Inter-Society Color Council *News*

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1991 SID INTERNATIONAL SYMPOSIUM CALL FOR PAPERS

The Society for Information Display (SID) is issuing a Call for Papers for its 27th Annual Symposium, Seminar, and Exhibition to be held My 6-10, 1991 at the Anaheim Convention Center, Anaheim, CA. SID '91 will focus on Multi-Media displays.

Original papers are sought in, but not limited to, the following areas of interest: Automotive Displays, Avionic Displays, CRT Displays, Display Addressing/Packaging, Display Circuitry/Packaging, Display Manufacturing, Display measurements, Display Systems and Applications, Flat Panels- Emissive and Non-Emissive, Hard Copy/Printers/Display Storage, Human Factors, Image Acquisition/Processing, Interactive I/O Technology, Large Area Displays, Liquid-Crystal Technology, Workstations.

A limited number of travel grants up to $1000 each are available to student authors of accepted papers. All authors are invited to submit both a 35-50 word abstract and a 3-7 page technical summary, including figures and/or illustrations, to: Jay Morreale (SID 91), Palisades Institute for Research Services, Inc., 201 Varick Street, Room 1140, New York, NY 10014; Phone (212) 620-3371; Fax (212) 620-3379. Please contact Mr. Morreale for a copy of the Regular and Student Call for Papers.

The deadline for receipt of the abstract and technical summary is Friday, November 30, 1990. Authors will be notified of their acceptance by January 31, 1991.

The Society for Information Display was founded in 1962 to promote the use and encourage the advancement of information displays by promulgating definitions and standards. The Society's annual International Symposium, Seminar, and Exhibition provides a forum for the exchange of new ideas in the display community.

PHOTOMETRY, COLORIMETRY AND ELECTRONIC IMAGERY SHORT COURSE

offered by UCLA EXTENSION, Dept. of Business, Engineering and Management Los Angeles, California November 5-9, 1990

Overview

The course provides comprehensive coverage of photometry and colorimetry as it applies to self-luminous displays, quality control, paint and dyes, highway signs, and electronic printing. Basic concepts of electromagnetic radiation and the visible spectrum, as well as the international agreements relating photometry and colorimetry to spectroradiometry are discussed, along with the appropriate units and metrics. A thorough review of color theory and characterization, including the basic color balance experiment, the 1931 CIE Munsell and CIELAB color spaces, and on up to CIELUV color space is given. The visual and psychophysical aspects of color and visible radiation are reviewed with classroom demonstrations utilizing modern microprocessor-controlled spectroradiometers.

Participants have an opportunity to perform photometric measurements and color balancing experiments in evening laboratory sessions, and measure their color aptitude. The technical aspect of the spectroradiometers are discussed in detail with diagrams on microprocessing capability, detector characteristics, optics, and theory of operation and limitations.

Twenty percent of class time is devoted to laboratory demonstrations and experiments. A kit of laboratory materials providing test charts, color tables, gray shade scales, metameric pairs, etc., is included in the course fee of $1395. Address: P.O. Box 24901, Dept. K, UCLA Extension, Los Angeles, CA 90024-0901.

TAROW INDOW RECEIVES JUDD-AIC AWARD

The Deane B. Judd-AIC Award was instituted in 1975 in honour of the memory of the outstanding colour scientist Deane B. Judd. It is awarded biennially by Association Internationale de la Couleaur (AIC) to recognize and honour persons who have performed work of outstanding merit in colour science. Previous recipients have been Miss Dorothy Nickerson, Professor William David Wright, Dr. Gunter Wyszecki, Professor Dr. Manfred Richter, Dr. David L. MacAdam, Professor Dorothea Jameson/Dr. Leo Hurvich, Professor Dr. Robert W.G. Hunt.

The 1989 Deane B. Judd-Aic Award was conferred on Professor Dr. Tarow Indow in recognition of his extensive contributions to the science and technology of colour, and in particular for his work on the method of multidimensional scaling and his work in which the global structure of the Munsell color space is examined by the method and its variations. His experiments were supported by the excellent technology of Japan to produce color chips and included tests of various methods of quantifying perceptual color differences of ranges within which color differences are meaningful for human eyes, of algorithms to define the configuration and the proof of some non-additivity involved in human assessment of color differences. All these are among the contributions noted here for recognition by the Association Internationale de la Couleur.

His professional career has extended over 40 years. He was Professor of Psychology in Keio University and has been, since 1977, Professor of Psychology at the University of California and also, since 1981, Adjunct Professor of Rensselaer Polytechnic Institute in Troy, NY. He was President of the AIC from 1973 to 1977 and has served on the Executive Committee from 1969 to 1981. His contributions to the science of colour have earned him the admiration and gratitude of colleagues and associates throughout the international colour community. The Executive Committee of the AIC is therefore pleased to honour Professor Dr. Tarow Indow with the 1989 Deane B. Judd-AIC Award.

The award consists of a gold medal with a portrait of Deane B. Judd on one side, and on the other side the inscription "To honour Tarow Indow 1989 for important work in colour science".

The AIC presented the award to Professor Indow at its sixth Congress COLOR 89 in Buenos Aires on the 13th of March 1989.

Professor Dr. Heinz Terstiege, Past President, AIC

CORM 90
FRANC GRUM MEMORIAL LECTURE 1990 MAY 09

A Sideliner's Encounters with Radiometry is the title of the lecture presented by Charles L. Amick, Consultant to Day-Brite Lighting, Inc., a subsidiary of Thomas Industries, Inc.

