



Inter-Society Color Council *News*

Issue 417 Contents

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2005

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ISCC – IS&T Special Topics Conference November 11-12, 2005

“Precision and Accuracy in the Determination of Color in Imaging”

The ISCC Special Topics Conference, “Precision and Accuracy in the Determination of Color in Imaging,” to be held in Scottsdale, Arizona, is approaching quickly. For this conference, the ISCC has joined with the IS&T, the Society for Imaging Science & Technology and the SID, the Society for Information Display. The conference will follow immediately after the IS&T annual Color Imaging Conference, CIC13.

The Special Topics Conference Program is given on page 7 of this newsletter. The conference will focus on measuring the color properties of printed and displayed images. Topics to be addressed include agreement or lack thereof in measurements made using international standard methods, appropriate product or process tolerances, and errors associated with the measurements. These topics are also important in non-image applications, such as plastics, textiles and paints, but they have risen to a critical stage in the graphic technologies.

Keynote addresses will be given by Patrick Emmel, Clariant, for the session on The Problem of Fluorescence; Dr. Maria Nadal, National Institute of Standards and Technology, for the Repeatability, Reproducibility, Traceability Session; and Mr. John McCann, McCann Imaging, for the session on Standardization in High Dynamic Range Imaging.

The conference chairs, Dr. Danny Rich and Mr. John McCann, have pulled together some of the world’s best scientists, engineers and technologists to report on various issues in critical color measurement and to provide insights into the state-of-the-art in color measurements and standardization for color measurement.

If you must make critical color measurements in your business or research, you cannot afford to miss this special topics conference. See page 6 of this newsletter for information on registration and hotel accommodations. You may use either the enclosed registration or register online at www.imaging.org. Updated information will be displayed at www.ISCC.org as it becomes available. Also, please feel free to call the ISCC Office at 703-318-0263 or to email the office at iscc@iscc.org for more information.

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NOTICE: New ISCC Office Email Address, iscc@iscc.org

The email for the ISCC office, and particularly Cynthia Sturke, Office Manager, has been changed to iscc@iscc.org. This email address is effective now. However, email to the old address, iscc@compuserv.com, will still be received by the office for a short period of time. To avoid having email messages not received by ISCC, please note the new email in your email address book.

ISCC Planning Special CD for 75th Anniversary Meeting

Next year is the 75th anniversary of the ISCC and the 75th birthday of 1931 CIE Standard Observer. To commemorate these events, ISCC is planning a special anniversary CD. All ISCC members as well as other interested individuals are invited to contribute "historic photos" for the CD.

Photographs may be submitted in either "hard-copy" or electronic format. Electronic format is preferred; any of the usual formats is acceptable, e.g., jpeg, tif, etc. Hard-copy photographs will be returned to the submitter after being optically scanned; however, the submitter will assume the risk of loss.

Please submit your photos in electronic format to Ellen Carter at Ellen.Carter@alum.rpi.edu or at 1001 North Vermont Street, Suite 809 Arlington, Virginia 22201. Please send "hard-copy" photographs to Mary McKnight, NIST, Mail Stop 8615, Gaithersburg, MD 20899-8615.

Please either call Cynthia Sturke, ISCC Office Manager, 703-318-0263, or email her, iscc@iscc.org, or email Ellen Carter, if have questions regarding the special anniversary CD.

All registrants for the ISCC 2006 annual meeting in Ottawa will receive a copy of this special anniversary CD. ISCC members will also be able to order copies of this CD when they renew their annual membership.

**American Textile History Museum
New Director of Advancement**

Linda Carpenter has been appointed Director of Advancement at the American Textile History Museum, Lowell, Massachusetts. Ms. Carpenter holds a bachelor's degree from the University of Miami and a master's degree in community and social psychology from the University of Massachusetts, Lowell. Susanne Bunker was promoted to coordinator of museum educational services. She has served as the lead outreach teacher for the past five years.

Request for Macbeth Award Nominations

The Inter-Society Color Council's Macbeth Award was established to honor the memory of Norman Macbeth. It is presented biennially in recognition of one or more recent, outstanding contributions to the field of color. Those contributions shall have advanced the field of color, interpreted broadly as in the objectives of the ISCC. A candidate's merit shall be judged by his or her contributions to any of the fields of interest related to color whether or not it is represented by a Member-Body of the ISCC. While a nominee for the Macbeth Award need not have been active in the affairs of the ISCC, he or she must be a member or former member of the ISCC. If you would like to nominate a person for

this award, please send a letter or e-mail detailing the candidates contributions to:

Dr. Robert Buckley
Xerox Corporation
MS 0128-30E 800 Phillips Road
Webster, NY 14580
585-422-1282 fax: 585-265-7441
Email: rbuckley@xeroxlabs.com

Please include the nominee's name, address, professional affiliation (company or institution, if any), title and any other information that will help in judging the candidate's merit. **Nominations must be received by December 15, 2005.**

Fifth Oxford Conference on Spectrometry, (Oxford V) Announcement and Call for Papers

The Fifth Oxford Conference on Spectrometry, co-sponsored by the National Physics Laboratory Optical Radiation Measurement (NPL ORM) Club and the Council for Optical Radiation Measurements (CORM), will be held June 25 through June 28, 2006 at Bushy House, National Physical Laboratory, Teddington, Middlesex UK

Papers, Titles, and Abstracts should be submitted to Fiona Jones and copies to Art Springsteen no later than March 1, 2006. Their email addresses are given below.

