Inter-Society Color Council *News*

Issue 444 March-April 2010

ISCC Welcomes X-Rite Incorporated as ISCC Sustaining Member

ISCC welcomes X-Rite Incorporated as a new sustaining member. X-Rite Incorporated is a global leader in the application of the latest technologies for accurate color measurement, communications and standards. Based in Grand Rapids, Michigan, X-Rite conducts research and development on new technologies to solve problems in industries where color is mission critical, such as photography, plastics, printing, automotive, paints and coatings, design, fashion, film and video, graphic arts, textiles and home décor. X-Rite offers end-to-end solutions and services to assist in every facet of color reproduction, from concept to consumer. With the acquisition of GretagMacbeth and Pantone in recent years, X-Rite has employees stationed in more than 100 countries.

In general, X-Rite has two major business segments: color measurement and color standards. Color measurement consists of quality control instrumentation that measures, communicates, and simulates color. The color standards segment includes the operations of Pantone and Munsell, which develop and market products for accurate communication and reproduction of color, servicing customers in a variety of industries.

X-Rite was established in 1958, and derives its name from its first commercial success in 1961, a tape that allowed medical personnel to indelibly mark X-rays of patients. In the mid 1970s, the company entered the quality instrumentation industry with a simple densitometer used to control the density of X-ray film. Building on its strong foundation of research and development, X-Rite quickly expanded its instrumentation into color measurement for the graphic arts and photography market in the 1980s, and in the 1990s, X-Rite broke into the color and appearance markets with handheld colorimeters and spectrophotometers for applications in coatings and paints, plastics, and textiles industries. Today, X-Rite continues to introduce solutions for faithful color communication across global value supply chains, such as the next generation of CxF (Color Exchange Format), a file format designed to accurately communicate commercially relevant aspects of color across devices, applications and geographies.

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The company designs and manufactures a full line of color instruments from handheld units to high-end precision bench top devices. X-Rite equipment can be found at paint stores, photographers' studios, print shops, film postproduction labs, home décor and hardware stores, even in dentists' offices for measuring the shades of white on teeth. For visual evaluation of color, X-Rite provides Macbeth lighting solutions including light boxes, luminaires, and rooms dedicated to creating the proper viewing condition for evaluating color.

X-Rite solutions allow users to measure, match, formulate, simulate and communicate color. Color standards from Pantone and Munsell are used for international reference and de facto standard for selecting, specifying, matching and controlling color in application ranging from ink to aerospace.

For more information on X-Rite, please access the company's website at www.xrite.com.

Mark Pyk, X-Rite Incorporated

DCC Short Course: Matching and Control of Metallic and Pearl Colors

For the tenth consecutive year the Detroit Colour Council will offer a unique 2-day course in a hands-on format, 'Matching And Control of Metallic and Pearl Colors," in Livonia, Michigan Tues-Wed April 27-28, 2010.

The course objective is to provide technical fundamentals for matching and maintaining color control for metallic and "effect" colors, including automotive components and non-automotive applications. The course features proper visual metallic color match evaluation using defined-viewing-angle color protractors as well as use of multi-angle color difference measurement to meet the revised SAE J1545 recommended practice. Correlation of visual to measured data is studied from student projects with metallic color samples and parts, using portable daylighting and multi-angle spectrophotometer data.

For more information contact course administrator Bill Longley, 734-420-4920, email, colourbill@sbcglobal.net or Jim Hall, 586-709-2606 at General Motors, email, james.1.hall@gm.com. or www.detroitcc.org.

HUE ANGLES

(send contributions to mbrill@datacolor.com)

Rotating a disk for fun, knowledge, dizziness, and profit—This month we'll hear from Don Hall, who has engaged in all of the above and even patented some of it. Don starts by reviewing a recent paper by Rolf Kuehni, and then reaches farther…

Disk Color Mixture and Beyond

Rolf Kuehni [1] recently published a comprehensive and well researched paper on the historic use of a modified child's toy, a spinning top, to investigate the mysteries of color.

