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Calendar

Number 300

MARCH-APRIL 1986

A WEEK OF COLOR

June 15-21, 1986

As all ISCC members should have learned by now, ISCC and the Canadian Society for Color (CSC) will hold their first joint meeting in Toronto, Canada. This meeting will be followed immediately by an interim meeting of the Association Internationale de la Couleur (AIC), all at Ryerson Polytechnical Institute, the third week of June. We trust everyone interested in color will endeavor to be in Toronto for this Week of Color, beginning Sunday, June 15. (You may also wish to be there the previous Friday and Saturday — see "ASTM Meeting in Toronto.")

The ISCC/CSC joint meeting schedule was outlined in the previous issue of the *News* (No. 299, Jan-Feb 1986). A more complete schedule with instructions for registration and housing is enclosed with this issue of the *News*. Please note that ISCC, CSC, and AIC meetings are open to non-members as well as to members. The officers urge all interested parties to attend.

If you have not yet done so, take steps now to register for the color meetings before space limitations prevent you from attending.

ASTM Meeting in Toronto

Because many of the members of American Society for Testing and Materials (ASTM) Committee E-12 on Appearance of Materials are involved in color and will be attending the color meetings in Toronto, this group of writers of test methods for factors of appearance (color, gloss, reflectance, color difference, and the like) has also decided to hold its summer meeting in Toronto. These are open meetings with no registration fee; so you may wish to consider attending them also. To obtain details of these meetings including location and agendas write the E-12 secretary, Norbert L. Johnson, 3M Co., 3M Center, Bldg 582-1-16, St. Paul, MN 55144.

1986 AIC Interim Meeting

By now everyone should have received a copy of the flyer on the AIC Interim Meeting on COLOR IN COMPUTER GENERATED DISPLAYS to be held at Ryerson Polytechnical In-

stitute, June 19-20. The flyer gives information on registration and accommodations, together with the names of invited speakers and the authors of contributed papers. The twenty people on the program have provided their manuscripts sufficiently far in advance that they have been reviewed, edited, and made ready for publication in a future issue of *COLOR Research and Application*.

PROGRAM

1986 AIC INTERIM MEETING COLOR IN COMPUTER GENERATED DISPLAYS

June 19-20, 1986

Ryerson Polytechnical Institute, Toronto, Ontario, Canada

Thursday, June 19

Welcome: Dr. Brian Segal, President, Ryerson Polytechnical Institute

Opening Remarks: Dr. Peter Kaiser, Program Organizer

Theme-Setting Paper: Introduction to Computer Generated Color, John C. Beatty, Xerox Palo Alto Research Center, Palo Alto, California

SESSION I. *Using Color for Information Display*, William B. Cowan, Chairman

1. The Effective Use of Color in Video: Text and Graphic Applications (Invited talk), Joann Taylor and Gerald Murch, Tektronix, Beaverton, Oregon

2. Using Color to Display Structures in Multidimensional Discrete Data, Colin Ware and John C. Beatty, University of New Brunswick, Fredericton, New Brunswick, Canada

3. Color in Multidimensional Multiparameter Medical Imaging, Haim Levkowitz and Gabor T. Herman, University of Pennsylvania, Philadelphia, Pennsylvania

4. Super Imposition of Colored Information, Charles M. M. de Weert, Catholic University of Nijmegen, The Netherlands

SESSION II. *Color Standardization*, Alan R. Robertson, Chairman

1. Colorimetry of Color Displays: 1950 to the Present (Invited talk), Paul Tannenbaum, Du Pont Co., Wilmington, Delaware

2. Overview of ISCC and ASTM Committee Work on Video Displays (Invited talk), Paula J. Alessi, Eastman Kodak Co., Rochester, New York

3. Color Rendering of Color Camera Data, Brian A. Wandell, Stanford University, Stanford, California

4. On the Gun Independence of Color Video Monitors, William B. Cowan and Nelson Rowell, National Research Council of Canada, Ottawa, Canada

5. Color Education and Color Synthesis in Computer Graphics, Gary W. Meyer and Donald P. Greenberg, Cornell University, Ithaca, New York

Friday, June 20

SESSION III. *Monitors and Vision*, John C. Beatty, Chairman

1. Computer-Controlled Color Displays in Vision Research. Possibilities and Problems (Invited talk), Donald I. A. MacLeod, University of California at San Diego, La Jolla, California

2. Minimizing Quantization Errors in Digitally-Controlled CRT Displays, Jeffrey B. Mulligan, University of California at San Diego, La Jolla, California

3. Visual Depth of Focus Measured for Various Colored Displays, Lucia R. Ronchi and L. di Fraia, National Institute of Optics, Florence, Italy

4. Factors in Using Color Video Monitors for Assessment of Visual Thresholds, Algis J. Vingrys and P. Ewen King-Smith, Ohio State University, Columbus, Ohio

5. Computer-Generated Screening Tests for Color Blindness, Stuart Anstis, Patrick Cavanagh, Daphne Maurer, Terri Lewis, Donald I. A. MacLeod, and George Mather, York University, Ontario, Canada

SESSION IV. *Hard Copy and Other Media*, Patrick Cavanagh, Chairman

1. A Color Correction Scheme for Color Electronic Printers, Gary K. Starkweather, Xerox Palo Alto Research Center, Palo Alto, California

2. Electronic Color-Printer Technology (Invited talk), Gary K. Starkweather, Xerox Palo Alto Research Center, Palo Alto, California

3. Color, Graphic Design, and a Computer System, Maureen Stone, Xerox Palo Alto Research Center, Palo Alto, California

4. A Description of Colour-Reproduction Methods Used for This Issue of Color Research and Application, Maureen Stone, William B. Cowan, and John C. Beatty, Xerox Palo Alto Research Center, Palo Alto, California

5. Interior Colour-Combination Schemes by Computer, Urban Willumsen, Sadefjord, Norway

AWARDS

An ISCC Awards Committee is appointed by the President to review the recommendations of each of the three established Award Subcommittees, namely Godlove, Macbeth, and Service. Dr. Stephen F. Bergen (Chairman of Delegates from the American College of Prosthodontists) is Chairman of the Awards Committee. Since their first presentations, it has been customary to make Godlove Awards in odd numbered years and Macbeth Awards in even numbered years. The Service Award is likely to be presented whenever a worthy candidate is identified.



New Embodiment of Godlove Award was designed by ISCC member Marjorie Ingalls. It is made of acrylic resin carved to depict CIE Color Space. ISCC photo by Tom Webber.

GODLOVE AWARD

The Godlove Award Fund was established in 1956 by Mrs. Margaret N. Godlove in memory of her husband Dr. I. H. Godlove (1892-1954). The award is presented for contributions to the field of color. Godlove served as Editor of *ISCC News* for 100 issues (1937-54) and as President (1948-50).

Nominations

Each member-body and individual member of the Council is invited to submit the name of a person deemed worthy of consideration for the 1987 Godlove Award. (See *Basis of Judgment for Godlove Award*.) Send *Information Required for Nomination* by August 31, 1986, to the Chairman of the Godlove Award Subcommittee: Dr. William A. Thornton, Prime-Color, Inc., 27 Harvard Road, Cranford, NJ 07016.

Basis of Judgment for Godlove Award

The Godlove Award is to be given for contributions to the subject of color. The contributions of an individual shall be examined in light of the Aims and Purposes of the Inter-Society Color Council given in Article II of the Constitution.

The merit of a candidate shall be judged by his contributions to any field of interest related to color whether or not it is represented by the Member-bodies. The contribution to color may be in the active practical stimulation of the appli-

cation of color, or it may be an outstanding dissemination of knowledge in color by writing or lecturing, based on original contributions by the nominee.

The candidate must be a member of the Inter-Society Color Council (a delegate, an individual member, a retired member, or an honorary member). Former members of ISCC not listed as "retired members," may be considered. The Candidate need not have been active in the affairs of the Council.

Citizenship, place of residence, age, or other personal circumstances shall not be considered in the granting of the Award.

Information Required for Nomination

1. Name and address of nominee
2. Professional affiliation (company, institution, etc., if any)
3. Title (present or most recent) and duties
4. Other professional society affiliations and any positions held
5. Nature of interest and activities in color
6. Evidence of the contribution made in encouraging the scientific, artistic or industrial use of color
 - a. In own organization (for company or employer)
 - b. In own aspect of color expertise in own industry or professional group
 - c. In outside-interest contributions in color (other industries, for example)
 - d. In national activities
 - e. In international activities
7. Writing or speaking done in support of scientific, artistic or industrial use of color. (Attach list of publications, talks, patents, etc., if possible — the list should be representative, not necessarily complete.)
8. Additional general background information
9. Source of Nomination
 - a. Member-body — Give name of person in Member-body who prepared the nomination
 - b. Individual member — Give name
 - c. Award Committee

Note: Confidentiality of the nomination is of the utmost importance. The nominator or nominating group must insure that the nomination is not disclosed to the proposed nominee. If any of the above information cannot be obtained without risking such disclosure, the information should be omitted from the nominating letter.

Recipients

The following persons have received the Godlove Award:

1957	Deane B. Judd
1959	Ralph M. Evans
1961	Dorothy Nickerson

1963	David L. MacAdam
1965	Isay A. Balinkin
1967	Edwin I. Stearns
1969	Harry Helson
1971	Norman Macbeth
1973	Dorothea Jameson Hurvich and Leo Hurvich
1975	Vincent C. Vesce
1977	Hugh R. Davidson
1979	Gunter Wyszecki
1981	Robert M. Boynton
1983	Eugene Allen
1985	Franc Grum

Godlove Award Design

The original (1957) design consisted of a suitably engraved acrylic plastic prism in which was imbedded a triangular gold ruled diffraction grating. When in 1970 the supply was exhausted, a new design was prepared consisting of an acrylic plastic regular tetrahedron, six inches on a side, in which were imbedded three sheets of colored plastic representing the subtractive primary colors (magenta, yellow, and cyan). Several years ago as the stock of the second design began to approach exhaustion, the Board deemed it desirable to seek a different design, and Majorie Ingalls volunteered to produce yet another physical embodiment for the Godlove Award. At the Board meeting of February 10, 1986, her design of a three-dimensional CIE chromaticity diagram in clear acrylic plastic was accepted and will be used when the supply of embodiments of the 1970 design is exhausted. See photographs herewith. Those of you who were in Williamsburg in February were privileged to see the first actual rendition of the newest Godlove Award in carved acrylic plastic.

