HA1 4TY, England, United Kingdom.

Correspondence concerning membership of the Group should be addressed to the Assistant Secretary (Dr. V. A. Barbur) at: Kodak Limited, Research Division, Headstone Drive, Harrow, Middlesex, HA1 4TY, England, United Kingdom.

ADVANCE NOTICE: 1989 January 25 there will be an INTER-SOCIETY CONFERENCE at THE ROYAL SOCIETY OF ARTS, 6-8 John Adam Street, London WC2N 6 EZ. The subject will be:

"Getting Colour Together: Who Leads? Who Follows?"

Sessions include: Colour Forecasting, Colour psychology and aesthetics, Colour dimension - the Swedish NCS System, and Colour co-ordination.

A title and short abstract (200 words) should be submitted as soon as possible. If accepted, authors will be asked to produce a short paper for the Conference Proceedings which will be published as a special issue of the Journal of Photographic Science. Manuscripts should be 2000-3000 words + figures and are to be available by the end of the Conference.

Abstracts or inquiries should be sent to:

Dr. M.R. Pointer
Kodak Limited - Research Division
Headstone Drive
Harrow
Middlesex HA1 4TY
England

Conference on Small Colour Difference Measurement
University of Bradford, 1988 April 6-7

"The Microspace Solution to Colour Difference Measurement"
K. McLaren

Studies in the late 1960s showed that ANLAB and three cube-root colour difference formulae were the most reliable of over 20 studied. When ANLAB was applied to the classical Davidson and

Friede data using optimum pass/fail boundary values, however, the number of wrong decisions was significantly greater than would have been made by the average visual shade passer. To overcome this major weakness the microspace concept was devised which led directly to CMC (1:c).

"Acceptability and Perceptibility Decisions using the CMC Colour Difference Formula" *R. MacDonald, Coats Viyella PLC, Glasgow*

CIELAB colour space, with its familiar Lab co-ordinates, is probably the most widely used system of colour specification in the colour using industries. However, it suffers from a degree of non-uniformity, the result of which is that, for pairs of samples located in different regions of colour space, equivalent visual colour differences can give numerical differences varying by up to 4:1. In addition the attributes of lightness-, chroma- and hue-difference are not correctly weighted in the CIELAB colour difference formula. This means that different numerical tolerances must be set up for each specific colour in order to carry out instrumental pass/fail quality control.

An extensive series of investigation in the UK has shown that these variations in CIELAB space can be described and overcome by the use of ellipsoidal tolerance volumes, in which the dimensions in the Hue, Chroma and Lightness directions are varied according to the location in colour space of the colour standard. The CMC colour difference formula defines this variation and thus allows the use of a single number pass/fail tolerance to be applied to all colours of a given product.

The formula allows adjustment of the ratio of lightness to chromaticity components of the colour difference, to accommodate the variation in acceptability criteria in different industries. This also enables the formula to be adjusted to reduce, when required, the comparatively large lightness tolerance; normally applied in acceptability matching for pass/fail quality control. For example, it enables equal weighting to be given to lightness and to chromaticity differences for perceptibility judgements, such as when using grey scales for assessment of change of colour in fastness testing.

The formula has been tested on a wide variety of visual acceptability and perceptibility data and has shown significant improvement in performance over the CIELAB formula and all other previously published formulae. Analysis shows that it consistently gives lower numbers of wrong decisions in pass/fail matching than the average individual observer, when compared to the majority decision of a matching panel. The CMC formula is being used with a considerable degree of success for quality control in the UK and throughout the world and is due to be issued as a British Standard for colour difference in early 1988. McDonald's article may also be found in the *Journal of Textile Chemists and Colorists* Vol. 20, No. 6: 31-37, 1988.

"Colour Discrimination Ellipsoids" *M.R. Luo, LUTCHI Research Center, Loughborough University*

A brief introduction to the advantages of applying colour discrimination ellipsoids in colour difference studies and the methods used to calculate these ellipsoids will be given.

A review of the Bradford work relating to colour discrimination ellipsoids will be given. The available results from various colour discrimination studies under daylight and tungsten sources have been collected and colour discrimination ellipsoids calculated. New experimental results have also been obtained. Little difference has

been found between perceptibility and acceptability data. The two sets of ellipses (daylight and tungsten) have also been used to test the two newly derived colour difference formulae, BFD (1:c) and BFDA (1:c).

"Relative Tolerances in the CMC Colour Difference Formula for Paint Samples and Uniform Colour Spaces Based on CMC", *B. Rigg, University of Bradford*

Previous work had shown that different l values were required in the CMC (1:c) formula for acceptability judgements on textiles and perceptibility judgements on paint samples. The different l values could have been due to the different methods of assessment or to different substrates. Parallel experiments were therefore carried out using gloss paint, matt paint and textile samples. The results for the three substrates were quite similar suggesting that the different l values found earlier were due to a difference between acceptability and perceptibility judgements rather than the difference between the substrates. The implication of this work in selecting the best l value for tolerance work with paint samples will be discussed.

One feature of the CIELAB a^*b^* formula which has proved to be most useful has been the associated colour space. Work leading to a similar colour space, but based on the CMC formula will be described. The new space represents a substantial improvement in uniformity while its form is similar to that of CIELAB a^*b^* and so it is easy to use.

"Minimum Perceptible Differences in the Colour Reproduction of Photographic Prints", *Miss C. S. Wood, Imaging Science and Technology Research Group, Polytechnic of Central London*

In practical colorimetry and industrial colour-control a problem of principal interest is the perception of small differences between the colours of two objects. Taken to the extreme, it is the differences an observer sees as just noticeable or to be on the threshold of perceptibility that are of interest.

The aim of this work was to investigate observer perceptibility of small colour differences in the colour reproduction of photographic prints. Sets of 168 prints, that were each perturbations from a standard, were made for each of the colour patches represented by the Macbeth Color Checker Chart. Twelve observers judged the prints in each set to be perceptibly different or not perceptibly different from the standard print for each patch. The experimental results, in the form of hue-orientated and non hue-orientated ellipses, were compared with MacAdam type ellipses, CIELAB unit ellipses, and ellipses derived from the CMC(1:c) colour difference formula: the comparison was made in the 1976 a^*b^* diagram. It was found that the CMC ellipses fitted the hue-oriented experimental ellipses most closely. The results showed that the CMC (1:c) colour difference formula could be used to predict the tolerance ellipse for any colour centre, under the viewing conditions used for this work. The minimum perceptible difference was found to be approximately equivalent to a CMC colour difference of 2 units.

"The Conversion of CMC (1:c) into B.S.6923:1988" *K. McLaren*

CMC (1:c) was developed from the visual assessments made by textile colourists but was expected to be valid for all of the colorant industries. As the British Standards Institute had established a Multitechnics Council it was obvious that this would be ideal for extending the validity of the CMC formula. A committee (M2) was therefore appointed in 1986 with representatives from the textile,

colorant-manufacturing, ceramic, leather, paint, paper, ink and lighting industries and from textile retailing and the Ministry of Defence. No alterations were made to the formula but a significant improvement was made to the derivation of hue difference descriptors which, together with chroma difference descriptors, are not permitted for achromatic colours.

Dr. S. T. Henderson, Honorary Member of the Colour Group, died on 20th June 1988 aged 87 years.

He was educated at the Haberdashers' School before going to Cambridge where he gained his Tripos in natural sciences, specializing in chemistry. He also obtained an external B.Sc. in physics from London University. On leaving Cambridge, he went to work for the Irish Linen Association in Northern Ireland where he met and married his wife, Dorothy. At the beginning of the 1930s, he returned to England, working for ICI for a short while before returning to Emmanuel College Cambridge to study for his Ph.D. His next move was to the EMI Research Laboratories at Hayes where he worked on phosphors for cathode ray tubes.

After the war, Henderson joined Atlas Lighting Ltd - later Thorn Lighting Ltd - as Deputy Manager of the Research Laboratories with special responsibility for research on phosphors for fluorescent tubes. He was an acknowledged expert in this field and in 1954 he organized an international symposium on luminescence at Cambridge for the Institute of Physics of which he was a Fellow. He was also a Fellow of the Royal Institute of Chemistry. His work on phosphors led to his interest in the colour rendering properties of lamps and he was a member of the CIE Committee dealing with this subject for over 25 years. In the late 1950s Dr. Henderson became Chairman of a BSI committee drafting a new version of BS 950: Artificial Daylight for the Assessment of Colour. The early discussions of this committee revealed the lack of knowledge of the spectral distribution of natural daylight in this country and stimulated the series of measurements which Henderson and Hodgkiss carried out in the early 1960s. The data obtained contributed greatly to the 1967 CIE daylight recommendations. Henderson became an authority on natural daylight and during the year following his retirement, he researched and wrote his book "Daylight and its Spectrum". Retirement did not stop his interest in scientific matters and for the next 15 years or so he was an active member of the CIE and NIC colour rendering committees. During the course of his long career, Henderson published numerous papers and articles on various topics. In addition, his knowledge of languages was put to good use - Latin and Greek for translating ancient documents, and German, French and Italian for translating and abstracting technical papers for lighting journals.

In his leisure time, Henderson was interested in many pursuits including classical music, antiques, fell-walking, bird watching and bee-keeping.

Dr. Henderson joined The Colour Group in 1942 when it was a group of the Physical Society. He was elected to the Committee for the period 1952-4. In 1967 he was elected Chairman and this was followed by the award of Honorary Membership in 1974. Finally he delivered the Newton Lecture in 1979 on the topic of daylight and its spectrum, a fitting tribute to his long career in luminescence, colour and lighting.

M. B. Halstead

Reprinted from THE COLOUR GROUP (Great Britain) Newsletter - Summer 1988

FROM THE PRESIDENT

It requires time and effort from a large number of people to keep a national society, such as the Inter-Society Color Council, functioning smoothly and serving its membership. We are all fortunate that the Council seems to attract individuals who are not only enthusiastic about color, but who are willing to contribute their efforts for the benefit of the rest of us.

This is particularly true of the Secretary and Treasurer, who offer continuing effort and steady leadership over a number of years. Terry Commerford has served as Secretary through three changes of President providing vital records and a central office for the business of the Council. Ed Connor, who just retired as Treasurer, has served equally long seeing that the dues, financial affairs and tax returns of the Council are in order. Phil Hunter has now efficiently assumed that responsibility. These long term officers are also members of the Executive Committee providing advice and critical decisions. Their offices do not receive any ISCC funding, although special expenses are paid by the Council.

Less well known are the jobs done by the ISCC standing committee chairpersons. I would like in this space to begin to introduce you to some of these individuals and their responsibilities. I hope that anyone who is interested in serving in the future on one of the committees described today or in future columns, will contact President-Elect Hugh Fairman or myself. New people are needed to keep any organization viable, yet there is a tendency to keep calling on the same people.

The first Standing Committee named in the By-Laws is the Nominating Committee. It is chaired by the Past President, in this case Allan Rodrigues. It must include the President-Elect and someone else who has served as ISCC president in the past. The President appoints as members two other voting delegates who are not representatives of the same member-body as the above. Their guidelines call for the committee to consider the various interests represented in the Council and to choose outstanding individuals who are suitable for the particular office representing, as much as possible, these different viewpoints. The committee is responsible to submit candidates for all ISCC offices to the Board of Directors for approval. If approved, these names are put on the ballot going to all voting delegates. Other names can be added to the ballot if nominated by five voting delegates.

The second standing committee named in the By-Laws is the Membership Committee. Members of this committee should be both imaginative and knowledgeable about color activity in different fields. The ISCC was formed because there are numerous national societies and organizations where color is just one of a range of interests. With the other interests they must serve, it is difficult for these organizations to be current in this specialized area. The ISCC serves as a center for expertise in color, where information can be both collected and developed and then fed back into the member organization.

To attract new member-bodies the Membership Committee contacts organizations that may not even be aware of the need of their membership for information on color and shows them how the ISCC can be useful to them. This requires people with a sufficiently broad base in color to understand the needs of different industries.

Of course, many of the most productive people in the ISCC are among its individual members. These are individuals who have a keen professional interest in color and join the ISCC both for what they can

contribute and what they can learn. To attract new individual members it is necessary to get the word out about the Council. Every ISCC member can assist here because a personal recommendation is the most effective way of interesting new people in the Council.

The ISCC has a new Sustaining Member, the Pantone Color Institute, and it is hoped that the membership committee can find other organizations and companies who want to support the goals of the ISCC.

The chairman of the membership committee is Nick Hale, who has been deeply involved in color for his entire career and who arranged and supervised the outstanding ISCC Annual Meeting held in Baltimore in May.

At Nick's suggestion the successful main program was co-sponsored by the Society for Information Display, one of the ISCC member-bodies. I know that Nick is a persuasive salesman for the ISCC because he convinced me to join back in the mid 1970's.

The other members of the Membership Committee are Don Hall, with broad experience in technical color and thoroughly familiar with the Council; and Ann Laidlaw, who is experienced in color but new enough to the ISCC to have an insight into what will attract new members. All three members are respected and recommended by everyone who has worked with them.

Any suggestions you might have for individuals or organizations that might be contacted about joining the ISCC should be sent to W. N. Hale, Hale Color Consultants, 1505 Phoenix Rd., Phoenix, MD 21131. Phone (301) 472-4790.