Kuehni starts with Ptolemy's second-century, first-recorded, observation that a fusion of color occurs when a spinning multi-colored potter's wheel reaches a certain speed. Eight hundred years later Alhazen, a Persian natural scientist, made a similar observation. After another 700 years, experimenters tried to understand why disk mixtures don't 'properly' correlate with pigment mixtures. After this was understood, disk color mixture found practical use. In 1763, Antonio Scopoli, an Austrian physician and natural scientist, used disk mixture in classifying insect colors. Two years later, Chevalier D'Arcy, a physicist, measured the persistence of a rotating visual image using a glowing piece of coal. He needed at least eight revolutions per second for the image to fuse. (See [2] for more on the time resolution of vision.)

Over the next hundred years, Kuehni continues, disk-mixture studies revealed "accidental colors," afterimages and complementary colors. During this period attention gradually shifted to empirically based color order systems. In 1810, the artist Philipp Otto Runge proposed such a system but had difficulty correlating Newton's colors with pigment mixtures and decided to experiment with disk mixtures. In the process he lightness-matched the chromatic segments against the black & white segments.

Several years later, in 1855, James C. Maxwell reported using the famous disk-mixture device of his own design to advance color theory. By 1860 he switched from a spinning disk to a visual colorimeter to match spectral colors with spectral primaries. A few years later O. N. Rood used disk mixture to reconstruct or "correct" Maxwell's diagram.

In 1900 A.H. Munsell patented his Color Sphere which, when spun, produced neutral grays of decreasing Value from the top to bottom of the sphere. Later Munsell used disk mixture to create the color panels that populated his 3D Color Tree. In subsequent years the Munsell Company offered his color chips in a circular form with a center hole and slitted radius for mounting on a spinning disk device.

By the 1920's and 30's, visual photometers, tristimulus colorimeters and spectrometers obviated the need for spinning-disk mixture. However, as Kuehni reports, there was one final gasp for that old technology. In 1977, Applied Color Systems Inc. (Princeton, NJ) began to develop an instrument for measuring color materials that were not readily measured on a reflectance spectrophotometer because of texture, pattern, size or geometry. After nearly two years of unsuccessfully exploring color CRT and color projection systems, Ralph Stanziola, ACS's Executive Vice President and Technical Director, decided to take a page out of the past, to the amazement of his associates, by developing a "Maxwell Disc" connected to a computer to match colors. Although the Visual Color Simulator (VCS-10) took three years to develop, it was technically successful as a visual color measuring input device for computer color matching and also as an accurate color simulator that could rapidly transmit visually simulated colors to remote locations. As Kuehni correctly points out, it may have worked well but it was too expensive to be widely accepted.

During the development of the VCS-10, some visual anomalies were encountered, particularly during start-up while the color disk pack accelerated to the flicker-fusion rate. Some observers complained

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of nausea and vertigo, and others saw different colors in their peripheral vision. To avoid these perturbations, the power to the controlled illumination lamps was not activated until the rotation was fast enough for flicker fusion.

The effect we were avoiding by turning the lamps off is related to a much weaker disk-color effect that is not properly disk color mixture (and which Kuehni doesn't mention). Produced in 1894 by toy maker C.E. Benham, the "Artificial Spectrum Top" [3] was a disk that was one half black and the other half a white background overprinted with four areas having a series of three concentric black arcs arranged in a step-wise fashion. When this disk was spun below the flicker-fusion rate, concentric circles of weak colors appeared. When rotated the opposite way the illusionary colors reversed order.

Benham's top is still a subject of scientific investigation [4, 5] and disk color mixture may be a matter for history. Nevertheless, I still have a Swiss Made "Optischer Farbmischer" on my desk [www.swissmade.com] as a reminder of the pleasure of working with Ralph Stanziola on the VCS-10 and in a sense reliving some experiences of the scientific pioneers that Kuehni documents so well.

