Inter-Society Color Council *News*

Number 333 September/October 1991

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THE COMPUTERWORLD SMITHSONIAN AWARDS

WINDOWS by ISCC member Anna Campbell Bliss was one of the finalists in the Media, Arts and Entertainment section of the 1991 Computerworld Smithsonian Awards.

WINDOWS 1989-90 is a unique effort to bring computers into the mainstream of art for a major mural at the Data Processing Center, Utah State Capitol. The computer was the inspiration, the subject and major tool in creating the mural. Other finalists included: 11th Asian Games; Capital Cities/ ABC, Inc.; Thames Television; and the winner, The Tenderloin Times.

Established in 1989, the Computerworld Smithsonian Awards program was created to search out and publicly honor those men and women who are applying information technology, to the broadest range of needs, to make our planet a more humane, healthy, and cooperative place to live. In marking their achievements, we demystify technology and further empower people to use it as a tool for positive change. Award winners are showcased in a major exhibit on the history of information technology at the Smithsonian Institution's Museum of American History.

ACS HAS A NEW PRESIDENT

Lawrenceville, New Jersey, July 19, 1991

Terry Downes has been named president of ACS-Datacolor, world leader in computer control systems for the textile, paint, plastics, inks and printing industries.

Formerly executive vice-president of the company, Mr. Downes succeeds Donald R. Hall as president. Mr. Hall, a co-founder of Applied Color Systems, Inc., (ACS), predecessor to ACS-Datacolor, retired in June, 1991 after guiding the company to a preeminent position in the field of industrial color control over the past 20 years. Applied Color Systems, Inc. was one of the first companies to combine the power of computers with color measurement instruments for the formulation, matching, correction and production dispensing of colorants in industrial applications.

ACS-Datatcolor is the successor to Applied Color Systems, Inc., which was acquired by the Eichholf Group, Lucerne, Switzerland in 1989.

Mr. Downes has served in various management and senior executive positions with the company during the past 18 years, and will direct the expansion and integration of the Eichholf Groups' Color division products and services in the Americas. In addition to ACS-Datacolor, the Color Division includes Datacolor AG, Zurich, Switzerland and ICS-Texicon Ltd., Newbury, England.

In making the announcement of Mr. Downes' appointment, Werner Dubach, CEO of the Eichhof Group, cited the many key roles Mr. Downes has performed in contributing to the growth of customer service, software development, operations, sales and marketing management.

A textile chemistry graduate of North Carolina State University, Mr. Downes joined ACS in 1973 from Burlington Industries. He has an MBA in marketing.

The Lucerne-based Eichhof Group is an international company with holdings in the brewery, computer color control, and laboratory and commercial food production equipment industries.

PROBLEMS OF COLOR EDUCATION IN ART

Among the elements of art, color is unique in its teaching requirements.

Special methods and materials are needed, language must be defined (for example, chroma, intensity, and saturation are terms used interchangeably in art to describe the purity dimension of hue), and a potpourri of color theories has to be untangled to explain this seemingly protean, complex, and multifarious subject. No less than 20 distinct and individually quite beautiful color systems in two- and three-dimensional color models have been developed since Della Porta's first crude diagrams appeared in the 16th century. Information about color in art textbooks is often a confusing blend of a few of these experiments.

Basic Theory

Most color instruction in art is based on the traditional Red-Yellow-Blue, three primary colors method. This method is inherently incorrect. Any of several other principal-color models would provide a better theoretical foundation. Still, because of its long tradition and basic simplicity, the RYB theory has persisted. It has been interrupted only occasionally by color theories of a more exact nature. Not until recently, for instance, has the magenta-cyan-yellow subtractive primary system begun to replace the old basic RYB primary artist pigments.

Clear understanding of the basic principles of color structure, that is, the scientific principles underlying the theories of color, is needed to explain the complex character of color interaction which guides effective color response. The ordinary color-circle, gray-scale-analysis approach to teaching color is too simple and results are often misleading. Students require a theory of color based on knowledge of accurate concepts without the frustrations of contradictory empirical experiences.

Solution Models

The German chemist and color theorist Wilhelm Ostwald saw an analogy between the organization of color in a color model and musical notes in a scale. He saw his own color system as being equivalent to a finely tuned piano. A musician who learns piano on an out-of-tune instrument will probably be destined to an unhappy and frustrating future as a concert artist. What is seen by the art student is altogether as critical as the correctly heard notes of the piano for the music student.

Visually "tuned" devices are available in color, but they are expensive and seldom available in the classroom. Alternatively, students may be asked to make their own models—color wheels—or to learn color from slides and films of uncertain color accuracy. They are taught to mix complementary pairs of colors, sometimes under vague instructional guidelines like: "red and green are complementary colors". After exploring infinite possibilities for variations of red and green color combinations, students may never know at precisely what visual juncture the two colors really were complementary. Yet the sensitization of the complementary sense is a critical step in learning color.

Illustrated books as color solution models are usually of little help. A recent visual comparison of complementary color plates found in several different art books showed radically different visual solutions to the same color problems. Under these circumstances the student may be better off to avoid color instruction altogether than to rely on references of such dubious value.

Good visual materials on color improve perceptual skills and serve as a motivational tool for finding personal and satisfying solutions to color use. The absence of affordable color materials may be a major reason for the apparent

CALL FOR MACBETH AWARD NOMINATIONS

Every two years the Inter-Society Color Council is honored to be able to present the Macbeth Award.

This award was established in 1970 by Mr. Norman Macbeth, Jr., in honor of the memory of his father, Norman Macbeth, a founding member of the ISCC and founder of Macbeth Daylighting Corporation, now a part of Kollmorgen. It is presented every second year for outstanding recent contributions to the field of color.

Nominations for the Macbeth Award are now being considered by the Macbeth Award Committee, Roy S. Berns, Chairman. Individuals or groups of individuals interested in having a specific nominee considered by the committee should submit nominations by October 1, 1991. Candidates will be judged for their recent significant contribution to any field of interest related to color whether or not it is represented by an Inter-Society Color Council Member Body. The candidate's contribution may be direct, it may be in the active practical stimulation to the application of color, or it may be an outstanding dissemination of knowledge of color by writing or lecturing, based on original contributions by the nominee. Candidates need not have been active in the affairs of the Inter-Society Color Council but the must be either a current or former member of the ISCC. Requests for nomination forms should be directed to:

Dr. Roy S. Berns, Macbeth Award Committee Chairman
RIT Center for Imaging Science
P.O. Box 9887
Rochester, NY 14623-0887
716-475-2230 FAX: 716-475-5988
INTERNET: rsbpph@ritvax.isc.rit.edu

lack of carryover of color learning experiences from basic design exercises. The retention of a learning experience is known to be directly related to its reinforcement. There is a need to relate classroom theories to pragmatic reinforcing experiences in such a way that the basic knowledge to describe both academic and practical examples of color use is retained.

Curriculum

The artist Henri Matisse said the essence of drawing is line; the essence of painting is color. His way of separating the categories of drawing and painting is perhaps inapplicable to the modern view of art which recognizes no such categories. But the statement nevertheless identifies some irrationalities in art education that are difficult to explain. Drawing courses are intended in part to be a means of strengthening the early basic design experiences in line and other compositional concerns. Color is almost always purposely omitted from drawing instruction. But in the sequence of courses, drawing may be a prerequisite to, for example, painting. Consequently, a student entering a painting course for the first time quickly falls back on drawing skills and may even view color as a frightening prospect. As a result beginning painters may be set virtually adrift in a sea of confusion regarding color. They spend the better part of their early painting experiences not learning how to paint but trying to somehow integrate previously neglected and formerly unclear, possibly invalid and essentially impractical knowledge about color into their work.

Courses designed to give to color as an element of art the emphasis enjoyed by line would be a useful curriculum change. Color is learned, a premise that has for some time stood as a reason for incorporating the teaching of color into art courses. Yet certain recurrent notions that it should, or can, be taught concurrently with painting or other applied studio practices fail to recognize the problems of teaching color.

Kenneth E. Burchett
University of Central Arkansas

COLOR & LIGHT '91

AIC Interim Conference, Sydney, Australia

A Unique View As Seen Through The Eyes Of Harry K. Hammond III

The conference was held June 25-28, 1991, in the Powerhouse, Australia's largest museum. The old power house was completely renovated to provide four floors that contain a wide variety of exhibits in four categories, including (1) Creativity and Australian Achievement, (2) Everyday Life in Australia, (3) Science Technology and People, and (4) Decorative Arts.