ISCC-DOROTHY NICKERSON SERVICE AWARD

As a result of suggestions from the membership, the Board of Directors in 1980 established the ISCC Service Award to honor members who have given outstanding service to ISCC in the form of organizational, clerical, or technical contributions.

At the meeting of the Board on February 10, 1986, the "ISCC Service Award" was redesignated the "ISCC-Dorothy Nickerson Service Award" in honor of the late Dorothy Nickerson (1900-1985) who provided outstanding service to ISCC from its founding in 1931 until her death in 1985. See *News* issues No. 295, p. 1 and No. 297, p. 3.

Nominations

Each member-body and individual member of the Council is invited to submit the name of a person deemed worthy of consideration for the 1987 Service Award. Send *Information Re-*

quired for Nomination by October 31, 1986, to the Chairman of the ISCC-Dorothy Nickerson Service Award Subcommittee: Mr. Ralph Stanziola, Industrial Color Technology, 512 Garretson Road, Bridgewater, NJ 08807.

Information Required for Nomination

1. Name and address of nominee
2. Professional affiliation (company or institution, etc. if any)
3. Title (present or most recent and duties)
4. Other professional society affiliations and any positions held
5. Nature of interest and activity in color
6. Evidence of service given toward the advancement of ISCC
7. Additional general background information
8. Source of nomination

Recipients

The following persons have received the ISCC Service Award.

1983	Fred W. Billmeyer, Jr.
1984	(No award)
1985	S. Leonard Davidson (posthumously) Dorothy Nickerson (critically ill)

THE EDITOR'S CORNER

As you may have deduced from small changes in the format, you have a new (Interim) Editor for the *News* with this issue, No. 300. Having spent a good many hours scouring for news and then writing copy for the Compositor, your Interim Editor makes the perennial plea of every editor: "Send me material so I'll have something to edit!"

Your Interim Editor also feels constrained to pay homage to all editors who have gone before him, especially to Mary Ellen Zuyus, our most recent Past Editor, with whom he has worked to gather material for previous issues.

Your Editor felt the need to volunteer to serve as Interim Editor for a year because it is not easy to find a replacement editor to take over immediately. He takes this opportunity to remind the Board of Directors that they must start immediately to find a long-term replacement editor within the year, for unless they do so, publication of the *News* is likely to come to a screeching halt a year from now. We have had long-term editors in the past and we trust that the Board can find one again. Our first editor put together 100 issues of the *News*! More on editors in the next issue.

Harry K. Hammond III
Interim Editor

ELECTION RESULTS

At the meeting of the ISCC Board of Directors in Williamsburg, February 9, 1986, Secretary Commerford announced the results of the election as follows:

President-Elect:	Joy Turner Luke
Secretary:	Therese R. Commerford
Treasurer:	Edward T. Connor
Directors:	Paula J. Alessi
	Roland L. Connelly
	Mary Ellen Zuyus

We congratulate these officers on their election, and we trust that in the years ahead each of you will find your assignments stimulating and rewarding. You have extra time this year to prepare yourselves to assume your duties that begin at the close of the Annual Meeting — this time in June instead of April.

To the unsuccessful candidates, we say "Thank you" for accepting the nominations, and don't say "No" if a subsequent nominating committee asks you to run again.

To the electorate we say, the ISCC does not require that every voting delegate cast a ballot, but it would be nice if they did. Yet the question in our mind is: Was there some reason that one-third of those eligible to vote did not return ballots? Were that many of you ill or out of the country???

For the benefit of the membership, we publish here biographic material on the successful candidates, together with a picture, if supplied to the Editor in time for this issue, otherwise the picture may appear in a subsequent issue.

President-Elect

JOY TURNER LUKE is a painter and owner of Studio 231 in Sperryville, Virginia, where she conducts intensive courses on color and on artists' paints. She also lectures widely on these topics for art schools and other groups with a specialized interest in color.

Her background includes studying art and color at Rollins College, Southern Methodist University and American University, and courses on technical color at Rensselaer Polytechnic Institute and Hunterlab. Beginning in 1960 she exhibited paintings in many of the large painting exhibitions in the Washington-Baltimore area, winning several awards. Her paintings were handled by several galleries and were shown in three one-man exhibitions at the Studio Gallery in Washington, DC.

Mrs. Luke presented invited papers on color at the International Williamsburg conferences sponsored by the Inter-Society Color Council (ISCC), "Objectives of Pictorial Color Reproduction" in 1978, "Creativity: Artists and Scientists Working Together" in 1981, and "Color and Illumination" in 1983.

She was Artists Equity Association's representative on the National Bureau of Standards Standing Committee on Artists'



Joy Turner Luke, ISCC President-Elect, 1986-88. Photo by Richard Lanier.

Paints and was chairman of the ISCC Committee on Artist' Materials. She is currently chairman of the American Society for Testing and Materials (ASTM) Subcommittee DO1.57, Artists' Paints and Related Materials, which has developed three national standards for artists' materials. For this work she has received the ASTM Gardner Award and a plaque for achievement from the Art and Craft Materials Institute, the National Art Materials Trade Association, National Artists Equity Association and the National Paint and Coating Association.

Mrs. Luke served on the Board of Directors of the Inter-Society Color Council and as a Trustee to the Munsell Foundation. She serves on the Advisory Committee of the Ralph Mayer Center for Artists' Techniques at the University of Delaware and on the Advisory Board of the Munsell Color Laboratory at Rochester Institute of Technology.

Joy Luke writes articles on color and artists' materials for professional journals and publications. She is on the Editorial Board of the journal *Color Research and Application*.

Secretary

THERESE R. COMMERFORD is Chief, Countersurveillance Section of the Materials Research and Engineering Division, Individual Protection Laboratory of the U. S. Army Natick R&D Center in Natick, Massachusetts. Prior to her employ-

ment with Natick, she spent many years with The Derby Company, Inc. as supervisor of their Color Measurement Laboratory.

Miss Commerford earned a B.S. degree in Chemistry from Lowell Technological Institute (now, University of Lowell). She has authored or co-authored papers on color, and has lectured on this subject at symposiums and workshops sponsored by AATCC and Clemson University.

Miss Commerford has been Secretary of the Inter-Society Color Council since 1982. She served as a Director from 1977 to 1980, as a member of the 1981 Long-Range Planning Committee of ISCC, and as a member and former chairman of the American Association of Textile Chemists & Colorists delegation to ISCC. From 1979 to 1982, Miss Commerford was a Vice-President of AATCC. She has served as an AATCC National Councilor, as Chairman of AATCC Research Committee RA36, Color Measurement, and as Chairman of the AATCC sponsored 1979 symposium, "Color Science in the Textile Industry." She presently serves as Secretary of the Natick Chapter of Sigma Xi.

Treasurer

EDWARD T. CONNOR is Director of the Gardner Laboratory Physical Testing Department of Pacific Scientific Company in Silver Spring, Maryland. He earned a BS degree in Electrical Engineering at the University of Pittsburgh. He spent ten years with the General Electric Company and was later President of Instrument Development Laboratories, Inc., prior to joining Gardner Laboratory in 1971. Over the years, he has served as President and a Director of the Manufacturers Council on Color and Appearance and as a Director of Collaborative Testing Services, Inc. He is a Senior Member of the Instrument Society of America and a 25-year member of the Inter-Society Color Council, becoming Treasurer in 1980. He has been heavily involved in community affairs as President of his Citizens Association, a past President of Rotary Club, a Director of the YMCA, as well as a active with United Fund, Little League, and Zoning Board. He and his wife, Louise, have six children and ten grandchildren.

Directors

PAULA J. ALESSI is a research scientist for Eastman Kodak Company, Rochester, New York, working on producing negative color film with improved color rendition characteristics. She received a Bachelor's degree in Chemistry from St. John Fisher College, 1970, followed by a Master's degree in Color Science from Rensselaer Polytechnic Institute. The essence of her thesis, "Assessment of Color Measuring Instruments," was published in *Color Research and Application*, v 6, n 4, Winter 1981. In 1979 she began working at Kodak on development of

computer modeling techniques that could be used to analyze the color reproduction characteristics of a negative/positive photographic system. She is co-author of a paper on, "Printing Compatability of Negative/Positive Photographic Systems," *Journal of Applied Photographic Engineering*, v 9, n 2, April 1983. Then she moved to evaluation of image couplers for possible incorporation into any Kodak photographic color product.

Alessi is a member of the American Chemical Society (ACS) and ASTM where she chairs Subcommittee E-12.06 on Appearance of Displays. In ISCC she chairs a similar project on Image Technology (No. 32), dealing specifically with transfer of color images from video display to hard copy. (See *ISCC News* No. 290, p. 10-17, and No. 297, p. 5-7.) She finds that ISCC helps to broaden her horizons in the field of color because of the diverse interests of the membership. She has also written some fine reports for the *News*. See No. 288, p. 3-6, "Summary of 1984 Williamsburg Conference" (on Color Imaging), and No. 295, p. 6-18, "1985 Williamsburg Conference" (on Color: Then and Now). Her vision for the future of ISCC lies in a desire to help the organization continue to pursue the answers to many basic color science questions shared by all members no matter what their area of expertise. Finally she desires to see ISCC continue to serve as a forum for pooling tools and techniques that will result in improved color communication and education.