Four sessions are planned. They will address:

- Fluorescence, including applications of optical radiation in biotechnology
- Appearance (and advances in colorimetry)
- Measurement scales, uncertainty and intercomparisons
- FT and other advances in instrumentation and measurement

The UK contact for the meeting is Ms. Fiona Jones (NPL) Fiona.Jones@npl.co.uk. US contacts are Dr. Art Springsteen, arts@avianttechnologies.com, Dr. Maria Nadal Maria.Nadal@nist.gov, and Mr. David Wyble, Wyble@cis.rit.edu.

Rooms have been booked at St Mary's College. There will be some minibuses for NPL staff to drive conference delegates to and from the college. There are also several hotels within the vicinity from which it is easy to reach NPL by car or public transport (a few are within walking distance). A list of these accommodations will be included with the registration instructions and in the next announcement.

**Note: ISCC has a new email.
It is: iscc@iscc.org**

AATCC 2005 International Conference and Exhibition Rolf Kuehni to Receive Olney Award

American Association of Textile Chemists and Colorist's (AATCC) 2005 International Conference and Exhibition will be held October 26-27 at the Hyatt Harborside in Boston, MA. This year's conference will feature three tracks that mirror AATCC's three interest groups. Concept2 Consumer (C2C), Chemical Applications, and Materials. The C2C track will address marketing strategy and concepts, visual planning and communication, color technology, and performance updates. The Chemical Applications track will discuss advances in pre-treatment, dyeing, printing, and finishing. The Materials track will focus on medical/biomedical, protective, and smart textiles as well as novel fibrous and chemical materials.

This year Rolf Georg Kuehni will receive the Olney Medal. The Olney Medal was established in 1944 in honor of Louis Atwell Olney, the founder and first president of AATCC. The Olney Medal recognizes fields of chemistry of major importance to textile science. The award consists of a gold medal, a scroll and an honorarium.

Presentation of the medal each year is a highlight of AATCC's IC&E. Kuehni will deliver the traditional Olney Medal Address on Thursday, October 27. His topic will be "Color Vision: How and Why."

In 1986, the Federation of Societies for Coatings Technology presented Kuehni with the Armin J. Brunig Award. He was also presented with the Godlove Award in 2003 by the Inter-Society Color Council.

Mr. Kuehni was the vice-president of staff and services of DyStar. He retired from DyStar and is now an adjunct professor of Color Science at North Carolina State University in Raleigh, NC. He also served as an editor for *Color Research and Application* from 1987-1989. The staff of the ISCC News congratulates Rolf on receiving the Olney Medal.

For more information on the conference or award, please see www.aatcc.org.

Gultekin Celikiz, ISCC News Editor

AATCC Joins MegaTex 2006

The American Association of Textile Chemists and Colorists (AATCC) has signed a contract with Mack Brooks on behalf of ATME-I Inc., a company owned by the American Textile Machinery Association (ATMA) and Mack Brooks Exhibitions Ltd., for the purpose of co-locating the annual AATCC International Conference & Exhibition (IC&E) with MEGATEX 2006. The event will be held October 31 through November 3, 2006, at the Georgia World Congress Center, Atlanta, Georgia.

Robert K. Lattie of SDL Atlas, AATCC president, said, "AATCC is very pleased to co-locate its annual International Conference & Exhibition at the MEGATEX exhibition in conjunction with ATME-I in Atlanta. AATCC and the textile industry will benefit by having our program be a part of this important industry event. We will also be hosting the Annual IC&E Awards Banquet, cutting edge poster sessions, and popular student activities."

David Tellett of Mack Brooks Exhibitions said, "We are delighted to have the AATCC International Conference & Exhibition co-locating with us at MEGATEX. The textile industry is responding to change right now, and the concept of drawing the many strands of the textile industry together under one roof for the first time at MEGATEX - the ultimate networking event - is generating a huge amount of interest, both within the U.S. and overseas. The AATCC event brings yet another dimension alongside the ATME-I 2006 textile machinery exhibition and the IFAI Expo, which showcases industrial fabrics technologies. Indications are that over 40% of visiting buyers at the event will come to Atlanta from outside the U.S. It's an exciting prospect, and one that is drawing support from all corners of the industry."

For further information, contact John Y. Daniels, Executive Director: telephone, 919-549-3522; or email, danielsj@aatcc.org.