The Coles Theater, where all the papers were presented, has 180 fixed tiered seats, so that everyone in the audience has an unobstructed view of the speaker and the projection screen. Poster papers and exhibits of vendors were displayed on another floor. There were 142 pre-registered participants from 18 countries, 87 from Australia, 15 from USA, and 1 to 6 from other countries. There was a total of 22 accompanying persons, 9 from the USA.

Registration took place on Tuesday morning at the Sydney Opera House located on Bennelong Point, adjacent to Sydney Cove. Tea, coffee and biscuits were served in the Northern Foyer where old acquaintances were renewed and new friends were made while enjoying the spectacular view of Sydney Harbour and its famous bridge. A quartet from the Cove Chamber Orchestra played selections of popular music. The short welcoming ceremony included speeches

IS&T SYMPOSIUM SLATED TO FOLLOW PRINT '91

The Society for Imaging Science and Technology (IS&T, formerly SPSE) will conduct its Second Symposium on Electronic Prepress Technology and Color Proofing, September 11-13, 1991 at the McCormic Center Hotel in Chicago, Illinois immediately following PRINT '91.

"This year's theme, 'Imaging in a Global Environment', is intended to help provide a global view of state-of-the-art electronic image scanning and processing, as well as emerging technologies that will alter or supplant the more traditional methods for page makeup during prepress operations," said I.V. Runyan, symposium chairman. "In support of this theme, we will have technical and applications papers presented by experts from around the world."

A total of 90 papers, covering topics ranging form electronic pagination systems to environmental challenges, will be presented. In addition, there will be five tutorials and 15 poster presentations.

A keynote address will be given b y W. Ed Tyler, group president of the Documentation Service Group at R. R. Donnelley & Sons, at the Wednesday night banquet. C. Harold Gaffin, vice president and general manager of the Graphic Imaging Systems Division at Eastman Kodak, will be the featured speaker at the Thursday luncheon.

IS&T is an international non-profit society whose goal is to keep members aware of the latest scientific and technological developments in the field of imaging through conferences, journals and other publications. IS&T focuses on imaging in all its aspects, with particular emphasis on silver halide, non-impact printing, electronic imaging, photofinishing, image preservation, pre-press technologies and hybrid imaging systems.

To register or to receive the complete listing of papers to be presented, call IS&T at (703) 642-9090, FAX (703) 642-9094, or write 7003 Kilworth Lane, Springfield, VA 22151.

by Dr. Alan Robertson, President of AIC and by Dr. Peter McGinley, President of The Colour Society of Australia.

After the opening ceremony, participants and accompanying persons boarded a modern Captain Cook Cruiser for a luncheon cruise of Sydney Harbour, past the spot where Captain Cook first landed in 1788, past Garden Island, the home of the Australian Navy, and along the shores where some of Sydney's finest homes are located.

The organizing committee published a 24-page printed provisional program that listed the papers to be presented on the three days. However, this publication was superseded by a booklet marked "Abstracts" that provided an up-to-date list of papers to be presented in the nine scheduled sessions. It also included an abstract of each paper together with an author index.

In addition to the special lecture on the occasion of the acceptance of the Deane B. Judd AIC Award, 47 papers were scheduled to be presented together with ten poster papers. An excellent alphabetical list of participants was provided that included title, name, mailing address, country represented, telephone and fax numbers, as well as lodging in Sydney when known.

Another booklet provided a picture and biographical sketch of each author and co-author. All this material was very useful at the meeting and will continue to be useful long afterward. Bryan Powell, Chairman, and his eight-man organizing committee did an excellent job of planning and carrying out this AIC Interim Conference. They performed a truly miraculous feat when you consider that the Australian Society was formed only five years ago.

On the other hand there were things that could be improved when the next conference is organized. There is always the question of how many papers to accept and on what basis to reject some papers. Some participants felt that too many papers were accepted. The schedule showed the allotted time for each keynote or invited paper to be 30 minutes and all others 20 minutes. This amount of time was to include discussion. Because many authors used the entire time for presentation there was either no discussion or else the subsequent papers were begun late. Each day it seemed that after the first presentation the chair could not adhere to the schedule if discussion were permitted. A number of participants felt that intelligent discussion would have added much to the conference.

The latter half of the second full day was allotted to the Poster Session. The banquet was held that evening, from 7:00 p.m. till midnight, at the Sydney Cove Passenger Terminal. It was a beautiful banquet with delicious food and drink. It was an expensive banquet even though it was subsidized in part by Dulux Australia (ICI Paint). At the banquet the Deane B. Judd AIC Award medals were presented to the joint awardees, Johannes Vos and Pieter Walraven, for their vision research at the Institute for Perception TNO, Soesterberg, The Netherlands. The citation was read by Dr. Stephen Dain, School of Optometry, University of New South Wales, Kensington, NSW. The medals were presented by Dr. Alan Robertson, President of AIC.

The Dulux awards were presented at the banquet between courses of the meal. "Dulux" is a registered trademark of ICI Australia Operations Pty Ltd. The Dulux Colour Award program was introduced by Dulux Australia in 1986 to recognize the powerful impact of color on architectural design and to reward creative vision. Projects are classed in five categories: Residential Interior, Residential Exterior, Restoration, Commercial Interior and Commercial Exterior.

This year there were over 150 entries competing for over $A11,000 in prizes and an overseas study tour. The 1991 awards were for projects completed during the past three years using Dulux brand paint. After the banquet, everyone was presented with a lovely 40-page booklet containing large, beautifully reproduced, color photographs of each winning project as well as those receiving commendations. Smaller prints (30 x 35 mm) were provided for every entry. The designations of the Dulux paint used in each project were also given. In addition to excellent food the banquet also included fine wines, and at the end, liquor and coffee, after which dancing was permitted. However, a five-hour banquet after a full day of meetings makes for a long evening and some of us felt the need to leave early to retire and be ready for the third day of the session.

To return to the technical program, the lecture on the occasion of the acceptance of the Deane B. Judd AIC Award was titled "Back to Helmholtz". It was delivered by Dr. Johannes Vos, the day after the banquet, at SESSION 8.

As is often the case some of the invited and contributed papers were judged to be of more interest than others. The interests of the listener may be responsible for his individual judgments. It is hoped that each author of original work or of a comprehensive review will submit a manuscript for publication in a journal such as Color Research and Application.

Your reporter would like to include a brief abstract together with the title and author of each paper, but the editor of a Newsletter frequently may not wish to allot many pages to one report; so many papers are listed only by title and author. Even a simple listing of title, author and country, let alone mailing address, for 47 papers will take considerable space, but a listing seems to be in order to indicate the variety of topics and the individuals involved in color activity in various parts of the world. This report will therefore contain at least a listing of all papers and authors. It will contain brief discussions of papers that the reporter, and some others, deem of more than passing interest. Papers are listed according to the session at which each one was presented.

SESSION 1. LIGHTING FOR COLOR ASSESSMENT AND REPRODUCTION

Colour Assessment in Industry, Peter McGinley, Res. & Dev. Labs., Dulux, Australia, P.O. Box 60, Clayton, Victoria 3168. Customer approval of a color in an industrial situation requires patience, color matching skills, negotiating power, and luck. The ideal of an exact color match, sought by many demanding customers, can neither be achieved by the supplier nor afforded by

the customer. Ability to judge the customer acceptability of a match became the color matcher's greatest asset. Progress has been made toward formalizing acceptability by use of controlled viewing conditions, application of instrumental measurements, and statistical analysis of data. The recent adoption of supplier quality assurance techniques requires the responsibility for the color match to be assumed by the manufacturer, as it has been for some time in the case of physical and chemical properties. The problem of specification now becomes one of "fitness-for-use," and this is the responsibility of the manufacturer.

The Draft Australian Standard: Colour-Lighting Booth for Visual Colour Assessment. Standards Australia Committee CH/3/9, John Bolton, Chairman, P.O. Box 4, Wentworthville, N.S.W. 2145, and committee members S. J. Dain, M. Luescher, A. Maxwell, P. McGinley, R. Parsons, B. Powell, and R. C. Wright. In the process of revising Australian Standard 1580.601.1, "Colour—Visual Comparison," the Committee found it necessary to draft a product standard for a light booth. A draft of this standard is available and comments will be appreciated.