Once an organization has become a member-body it comes under the aegis of the Member-Body Committee. This committee has the difficult job of maintaining a continuing fruitful association with organizations where the membership and officers change over time. The Chairman of the Member-Body Committee is Lou Graham. Besides a career in color marked by unusual inventiveness and insight, Lou is a past president of the ISCC and familiar with every detail of how it should function. His committee is composed of all the delegates from the member-bodies. He has already contacted all 27 member organizations and their delegations and made excellent suggestions for maintaining a two way flow of communication.

Suggestions for additional ways to make the relationships between the ISCC and its member organizations fruitful should be sent to Louis A. Graham, Lou Graham and Associates, 1207 Colonial Ave., Greensboro, NC 27408. Telephone (919) 379-1809.

New ISCC Sustaining Member

The Pantone Color Institute became a Sustaining Member of the Inter-Society Color Council in July. Organizations, companies or individuals who want to support the goals of the Council are eligible to become ISCC Sustaining Members. Sustaining Members receive the *ISCC News* and other Council publications and participate in activities of the Council, but primarily they wish to contribute toward communication, educational activities and research in color. Their support is greatly appreciated.

The executive director of the Pantone Color Institute is Leatrice Eiseman and her assistant is Victoria Herbert. The Institute address is 6324 Variel Avenue, Suite 319, Woodland Hills, CA 91367. Tele-

phone: (818) 340-2370. The Institute has an advisory board composed of well known designers.

The Pantone Color Institute was established as a separate entity by Pantone Inc. to "study the psychology of color, societal color trends and how individuals interact with color on a daily basis." These aims were stated in the first issue of the Institute's newsletter *Color News* (Vol. 1 No. 1, Spring 1986). The newsletter is published four times a year and features some color in each issue.

Saving Historic Color Documents

Several ISCC members have mentioned that they have historic books and documents on color that they will want to donate someday to a library or other safe public repository, but would like them to be part of a collection on color. The question is whether a suitable place can be found that will accept and care for material on color for the benefit of the public.

The first step is to determine how much and what type of material of historical interest concerning color might be available. Would anyone who has suitable material that they are interested in donating to such a collection please describe the items and send the description to:

Joy Turner Luke
Studio 231, Box 18 Route 1
Sperryville, VA 22740.

If there is sufficient material of historic interest, the next step will be to establish an ISCC committee to approach various institutions about the possibility of establishing a color collection, or making additions to an already existing color collection.

NEWS FROM MEMBER-BODIES

Color Association of the United States

Color and Champagne **

Do you know that there is a variation of wine colors in their making and aging, and that color is important for the quality-control of wines? In modern wine making, the wines can be measured by three techniques: 1) measuring the absorbance at 420 and 520 nm. which are the minimum and maximum of the red wine spectrum, 2) color intensity and luminance, and 3) measurement of chromaticity and luminosity. Philippe Fagot - who specializes in the study of the rainbow - reports on a recent study on 54 Champagne wines, in which objective measurements were compared with observations and comments of 20 tasters. They arrived at a clear classification of 5 groups of color: 1-Gold; 2-Green gold; 3-Golden yellow; 4-Amber yellow; and 5-Oxidized pink-yellow.

Books Briefly Noted **

The CAUS Newsletter briefly reviewed the following books:
Sonia Delaunay, Magician (1885-1979) Editions Ramsay, 1988.
Sublime Indigo by Marseilles Museum, Ed. Vilo 1987.
Regional Influences in Architecture & Interior Design
by Jim Kemp, Viking, N.Y., 1987.

Symbols of America by Hal Morgan, Penguin, N.Y., 1987

** All the above items are taken from the CAUS Newsletter, April 25, 1988 issue

Inter-Society Color Council *News*



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November-December 1988

FROM THE PRESIDENT

In the last issue of this newsletter I began describing the ISCC standing committees and their current chairmen. Any organization is successful in direct proportion to the foresight and efficiency of its board of directors and standing committees. The ISCC had the good fortune to have been founded and led by exceptional individuals who were pioneers in color technology. The Council has grown until it is difficult to be aware of who is doing the work that keeps the Council functioning smoothly.

In the previous article I mentioned the continuing service performed by the Secretary, Terry Commerford and the Treasurer, Philip Hunter. In fact, Terry has just finished putting together a new issue of the Membership Directory with the assistance of your President Elect, Hugh Fairman. This is in addition to preparing minutes for the Board of Directors, keeping in touch with members and corresponding with new members.

Taking the committees in the order that they appear in the By-Laws, I described the Nominating Committee chaired by Past President Allan Rodrigues, the Membership Committee chaired by Nick Hale and the Member-Body Committee chaired by Lou Graham, who is also a past president of the Council.

Another committee that is named early in the By-Laws is the By-Law Committee itself. This is a particularly difficult time to chair this committee because we have reached the point where it is necessary to revise the Constitution, By-Laws and Standing Rules. Down through the years small changes had been tacked into the last two documents. Some of these changes affected other sections in the documents making interpretation difficult, until finally it had become necessary to rewrite several sections to accommodate these changes and also to accommodate the new the Interest Groups and voting representation for the individual members. Anyone who has ever served as an officer or director in an organization where the by-laws and standing rules are being revised will understand at once the tedious job involved.

Jay Rennilson, with the assistance of Nick Hale and Bonnie Swenholt, led the By-Laws Committee through two drafts of the proposed revision, until the press of his own business forced Jay to step down. The chairmanship was accepted this spring by Fred Billmeyer who, with input from Nick Hale, Allan Rodrigues and Hugh Fairman, has produced two more drafts. Fred's services to the Council in the past have been so outstanding that he has been awarded both the Macbeth and the Nickerson Service Awards and made an honorary

NICKERSON SERVICE AWARD NOMINATIONS REQUESTED

ISCC members are urged to submit names of individuals and evidence of qualification to the committee, Dr. Paul Hoffenberg, Chairman, ACS, P.O. Box 5800, Princeton, NJ, 08543. Other members of the committee are Bonnie Bender, Ed Cairns, Harry Hammond, and Nancy Jo Howard.

The Service award was established by the Board of Directors in 1980 to recognize outstanding, long term contributions toward the objectives of the Council. In 1986, Nickerson was added to the title of the award to honor the memory of one of the founding members who continued to serve the council for the rest of her life.

The first recipient of the award was Dr. Fred Billmeyer in 1983. Next to receive the award were Dorothy Nickerson and Leonard Davidson followed by George Gardner, Harry Hammond and Ruth Johnston-Feller.

If there is someone who, in your view, should be considered for this award please—without contacting the proposed recipient—submit the name together with a statement of his or her long term service. If the award is to be made in 1989, the committee must have this information early in December 1988 so that it may review the nominations and make a recommendation to the board at its winter meeting well before the annual meeting.

member of the Council. It is very gratifying that someone with so much knowledge of the Council and its goals is willing to undertake this task. This is a strictly non-fun job but a very important one.

Once the revised Constitution and By-Laws are approved by the Board of Directors they will be sent to the voting delegates for their study and approval. Then work must begin on the Standing Rules so that all three documents fit neatly together and can guide the Council in the future.

Another major committee is the Problems Committee. This committee and its subcommittees, known as project committees, are the main reason for the Council's existence. Project committees work on significant color problems for the benefit of the color community at large. The ISCC was formed to allow professionals from different fields to cooperate in solving common concerns involving color. In the past these committees have made major contributions to knowledge about color and continue to be the main function of the Council.

President-Elect Hugh Fairman is the chairman of the Problems Committee and led the recent reorganization of the committees. Committees that were not active were disbanded and the remaining committees chose restricted goals that are expected to be reached within two years. These goals can be part of a larger purpose but they assure that the committees achieve definite objectives within a comparatively short time. Currently there are six project committees: #22, Materials for Instrument Calibration, chaired by Danny Rich; #27, Indices for Metamerism, chaired by Past President Allan Rodrigues; #32, Image Technology, chaired by Paula Alessi; #37, Artist's Materials and Contemporary Art, chaired by Hilton Brown; #44, Regular Rhombohedral Sampling of Uniform Color Spaces, chaired by Chuck Reilly; #45, Psychological Response to Color, chaired by Magenta Yglesias and George Brainard.

Anyone can join these project committees who wants to contribute toward their goals and all ISCC members are welcome to attend as spectators the project committee open sessions that are held during the Annual Meeting. New project committees can be formed whenever there is a group of people who wish to work together on a common project. I want to encourage all ISCC members to bring to Hugh's or my attention any color problem that you believe can be solved through this cooperative approach.

1989 ANNUAL MEETING

The next annual meeting of the ISCC will be held April 9-11 inc.) 1989 at the Ambassador West Hotel in Chicago, Illinois. The meeting will include Interest Groups, workshops, project committee and contributed paper/poster sessions plus a tour of famous Chicago landmarks.

The meeting is being co-sponsored by the Chicago chapter of the American Institute of Architects and the symposium to be held on April 11 on the subject of Color in Architecture. The symposium will feature prominent Architects and Building Product Specialists.

NOTICE

At future ISCC Annual Meetings there will be a bulletin board where notices about job opportunities in the various color fields can be posted and where individuals seeking employment related to color can place their names, addresses and area of expertise.

The Council in no sense recommends either the jobs or the individuals seeking job opportunities. People using the bulletin board must put the information on a 3"x 5" card and post it themselves at the meeting. The ISCC just furnishes the bulletin board for the convenience of its members.

COLOR RESEARCH & APPLICATION Vol. 13, No. 6, December, 1988

IN THIS ISSUE

Metamerism is the scourge of the industrial colorist. Imagine the interior of a car with perhaps four or five different materials, colored with different colorants, and all supposed to match. Metamerism is unavoidable. How will the various colorations appear under the incandescent illumination of the dome light? Is there even an overlap of the mismatch gamuts of the various coloration systems or is it impossible to obtain a reasonable approximation with combinations from two different coloration systems? This is a complex and wide-ranging industrial problem. Roy Berns, Mark Fairchild, and Michael Beering have investigated this matter for four different coloration systems. Their results are described in *The Quantification of Industrial Illuminant Metamerism: Metameric Mismatch Galaxies*.

The classical computer colorant formulation algorithm employs tristimulus matching. This is not always the most efficient method and under special circumstances may not be sufficient. An example is a formulation for military purposes that need not only match the standard in the visible portion of the spectrum but also in the near-infrared region. Another item from the Munsell Color Science Laboratory, Eric Walowitz, Cornelius McCarthy, and Roy Berns, describes in *Spectrophotometric Color Matching Based on Two-constant Kubelka-Munk Theory* a novel algorithm to solve this problem.

In *The Effect of Stimulus Duration on the Luminous Efficiency Function for Brightness* Tohru Tamura, Mitsuo Ikeda, and Keiji Uchikawa show that stimulus duration has a distinctive effect on the shape of the luminous efficiency function as derived by heterochromatic brightness matching. Clearly defined double peaks were obtained with a one second stimulus duration while shorter or longer exposures resulted in less well defined peaks.

In an article in the April 1988 issue (13, pp.106-112) Marcia Finkelstein has shown that the spectral tuning of the opponent channels of the visual system has a spatial dependency. In *Spectral Tuning of Opponent Channels is Temporally Dependent*, the same author shows that the opponent system is also affected by the duration of the exposure to the stimulus.

In 1982 the Project Committee on Indices of Metamerism of the Inter-Society Color Council conducted a survey among industrial colorists concerning their understanding of many aspects of the phenomenon of metamerism. The results of this survey have been analyzed by the committee and the outcome of the analysis is presented by Fred Billmeyer in *Results of ISCC Questionnaire on Metamerism*.

Pairs of colored fields can appear to be in balance or out of balance. This aesthetic question bears on design and art. A rule relating chroma and field size in regard to their balancing effect has been proposed by Albert Munsell in 1905. Robert Morriss and William Dunlap have investigated this problem anew, with additional emphasis on the effect of the background. They report their finding in *Influence of Chroma and Hue on Spatial Balance of Color Pairs*.

In his eighties, Faber Birren continues to elucidate for us the mysteries and histories of color. In *Masters of Harmony* he describes the efforts of three influential personalities at mastering color harmony. *Rolf Kuehni, Editor Color Research & Application*

BERT BASSETT SCHOLARSHIP FUND

Bert Bassett is retiring after fourteen years as executive director of the Graphic Arts Technical Foundation, a tenure distinguished by outstanding service to the graphic arts industry.

In considering how we might honor Bert on the occasion of his retirement, our thoughts turned naturally to his interest in those young people who aspire to careers in the graphic arts and a means of ensuring that they receive the education and training they need to take their places in our businesses. We decided a scholarship in Bert's name—to give the next generation a helping hand—would be a most fitting tribute.

We invite you to join us in establishing the Bert Bassett Scholarship Fund. Each year, awards of \$2,000 will be granted through the National Scholarship Trust Fund to promising students preparing for careers in the graphic arts.

To be a part of this tribute to Bert, send a note saying YES, I want to be part of establishing the Bert Bassett Scholarship Fund. Include your name, address and telephone number and the amount you pledge to contribute over your signature. You will be billed later. Your contribution is, of course, tax deductible. Mail to BERT BASSETT SCHOLARSHIP FUND, P.O. Box 11176, Charlotte, NC 28220.

Bert will be presented with the details of the scholarships in a special ceremony during the fall GATF meeting in Bermuda.

SOCIETY FOR INFORMATION DISPLAY

SID 89, The Society for Information Display International Symposium, Seminar and Exhibition will be held May 15-19, 1989 at the Baltimore Convention Center, Baltimore, Maryland. SID was formed in 1962 as a worldwide, interdisciplinary professional society committed to the advancement of information display.