Don Hall, Former President of Applied Color Systems, Inc. (ACS) and ACS-Datacolor

REFERENCES:

1.) Kuehni, RG. A brief history of disk color mixture, *Col. Res. Appl.* **35**, 110-121 (2010).

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4.) LeRohellec J, Vienot, F. Interaction of luminance and spectral adaptation upon Benham subjective colors, *Col. Res. Appl.* **26**, S174-S179 (2001).

5.) Kenyon,G, Hill, D, et al. A theory of the Benham top based on center-surround interactions in the parvocellular pathway, *Neural Networks* 17, 773-786 (2004). 773-786 (2004).

Hue Angles Supplement

Several people have recently demanded to know whether I am a "color realist"— as if they were choosing up sides for Armageddon. It seems a popular topic now. One episode (with arguments not seen since George "to be is to be perceived" Berkeley in the 18th Century) drove me to verse that reveals my true colors:

World and Mind
(with apologies to Robert Frost)

Some say that color's in the world,
Some say in mind.
From optics bench with light pipes furled
I hold with those who favor world.
But since you bug me for advice—
I think I know enough of dreams
To know that *there* the hues are nice,
And Berkeley schemes
A modest price.

Michael H. Brill

Color Management Understanding and Using ICC Profiles, Phil Green, ed.

The latest addition to the IS&T/Wiley Series, *Color Management, Understanding and Using ICC Profiles,* is now available to ISCC members at a special price. To take advantage of this offer, please download the PDF found at www.imaging.org/IST/pdfs/2010_Special_Offer_on_ICC_Profiles_Book.pdf and fax it to 703/642-9094 by May 31, 2010.

This book is a comprehensive guide to the implementation of the ICC (International Color Consortium) profile specification—widely used for maintaining color fidelity across multi-media imaging devices and software It draws together many of the White Papers produced by ICC to promote the use of color management and disseminate good practice. Other chapters include material that will form future ICC White Papers, as well as some original content. The ICC review process ensures that material and recommendations included are collaborative, reflecting the input of the wide community of color and imaging scientists and developers who make up its membership.

YOSHINOBU NAYATANI

(1927 - 2009)

Yoshinobu Nayatani passed away at a hospital in Hyogo Prefecture, Japan, on May 29th, 2009. He was a great color scientist, a diligent contributor to the color research community and a member of ISCC for a number of years. The following paragraphs are taken from Color Research and Application, 35:84 (2010).

Dr. Nayatani graduated from Osaka University in 1951, where he studied electrical engineering. Upon graduation he began working in the Electrotechnical Laboratory of Japan (ETL) of the Ministry of International Trade and Industry (MITI) where he has been engaged in photometry, colorimetry, and fundamental theory of illuminating engineering. Meanwhile he continued his education earning a Ph. D from Osaka University in 1961. In 1974 he was promoted to director of the Osaka Branch of ETL where he continued to work until his retirement in 1980. He joined the Faculty of Engineering at Osaka Electro-Communication University as a Professor in 1980, and served as Dean of Faculty of Engineering (1995-1997). He became Professor Emeritus in 1998 and served on the Board of Trustees from 1999 to 2002.

He was very active in the color community serving on the Editorial Board of Color Research and Application from 1977 until 2008. In the CIE, he was Chairman of TC 1.3 on Standard Sources for 8 years, and TC 1.32 Prediction of Corresponding Colors. He was an honorary member of the Japanese National Committee of CIE, the Color Science Association of Japan, Illuminating Engineering Institute of Japan (IEIJ), and Japanese Society for Quality Control. For the International Colour Association (AIC) he was chair of the Organizing Committee for the AIC Quadrennial Kyoto 1997.

He received many awards for his contributions including: the IEIJ Prize (1966), the Deming Prize for individual contribution to quality management (1985), Award Paper for Illuminating Engineering Institute of Japan, the AIC Deanne B. Judd Award in 1993, and in 1998 the Color Science Association of Japan Prize. Also in 2003, he was honored with a Special Testimonial for Color Technology by Suga Foundation for Promoting Weathering Technology.