Methods of Selecting Light Sources for Colour Assessment and Reproduction, Bryan Powell, Sr. Engr., Fed. TV Tech. Services, Aus. Broadcasting Corp., 7 Gary Street, Castle Hill, NSW 2154. Lamp manufacturers continuously search for ways to produce more light, more efficiently, and from smaller sources. Sources now available range from the warm color of incandescent lamp light to the cool blue of daylight, but they may have undesirable color rendering properties. When selecting a light source for color assessment, one should consider the spectral characteristics of the objects, the spectral sensitivities of the observers, and their chromatic adaptation. New methods have been developed to assess the suitability of light sources for color matching and for television color rendition.

Colour Matching Using Fluorescent Lamps and the Judgment of the Whiteness of Papers, Ursula Schulz, FOGRA — Institut, Streitfel Str. 19, D 8000 Munich 80, Germany. To simulate standard illuminants such as D65 or D50, luminaires with fluorescent lamps are used in photography and printing. The quality of the light obtained from them can be tested by using the relevant CIE methods. The uniformity of illuminance must be evaluated. Whiteners in printing papers can affect the perceived color match.

Lighting for Color Vision Examination — An Outline of the Problem, Dr. Stephen Dain, School of Optometry, University of NSW, P.O. Box 1, Kensington, NSW 2033, Australia. The effect of fluorescent tube sources on results obtained with Ishihara Tests depends on the individual color plate. The goal is to list suitable sources for each color-vision test and then establish a criterion for all tests.

Quality of Daylight Simulators, Prof. Dr. Heinz Terstiege, BAM, Unter den Eichen 87, D — 1000 Berlin 45, Germany. The required quality of simulated daylight illuminants depends on the task. For general illumination, the most unsaturated colors must appear as though illuminated by natural daylight. In 1968 the CIE introduced the "Color Rendering Index (CRI)", but it is inadequate for saturated colors. Spectral power distributions (SPDs) of common lamps were evaluated for: integral errors, metamerism and color rendering indexes and color difference of their SPD of D65.

AIC INTERIM CONFERENCE

Personal Observations by Christina Burton

During the conference in Sydney from June 25-28 1991, colleagues from around the world gathered, many old friends and new. The talks and events were worthy of a trip almost half way around the world. I could write about the beauty of Australia and graciousness of her people for pages, but instead will capture moments and special times that happen when international conferences or "conventions" are scheduled.

During one of our lunches, a group of designers and scientists discussed the ever changing world of advanced technology and communications. Enjoying good company and a multicultural group, we wondered if teleconferencing would ever replace our "conferences"? Perhaps, however so many of the spontaneous, interchanges that occur would be missed. How can the variety of events be replaced over the phone lines? You would never hear some of those stories, meet significant others and spouses of colleagues and—yes—have fun!

One area that I have participated in, and observed, is a valuable return on my American dollar and this never seems to shrink. Probably, the most significant occurrence is the continued and increased interaction between the various disciplines, especially design and science. As an ISCC and AIC participant and presenter since 1983, I continue to acknowledge the need and value of these interactions for the livelihood and pursuit of each of our goals.

How could you capture the events of the interesting, colorful bus tour between Sydney and Melbourne to the CIE Congress in Melbourne, Australia? This journey created the opportunity to observe some colorful scenes and characters.

Discussions with a wide range of color specialists representing a variety of cultures, ages and experiences is so vital to our networking and to challenging ourselves and our work. No, none of us work in a vacuum, not even a colored one.

Colleagues were missed, those we wish to see more often and those who unfortunately we will not see until the end of time. My heart and prayers go out to their families as their work will lead us on.

Christina M. Burton
COLOR AND DESIGN for Health Care

Simulating Surface Colors on CRT Displays: The Importance of Cognitive Clues, Dr. Roy Berns and Mark Gorzyniski, Munsell Color Science Laboratory, RIT, Rochester, NY, USA. In order for image elements of a CRT display to appear as related surface colors, we hypothesize that there must be cognitive clues so that the color of the illumination will be discounted when adaptation is incomplete. The hypothesis was tested by requiring observers to make judgments of neutral in colored images presented (1) on a CRT, and (2) as photographs in an office environment under tungsten and fluorescent daylight illumination. Results indicated that the state of observer chromatic adaptation was primarily dependent on image areas and not on the surrounding environment. When viewing photographs, observers discounted ambient illumination. With CRT images, discounting of the illumination occurred only when appropriate cognitive information was added to the images.

Thresholds and Scaling of Light and Color by an Opponent Model of Vision, Prof. Dr. Klaus Richter, BAM, Berlin. Scaling of achromatic colors depends on the luminance and chromaticity of samples and surround. Perceived color difference also depends on presentation time, illuminance and subtense of samples. An opponent model of color vision involves central and surround luminance and chromaticity and presentation time. Threshold and scaling experiments can be described in terms of two opponent processes, white-black, red-green, yellow blue. For presentation times of the order of 0.1 s, one of the two processes is more sensitive, and it determines the thresholds. For presentation times greater than one second, a linear summation of the two process signals fits the scaling experiments.

SESSION 2. COLOR IN THE VISUAL ARTS AND ARCHITECTURE

Light and Color in Environmental Design (keynote address), Prof. Werner Spillmann, Winterthur Polytechnic Dept. of Architecture, Switzerland. Permit me to attempt to relate science to design. Architects and designers devote their time to creation of a suitable environment for human activities. Although much scientific work has been done in the field of colour, the design-relevant problems concerning effect of colour in the environment await further investigation. Color designers welcome every scientific study that offers real help. But there are questions that today have no scientific answers. For environmental designers, it is not enough simply to learn more about colour. They need to develop colour sensitivity and comprehensive visual awareness in real environments. Before this can happen they need to understand that colour and light are important space-modifying design means that are still widely neglected. (Spillmann's lecture was based primarily on pictures because he believes that the sensual experience in real environments is needed to convince architects and designers that they must pay more attention to light and colour.

Colour and Architecture. The Coloring of the Crystal Palace for the Great Exhibition of 1851 in London, Prof. Giovanni Brino, Torino, Italy.

So what is New About Colour? Interior Design Colour Schemes in 1870 and 1970, Mr. David Denne, Killara NSW, Australia.

Color and Light: The Visual Reality of Architectural Space, Prof. Alexander Styne, University of Miami, Florida, USA.

Impact of Colour and Light on the Office Environment — A Breakthrough Study, Dr. Nancy Kwallek, Univ. of Texas, Austin, USA, C. M. Lewis, and J. Dilling.

Hong Kong Housing Harmony Chromatic Chart, Mr. Michael Cler, Atelier Cler, Paris, France.

Color & Light: A Post-occupancy Evaluation of a Student Health Centre, Prof. Christina Burton and Christine Anderson, Univ. of Texas, Austin, Texas, USA.

Entropy and Colour, Ms Wendy Light, Victoria University, Wellington, New Zealand.

Light and Colours in Chinese Architecture and Architectural Paintings, Yang Chung.

SESSION 3. COLOUR EDUCATION

Colour Science Education in the 1990s, Dr. Roy Berns (Keynote Speaker), RIT, Rochester, NY, USA. Educators have approached teaching colorimetry from two metameric points of view: (1) Avoid it at all costs, or (2) Consider it a rare issue that can generally be ignored. The two positions resulted from two different applications: (1) In the coloration of materials, the goal is to match the spectral character of the standard. (2) In the second application the color is reproduced by means of a metameric match.

A colored stimulus can be matched metamerically by adjusting the amounts of three or four primaries. A group of scientists and engineers dealing with material colors now can use a cathode ray tube (CRT) display and color printers to simulate their product. Another color-reproduction group is using computer colorant formulation to calorimetrically characterize color peripherals. Some technologists have difficulty assimilating important information derived from the approach of the other group. At the Rochester Institute of Technology (RIT) Munsell Color Science Laboratory, academic and industrial education is provided for each of these groups which in our view will eventually become one.

Creative Colour Communication, Eva Fay and Prue Leith, School of Colour and Design, Sydney, Australia.