CPMA 2006 International Color Pigments Conference

The Color Pigments Manufacturers Association, Inc. (CPMA) in association with Rodman Publications, publishers of *Coatings World* and *Ink World* magazines, is presenting a two day conference, "Color Pigments 2006 - A Global Perspective," April 18-20, 2006 at the Hotel InterContinental in Chicago, IL, aimed at users and manufacturers of color pigments. Speaker presentations, round-table discussions, and panel sessions on organic and inorganic pigments for automotive and architectural coatings, inks, ceramics, cosmetics, artists' colors, and other applications will be provided.

Those interested in presenting papers at the conference are invited to submit a brief abstract (250 words or less) to CPMA either by hard copy or email. For more information, either see <http://www.pigments.org/index.php?id=61> or call 703-684-4044.

Printing Technology SPb '06

Imaging Science and Technology (IS&T) is pleased to announce it's co-sponsorship of Printing Technology SPb'06, an international conference organized by the St. Petersburg (Russia) State University of Technology and Design to be held June 26-30, 2006 in St Petersburg. The First Call for Papers has been issued and can be accessed via <http://www.imaging.org/conferences/SPb06>.

Conference topics include:

- Traditional approaches to and new methods of pre-press, press, and post-press production
- Developments in Printing Consumables and Equipment
- Color in Printing; and
- Print quality and process control instrumentation

IS&T members Dr. Eric Hanson (eric.hanson@hp.com), Prof. Franziska Frey (fsfp@rit.edu), and Dr. David Weiss (David_Weiss@NexPress.com) will serve as Vice Chair, Program Chair for Digital Printing, and Tutorial Chair, respectively.

For more information, contact: +7-812-3151474; +7-812-3157470, Fax.



IESNA Centennial Conference January 8-10, 2006

Celebrate 100 years of illuminating engineering and design by attending the Illuminating Engineering Society of North America's 100th Anniversary, IESNA Centennial Conference, in New York City, January 8-10, 2006 at the Marriott Marquis Hotel. Conference events are designed not only to honor past accomplishments, but also to afford opportunities for collective imagining of our future. Exhibits, keynotes, discussions, presentations, awards, and gala soirees will all play important roles in this significant celebration.

There will be important sessions on Lighting Education, Research, Technology, and Design & Application, variously presented by experts who apply keen observations of past achievements to their visions for the future. Recognition of committees, individual members, Sections and Regions will be woven into the celebratory agenda, underscoring the importance of volunteering and involvement in the Society. The IESNA Journey Through Time, will showcase collections and displays from lighting history enthusiasts with representation from each decade since the IESNA's founding in 1906.

See <http://www.iesna.org/100/index.html> or call 212-248-5000 for more information.

CIE/ISCC Expert Symposium: 2nd -Call for Papers May 16-17, 2006

The year 2006 marks the 75th Anniversary of the CIE Standard Colorimetric Observer. To celebrate the occasion, the ISCC and the CIE are hosting an Expert Symposium on the Standard Colorimetric Observer, May 16 - 17, 2006 at the National Research Council in Ottawa, Canada.

The Symposium will be the centre-piece of an exciting week-long Jubilee celebration in Ottawa. The week will start off with the 75th Anniversary Annual Meeting of the ISCC that will be held from the May 14 - 15 and will end with the meetings of Division 1 of the CIE, Vision and Colour, on the May 18 - 19. The highlight of the Symposium will be a banquet at the spectacular Canadian Museum of Civilization.

The goals of the Symposium are to recall the many advances that have been made since the introduction of the Standard Colorimetric Observer, to understand the current state of colorimetry and colour appearance, and to provide guidance on directions for future work. Specific topics will include:

- * Standard Colorimetric Observer - past, present, and future
- * Colour matching functions
- * Colour appearance
- * Temporal and spatial issues in colorimetry
- * Colour differences and tolerances
- * Colour management
- * Instruments and standards

International experts have been invited to give key presentations introducing each of these topics. You will want to be part of the exciting two days of paper and poster presentations discussing the achievements and future directions of colorimetric research. The results will be captured in a Special Proceedings to be published by the CIE.

The Symposium will be held in the National Research Council of Canada's historic Sussex Drive research facility close to the downtown centre of Ottawa and the Parliament Buildings. Ottawa, in Canada's national capital region, is a showplace for the history and culture of Canada. The City has over 50 museums, 50 galleries and beautiful natural outdoor attractions, such as the Gatineau Hills and Tulip Festival by Dow's Lake in late May. Attendees can meander along the banks of the historic Rideau Canal and watch boats being lifted by hand-operated locks dating back to 1832; board an elegant Edwardian style vessel for a cruise on the Ottawa River or go museum hopping through all your special interests. Alternatively, enjoy one of the many outdoor cafés and restaurants in Ottawa's historic Byward Market and watch the world go by.

Come and be a part of this important event. Help guide the ISCC and the CIE in developing new research and standardization goals for the next 75 years. Submit a paper or just

come and join in the discussion. The deadline for paper submissions is **January 15, 2006**. Early registration deadline is **April 12, 2006**.

For more information and the Call for Papers, visit the Symposium website at www.iscc.org/jubilee2006.

Joanne Zwinkles, NRC, Canada

Color Curious? Why is Color Anyway?