After introductory remarks delineating his experience in the lighting industry, Mr. Amick spoke of his association with Franc Grum as follows. "At the 1972 USNC Annual Meeting, I first met Franc Grum." He presented a report on *Florescence and Polarization*. Fluorescence had long been dear to my heart, and polarizing panels for the enclosing element of recessed fluorescent lighting fixtures were then being promoted. It was obvious that Grum knew what he was talking about. At the 1973 Annual Meeting of the UNC/CIE, Grum presented a report on colorimetry for Dave MacAdam.

Klaus Mielenz recalls that CORM may have started as a committee of the USNC/CIE. But there is no question that Franc Grum was a sparkplug in the formation of CORM, and in influencing the Director of the National Bureau of Standards to endorse CORM's programs. Mielenz tells me that the CORM Reports, giving priority listings of needed measurement standards have been most helpful, and he credits Grum with being a major driving force.

I really got to know Franc during his term as President of the USNC/CIE from October 1979 to October 1983. I was Vice-President in charge of technical activities. I quickly say that Grum was dedicated to his work on optical metology and intracompany standardization at Eastman Kodak, where he became a Senior Laboratory Head. He was Chairman of CIE TC2.3 on Materials, and became the first Director of Division 2 (Physical Measurement of light and Radiation) when CIE reorganized in 1983. In 1985, while I was President of USNC/CIE, our Executive Committee unanimously nominated him to be President of the CIE for the 1987-1991 Quadriennium. His death shortly before Christmas in 1985 was a tragic loss to those concerned with optical radiation measurements, with color technology, and with standardization.

THE COLOUR GROUP (GREAT BRITAIN)

A fiftieth birthday deserves a celebration. The Colour Group (Great Britain) will mark its golden jubilee with two full days of meetings on Wednesday and Thursday 13th/14th February, 1991 at the Institute of Physics, 47 Belgrave Square, London SW1X 8QX. Included in the event will be the Newton Lecture and Dinner, these to be held at Imperial College, London SW7.

The lectures will cover the wide range of activities which the Colour Group has encouraged since it was founded including the most up-to-date applications. The total cost of about 70 pounds includes coffee, lunch, tea, Newton Dinner and the anniversary book which is due for publication at the meeting.

Further details from: Dr. J.A.F. Taylor, The National Physical Laboratory, Queens Road, Teddington, Middlesex, TW11 OLW.

BILLMEYER RECEIVES ASTM AWARD

At the meeting of ASTM Committee E-12 on Appearance of Materials in San Francisco, CA, June 19,1990, Fred W. Billmeyer, Jr., was given the prestigious ASTM Award of Merit. Billmeyer is only the fourth person to receive this Award as a result of a recommendation by E-12 since the committee was formed in 1946. A large engraved plaque was presented to him by the 1990 ASTM Chairman of the Board of Directors, Albert J. Bartisoc.

The engraving on the plaque reads: "Billmeyer is granted an Award of Merit and the honorary title of Fellow, for outstanding leadership in Committee E-12 on Appearance of Materials in the development or revision of ASTM standards, dealing with optical of appearance properties, such as color, gloss and haze."

Early in his professional career Billmeyer was associated with the Plastics Department of E.I. duPont de Nemours & Co., Wilmington, Deleware, and was associated with Alfred C. Webber, for many years an ISCC member and ASTM President 1962-63, who was responsible for Billmeyer's initial association with ASTM and ISCC.

Those of us who are familiar with Billmeyer's tremendous accomplishments in the field of color may not be aware that he has been an outstanding contributor to the field of polymer science. At Rensselaer Polytechnic Institute he held the post of Professor of Analytical Chemistry and in that capacity directed research in both polymer science and color.

Billmeyer is currently the very active chairman of Subcommittee E-12.01 on Definitions and Terminology. He was recently appointed a member of the ASTM Committee on Terminology that reviews the terminology of the 140 different ASTM committees. In the Appearance Committee he has been extremely productive in developing new or revised standards for Subcommittee E-12.02 on Spectrophotometry and Colorimetry, E-12.03 on Geometry and E-12.07 on Color Order Systems. Billmeyer has also written standards for ASTM Committee D-1 on Paint and Related Coatings and Materials and for Committee D-20 on Plastics.

Harry K. Hammond, III

CIE SESSION IN MELBOURNE

The 22nd Session of the CIE will be held in Melbourne from 1991 July 2 to 11. It will be the first Session to be held in the Southern Hemisphere and only the second to be held outside Europe or North America.

Melbourne is a city of a little over three million people, situated on port Phillip Bay with the Dandenong Ranges to the East. The Yarra river runs through the city centre of Melbourne with its source in the Dandenongs. Suburban Melbourne is very extensive, with many bayside suburbs and spreading right to the hills.

Melbourne was founded on the money from the gold discovered in western Victoria in the 1850's and was laid out with wide streets and grand buildings. Melbourne now is very multicultural with large communities of Chinese, Greeks, Italians, Jews, Anglo-Saxons, Celts and very many other different peoples. This mix gives the city a vitality and warmth it otherwise wouldn't have.

Melbourne boasts a wealth of parks and gardens close to the central business district, it has a wide range of restaurants which cater for practically any culinary taste, it has an impressive cultural complex which includes the National Gallery, the Melbourne Concert Hall and several live theatres, the Melbourne Zoo, the Royal Botanical Gardens, the Victoria Market, Melbourne University, and many other activities are available within 5 km of the Session.