Colour Navigation, Eugene Maxwell-Smith, University of Newcastle, Director, School of Artists' Colours. Pigments have been evaluated by means of scientific colour measurements, and this has led to development of navigation charts to facilitate colour mixing. In art education, it may prove useful to treat colour not only as a subjective figment of imagination, but also as an objective fact, created by the interplay of light on tangible materials.

Localized Environmental Colour Palette, Peter Day, Cultural Development Coordinator, Wollongong City Council, NSW 2217, Australia. When deciding on colours for a built

environment, more concepts are needed than simply "Heritage Colours" or "Post Modern Pastels." A localized environmental colour palette provides a context in which decisions about colour relationships can be made that will result in a visual environment that can be stimulating, exciting and yet nurturing and sympathetic with the natural environment.

SESSION 4. COLOUR IN THE VISUAL ARTS AND ARCHITECTURE, PART B

The Relationship of Light-and-Shade to Colour in European Painting, Roy Osborne, The American College in London, England.

Colour in the Fourth Dimension, Paul Green-Armytage, School of Design, Curtin University of Technology, WA 6008, Australia. The colour of a surface can be given a name, number, or location in three-dimensional colour space, yet our appreciation of that surface is not complete without the element of time — the fourth dimension. The appearance of a surface can change with time and movement. Our identification of objects is assisted if we are conscious of these changes. For example, a change in the direction of the light may reveal that the surface is glossy. On the other hand, it may be helpful that we are not aware of a change in the spectral composition of the illumination. The implications of these changes were discussed, especially as they relate to those who apply colour and to those who measure it. Appearance can be affected by a change in distance, change in direction and colour of the light, and change in surface structure. Illustrations were taken from the work of artists who have addressed these issues; Claude Monet, Howard Taylor and Pete Sedgley. Colour changes in polarized light and those that accompany chemical reactions were demonstrated. Opportunities for designers to use such things as metallic films and pearlescent pigments were presented.

On the Subjective Colors of Stained Glasses, Prof. Lucia Ronchi, Florence, Italy, and Dr. Janos Schanda, CIE Central Bureau, Wien, Austria. Stained glasses have been used as window material in cathedrals, public buildings, and villas. The viewing conditions can be quite different. In a cathedral the low light level causes the observers vision to operate in the mesopic region. In modern buildings, high levels of illumination produce photopic adaptation of the observer. Results of experiments were presented in which stained glasses were viewed under different adaptation conditions. Special emphasis was given to explain some visual impressions gained by looking at blue stained glasses with different levels and spectral composition of exterior daylight. The question was raised as to whether the visual observations correlated with the colorimetric data when various stained glasses were classified so that their appearance could be predicted.

SESSION 5. INSTRUMENTATION FOR COLOUR MEASUREMENT

Making Meaningful Colo(u)r Measurements (keynote address), Prof. Frederick T. Simon, FTS, Inc., Clemson, South Carolina, USA. The marvel of modern color measurement technology has been developed over the past 25 years. In the author's view, five things have contributed to better applications of color measurement:

- Increased knowledge about color science gained from research.
- The economical microprocessor or personal computer.
- Much better color measurement instrumentation.
- Better computer programs for interpretation of data.
- Graphical presentation of color information.

What is most needed to benefit from the available elegant equipment is adequate training of the operating personnel. Those who must act on the reported data must also have an understanding of its limitations. In any application of technology it is necessary to train key people who are dedicated to the use of the equipment and who can evaluate the data. Several relatively simple things can be done to provide a foundation for reliability:

- Know the repeatability of any instrument and its supporting system.
- Have regular calibration checks of the instruments involved.
- Go back and review old color measurements for long- term behavior.
- Perform regular and thorough maintenance on instruments.
- Use color video displays of sample measurements to monitor data.
- Understand and use spectro-photometric curves.
- Look at the samples, not just the data.

The Sensitivity of Various Instruments in the Measurement of Small Colour Differences: A Comparison, Dr. Andrea Raggi and Dr. Giancarlo Barbiroli, Instituto di Merceologia, University of Bologna, Italy. This research compared small color differences measured on nine different makes or designs of instruments. Test panels were prepared by the application of films of uniform thickness of paint. A few basic hues were modified by the addition of controlled amounts of white paint and also by addition of black. The results revealed the sensitivity of instruments to measurement of color differences in several regions of color space.

A Modular Design Smart Colorimeter, L. Dobrentei and I. Reti of the Res.Inst.Techn Phys, Hunmg. Acad. Sci., Budapest, Hungary, and Dr. Janos Schanda, CIE Central Bureau, Wien, Austria. A universal colorimeter-photometer was constructed using modular design. The receptor optics is easily changed to measure luminance or illuminance. The measuring head contains microprocessor- controlled electronics. It can be connected to a portable data collector or to a personal computer. Software provides output in any CIE recommended colour space and direct information display of equivalent luminance of coloured lights in the photopic or mesopic region. Measurements can be made in 0/45 geometry, or the instrument can be used as a tele-colorimeter for on-line measurement.

Parameterising Colour-Difference Evaluation, Dr. Klaus Witt, Bundesanstalt fur Materialforschung und -prufung, Berlin, Germany. He pointed out that a review of published data

difference contours due to human factors, such as physiological and psychological conditioning of observers, and due to external factors like the presentation of a physical arrangement of the color differences to be judged. Some factors have been studied quantitatively by use of a visual colorimeter or by using physical specimens. The more important factors of recent interest are intra- and inter-observer variability under constant conditions, effect of sample size, sample separation, and color of surround. Data analysis has usually been done by ellipsoid fitting in colorimetric space, but results may depend on the specific space used. Up to now no exact physiological model of colour- difference perception exists that will predict either basic threshold contours or even parametric effects. The present status of parametric description is: Some factorial changes in colour-difference formulae according to lightness, metric chroma and hue are advised, but a deeper understanding of the reasons and possible functional dependence is missing.

Color Uniformity as a Food Quality Factor, Dr. Giancarlo Barbiroli and Dr. Andrea Raggi, University of Bologna and Dr. Palmira Mazzaracchio, University of Ancona, Italy.

As a food quality factor, colour can be measured either on an absolute scale or as a difference. For some food products, colour uniformity is a relevant quality parameter. The degree of non uniformity of some food products needs to be known in order to establish industrial tolerance limits. The adequacy of commonly available instruments and measurement methods needed to be investigated. To eliminate the effect of non uniformity of food color in the test designed to compare instruments, uniformly colored painted specimens were used. In this test the color-differences measured with the different instruments were comparable. When measuring non-uniform food samples, the different geometric features of the instruments influenced the results. Thus the conclusion that the most suitable instrument will depend on the characteristics of the food product surface.

SESSION 6. POSTER SESSION.

The titles and authors of the poster papers are given below.

1. Harmony or Discord? The Paradox of Discordant Colour Relationships, Ms Carol Arthur, Design Motivations, Sydney, Australia.

2. The Orchestration of Colour and Light in Nature and Art, Ms Doris-May Bull, Balmoral NSW, Australia.

3. Cone Sensitivity and Spatial Summation, Maria. L. F. de Mattiello, Jamie Carpinell, and Vincent Climent, Valencia, Spain.

4. Creative Colour Communication, Eva Fay and Prue Leith, Sydney, Australia.

5. Culture of the Colour in Spain, Begona Munoz Fernandez.

6. CMC(l:c) and BDF(l:c) Formulas Applied to Classical Color-Difference Thresholds, M. Melgosa, E. Hita, L. Jimenez del Barco, and J. R. Jimenez Guesta, University of Granada, Spain.

7. Coloroid Colour Harmonies at the Budapest Underground Railways, Prof. Antal Nemcsics, Technical University of Budapest, Hungary.

8. The Two Facets of Pseudocolour Technique, Prof. Lucia Ronchi and Franco Querciola, Italy.

9. New Approach to Colour Instrument Calibration, Prof. Frederick Simon, Clemson, SC, USA.

10. Eddie's Room — A Special Room for a Special Child, Magenta Yglesias, Jena International, Washington, DC, USA.

In the same area in which the papers were posted there were displays of instruments and literature. ABI Colour Australia displayed Minolta equipment as well as the Natural Colour System (NCS). A booth designated Advance Colour System (ACS) had ACS equipment. Macbeth exhibited their latest spectrophotometer, a Light Booth and the Munsell Book of Color. In another booth there was an exhibit of X-Rite Printing Technologies.