Areas to be Covered

Original papers, not previously published or presented, covering all aspects of information display will be presented at the three-day Symposium, May 16-18. The areas of interest include, but are not restricted to:

Emissive Flat Panels: Plasma, electroluminescent, vacuum fluorescent and other flat cathodoluminescent displays and materials, light-emitting diodes, backlights.

Nonemissive Flat Panels: Liquid-crystal, including active-matrix-addressed liquid crystal, electrochromic, electrophoretic, magneto-optic, electromechanical and ceramic displays and materials.

CRT Displays: CRTs and monitors for entertainment, computer display and specialized applications; flat and miniature CRTs; electron optics including gun and yoke design; CRT materials; high resolution, storage, beam index, high brightness, and multibeam CRTs.

Hardcopy/printers: Ink jet, thermal, electrographic, electrostatic and impact systems; plotters; optical disk/video disk; videotape; electronic photography; facsimile.

Display systems and applications: High-definition TV, digital TV, teleconferencing, display systems, automated crew stations/workstations, displays in expert systems.

Automotive Displays: Display requirements, voice and command I/O for the driver, light control and day/night readability, head-up displays, environmental requirements, comparison of display technologies for automotive needs, use of TV systems for improved driver visibility.

Display Addressing/packaging: "Active" matrices including thin-film transistors and two-terminal devices; multiplexing techniques, ICs for display drivers and controllers; interconnection techniques; glass and plastic processing; ruggedized display fabrication.

Interactive I/O Technology: Interactive displays; input/output devices including touch panel, keyboard and voice-I/O software.

Human Factors: Display viewability; display standards, measurement and characterization; visual perception; choice of color, font.

Large-area Displays: Projection systems including projection CRTs, light valves, lasers, optics and screens; message boards and mosaic displays; simulator displays.

Workstations: Architecture, engines (and specialized processors), storage and storage management, standards, connectivity, applications such as CIM, CAD/CAM, graphics, image processing, OCR software.

Abstract Deadline

The deadline for receipt of abstract and technical summary is December 2, 1988. (We regret not having received this information in time for inclusion in the last issue of the ISCC News, Editor)

Late-News Papers

A limited number of late-news papers, reflecting important new developments, will be considered if an abstract and technical summary are received by March 1, 1989. Follow the guidelines and include a statement as to why the paper should be considered as a late-news item. The guidelines may be obtained from Lynne Henderson, Palisades Institute for Research services, Inc., 201 Varick St., Rm. 1140, New York, NY 10014 Tel. No. (212) 620-3375.

Supplementary SID 89 Features

Seminar: Tutorials on display technology and applications, presented by experts in the field of information display, will also be held during SID 89—Monday, May 15 and Friday May 19. Featured will be in-depth presentations on diverse aspects of information display, techniques, and systems.

Exhibits: An expanded exhibit area will feature displays of the latest equipment, components, and accessories by industry from U.S. and overseas. This three-day exhibition runs concurrently with the Symposium and is not to be missed.

Evening Panel Discussions: Lively and informal discussions are held on topics of current interest to the display community.

Author Interviews: These sessions, pioneered by SID, which follow the conclusion of daytime presentations, provide a forum for extended discussions between author and audience. Demonstrations of devices and equipment are encouraged.

For Further Information:

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DataBeam Corp.
3256 Lochness Dr.
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(606) 273-3204

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201 Varick St. Rm 1140
New York, NY 10014
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NEWS FROM MEMBER BODIES**Federation of Societies for Coatings Technology**

John C. Ballard and Kurt F. Weitz
Nominated as 1988-89 Officers

John C. Ballard, Vice-President, Research, Kurfees Coatings, Inc., Louisville, Kentucky, has been nominated for the position of President-Elect of the FSCT. Mr. Ballard, currently Treasurer of the Federation, is a member of the Executive Committee and sits on the Board of Directors. He has served the Federation in various positions. Mr. Ballard, Past-President of the Louisville Society (1976-77), is a graduate of the University of Louisville and has been in the coatings industry for 31 years.

Nominated for the position of Treasurer for the Federation is Kurt F. Weitz, Manager - Technical Support, Indusmin, Division of Falconbridge Limited, Toronto, Ontario, Canada. Mr. Weitz has served on the Executive Committee since 1985 and has been the Toronto Society Representative to the Board of Directors since 1981. In addition, he served on the Room Awards Committee for six years and was a member of the Finance Committee. Mr. Weitz, a Past-President of the Toronto Society (1974-75), graduated from the University of Toronto and has served the coatings industry for 31 years.

The current President-Elect, James E. Geiger, founder and President of Sun Coatings, Inc., Largo, Florida; President of Chemex Chemicals & Coatings Co., Inc., Tampa, Florida; and President and Chairman of the Board of Penn Paints, Inc., Sanford, Florida, will assume the Presidency at the close of the 1988 Annual Meeting, October 21, in Chicago, Illinois. Mr. Geiger, who has served on numerous committees and in many positions for the Federation, is Past-President of the Southern Society (1984-85). He graduated from Northern Illinois University and is a member of the University of southern Mississippi Industrial Advisory Committee. Mr. Geiger has been in the coatings industry for 30 years.

The nominating committee also submitted names of the candidates for Executive Committee and Board of Directors positions. Society Representative Members: Thomas E. Hill, Manager - Technical Service Department, Pratt & Lambert, Inc., Buffalo, New York has been nominated for a three-year term. Richard M. Hille, Marketing Manager, General Paint & Chemical Company, Division of Cotter & Company, Cary, Illinois has been nominated to serve a one-year term to fill the unexpired term of Mr. Weitz. Board of Directors: John J. Oates, retired from Troy Chemical Corporation, Newark, New Jersey and Past-President of the Federation (1977-78) and the New York Society (1961-62) is nominated as Past-President Member, a two year term. George R. Pilcher, Corporate Technical Director, Hanna Chemical Coatings Corporation, a subsidiary of Reliance Universal, Inc., Columbus Ohio, is nominated for Members-At-Large position, a two year term. Also, Patricia Shaw, Technical Director, Davlin Paint Company, Berkeley, California, has been nominated for Board Member-at-Large. American Society for Testing and Materials (ASTM). ASTM Committee E-12 on Appearance of Materials held meetings

immediately following the ISCC Annual Meeting in May in Baltimore. The meetings included a general meeting chaired by J. J. Rennilson, and Executive Subcommittee 12.90 meeting and numerous subcommittee meetings. ISCC News Number 314 (July-August issue) included summaries of many of the subcommittee meetings. Subcommittee E12.07 on Color Order Systems met on May 11, 1988 with 27 members and visitors present. Nick Hale, the subcommittee chairman presided. They reviewed the proposed Standard Practice for Specifying Color Using the OSA-UCS System. A number of modifications will be included in the next draft. To develop a precision and bias statement for the visual method, a series of colors will be circulated among selected members along with an experimental procedure. In its role as the United States' Technical Advisory Group (T.A.G.) to the International Standards Organization Technical Committee 187 (ISO/TC187) on Colour Notations, E12.07 has received an advice from the TC187 Secretariate (Sweden) regarding their desire to have a full committee meeting in 1989. It was decided to invite TC187 to meet in Baltimore, beginning December 4, 1989. They noted that there will be an ISCC Williamsburg Conference on Color Discrimination Psychophysics from November 28 to December 1 which should be of interest to many of the delegates to TC187 from other countries.

New Monograph Offered in Federation Series on Coatings Technology

"Organic Pigments" the eleventh monograph in the continuing series on Coatings Technology was announced in October, 1988. The series is prepared in an attractive 8 x 11 inch format, designed to fit in a three-ring binder. Monographs may be ordered by contacting Meryl Cohen, FSCT, 1315 Walnut St., Suite 832, Philadelphia, PA 19107 at a cost of \$5.00 each. The series, when complete, will total approximately 35 booklets and is intended to serve as a valuable teaching and training resource for the industry.

Gemological Institute of America (GIA)

International Gemological Symposium Convened at GemFest Europe '88. Over 200 gemology researchers and representatives of the jewelry industry converged on Vicenza, Italy, on September 11 for GemFest Europe '88. The international gemological symposium was held in conjunction with the Orogemma trade fair. It was sponsored by the Istituto Gemmologico Mediterraneo (the Italian affiliate of the Gemological Institute of America, which administers GIA home study courses in Italian), and the Vicenza Trade Fair Board. GIA and its U.S. and international Alumni Association chapters were actively involved in the event.

Speakers included Dr. Vincent Manson, GIA Director of Education, Chief Gemologist John Koivula, Raffaele Zancanella, President of I.GEM.M., Zhang Guo Liang from the People's Republic of China, Northern Italy chapter President Luigi Costantini, and Alumni Association Assistant Executive Director Gary Roskin.

GIA Announces the 14th Annual Schuetz Jewelry Design Contest. Rules and entry blanks are now available from the GIA for the 1989 George A. Schuetz Memorial Fund Jewelry Design Contest. The contest is open to everyone, with two winners receiving \$500 scholarships for jewelry-related training at the institution of their choice. The two categories are men's jewelry or accessories, and ladies' jewelry featuring colored stones. All designs must be original and not previously exhibited in public or offered for sale. Manufacturability is one of the prime considerations of the judges along with beauty and originality of design, feasibility, and effective use of materials. To receive contest rules and entry blanks, write GIA, Jewelry Manufacturing Arts Department, 1660 Stewart Street, Santa Monica, CA 90404, or call (213) 829-2991, ext. 311. The contest entry deadline is February 28, 1989.

American Association of Textile Chemists and Colorists (AATCC)

Davidson and Hemmendinger to Receive The Millson Award

Two men whose names are synonymous with color measurement have been named co-recipients of The Henry E. Millson Award for Invention. They are Hugh R. Davidson and Henry Hemmendinger, developers 30 years ago of the first successful color matching computer system.

Hugh Davidson was barely out of Lehigh University when he joined the National Defense Research Council to work on antisubmarine warfare systems. In January 1945 he joined an operations research group of the U.S. Navy where he met Henry Hemmendinger, a graduate of Harvard and Princeton, who was working on prosubmarine warfare. Their chance wartime assignment began a relationship that was to continue for the next 25 years. Immediately after the war they both joined General Aniline & Film Corporation where they worked together on general physics problems and where they both became interested in color through I. H. Godlove who was in the same department. At GAF they developed the automatic Tristimulus Integrator which provided for the first time a rapid means of obtaining XYZ values.

The two men left GAF in 1952 to form their own company, Davidson and Hemmendinger, to do color consulting and color measurement. They painted the first Munsell Book of Color based on the "renotation" specifications adopted by the Optical Society of America in 1943. As important as this work was, it was overshadowed by their collaborative development of the first successful color matching computer system. Based on technologies developed for antisubmarine warfare in 1944, their COMIC (Colorant Mixture Computer) was an analog computer. The first COMIC was delivered in 1958. A digital version of it, called COMIC II, was introduced in 1967. Shortly after their introduction of COMIC II, Davidson and Hemmendinger sold their company to Kollmorgen where it was combined with the Macbeth and Instrument Development Laboratories groups.

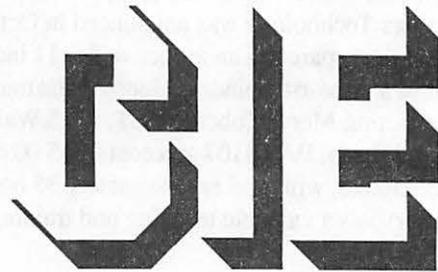
In 1972 Davidson established Davidson Colleagues in collaboration with Thelma Roesch to develop color matching software for use first in mini computers and then in the new generation of personal computers. The company has developed several versions of software for use in textiles, paints, plastics, etc. culminating in the recently published ColorMentoR system. Davidson is a member of the AATCC, the ISCC, the FSCT, and the OSA. Hemmendinger became a consultant on colorimetry and spectrophotometry. "My current work," he notes, "is centered on two problems: on providing instrumental color standards to facilitate the use of color specifications as a language of precise communication, and on a study of the practical limits of precision resulting from the color perception variations among normal observers." He is a Fellow of the OSA, a member of the ISCC, ASTM and a member-for-life of the U.S. National Committee of the CIE. The Millson Award for Invention was established in 1979 to recognize outstanding contributions to textile wet processing technology. The award is named for Henry E. Millson, retired head of dyes research for American Cyanamid Co. who also is a noted inventor and was the 1958 recipient of The Olney Medal for Outstanding achievement in textile chemistry. *Summarized from J. of AATCC Sept. 1988*

NEWS FROM OTHER ORGANIZATIONS

CIE 75th Anniversary

A one-day celebration was held at Ettlingen, near Karlsruhe, Germany, Sept. 7, 1988, in recognition of CIE's 75th Anniversary. Among those invited to attend were Harry K. Hammond, III and his wife Pauline. Why Ettlingen? First, it is close to Karlsruhe, where CIE President Prof. Dr. Hans Bodmann heads the Lichttechnisches Institute at the University of Karlsruhe. Second, Ettlingen is a lovely old village that this year is celebrating its 1200th Anniversary! So, with the help of the University, an organizing committee, the German National Committee of the CIE, and twenty-eight sponsoring industrial organizations of the Federal Republic of Germany, a tremendously interesting and enjoyable day was planned with historical and convivial social programs. There were about 170 persons present for the occasion, consisting of the International Officers and Division Members of the CIE, Officers of many National Committees, and representatives of closely connected national and international organizations dealing with light or lighting, such as the American Society for Testing and Materials (ASTM) and the Illuminating Engineering Society of North America (IESNA). Both of these organizations are ISCC Member Bodies. The morning program began with opening remarks and a brief presidential address by Prof. Dr. Bodmann. He pointed out that the origin of the CIE is linked to the increasing use of coal gas lighting for streets and buildings in the 19th century. The development of the electric lamp and means for generating and transmitting electricity are what were responsible for the rapid simultaneous growth of electrical and illuminating engineering. The original CIE statutes (1913) stated: "The purpose of the Commission is to study all ques-

tions of concern to the lighting industry and to the associated sciences, and to establish by all appropriate means international cooperation on questions of lighting." This is the basis on which the CIE has grown to be the independent international authority for photometry, colorimetry, lighting and signalling. The CIE is now comprised of 38 member countries and more than 100 Technical Committees organized into seven Divisions. Bodmann called on Prof Dr. K. Rochmann who brought greetings as President of the German National Committee of the CIE. Prof. Dr. S. German, Vice-President of the Physikalische Technische Bundesanstalt (the German Bureau of Standards) spoke on behalf of the President of the Comite International des Poids et mesures (CIPM), the CIE's oldest liaison organization and the final authority on base units of the Systeme Internationale (metric system), such as the meter, kilogram, and candela. Bodmann then welcomed the representatives of eight international organizations including Prof. Dr. Heinz Terstiege, President of the Association International de la Colour. Our local host, Herr Oberburgermeister Josef Offele, the head of the town of Ettlingen was also introduced. Bodmann recounted that the *candle* has been the CIE symbol for about 25 years. However, it was felt by some that the CIE logo should embrace a more general design because its present scope is so much broader than photometry. The CIE Vice-President for Publications, Robin Aldworth then introduced Ken Scott who unveiled a large flag with the new CIE logo. The flag was a gift of the British National Committee.



