



Inter-Society Color Council *News*

Issue 427 Contents

May/June 2007

President's Column	1
HUE ANGLES	
Green & the Fashion Industry	4
Book Review: Art for a House of	
Mathematics	5
Members' News	6
AIC Judd Award 2007 to	
Alan Robertson	6
DCC March Meeting Summary	6
ISCC Welcomes Two New Sustaining	
Members	6
Power to the Pupil: Color Vision, Cameras	
and the Energy Crisis	7
Avian Technologies LLC	7
COLOR RESEARCH AND APPLICATION	
In This Issue, Volume 32 June 2007	8
R•I•T to Offer Ph.D. in Color Science	9
ISCC Welcomes New	
Individual Members	9
CALENDAR	10
Publications Available from	
ISCC Office	11
ISCC Sustaining Members	12
ISCC Member Bodies	12
ISCC News Editor	12

President's Column

This year's Annual Meeting, and the Board Meeting that preceded it, were held at the end of April in Kansas City. Our meeting there benefited from the presence of Hallmark and the two people from Hallmark on our Board of Directors—Steve Glasscock and Scot Fernandez. They ably took care of both the social and technical aspects of the program, resulting in an Annual Meeting that was a delightful and memorable experience for those who were able to attend. For those who missed the meeting, I would like to use this column to convey some of what it was like to be in Kansas City.

First of all, the weather was perfect—although it rained the days before and after. The three days of the meetings were hot and cloudless. Attendees were able to enjoy the perfect weather early in the morning or in the evening, when it was possible to stroll to the Country Club Plaza area, a shopping and entertainment district, down the hill from the Marriott hotel where the meetings were held.

The Annual Meeting was split into three sessions aligned with the three Interest Groups of the Council. The meeting started late Sunday morning with IG3 (Art, Design & Psychology), continued with IG2 (Applications) which was split across Sunday afternoon and Monday morning and ended mid-afternoon Monday with IG1 (Research).

Sunday sessions seemed to offer plenty of time for questions and discussions after the presentations. Monday was more rushed. Rather than having a leisurely pace that would have taken us to Tuesday morning, we planned for the presentations to end in time for Monday evening flights. About a third of the attendees stayed after the last talk for a business meeting that ran until 5 pm. A dedicated group of individuals who were able to stay through Tuesday were treated to a tour of the Nelson-Atkins Museum of Art.

Although we are planning in a future newsletter to print reports written by students of FIT and RIT about what the meeting offered



Dr. Robert Hunt receives Godlove Award; presented by Rob Buckley



Kansas City, MO - 2007 Annual Meeting Site

Continued on page 2

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Continued from page 1

from a student's point of view, I do want to mention a few highlights to give you a sense of the conference. This year we used the theme, "Bridging the Creative and Production Sides of Color," to anchor the content of the meeting. To open the conference Chuck Kijak, from Crayola, discussed how integral color is to their product innovation process, and how Crayola is exploring new products that encourage the use of color and creativity in new areas of learning and development.

A series of papers from Hallmark is worth noting because it bridged the two sides, starting on the creative side and then progressing over to end on the production side. First was Scott Butterfield's talk on the 2008 forecasts for color, which the Hallmark Trends Group sees moving in four distinct directions. One of them for example is Dream, including a color they call Ming, specified as Pantone 7485C. Next was Becky Wyko, a Senior Art Director, who talked about the application of trends and use of color in everyday and seasonal greeting cards. She was followed by Todd Storbeck, whose keynote described a workflow intended to be a transparent part of the design process, bridging the gap between creative color intent and final printed product. Finally, Karl Guyler described how the printed product is realized with a five-color process using stochastic screens. Where else could you hear this pulled together into a coherent story but at an ISCC meeting?

Among the other presentations attendees heard were ones by students from FIT and RIT; from technologists at Kodak and CMU, who also hold leadership positions in two of our member bodies, the ICC and TAGA; and from my colleague, Geoff Woolfe, whose talk at the meeting on a natural language system for editing color was reported later in the week by PCWorld Online and in the New York Times.