SESSION 7.

Colour in Astronomy, Dr. David Malin, (Invited Lecturer) Anglo-Australian Observatory, Epping, NSW, Australia. Colour information permits making profound statements about the birth, evolution and death of stars and about the evolution of stellar systems such as globular clusters and galaxies. An astonishing range of hues is also found in the tenuous gas and dust from which stars are born. Colour tells us about the condition and composition of these materials and offers important clues about size, shape, and dynamics of distant nebulae. However, most astronomical objects appear to be colorless to the eye, even when observed through the largest telescopes, but measurements reveal that there is colour. Now, new photographic processes reveal some of the faintest objects ever detected, and three- colour photography can now show the true colours of astronomical objects.

Goethe's Theory of Colours, Blanche Merz, University of Melbourne, Australia.

The Gem of a Thousand Lights, Michael Costello, James Costello, and Rudi Weber, The Opal Skymine.

Ideal Primary Colours: Theory and Relations with other Functions, Ralph Pridmore, Central Houses Pty Ltd, Australia.

Ergonomic Aspects of Colour Monitors, Gunnar Tonnquist, Royal Institute of Technology, Stockholm, Sweden. Computer monitors can produce positive or negative displays. Negative displays are usually used with monochrome screens having white, blue, green, or amber characters on a dark background. Operators find that white on back is tiresome and green on black can evoke disturbing pink after-images. Reasons for various choices and their implications was discussed with regard to ambient illumination and good colour fidelity in design and preprint work. All stimuli from a monitor a physically luminous, even when illustrating surface colors. How should screen colors be described? RGB values do not correlate with appearance, and HLS and HSV systems have serious errors. The Natural Colour System (NCS), although designed for surface colours, has been found useful.

SESSION 8. SPECIAL LECTURE ON THE OCCASION OF THE ACCEPTANCE OF THE DEANE B. JUDD AIC AWARD

Back to Helmholtz, Dr. Johannes Vos and Pieter Walraven (co-recipients), Institute for Perception TNO, Soesterberg, The Neterlands. (The lecture was presented by Dr. Vos. It will be published in full in a forthcoming issue of COLOR Research and Application.) The coincidence of the 1991 Award with the centennial of Helmholtz' line element for color metrics provided the incentive for the authors to rewalk their own pathway through color science and to show that it comes back to Helmholtz after some detours.

SESSION 9. COLOUR IN THE VISUAL ARTS AND ARCHITECTURE: PART C

Colour in Marketing: Is There Any Reliability In the Anticipation Of the Colours To Come? Dr. Leonhard Oberascher, Psychologist and Design Consultant, University of Salsburg, Austria.

Consumer acceptance of a product is influenced to a large extent by its appearance, determined by form, texture and colour. Colour is a most efficient tool for product marketing. It is the least difficult and thus the least expensive parameter to control. It serves as a powerful "visual code" for consumer product perception, revealing much about "style", "modernness", and "value". Successful product innovation and segmentation strategies depend on the reliability of the anticipation of new colour trends. Assessment of different trend anticipation methods requires inclusion of all relevant contributing factors. A theoretical framework needs to be established and contradictory theoretical and pragmatic approaches examined. The results of empirical studies were presented.

NCS, A Method for Determining Perceived Colours of Objects in Environment Observed Under Various External Conditions, Anders Hard and Thomas Hard, Scandinavian Colour Institute, Stockholm, Sweden. The Natural Colour System (NCS) represents a method for notation of colour percepts from objects in arbitrary situations. It is useful for colour analyses of objects in their environment. Colours of leafy trees were assessed from distances between zero and 20 km. With increasing distance the yellowness of green leaves began to disappear. Finally the trees appeared bluish, high chromaticness vanished while blackness and whiteness increased.

Comparison Between Aperture and Surface Colors, Prof. Tarow Indow, University of California, Irvine, USA. The colors we perceive daily are primarily of surface mode,whereas the majority of basic data were obtained with aperture mode. Comparisons between the two modes of appearance are made with regard to unique hues and discrimination ellipsoids. Color discrimination ellipsoids for real and simulated surface colors are compared, by matching and by the method of constant stimuli, with those for aperture colors. The matching procedure yields almost the same ellipsoids for both modes, but the method of constant stimuli gives larger ellipsoids than matching for aperture colors, though the ellipsoids are almost always the same in shape and orientation.

Cross-cultural Studies of Colour Meaning, Lars Sivik and Charles Taft, University of Goteborg, Sweden. Colour preferences and other aspects of colour meaning are of great interest to people in general,but particularly to behavioral scientists. Most of the hundreds of studies that have been conducted since the turn of the century lacked an awareness of the complexity of colour dimensions. This fact prompted the authors to conduct studies aimed at identifying and mapping the main dimensions of meaning in colour space. One question is how similar are the associations of colours in different cultures? Data have been obtained from Sweden, USA, Yugoslavia, and Russia. The same colours and the same 26 semantic variables have been used in each study. There appears to be general similarity between the groups, but some systematic differences have been identified.

Colour Appearance and the Effect of Simultaneous Contrast, S. A. R. Scrivener, Dr. Ronnier Luo, A. A. Clarke, LUTCHI Research Centre, Loughborough University and L. W. MacDonald, Crossfield Electronics Ltd, UK. One of the factors affecting colour appearance is simultaneous contrast. Previous studies have shown that the hue, saturation, brightness and spatial parameters of the central (test) stimulus and its surround all have an effect on the change in the perceived colour of the test stimulus. The apparent change in lightness, known as lightness induction, has been studied extensively, but less work has been done on chromatic induction, the effect on hue and colourfulness caused by the surrounding colour. Very recently work has been done in this area by use of CRT displays. In a recent experiment, five subjects were asked to estimate the magnitude of the lightness, hue and colourfulness of a sequence of CRT test fields. Nine different colours were used for the test field and the same nine were used for the surrounding induction field at four levels of lightness, a total of 333 combinations. The results support and add to the findings of previous studies. Lightness of the test field decreases with increasing lightness of the induction field. The effects of hue on hue appear to be opponent. Colourfulness is affected by both the lightness and the hue of the induction field, an effect not previously reported. A theory based on colour opponency and suppressional interaction between channels may explain the results.

Coloured Transparency Over an Undulated Surface, Prof. Osvaldo da Pos and Mirella Pietrella, University of Padua, Italy. The impression of transparency requires a clear depth distinction between the transparent surface and what is seen through it. This research was designed to show that a simple sinusoidal grating pattern provides a suitable stimulus. We have already shown that Metelli's mathematical model of phenomenal transparency holds for colour situations, provided the colours are measured in purely psychological scales. We have

NEW MEMBERS

We are pleased to list the latest members to the ISCC. Their names will appear in next years Membership Directory.

Welcome!

Mr. Ron Beck
Americhem Inc.
723 Commerce Drive
Concord, NC 28025 USA

Ms. Teresa A. Bell
Rosco Labs
82 Glen Avenue
Port Chester, NY 10573 USA

Ms. Gayle Ditzel
Nevamar Corporat ion
8339 Telegraph Road
Odenton, MD 21133 USA

Mr. Stanley V. Gravatt, Jr.
Izumi Corporation, Inc.
Yaphand, NY 11980 USA

Ms. Sharla J. Hoskin
Magic Image, Inc.
254 East Main Street
Carlisle, KY 40311 USA

Mr. Kevin Loughrey
Trans Mir Associates
20 Long Plain Road
South Deerfield, MA 01373 USA

Mr. Nathan M. Moroney
RIT
795 Sunflower road
Rochester, PA 15074-1161 USA

Mr. William L. O Haver
Package Products Flexible Corporation
P.O. Box 31428
Charlotte, NC 28231-1428 USA

Mr. Kendall Scott
BASF Corporation
26701 Telegraph Road
Southfield, MI 48034 USA

Mr. Allen H. Simpson
Hunter Associates Laboratory
Suite 200
114 Williams Street
Lancaster, SC 29720 USA

Ms. Susan K. Traub
Health East
1243 S. Cedar Crest Blvd
Allentown, PA 18103 USA

Mr. Andrew G. Trend
Department of Archeology
University of Southampton
Southampton S09 5NH UK

Ms. Jerilyn Caroso
Honda R&D North America
1900 Harpers Way
Torrance CA 90501 USA