The Session will take place at the World Congress Centre, close to the heart of the city and located on the banks of the Yarra. The Centre was opened in April 1990 and it is integrated with the World Trade Centre and an International-standard hotel (Eden on the Yarra) overlooking the Yarra River. The Centre has been designed for flexibility and state-of-the-art audio-visual facilities and services.

As in Venice the Session will be divided into two parts: a conference during which papers will be presented, followed by a second part during which meetings of the Divisions will take place.

For more information please contact: Dr. S.E. Jenkins, Australian Road Research Board, P.O. Box 156, Nunawading, Vic. 3131, Australia; Telephone +613 881 1555; Telefax +613 803 8878; Telex (AA) 33113

COLORS OF NEW ARCHITECTURAL STRUCTURES IN PARIS

Paris, in celebrating the bicentennial, has undertaken a spectacular building program - an ambitious ten years of "Grand Projects." Newly in place are the following: the white open cube of La Defense (ending the well-known Champs-Elysees axis), the glass pyramid of entry and reception to the Louvre Museum, the post-modern renovation to the Orsay RR station into a museum dedicated to art created during 1848-1914, the glass-wall transparency of the Bastille Opera (in the city's plaza of celebrations), the stark space-age Park and Museum of Science and Technology at La Villette, and the play on white and gray of the Arab World Institute. All of the above announce the Paris of the year 2000. All suggest possibilities for the fashionable in architectural colors in the next century. These include mixing the whites of concrete and Carrara marbles; combining artificial and natural white light; using primary colors on functional materials; using "natural" colors of steel and blue and green glass to create textured surfaces or to reflect the surrounding urban tableaux; and the use of high-tech building material to emulate fabric textures and layering color effects.

CAUS Newsletter, Sept. 26, 1989

ON BEING COLOR BLIND (COPYRIGHT 1989 PANTONE, INC.)

Dr. Charles R. Snyder of the University of Kansas shares his insights on being color-blind in a colorful world.

I have made a lifelong study of color-blindness - although nothing technical about color mixture functions, spectral locus, luminosity curves or anything of the sort. Rather, I have experienced what it is like to lack color vision. What are the psychological implications of being color defective?

The two questions I am asked most frequently are "What is it like?" and "What do you see?" I think I have finally come to understand these questions. "What is it like?", means that the questioner would like to know how I operate with defective color vision. "What do you see?" implies that the questioner would like to look through my eyes and to perceive as I do. There is no way to answer this second question because I do not have the same frame of reference as does the person with normal color vision.

Turning the situation around, I ask the person with normal vision to tell me what he sees. He cannot tell me—at least so that I understand him - because his perceptual sensations and the names which he applies to these sensations are different from mine. In turn, there is no way, in words for me to communicate to him what I see. Thus the second question must go unanswered. My first memory regarding color dates from my fourth year. I developed by own labels for the colors I saw. These labels baffled my parents, as I stubbornly resisted using the more usual color names, e.g. red, yellow, blue, green, etc. In retrospect I realize that I was developing a color vocabulary of my own, probably because I could not understand or learn the normal color labels. This is similar to the normal child's process of initially developing his own vocabulary of labels for the objects he sees (a "baby talk" of sorts). However, the child eventually learns the correct labels for these objects. The color-defective child, on the other hand, has difficulty adapting his color vocabulary to match that of normals.

My kindergarten teacher drilled me on the naming of colors. My inability to learn the names for the colors annoyed the teacher and made me feel anxious and different from the other children. After considerable effort aimed at having me learn colors, the teacher gave up in dismay. It was not until the first grade that I was given a color test and was correctly diagnosed as being color defective. Over the years I have endured a plethora of color tests, with diagnoses ranging from total color blindness (monochromatism) to a red-green confusion (deuteranopia). The actual nature of my deficiency was of little interest to me, although the knowledge that I suffered from an actual color deficiency reduced my feelings of inadequacy regarding my inability to learn colors. Psychologists tell us that a child is especially susceptible to negative feelings arising from the deficiencies he notes in himself as compared with other children. Any characteristic which makes the child different from his peers can severely hinder the development of self-concept. My early experience highlights the importance of a visual examination of children for both acuity and color vision (often color tests are not given). An early diagnosis of color deficiency could lessen or eliminate the potentially frustrating and negative learning experiences of a color-defective child. As the child matures, he becomes less sensitive to the differences between himself and his peers, and his defective color vision loses its psychological impact.

With the increased reluctance in our society to offend a particular minority group, the term color-blind has been replaced by the euphemism color defective. While there may be some use in the technical distinction between

COMPUTER COLORANT FORMULATION —CALL FOR PAPERS

The International Colour Association (AIC) was started at a meeting in Washington DC,USA in 1967. It will return to the United States in 1992 to celebrate its 25th Anniversary with a two-day international symposium on Computer Colorant Formulation. This meeting will be held on June 23-24 on the campus of Princeton University, easily accessible from New York or Philadelphia. It will be preceded by the ISCC Annual Meeting on June 21-22. The Meetings will include discussions on a wide range of topics related to color and appearance, working sessions of ISCC project committees, social functions to get to know your fellow-workers in color, visits to nearby places of interest, the symposium, and a banquet celebrating the AIC Silver Jubilee.

The symposium will be divided into four sections covering Colorant Formulation:

- Where the substrate plays a significant role, e.g., printing.
- From simulated color, e.g., from CRTs, liquid crystal, Maxwell disk.
- Allowing for appearance effects, e.g., due to gloss or polychromatic pigments.
- General theory and practice.