ROLAND L. CONNELLY, SR. is Manager of Burlington Industries (BI) Corporate Research and Development Color Science Laboratories, Greensboro, North Carolina. He went with BI in 1970 after receiving his Master's degree in Textile Science from Clemson University. Connelly's work has involved all aspects of color measurement and control for BI. He has been responsible for the design, development, and implementation of laboratory, production, and quality control color systems in their dyeing and finishing operations worldwide, now involving more than fifty systems. He also works closely with BI's marketing and design staffs on customer's needs related to color, including lighting and viewing conditions, computer-aided textile design, and customer-computer linkage.

Connelly has been active in ISCC for many years, serving on numerous project committees. He is currently a member of the delegation from the American Association of Textile Chemists and Colorists (AATCC), having previously served as Chairman. He has been Chairman of the AATCC Color Measurement Research Committee and an active member of the Light Fastness and Dye Properties Committees. He was an organizer of AATCC's Color Measurement Workshop that has enjoyed ten years of increasingly active participation.

Connelly is currently the spokesman on color measurement of the U.S. Delegates to the International Organization for

Standardization (ISO) Technical Committee on Textiles, ISO/TC. He is also Chairman of the AATCC delegates to the United States National Committee (USNC) of the International Commission on Illumination (CIE).

Roland and his wife Lynn have two sons, R. Lee Connelly, Jr., 16, and Christopher Barrett Connelly, 14. He is serving a third term as President of the North Carolina Chapter, National Hemophilia Foundation. He is a charter member and board trustee of Ronald McDonald House, Chapel Hill, and a member of the building committee. He has been active in scouting and currently serves on the witness committee of Alamance Presbyterian Church.

MARY ELLEN ZUYUS is Manager, Advanced Development Department, Hunter Associates Laboratory, Inc., Reston, Virginia. She has been with Hunterlab since. She is involved in new instrumentation, instrument standards and instructional workshops.

Zuyus received a Bachelor's degree from Dickinson College, Carlisle, Pennsylvania, and a Master's in Library Science from the University of Maryland, College Park, Maryland. She has served as Editor of ISCC News for 26 issues, No. 274 (Sep-Oct 1981) through No. 299 (Jan-Feb 1986). She is a member of ISCC Project Committee 22, Procedures and Materials for Instrument Calibration.

BY-LAW AMENDMENTS

In accordance with Article X, Amendments, the Board of Directors at its meeting on February 9, 1986, recommended two changes in the By-Laws and hereby publishes them. The voting delegates of the Council will receive a ballot no less than 90 days after the mailing of the Newsletter in which this notice appears. The pertinent paragraphs are reproduced below with dashes through wording to be deleted and parentheses around wording to be added.

Amendment to Article III, Officers, Section 3, Mode of Election, first paragraph, second sentence: "It shall be the duty of the Nominating Committee to obtain the consent of each nominee to stand for election and to submit its report to the Board of Directors prior to ~~November 1 of each year~~ (the Fall meeting of the Board)." The reason for the recommended change is that the Fall meeting of the Board is usually in October and nominations must be approved at that time.

Amendment to Article VI, Section 1: "The President shall appoint ~~two past Presidents~~ (one Past President), other than the most recent Past President, to serve on the Nominating Committee. He shall also appoint two other members. No two of these members of the committee shall be accredited delegates from the same Member-Body. The most recent Past President shall ~~also serve on the Nominating Committee and~~ act as its Chairman (, and the President-Elect shall be a member.) The

reason for the change is that the inclusion of the President-Elect will provide better continuity.

NOTE OF THANKS

The family of Franc Grum would like to thank all the members of the scientific community who have expressed their condolences to us. It is gratifying to know how much you respected Franc, and we are most appreciative of the many kind words you have said about him. He was certainly special to us and obviously to many others as well, both on a professional and a personal level. Your expressions of sympathy have been a great comfort to us during this very difficult time. He will certainly be missed by all of us. Please forgive the impersonal manner of this acknowledgment. So many of you have written from so many different parts of the world that it would indeed be difficult to reach each of you individually. Thank you again.

Albina Grum

Iva and Richard Ester

Mary Ann and Anthony Mrva

Margaret "Peg" and James Bodine

COLOR RESEARCH AND APPLICATION

Articles in Spring, 1986, Issue

Ever since Dorothy Nickerson's seminal publication in 1936 of her Index of Fading, the task of finding equations that represent a perceptually uniform color space has been a major unsolved problem in what Gunter Wyszecki liked to call Advanced Colorimetry. The steps toward success in this task stemming from the research of the Norwegian team of Thorstein Seim and Arne Valberg have been largely overlooked in the U. S. Literature. The lead article in this issue describes their research *Towards a Uniform Color Space: A Better Formula to Describe the Munsell and OSA Color Scales*.

Whereas the Seim and Valberg article provides a more nearly uniform color space describing global color order systems based on equality of perception, the problem of describing small color differences perceptually uniformly may — we still do not know — be somewhat different. Here the criterion of uniformity often invoked is *Chromaticity-Discrimination Ellipses for Surface Colours*. M. R. Luo and B. Rigg have selected from the literature the most reliable of these ellipses, as judged by criteria they have developed, have augmented them by performing new experiments, and have analyzed them for consistency and regularity to provide a unified body of data.

Few uses of color throughout history provide the fascination of the cave paintings of prehistoric civilizations. P. L. Fernández and his coworkers from Santander, Spain, have

now documented one of the best-known examples of this art by their *Measurement and Specification of the Colors of the Polychromatic Roof of the Altamira Cave*.

With one foot placed squarely in each field, Milton Pearson proposes that colorimetry be divided into two distinct and different areas, one concerned with color matching and formulation, directed toward reproducing color precisely and without metamerism, and the other concerned with the reproduction of images by any of a number of techniques where, for reasons he explains, metamerism is an essential part and colors are not normally required to be reproduced with as high precision. *Image-Reproduction Colorimetry*, less often considered in the literature, is here analyzed in detail and compared to matching-and-formulation colorimetry.

In the article *Philosophy of Perceptive Color Order Systems*, Gunnar Tonnquist considers guiding principles for color order systems that are based in some way on visual perception, in contrast to material properties such as colorant concentrations, or the description of the physical stimulus for color as in the CIE system. The perceptive systems may be based on equality of spacing or resemblances to specific colors, among other possibilities, as described by Tonnquist using the Munsell, NCS, OSA, and other color order systems as examples.

Perhaps the most exciting new use of color these days is in cathode-ray-tube displays associated with computers. In such applications it is often desired to utilize sets of high-contrast colors in order to provide maximum efficiency in information transfer. W. de Corte proposes here some new ground rules and a methodology for *Finding Appropriate Colors for Color Displays*.

Yoshinobu Nayatani and his coworkers are perhaps best known to our readers for their series of articles on the development of a nonlinear model of chromatic adaptation. In this issue, they point out that the *Prediction of Color Appearance under Various Adapting Conditions* requires not only such a theory but its combination with an adequate color order system. In their article, they provide a model of color vision combining these two to allow the prediction of such color-appearance attributes as constant-hue loci and the Munsell color scheme, among other perceptive phenomena.

Not only the prediction of color appearance, but in the last analysis all of color depends on the color matching functions of the human eye. Of these, the luminous efficiency function [familiar as $V(\lambda)$ or CIE y] has been the most widely studied. S. N. Luria and David F. Neri have reviewed *Individual Differences in Luminous Efficiency Measured by Flicker Photometry*, and show that the measurement accuracy has been underestimated all along due to the particular selection of means of presenting the data.

In our Fall, 1983 issue, we published in Color Forum several proposals for new terminology to describe various aspects

of metamerism. The total lack of response that resulted might suggest that our readers could not care less. But the Inter-Society Color Council Project Committee on Degree of Metamerism did care, and has taken action. It endorses one of the new terms proposed in 1983, and the Committee's Chairman Hugh S. Fairman tells why in his Note, *New Terminology for Metamerism Revisited*. We invite you to become familiar with this proposal and use it, in the interests of precise terminology.

The nonlinear model of chromatic adaptation developed by Nayatani and coworkers has now been recommended for field trial by the CIE. This means that tests of the model are requested from all colorists equipped to carry them out. To facilitate this work and allow any of our readers who so desire to contribute to the ongoing progress of the CIE, Roy S. Berns has provided *A FORTRAN Program for Predicting the Effects of Chromatic Adaptation on Color Appearance Based on Current CIE Recommendations*. This industrial Note gives full details of how to conduct the field trials and analyze the data, together with a worked example using the computer program listed. Berns even offers to collect your data and forward it to the CIE.

Fred W. Billmeyer, Jr.

MEETING REPORTS

Boston Color Symposium Munsell to Pixel

A one-day symposium entitled "Munsell to Pixel" was held at Massachusetts College of Art, December 17, 1985. It covered the possibilities for the use of the Munsell color system in computer graphics. The College was a particularly appropriate place to hold such a symposium since it grew out of the Massachusetts Normal Art School, attended by Albert H. Munsell. More important, he later taught drawing, painting and composition there while developing his color system.

Nathaniel Jacobson, who taught for years at the college, expressed his view that the Munsell system should have much wider use among people in the visual arts. He devised the Modular paints that were formulated to cover the Munsell color space and simplify the task of mixing color for the artist. These paints were marketed by Binney & Smith and still form the backbone of their artists' paint lines.

Other speakers included Harold Marcus and Bob Marcus from Munsell division of Macbeth; Walter Bender, principal Research Scientist at the new Arts & Media Technology Laboratory at MIT; Alyce Kaprow, consultant in computer graphics; Paul Zelanski and Arthur Hoener, both Professors of Art at University of Connecticut; Barbara Meier, Computer Graphics, Brown University; and Professor Lois Swormpff, Department of Design, UCLA.