The new logo utilizes an important principle of lighting to depict a three-dimensional form by use of light and shadow. John Kaufman, President of the U.S. National Committee, was then called upon to present a gift, namely a set of table flags for each member country. Prof. Dr. J. B. de Boer, CIE President 1979-1983, was then called upon to give an invited address, *The CIE and Human Society* (see published abstract), after which Bodmann commented that there is probably no one else in the room who has made a greater contribution to the development of CIE over the past 50 years. {Harry Hammond}

AIC Nominates Officers For 1990-93 Term

The International Colour association (AIC) Executive Committee has announced its slate of candidates for AIC officers for the 1990-93 term. They are: Dr. Alan Robertson (Canada) for President, Dr. Lucia Ronchi (Italy) for Vice-President, Dr. Michael Pointer (Great Britain) for Secretary/Treasurer and four

executive committee members, Mr. P. Green-Armytage (Australia), Dr. Antal Nemcsics (Hungary), Mr. L. Oberascher (Austria) and Dr. Allan Rodrigues (USA).

Additional candidates may be nominated if endorsed by at last two other national organizations. Dr. Nemcsics is automatically appointed to the executive committee because the 1993 AIC Quadrennial will be held in Hungary. If there are additional nominations, an election will be held during the AIC Business Meeting in Buenos Aires in March. Many of these candidates are familiar to the ISCC, four are IMGs. Dr. Robertson, currently vice-president of the AIC has served on the ISCC Board of Directors. Dr. Rodrigues is our immediate past-president and AIC Liaison.

National Bureau of Standards Receives a New Name

As a result of the Omnibus Trade and Competitiveness Act, signed into law on August 23, the National Bureau of Standards officially became the National Institute of Standards and Technology (NIST). The new institute retains all the traditional functions and services of NBS and takes on several new assignments designed to boost American Industry in the world marketplace. NIST will work with several new constituencies, including state and local economic development organizations.

Four major new programs are called for by the legislation: the development of regional centers for transfer of manufacturing technology; the creation of a focal point within the federal government to work with and support state and local industrial extension services; the creation of an advanced technology program to support and encourage the rapid commercialization of promising new inventions and technologies; and the creation of a national clearinghouse of information on state and local technology development initiatives. Existing NBS programs will continue under NIST.

Richard W. Harold Honored

Richard Harold, Manager of Educational Services and Advanced Research at Hunterlab, has been named a Fellow and Chartered Colourist of The Society of Dyers and Colourists in Great Britain. Mr. Harold's ongoing dedication to the advancement of color science and technology contributed to his receiving this award.

Mr. Harold holds membership in several other color science organizations: The Detroit Colour Council (DCC), the Inter-Society Color Council, the U.S. National Committee of the CIE, the International Organization of Standardization (ISO), and the Industrial Fabrics Association International (IFAI). His extensive knowledge in the textile industry was instrumental in his election to Chairman of the Color Measurement Committee of the American Association of Textile Chemists and Colorists (AATCC). We want to congratulate Mr. Harold on his dedication to color science and his outstanding achievements.

ROCHESTER INSTITUTE OF TECHNOLOGY (RIT) NAMES CENTER FOR IMAGING SCIENCE FOR CHESTER F. CARLSON

When completed in 1989, the Center for Imaging Science will be the largest academic facility in North America to specialize in the science of how images are formed, recorded and transmitted and will be named for Chester F. Carlson, whose creation of the technology for office copiers revolutionized the business world.

As a young lawyer and physicist living in Queens in the 1930s, Carlson was often frustrated by the costly and time-consuming methods then in existence for copying documents. He theorized that a combination of the phenomena of electrostatics and photoconductivity could be used to produce dry copies of printed materials. On Oct. 22, 1938, he and his assistant produced an image on a zinc plate which he transferred to wax paper, creating the first of what has come to be known as a xerographic copy.

After a long and frustrating attempt to enlist corporate interest—more than 20 companies turned down the idea—his dream was commercialized through The Haloid Company of Rochester, NY. The invention proved so popular that Haloid renamed itself in recognition of its greatest product and is now known as Xerox Corporation.

Until his death in 1968, Carlson also was a lifelong humanitarian and donated substantially to charity while shunning publicity about his donations. He actively supported RIT, visiting the campus several times and joining RIT's Nathaniel Rochester Society. At his death, he left a large bequest to RIT, and his widow, Dorris, continues to support the Institute.

The Chester F. Carlson Center for Imaging Science will be an international resource for the imaging community, containing several laboratories each devoted to a specific area of imaging research, including digital image processing and electronic printing. The facility also contains The Munsell Color Science Laboratory devoted to the study of color science.

CHRONIC HEALTH HAZARDS IN COLORED ART AND CRAFT MATERIALS

The decision on whether or not a product poses a chronic health hazard rests on a series of estimates where information is often incomplete. This has made it particularly difficult for small companies to be certain that they are labeling their products correctly. Chronic health hazards in art and craft materials are of special concern because young children and people in rest homes use these materials. It is also true that the substances found in art and craft supplies are common in other consumer products. ISCC project committee #37, Artists' Materials, composed of artists and art materials manufacturers recognized in 1978 that a way must be found to assure the public that these products were adequately labeled for possible health hazards. Since the ISCC does not write standards, the group established an ASTM subcommittee, D01.57, to write both health and quality labeling standards.

By 1983 the voluntary standard D 4236, Labeling Art Materials for Chronic Health Hazards, was approved, calling for a

toxicological review of all products. The Art & Craft Materials Institute was formed so that companies could band together to hire toxicologists to advise them on labeling, and within two years some 90% of the industry had begun the relabeling process. Meanwhile six states passed laws mandating health labeling and five of these included D 4236. A similar bill including D 4236 passed the U.S. House of Representatives in October.

The Art & Craft Materials Institute employs a primary toxicologist, Woodhall Stopford, M.D., of Duke Medical Center and a board of three other eminent toxicologists to advise him. The Institute's advisory board is composed of Jay M. Arena, M.D., Professor of Pediatrics at Duke University, Tom S. Miya, Ph.D., Dean of the School of Pharmacy at the University of North Carolina and Leonard J. Goldwater, M.D., Professor Emeritus of Occupational Medicine at Duke University. National Artists Equity Association has representatives on the Institute's certifying committee along with representatives of school teachers and administrators. At meetings of this committee the toxicologists detail the reasons for their decisions concerning hazard labeling. Their decisions are difficult and sometimes the requirements change as the results of new studies become available.

There are poisonous substances in very small amounts in almost everything, for instance, arsenic in lettuce and oranges; so it is not enough to analyze a product and find it contains a hazardous substance. Some way must be found to decide what amount of that substance will be harmful if someone were exposed to it over many years. If the health effect is cumulative, as it is with lead and cadmium, it is also necessary to consider other sources of exposure to that substance. Lead accumulates in the body and since automobile engines add lead to the atmosphere, a smaller exposure to lead paints today might cause an illness than would have been harmful in pre-industrial times.

This has meant that the Institute, in addition to relying on information from government agencies, has to consider current test methods and types and amounts of probable exposure. To my knowledge this is the only industry that has approached these difficult issues in a cooperative fashion. The following information comes from those meetings.

Pigments

Manufacturers must submit to Dr. Stopford for review the formulations for all products that were evaluated prior to 1982, and must send him samples of all colors containing cobalt violet. Dr. Stopford has decided to have cobalt violet paints analyzed for solubility. Cobalt like cadmium is definitely toxic, but it has been accepted in the past that in artists' paints these heavy metals are present in an insoluble form. In other words, they cannot be absorbed and thus cannot harm the human body. Another important cobalt pigment, cobalt blue (PB 28), is approved by the FDA for use on food packaging and in surgical sutures, in spite of containing cobalt and aluminum, because the metals are believed to be present in an insoluble form. Dr. Stopford requires warnings about cobalt or cadmium when they

are present in a product in a form that can be absorbed by the human body.

Cobalt Violet has been present in artists' paints in two forms. One form contained arsenic, but it has almost completely disappeared from the market and is not in any paints reviewed by the Institute. The form in common use is cobalt violet phosphate and it is regarded as insoluble, but Dr. Stopford wants to study it more carefully to assure himself that this is true in all cases.

To date solubility has been determined by the British Toys Regulation method or its equivalent; however, a new ASTM D01.57 task group has just been established to work on developing a national consensus test method for determining solubility. If the method proves to be repeatable and reproducible, it will still be necessary to establish the connection between solubility and health hazards through an animal feeding study.

In 1982 Dr. Stopford reviewed artists' cadmium paints and tested the different brands of cadmium pigments for solubility. It was found that: (1) the cadmium pigment manufactured in England was practically insoluble, (2) the cadmium pigment manufactured in this country had a satisfactorily low solubility, but (3) a cadmium manufactured in Japan was very soluble and so presented possible health hazards. Companies within the Institute were forbidden to use this type of cadmium pigment. Finding this range of solubility among versions of the same, supposedly insoluble, pigment when it is manufactured by different companies, made the Institute toxicologists believe it is necessary to examine solubility variation among other pigments containing heavy metals.

The Institute toxicological board has decided to accept the results of a European study on cadmium yellow showing it is a carcinogen, even though the pigment used in the study was not the usual commercial product, because examination showed it had an identical chemical structure. Therefore, cadmium yellow paints must be labeled as a carcinogen. As a precaution all paints containing cadmium pigments must carry the warning statement, "Do not spray apply" since the hazard is from inhalation. Products where users are subjected to dusts also present the hazard. If cadmium paints are heated to extremely high temperatures, the resulting cadmium oxide fumes are definitely hazardous. Cadmium paints are not thought to be absorbed through the skin so they are safe to use in the traditional ways.

Some modern pigments and dyes are manufactured from chemicals that are toxic, but which are converted to harmless forms during the manufacturing process. The question arises whether significant amounts of the toxic chemical might remain in the finished product. Several years ago it was discovered that there were significant amounts of PCB's, which are very hazardous, remaining in certain brands of phthalocyanine pigments. The federal government banned sale of those forms of the pigment in this country, so the phthalocyanine pigments (artists' Thalo Blue and Green) on the market today are safe.

Another example is that benzidine can be found in the benzidine-derived type of direct dyes, and they must be handled with a great deal of care. These particular dark dyes are rapidly

disappearing from the market. There are also dyes based on toluidine and bioavailability studies are needed for these. Most are vat dyes.

It has been questioned whether there may be dangerous free amines in pigments derived from nitroaromatic amines. Pigments of this type include the Arylide Yellows (commonly called Hansa Yellows), some orange (Pigment Orange 36 and Pigment Orange 43) and red (Pigment Red 14, Pigment Red 17 and Pigment Red 194) pigments found in many paint lines. Indications so far are that this is not true, but Dr. Stopford has been pursuing the question and reported a new test for free amines developed by the Dry Color Manufacturing Association (DCMA) which he believes can be used successfully in making these determinations. This test method follows an evaluation of three types of analysis reported by DCMA last year. Companies must test for extractable nitroaromatic amines, as well as metals.

The Arylide yellows (Hansas) are very useful pigments. There are a number of them and they vary in lightfastness. There are seven with lightfastness good enough for use in artists paints and some are to be found in all paint lines. The newer versions of the pigment are especially good for permanence.

Pigment Orange 36, Benzimidazolone Orange HL, is given the highest rating, Lightfastness I, in artists' oil and acrylic paints, and so is Pigment Orange 43, Perinone Orange. When intermixed with white, paints made with these pigments result in higher chroma pale colors than Cadmium Orange does.