A new project in the planning stages at RIT's Munsell Color Science Laboratory aims to satisfy your curiosity about color and answer some of your questions. The "Color Curiosity Shop" is an educational resource being developed by Mark Fairchild, the Xerox Professor of Color Science and Director of the Munsell Color Science Laboratory. When completed, the resource will include an interactive website, a downloadable electronic book, a printed book, and perhaps interactive science museum exhibits. The project will be completed in collaboration with numerous school teachers, the Rochester Museum and Science Center (and other museums interested in color and science education), and input from students around the world. ISCC members are also encouraged to become involved with the project by submitting questions, reviewing material, and making comments or suggestions.

The overall project objective is to help inspire students to become more interested in various scientific disciplines through the overarching theme of color. Student questions will be collected from a variety of sources and answered with photographic and video illustrations and links to other internet resources. The questions and answers will span a range of scientific disciplines and levels from preschool to postgraduate.

A website is already in place for the project at www.whycolor.org. More details about the project can be found on the site along with a feedback form for submission of comments, suggestions, and potential questions. If you are interested in becoming involved in the project in any way, as a collaborator, as a question submitter, or as a sponsor, please visit www.whycolor.org or contact Mark Fairchild at mdf@cis.rit.edu.

Mark Fairchild, RIT Munsell Color Science Laboratory

AIC - Environmental Color Design Study Group

The web page of the International Color Association Study Group on Environmental Color Design has been updated with the new ECD members, links to the next AIC congresses, the Proceedings of AIC 2004 Color and Paints, etc. Take a look: <http://www.fadu.uba.ar/sicyt/color/ecd.htm>.

13th Color Imaging Conference Preliminary Program Announced

The Society for Imaging Science and Technology (IS&T) has announced the Preliminary Program for the 13th Color Imaging Conference (CIC13). The conference, which is co-sponsored by the Society for Information Display (SID), is being held November 7-11, 2005 in Scottsdale, Arizona. Detailed information on CIC13 and a downloadable PDF of the Preliminary Program is available at www.imaging.org/conferences/cic13.

The conference will kick off with a special two-day, in-depth tutorial, "Basic Color Science and Imaging," by Robert W. G. Hunt. With a comprehensive program featuring more than 60 invited and contributed papers on a wide range of topics, CIC13 is an ideal venue for imaging professionals to learn more about this exciting field. The conference also includes 13 exciting two- and four-hour tutorials ranging from "Device Simulation for Image Quality Evaluation" to "Color Science for HDTV and Digital Cinema." The technical sessions begin on Wednesday, November 9 and continue as a single track until Friday at noon.

We are offering pre- and post-conference programs as an added benefit for attendees. On Monday, November 7, the International Color Consortium (ICC) is sponsoring DevCon '05, a one-day seminar designed for users and product developers working with ICC-based color-management systems. In addition, the Inter-Society Color Council (ISCC) Special Topics Conference begins at 2:00 pm on Friday, November 11th and continues through Saturday afternoon. Co-sponsored by IS&T and SID, the symposium will focus on issues related to making reliable measurements for calibrating and profiling the color of digital imaging devices, including emissive displays and printed media. See the adjoining page for a complete program listing.

For more information, please contact IS&T or visit www.imaging.org/conferences/cic13.

"Colour in Culture and Colour in Fashion" 2006 AIC Interim Meeting

The Colour Group of South Africa is sponsoring the 2006 AIC Interim Meeting to be held in Johannesburg, South Africa October 24 -27, 2006. It will bring together experts from all over the world to exchange the latest information on the trends and developments in colour science, technology, art and design. The theme of the meeting is "Colour in Culture and Colour in Fashion." All topics related to this theme will be accepted, including: color in art and design, color perception, color appearance, color and psychology, color measurement, color standardization, color education, and many more.

For more information, please visit the web site, www.colourgroupsa.org.za, which will be updated regularly with new information.

ISCC/IS&T/SID November Meeting Registration

To register for the special topics conference, "Precision & Accuracy in the Determination of Color in Images," please see <http://www.imaging.org/conferences/cic13/> or contact IS&T at registration@imaging.org or Cynthia Sturke, ISCC Office Manager, at ISCC@iscc.org.

The fees are:

	until 10/5	after 10/5
ISCC/SID/IS&T Member	\$200	\$250
Non-Member	\$250	\$300
Student	\$100	\$100



Hotel Information — ISCC Special Topics Conference

A special block of rooms at a discounted rate is being held at The Caleo for IS&T/SID Color Imaging Conference, as well as the ISCC/IS&T Special Topics Conference attendees for the nights of November 5 through 14. The discounted rate will also be extended for 3 days before and after these dates if space is available. Reservations will be assigned on a priority basis provided they are received by October 5, 2005. To guarantee your room, a deposit equal to one night's housing must accompany your reservation request. Deposits can be made by check or a major credit card. Reference the IS&T/SID Color Imaging Conference when making reservations. The conference hotel rate is \$155.00 plus state and local taxes.