Walter Bender has developed software that allows him to display the Munsell color solid on a computer graphic terminal and slice it in different ways. Another program allows the viewer to fly through color systems. Barbara Meier showed an interactive program she developed for teaching color to art students that includes general information of the type made famous by Josef Albers' color course in the art department at Yale University.

An attendee familiar with ISCC symposiums on color held at Williamsburg felt much like someone observing the other side of a coin. Much enthusiasm, interest and talent were evident. At the same time it was distressing to realize how much the speakers and the audience needed contact with the kind of color expertise that ISCC embodies. Conversely, one could not help but realize how much the ISCC needs to be aware of the color problems that confront people working in the visual arts.

The audience was composed of students and people from the local community who were interested in computer graphics as a future career. There were also a few people who had already purchased equipment and who were struggling to use it effectively in one of the arts fields.

The program included beautiful displays and a strong case for the usefulness of the Munsell system by Nat Jacobson and Bob Marcus, but, as is so often the case, the application problems encountered in the real world were not covered. Color as manipulated on a computer graphics terminal is so beautiful and seems so flexible that the very real and difficult reproduction problems that have faced every other color reproduction system are scarcely mentioned. Yet the young people in the audience will certainly have to deal with them.

The program was in charge of Dorothy Simpson Krause, Director of the Computer Arts Learning Center at the College. She moderated a lively general session at the close of the symposium. Nathaniel Jacobson, who taught for years at the College, assisted in arranging for some of the speakers.

Joy Turner Luke

Report of Subcommittee on Color Education Resources & Materials ISCC Project No. 40 Evelyn Stephens, Chairperson

At the meeting in Pittsburgh, April 15, 1985, there was a discussion of the circulated questionnaire and response sheet. Committee members reported work in progress. Nancy Jo Howard is compiling slides and a bibliography with the assistance of Chris Burton. Stephen Bergen continues work on the Speakers Bureau. Howard explained about her work on the slides during the past 12 months. The 1987 ISCC meeting will be in Philadelphia and the topic will probably be "Color Education." Howard has catalogued 900 slides and needs input on what direction to take. Nancy suggested that there be about

20 slides to several series in various categories such as perception, light. The bibliographies will be divided into categories, such as photography, television and printing; light, design; pigments; biology, zoology, food and dermatology; psychology and color vision. The slides can then be geared to the different interest groups. Contact needs to be made for permission to reproduce slides. She estimated that a set of 20 slides might cost \$10-\$12. Howard also reported on the AIC Color Education Interim Meeting (June 1984) and how this group is accumulating a bibliography of books on color published in English in various countries. Jacki Welker mentioned compiling a list of books that are out of print. Stephens asked if the bibliography would be annotated. Howard replied that she would be willing to contribute bibliographies and send them to her.

Stephen Bergen has been working on the Speaker's Bureau and so far has 20 to 30 respondents. He will make another effort to obtain speakers.

Discussion followed on how to distribute material. Should there be a fee? There was general agreement on sending the first list out free, and technical reports for a nominal fee for the first year. A suggestion was made to send a copy to the libraries that responded to the survey.

A request was made for persons to work on compiling information for schools on industrial applications of color. Roland Connolly and David Johnson said they would work on this.

A question was raised about how much an artist needs to know? Contributions were received from Ed Cairns on the demand in art and industry, from Bonnie Bender about the end-user, from John Trauger about the ability to do something better, and from Yorick Hurd about the importance of communication between artists and production people. There was general agreement on the importance of a common language for communication. Connolly elaborated on communication and marketing. Franc Grum stated that we should consider ways of pursuing and exploring color by different groups. Howard added that groups could be held on several levels, including teaching color, how to teach color with appropriate back-up material and the many different ways material can be presented. Larry Lerner suggested that something should be presented on colorants, and the difference between dyes and pigments.

A request was made for ideas for the 1987 Education Conference. Bender suggested that we draw on the schools in the Philadelphia area. Connolly added that an Industrial Education Workshop would be good. Burton suggested that we try to involve other educational organizations. Bender added that involvement with architects would be good. Gerry Snow mentioned that elementary schools could lead to specific education in other fields and that we should define the bounds.

Trauger suggested that we not overlook photography and color graphics. Other suggestions included putting ads in journals, and contacting the National Association of Schools of Art, AIA, and related Associations and Societies.

Preliminary Report on 1986 Williamsburg Conference The Colors of History: Identification, Re-creation, Preservation, February 10-12, 1986

This year's conference was another in the series of meetings on special topics sponsored regularly at Colonial Williamsburg under the aegis of ISCC. It was graciously cosponsored by the Colonial Williamsburg Foundation and by the Society for the Preservation of New England Antiquities.

In this preliminary report only the titles of papers are given with the names of the authors and their affiliations.

Appearance Factors in the Conservation of Historical Collections, Nathan Stolow, Foundation Conservator, The Colonial Williamsburg Foundation

Practical Aspects of Reproduction Colors, Robert F. Bitter, Vice President, Scalamadré, New York

Reproducing Museum Objects, Special Opportunities, Perplexing Problem, Kristin Fischer, The Colonial Williamsburg Foundation

Basic Principles of Color Measurement, Calvin S. McCamy, Kollmorgen, Inc., Newburgh, New York

The Role of Textile Conservation in the Reproduction Program at Winterthur, Margaret Fikioris, The Henry Francis dePont Winterthur Museum, Winterthur, Delaware

Reproduction Wallpapers — "Colours Proper to be Used for Paper Hangings," Andrea M. Gilmore, North Atlantic Historic Preservation Center, Boston, Mass.

Problems in the Painting of Historic Vessels, Dana Hewson, Mystic Seaport Museum, Mystic, Conn.

The Study and Replication of Old House Paints, Morgan Phillips, Society for the Preservation of New England Antiquities, Boston, MA

Identification of Historical Pigments, Elisabeth FitzHugh, Freer Gallery of Art, Washington, D.C.

The Literature Regarding Historical Colorants, Robert L. Feller, Mellon Institute

The Analysis of Dyestuffs in Historic Textile, Max Saltzman, Institute of Geophysics and Planetary Physics, UCLA

Aspects of Metamerism and Illuminant Sensitivity of Artists' Paints, Roy Berns, Munsell Color Science Laboratory, Rochester Institute of Technology

Digital Image Processing in Conservation, J.F. Asmus, University of California, San Diego, and H.J. Myers, IBM, Palo Alto

A Case History: Determination of Colorants in Traditional Japanese Prints, Robert L. Feller, Mellon Institute, Pittsburgh

Modern Assessment of the Lighting of Precious Objects,

William A. Thornton, Prime-Color, Inc., Wayne, N.J.

Conference Wrap-Up Session: What Have We Learned; Where Do We Go From Here? Ruth Johnston-Feller, Mellon Institute, and panelists

Ed. Note: Authors were requested to provide summaries of their papers, but most of them were not very informative. However, one of the summaries was so well prepared that it is included in this preliminary report so that it may be used as a model by other authors for the preparation of summaries of their papers. In one typewritten page it gave the essence of the entire talk. However, the author indicated that the summary might be too long for the purpose intended; so he also prepared a "short abstract," one paragraph of six lines, and he was still able to include the most important aspects of the paper! See the paper summary and abstract below.

MODERN ASSESSMENT OF THE LIGHTING OF PRECIOUS OBJECTS

William A. Thornton, Ph.D.

PRIME-COLOR, INC.

27 Harvard Road, Cranford, NJ 07016

SUMMARY OF PAPER

Precious objects are of course best left in the dark when not being observed, to minimize irradiation at all wavelengths, and thus to minimize fading and decomposition. On display, (1) the objects must experience a minimum of irradiation, especially in the violet and ultraviolet; (2) the objects must be clearly visible to the observer; and (3) they must appear in satisfying coloration.

What characteristics of the illumination need be measured to assure the best compromise among these competing requirements, and what, exactly, is the nature of the ideal illumination? Recent advances in instrumentation and in the understanding of human vision have brought nearer a complete answer to these questions.

First, it must be determined how much illumination is necessary for adequate visibility; adequate visibility depends strongly upon the spectral composition of the illumination, as well as upon how much is present. In determining how much light is needed, the "brightness units," resident in a given illumination, are more relevant than traditional "footcandles," and "visibility units" constitute a still better measure.

Second, as to perceived coloration of the display in the given illuminant, the traditional measure (since about 1965) is the color-rendering index. Yet measured "color-preference index" or "color-attractiveness" are actually more dependable criteria for pleasing the observer.

Third, given good coloration and adequate visibility, as measured by the better indices, it remains to measure the con-

tent of harmful (fading or decomposing) radiations in the lamplight or daylight. Quantities such as: visibility per ultraviolet milliwatt of radiation per square meter, or ultraviolet microwatts per lumen, can characterize the hazard in the use of a given illumination.

"Seeing," and degradation of the object by the light necessary for that seeing, go less hand-in-hand than has been supposed. The illumination of a precious object need contain no wavelengths shorter than about 460 nm. Use of that wavelength, and also the two other "prime-color" wavelengths, to compose ideal museum lighting, allows good visibility and beautiful coloration of the exhibit, with an absolute minimum of harmful content.

A short discussion of human color vision, of a commercial approach to the ideal museum illuminant, and of the more modern measures of quantity and quality of illumination will be given.

SHORT ABSTRACT:

"Seeing," and degradation of what is seen, go less hand-in-hand than has been supposed. Illumination need contain no wavelengths shorter than about 460 nm. Use of that wavelength, with the two other "prime-color" wavelengths, to compose ideal museum lighting, allows good visibility and beautiful coloration of the exhibit, with an absolute minimum of harmful content.

1987 Williamsburg Conference Geometric Aspects of Appearance

ANNOUNCEMENT

The Inter-Society Color Council will sponsor a technical conference on geometric aspects of appearance evaluation. This will be the 1987 edition in the series of ISCC Williamsburg Conferences on special topics in color science and technology. The conference will be held at Colonial Williamsburg, Virginia from Sunday February 8 to Wednesday February 11, 1987.