His professional interests covered information processing at the interface between psychology and physics; color engineering (color appearance and metamerism); statistical information processing, and quality management and control. He published much on the relationship between color order systems, color appearance and color difference. In addition he published on quality management and control – "Proposal of Seven New Tools for Quality Management" in 1977, which are now widely used in Japan. The books on the tools are translated into several languages. *Management for developing creative new products*, a book was published in 1997 with two colleagues, and received awards.

Dr. Nayatani, joining with Hideki Sakai, continued contributing to color science right up to his death. His last article for *Color Research and Application* will appear later this year and is already submitted for Early View.

Textile Test Methods Workshop

April 28-29, 2010

AATCC Technical Center
Research Triangle Park, NC

AATCC's Introduction to Textile Testing Workshop, to be held April 28-29 at the AATCC Technical Center in Research Triangle Park, NC, will cover tests of physical properties published by ASTM International, as well as performance tests published by AATCC.

Featured ASTM methods will include tests for tearing strength, pilling resistance, and abrasion resistance. AATCC instruction will focus on basic color theory and measurement, colorfastness, color evaluation, fiber identification, dimensional change, appearance retention, and water repellency and resistance tests.

The workshop will provide vital theory, application, and industry practice. Time is allotted for participants to perform many of the methods discussed and to ask questions of all instructors.

Attendees will receive a copy of the *AATCC Technical Manual,* and relevant ASTM methods. Luncheon and break refreshments are also included. Attendance is limited to ensure personal instruction, so early registration is encouraged.

Details and registration are at www.aatcc.org/programs/workshops/ITT_Workshop.cfm.

2010 ISCC Annual Meeting: Call for Papers
October 7-8, 2010
North Carolina State University, Raleigh, NC

Mark your calendar now for the **2010 ISCC Annual Meeting**, to be held at the campus of North Carolina State University in Raleigh, NC on October 7-8. The meeting will include non-concurrent sessions of all three interest groups, an educational session and a business and awards luncheon.

Papers are being accepted in each of the ISCC's three Interest Groups (IG). For submissions on

- IG1 on Basic and Applied Color Research, contact Ms. Ann Laidlaw, ALaidlaw@XRite.com
- IG2 on Industrial Applications of Color, contact Mr. James Roberts, jim.roberts@altanachemie.com
- IG3 on Art, Design and Psychology, contact Dr. Barbara Martinson, bmartins@che.umn.edu.
- For the educational session, contact Dr. David Wyble, wyble@cis.rit.edu.

The technical chair is Dr. Michael H. Brill (MBrill@datacolor.com) and general chair is Dr. David Hinks (david_hinks@ncsu.edu). Please contact Ms. Ann Laidlaw (ALaidlaw@XRite.com) if you have questions regarding this meeting. The nearest airport is RDU and hotel information will be provided closer to the meeting date.

2011 Midterm Meeting of the AIC

Zurich University of the Arts
Zurich, Switzerland

The theme of the midterm AIC 2011 Scientific Program is "Interaction of Colour and Light in the Arts and Sciences." The meeting will be held June7-10 at Zurich University of the Arts, Zurich, Switzerland. The theme includes both real and virtual environments. The aim is to explore from theoretical and practical points of view how the interaction of color and light performs a crucial role in the perception, conception and realization of spaces and platforms in different fields. Conference presentations will address such terms and concepts, as appearance, interaction, performance, event, and by privileging the materiality, mediality, and the interactive dimension of color and light.

The fields of inquiry include education, design, art, media, architecture, theatre, dance, as well as psychology, radiation and matter interactions, and color science and technology. Researchers, scientists, professionals and industrialists alike will learn of new results, concepts and applications. The AIC 2011 Midterm Meeting embraces discussing and nurturing the latest findings in a broad field involving theory and practice from a variety of disciplines and perspectives.