Pigment Red 14, Naphthol AS-D, has a Lightfastness II rating in artists' paints and is found in quite a few paint lines. Pigment Red 17, also a Naphthol AS-D, faded excessively in lightfastness tests. It does not meet the requirements of the artists' quality standard D 4302, but was assigned a Lightfastness III rating in acrylic paints. It is not even this good in oil paints, but nevertheless can be found in artists' paints. Pigment Red 194, Perinone Red Deep, is a valuable new pigment with a Lightfastness I rating in both oils and acrylics.

Dr. Stopford required that Pigment Red 53, known as Red Lake C, be removed from products or the products must carry warning labels and safe handling instructions by January 1, 1988. Disappearance of this pigment from art materials will not be a loss to the professional artist because Red Lake C fades in a short time. Unfortunately it was found in several manufacturers' paint lines in 1979 during the pigment identification tests sponsored by the Inter-Society Color Council and National Artists Equity.

Pigment Orange 5, known as Dinitraniline Orange, must be removed from products or they must carry the warning statement and safe handling instructions. This pigment has been a valuable addition to artists' paints. It has a Lightfastness II rating.

Questions have now been raised about all the lightfast oranges and many reds. Test methods are now being developed that should show whether or not any, in addition to Pigment Orange 5, actually pose a hazard. Indications at this time are that they do not; however, until the test results are in it is

impossible to know whether all are safe, or whether one is safer than another to use. It will be too bad if recent negative publicity in the general press drives the cadmium pigments from the market and then it turns out that the other oranges and reds present equal or more hazards.

Markers and Spray Products

Regarding possible hazards in using markers: A risk assessment has been completed on xylene and up to 40 ppm is considered a safe level of exposure for pregnant women. Xylene can present a hazard to a developing fetus. An Institute study will be done to assess whether or not markers containing xylene can release that much xylene in the air. A health survey of six ad companies using 300 markers a month showed that something was affecting the artists' health; but the artists were exposed to other substances that would cause the same symptoms, and, when tested, the air in the studios did not contain elevated amounts of xylene. Further study showed that spray adhesives were the hazard because the test results showed a correlation between the amount and manner of use of spray adhesives and the health effects.

While this study did not show a hazard from xylene in markers, there is a machine on the market that blows the color out of markers. These machines definitely must carry hazard labels because the amount of xylene released in the air is greatly increased.

Rhodamine B, a coloring agent used in fluorescent and high chroma markers, is an experimental cancer agent at high levels but the risk in markers is minimal since markers contain such a small amount and since Rhodamine B has to be ingested or absorbed to present a hazard; nevertheless, Dr. Stopford is requiring that the Rhodamine B must be listed on the label. He is also developing a method of determining what the exposure is in a working situation. The questions to be answered include: how much Rhodamine B is there per inch of marker line and, assuming that all the Rhodamine B is absorbed, what is someone's exposure over time using a quantity of the markers?

Manufacturers were told that methylene chloride, which is sometimes used in spray products, paint strippers and some markers, must be removed from all children's products; and any adult products that contain a significant amount must carry warning labels. There are still questions about whether it poses a significant hazard; but the toxicologists had decided last year that there were sufficient suspicions to warrant warnings about possible hazards and to get it out of children's products. All companies were required to send the Institute office an affidavit that this has been done and, in the case of those adult materials where there is not a satisfactory substitute, the company must send the Institute office copies of the warning labels.

The main hazard comes from sprays and paint removers that release a great deal more methylene chloride into the air than markers do. Without sufficient ventilation these can cause heart irregularities in people with angina. At very high levels of exposure they can result in nervous system damage and even death. Federal regulations require warnings about adequate

ventilation; but now a government test indicates that methylene chloride may cause cancer, which calls for a different type of warning and indicates that lower exposure may present a danger.

Ironically, one factor that has delayed the substitution of other solvents for methylene chloride in spray products has been that the substitutes are lighter in weight, so the same size spray can weighs less. Companies were afraid that customers would purchase by weight, believing they were getting more for their money.

Ceramics

The first set of tests on emissions from ceramic kilns was performed at the University of North Carolina on bisque (greenware) and glaze firings in both small and large electric kilns using three levels of ventilation. The study recommended that low sulfur clays should be used and all kilns should be ventilated. The amount of carbon monoxide and formaldehyde given off was greater when firing bisque than when firing these glazes; but an exhaust fan, or preferably a hood fan, took care of the problem. In this set of tests the glazes, Duncan E-Z Flow Light Eggnog Ceramic Glaze and Amaco Chrome Green Majolica Gloss Glaze, did not give off detectable metal fumes.

A second set of tests on the emissions from ceramic kilns is planned. This time tests will be conducted on high solubility lead glazes. Tests on decal and luster firings will be delayed until the lead tests are completed.

Lead is considered carcinogenic in all forms. Fifty percent of all glazes contain lead. The Institute's position is that long years of making ceramics, either as a hobby or as a professional potter, is similar to industrial exposure. Dr. Stopford believes that education about proper precautions is effective because background levels of lead in the blood, even with long term high exposure, are not high when people are instructed about ventilation and cleanliness.

The light microscope has been used to examine samples of talc for asbestos and asbestos-like particles. Smaller particles than can be seen with these microscopes have now been shown to cause cancer. The electron microscope can detect these, so a new method of examination using the electron microscope will be developed by the toxicologists.

Masks and Respirators

Dr. Stopford recommended that companies not market cartridge respirators because fit to the user's face is so important. Getting a correct fit is especially difficult for women and almost impossible for men with beards. Companies might be sued if someone purchased a respirator that did not fit properly and later became ill. He did recommend some inexpensive dust masks from 3M that have good fit, but repeated last year's warning that wearing a dust mask could be very dangerous to someone who is using organic solvents. Accumulated dust in the mask can absorb the solvent vapor and concentrate it near the wearer's nose. People must be certain to use the proper mask for the job they are doing.

CALLS FOR PAPERS

Royal Photographic Society Symposium on the Quantification of Images to be held at the University of Cambridge September 18-22, 1989. It is hoped that this theme will embrace the full spectrum of topics from the relatively simple measures of the granularity and modulation transfer function of photographic images, to the more complex assessment and processing of pictorial images. It is expected that 'images' should be interpreted in its broadest sense to include both photographic and electronic, both analogue and digital, both colour and monochrome. A title and short abstract (200 word) should be submitted as soon as possible. If accepted, authors will be asked to produce a short paper for the Conference Proceedings which will be published as a special issue of the Journal of Photographic Science. Abstract deadline is December 31, 1988. Abstracts or enquiries should be sent to: Dr. M. R. Pointer, Kodak Limited - Research Division, Headstone Drive, Harrow, Middlesex HA1 4TY, England.

1989 ISCC Annual Meeting The poster paper session at last year's annual meeting was such a success that we have decided to repeat it and expand upon the concept at the 1989 meeting in Chicago. The expansion involves a contributed papers session where you, the ISCC general membership, are encouraged to submit contributed papers for either oral or poster presentation. The intent of this contributed papers sessions is to provide a forum for us to share state-of-the-art color information. Whether you are an artist, scientist, industrialist, educator, student or researcher, we want to hear what is new in your area of color. We are asking for both oral and poster presentations to promote verbal as well as written color communication, whichever may be more appropriate for your subject matter. The topics for this contributed papers session are completely open.

Don't miss this opportunity to present the innovative color work that you may be doing on a daily basis. Please send your entries, in the form of a title and abstract, to: Paula J. Alessi, 10 Bay Park, Webster, NY 14580. Please feel free to call Paula at (716) 477-7673 with any questions that you may have.

ISCC Williamsburg Conference "Color Discrimination Psychophysics" to be held on November 28 - December 1, 1989 at Colonial Williamsburg, Virginia. Abstract deadline is February 28, 1989. For information contact Dr. Roy Berns, Rochester Institute of Technology, P. O. Box 9887, Rochester, New York 14623-0887 or (716) 475-2784.

Symposium on Daylight and Solar Radiation Measurement A symposium covering spectral and broadband measuring methods, instrumentation, calibration and standards, data acquisition, solar radiation and daylighting simulation will be held at Technische Universität Berlin (West), Germany. The working language of the symposium will be English. Deadline for abstracts is February 15, 1989. Information: Herr Prof. Dr. H. Kasse, Institut für Lichttechnik der Technischen Universität Berlin, Einsteinufer 19, D-1000, Berlin 10 GERMANY. Tel.: (030) 314 224 01.

MORPHOGENESIS OF A PROJECT COMMITTEE

We have been asked: How are project committees established?

First: a problem is recognized by one or more individuals. This is very likely to occur during, or as a result of, a meeting of an Interest Group. Next: A small group (from 1 to 5 people usually) try to identify specific projects that will contribute to the solution of that problem. When a project has been identified for which a scope can be defined and objectives, achievable within a period of 1 or 2 years, can be clearly stated, this scope and objectives can be submitted to the board of directors for approval. At the same time, a recommendation for a chairperson and active committee members should be submitted. It is the consensus of the board that it is unlikely that any one individual will be able to effectively chair more than one project committee at a time.

BUENOS AIRES AIC MEETING

Enclosed with this issue of ISCC News is a brochure from Garber Travel on arrangements they offer for the AIC, March 13-17, 1989 meeting in Buenos Aires. Garber comes highly recommended to us and is affiliated with the agency making all AIC Congress arrangements in Buenos Aires. We find their rates competitive and they promise lowest cost connection to New York or Miami from anywhere in the U.S. or Canada. They offer the convenience of "one-stop shopping", including hotel reservations and handling of meeting registrations. They also are arranging attractive optional pre- and post-congress tours to Brazil and Peru.

If you plan to attend the AIC Meeting, note that you can save \$50 on registration fees if you register before December 31, 1988. Phone Garber on (800) 225-4570 and they can register you. For additional information on the meeting, including the meeting circular and registration forms, phone Garber directly or you can contact me (313) 483-8245. *Allan B. J. Rodrigues, Past-President & AIC Liaison*

CALENDAR

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

Harry K. Hammond, III
Pacific Scientific Instrument Division
2431 Linden Lane
Silver Spring, MD 20901
(301) 495-7046

1988

AATCC NATIONAL COMMITTEE MEETING, Nov. 15-17
The Doral Inn, New York, New York, Information: Jerry Tew, (919) 549-8141.

1989

ASTM COMMITTEE E12 ON APPEARANCE, Jan. 15-17
Embassy Suites Hotel, 1100 SE 17th St. Ft. Lauderdale South, Florida 33316. Information: Sharon Kauffman, (215) 299-5599.

ASTM COMMITTEE D01 ON PAINT, Jan. 15-18
Embassy Suites Hotel, Ft. Lauderdale South, Florida.
Information: David Bradley, (215) 299-5504

AATCC NAT'L COMMITTEE MEETINGS, Feb. 14-16
Hilton at University Place, Charlotte, North Carolina.
Information: Jerry Tew, (919) 549-8141.

AIC COLOR 89, Mar. 13-17
Centro Cultural, General San Martin Sarmiento 1551, Buenos Aires, Argentina. Information: Grupo Argentino del Color, Division Optica, INTI, c.c. 157,1650 San Martin (BA), Argentina or Allan Rodrigues, (313) 583-8245.

ISCC ANNUAL MEETING, Apr. 9-11
Chicago, Illinois

AATCC NAT'L COMMITTEE MEETINGS, May 9-11
AATCC Technical Center, Research Triangle Park, North Carolina. Information: Jerry Tew, (919) 549-8141.

ASTM COMMITTEE E12 ON APPEARANCE, May 15-16
National Institute of Standards and Technology,
Gaithersburg, Maryland. Information: Sharon Kauffman
(215) 299-5599.

SID International Symposium, May 15-19
Society for Information Display Symposium, Seminar, and
Exhibition, Baltimore Convention Center, Baltimore,
Maryland. Information: Jay Morreale, (212) 620-3371.

FSCT - Federation Spring Week, May 16-19
Seminar on 16th & 17th, Society Officers' meeting on
18th, and Board of Directors' meeting on 19th.
Airport Marriot Hotel, Los Angeles, California.
Information: (215) 545-1506.

CORM ANNUAL MEETING, May 17-19
National Institute of Standards and Technology,
Gaithersburg, Maryland, Information: Norbert Johnson,
(612) 733-5939.

WORK WITH DISPLAY UNITS, Sept. 11-14
Second International Scientific Conference, Queen Elizabeth
Hotel, Montreal, Canada. Information: Diane Berthelette
(514) 288-1551.

ROYAL PHOTOGRAPHIC SOCIETY, Sept. 18-22
Symposium on the Quantification of Images, Clare
College, University of Cambridge. Information: Dr. M. R.
Pointer, Kodak Ltd, Harrow Middlesex, HA1 4TY England, Tel. 01
427 4380.

CIE INTERIM MEETING, Oct. 2-3
Information: Dr. J. D. Schanda, Central Bureau, A-1030
Vienna, Kegelgasse 27 Austria, or Dr. Jack Hsia (301) 975-2342.

**SYMPOSIUM ON DAYLIGHT AND SOLAR RADIATION
MEASUREMENT, OCT. 9-11**
Technische Universitat Berlin (West), Germany. Information:
Herrn Prof. Dr. H.Kaase, Institut fur Lichttechnik der
Technischen Universitat Berlin, Einsteinufer 19, D-1000
Berlin 10 GERMANY. (030) 314 224 01.

OPTICS 89, Oct. 15-20
Optical Society of America Annual Meeting, Orlando, Florida.
Information: OSA, 1816 Jefferson Place, N.W., Washington,
D.C. 20036, (202) 223-0920.