Bob Hunt, this year's recipient of the Godlove Award for lifetime achievement in the field of color, delivered the final talk of the Annual Meeting. His delightful presentation intertwined the history of CIE colorimetry with the contributions of past recipients of the Godlove Award. Also the Nickerson Service Award was awarded to Dave Wyble for his many contributions to the Council, most recently as webmaster of the ISCC website.

For those of you who want to learn more about the talks, extended abstracts (1 to 3 or more pages) are available on line at www.iscc.org/ISCC2007/ as well as in the form of an abstract book, handed out to attendees and now available through the office. The abstract book was printed in color and for archival purposes assigned an ISBN, a procedure we intend to use for future Annual Meetings.

I am pleased to say that the Annual Meeting made a surplus, something it needs to do to help cover the costs of running the Council, since the membership fees alone are usually not sufficient. The Board tasked the Finance Committee to take a closer look at our cost structure and budget management, and what we need to realize from meetings, if not to enjoy an overall surplus, then at least to avoid an

Continued on page 3

Continued from page 2

operating deficit. Also key to the future of the Council is membership. Scot Fernandez has stepped forward to chair the Membership Committee and will put together a team to look at recruiting and retaining members: individual, sustaining and member bodies.

The Annual Meeting is when we say goodbye to Board members whose three-year terms are ending, and welcome the new Board members taking their place. Leaving the Board in Kansas City were Britt Norby, Frank O'Donnell and Michael Vrhel. Britt and Frank will remain on the Finance Committee so we will continue to benefit from their experience; Michael will be concentrating on his start-up in the Seattle area.

Joining the Board from the west coast is Barbara Parker, a color designer with JDS Uniphase in Santa Rosa, California. Also new to the Board are David Hinks, professor in the College of Textiles at North Carolina State, and Cameron Miller, who is the Photometry Project Leader at NIST in Gaithersburg, Maryland.

What's next? The meeting in Kansas City was the last the Council is planning for 2007. In 2008 we are planning a joint meeting with the Color Marketing Group in Montreal in late March and the Annual Meeting in Baltimore in the fall, followed by a special topics meeting on Safety Colors. All are in the active planning stage—look for details in future newsletters.

*Robert Buckley, Xerox
(Contributions from Scot Fernandez, Hallmark are gratefully acknowledged.)*



Rob Buckley thanks Cynthia Sturke, ISCC Office Manager, for her hard work and contributions to the successful meeting.



Award Winners Dave Wyble (Nickerson Service Award) and Bob Hunt (Godlove Award) and Eileen Hunt



Scenes from the reception at the Kemper Museum of Contemporary Art: Steve Glasscock, Rob Buckley and Scot Fernandez

HUE ANGLES

(Send contributions to Michael H. Brill, mbrill@datacolor.com)

The Color Association of the United States, with Margaret Walch at its helm, forecasts color trends in the fashion industry. In 1985, when Margaret and I rode a bus through France to the Monte Carlo AIC meeting, I expressed a barbaric attitude toward fashion. She responded, not by debating, but by inviting me to the ballet in Monte Carlo, whereupon I mellowed about fashion. Here is Margaret's defense of the much-maligned color green.

Green & the Fashion Industry

In 1972 Kermit, the frog of Sesame Street, lamented, "It's Not Easy Being Green." Thirty-five years later, being green has taken on new meanings, as green seems to be enjoying a fashion vogue.

Green's popularity is especially notable in view of its limited promotion by the fashion industry. Unlike red or pink and now yellow, green is not considered a glamorous color and is consistently avoided on women's fashion magazine covers. Julia Turner, an editor of Newsweek, quoted a colleague's plausible theory (*Slate*, 22 Nov 2006, www.slate.com/id/2153949) on why green is seldom used in print: Green, like brown, is difficult to control on press and either shade "can migrate in the baby poop direction if the printer isn't careful." Curiously enough, when studies were made, as in the case of the January 2006 issue of Harper's Bazaar that featured a green dress on Julianne Moore, the shade increased the magazine's newsstand sales, selling 8.6 per cent better than the January 2005 issue and 8.1 percent better than the December 2005 issue.