The AIC 2011 Organizing Committee invites you to participate in this unique event. Those who wish to attend the conference or would like to be sponsors or exhibitors are welcome to contact us. Further information will be posted on our web site / www.aic2011.org/ or you may contact Verena M. Schindler, AIC 2011 General Chair, Email: info@aic2011.org or mailing address in Switzerland, pro/colore, Postfach 8701, CH-8036 Zurich, Switzerland.

Standards: What they are— What will they be? What should they be?

Logistics for ISCC/CIE/ASTM Topical Meeting June14-18, 2010

The conference program is now complete (see ISCC News # 443, and **a new information brochure** at www.iscc.org). Now it is time to book your accommodations.

The organizers recommend that everyone stay at the sleeping rooms in Princeton University. The rooms are more than adequate and the most convenient to the conference (which will be at **Friend Center, on the West side of Olden Ave. between Nassau St. and Prospect St.**). You will enjoy strolling through the Princeton University campus, while networking with others. Avail yourself of this opportunity! The rooms are air-conditioned singles with semi-private baths. Each room is equipped with a twin bed, bureau, desk and chair.

Rates per single-room-night are only $60.00 total. There are no other fees or taxes. Breakfast is not included but there are numerous restaurants within walking distance. Reserve your room today, by returning to ISCC the form at www.iscc.org/meetings/ST2010/ (Ignore charges on page 1 if you already registered for the conference itself.)

Hotel rooms are also available (see table below)**.** Reserve as soon as possible. Princeton is a popular tourist destination and rooms may be scarce. For more suggestions see www.campustravel.com/university/princeton/visit2.htm.

Hotel	Address	~ Distance to PU	Phone No.
Nassau Inn	10 Palmer Square Princeton, NJ	0.5 miles	(609)-924-7500
Hyatt Regency Princeton	302 Carnegie Center Princeton, NJ	3.5 miles	(609) 987-1234
Courtyard by Marriott Princeton Hotel	3815 US Highway 1 @ Mapleton Rd Princeton, NJ	3.5 miles	(609) 716-9100
Holiday Inn Princeton	100 Independence Way, Princeton, NJ	5.0 miles	(609) 520-1200
Princeton Forrestal Village	201 Princeton Road, Linden, NJ -	4.8 miles	(609) 452-0383
Princeton Marriott Hotel & Conference Center at Forrestal	100 College Road East, Princeton, NJ	4.4 miles	(609) 452-7800
Hampton Inn Princeton	4385 US 1 South, Princeton, NJ	4.6 miles	(609) 951-0066
Doubletree Hotel Princeton	4355 Route 1 @ Ridge Road, Princeton, NJ	4.9 miles	(609) 452-2494
Wyndham Hotel & Conference Center	900 Scudders Mill Rd, Plainsboro, NJ	4.2 miles	(609) 936-4200
Chauncey Conference Center	660 Rosedale Rd, Princeton, NJ	3.6 miles	(609) 921-3600

Color Research and Application IN THIS ISSUE, April 2010

Before I begin discussing the contents of this issue, I wanted to share with you some exciting news about *Color Research and Application*. *Color Research and Application* is now participating in EarlyView®—Wiley's system for online publication of individual articles as soon as they are ready—before release of the compiled print issue of the journal. Articles posted online in EarlyView are peer-reviewed, copyedited and author-corrected, and include all figures and tables. They are also fully citable! EarlyView means you, both authors and readers, benefit from having the best of two worlds — fast online availability as well as traditional, issue-based archiving. It serves our authors and readers by reducing the time to publication, offering fully citable online publication, and full integration of all EarlyView articles into the comprehensive search and browse functions that cover all Wiley journals.