FSCT, Nov. 8-10

Federation of Societies for Coating Technology 67th Annual Meeting and 54th Paint Industries' Show, The Rivergate, New Orleans, Louisiana. Information: (215) 545-1506.

AATCC NAT'L COMMITTEE MEETING, Nov. 14-16

The Doral Inn, New York, New York, Information: Jerry Tew, (919) 549-8141.

ISCC WILLIAMSBURG CONFERENCE, Nov. 28-Dec. 1

"Color Discrimination Psychophysics", Colonial Williamsburg, Virginia. Information: Dr. Roy Berns, (716) 475-2784.

NEWSLETTER EDITOR: Mrs. Bonnie K. Swenholt

Send material for publication to the editor at:
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If possible, 5 1/4 inch diskette for MSDOS (ASCII text file) would be appreciated, or send via MODEM: Tel. (716) 229-5925

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American Society for Photogrammetry and Remote Sensing (ASPRS)
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Color Marketing Group (CMG)
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Federation of Societies for Coatings Technology (FSCT)

Gemological Institute of America (GIA)
Graphic Arts Technical Foundation (GATF)
Illuminating Engineering Society (IES)
National Artists Equity Association (NAEA)
National Association of Printing Ink Manufacturers (NAPIM)
National Paint and Coatings Association, Inc. (NPCA)
Optical Society of America (OSA)
Society for Information Display (SID)
Society of Motion Picture and Television Engineers (SMPTE)
Society for Imaging Science and Technology (SIST)
Technical Association of the Graphic Arts (TAGA)
Technical Association of the Pulp and Paper Industry (TAPPI)

SUSTAINING MEMBERS

Pantone Institute

The Gemological Institute of America

At the Gemological Institute of America (GIA) the new department of technical development will assist in basic and applied research. Bill Boyajian, President of the GIA said that the new department's work will include but not be limited to projects in education, our laboratories, gem instruments, gem testing, and new product development. The department will be headed by Robert C. Kammerling, General Manager, and John I. Koivula, GIA's Chief Gemologist.

The Summer 1988 issue of GIA's journal, *Gems & Gemology*, features the final section of a three part series on the causes of color in gem materials, and includes a comprehensive table on the origin of color in gems.

Information on the journal may be obtained by calling (800) 421-7250 ext. 201 or (213) 829-2991, ext. 201.

American Society for Testing and Materials

The ASTM Subcommittee D01.57 on Artists' Materials

The ASTM Subcommittee D01.57 on Artists' Materials met June 4-5, 1988 at the Marriott Marquis Hotel, New York City.

In *Task Group .01 - Drawdowns of Artists' Paints*, Joy Luke and Treva Pamer presented a memorial tribute to Henry Levison, who died recently, for the foundation he laid for the proposed drawdown standard and other crucial work that he had done for the group. The latest draft of the proposed drawdown standard was circulated and discussed. The task group recommended that the standard be sent out for subcommittee ballot.

Both *Task Group .02 - Lightfastness of Pigments* and *Task Group .04 - Specification for Artists' Paints*, reported that D4302 has passed the Society level of balloting and will be included in the next version of Volume 6.01. A small group will investigate subdivision of types of artists' paints into separate standards and have ASTM D4303 revised to be the common lightfastness exposure standard for all artists' paints.

Task Group .03 - Tinting Strength of Chromatic Paints, studied a research report which will be filed at ASTM headquarters in support of D4838, Test Method for Determining the Relative Tinting Strength of Chromatic Paints.

In *Task Group .08 - Labeling for Toxicity*, Chairman Dr. Stopford presented the set of warning and precautionary statements approved by Committee C21.08 as a revision to D4236. Other discussion of D4236 followed including the note that Connecticut has passed a chronic health law regulating purchase of school supplies that includes D4236.

The 20 individuals present at *Task Group .10 - Consumer Evaluation* participated in a study to establish what degree of fading in ISO Blue Wool Standard #3 and #6 will be judged by observers to be equivalent to the contrast illustrated by one of the steps of the AATCC Gray Scale for Evaluating Color Change.

In *Task Group .11 - Gouache*, Chairman Takigawa distributed a summary of his studies on the definition for gouache, discussions on which types of gouache should be covered in the standard and problems in measuring exposure in the different types of interior exposure that will be used to evaluate pigments for lightfastness in gouache paints. The group agreed that the definition of gouache paint be revised to:

gouache - a pigment dispersion in a water soluble gum/resin vehicle that dries water resolvable and is intended primarily for opaque applications

Much discussion followed.

Task Group .12 - Determination of Chronic Toxicity reported no negative votes or comments on the most recent revision of D4236 to include labeling children's as well as adult art supplies for chronic toxicity. The revision has been approved for printing and should be available before long as a single standard, designated D4236-88, and will appear in the next edition of ASTM Volume 6.01. The remaining discussion was on a method for simulated gastric solubility of heavy metals. It was decided that a round robin should begin with a material that would not have to be ground in order to eliminate that variable. Paint was suggested. It is hoped that the report on the round robin could be completed by the task group meeting in January.

Detroit Color Council

The Detroit Colour Council (DCC) has arranged a fall, 1988 two-credit course in *Colour Technology* at Eastern Michigan University in Ypsilanti, MI, near Detroit. This course has a somewhat less technical flavor than *Color Science*, an EMU course taught by Dr. David Alman of DuPont.

Color Technology blends color measurement and visual aspects of color technology, including the link with design, to present a basic approach to organization, formulation and process control. Included is a hands-on opportunity to mix pigment preparations in the EMU laboratory facilities which include automotive specification Macbeth lighting and recent model color measuring equipment. SAE J-1545 is emphasized.

Instruction is divided among three members of the DCC board: Joseph Koreck of Morton Thiokol, Mark Taylor of Hunter Associates and William Longley of Ford Motor. The DCC also provides equipment and supplies.

Graphic Arts Technical Foundation (GATF)

On September 24, 1988 and March 1, 1989 two new Community Right-to-Know reporting deadlines go into effect for certain segments of the printing industry, according to the Environmental Conservation Board (ECB) of the Graphic Communications Industries, headquartered at the Graphic Arts Technical Foundation (GATF).

The deadlines are for in-plant and quick printers as well as schools with graphic arts design departments and independent graphic design, bindery, and typesetting firms.

All must comply with reporting requirements of Sections 311 and 312 of the Emergency Planning and Community Right-to-Know Act (EPCRA), enforced by the Environmental Protection Agency (EPA).

The ECB has a compliance handbook available to help printers understand the confusing reporting requirements of EPCRA. The manual, *Title III, Emergency Planning and Community Right-to-Know Act (EPCRA), What You Must Know and Do for Your Community...It's the Law!*, costs \$50.00 for GATF members and \$100.00 for nonmembers.

More information and assistance are also available from Fred Rosenbloom, environmental manager, or Gary A. Jones, environmental editor, for the ECB at GATF, 4615 Forbes Avenue, Pittsburgh, PA 15213; telephone (412) 621-6941.

NEWS FROM OTHER ORGANIZATIONS

United States National Committee of the CIE

* 1991 International Daylight Measurement Year

The CIE has designated the year 1991 as the "International Daylight Measurement Year" (IDMY). Measuring stations throughout the world will participate in a coordinated program of recording daylight availability.

Stations will be in two categories: the General Class in which illuminances and irradiances will be the principal quantities measured and Research Class in which the stations will make illuminances, irradiances and other metrological quantities. One or two establishments will act as coordinating centers for the IDMY.

Dr. P. R. Tregenza, U. of Nottingham, U.K.

* CIE Publications

The USNC maintains a stock of recent CIE publications. Publication sales are handled by USNC member Bob McCully and orders may be sent to:

Mr. Robert McCully
North American Philips Lighting Corp.
Philips Square, CN 6800
Somerset, New Jersey 08873-6800

Payment with your publication order is preferred but purchase orders are accepted.

Make checks payable to: "U.S. National Committee/CIE".

Current items on color include:

CIE Publication No. 15.2 (1986). Colorimetry.
Technical Committee report from TC-1.3 with 77 pages and 11 tables. Price \$22.00
CIE Standard S 001, 1st. Edition (1986).
Colorimetric Illuminants. 19 pages and 1 table. Price \$11.00
CIE Standard S 002, 1st Edition (1986). Colorimetric Observers. 39 pages and 2 tables. Price \$18.00

Soon to be available is the CIE Publication No. 72

(1987) Guide to the Properties and Uses of Retroreflectors at Night.
Proceedings (Papers and Division Reports) of the Venice meeting.

* Items of interest taken from the USNC-CIE Newsletter, May 1988

THE COUNCIL FOR OPTICAL RADIATION MEASUREMENTS

The Council for Optical Radiation Measurements (CORM) held its conference and annual meeting at the National Bureau of Standards (NBS), Gaithersburg, Maryland on May 18-19, 1988. CORM Secretary Norbert Johnson, reported that 327 persons attended, including 17 internationals and 55 NBS staff members. At least four NBS alumni are active in CORM and attended the conference. CORM was organized in 1972 to bring to the attention of NBS "pressing problems and projected national needs in radiometry and photometry."

At this conference eighteen contributed papers were presented in three sessions designated as follows:

- 1) Radiometry at NBS
- 2) Ultraviolet Radiation Measurements,
- 3) Infrared Radiometry.

There was also an invited paper on "Charge-Coupled Devices in Astronomy."

The Franc Grum Memorial Lecture, entitled "Artificial Daylight for the Measurement of Optical Properties of Materials," was given by Professor Doctor Heinz Terstiege, Federal Institute for Materials Science and Testing, Berlin, Federal Republic of Germany.

Franc Grum, one of the founders of CORM (also a former President of ISCC) and a major contributor to its active growth, was killed December 20, 1985, at the age of 63, when the car he was driving was hit head-on by a drunken driver 30 miles from his home.

The next CORM meeting will be May 17-19, 1989, at NBS, Gaithersburg. Future meetings are planned for Spring 1990 at Rochester Institute of Technology and Spring 1991 at NBS, Gaithersburg. *Harry K. Hammond III*

INTERNATIONAL ASSOCIATION OF COLOUR-CONSULTANTS

In 1957, with the participation of individuals from twelve countries sharing a mutual interest in the field of color, the International Association of Colour Consultants (IACC) was founded in Hilversum (Holland). The motivating force was an acute shortage of professional consultants, and an absence of possibilities for competent training in the field.

I am happy to announce that the IACC is now represented in this country; making the United States the thirteenth nation to be part of this growing international community of color professionals. The aim of the American branch of the IACC is to present the importance of the interdisciplinary approach to color to the American design community, and to all organizations and associations concerned with color and environment. Our ultimate goal is to provide an educational program similar to the one conducted in Salzburg, Austria since 1958—thereby setting internationally recognized standards for the profession of color consultant in the United States.

The following paragraphs serve as an introduction to the IACC. More detailed information is available from the IACC office in San Diego (Tel: (619) 295-5452. I would like to emphasize that the IACC offers its close cooperation to all organizations, associations, and professional groups in the United States sharing the mutual interest of color and environment. *Frank H. Mahnke, IACC President*

Professional Standards and Responsibilities Expected of the Color Consultant

Color, or the concept of color, can be approached from different perspectives and disciplines, such as the natural sciences, color theory, technology, philosophy, biology, medicine, psychology and art. In the color experience all these perspectives and disciplines are interrelated, and from the standpoint of designing the man-made environment they are all involved to some extent.

Color and light are major factors in artificial environments. Today, thanks to sophisticated techniques of research and analysis, we know that color affects cortical activation (brain waves), functions of the autonomic nervous system, and hormonal activity, and that color arouses definite emotional and aesthetic associations. In short, our response to color is total; it influences us both psychologically and physiologically.

Requirements to perform the highly skilled job of color consulting demand the appropriate training in all areas of color; from the psycho-physiologic effects to the intricate technical considerations. For thirty years the IACC has set guidelines, criteria and accreditation for the profession of color consultant. The Association is comprised only of members that hold the IACC Color Consultant diploma. This degree is obtained through the IACC's educational program (Salzburg Seminars), and is the only one of its kind in the world.

The Salzburg Seminars for Color and Environment

The Salzburg Seminars are recognized for a comprehensive interdisciplinary approach to all areas connected with color: physics, psychology, color psychology, physiology, biology, visual ergonomics, light technology, color systems, art and so forth. Interdisciplinary training such as this is the most important prerequisite for a competent command of the laws of color. Therefore, the aim of the seminars is not to train "specialists" who master only a limited professional area, but rather to shape professionals with comprehensive capabilities in all the areas of knowledge needed to create beneficial environments.

The courses are under the direction of the renowned color authority Dr. Heinrich Frieling, who, along with six other leading experts, teaches the core curriculum. Docents, each in his field an established authority, from Sweden, Britain, West Germany, France, Belgium, the Netherlands, Switzerland and other parts of the world also lecture on established knowledge of fields related to color and environment.

The total course consists of six seminars conducted in the spring and fall over a period of three years. Students gain practical experience from assigned exercises carried out during the months the seminars are not in session. Completion of the total course, which includes a final examination before an international examining board, earns the student the title of "Color Consultant IACC with diploma".

Similar courses, for English speaking students, are being planned by the American branch of the IACC. Individuals interested in a U.S. degree program should write to the San Diego office and have their names placed on the mailing list. As soon as the seminars have evolved from the planning stage to reality notification will be made.