The objective of the conference is to stimulate research and disseminate recent information on appearance evaluation through a specialist conference. The technical program will consist of two and a half days of invited and contributed papers.

CALL FOR PAPERS

The program committee solicits contributed papers related to models, theories, instrumental techniques, research methods and practical applications of appearance evaluation. Appearance evaluation is the investigation of perceived appearance attributes caused by variation in the spatial and directional

distributions of light intensity. Within this subject area there can be reports concerning topics such as retroreflection, texture, translucency-transparency, metallic flake and pearlescent flake finishes appearance, geometric appearance reproduction, goniophotometry, gloss, distinctness of image and visual response to appearance stimuli.

Abstracts of proposed papers must be received by the program committee by August 1, 1986. The authors, affiliations, principal author's address and daytime telephone number, title and abstract should be submitted on one double-spaced page. Final contributed papers will be 30 minute presentations. The selection committee will notify the authors of acceptance by September 1, 1985. A conference proceedings consisting of four page summaries of the papers will be available at the conference. The deadline for submission of the paper summaries will be November 15, 1986. Abstracts and requests for information should be sent to: Dr. David H. Alman, E. I. Du Pont Co., 945 Stephenson Highway, P.O. Box 2802, Troy, MI 48007, Telephone 313-583-8241.

NBS CENTROID COLORS

A set of color charts was assembled in 1964 to illustrate the color-name blocks in NBS Circular 553, "The ISCC-NBS Method of Designating Colors and a Dictionary of Color Names." After 20 years, significant color shifts had taken place in a number of the colors; so in 1984 an unused set was measured by Hemmendinger Color Laboratory by using the same measurement techniques and spectrophotometer that were used for the original measurements.

The 1984 data together with the 1964 data are tabulated in "Addendum, COLOR — Universal Language and Dictionary of Names. NBS Special Publication 440, September 1985." If you have a set of the original color charts, you should acquire a copy of the Addendum by sending your request to Mr. Richard W. Seward, Office of Standard Reference Materials, Room B 317, Chemistry Building, National Bureau of Standards, Gaithersburg Maryland 20899. The Addendum will be furnished without charge.

On the other hand, if you do not have a set of the color charts you may wish to order SRM 2106. The current price is \$31.00. Cash with order is desired. A copy of COLOR, Universal Language and Dictionary of Names, NBS Special Publication 440 can be obtained together with the color charts by ordering SRM 2107, price \$40.00. An Addendum will be supplied with each order for an SRM. Note, however, that if you have the color charts, the Addendum can be requested at no charge.

The Centroid Colors are contained on 18 charts having a total of 251 color chips and 16 blank spaces for which colors could not be reproduced in painted ships.

The color changes that occurred were surprisingly small for most colors, indicating an excellent overall stability of the color chips. Therefore, the charts are still considered to be an excellent visual supplement for the color-name blocks.

For those who have forgotten or have never encountered NBS Special Publication 440, it comprises 19 pages of text on the "Universal Color Language" by Kenneth L. Kelly, including ten figures in color and two tables listing generic and intermediate hue names and illustrated by an appropriate centroid color.

Publication 440 also contains "The Color Names Dictionary" by Kenneth L. Kelly and the late Deane B. Judd, as well as "The ISCC-NBS Method of Designating Colors and a Dictionary of Color Names," occupying 158 pages.

As pointed out earlier, my initial purpose in providing this brief report is to alert users of the centroid color charts that they have been remeasured after 20 years and that an Addendum is available that tabulates the nominal shift of the coordinates of the colors when stored in the dark. The secondary purpose is to bring to the attention of new workers in the field of color the fact that the charts and text are still available in limited quantities.

SUMMER COLOR COURSES

Munsell Color Science Laboratory Rochester Institute of Technology

Two industrial short courses in color science, appearance and technology will be given at the Munsell Color Science Laboratory as follows:

May 19-20, 1986. An intensive short course for technicians and marketing personnel with the following objectives:

1. Identify the important variables in visually evaluating color and color differences
2. Develop the CIE System of Colorimetry emphasizing industrial applications
3. Establish the principles and learn the practice of accurate color measurement
4. Gain familiarity with most commercial color measuring instruments
5. Identify the proper measurement technique for a given material

Textbook: "Color: Essence and Logic," R. G. Keuhni, Van Nostrand Reinhold, 1983.

June 2-4, 1986. An intensive short course for scientists and engineers with the following objectives:

1. Identify the important variables in visually evaluating color and color differences
2. Derive in detail the CIE System of Colorimetry
3. Study the accurate calibration and correct use of current color measuring instruments

4. Identify the proper measurement technique for a given material
 5. Develop methods to apply colorimetry to quality control
 6. Develop the principles of computer colorant formulation
- Textbook: "Principles of Color Technology," Fred W. Billmeyer, Jr. and Max Saltzman, Wiley, 2nd Edition, 1981.

For more information about which course is most appropriate or to register by phone, contact Ms. Martha Pschirrer, Munsell Color Science Laboratory, Rochester Institute of Technology, Post Office Box 9887, Rochester, NY 14623, (716) 475-6013.

Cape Cod Community College Course in Colorimetry June 23-August 8, 1986

A seven week course based on the new revised edition of his book, *Color Measurement: Theme and Variations*, will be taught by David L. MacAdam at Cape Cod Community College, from June 23 until August 8. The course will consist of 3-hour meetings (lectures, recitations, and computation exercises) twice each week. The course will be of interest to all persons who are or want to be involved in modern design, reproduction, control or use of colors in industry, commerce, graphic arts, printing, electronic or other media. For further information, write to Cape Cod Community College, Continuing Education, West Barnstable, MA 02668, or phone (617) 362-2131, ext. 388.

CIE ANNOUNCES 21ST SESSION

The 21st Session of the International Commission on Illumination (CIE) will be held at Venice, Italy, from June 17 to 25, 1987, in a former monastery on the island of San Giorgio Maggiore just opposite San Marco.

As planned, the Session will consist of two parts:

1. Conference from June 17 to 20 with 3 to 4 invited papers, about 40 contributed papers, poster presentations, and workshops.
2. Technical meeting of Divisions from June 22 to 25.

Prospective contributors are invited to submit papers dealing with new results in the field of light and lighting. The subjects of these papers should be relevant to the work and the terms of reference of the seven CIE Divisions and their Technical Committees. Contributions that have been published previously will not be accepted. Papers dealing with questions of direct concern to the work of the Divisions will receive priority.

Prospective contributors can obtain further information and application forms from USNC Vice President, John E. Kaufman, Illuminating Engineering Society, 345 East 47th Street, New York, NY 10017 (212-705-7916). Completed forms and

a summary of the paper should reach him no later than May 1, 1986.

A summary of the paper, in triplicate, is to accompany the application. It should contain a minimum of 400 and a maximum of 600 words. The summary should be specific and informative. It should make clear the novelty the author wishes to describe, referring to results and practical applications. Based on this information the US National Committee and the CIE Council will make a decision on the acceptance of the paper and whether it will be given orally in a papers session or as a poster.

Authors will be informed of the decision for acceptance of the USNC by May 30 and of CIE Council by mid-August 1986.

The submission of a contributed paper means that the CIE has the right of "first refusal," that is, the CIE has the choice of publishing the paper in its proceedings or of releasing it for publication elsewhere. Accepted papers cannot be published elsewhere before the Proceedings of the Session have been published. Papers not accepted by the CIE may be published elsewhere after the Session.

ADVANCES IN SPECTROPHOTOMETRY

An international conference on "Advances in Standards and Methodology in Spectrophotometry" is being held 14-17 September 1986 at the Clarendon Laboratory, Wadham College, Oxford University, Oxford, England. The conference has been organized jointly by the UV Spectrometry Group (UVSG) of the United Kingdom and the Council for Optical Radiation Measurements (CORM) of the United States. The first announcement of the conference appeared in ISCC News No. 299, Jan-Feb 1986. The program Sessions with titles and authors of invited papers, recently released, are as follows:

KEYNOTE LECTURE: THE HISTORICAL DEVELOPMENT OF ANALYTICAL SPECTROMETRY

Prof. D. Thorburn Burns (University of Belfast)

SESSION 1: BASIC CONCEPTS

(Chairman) Dr. C. Burgess (Glaxo)

1.1 Recent Advances in Analytical Spectrometry, Prof. A. Townshend (University of Hull).

1.2 Spectrometry for Colour Measurements, C. S. McCamy (Macbeth Corporation).

1.3 Fluorescence Spectrometry in Analytical Chemistry and Colour Science, Dr. K. D. Mielenz (NBS).

SESSION 2: HIGH ACCURACY SPECTROMETRY

(Chairman) Dr. K. D. Mielenz (NBS)

2.1 The New Automatic Reference Spectrometer at the NPL, Dr. G. H. C. Freeman (NPL).

2.2 High Accuracy Gonio-Reflectance Spectrometry, Dr. W. Erb (PTB).

2.3 National Scales of Spectrometry in the U.S., Dr. J. J. Hsia (NBS).

ROUND TABLE DISCUSSION: SECONDARY STANDARDISATION

SESSION 3: STANDARDS AND CALIBRATION I

(Chairman)

3.1 Physical Standard in Absorption and Reflectance Spectrometry, J. F. Verrill (NPL).

3.2 Chemical Standards for Calibration Purposes, R. Mavrodineanu (NBS).

3.3 Liquid Standards in Fluorescence Spectrometry, Dr. R. Velapoldi (NBS).

3.4 Solid Standards in Fluorescence Spectrometry, Dr. R. A. McKinnon (NPL).

SESSION 4: STANDARDS AND CALIBRATION II

(Chairman) Dr. J. J. Hsia (NBS)