You are invited to contribute papers within these general categories for this symposium. If you would like to present a paper at the meeting, please contact the Program Chairman before June 1991. Extended abstracts will be required by October, 1991, for acceptance by the Program Committee by January, 1992.

AIC President: Dr. Alan Robertson, Institute for National Measurement Standards, National Research Council, Ottawa, Canada, K12A OR6. ISCC President: Mr. Hugh Fairman, Armorguard Products, P.O. Box 215, Andover, NJ 07821, U.S.A. Meeting Chairman: Dr. Allan Rodrigues, E.I. DuPont, P.O. Box 2802, Troy, MI 48007-2802, U.S.A. Program Chairman: Mr. Ralph Stanziola, Industrial Color Technology, 410 Clover Court, Neshanic Station, NJ 08853, U.S.A.

color-blind (denoting only black and white vision) and color defective (denoting partial color vision), neither term is offensive to me.

The person with defective color vision must operate in the world of color normals. He, therefore, must learn to compensate for his deficiency, although the magnitude of this compensation is, of course, far less than that made by the blind individual. In my case, I tried to learn the normal colors or labels which people apply to objects. For example, an early recollection regarding color was learning that grass was brown in winter. When summer came, I continued to label the grass brown and then had to learn that grass is labeled green in the summer. Other fairly "safe" labels which I initially learned: fire engine - red; snow - white; water - blue; automobile tires - black; oranges - orange; sun - yellow. The word safe is in quotation marks because objects need not be their normal colors, e.g., sky can be blue, gray, yellow or orange; water can be blue, gray or black; and so forth. Further, a rough rule-of-thumb for guessing at the color label which normals attach to a given object is to appraise the shade of the object. Generally, I have found that moving from dark to light, colors run as follows: black, purple, red, brown, blue, gray, orange, yellow and white.

Most objects, unfortunately for the color defective, are not pure colors, and the labeling is not easy. I think that normal vision is comprised of many in-between colors; these labels have always confused me. As a result, my color vocabulary is meager in comparison to that of a normal person, for I have never had the color vision to attach such labels as fuchsia, turquoise or the multitude of other between-color labels.

In our society colors are sometime used a symbols. The most obvious example is the traffic light: red signifies stop, yellow means caution, and green means go. The color-blind person can respond correctly to the traffic light, however, by noting that the green light is on the bottom, the yellow is in the middle, and the red at the top. (There is also a definite change in brightness that indicates which light is on.) On the other hand, the color-blind person is oblivious to the psychological connotations applied to many colors, e.g., green - soothing; blue, gray - depressing; red, yellow, orange - hot; white - sterile; pink - girl; blue - boy.

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Painting is another activity in which my color blindness has not been a hindrance (as far as I know). The most common descriptions of my paintings is that they are "bold", which, translated, means that the color contrasts are sharp and different. As a matter of preference, I find that the contrast of very light and very dark colors is visually pleasing, giving a feeling of starkness that I like. As I hypothesized earlier, the color-defective person may become more sensitive to texture, shape and form because of his lack of visual color cues. In painting and in my evaluation of other paintings, I place emphasis on the form and especially on the texture of the work. Interestingly, my wife (with normal color vision) and I often differ in our appreciation of a painting because we have different criteria. She values the color and mood achieved by color; I value the form and balance. The color-defective painter or artist, however, need not completely lack a sense of the color he uses: paint tubes and sets are individually labeled so that he can coordinate colors in the more usual sense. Much to my own pleasure, a recent trend in art (as well as in dress, architecture and other phases of our lives), has been toward the use of almost all colors in combination. For me, the change has added the visual contrast which I enjoy.

Sunsets are colorful sensations, I hear. I have never seen this colorful sunset of which you speak so I do not miss it. There is no sense of loss - not even a feeling of being strange or somehow different from people with normal color vision. At times, however, I must admit to a reticence to reveal my color deficiency because, as I have said, this disclosure leads to questions which imply that defective color vision must be a problem. Another attitude which I sometimes meet is best described as solicitous: the individual who wants to help me by naming the colors of objects. The danger in this kind of treatment is that the color-blind person can come to believe that he is different, or that he really does have a problem. For example, a primary tenet of the mental health field is that an individual maintains his abnormal behavior because of his continued treatment as abnormal, strange or different. Probably people treat the color-blind person as if he had a problem because they consider it a serious handicap. It isn't at all. As I have pointed out previously, through compensation the person with defective color vision can learn to operate nicely in the world of normal color-vision individuals. For me and for many other color defectives like me, the world is no different at all. *Pantone Color Institute Color News, Volume 4, No. 4, 1989*

INTEREST GROUP IV: COLOR EDUCATION

Interest Group IV met on Monday April 23, 1990 during the annual meeting of the ISCC which was held in Cleveland, OH.

After much discussion, the topic of Lecture Tours by ISCC members was tabled.

The group agreed to form student chapters if ISCC. With Board Approval, this could become a project committee under the auspices of Abdul Sarmadi (University of Wisconsin) and Glenn Miller (Rochester Institute of Technology).

The rest of the meeting was spent discussing a prepared outline for a course in Color. The major suggestion that was forthcoming was to do each unit in "Module Format". Each module is to include a history unit (where applicable) and the appropriate slides developed by Project Committee #48.