Persons interested in the Salzburg Seminars (conducted in the German language) may obtain information by writing to: Louise Senn, Chairwoman Salzburger Seminare - Vice-President IACC for Switzerland, Bergstrasse 117, Ch 8707 Uetikon a/See, Switzerland.

FRANC GRUM MEMORIAL SCHOLARSHIP TO BE INAUGURATED

On the evening of November 2, 1988, the Franc Grum Memorial Scholarship will be inaugurated in the Munsell Color Science Laboratory at Rochester Institute of Technology.

Dr. Franc Grum devoted his professional life to the advancement of color science through a commitment to excellence in physical measurement. He was tragically killed in an automobile accident December 20, 1985. Dr. Grum spent 32 years with the Eastman Kodak Company where he rose to the position of senior research laboratory director. He developed world-wide corporate metrology standards and was active nationally and internationally in standards activities. Dr. Grum was president of the Inter-Society Color Council and in 1985 received the prestigious Godlove award from that organization. He co-founded the Council for Optical Radiation Measurements and served on its Board of Directors. He was very active in the International Commission on Illumination (CIE) and served on numerous technical committees and as Director of Division 2 and president of the U.S. National Committee. IN 1982 Dr. Grum became the first Richard S. Hunter Professor in color science, appearance, and technology at Rochester Institute of Technology. As the Hunter Professor, he established the Munsell Color Science Laboratory as one of the foremost academic laboratories devoted to color science. He was keenly aware that the students of today may become the scientific leaders of tomorrow. Professor Grum was tragically killed at a time when the Laboratory was quickly gaining an international reputation for excellence in color science education and research.

In order to perpetuate the memory of Professor Grum as one of the leading color scientists of his time, a memorial scholarship has been established and endowed by contributions from his family, friends, colleagues, technical societies and corporations.

In celebration, the Scholarship will be inaugurated on the evening of November 2, 1988 in the Munsell Color Science Laboratory at Rochester Institute of Technology followed by a buffet reception. To receive an invitation, please contact Ms. Barbara Capierso, Munsell Color Science Laboratory, Rochester Institute of Technology, P.O. Box 9887, Rochester, NY 14623-0887, phone: (716) 475-5842.

APPRENTICESHIP PROGRAM IN THE ART OF DECORATIVE PAINTING

For the first time in the United States, an apprenticeship program which has prepared generations of European craftsmen in the art of decorative painting, is available starting in September, 1988, at the Ashville-Buncombe Technical Community College.

Beginning Date: September 12, 1988

Schedule: MTWTF 8:30 am - 3:30 pm

1st year: 44 weeks Lecture and Laboratory

City and Guilds of London Craft Certificate

2nd year: Apprenticeship: on-the-job supervised training

3rd year: 44 weeks Lecture and Laboratory

City and Guilds of London Advanced Craft Certificate

Location: Auditorium on A-B Tech campus

Instructor: Roger Tidbury, currently Lecturer of Painting and Decorating, Portsmouth College, England

Minimum Admission Requirements:

- 18 yrs. of age minimum
- High School graduate or GED
- Must pass entrance examination (primarily reading comprehension, basic mathematics, etc.)
- No color blindness
- No acrophobia
- Strong commitment to painting and decorating career
- Must be willing to travel extensively and to temporarily relocate.
- Personal interview by selection committee

Final selection and acceptance into the program will be the decision of the instructor based on recommendation of the committee

To Apply: Send letter or resume indicating your interest and verification of meeting the minimum requirements to:

- Lowell Smith, Dean of Continuing Education
- Asheville-Buncombe Technical Community College
- 340 Victoria Road
- Asheville, NC 28801
- Telephone: (704)254-1921

CALLS FOR PAPERS***Colour Group & UV Spectrometry Group***

Reflectance Measurement: Basic Concepts, Developments and Uses to be held at the National Physical Laboratory April 5, 1989. This meeting will discuss some of the problems and some of the techniques in use today in measurements in the UV and the IR (200 nm to 3000 nm). Any one who has ideas for papers for this meeting please contact: Dr. Julie Taylor or Dr. George Freeman at the NPL (01-943 6539 or 01-943 6821, Telex 262344, Fax 01-943 2155) or Dr. David Saunders at the National Gallery (01-893 3321) before November 14, 1988.

Royal Photographic Society

Symposium on the Quantification of Images to be held at the University of Cambridge September 18-22, 1989. It is hoped that this theme will embrace the full spectrum of topics from the relatively simple measures of the granularity and modulation transfer function of photographic images, to the more complex assessment and processing of pictorial images. It is expected that 'images' should be interpreted in its broadest sense to include both photographic and electronic, both analogue and digital, both colour and monochrome. A title and short abstract (200 word) should be submitted as soon as possible. If accepted, authors will be asked to produce a short paper for the Conference Proceedings which will be published as a special issue of the Journal of Photographic Science. Abstract deadline is December 31, 1988.

Suggested topics include:

- Electronic-photographic interface
- Comparison of imaging techniques
- Digital image processing
- Advances in measurement Techniques
- Assessment of customer requirements
- Modeling of imaging systems
- Objective and subjective image assessment
- Graphic arts

Abstracts or enquiries should be sent to: Dr. M. R. Pointer, Kodak Limited - Research Division, Headstone Drive, Harrow, Middlesex HA1 4TY, England.

ISCC Williamsburg Conference

"Color Discrimination Psychophysics" to be held on November 28 - December 1, 1989 at Colonial Williamsburg, Virginia. Abstract deadline is February 28, 1989. For information contact Dr. Roy Berns, Rochester Institute of Technology, P. O. Box 9887, Rochester, New York 14623-0887 or Telephone (716) 475-2784.

COLOR RESEARCH & APPLICATION 13/5 SEPT/OCT. 1988 IN THIS ISSUE

It is a generally assumed belief that there is a relationship between color matching functions and absorption functions of the human visual pigments. However, differences are obtained when suitably transformed color matching functions are compared to these visual pigment absorption data measured directly at the retinal level. The assumption is that the differences between the two sets of curves are due to macular pigmentation of the retina and the transmittance of the eye fluids. Leo Lipetz has investigated the relationship carefully and come to the conclusion that one set of data is in fact derivable from the other with good accuracy making certain assumptions about macular pigmentation and the transmittance of eye fluids.

It is well known that each of us is somewhat different from others in color vision ability. On particular aspect of these differences are individual variations obtained in color matching experiments that can be represented by individual color matching functions. This has led to the proposal in the past of a "standard deviate observer: as a companion to the standard observer, e.g., in the calculation of indices of metamerism. Yoshinobu Nayatani and his co-workers have investigated mathematically the variation in the color matching functions of 20 different observers reported by Stiles and have concluded in *Physiological Causes of Individual Variation in Color Matching Functions* that the variability in these data can be accounted for by variation in eye fluid and macular densities.

Nayatani and his co-workers have in recent years made proposals for the calculation of color appearance under different conditions from colorimetric data. These formulas are being considered for general recommendation by the relevant CIE committee. Before recommendations can be approved it is necessary that field trials are performed to determine the validity of the formulas under appropriate conditions. In *Field Trials on Color Appearance and Brightness of Chromatic Object Colors under Different Adapting-Illuminance Levels and Field Trials on Color Appearance of Chromatic Colors under Various Light Sources* these same authors show that substantial progress has been made in the prediction from measured data of the appearance of colored materials under a wide variety of illumination conditions.

The measurement of fluorescent samples is a technical problem. The results depend on many factors that must be closely controlled. This problem has been under investigation by CIE Technical Committee 2-08, chaired by Fred Billmeyer. The work of the committee has led to a to be published CIE Technical Report. In *Intercomparison on Measurement of (Total) Spectral Radiance Factor of Luminescent Specimens* Billmeyer presents a shortened version covering the main aspects of the investigation and recommendations.

The proliferation of CRT's (cathode ray tubes) for information display in our daily lives and a wide variety of ambient light conditions under which they are viewed raise the question of optimum colors for detectability under widely changing illumination conditions. In *Ergonomically Optimal CRT Colours for Non-fixed Ambient Illumination Conditions*, Wilfred De Corte presents the results of his investigation of this question.

Rolf Kuehni, Editor, *Color Research & Application*

BOOK REVIEW: Color Theory and Its Application in Art and Design

by George A. Agoston, Springer Series in Optical Sciences, Springer-Verlag, Berlin, Heidelberg, New York, London, Paris, Tokyo, 1987. 286 pp., illus. Paper, \$59.50. ISBN: 3-540-17095-2; ISBN: 0-387-17095-2

Reviewed by Joy Turner Luke, Studio 231, Box 18 Route 1, Sperryville, VA, U.S.A. 22740.

George Agoston's 1979 book on color was a pioneering effort to bring recent scientific and technical information about color to the artist and designer. This new edition, which contains major additions, has evolved into an invaluable reference and text book on color for those fields. An indication of the book's development is that the 5 pages of references in the 1979 edition have grown to 10 pages; there are now 23 color plates, instead of 6; and the notes, tables and formulas given in the Appendix require 38 pages rather than the single page in the first edition.

The book is a condensation of knowledge about color densely interlaced with references to literature from the various technical and scientific fields producing fundamental information about color and color perception. From the arts viewpoint it is an excellent summary and also an introduction to further reading in areas of interest to the reader.

As Dr. David L. Macadam, who is a major figure in color science, stated in his foreword to the first edition, scientists have long understood that their work has relevance for artists and designers. Macadam and the author hope that this book will be an important bridge between art and science. This is not an unreasonable hope since it is certainly true that in the 1800's books by the chemist, M.E. Chevreul, and the physicist, Ogden Rood, completely changed the approach to color by impressionist painters, and so forever changed the look of art.

This reviewer would like to see this revised and updated edition of Agoston's book a part of every college level art and design curriculum in the United States. It is unlikely that this will happen for several reasons. The book with its diagrams and tables will not attract the eye of the artist, even though it does have a section of color plates and includes a mask for viewing colors. The second reason is cost. Books in the Springer Series in Optical Sciences are comparatively expensive since they usually appeal to a limited number of readers. Thirdly, only a few art and design instructors are aware that the information exists and fewer still what its relevance is.

The book is for the most part clearly written, a difficult task when attempting to bridge between disciplines, and covers most important areas. Included are: illumination and standard illuminants, fluorescence, metamerism, additive and subtractive color, color specification, yellow background change. This can be seen if the viewer moves his

iridescent colors, color rendering, color systems, color names and conditions of viewing. It is the most useful book covering this material for an arts audience that this reviewer has seen; however, there are a few areas where comments are warranted.

Additional specific information on artists' and designers' colorants would be useful, although some information along this line has been added in this new edition. For instance, a 1976 study by Henry W. Levison on the lightfastness of pigments found in artists' paints is described. It is regrettable that Agoston was not aware of the later, more extensive series of tests done by Levison from 1978-1982.

These tests have formed the basis of a standard specification for quality artists' paints, ASTM D4302. A larger number of pigments were tested than in the 1976 study; more advanced instrumentation was available for measuring the paint specimens before and after exposure, four types of exposure for each specimen were used; additional identification in the form of Colour Index Names and Numbers were given for each pigment; results were reported in CIELAB units; and a rating system established that is gaining acceptance in the art material industry. Information from these tests and from two pigment identification studies would have provided Agoston with pertinent information on what pigments are used in artists' paints and how lightfast they are.

Analysis of organic pigments in artists' paints was done by Romesh Kumar at the former Color Measurement Laboratory at Rensselaer Polytechnic Institute and was published in his doctoral thesis, "Analysis for Organic Pigments using Solution Spectrophotometry." Dr. Treva Pamer's work on identification of inorganic pigments found in artists' paints was presented at the American Institute for Conservation meetings. A description of Levison's work is available in ASTM Research Report D-1 1036.

The book contains one color plate illustrating complementary afterimages that does not work in the way intended. A green square is printed on a gray background in Plate XVII and the same green square printed on a yellow background in Plate XVIII. The reader is to stare at the green square on the gray background and then shift his eyes to a black dot on the same gray. As the text describes, a pale magenta afterimage of the square appears. The reader is next to stare at the same green square on the yellow background and then focus his eyes on a black dot on that same yellow. A pale orange afterimage is supposed to appear, but this does not happen. Instead the viewer sees a yellow afterimage that is lighter and more saturated than the yellow surrounding it.

However, if the viewer stares at the green square on the gray background and then shifts his gaze to the dot on the yellow background, the expected pale orange afterimage appears. The reason for this is that a major change in sensitivity can occur not only in the receptors looking at the green squares, but also in those looking at the backgrounds. These receptors do not change in their sensitivity to hue while focused on the gray, so there is no colored afterimage to affect the color of the surround; therefore, the viewer sees the complement to the green square, a magenta square projected on the gray background. If that afterimage, in which the 'background' receptors remain balanced, is projected on the yellow, the additive mixture of yellow plus magenta afterimage results in a perception of a pale orange square.

In the case of the green square on yellow, both the hue sensitivity of the receptors focusing on the square and those focusing on the

gaze from the yellow area to a white paper. A "warm" (slightly reddish) pale blue color is seen where the yellow was and the green square afterimage has become yellow instead of magenta or orange. If instead of projecting the image on the white paper the afterimage is projected, as instructed in the text, on the yellow, the yellow appears to be grayer and warmer due to the additive effect of the blue afterimage. Since the saturation of the background has been reduced, the yellow afterimage of the square looks more saturated by contrast.