Every EarlyView article is fully citable through its online publication date and Digital Object Identifier (DOI), a unique identifier that is assigned to an article when it is published online, and that stays with it for the life of the article. The DOI will be visible with each article on EarlyView. When citing, authors can copy the DOI from the online reference and paste it into their papers. The DOI was developed by the International DOI Foundation on behalf of the publishing industry. Because it provides for article identification, the DOI is useful for many purposes other than citation. You can read more about it at www.doi.org

How can you find EarlyView articles for Color Research and Application? You can search for the journal Color Research and Application or go to our web address: www3.interscience.wiley.com/journal/35037/home. Once there look for the topic "Issue Navigation" and then click on the link to EarlyView.

Now I had better get on with talking about what is in this issue. To start this issue, Peter van der Burgt and Johan van Kemenade write "About colour rendition: The balance between accuracy & simplicity." While the International Commission on Illumination (CIE) 's Color Rendering Index, usually called CRI, has been successfully used as a measure of the quality of illumination provided by a light source, its validity has been questioned for some of the newer solid state light sources such as light emitting diodes. In their article Drs. van der Burgt and van Kemenade analyze the principal elements of the CRI calculation and their influence on the color rendering. Then they suggest that by increasing the number of uniformly distributed colors, the calculations lead to similar results, but give the opportunity to provide detailed information on the color shift as a function of hue. We will now wait to see what the CIE technical committee on color rendering (TC1.69) concludes in their upcoming report.

Our next two articles deal with color differences evaluations, but in completely different ways. First is an article dealing with the effect of different textures and weaves of textile on the performance of various color-difference formulae. S. Gorji Kandi and M. Amani Tehran designed an experiment utilizing eight differently knitted fabrics covering various levels of coarseness and dyed around seven hue centers roughly corresponding to red, orange, yellow, green, blue, purple, and brown to investigate the relative performance of color difference metrics. In "Investigating the effect of texture on the performance of color difference formulae," they compare CIEDE2000, CMC, CIE94 and CIELAB formulae to observer evaluations for samples in three sizes of color differences: less than 5 CIELAB units, 5.6 to 9 units, and 9 to 12 units.

Then we have an article about a device that enhances color differences…a michromatic scope. A michromatic scope, a microscope with multiple specially selected color filters, is a multichannel camera with more than just red, green and blue filters. It is designed for differentiation of two or more colors that are visually similar under normal conditions. Use of extra or different filters enhances color differences for specialized applications, and the filters differ for each application. The camera construction depends on the application, as both the filters and the back-end processing are defined separately for each application. In the article "Michromatic scope for enhancement of color difference," Arto Kaarna, Ken Nishino, Kanae Miyazawa, and Shigeki Nakauchi propose two approaches for the design of the filters for a michromatic scope. The first is based on filter design to enhance color difference, and the second approach is based on the non-negative factorization of the measured spectral data overtop from other approaches in color difference enhancement. The filters are defined as the non-negative basis functions of the data from the application, but the post-processing is defined such that the camera construction utilizes regular RGB CCD cells.

For our next article we once again delve into the history of color science with Rolf Kuehni as our guide. In "A brief history of disk color mixture" Mr. Kuehni describes the use of a spinning top to investigate the mysteries of the color phenomenon. In this article, beginning with Ptolemy's second century observation that there is a fusion of color that occurs when a spinning multi-colored potter's wheel reaches a certain speed, we can follow through the centuries on the uses of the disk and wonders of the colors produced, including "accidental colors', after images and complementary colors. He points out that for a time the 19th century disk mixture was the only means of establishing color matching equations and quantitatively defining color stimuli, but that this led to much confusion for both artists and scientists because the results from the spinning disk neither agree with Newtonian predictions of spectral light mixture nor with the results of pigment mixture. Today, while there is no practical application of disk color mixture left, it is interesting to look at where the explorations through the centuries have led us.