4.1 Colour Standards, F. Malkin (BCRA).

4.2 Metrology and Standards for the Infrared Region, Dr. F. J. J. Clarke (NPL).

4.3 Stray Radiant Energy, Dr. W. Kaye (Beckman).

4.4 Diagnostic Performance Evaluation of Spectrometers, Dr. A. Robertson (NRC, Ottawa).

SESSION 5: MODERN SPECTROMETRY INSTRUMENTATION: ARRAYS & LASERS

(Chairman) W. D. Partlow (President, CORM)

5.1 The Physics of Diode Arrays, G. P. Weckler (EG&G RETICON).

5.2 Standardisation of Diode Array Spectrometers, Dr. D. G. Jones (TRACOR Northern) (ASTM Committee E13.01).

5.3 Analytical Applications of Diode Array Spectrometry, Dr. C. Burgess (GLAXO).

5.4 Tuneable Dye Laser Spectrometry, N. P. Fox (NPL) & Dr. A. R. Schaefer (NBS).

SESSION 6: NEW TRENDS IN FOURIER TRANSFORM AND IR SPECTROMETRY

(Chairman) Dr. M. A. Ford (Perkin Elmer UK)

6.1 Theory and Practice in FT Spectrometry, Dr. A. J. Everett

(Wellcome Institute)

6.2 Applications of FT Spectrometry in UV-Visible-NIR.

6.3 Dispersive Fourier Transform Spectrometry, Dr. T. J. Parker (Royal Holloway College).

6.4 Applications in IR Spectrometry.

Accommodations for the participants will be on the Oxford University Campus. For conference information and registration materials contact: Dr. Klaus D. Mielenz, B306 Metrology Bldg., National Bureau of Standards, Gaithersburg, MD 20899.

SYMPOSIUM ON DETERMINATION OF COLOR DIFFERENCE

June 3-6, 1986

The new SAE Recommended Practice J1545 for determining measured color difference for automotive parts and materials will be covered in-depth at a Symposium on Automotive Color Control, to be held June 3-6 at the Michigan Inn, Southfield, MI.

The Symposium will combine general sessions and workshops with "hands-on" equipment demonstrations. Programming is specifically directed to coatings, soft trim, and plastics, with each addressed in separate, two-day overlapping segments (Coatings, June 3-4; Soft Trim, June 4-5; and Plastics, June 5-6).

The Symposium is being sponsored by the Detroit Colour Council, Federation of Societies for Coatings Technology, and Manufacturers Council on Color and Appearance. It has been endorsed by the Detroit Society for Coatings Technology, and the Inter-Society Color Council.

The recently announced SAE Recommended Practice J1545 is the culmination of work carried out by an industry-wide committee formed by the Detroit Colour Council to develop the best method of color difference measurement. It is expected that "J1545" will be widely adapted and will be useful for statistical process control.

The opening session of each two-day segment will be devoted to color difference measurement, with a discussion of J1545 and procedures for implementation.

Lectures will follow on specific issues: Statistics of Proper Sampling; Effect of Metamerism — Alternative Illuminant — Standard Observer; Reference Standards for Matching Parts.

Additionally, the Coatings segment will include a lecture on Multi-Angle Measurement for Metallic Colors, and the Soft Trim segment will include a lecture on Shade Sorting of Fabrics.

The lectures will be presented by members of the DCC/SAE Color Measurement Committee, who developed J1545.

The lectures will be followed by three concurrent workshops: two on instrumental color measurement, which will feature equipment/services demonstrations; and a tutorial on

sample preparation and presentation. The workshops will afford an opportunity for participants to measure samples and determine correlation of the various instruments for metamerism and non-metameric samples.

Participating workshop exhibitors include Applied Color Systems, Inc.; DIANO Color Group, Milton Roy Co.; Byk-Chemie USA, Inc.; Hunter Associates Laboratory; Macbeth Div., Kollmorgen Corp.; Minolta Co.; Gardner/Neotec Div.; Pacific Scientific Co., Collaborative Testing Services.

Concluding each segment will be a panel discussion on automotive utilization and a summary of the workshop visual-instrumental correlation study.

The format is designed to offer a working-meeting environment. Registrants are invited to bring color samples for measurement. Time will be available at the workshops for those wishing to pursue additional inspection of equipment and for one-on-one discussions with representatives of the exhibiting firms.

Attendance will be limited to assure individual participation.

Symposium General Chairman is James E. Grady, Pigments Dept., CIBA-GEIGY Corp., Birmingham, MI. General Program sessions are under the direction of William V. Longley, Design Center, Ford Motor Co., Dearborn, MI. Arrangements for the workshops and instrument displays are being handled by the Manufacturers Council on Color and Appearance.

To obtain further program information (specify Coatings, Soft Trim, or Plastics) and registration/housing forms, contact Federation of Societies for Coatings Technology, 1315 Walnut St., Suite 832, Philadelphia, PA 19107. Telephone (215) 545-1506.

APPLICATIONS FOR INDIVIDUAL MEMBERSHIP (27)

Approved at Board of Directors Meeting
September 27-28, 1985

Mr. Steven J. Bloomberg
494 Berry Hill Road
Syosset, NY 11791

particular color interests are in imaging systems.

Mr. Bloomberg is a student at Rochester Institute of Technology, studying Color Science at the Munsell Color Science Laboratory. His

Ms. Cynthia A. Brewer
Department of
Geography
315 Natural Science
Michigan State
University
Lansing, MI 48824-1115

Graduate student at Michigan State. She is attempting to apply color research from other disciplines to color use in cartography. Ms. Brewer is also involved in research in color harmony, and maps for color deficient map users.

- Ms. Marilyn Crenshaw
4301 W. Buckeye Rd.
Phoenix, Arizona 85043
Ms. Crenshaw's work involves quality assurance for cosmetics. She is presently a color technologist for Revlon, Inc. Her color interests include the colorants used in cosmetics and the practical methodology needed to match production to a "standard."
- Mr. Peter M. Cruz
230 East 5th Street
Color Formulators, Inc.
Paterson, NJ 07524
Mr. Cruz works with fiber color concentrates. His interests are in color control and appearance of pigment concentrates in synthetic fibers.
- Mr. Maurice Day
2011 48th Avenue
Montreal, Canada H1A 2Y7
Mr. Day is with CBC Television. His interests are in color and television and in computer design. He also has interests in education and art.
- Ms. Lynn Felsher
227 West 27th Street
New York, NY 10001
Ms. Felsher is involved in teaching, research, design of textiles at the Fashion Institute of Technology. Her particular color interests are industrial/designer usage of color reference materials; study of historical textiles; dissemination of knowledge on importance of color in their work to design students.
- Ms. Barbara Fitzgerald
441 Maple Street
Franklin, MA 02038
Ms. Fitzgerald works with textiles used in military applications. Her current efforts involve instrumentation, color acceptability and color specification.
- Mr. John B. Hutchings
Unilever Research
Laboratory
Sharnbrook, Bedford,
England
MK44 1LQ
Work relates to food, packaging, research and consultation. His main interest in color is the concept of total appearance in nature, man and his products. Spare time interests include color in folklore, tradition, superstition and legend, and color in archaeology.
- Ms. Laura T. Jezyk
Hercules
3169 Holcomb Bridge
Road
Norcross, GA 30201
Work relates to textiles (carpets, upholstery, apparel). Her particular color interests include color trends and developments as they apply to interiors, both commercial and residential.
- Mr. Gary J.L. Johnson
Inmont Corp.
1255 Broad Street
Clifton, NJ 07015
His work relates to paints and Inmont research and development, and control. Present color problems are color matching in automotive paints and printing inks.
- Mr. Thomas J. Keane
Pacific Scientific
2431 Linden Lane
Silver Spring, MD 20910
His present work involves instruments-spectrophotometers & colorimeters. He has served as a physicist with Pacific Scientific for 20 years, involved with all phases of appearance measurement. His particular interests include the design of instruments for industrial color control.
- Mr. Paul J. Keating
Rohm & Haas Delaware
Valley, Inc.
Post Office Box 219
Bristol, PA 19007
Work relates to acrylic plastic products. He has spent 19 years of work related experience in instrumental color measurement and color matching. Particular interests include color measurement of translucent materials, color matching, pigment/dye strength determinations.
- Mr. Do Kien Tan
623 Highlands Road
Lake Elsinore, CA 92530
His work relates to plastisol, vinyl, pigment concentrate. He presently works as a master dyer-textiles, carpet (polyester). Also serves as a color specialist-computer color sample preparation.
- Dr. Nancy Kwaliek
8906 A. Parkfield
Austin, TX 78758
Dr. Kwaliek teaches at the University of Texas on interior design and related products. She has always taught color theory of color in design. Her particular color interests involve psychological reaction to color in space; color in use in interior design practice and education; individual's response to color in the environment.
- Mr. Andrew Masia
11 Plummer Ave.
Newburyport, MA 01950
Work relates to the graphic arts. His present color interests involve imaging and photographic science; design and building a color separating scanner; calibration of color CRT's, ink jet plotter, lithographic printing, etc.
- Mr. Kenneth A. Miller
5592 Maricopa Drive
Simi Valley, CA 93063
Mr. Miller's work relates to photometric, colorimetric and spectrophotometric instruments. His experience in color includes 15 years in color instrument manufacturing and testing at Photo Research, a division of Kollmorgen Corp. Is interested in display measurement techniques and color difference formulae based on perceptibility.
- Prof. Judy M. Olson
556 Collingwood Drive
E. Lansing, MI 48823
Prof. Olson is with the Department of Geography at Michigan State University. Her work involves teaching, research and production of maps. Her particular interests in color are exploiting the

knowledge of color in producing maps, color systems, measurement and calculation of color.

Mr. Randy Spalinger
PrismaColor, Inc.
2400 Westheimer, 217C
Houston, TX 77098

Mr. Spalinger studied Photographic Science at R.I.T. His present work is with chromogenic dyes (quality control) and teaching. His color interests involve photographic recording, color measurement, and illumination.