Hotel information for mail, telephone, and fax is:

Reservations Manager
Attn: IS&T/SID - Color Imaging
The Caleo - Scottsdale
4925 North Scottsdale Road
Scottsdale, Arizona 85251
480-946-4056 fax
480-945-7666 phone

Airport shuttle and taxi service from Phoenix Sky Harbor International Airport is available. Also, complimentary parking is available at the hotel.

ISCC/IS&T/SID Special Topics Conference Program
“Precision & Accuracy in the Determination of Color in Images”

November 11-12, 2005

Scottsdale, Arizona

The ISCC has joined with the IS&T, the Society for Imaging Science & Technology and the SID, the Society for Information Display, to offer a “Williamsburg” special topics conference immediately following the annual IS&T/SID Color Imaging Conference. This special topics one-and-a-half-day conference will focus on issues related to making reliable measurements for calibrating and profiling the color of digital images, including emissive displays and printed media.

Friday, November 11, 2:00 – 4:00 pm

The Problem of Fluorescence

Keynote Speaker: **Patrick Emmel** (Clariant), “Introduction to Fluorescence and Optical Brighteners”

Contributors: **Danny Rich** (Sun Chemical), “Effect of Brightened Substrates on Color Management”

Claudio Puebla (Axiphos), “Compensating or Correcting for Brightened Substrates”

Dave Wyble (RIT Munsell Color Science Lab), “A Dataset for Evaluation of Color Measuring Instrumentation”

Saturday, November 12, 9:00 am – noon

Repeatability, Reproducibility, Traceability

Keynote Speaker: **Maria Nadal** (NIST), “Fundamental Standards for Image Color Assessment”

Contributors: **Dave Wyble** (RIT Munsell Color Science Lab.), “Comparison of Repeatability Metrics for Color Measurement Instruments”

Danny Rich (Sun Chemical), “Comparison of Reproducibility Metrics for Color Measurement Instruments”

Charles Leete (Collaborative Testing Service), “A Process for Assessment of Inter-Instrument Agreement”

Tuo Wu (Hewlett-Packard Co.), “Validation of Colorimeter Performance in the Field

Jack Ladson (Color Science Consultancy), “An Instrument Correction Program”

Saturday, November 12, 2:00 – 4:00 pm

Measurements Using Images

Keynote Speaker: **John McCann** (McCann Imaging), “Radiance Calibration of High Dynamic Range Image Segments”

Contributors: **Rejean Baribeau** (NRC Canada), “Predicting Color Corrections from the Measured Spectral Response of a Colorimeter”

Jeff DiCarlo (Hewlett-Packard Co.), “Imager Calibration Trade-offs”

Mark Fairchild (RIT Munsell Color Science Lab.), “Using HDR Display Technology and Color Appearance Modeling to Create Display Color Gamuts That Exceed the Spectrum Locus”

Color Research and Application In This Issue, October 2005

In 1937, Hans E. J. Neugebauer published the article “Die theoretischen Grundlagen des Mehrfarbendrucks.” This article introduced what became known as the Neugebauer Equations. They form the basis of many current applications in color image reproduction. An English translation by David Wyble and Andreas Kraushaar of this 1937 publication is included as a Classical Article on Color in this issue. “The Theoretical Basis of Multicolor Letterpress Printing” also includes a commentary of personal reflections of Dr. H. Neugebauer by Milton Pearson.

With more people using electronic communications, the pictures displayed on a computer are increasingly a substitute for looking at the object directly. While in some cases merely seeing the concept (such as a design suggestion) is sufficient, in other cases such as remote medical diagnostics, an accurate image perception including its color is critical. Thus the tone reproduction curve that represents the display becomes an important parameter. In display standards and color management systems the function gamma, the exponent of the power function, relates input voltage and light output on a display. It is the main parameter in the display’s tone reproduction curve. As defined here, gamma is generally considered an objective physical metric. However, Besuijen contends that this is not necessarily true. Current models tend to map all digital code values below a threshold to a luminance of 0. This clipping can lead to incorrect gamma fits. In the article, “The Shifting Gamma Perception” he says that gamma is computed based on a minimum error with the perceptual lightness curve. So gamma is based on perception. The best choice for gamma depends on the way it is measured and on the purpose of its use. Dr. Besuijen goes on to suggest two improvements to the current models.

Traditionally when evaluating color of materials, one tries to have smooth specimens where other appearance aspects will not distract from the color. In this situation computer displays might be better than the actual materials. However, for the case of textiles, the final product will definitely have texture, and the evaluation of the color difference between materials needs to include the texture. Our next article reports on the “Investigation of Texture Effect on Visual Colour Difference Evaluation.” To study the effect, John H. Xin, Hui-Liang Shen, and Chuen Chuen Lam used five color centers and mapped various texture patterns onto the colors. They show that the visual color-difference evaluation is strongly influenced by the texture of the sample pairs.