Agoston is aware of the sensitivity changes in the receptors viewing background colors because a good example of these effects are illustrated in Plate XX and described in the text. Most likely the illustration was planned for the viewer to stare at the green square surrounded by gray and project the afterimage on a gray and then on a yellow background. Someone probably decided it would make a more attractive color plate printed as it is, without realizing that the change in background for the square would change the color of the square's afterimage.

Agoston does a fine job of describing the major color systems, both those used in colorimetry and those that are used in visual color determinations, and are represented by collections of color samples. However, he fails to mention a point about the Swedish Natural System (NCS) that can be important to artists and designers. The NCS does not contain horizontal planes of constant lightness, as many other systems do. This is important since lightness differences between colors is crucial in the perception of edges and forms. This is evident in black and white sketches or photographs where the perception of forms and lighting, and even composition, is preserved. If the amount of lightness contrast between colors in a graphic design has been chosen for legibility, or to unify or delineate a group of colors in interior design or painting, it is not possible using NCS samples to keep that relationship while adjusting the hue and chroma of the colors until the desired harmony is achieved. This can be done when working with Munsell or the OSA Uniform Color Scales samples.

Also Agoston seems to have accepted too literally the claim that it is possible to specify color in NCS notation without color samples. On page 133 Agoston says, "The NCS can be employed directly for determining the perceived color of a wall in a room, of foliage in the distance, of painted areas in which simultaneous contrast occurs, of a spot on a television screen, etc. A color determined in this way is an absolute measure based on color perception." He goes on to say, without questioning the claim, that it is claimed that colors can be identified by NCS notation within a scale of about 10,000 to 20,000 colors without reference to color samples. This is very difficult for people with experience in color matching to accept.

A study by Whitfield, Powell and O'Connor published in the April 1988 issue (Vol. 13 No.2, pp. 119-123) of the journal, *Color research and application*, reports that a replication of the Swedish studies did not support this claim. In fact it was found that it is possible to estimate colors without samples about as well using Munsell notation as NCS notation, and neither is very accurate. This study also indicates that it is easier to assign color notations to colors in some regions of color space than in others.

A comparatively large amount of space in the book is given to the Optical Society of America (OSA) Uniform Color Scales (UCS). This color order system is comparatively new, having been marketed in 1977. Color space is sampled at the intersections of a three dimensional cubo-octahedral lattice, which means that throughout the gamut

of color obtainable with current pigments, each color sample is surrounded by twelve perceptually equidistant colors. This geometry was chosen as a stringent test of uniformity because a uniform sampling of color space was the major goal of the OSA committee. The geometry also makes it possible to cleave the color solid along many angles and slopes. At each angle there are a set of parallel planes that can be sliced through the solid from one side to the other. Each of these sets contain all the color samples in the OSA system, but they are surrounded with different color neighbors. These planes exhibit unusual and beautiful arrays of color not easily seen in other color systems. Unfortunately, this geometry also makes the system difficult to describe.

Agoston describes the notational system developed by the OSA committee, but also suggests changes that he believes would make it easier to understand and teach this color system. The OSA numerical notation system uses negative as well as positive single digit numbers to indicate a color's amount of lightness, yellowness or blueness, and redness or greenness. Agoston suggests ways to avoid using negative numbers. Secondly, the planes in the OSA-UCS notational system are identified by simple formulas, such as $j-g=2$. In this notational system j stands for yellowness, while $-g$ indicates redness. Agoston would replace these formulas by assigning a different letter to each set of planes.

This is a logical simplification as long as only the first seven sets of planes are considered. In most of the literature published to date these seven types of slices are the only ones considered since they contain all the planes where most samples are separated by the system's basic unit of 2. It is overlooked that uniform color scales with other spacing are of equal interest to artists and designers. The ideal system would display color scales between every pair of colors in the color space. This is impractical because at some angles through color space samples are too widely spaced to form a true scale, but there is no reason to restrict use of the system to scales where the spacing is 2 OSA-UCS units. There are several sets of planes where the spacing is $2\sqrt{2}$ (2.82), and a large number more where the spacing between colors is $2\sqrt{3}$ (3.46) OSA-UCS units. Assigning letters to these and then remembering which letter refers to what set of planes would not be simple.

Identifying the planes by formulas has the advantage that the colors on any particular plane can be generated by finding all the color notations that fit the formula for that plane. The formulas themselves also provide insight into the type of plane. Negative numbers and formulas are not appealing, but they are useful.

Whether or not Agoston's suggestions would simplify use of the OSA-UCS system, it is certain that describing both types of notation for a color system based on complicated geometrical spacing, makes this section of the book difficult to follow.

Agoston's statement on page 172, "At the start, it was recognized that it might be impossible to achieve a perfectly uniform lattice sampling (based on the geometry of inter-locked cubo-octahedra) of color space, for a fixed background." This statement can be read to mean that the cubo-octahedral spacing itself made it impossible to achieve perfect uniformity, while actually it was found to be impossible to place colors with perfect uniformity in any three dimensional space, no matter what configuration is used for the color samples.

In the section on conditions of viewing, Agoston describes the enhancement of contrast along the border between colors of different

lightnesses (Mach bands), but no mention is made of the enhancement of hue and chroma (or saturation) contrast at the border between touching colors in a hue or chroma series that have constant, or near constant, lightness. The visual system's job is to separate the visual array into objects, so any abrupt change in color that might signify the edge of an object, is magnified. It is worth noting how much more noticeable the enhancement of lightness is than the enhancement of hue or saturation.

The above are minor criticisms. The fact remains that this book brings together a great amount of information on color that is not readily available to artists and designers, and presents it as clearly as the material allows.

CALENDAR

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

Harry K. Hammond, III
Pacific Scientific Instrument Division
2431 Linden Lane
Silver Spring, Maryland 20910
(301) 495-7046

1988

AATCC 88 INT'L CONF. & EXHIBIT, Sept. 28-Oct. 1
Opryland Hotel, Nashville, Tennessee, Information: Jerry Tew, (919) 549-8141

SOCIETY FOR INFORMATION DISPLAY, Oct. 4-6
International Display Research Conference (IDRC), Hyatt Islandia Hotel, San Diego, California. Information: (213) 305-1502 or (212) 620-3388.

ASTM COMMITTEE D-20 ON PLASTICS, Oct. 10-14
Toronto Canada. Information: Robert Morgan, (215) 299-5505.

FSCT, Oct. 19-21
Federation of Societies for Coatings Technology 66th Annual Meeting and 53rd Paint Industries' Show, McCormick Place, Chicago, Illinois. Information: (215) 545-1507.

USNC/CIE, Oct. 23-25
U. S. National Committee of the CIE, Hawthorne Inn, Salem, Massachusetts. Information: Jack Hsia, (301) 975-2342.

AATCC COLOR MEASUREMENT WORKSHOP, Oct. 25-26
AATCC Technical Center, Research Triangle Park, North Carolina. Information: Jerry Tew, (919) 549-8141.

OSA ANNUAL MEETING, Oct. 31- Nov. 4
Optical Society of America, Santa Clara Convention Center Santa Clara, California. Information: (202) 223-0920.

DETROIT COLOUR COUNCIL, Nov. 3
Visual Shading and Instrumental Color Matching, Allan Rodrigues. Northfield Hilton, Troy, Michigan. Information: Jim Kaiser, (313) 583-8345.

1989

ASTM COMMITTEE E12 ON APPEARANCE, Jan. 15-17
Embassy Suites Hotel, 1100 SE 17th St. Ft. Lauderdale South, Florida 33316. Information: Sharon Kauffman (215) 299-5599.

ASTM COMMITTEE D01 ON PAINT, Jan. 15-18
Embassy Suites Hotel, Ft. Lauderdale South, Florida. Information: David Bradley (215) 299-5504

AATCC NAT'L TECH. COMMITTEE MEETING, Feb. 14-16
The Doral Inn, New York, New York, Information: Jerry Tew, (919) 549-8141.

AATCC RESEARCH COMMITTEE MEETINGS, Feb. 14-16
Hilton at University Place, Charlotte, North Carolina. Information: Jerry Tew, (919) 549-8141.

AIC COLOR 89, Mar. 13-17
Centro Cultural, General San Martin Sarmiento 1551, Buenos Aires, Argentina. Information: Grupo Argentino del Color, Division Optica, INTI, c.c. 157,1650 San Martin (BA), Argentina.

ISCC ANNUAL MEETING, Apr. 9-11
Chicago, Illinois

AATCC RESEARCH COMMITTEE MEETINGS, May 9-11
AATCC Technical Center, Research Triangle Park, North Carolina. Information: Jerry Tew, (919) 549-8141.

ASTM COMMITTEE E12 ON APPEARANCE, May 15-16
National Bureau of Standards, Gaithersburg, Maryland. Information: Sharon Kauffman (215) 299-5599

FSCT—Federation Spring Week, May 16-19
Airport Marriott Hotel, Los Angeles, CA.
Seminar on 16th & 17th. Society Officers meeting on 18th. Board of Directors Meeting on 19th

CORM ANNUAL MEETING, May 17-19
National Bureau of Standards, Gaithersburg, Maryland, Information: Norbert Johnson, (612) 733-5939.

WORK WITH DISPLAY UNITS, Sept. 11-14
Second International Scientific Conference, Queen Elizabeth Hotel, Montreal, Canada. Information: Diane Berthelette (514) 288-1551.

ROYAL PHOTOGRAPHIC SOCIETY, Sept. 18-22
Symposium on the Quantification of Images, Clare College, University of Cambridge. Information: Dr. M. R. Pointer, Kodak Ltd, Harrow Middlesex, HA1 4TY England, Tel. 01 427 4380.

CIE INTERIM MEETING, Oct. 2-3
Information: Dr. J. D. Schanda, Central Bureau, A-1030 Vienna, Kegelgasse 27 Austria, or Dr. Jack Hsia (301) 975-2342.

(Continued)

OPTICS 89, Oct. 15-20

Optical Society of America Annual Meeting, Orlando, Florida.
Information: OSA, 1816 Jefferson Place, N.W., Washington,
D.C. 20036, (202) 223-0920.

ISCC WILLIAMSBURG CONFERENCE, Nov. 28-Dec. 1

"Color Discrimination Psychophysics", Colonial
Williamsburg, Virginia. Information Dr. Roy Berns
(716) 475-2784.

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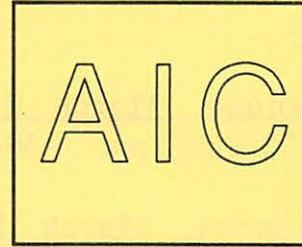
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COLOR 89
MARCH 13 - 17, 1989
BUENOS AIRES, ARGENTINA

The 6th Congress of the Association Internationale de la Couleur (AIC - International Colour Association) will be held at the Centro Cultural General San Martin in Buenos Aires, Argentina. The usual AIC Congress format will be followed, including invited papers, oral and poster sessions, round table discussions, equipment exhibits, and a social program. A Tentative Program is attached. The Final Program will be available after the Papers Committee evaluates contributed papers for acceptance. The Inter-Society Color Council is the U.S. member of the AIC.

Garber Travel, affiliate of the International Congress and Conference Association which is making all arrangements in Buenos Aires, is offering all U.S. and Canadian attendees group rates on air travel to the meeting with flexible scheduling. They also offer the benefit of "one-stop" arrangements as the Organizing Committee has authorized them to collect registration fees for the conference and make reservations at hotels selected by the AIC at conference rates. Round trip airfare would be \$882.00 from New York and \$782.00 from Miami via Varig, the Brazilian airline. Garber will also book lowest cost connections from home cities. We find this a considerable savings over regular commercial fares and competitive with airfare/land packages offered by other travel agencies. They also offer us optional pre- and post-congress programs, visiting Rio de Janeiro, Brazil (no additional airfare) or a post-congress tour of Lima/Cuzco, Peru. Garber is a member of the American Society of Travel Agents and is well known in the Boston area, with 48 offices in New England, New York and Chicago.

For further information including the AIC Circular and registration forms, please contact:

Garber Travel, 1047 Commonwealth Avenue, Boston, Massachusetts 02215, phone (800) 225-4570

or

Dr. Allan Rodrigues, ISCC Past-President, c/o E. I. Du Pont, P. O. Box 2802, Troy, Michigan 48007-2802, phone (313) 583-8245.

PROGRAM

Sunday, March 12

7:30-9:00 pm Welcoming reception. Wine and light snacks.

Monday, March 13

Morning I: "Color in Architecture"

Afternoon I: "Color Order Systems" *Fashion Show*

R: "Is any Color Order
System better?"

Evening *Buenos Aires by Night*

Tuesday, March 14

Morning I: "Color Formulation"

Afternoon I: "Fluorescence" *City Tour*

Wednesday, March 15

All day *Excursion to San Antonio de Areco "Fiesta Criolla"*
No lectures or papers

Evening Visit to National Institute of Industrial Technology
(INTI)

Thursday, March 16

Morning I: "TV and Color Reproduction"

Afternoon I: "Color in Foods" *Excursion to Tigre's
Delta*

R: "Is anything like Color Pollution?"

Evening *Banquet*

Friday, March 17

Morning I: "Color in Art in Latin America" *Theatre/Museum*

Afternoon I: "Color Education"

Discussion: "Balance and what next?"

Closing Session & Farewell Party

I: Invited Lecture, R: Roundtable Discussion; Contributed papers and poster sessions each day, except Wednesday.

- Social events shown in italics are not included in the registration fee.

- Registration fees are US\$250.00 for participants and US\$80.00 for accompanying persons if received before 1/1/89; US\$300.00 and US\$100.00 respectively after that.