Mrs. Norma W. Stemler
5863-A Western Run
Drive
Baltimore, MD 21209

Mrs. Stemler provides services in instructional/training materials, ceramics and interior design. Her present color problems are concerned with non-utilization of, or application of, color/vision research for: design of instructional materials; as the basis of much architectural/interior design curricula; in the conceptual design/development stages of artistic ceramic products; and by the industrial products offered to ceramists for artistic uses.

Ms. Shelagh J. G. Stewart
3 Hillsboro Avenue
Toronto, Ontario, Canada
M5R 1S6

Ms. Stewart provides services in teaching and painting. Her connections with color problems are curriculum for university level, multi-disciplined courses; Museum display (lighting). Ms. Stewart is President of the Canadian Society for Color.

Ms. Patricia A. Szczerba
425 E. 63rd Street,
Apt. W2E
New York, NY 10021

Ms. Szczerba provides teaching services and is involved in research. Her particular color interests include teaching and research in human response to color.

Mr. R.R. Traylor
Union Carbide Corp.
P.O. Box 446
Marietta, Ohio 45750

Work involves the quality control of pigmented plastics. He is interested in increasing his knowledge of color science.

Ms. Mary Woods
Box 24
Newmarket Head House
Square
Philadelphia, PA 19147

Her work involves color analysis/image in the cosmetics area. She is a consultant in this field and is interested in color as it pertains to her business.

Dr. Henry K. Wren
Southwestern Points
1801 W. Sheridan
Oklahoma City, OK
73106

Dr. Wren is in research as it applies to paint products. His particular interests in color include color matching and dispersing.

Mrs. Magenta Yglesias
1820 Kalorama Square
Washington, D.C. 20008

Mrs. Yglesias' work is in design and teaching. Her color interests are in interior design.

Mr. Jeffery M. Young
Color Development
Rm 299-24
Chevrolet-Pontiac-Canada
Group Headquarters
30001 Van Dyke Avenue
Warren, MI 28090

Works with paint products in their control and in styling. His current color problems are the development of color standards for the automotive industry and measurement of these standards. His particular interest is to develop an accurate and precise method of measuring automotive color standards that will eventually replace the visual or subjective aspect of determining color differences.

Ms. Jeri L. Foley*
1-4-16-304 Azarudai,
Minato-ku
Tokyo, Japan T 106

Works with paints and textiles, as a stylist. Color problems involve color design for buildings (apartment complexes, department stores, cinemas, automobile showrooms), package design and product color image design.

*Application form arrived after this list sent to Board. Information telephoned to President Joyce S. Davenport on 26 Sept. 1985 for inclusion in the List as presented to the Board for approval on 27-28 Sept. 1985 (Secretary unable to attend this Board Meeting).

APPLICATIONS FOR INDIVIDUAL MEMBERSHIP (23)

Approved at Board of Directors Meeting February 8-9, 1986

Mr. J.K. Aggarwal
Elec. and Computer
Engineering
ENS 519
University of Texas at
Austin
Austin, Texas 78712

Mr. Aggarwal is an educator, teaching image processing. His business association with color problems involves the segmentation of aerial color photographs. In addition to image processing, he is interested in graphics.

Mr. Martin Angebrannndt
Box 1175
25 Andrews Memorial
Drive
Rochester, NY 14623

Mr. Angebrannndt is a student at R.I.T., where he is taking courses in advanced colorimetry. His color interests include the specification of fluorescence in materials, and the problems with establishing industrial standards for these materials.

Ms. Ana Beatriz Azpiri
6532 East Hill Drive
Austin, Texas 78731

Ms. Azpiri's chief interests in color lie in art and education. She is an interior designer for industrial and commercial markets. Her interests in color are the psychological effects in people and in industry.

Mr. Osvaldo Da Pos
Vicolo dei Conti 13
Padova, Italy 35100

include modes of appearance of colors and perceptual transparent colors.

Mr. Mark D. Fairchild
100 E. Squire Drive, #4
Rochester, NY 14623

Laboratory. His particular color interests are spectroradiometry, color vision and perception, and standardization.

Mr. Robert Friederichsen
Rt. 6 Box 220
Buffalo, MN 55313

educational and practical applications of color systems.

Mr. Roger L. Funk
2 East 57th Street
Kansas City, Missouri
64113

colors and in color matching between systems and pigments.

Mr. Marvin Gelman
28 Rayfield Road
Westport, CT 06880

lighting equipment museum lighting, and color for commercial lighting equipment. Is a member of IES.

Ms. H. Katherine George
3301 Bourke Ave.
Detroit, MI 48238

ing, quality control, spectrophotometric measurement, pigment identification, tolerances and education. Member of DCC.

Mr. Andrew Juenger
250 Meigs Street, 301
Rochester, NY 14607

metamerism, graphic arts and CRT are his particular interests in color.

Miss Barbara Anne
Keating
273 Hemlock Lane
Springfield, PA 19064

Mr. Da Pos teaches physiological correlates of color perception, and performs university research on color perception. His color interests

Mr. Fairchild is a student at R.I.T., where he performs research, calibration and measurements, and studies in the Munsell Color Science

Mr. Friederichsen is a teacher at Augsburg College in Minneapolis, MN, and also works as a graphic designer. His color interests are in the

Mr. Funk is a teacher of color usage to design students. Color problems experienced in his professional work are associated with consumer products, exterior architectural

Mr. Gelman's work is in museum lighting. He was past Lighting Director for NBC TV, NYC. His color interests include color filters for

Miss George works with paints and printing inks in such services as R and D, education, control and styling. Her interests are in match-

Mr. Juenger is a student in the Color Science program at R.I.T., specializing in imaging and photographic sciences. Appearance,

Miss Keating is a student in Color Science. Her interests include computers, psychology and color science.

Mr. Michael Keating
236 Kimball Drive
Rochester, NY 14623

formulation techniques, metamerism, color difference equations.

Mr. Donald G. Miller
1125 Marston Avenue
Ames, Iowa 50010

color, but especially the relationship of color measurement to perception.

Mr. Ricardo J. Motta
275 Kimball Drive
Rochester, NY 14623

differences, spatial and temporal color perception. In general, he is interested in all topics related to vision and psychophysics.

Ms. Carol J. Neri
Defense Personnel
Support Center
2800 So. 20th Street
Philadelphia, PA 19101
Attn: TTL

Ms. Hendretta L. Reagan
3525 Park Lodge Court,
Apt. F
Indianapolis, Indiana
46205

Miss Mary Heather Ridge
4 W Butler Ave., Apt. 4B
Chalfont, PA 18914

appropriate dyes to achieve cross-dyed fabrics. She desires to learn more about color problems and the solutions pertinent to textiles.

Mr. Richard F. Rollins
Milton Roy Co.
30 Commerce Way
Woburn, MA 01801

and application techniques. Member of AATCC.

Mr. Keating is a student in the Munsell Color Science Laboratory at R.I.T. His present work involves developing and writing color formula-

Mr. Miller works with color in polymers, specifically in colored polymer formulations and controls. His interests include all aspects of

Mr. Motta is a graduate student at the Munsell Color Science Laboratory, R.I.T. His color interests include chromatic adaptation, color

Ms. Neri is a quality assurance specialist for clothing and textiles. Her work involves the use of color measuring instrumentation to quantify and assess visual properties of materials. Member of AATCC.

Ms. Reagan's work involves the control and specification of plastic and paint materials. She is the color chemist for all AT&T entities. She seeks more knowledge of color Science, color measurement and industrial applications of color.

Miss Ridge is a stylist in the textile field. Her work involves color selections, matching of piece dyed fabrics, and working with appropriate

Mr. Rollins is a color applications engineer for Milton Roy/Diano Co. His color interests include new developments in color terminology, equations, CIE recommendations

Ms. Dyan G. Roth works with textiles, providing service in color technology and applications development for Burlington Industries. Her particular color interests are current research in color science, effective application of formulation systems, and color instrumentation. Member of ACS and AATCC.

Dr. Steven A. Shafer is both an educator and a researcher. His interests and work are in robot vision, color cameras and displays; in the relationship between color and gloss for purposes of vision; color reflection models and measurement; and color for object recognition. Member of OSA and IES.

Mrs. Jayne Vercnocke works in R&D for food and packaging materials. Her experience has been in formulation, processing, regulatory, sensory aspects of color in food and food packaging materials. Member of IFT.

Mr. William S. Vogel's work relates to quality control of dyestuffs for textiles. His color interests are in establishing specifications for press-cake and intermediate dyestuff forms, by the use of spectrophotometry. Member of ACS and AATCC.

Mr. Robert H. Zabel is in the application and control of pigment colors for paint, ink and plastics. He is involved with color matching, control testing and new product applications. Member of ASTM, DCC, and NAPIM.

REPORTS

Report on Project 18 Colorimetry of Fluorescent Materials Danny C. Rich

This project has been completed. It was initiated in 1952. The objective was to develop spectroradiometric techniques that would provide colorimetric data on fluorescent materials. Over a period of thirty years, the chairmanship changed from Seymour Goldwasser to Eugene Allen, Franc Grum, Per Stansby, Frederick Simon, Thomas Cullen, and David Alman. Members of the Project and their colleagues investigated light sources and instrumentation for characterizing fluorescent materials.

The direction of effort changed as new instruments and methods of evaluation became available. Work by Franc Grum and Cindy Ashton led to development of a set of diagnostic standards for evaluation of instruments used to characterize the color of fluorescent materials. The results have been passed on to Project 22, Materials for Instrument Calibration.

Important publications include:

Colorimetry of Fluorescent Materials: Visual Evaluation of Fluorescent Whites, Bonnie K. Swenholt, Franc Grum, and Robert F. Witzel, *Color Res. Appl.* v 3, n 3, p 141-145, Fall 1978.

A Comparison of Several Proposed Methods for Evaluating Daylight Simulators in the Ultraviolet Range, David H. Alman and Franc Grum, ISCC Technical Report 78-1, 24 pages, 1978.