The International Commission on Illumination (Commission Internationale de l’Éclairage, CIE) in its Publication 15 defines Tristimulus values in terms of integrals over the whole spectrum, that is, 1-nm intervals from 380 to 830 nm. However, in practice the integration is approximated by summing over a shorter wavelength interval in steps of 1, 5, or 10 nm. Generally CIE data is tabulated at 1-nm intervals, but not for spectral power distributions of CIE Test illuminants, which

are provided at 5-nm intervals. Measured data may be at any of several wavelength intervals. How do you get to 1-nm data, or what do you do in the calculation? Usually the answer is to interpolate the measured data, but which method is best? For several years technical committees have been discussing the advantages and disadvantages of different spectral interpolation methods. N. Sándor, T. Ondró, and J. Schanda investigate the differences caused by using different interpolation methods. In “Spectral interpolation errors,” they report similar results for each (linear, Lagrange, cubic spline and Sprague) method for most well-behaved spectra. They also found that 5-nm sampling and use of the 5-nm tables is almost as good as an interpolation to 1-nm sampling and calculations using the 1-nm tables.

The next article is the third part of “Theoretical Analysis of Subtractive Color Mixture Characteristics.” In Part I, published in 2003 [Vol 28:175-181], Nobuhito Matsushiro and Noboru Ohta proved theorems for the ideal color. In Part II on General Colorants, published last year, Drs. Matsushiro and Ohta established the bounds on mixtures of colorants given stimulus measurements of the constituent single-color samples and the illuminant. Now in this issue in “Part III – Realistic colorants and single tristimulus dimension,” new theorems related to the comparison between the bounds of the ideal color, general colorants and realistic colorants are provided.

For over 70 years we have talked about the color matching functions of the CIE standard observer. After about 30 years, we differentiated between the 2 and 10 observers based on the field size being considered. However, we always accepted the fact that the standard observer is not a real person, nor is there a person who conforms exactly to the standard observer. Consequently about 15 years ago the CIE proposed a Standard Deviate Observer. The deviate observer enables the evaluation of differences caused by the variability between observers all of whom have normal color vision. In our next article, “Testing the Behavior for Metamerism of the New Deviate Observer (JF-DO),” J. A. Martínez, F. J. Vega, A. Díaz, F. Perez-Ocón, and J. R. Jiménez discuss observer metamerism using actual observers. They report on the experimental results of the JF-DO using metameric reflectances in comparison to the CIE-1931 Standard Observer and the CIE-1989-Standard Deviate Observer. The results obtained are far beyond those predicted by the CIE method. The CIE method is based on the color matching functions of the 20 Stiles-Burch observers.

A “Theory of Corresponding Colors as Complementary Sets.” is given in our next article. Ralph W. Pridmore describes an interesting method for predicting corresponding colors and complementary colors based upon the basic colorimetric terms of wavelength and excitation purity. It is remarkable because the former can be precisely determined by calculation whereas the latter can only be determined approximately by experiment.

For the final article in this issue, we move to the area

Continued on page 9

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where the challenge is preserving historical buildings. In learning as much as we can through physical and chemical analysis, scientists are able to follow the history of a building and to choose materials and colors that should be used in a restoration of the building. M. J. Feliu, M. C. Edreira, J. Martín, S. Calleja, and P. Ortega formed a research team to study historical artifacts. In "Study of Various Interventions in the Façades of a Historical Building. Methodology Proposal, Chromatic and Material Analysis" they report how a detailed chemical analysis of the restoring materials is superimposed during several interventions.

Two communications relate to the Founding Editor of this journal, Fred W. Billmeyer, Jr. As was announced in an obituary in Issue #2 of this year, Dr. Billmeyer died last December. In this issue, Dr. Hunt sends some personal comments in the Communication and Comments section. Also, Roy Berns announces the formation of a Fred W. Billmeyer, Jr. Scholarship Fund at Rochester Institute of Technology.

Our Reviews section features *Visual Neurosciences* by Chalupa and Werner, *Artist's Color Manual* by Simon Jennings, and *Light-Matter Interaction* by Weiner and Ho. I thank Rolf Kuehni, Marcia Cohen, and Rejean Baribeau for their reviews. Two CIE Publications and an ASTM CD are briefly mentioned. ASTM has a *Lexicon for Sensory Attributes Relating to Texture and Appearance* in CD form. From the CIE we find out about *CIE Publication CIE 164:2005 - Hollow Light Guide Technology and Applications* and *CIE x027 Proceedings of Light and Health Symposium*.

Ellen Carter

Editor, Color Research and Application

More on the Color Red

"The Lady in Red" story in the the July/August ISCC News-letter noted the importance of the red dye cochineal in earlier centuries. More on the color red is contained in a brief communication in *Nature*, May 10, 2005. Hill and Barton, University of Durham, UK, report that red coloration has been found to be a sexually selected, testosterone-dependent signal of male quality in a variety of animals. They show in this communication that a similar effect can influence the outcome of physical contests in humans. For example, they report that in Euro 2004, a soccer tournament in which five teams alternated shirt color from game to game; all five teams did better when wearing their red shirts. The researchers speculate that because red is associated with anger and violence, competitors may be subconsciously intimidated by opponents dressed in it—and that wearing red may boost an athlete's testosterone levels and thereby improve his performance.