Ms. Gertrude Casciano
Department of Art
Univ of Central Arkansas
1921 Romine Road
Little Rock AR 72205 USA

Ms. Samuelle Easton
Samuelle Easton & Associates
12 Charles Street
New York NY 10014 USA

Ms. Ann G. Elwell
Interphase
380 Mt.Auburn Street
Watertown MA 02172 USA

Ms. Bernice T. Glenn
Glenn & Associates
2020 S. Robertson Blvd.
Los Angeles CA 90034 USA

Mr. Daniel H. Johnson
Texas Instruments
5701 Airport Road
Temple TX 76503 USA

Dr. Peg Liebman
La Salle University
20th and Olney Avenues
Philadelphia PA 19141 USA

Ms. Martha G. Nossiff
Gleeful Color
774 Middle Street #3
Portsmouth NH 03801 USA

Mr. Albert Rowe
143 Wendell Avenue
Pittsfield MA 01201 USA

Mr. Eran Steinberg
Electronics for Imaging
950 Elm Avenue
San Bruno CA 94066 USA

Ms. Nora Olgyay
FOCI Studio
2707 Adams Mill Road, NW
Suite A
Washington DC 20009 USA

COLOR & LIGHT '91 from page 9

also shown that figural and chromatic complexity of the background enhances the degree of perceived transparency. Now the aim is to verify that the degree of transparency of a coloured rectangle over a bicoloured grid depends also on the contrast and frequency of the grid. Stimuli were produced by a computerized video display unit. Subjects had to vary the degree of transparency of a rectangle lying over a bicoloured grid (horizontal or vertical) at different frequency and contrast levels, until it matched with an analogous situation in which frequency and contrast were fixed. Results show that (1) the perceived transparency of the rectangles a nonotonic function of the grid contrast and (2) U-shaped function of the frequency, with a minimum at 2 cycle/degree.

The Orchestration of Colour and Light in Nature and Art, Doris-May Bull, Director, Simply Sensational Colour and Design, Northcote, Victoria, Australia.

Colour and Interior Design, Begona Munoz Fernandez, Spain. (Not registered, not present, paper not presented.)

Colour and Psycho-physiological Arousal, Dr. Byron Mikellides, Senior Lecturer in Architectural Psychology, Oxford School of Architecture, England.

The Psychological and Physiological Effect of Coloured Light, Kazunori Shimagami and Motoko Hihara, Beauty Culture Laboratory, Kanebo, Ltd., Industrial Products Research Institute, Japan.

Textural properties of the Traditional Materials and the Possibilities of Using These Materials, Today, Ayfer Aytug and Fikret Evci, both Associate Professors and Architects. (Not registered, not present, paper not presented.)

Harry K. Hammond III

MEMBER BODIES DELEGATION MEETING REPORT

A scheduled meeting of the ISCC Member Body Delegates was held during the ISCC Annual Meeting in New York.

Delegates attended from CMG, AATCC, SID, IES, HFS, DCC, CAUS. Delegates from ASTM, ACS, FCS attended the General Meeting and gave input, but were not available for round table discussions. The meeting was chaired by Jim DeGroff, Board Member Body Liaison and CMG Delegation Chair.

During a round table discussion, each of the Delegates reviewed their organization's orientation to color and its interest in ISCC. The over whelming opinion of the attending delegates was:

• The organizations see ISCC as a forum for communications of color interests from and to their area of special interest from and to the general color field.

• Most Delegates do not get specific direction from their organizations to bring to ISCC. It is felt that they represent themselves and their personal interests rather than their organizations.

• Most ISCC Member Bodies see their own organization as the place to sponsor and develop color research for their area of interest. They see ISCC as dealing more with problems of general or individual interest.

• All Delegates attending felt that more direction and communications is needed from ISCC to get their organizations and delegation involved with ISCC.

The Following are specific suggestions made by the meeting Delegates:

• ISCC should present more opportunities to communicate on color subjects. This would mean a greater variety of Interest Group Speakers, round tables, information exchanges and networking rather than more problems.

• Deadlines need to be made for Member Delegations to submit Member Body reports.

• The Member Body Delegation Chair must be active in ISCC and should be used as the major contact to get action from each Member Body. If the Chair is not active, the Member Body Chair should actively pursue the Member Body Officers to select a more active Chair.

• An update should be done on the history of ISCC. It should be distributed to new members and used as a recruiting tool.

A specific recommendation was made by the meeting Delegates:

Develop a specific color problem to be submitted to the ISCC Board of Directors from the Member Body Delegates to begin the development of a practical, limited, but current annotated bibliography in ISCC color subjects. It should be submitted by the Member Bodies and they should develop a methodology to keep it current and practical.

Jim DeGroff volunteered to prepare the draft. It will be circulated to the Member Bodies for review and comment, prior to submittal to the ISCC Board of Directors.

Dr. Joanne Taylor was introduced to the Delegation. Joanne will become the new ISCC Board of Directors Member Body Liaison with the retirement of Jim DeGroff from the ISCC Board.

Member Body Delegates can contact Dr. Taylor at Tektronix Laboratories, Telephone (503) 627-4911, FAX (503) 627-5502.

Jim DeGroff, Member Body Board Liaison

ROCHESTER INSTITUTE OF TECHNOLOGY (RIT)

How will digital technology transform the printing industry?

RIT is answering that question today with the creation of a multi-million dollar electronic and digital laboratory for printing and publishing. This unique facility will focus on the integration of these emerging technologies to achieve enhancements in quality and productivity necessary for printers to compete effectively in a rapidly changing and expanding marketplace.

The printing and publishing laboratory will provide graphic arts companies with an arena for learning to adapt new technologies to their current operations. It will concentrate on the evolving digital transfer, storage, manipulation, and output of images in black-and-white and color, and the integration of these methods with existing systems.

The printing and publishing laboratory will be one of several specialized areas within the Center for Integrated Manufacturing Studies (CIMS) facility. Others will focus on the fields of electronics, imaging, mechatronics, and advanced materials. Each area will consist of a real-time manufacturing bay surrounded by research and development laboratories and state-of-the-art training classrooms.

NEWS FROM MEMBER BODIES

COLOR MARKETING GROUP (CMG)

International ColorLink Award

Sydney A. Sykes, CV Home Furnishings, Ltd., is the first recipient of Color Marketing Group's International ColorLink Award. The award was presented at CMG's Spring International Conference held in Dearborn, Michigan April 7-9, 1991. The purpose of the ColorLink Award is to recognize extraordinary accomplishments in providing international color marketing information and to enhance CMG members' capabilities to exchange information with like-minded organiza-

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

1991 Annual Book of ASTM Standards

The Annual book of ASTM Standards (Vol. 14.02) contains the following items related to the appearance of materials:

Methods for:

E 306-71 Absolute Calibration of Reflectance Standards
E 430-78 Gloss of High-Gloss Surfaces by Goniophotometry,
D2616-88 Evaluation of Visual Color Difference With a Gray Scale
E 429-78 Reflecting Characteristics of Metallic Surfaces Using Integrating Sphere Instruments

Test Methods for:

E1392-90 Angle Resolved Optical Scatter Measurements on Specular Diffuse Surface
E 810-81 Cofficient of Retroflection of Retroreflective Sheeting
E1327-90 Color and Color Difference Measurements by Tristimulus (Filter) Colorimetry
E 308-85 Computing the Color of Objects by Using the CIE System
E1260-88 Determining Liquid Drop Size Characteristics in a Spray Using Optical Non-Imaging Light Scattering Instruments
E 97-82 Directional Reflectance Factor, 45-deg, 0-deg.
E1356-90 Flass Transition Temperatures by Differential Scanning Colorimeter of Differention Thermal Analyses
E1247-88 Identifying Fluorescence in Object-Color Specimens by Spectrophotometry
E 313-73 Indices of Whiteness and Yellowness of Near-White Opaque Materials
C 523-68 Light Reflectance of Acoustical materials by the Integrating Sphere Reflectometer
E1336-91 Obtaining Colorimetric Data from A Visual Display Unit by Spectroradiometry
E1349-90 Reflectance Factor and Color Using Bidirectional Geometry
E1348-90 Transmittance and Color by Spectrophotometry Using Hemispherical Geometry
E1331-90 Reflectance Factor and Color by Spectrophotometry Using Hemispherical Geometry