When we speak of color we are often talking about the hue. Color, in particular hue, has meaning both physically, psychophysically, and as psychological sensations, but how do we relate these? We see color via the responses of the cone cells in our eyes, but it is left to transmission of responses of other cellular layers and then action in our brain to get to the final interpretation of color as to what hue it is. Hue is often pictured in a circle showing continuous variation from one color to another. However that is not how color is physically measured. Spectrometers measure as a function of wavelength usually from roughly 400 to 700 nanometers; this does not complete a hue circle. The final interpretation of the measured color takes further analysis. Our next two articles come as a pair from Ralph W. Pridmore. In the first "Relative wavelength metric for the complete hue cycle: Derivation from complementary wavelengths" Dr. Pridmore describes a relative wavelength metric and its derivation from complementary wavelength functions. The metric provides a useful psychophysical, wavelength-based, ratio scale for the hue cycle allowing nonspectral colors to be treated in the same coherent scale as spectral hues.

Before we get to the second article in the set, we need to remember another article by Ralph W. Pridmore published in the journal in 2008 [vol. 33; pp 238-249], "Color constancy from invariant wavelength ratios: I. The empirical spectral mechanism." In that article Pridmore described an empirical study of the regularity in the way that dominant wavelengths of corresponding colors shift under illumination changes to search for a psychophysical mechanism of color constancy. Armed with the spectral mechanisms described in the 2008 article and the article just described in the paragraph above, now Dr. Pridmore can formulate the nonspectral mechanisms, "Color constancy from invariant wavelength ratios: II. The nonspectral and global mechanisms." While Dr. Pridmore states, "The formula implies this color-constant hue cycle is isomorphic across illuminants. Extending the ratios to the nonspectral "equivalent wavelengths" predicts the nonspectral constant hues; however, to identify these colorimetrically, their (spectral) complementary wavelengths are specified for various illuminants. This completes the global color constancy mechanism for the illuminant color temperature range 2,800 to 25,000 K and the complete hue cycle." This is not the end of the story. In a later issue this year, we will have Color constancy III. Chromatic adaptation theory, model, and tests."

For a change of pace, we move to "Colour research with architectural relevance: How can different approaches gain from each other?" Karin Fridell Anter and Monica Billger speaking from an architects point of view, discuss some of the recent studies about color emotion and color appearance. They stress the need for further development and clarification of concepts and conclude that the multitude of studies with different approaches can be seen as cases, jointly adding to a widened and deepened understanding of color that bridges across disciplines.

Finally we look at the "Color distribution of maxillary primary incisors in Korean children" using a portable contact colorimeter to measure the color. Hong-Keun Hyun, Yong-Keun Lee, Young-Jae Kim, Jung-Wook Kim, Ki-Taeg Jang, Chong-Chul Kim, Se-Hyun Hahn, and Sang-Hoon Lee, all from the School of Dentistry at Seoul National University, provide an in depth study of the color of children's primary teeth. They look for differences relating to both sex and age of the children.

We close the issue with a review of a book published in Spanish. Emilio Gómez Milán reviews *El Lenguaje del color* (The Language of Color) by Juan Carlos Sanz. It has the subtitle *Chromatic synaesthesia in poetry and visual art*.