The researchers conclude that these results indicate not only that sexual selection may have influenced the evolution of human response to colours, but also that the colour of sportswear needs to be taken into account to ensure a level playing field in sport.

Member Item:

Roy Berns Explains Application of Color Science to Art on NPR

The National Public Radio (NPR) featured an interview with Roy Berns on how he applies color science to art. Late spring, Mr. Christopher Joyce from NPR toured the Munsell Color Science Laboratory (MCSL), Rochester Institute of Technology, Rochester New York, and interviewed Roy about his color science research and its application in art conservation.

During Joyce's visit to the MCSL research facilities, Roy described how he and his colleagues are working with museums to develop cameras and inks to assist them in producing more accurate reproductions. To illustrate the issues involved, Roy and Christopher took a field trip to the Annual Rochester Lilac Festival to look at the vibrant and lively colors of the lilacs. Roy picked several blossoms with varied colors and changes in hue to measure in the laboratory. Once the spectrophotometric data were gathered, Roy explained how he can narrow the pigment selection by comparing a blossom's spectral characteristics with a potential pigment's data. They compared a selected pigment with the petals under the lighting where the reproduction would be viewed to evaluate their match. Roy also showed reproductions of Seurat's famous Sunday at La Grande Jatte in the spectral laboratory equipped with specific lighting. They discussed potential problems such as metamerism, the color shift that can occur when the light sources change especially if the proper replacement pigments are not selected.

The segment aired on NPR on July 19, 2005 during the Morning Edition. You can find the interview, "Using Science to Rescue Art," at the NPR website in the archives or at: www.npr.org/templates/story/story.php?storyId=4760267.

Call for Papers: 2006 Gemological Research Conference

Papers are being requested for the Gemological Institute of America's (GIA) first Gemological Research Conference, being held in San Diego, Calif., Aug. 26-27, 2006, just prior to the 4th International Gemological Symposium Aug. 27-29. The conference will feature oral and poster papers and keynote presentations in six sessions.

The session themes are: Geology of Gem Deposits, Gem Characterization Techniques, New Gem Localities, Gem Synthesis, General Gemology, and Diamond and Corundum Treatments.

Researchers who wish to present a paper should send an abstract for consideration by March 1, 2006. Abstracts for oral presentations should be submitted to the organizing committee at gemconference@gia.edu. Abstracts for poster presentations should be submitted to Dona Dirlam at ddirlam@gia.edu. For further information, contact the organizing committee at gemconference@gia.edu or visit www.gia.edu/gemsandgemology or www.symposium.gia.edu.

CALENDAR

Please send any information on Member-Body and other organization meetings involving color and appearance functions to:

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iscc@iscc.org website: <http://www.iscc.org>

2005

- Oct 6-7** **VEHICLE DISPLAY 2005, 12th Annual Symposium on Vehicle Displays, SID**, Dearborn, Michigan, 408-977-1013, <http://www.sid.org/>
- Oct 14-18** **CMG's Fall International Conference**, Color Marketing Group, Vancouver, British Columbia, Canada, 703-329-8500, www.colormarketing.org
- Oct 16-20** **Frontiers in Optics 2005 / Laser Science XXI**, Optical Society of America/American Physics Society, Hilton Tucson El Conquistador Golf and Tennis Resort, Tucson, AZ, 202-223-8130, <http://www.osa.org/meetings/annual/>
- Oct 19-21** **49th NPIRI Technical Conference & Manufacturing Symposium**, The National Association of Printing Ink Manufacturers, Alexis Park Resort and Spa, Las Vegas, NV, <http://www.napim.org/tc2005/tech05Program.asp>
- Oct 21-23** **OSA Vision Meeting**, Optical Society of America, Doubletree Hotel, Pat Broyles, Tucson, AZ, 520-322-3800 ext. 202, <http://www.osavisionmeeting.org/2005/overview.php>
- Oct 25-27** **2005 AATCC International Conference & Exhibition, Hyatt Harborside**, Boston, MA, 919-549-8141, <http://www.aatcc.org/>
- Nov 6-9** **Western Coatings Societies Symposium & Show, FSCT**, Westin Casuarina Hotel & Spa, Las Vegas, NV, 610-940-0777; fsct@coatingstech.org, www.coatingstech.org.
- Nov 7- 11** **IS&T/SID's Thirteenth Color Imaging Conference**, The SunBurst Resort, Scottsdale, Arizona, 703-642-9090, <http://www.imaging.org>
- Nov 11-12** **ISCC/IS&T Special Topics Meeting, "Precision and Accuracy in the Determination of Color in Imaging,"** Scottsdale, Arizona, 703-318-0263, <http://www.iscc.org>
- Dec 4-6** **PIA/GATF Color Management Conference**, Pointe Hilton Tapatio Cliffs Resort, Phoenix, AZ, 412-259-1755 <http://www.gain.net/conference/brochure/index.cfm?ConferenceID=550>