Practices for:

E 911-90 Color Measurement of Fluorescent Specimens
E 811-81 Measuring Colorimetric Characteristics of Retroreflectors Under Nighttime Conditions
E 808-81 Describing Retroreflection
E 312-80 Description and Selection of Conditions for Photographing Specimens
E 167-77 Goniophotometry of Objects and Materials
E 805-91 Identification of Instrumental Methods of Color or Color-Difference Measurement of Materials
E1164-91 Obtaining Spectrophotometric Data for Object-Color Evaluations
E1346-91 Obtaining Spectroradiometric Data from Radiant Sources for Colorimetry
E 809-90 Photometric Characteristics of Retroreflectors
E 259-66 Preparation of Reference White Reflectance Standards
D3134-89 Selecting and Defining Color and Gloss Tolerances of Opaque Materials and for Evaluating Conformance
E1360-90 Specifying Color by Using the OSA Uniform Color Scales System
E1345-90 Reducing the Variability of Color Measurements by the Use of Multiple Measurements
D4086-82 Visual Evaluation of Metamerism Guide for:
E 179-90 Guide for Selection of Geometric Conditions for Measurement of Reflection and Transmission Properties of Material

COLOR MARKETING GROUP (CMG) from page 11

tions or individuals from outside North America. Sydney A. Sykes was chosen for this award in recognition of his tireless efforts to promote an awareness of the importance of the international aspects of color marketing within CMG and, more specifically, of his successful efforts to forge a link with The Colour Group in England.

The Color Marketing Group is a non-profit international association of over 1,200 design and color professionals who forecast color directions one to three years in advance in all industries: consumer, contract, transportation, fashion, graphics, office and health care. Involved in the use of color as it applies to the profitable marketing of goods and services, CMG provides a forum for the exchange of non-competitive information on all phases of color marketing: color trends and combinations, styling and design, merchandising and sales, education and research. For more information please call: Color Marketing Group 703-528-7666 or write 4001 N. Ninth Street, Suite 102, Arlington, Virginia 22203.

COLOR RESEARCH AND APPLICATION

October 1991, In This Issue

We start this issue with an article from the color vision community, "Effects of Luminance Level on the Saturation Function: Sensitivities Based on Saturation Discrimination". The term saturation generally refers to the amount of chromatic color of an area judged in proportion to its brightness. The most saturated colors are the spectral colors. However, the saturation of spectral colors varies as a function of wavelength. The saturation function has been used to reflect the relative amounts of chromatic systems activity to that of the achromatic system, thus showing one of the fundamental properties of the color vision mechanism. Since activities of the chromatic systems increase nonlinearly with the stimulus intensity, the shape of the saturation function is

likely to be influenced by the luminance level. Eiji Kimura examines the change in shape of the saturation function as the luminance level ranges from 10 to 1000 Td. In 1984 Dupont joined with Munsell Color Science Laboratory to design and perform a color-tolerance experiment that 1)minimizes systematic errors (by using a single set of experimental parameters), 2)adequately samples surface-color space to promote equation development and testing, and 3)provides an additional data base of visual color-difference judgements. In 1989 [vol.14, page 139] David H. Alman, Roy S. Berns, Gregory D. Snyder, and Wayne A. Larsen in the article "Performance Testing of Color-Difference Metrics Using a Color Tolerance Dataset", reported on the methodology and initial results of assembling a uniform data set. Now Roy Berns, David Alman and Gregory Snyder team up with Lisa Reniff, and Mitchell R. Balonon-Rosen to describe the second phase of the study in "Visual Determination of Supra-Threshold Color-Difference Tolerances using Probit Analysis". In this article the remainder of surface-color space and additional vectors about the phase I color positions are sampled and visually evaluated.

In "An Evaluation of Some Tristimulus Weights" Dr. E. I. Stearns looks at the variation or "error" in calculated tristimulus values for four typical samples when different bandwidths and bandpass profiles are used in the measurements. The CIE prescribes a method of calculating tristimulus values for a specimen using prepared tables of weights given at 1-nm. intervals. The bandpass profile of the radiance measurements is not specified, and variation in it would lead to only negligible errors as long as the bandwidth is 1 nm. However, as the tables are adapted to be used with wider bandwidth intervals, the bandpass profile becomes important. Thus, Dr. Stearns recommends that any publication of tables of weights which are intended for accurate tristimulus values should include a specification of the profile and width of the bandpass used for the measurement of the radiance factor data. Is the age of absolute colorimetry here? It may be that modern spectrophotometers have better short and long term stability than ones ability to make and maintain material standards or judge colored specimens. Since 1935 when the recording spectrophotometer was first described by Hardy, the science of color measurement has been based on instruments following that basic design.

Metamerism, the situation where two samples with different spectral curves can have the same tristimulus values under certain conditions, provides the basis for advanced colorimetry, as well as many of its problems. During the 1980s Matrix R theory developed by Cohen and Kappauf gained interest and application in the color community. The first application was to the problem of metamerism. The spectral decomposition theory, as it is now called, provides a means whereby a spectral power distribution can be broken into two components, the fundamental, which carries the tristimulus values, and the spectral difference (or residual) between the fundamental and the original spectral power distribution. The terminology for the building blocks of this theory (mainly in matrix form) has been evolving as the theory develops. To promote uniform practice, the Inter-Society Color Council Project Committee #27: Indices of Metamerism has undertaken to make recommendations for terminology, definitions, and (where appropriate) symbols to be used for both the subjects of metamerism and spectral decomposition theory. Hush S. Fairman presents the ideas of the committee in "Recommended Terminology for Matrix R and Metamerism".

Since the preceding article includes terminology for metamerism, it is appropriate that the topic for this issue's Color Forum is metamerism indices. Fred W. Billmeyer, Jr. presents "Notes on Indices of Metamerism". These notes include the differentiation between general and special indices of metamerism and review the methods of calculating both types of metamerism indices.

SOCIETY FOR INFORMATION DISPLAY (SID)

Call For Papers

SID '92 will feature topical sessions which cover specific issues or key developments in the area of information display. The following are only some of the many sessions where papers are welcomed: 1) Virtual Reality: the Ultimate Large Field-of-view Display, 2) Novel Light-value and Laser Projection Displays, 3) CRT Projection Displays and Technology, 4) Large-area Direct-view Displays, 5) Liquid-crystal Projection Television, 6) LCD Optical Materials and Modeling, 7) Visual Factors in Virtual Image Displays, 8) Spatial Sampling and Luminance Quantization for Information displays, 9) Color Rendering and Color Coding, Device Calibration for Color WYSIWYG, 10) Color Reproduction, 11) Perceptual Issues in Image Coding 12) Novel Light Valves, 13) Direct View Displays, and 14) Color Measurement, Perception and Manipulation A new offering for SID '92 would be Applications Sessions in which practical information relevant to design engineers will be presented in standard 20-minute presentations. Topics include technical information on new products and tools, how to use new devices, design techniques and design case studies. A separate digest of applications session papers will be provided. Submissions are invited - label submissions "applications."

Titles and abstracts must be submitted by November 15, 1991. So contact Joyce Farrell, SID '92 Program Chair for more instructions and information. Her address Hewlett-Packard Laboratories, P. O. Box 10490, Palo Alto, CA 94303-0969; phone (415) 857-2807, FAX (415) 857-4320.

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

1991

IS&T, Oct. 6-11
The Society for Imaging Science & Technology (formerly SPSE) 7th International Congress on Advances in Non-Impact Printing Technologies w/Exhibit, The Portland Hilton, Portland, Oregon. Information: (703) 642-9090.

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 - CONFERENCE AND EXHIBITION, Oct. 8-11
American Association of Textile Chemists and Colorists, Convention Center, Charlotte, North Carolina. Information: Jerry Tew, (919) 549-8141.

SID - International Display Research Conference, Oct. 15-17
The Society for Information Display with the Institute of Electrical & Electronics Engineers, & the Advisory Group on Electron Devices 1991 International Display Research Conference, Hyatt Islandia, San Diego, California. Information: Mark Goldfarb (703) 769-588.

COLOR & APPEARANCE OF THERMOPLASTIC FILMS, Oct. 16-17
Society of Plastic Engineers, Conference, Marriott Hotel, New Orleans, Louisiana. Information: (812) 466-9828, FAX (812) 466-6796.