Ed. Note: The most recent annual report on Project 18 was a fairly comprehensive one by Thomas E. Cullen that appeared in ISCC News No. 267, July-August 1982, p 9-10. There were no reports on Project 18 in the Annual Report Issues of the *News* for 1983, 84 or 85.

Report from the American Psychological Association Edward J. Rinalducci, Chairman of Delegates

The following references represent relatively recent contributions by psychologists to the study of color.

Fuld, K., Otto, T. A. (1985). Colors of monochromatic lights that vary in contrast-induced brightness. *Journal of the Optical Society of America*, 2, 76-83.

Grinberg, D. L., & Williams, D. R. (1985). Stereopsis with chromatic signals from the blue-sensitive mechanism. *Vision Research*, 25, 531-537.

Jacobs, G. H., & Neitz, J. (1985). Color vision in squirrel monkeys: sex-related differences suggest the mode of inheritance. *Vision Research*, 25, 141-143.

Kaiser, P. K., & Boynton, R. M. (1985). Role of the blue mechanism in wavelength discrimination. *Vision Research*, 25, 523-529.

Knoblauch, K., Sirovich, L., & Wooten, B. R. (1985). Linearity of hue cancellation in sex-linked dichromacy. *Journal of the Optical Society of America*, 2, 136-146.

Mollon, J. D., & Sharp, L. T. (Eds.) (1983). *Color vision. Physiology and psychophysics*. Academic Press: New York.

Nagy, A. L., Purl, K. F., & Houston, J. S. (1985). Cone mechanisms underlying the color discrimination of deutan color deficient. *Vision Research*, 25, 661-669.

Varner, D., Cook, J. E., Schneek, M. E., McDonald, M. A., & Teller, D. Y. (1985). Tritan discrimination by 1- and 2-month-old human infants. *Vision Research*, 25, 821-831.

Wandell, B. A. (1985). Color measurement and discrimination. *Journal of the Optical Society of America*, 2, 62-71.

Worthey, J. A. (1985). Limitations of color constancy. *Journal of the Optical Society of America A*, 2, 1014-1024.



ISCC President, Joyce Davenport, presents ISCC check for \$2,500, in name of recently deceased members, to help perpetuate RIT color program begun by the late Franc Grum, and Roy Berns, Acting Director, Munsell Color Science Laboratory, accepts it. ISCC photo by Norman Burningham.

SYLVESTER K. GUTH (1908-1985)

Many members of ISCC will only now be learning of the sudden passing of their fellow member, Dr. Sylvester (Syl) Guth, at his home, 637 Quilliams Road, South Euclid, Ohio 44121, on June 5, 1985. He is survived by his wife of 64 years, Beryl Van Deraa. Guth served in the U.S. Army Corps of Engineers from 1941-1946. He was buried with Military Honors at Arlington National Cemetery, across the Potomac River from Washington, DC.

Guth received a Bachelor's degree in Electrical Engineering from the University of Wisconsin in 1930, and soon thereafter joined the General Electric Lamp Division at Nela Park, Cleveland Ohio. From 1931 until his retirement in 1974, he developed many of the criteria and techniques used in evaluating visibility, contrast sensitivity, ease of seeing and quality of lighting. He is especially recognized for work on discomfort glare. Guth received the Professional EE degree from the University of Wisconsin in 1950. In 1953 he was awarded the degree of Doctor of Ocular Science by the Northern Illinois College of Optometry.

Guth was active in the Illuminating Engineering Society of North America being made a Fellow in 1953 and receiving the IES Gold Medal in 1967. He was also a Fellow of the American Academy of Optometry and the American Association for the Advancement of Science. Other memberships included the Optical Society of America, British IES, Armed Forces' National Research Council Committee on Vision, Association for Research in Ophthalmology, American Society for Photobiology, and the Ohio Academy of Science. He was the author of 76 papers on light, vision and seeing. In 1980 he received the Charles F. Prentice Medal of the American Academy of Op-

tometry for outstanding research in vision.

Throughout the world, Guth was known for his long connection with, and his many contributions to, the International Commission on Illumination (CIE). He was a U.S. delegate to the Session in 1951 and to every one since then. He served as President from 1975 to 1979. Guth was also an active member of the U.S. National Committee of CIE. He participated in every annual meeting for 33 years, 1952-1984. Guth was highly regarded as an engineer, scientist, writer, lecturer, and cultivator of international amity. He will be missed by all who knew him.

Editor's note: This obituary is based on one written by Charles L. Amick, President, USNC/CIE, published in the minutes of the annual meeting of October 1985.

PERSONALS

Richard S. Hunter, founder of Hunter Associates Laboratory, has received many honors. One of the most recent was that of being made a Member-for-Life of the U.S. National Committee (USNC) of the International Commission on Illumination (CIE). He is one of three delegates to the USNC from the American Society for Testing and Materials, the others being Harry K. Hammond III and Fred W. Billmeyer, Jr., the latter also a USNC Member-for-Life. Other ISCC members who are Members-for-Life of USNC include Glenn Fry, Henry Hemmendinger and David MacAdam. Four ISCC members who were Members-for-Life passed on during 1985; they were Franc Grum, Sylvester Guth, Charles Jerome, and Dorothy Nickerson.

MEASURING ART WORKS

A colloquium on this subject in a series sponsored by the National Bureau of Standards was presented on Friday, December 20, 1985 in the NBS Auditorium by Joan and Russell Kirsch, Sturvil Corp., Clarksburg, Maryland. The announcement in the NBS Technicalendar was as follows:

"Art historians describe great art as 'coming at you with everything it's got.' This may explain why it has proved so difficult to measure art with the simple numerical mathematical tools that have successfully tyrannized the physical sciences. But contributions from artificial intelligence and formal language theory have shown how to describe architecture and designs, and now paintings. These structural characterizations have properties of measurement which lead to predictive theories for art, which Joan and Russell Kirsch will demonstrate. If these techniques prove successful in the fine arts, maybe use in the physical sciences will follow." Unfortunately your Editor was unable to attend the meeting and has not been able to talk to anyone who did attend.

CALENDAR

1986

DETROIT COLOUR COUNCIL

Tour of Center for Creative Studies, College of Art and Design
Dinner at Detroit Institute of Arts, Detroit, MI, April 17

SOCIETY FOR INFORMATION DISPLAY

International Symposium, Seminar and Exhibition
Town and Country Hotel, San Diego, CA, May 5-9

INTERNATIONAL SCIENTIFIC CONFERENCE

"Work with Display Units," sessions and Exhibition at
Stockholmsmassan (Stockholm International Fairs), Alvsjo,
Stockholm, Sweden, May 12-15

SOCIETY OF PHOTOGRAPHIC SCIENTISTS AND ENGINEERS

Annual Conference, Minneapolis, MN, May 18-22

COLORIMETRY, AN INTENSIVE SHORT COURSE FOR TECHNICIANS AND MARKETING PERSONNEL

Munsell Color Science Laboratory, Rochester Institute of
Technology, Rochester, NY, May 19-20

COLORIMETRY, AN INTENSIVE SHORT COURSE FOR SCIENTISTS AND ENGINEERS

Munsell Color Science Laboratory, Rochester Institute of
Technology, Rochester, NY, June 2-4

SYMPOSIUM ON AUTOMOTIVE COLOR CONTROL (SACC)

Sponsored jointly by: Detroit Society, FSCT, Detroit Color
Council, Mfgs Council on Color and Appearance, Michigan
Inn, Southfield, MI, June 3-6

ASTM E-12 ON APPEARANCE

The Delta Chelsea Inn, 33 Gerrard Street West, Toronto,
Ontario, Canada, June 13-14

ISCC ANNUAL MEETING JOINTLY WITH CANADIAN SOCIETY FOR COLOR

Ryerson Polytechnical Institute, Toronto, Ontario, Canada
June 15-18

INTERNATIONAL COLOR ASSOCIATION (AIC)

"Color in Computer Generated Displays", Ryerson Polytech-
nical Institute, Toronto, Ontario, Canada, June 19-20

SUMMER COURSE IN COLORIMETRY

Cape Cod Community College, West Barnstable, MA 02668
June 23 - August 8

IES ANNUAL CONFERENCE

Marriott Copley Place Hotel, Boston, MA, August 17-21

ISO/TC 187, COLOUR NOTATIONS

"Stadsmissionen" House, Stockholm, Sweden, September 2-4

INTERNATIONAL CONGRESS OF PHOTOGRAPHIC SCIENCE (ICPS)

"Progress in Basic Principles of Imaging Systems."
University of Cologne, Germany, September 10-17

INTERNATIONAL CONFERENCE

"Advances in Standards and Methodology in Spectro-
photometry," Oxford University, Oxford, England
September 14-17

SYMPOSIUM ON COLOUR IMAGING SYSTEMS

The Royal Photographic Society, Clare College, Cambridge,
England, September 22-25

INTERNATIONAL DISPLAY RESEARCH CONFERENCE

Tokyo, Japan, Society for Information Display, September
30 - October 2

U.S. NATIONAL COMMITTEE, CIE

Town and Country Hotel, San Diego, CA, October 26-28

FEDERATION OF SOCIETIES FOR COATINGS TECHNOLOGY

64th Annual Meeting and 51st Paint Industries Show, World
Congress Center, Atlanta, GA, November 5-7

1987

ISCC WILLIAMSBURG CONFERENCE

"Geometric Aspects of Appearance", The Lodge, Colonial
Williamsburg, VA, February 8-11

CIE, 21st SESSION

San Giorgio Maggiore, Venice, Italy, June 17-25

FEDERATION OF SOCIETIES FOR COATINGS TECHNOLOGY

65th Annual Meeting and 52nd Paint Industries' Show, Con-
vention Center, Dallas TX, October 5-7

4/5-7 ISC A.M. Phila.
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OFFICERS 1984-1986

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