2006

- Jan 8-10** **IESNA Annual Conference**, Marriott Marquis Hotel, New York City, NY, 212-248-5000, http://www.iesna.org/programs/meetings_calendar.cfm
- Jan 22-25** **ASTM E12, Color and Appearance**, Embassy Suites Hotel, Ft. Lauderdale, FL, 610-832-9585, www.astm.org
- Mar 18-22** **NAPIM Convention**, La Costa Resort & Spa, Carlsbad, CA, 732-855-1525 <http://www.napim.org/>
- Mar 19-21** **TAGA 2006**, Vancouver, Four Seasons Hotel, Vancouver, British Columbia, Canada, 585-475-7470, <http://www.taga.org/>
- Apr 7-11** **CMG's Spring International Conference**, Color Marketing Group, Denver, Colorado, 703-329-8500, www.colormarketing.org
- Apr 18-20** **Color Pigments 2006 - A Global Perspective**, Color Pigments Manufacturers Association, Inc., 703-684-4044, Hotel InterContinental, Chicago, Illinois, cpma@cpma.com, <http://www.pigments.org/index.php?id=61>
- May 1-5** **Prospecting for Geospatial Information Integration, asprs**, The Imaging and Geospatial Information Society, Reno Hilton Hotel, Reno Nevada, 301-493-0290, <http://www.ASPRS.org>

2006, Continued

- May 9-11** **CORM 2006 Annual Conference, Industry and National Metrology Institutes: Partners in Light Measurement Problem Solving**, National Institute of Standards and Technology Gaithersburg, MD, 440-542-8042, http://www.corm.org/_CORM2006_information.shtml
- May 7-12** **2006 International Congress of Imaging Science (ICIS 2006)**, Hyatt Regency Hotel, Rochester, New York, 703-642-9090, www.imaging.org/conferences/icis2006
- May 14-15** **ISCC 2006 Annual Meeting**, Ottawa, Canada, 703-318-0263, www.ISCC.org, ISCC@compuserv.com.
- May 16-17** **CIE Expert Symposium on the Standard Observer**, National Research Council, Ottawa, Canada, www.iscc.org/jubilee2006, iscc@iscc.org
- May 18-19** **CIE Division I Meeting**, Ottawa, Canada, <http://www.bio.im.hiroshima-cu.ac.jp/~cie1/>
- May 23-26** **IS&T Archiving Conference**, Ottawa, Canada, 703-642-9090, archiving@imaging.org, <http://www.imaging.org/conferences/archiving2006/>
- Jun 14-16** **ASTM E12, Color and Appearance**, Sheraton Centre Toronto; Toronto, ON CAN, 610-832-9500, www.astm.org
- Aug 26-27** **Gemological Research Conference**, www.symposium.gia.edu, San Diego, California.
- Aug 27-29** **4th International Gemological Symposium**, www.symposium.gia.edu, San Diego, California.
- Oct 24-27** **"Colour in Culture and Colour in Fashion," AIC 2006**, Interim Meeting, www.colourgroupsa.org.za, Misty Hills Country Hotel and Conference Centre, Johannesburg, South Africa

Publications Available from ISCC Office

Color and Light by Fred W. Billmeyer Jr. & Harry K. Hammond, III. Authorized reprint from: ASTM Manual 17, Copyright 1996, ASTM International, 100 Bar Harbor Dr., W. Conshohocken, PA 19428.

.....\$5 ea or 20 copies/\$50.00

Demystifying Color by Bob Chung, 11 pages. Discusses and explains ten myths about color.

.....\$5 ea or 20 copies/\$50.00

Proceedings-9th Congress of the International Colour Association, AIC Color 01 Rochester, Allan Rodrigues, Ed., papers given at technical sessions...\$75*

Guide to Material Standards and Their Use in Color Measurement (ISCC TR-2003-1). The Guide, developed by ISCC Project Committee 51, provides an introduction to material standards and their use for the standardization of color measuring instruments.\$50*

*Plus shipping and handling

Advertising Policy

The ISCC advertising policy for the ISCC News is as follows: Pre-paid color-related advertising will be accepted 30 days in advance of the publishing date.

The rates are:

\$ 100	business card-size ad
\$ 250	1/4 page ad
\$ 500	1/2 page ad
\$ 1,000	full page ad

The editor reserves the right to determine the acceptability of the advertising. A 20% discount is available for a yearly contract.

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All submissions must be in English. Please submit materials by the first of each even numbered month. Materials submitted later may be printed in the following issue.

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Prime-Color, Inc.	watprime@hotmail.com	908-272-5759

ISCC Member Bodies

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The Color Association of the United States, Inc. (CAUS)
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Graphic Arts Technical Foundation (GATF)
Illumination Engineering Society of N. America (IESNA)
National Association of Printing Ink Manufacturers (NAPIM)
Optical Society of America (OSA)
Society for Information Display (SID)
Society of Plastics Engineers, Color & Appearance Div.(SPE)
Society for Imaging Science and Technology (IS&T)
Technical Association of the Graphic Arts (TAGA)

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