These modules will be developed and distributed to interested parties before the 1991 Annual Meeting. The suggestions that were sent to us will also be studied and included where suitable. *Nancy Jo Howard & Evelyn Stephens, Co-chairs*

PROJECT COMMITTEE #37: ARTIST'S MATERIALS

The immediate objective of Committee #37 is the selection of a limited group of pigments that, when formulated in an acrylic emulsion vehicle, are sufficiently lightfast for use in art works and that intermix to cover as large a gamut of colors as possible. In addition the committee is investigating whether it is possible, and practical, to develop a table giving the proportions of paints containing these pigments that mix to a reasonable approximation of specific colors. In other words, is it possible to construct a table of paint formulas that would serve as a guide to artists and students in mixing colors?

A short special session of Committee #37 was held on Sunday morning in the ISCC suite because Jim DeGroff, who had completed some work for the committee, could not attend the scheduled meeting on Monday afternoon. Chairwoman Joy Luke contacted as many committee members as possible to alert them to the extra session.

DeGroff had measured a large group of artists' paint samples provided by Luke. These specimens of commonly used artists' acrylic emulsion paints were made with a drawdown bar having a .003" gap. (It has been estimated in the past that this is approximately the thickness of a stroke of paint laid down by an artist's brush.) The paints were manufactured by Binney & Smith and Golden Artist colors. Binney & Smith's Liquitex paints were chosen because they are accurately labeled, it is known that color control within the company is good, and they are widely used. Golden Artist Colors are also well labeled and, while they are not so widely distributed, the company uses some suitable pigments not found in the Liquitex line. Each of the nineteen paints contained only one pigment and the pigments chosen are listed as Lightfastness Category I or II in Table 1 of ASTM D4302.

Drawdowns were made at mass tone and also diluted with white. A few were also let down with black. The drawdowns were made on Leneta 2A opacity charts. Two-inch square specimens were cut from each chart, one showing the paint over the white substrate, the other showing the same paint over the black substrate. Including the dilutions and samples over black and white, there were 118 specimens. DeGroff brought his computer to the Sunday session and was able to display the overlapping curves for these specimens on the screen. He explained that by displaying the curves of selected paints the color gamut possible to cover with that particular set of pigments could be seen. He said this will enable the committee to explore systematically the gamut of color possible from different sets of pigments. He can also print out the curves and data for each pigment for future reference.

Another approach to determining the set of pigments that would intermix to cover the largest gamut would be to plot at different lightness levels in CIELAB space the pigments and predicted mixtures obtained with the Kubelka Munk program.

On Sunday and at the scheduled meeting on Monday, there was a report by Allan Rodrigues and Hugh Fairman on the investigation into the possibility of a paint mixture system for artists. Developing such a mixing system using paints available to artists presents serious problems because the complete ingredients and their amounts in the paints are unknown. This means it cannot be expected that any table of mixture proportions can be exact. The question is whether the table can be accurate enough to be useful.

Under Allan Rodrigues' supervision, his son, Ashok, and daughter, Kamala, made a set of dilutions of an artists' phthalocyanine blue with white. (The commercial blue paint already contained an unknown amount of white.) The volumetric dilutions were made with a syringe, an inexpensive measuring device that could be used by an artist. Hugh Fairman used his Kubelka Munk program to characterize the artists' titanium white paint and to establish the percentage of white that should be used to dilute the phthalocyanine blue. Hugh found that the 10% and 25% let down in white resulted in reasonable data. He also decided that the Saunderson correction should be used. Synthesized colors compared reasonably well with measurements of Ashok's and Kamalas's specimens.

PROJECT COMMITTEE #27: INDICES OF METAMERISM

The Committee was asked by the editor of *Color Research and Application* to recommend standardized terminology for Matrix R and Metamerism. Hugh Fairman drafted a paper on this subject. After incorporating suggestions from other committee members, the manuscript was presented by Hugh and discussed at the 1990 meeting. After further revisions, the manuscript will be circulated to the entire membership and submitted to the Board of Directors for approval to publish it in the journal.

Future directions for this committee were discussed at the annual meeting. It was agreed that we should pull together the committee data on metamerism judgements, test these against various indices of metamerism, and publish the results. Other suggestions for future work were:

A study of observer versus illuminant metamerism: Henry Hemmendinger has a lot of data on this. Mike Brill volunteered to talk to Henry about this, and work with Don Campbell, Duane Dregits and Paul Hoffenberg in formulating a plan for committee work. Testing of Metamerism Potential: this concept has formerly been referred to as the general index of metamerism. The terminology draft calls it metamerism potential as this is a more descriptive term. Chairman Allan Rodrigues will try to incorporate testing of formulas with analysis of the committee data referred to above.

These new objectives will be presented to the Board of Directors at its fall meeting.

Allan B. J. Rodrigues, Ph.D., Chairman, Committee #27

In the second step, Ashok and Kamala purchased Liquitex Mars Black (PBk 11), Phthalocyanine Blue (PB 15), Permanent Green Light (Cadmium-Barium Sulfate, PY35 and Phthalocyanine Green, PG 7), Turner's Yellow (Hansa G, PY1, and Yellow Iron Oxide, PY 42) and Red Oxide (PR 101), and prepared drawdowns at full strength and of their intermixtures. It was pointed out that while these paints were suitable at this stage, they should not be used in the final evaluation since Turner's Yellow and Permanent Green Light contain more than one pigment. It is unavoidable that the phthalocyanine blue will be reduced with white to make it useable to the artists, but otherwise the paints should contain single pigments.