TAPPI SYMPOSIUM AND TRADE FAIR, Oct. 28-31
Technical Association of the Pulp and Paper Industry, Holiday Inn, Genessee Plaza, Rochester, New York. Information: Jerry Popson, (812) 948-2884.

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
Optical Society of America Annual Meeting including OPTICON '91, San Jose Convention Center, San Jose, California. Information: Optical Society, (202) 223-0920.

FSCT ANNUAL MEETING AND PAINT SHOW, Nov. 4-6
Federation of Societies for Coatings Technology, 69th Annual Meeting and 6th Paint Industries Show, Metro Convention Center, Toronto, Ontario, Canada. Information: (215) 545-1506.

ASTM COMMITTEE D-20 ON PLASTICS, Nov. 4-7
San Diego, California. Information: Katharine Schaff, (215) 299-5529.

AATCC FALL MEETING, Nov. 19-21
American Association of Textile Chemists and Colorists, The Doral Inn, Hew York City, New York. Information: Jerry Tew, (919) 549-8141.

1992

ASTM COMMITTEE D-1 ON PAINT, Jan. 19—22
Embassy Suites Hotel, Ft. Lauderdale South, Florida. Information: Scott Orthey, (215) 299-5507.

ASTM COMMITTEE E-12 ON APPEARANCE, Jan. 20-23
Embassy Suites Hotel, Ft. Lauderdale South, Florida. Information: Bode Buckley, (215) 299-5599.

ADVANCES IN COLOR VISION, Jan. 30-Feb. 1
Optical Society of America Topical Meeting on Advances in Color Vision, Irvine, California. Information: (202) 462- 6272.

SPSE/SPIE SYMPOSIUM, Feb. 9-14
Electronic Imaging: Science and Technology, The San Jose Convention Center, San Jose, California. Information: Khe Nguyen, (408) 954-5486.

AATCC WINTER MEETING, Feb. 11-13
American Association of Textile Chemists and Colorists, Hilton at University Place, Charlotte, North Carolina. Information: Jerry Tew, (919) 549-8141.

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.

ASTM COMMITTEE D-20 ON PLASTICS, Mar. 8-12
Ashville, North Carolina. Information: Katharine Schaff, (215) 299-5529.

IS&T IMAGING '92, May 10-15
The Society for Imaging Science & Technology 45th Annual Conference, The Meadowlands Sheraton, East Rutherford, New Jersey. Information: (703) 642-9090.

AATCC SPRING MEETING, May 12-14
American Association of Textile Chemists and Colorists, AATCC Technical Center, Research Triangle Park, North Carolina. Information: Jerry Tew, (919) 549-8141.

(continued page 17)

INTER-SOCIETY COLOR COUNCIL Application for Individual Membership

Name _____ Date _____

❒ Dr. ❒ Mr. ❒ Ms.

Company/Affiliation _____

Street _____

City, State, Zip _____

Telephone (____) _____ ❒ Home

Fax (____) _____ ❒ Business

_____

Signature

My chief interests in color are:

❒ education ❒ art

❒ industry ❒ science

_____

Name other interests

My work relates to the following products and services:

_____

_____

_____

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

_____

_____

_____

My particular interests in color are: _____

_____

_____

_____

I belong to the following national organizations or associations: _____

_____

_____

_____

I learned about ISCC from: ❒ ISCC Newsletter ❒ Other source: _____

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

ISCC dues are shown on the reverse side. Applications for membership dated prior to July 1 should be accompanied by full annual dues; those dated July 1 and later should be accompanied by 50% of annual dues. You have the option of subscribing to Color Research & Application at special membership rates. If you wish to do so, please add $60.00 (US) or $90.00 (overseas) to the amount of your check.

This application and remittance should be sent to

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

Telephone: (919) 274-1963

EXCERPT FROM THE BY-LAWS OF THE INTER-SOCIETY COLOR COUNCIL, INC.

Constitution, Article II — Aims and Purposes

The Council shall operate solely and exclusively as a non-profit organization with the aims and purposes:

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

Council Activities

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

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

The ISCC is the U.S. Member of the Association Internationale de la Coulour (AIC), which holds general meetings quadrennially and topical meetings annually. Color Research & Application, published bimonthly in English, is the principal international journal in this field; it is endorsed by ISCC. It reports recent research and opinions of colorists, review books and reports on national and international color meetings. Membership in ISCC permits subscription at more than a 50% discount.
The ISCC News, a bimonthly newsletter, reports the color activities of the Council, its members, Member-Bodies and international color organizations. Members receive the ISCC News at no cost. Member-Bodies and Sustaining Members receive 10 copies of the ISCC News.

Categories of Membership	Annual Dues
Individual Member. Any person interested in color and desirous of participating in the activities of the Council.	$25.00
Student Member. Full time students.	$10.00
Member-Body. Any non-profit national organization interested in color and desirous of participating in the activities of the Council.	$100.00
Sustaining Member. Any organization not eligible as a Member-Body, or any individual, interested in color and wishing to support the work of the Council. Receives 10 copies of ISCC News.	$250.00
Retired. Treasurer must be notified, in writing, of retirement before dues have been billed.	$10.00
Library Subscriptions. Receives all ISCC mailings, including ISCC News.	$40.00
Overseas Member. A surcharge of $15 is added to $25 dues to cover additional mailing costs.	$40.00

Calendar, continued from page 14

SID '92, May 17-22
Society for Information Display International Symposium Seminar and Exhibition, Haynes Convention Center, Boston, Massachusetts. Information: Paul M. Alt, (914) 945-2437.

CORM ANNUAL MEETING, May 19-20
NIST, Gaithersburg, Maryland. Information: Albert Parr, (301)-975-3739.

ASTM COMMITTEE D-1 ON PAINT, Jun. 21-24
Marriott, Minneapolis, Minnesota. Information: Scott Orthey, (215) 299-5507.

INTERNATIONAL GEMOLOGICAL SYMPOSIUM, Jun. 20-24
Century Plaza Hotel, Los Angeles, California. Information: (800) 421-7250, ext. 211.

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

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

ASTM COMMITTEE E-12 ON APPEARANCE, Jun. 24-26
Nassau Inn, Princeton, New Jersey. Information: Bode Buckley (215) 299-5599.

IESNA ANNUAL CONFERENCE, Aug. 2-6
Illuminating Engineering Society of North America, 86th Annual Conference, San Diego, California. Information: Valerie Landers, (212) 705-7269.

IMAGING THE FUTURE, Sep. 21-25
The Royal Photographic Society Science Committee Symposium on Imaging the Future, University of Cambridge, England Information: Dr. M. R. Pointer, Kodak Ltd., Research Div. W-93, Harrow, Middlesex, HA1 4TY, England, tel. 44-81-427-4380 or FAX 44-81-863-4798.

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

FSCT, Oct. 21-23
Federation of Societies for Coatings Technology, 70th Annual Meeting and 57th Paint Industries Show, McCormick Place, Chicago, Illinois. Information: (215) 545-1507.

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

ASTM COMMITTEE D-20 ON PLASTICS, Nov. 15-19
Miami, Florida. Information: Katharine Schaff, (215) 299-5529.

OSA - ANNUAL MEETING, Nov. 15-20
Optical Society of America Annual Meeting including OPTICON '92, Boston, Massachusetts. Information: Optical Society, (202) 223-0920.

AATCC FALL MEETING, Nov. 17-19
American Association of Textile Chemists and Colorists, The Doral Inn, Hew York City, New York. Information: Jerry Tew, (919) 549-8141.

1993

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

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

AIC-Colour 93, Jun.14-18
The 7th Congress of the International Colour Association, Technical University of Budapest, Budapest, Hungary. Information: Prof. Antal Nemcsics, Technical University of Budapest, Conference Office, Building Z, Room 101/b, H-1521 Budapest, Muegyetem rkp. 3-9 Hungary, phone and fax (36-1) 185-2218.

IESNA ANNUAL CONFERENCE, Aug. 8-12
Illuminating Engineering Society of North America, 87th Annual Conference, Houston, Texas. Information: Valerie Landers, (212) 705-7269.

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

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

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FROM ISCC MEMBERSHIP BODIES.

NEWSLETTER EDITOR

Michael A. Hammel

Send photo material (black and white if possible) to:

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

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