Ellen Carter
Editor, Color Research and Application

CALENDAR

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

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2010

Apr 18-21	**2010 Annual Conference, Association of Printing Ink Manufacturing**, Arizona Biltmore Hotel, Phoenix, Arizona, www.napim.org/publicarea/Conv2010/Place.aspx
Apr 26-30	**ASPRS 2010 Annual Meeting, Opportunities for Emerging Geospatial Technologies**, Imaging and Geospacial Information Society Town and Country Hotel, San Diego, California, www.asprs.org/SanDiego2010/index.html
May 10-14	**LIGHTFARE INTERNATIONAL, 2010 Annual Trade Show and Conference**, Illumination Engineering Society, Las Vegas, Nevada, www.lightfair.com/lightfair/V40/
May 16-20	**ANTEC 2010**, Society of Plastic Engineers, Marriot World Center, Orlando, Florida, specad.e-xyn.com/index.php?navid=124
May 18-20	**AATCC's International Conference (IC)**, Georgia World Conference Center, Atlanta, Ga., USA, www.aatcc.org/ic/index.cfm
May 23-28	**SID 2010 International Symposium, Seminar, and Exhibition,** Washington State Convention and Trade Center, Seattle, WA, www.sid.org/conf/sid2010/sid2010.html
Jun 1-4	**Archiving 2010,** Society for Imaging Science and Technology, Den Haag, The Netherlands, www.imaging.org/ist/conferences/archiving/index.cfm
Jun 14-18	**Joint Meeting of ISCC/ASTM E12/CIE Div. 1, Standards: What they are--What will they be?--What should they be?** Princeton University, Princeton, NJ, www.iscc.org/meetings/ST2010/
Jun 14-18	**CGIV 2010: 5th European Conference on Colour in Graphics, Imaging, and Vision,** Society for Imaging Science and Technology, Joensuun Yliopisto and University of Eastern Finland, www.imaging.org
Jun 29-Jul 2	**OEPT 2010, 2nd International Symposium on Optical Engineering and Photonic Technology,** Orlando, Florida, USA, www.2010iiisconferences.org/OEPT
Sep 19-23	**NIP26, International Conference on Digital Printing Technologies,** Austin, Texas, Society for Imaging Science and Technology Society for Imaging Science and Technology, www.imaging.org/IST/conferences/nip/
Sept 24-25	**Bridging the Gap, Pioneering the Future,** The Society for Color and Appearance in Dentistry (SCAD), Newport Beach, California, www.scadent.org
Oct 7-8	**Annual Meeting of the ISCC,** College of Textile, North Carolina State University, isccoffice@cs.com

CALENDAR, Continued

Oct 19-21	**2010 NPIRI Conference**, National Association of Printing Ink Manufacturers, Sanibel Harbour Resort, Ft. Myers, Florida, http://74.0.252.227/publicarea/techconf2010/techconf10CFP.aspx
Nov 8-12	**CIC18, 18th Color Imaging Conference**, Society for Imaging Science and Technology, San Antonio, TX, 703/642-9090, www.imaging.org/ist/Conferences/cic/index.cfm
	2011
Feb 2-3	**ASTM E12, Color and Appearance,** Baltimore Marriott Waterfront, Baltimore, MD www.astm.org/COMMIT/COMMITTEE/E12.htm
Jun 7-10	**2011 AIC Midterm Meeting, Interaction of Color and Light**, Zurich, Switzerland, Organizer: Pro/colore, www.aic2011.org

MCSL Summer Short Course 2010: *Essentials of Color Science* June 22-23, 2010

The Munsell Color Science Laboratory is offering Summer Short Course "2010: Essentials of Color Science" June 22-23. This two-day course will be made up of a series of 10 sessions delivered by leading experts in the topical areas. The lecture series is designed to form a coherent course that introduces the fundamental concepts of color science. Instructors will be available for informal discussions during the breaks, lunch, and at the end of each day. There will also be one evening reception with an open house, tours of the MCSL facilities, and opportunities to interact with the lab's faculty, staff, and students. For more information, please see www.cis.rit.edu/mcsl/outreach/files/2010Brochure.pdf.

Publications Available from ISCC Office

ISCC 76th Annual Meeting Program and Abstracts, ISBN 978-1-4243-4273-0 $25.00*

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. $5 ea or 20 copies/$50.00

ISCC 75th Anniversary Commemorative CD and Pin $30*

Guide to Material Standards and Their Use in Color Measurement (ISCC TR-2003-1) $50*

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2010 ISCC Meetings

Following on the successful March Special Topics Meeting, Lighting in Art, Commercial and Retail Spaces, the ISCC is planning two more meetings in 2010. In June (14-18), ISCC will meet jointly with CIE and ASTM to discuss Color-related Standards. See page 7 of this newsletter and the ISCC web site (www.iscc.org) for more information. In October, the ISCC will hold its annual meeting in Raleigh, NC at North Carolina State University. A call for papers is on page 6 of this newsletter.