Fairman reported the predicted versus the actual mixture formulas for the intermixtures. The predictions were not good for mixtures containing the green or blue paint. Fairman believed this was due to the fact that these paints were not sufficiently well characterized. New calibration samples with a larger black content should be made. The predicted mixtures of the black, red, yellow and white paints were almost identical to the actual paint proportions. Results were encouraging enough to warrant further study.

Ruth Johnston-Feller protested that the paint mixing program would not be accurate or useful to artists. Wade Thompson and other art and design teachers in the meeting felt it would be useful to them because much class time is spent mixing colors. Students would still need to receive training in mixing paint, but the required designs and exercises could be completed quickly if students were given the general proportions of paints needed to make specified colors. If students become accustomed to using lightfast pigments in simple proportions to mix most colors, it will be of service to them in the future and should reduce metamerism among their colors. Use of additional pigments for special effects and mixtures using 'complementary' colors would also be a part of art and design courses.

The discussion took so long that it was necessary for Luke to show very quickly a fine set of slides on spectrophotometric curves and metamerism, and the accompanying set of paint samples in masstone and several letdowns, that was loaned to the committee by Henry Hemmendinger. Luke also briefly showed a large chart she put together relative to the project and to serve as a teaching aid. The 19 paints and letdowns in white were placed visually in the Mundell system. Then small samples of each color were placed on a large Munsell color wheel. This identifies the color of the paints within the color system most familiar to artists, displays the color relationship of one paint to another, and demonstrates visually how the colors shift in hue and chroma as white is added. One interesting observation was that a large number of paints are marketed that have a Munsell hue close to 7.5R. It is also evident from the chart that the color region where it is most difficult to achieve high chroma with permanent pigments lies between the red-violets and purples. *Joy Turner Luke, Chairperson, Committee #37*

PROJECT COMMITTEE #44: UNIFORM COLOR SOLID

The Committee is studying existing color order systems to determine where they may be improved upon for uniformity, with the intent to publish a specification for an improved system if one can be found. Such a specification would allow others to execute the atlas of such a system. The major color order system studied was the Optical Society of America's Uniform Color Scales (OSA-UCS), as it is reported to be among the most uniform of available systems.

The Committee began the year with a scaling experiment utilizing scales of three adjacent colors chosen from the OSA-UCS. The Committee has six such scales ranked by 78 color normal observers for the scales' color difference magnitude. Some preliminary trials determined that the quality of daylight used in the observations did not appear to be a significant factor affecting the results. Then, by studying the number of observations required in order that the variance in data distribute itself in an approximate standard normal distribution, it was determined that approximately 50 observers were sufficient.

The Committee was able to convert the results from mean rank order to an interval scale by application of a mathematical technique. This interval scale, then in terms of relative color difference among the scales, showed that the OSA-UCS spacing between unit differences in notation appears to diminish in color difference as the samples become more and more chromatic.

The Committee was at the time studying an alternate system for colorimetry involving color-matching functions differing from those used by the CIE and equations for putting the resultant tristimulus values into opponency which differ somewhat from conventional methodologies. Preliminary results generated by plotting the OSA-UCS in the new system appeared promising as to its uniformity. Certain factors such as relative magnitude scaling factors for the three axes, two chromatic opponent axes and a lightness axis, were at this point undetermined. Also not yet determined was the degree of rotation of the samples in the chromatic plane with respect to the primary axes of that plane such that unique hues would be represented by the most chromatic axial samples of the atlas.

In order to determine some of these missing factors, three scales of three colors each were made according to the then existing estimated scaling factors of the new system, and the visual experiment was repeated with 50 observers by substituting the three newly made scales for three of the previously used scales. The three remaining scales from the original experiment were then used as anchors to the previously known scaling. From this experiment new scaling factors were derived, and substituted into the model equations (continued).

PROJECT COMMITTEE #45: PHYSIOLOGICAL RESPONSE TO COLOR

The fundamental aim of ISCC Committee #45 is to classify and define how color influences human physiology, psychology, and behavior in order to improve use of color in the human environment. During 1989-1990 this committee has sought to clarify its scope and specific objectives with the guidance of the ISCC Board. Currently, there are four main areas of work which concern the committee:

- To develop the appropriate terminology and definitions for describing the effect of color on human physiology, psychology, and behavior.
- To conduct experiments to generate data necessary to define human physiological response to color.
- To conduct experiments to study the effects of color on human psychology and behavior.
- To create an active network of individuals who are interested in the work of this committee and who will freely exchange published information.

During 1989-1990 the committee has made significant progress in each of these areas. Specifically, library and computer searches on the topic of how color influences human physiology, psychology and behavior were run and a file of published references, articles and books were organized into a central numbered file. In addition to this reference system, a mailing list of individuals willing to share published, professional or personal information on how color influences human physiology, psychology an behavior was created. Copies or references of this information were distribute to all members who made requests. Currently, the committee is organizing an "electronic" network consisting of phone numbers, computer modem numbers, Bitnet numbers, and fax numbers of the individuals who wish to interact in this committee work.

In the area of new research, the committee pooled talents to design two protocols for testing the effects of specific wavelengths of light on cardiovascular functions in normal humans. The experimental protocols were presented to both ISCC and AIC members for review and critique of all aspected of the study. Each experiment on the effects of different wavelengths on cardiovascular function was run on sixteen normal humans, and the preliminary results were reported at the annual ISCC meeting in Cleveland. A third study on the effects of different wavelengths on cardiovascular function is now underway. It is anticipated that the results from this series of experiments will be written for submission to *Color Research and Application.*

The committee has recently determined that it would be useful to establish a short set of guidelines for conducting human studies involving color. Briefly, four aspects of experimentation are to be outlined: stimulus control, subject selection, measurement of dependent variables, and data analysis. Several committee members expressed willingness to work on such a document over the next two years with the ultimate intent of publishing it as an ISCC Technical Report. *Walter Granville, Chairman Emeritus, George Brainard, Ph.D., Magenta Yglesias, ASID, co-chairs, Committee #45*

(From page 7) In a third experiment also using 50 observers, the new scaling factors were tested by again substituting three scales of the three samples each derived from the current equations to test the scaling factors' magnitudes against each other, and against an achromatic scale which was also substituted in the third experiment.

Toward the end of this year, the Committee derived a simplified model leading to the lightness scale. This expression is simplified in that it is stated in cube-root terms replacing what had previously been a complicated expression. In addition, the new expression does not require transfer to another equation at low values of lightness as do both the CIELAB and the Committee's previously used expression for lightness.

Hugh Fairman presented much of the details on the above at the Committee's annual meeting in Cleveland. *Hugh S. Fairman, Chairman, Committee #44*

PROJECT COMMITTEE #46: SPEAKERS BUREAU

The speakers bureau project committee met at the 1990 Annual Meeting in Cleveland, OH. 25 names are currently on the Speakers Bureau list which was distributed to members in attendance. A new application form was given to the attendees so that updates could be submitted.

So that the application could be published in the July-August issue of the News a copy was given to the editor at the Annual Meeting. All information collected will be incorporated and presented to the Board of Directors at their February meeting. Upon approval, the speakers bureau list will be distributed to the membership.
Stephen F. Bergen, DDS, Chairman, Committee #46

Editors Note: I failed to incorporate the application.—I just plain lost it in my computer and had already disposed of the hard copy—that' ll teach me to back up my hard disk frequently! Your chairman did his best and I am still wiping the egg off my face.

PROJECT COMMITTEE #47: COLOR EDUCATION RESOURCES

The Committee meeting in Cleveland on April 22, 1990 tentatively defined its scope and objective, subject to approval by the ISCC Board of Directors:

Scope: To list and to describe materials and demonstrations useful as aids for teaching color.

Objective: To collect a list of education resources with descriptions and to publish them in ISCC NEWS and/or in a technical report or in *Color Research and Application.*

Members of the group listed demonstrations of which they were aware:

A light box and colored filters can be used to demonstrate additive and subtractive mixing. A variation uses overhead projectors. Munsell has Maxwell disks for demonstrating partitive mixing.

Copies of some slides used by Ralph

Evans in his lectures are available.

Isay Balinkin had several useful teaching aids and will be contacted by the Committee.

Demonstrations were discussed for color rendition of spectral verus broad-band yellow, simultaneous contrast, color vision effects and producing daylight sources.

Those who have ideas or materials to contribute to the Committee are asked to contact Prof. Frederick T. Simon, P.O. Box 391, Clemson, SC 29633. Telephone (803) 654-4699, Fax (803)654-6564 *Harry K. Hammond III, Acting Secretary, Committee #47*

CALENDAR

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

Harry K. Hammond, III
BYK-Gardner, Inc.
2435 Linden Lane
Silver Spring, MD 20910

(301) 495-7150 FAX (301) 585-4067

1990

AATCC - ANNUAL MEETING, Sept. 30-Oct.3
American Association of Textile Chemists and Colorists, Sheraton Hotel; Boston, Massachusetts. Information: AATCC, (919) 549-8141.

SPSE 6TH INTERNATIONAL CONGRESS, Oct. 21-26
Advances in Non-Impact Printing Technologies Black & White and Color with Exhibit, Orlando, Florida. Information: Pam Forness, (703) 642-9090.

UCLA COLOR DOPPLER, Oct. 25-27
University of California, Los Angeles' Second Annual Color Doppler, Beverly Hilton Hotel, Beverly Hills, California. Information: Kathy Oss, (206) 937-0355.

USNC/CIE ANNUAL MEETING, Oct. 28-30
U.S. National Committee of CIE, Keller Conference Center, The Pennsylvania State University, University Park, Pennsylvania. Information: Dr. Craig Bernecker, (814) 863-2041.

FSCT, Oct.29-31
Federation of Societies for Coatings Technology, 68th Annual Meeting and 55th Paint Industries's Show, Convention Center, Washington, District of Columbia. Information: (215) 545-1506.

OSA ANNUAL MEETING '90, Nov. 4-9
Boston, Massachusetts. Information: Optical Society of America, 1816 Jefferson Place, N.W., Washington, D.C. 20036. (202) 223-0920.

AMERICAN CERAMIC SOCIETY SECOND INTERNATIONAL CERAMIC SCIENCE & TECHNOLOGY CONGRESS, November 12-15
ACerS Electronics Division, Symposia on Glasses for Electronic Applications; Ceramic Superconductors; Ceramic, Polymer and Metal Matrix Composites. Orlando, Florida. Information: The American Ceramic Society, Inc. 757 Brooksedge Plaza Dr., Westerville, OH 43081.

1991

WILLIAMSBURG CONFERENCE, Feb. 24-26
Colorfastness to Light, Colonial Williamsburg, Virginia. Information: Jacqui Welker, (216) 671-0050.

SPIE/SPSE SYMPOSIUM, Feb. 24 - Mar. 1
Electronic Imaging Science and Technology, San Jose Convention Center, San Jose, California. Information: SPIE, P. O. Box 10, Bellingham, WA 98227-0010, (206) 676-3290.

CMG - SPRING MEETING, Apr. 7-9
Color Marketing Group Spring Meeting, Hyatt Regency, Dearborn, Michigan. Information: Nancy Burns, (703) 528-7666.

COLOUR AND APPEARANCE IN FOLKLORE AND DISPLAY, Apr. 13
Sponsored by the Colour Group (G.B.) and the Folklore Society at the Institute of Classical Studies, Gordon Square, London, England. Information: John Hutchings, 6 Queen's Road, Colmworth, Bedford MK44 2LA.

ISCC ANNUAL MEETING, May 5-8
Held jointly with CAUS, Doral Inn Hotel, New York City, New York. Information: Evelyn Stephens, (212) 760-7871.

SOCIETY FOR INFORMATION DISPLAY INTERNATIONAL SYMPOSIUM, May 6-10
The 27th Annual Symposium, Seminar, and Exhibition at the Anaheim Convention Center, Anaheim, CA. Contact Jay Morreale (212) 620-3371

AIC INTERIM SYMPOSIUM, COLOUR & LIGHT, Jun. 24-29
Sidney Australia. Information: The Colour Society of Australia, P.O. Box 63, Concord West, N.S.W. 2138, Australia.

CIE 22ND SESSION, Jul. 2-11
International Commission On Illumination, Melbourne, Australia. Information: Dr. J. D. Scandal, Central Bureau, A-1030 Veiny, Kegelgasse 27 Austria, or Dr. Jack Hsia, (301) 975-2342.

PRAKESH 1991, Oct. 7-13
Indian Society of Lighting Engineers, International Trade Fairgrounds, New Delhi, India. Information: H. S. Mamak, Indian Society of Lighting Engineers, c/o Philips India, 7th Floor, Hindustan Times, Kasturba Gandhi Marg, New Delhi, India 110 001, Tel. 3314328, 3318370, Fax. 3316839.

AATCC - ANNUAL MEETING, Oct. 8-11
American Association of Textile Chemists and Colorists, Convention Center, Charlotte, North Carolina. Information: AATCC, (919) 549-8141.

CMG - FALL MEETING, Nov. 3-5
Color Marketing Group Fall Meeting Hyatt Regency, New Orleans, Louisiana. Information Nancy Burns, (701) 528-7666.

OSA - ANNUAL MEETING, Nov. 3-8
Including OPTICON '91, San Jose Convention Center, San Jose, California. Information: Optical Society, (202) 223-0920.

1992

ISCC - WILLIAMSBURG CONFERENCE, Feb. 23-26
"Comparison of Color Images Presented in Different Media" cosponsored with TAGA, Colonial Williamsburg, Virginia. Information: Milton Pearson, (716) 475-5290.

ISCC - ANNUAL MEETING, Jun. 21-24
Nassau Hotel, Princeton, New Jersey. Information: Allan B. J. Rodrigues, (313) 583-8245.

AIC INTERIM SYMPOSIUM, Jun. 23-24
Computer Colorant Formulation, Nassau Hotel, Princeton, New Jersey. Information: Allan B. J. Rodrigues, (313) 583-8245.

AATCC - ANNUAL MEETING, Oct. 4-7
American Asssociation of Textile Chemists and Colorists, Hyatt Regency, Atlanta, Georgia. Information: AATCC, (919) 549-8141.

OSA - ANNUAL MEETING, Nov. 15-20
Including OPTICON '92, Boston, Massachusetts. Information: Optical Society, (202) 223-0920.

MEMBERSHIP IN THE ISCC

IS OPEN TO EVERYONE INTERESTED IN COLOR!!

For further information and membership application, please fill out the items below and mail to the address shown.

Your name _____

Address _____

City_____ State____Zip _____

MAIL TO: Ms. Anne Laidlaw **OR:** Tel: (919) 274-1963
Shelyn Incorporated FAX: (919) 274-1971
1108 Grecade Street
Greensboro, NC 27408

The ISCC is composed of both individual members and member bodies who have an interest in color. If you are a member of a national organization that might be interested in this affiliation, please indicate its name below and we will get in touch with you about it.

Organization _____

Your Phone No. (daytime) (_____)_____

NEWSLETTER EDITOR:

Mrs. Bonnie K. Swenholt

Send material for publication (photos should be black and white if possible) to the editor at:
5717 Gulick Rd.
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If possible, 5 1/4 inch diskette with ASCII text file for MSDOS, or send via MODEM:
Tel. (716) 229-5925

Or send material to Mr. Michael Hammel at:
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For hard copy transmission, FAX to
(716) 425-2411.

Or send to Dr. Ellen Carter:
2509 N. Utah St.
Arlington, VA 22207

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Dr. Romesh Kumar	American Hoechst Corporation, 129 Quidnick St., Coventry, RI 02816	(401) 823-2161	(401) 823-2700

ISCC MEMBER-BODIES

American Association of Textile Chemists and Colorists (AATCC)
American Chemical Society (ACS)
American College of Prosthodontists (ACP)
American Psychological Association (APA)
American Society for Testing and Materials (ASTM)
American Society of Interior Designers (ASID)
American Society for Photogrammetry and Remote Sensing (ASPRS)
The Color Association of the United States, Inc. (CAUS)
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Optical Society of America (OSA)
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