Green's minimal glossy-magazine exposure does not seem to have hindered its current popularity in clothing. Camouflage greens, khaki greens, olives, lime greens, and Irish greens are popular shades. In 2007, we might well ask why green is consistently so appealing to the general public, if not to the fashion mavens.

Certainly a large part of green's appeal is its connection with the tranquility of nature. Like brown, another color that has become fashionable, green is associated with goodness. We perceive greens as soothing and

calming. In an age of information overload, green is a restful color, quieting the mind. The green room in the theater, thought to date to Shakespeare's time when actors would prepare for their performance in a room filled with plants and shrubs that provided moisture to benefit their voice, is still used today to quiet nervous actors about to go on stage. Nature shows us many shades of green, and is a testimony to just how expansive the color can be.

Green is of course an environmental color, and at a time when the planet Earth is threatened, green suggests the goodness of an ecological approach to one's life. It is the color for Greenpeace and emphasizes the organization's association with life and growth. Grassroots democracy, pacifism and social justice can all be evoked by green. In an op-ed article in The New York Times (January 16, 2007) Thomas Friedman focused on the need for a Green New Deal, a major US policy change that would put a priority on environmentally friendly legislation. At a time when the temperatures are rising, green is a cooling color. Friedman's Green New Deal could be realized under the color's banner, making a broad range of environmental programs possible.

In a fast-paced world of endless change, green suggests heritage and stability. There is loden from Austria, a fabric as well as a color, and the many richly dark tartan greens of Scotland. Ralph Lauren has favored greens in his collections for their evocation of a venerable past. Greens lend his clothes a sense of tradition and impart a timeless quality. In the 1980s Ralph Lauren made Hunter green such a popular shade that it became a color marker of the decade, along with mauve, another historic Victorian shade.

At a time when full spectrum color and multicolored design are favored over monochromatic or analogous approaches, greens will continue to have appeal. In the Color Association's fashion forecasts, and even in its interior-design forecasts through 2009, green floats through the various projected color stories, showing that it is a hue that accommodates many sensibilities and designs.

Margaret Walch

The Color Association of the United States (CAUS)



Book Review: Art for a House of Mathematics

By Anna Campbell Bliss

Published by Bliss Studio Publications,
ISBN 0975491512. Price: \$10

Distributed by American Mathematical Society
Orders: 1-800-321-4267

This small paperbound book is an extraordinary blend of mathematics, art and design. The author, Anna Campbell Bliss, has a background in architecture, as well as in painting and design. She has been a member of the Inter-Society Color Council for a number of years and her book, and the murals upon which it is based, are optimal examples of the Council's goal to bring science and art together. They are aesthetic triumphs while honoring the history of mathematics.

The book documents murals by Bliss that were commissioned for the Cowles Mathematic Building at the University of Utah. The competition for that commission had specified that the art must identify the building as a "House of Mathematics" and also be a "source of pleasure, intrigue and inspiration." Bliss realized that the structure of the building, which includes large glass surfaces, would best be enhanced by placing murals in the lobbies on the three floors, which can also be seen through the exterior glass wall. The murals are modular. Each one consisting of a cluster of square, eighteen-inch aluminum panels with a common theme. Most of the panels were screened, although a few are hand painted, or include mixed media to add a tactile sense. Coordinated panels reach down the corridors from the main lobby murals.

The book illustrates and describes the arrangement of the panels forming each mural and provides close views of individual panels. The murals are effective at a distance as carefully spaced units on a white wall, and are equally effective in their placement on the book pages. Each panel invites close study, both for its appearance and the information it contains. The first floor mural is made up of eighteen panels that include Mayan, Babylonian and Fibonacci numbers, sign language numbers, and Islamic calligraphy. The theme is expanded to include measurement, so there are panels of the spacing between olympic racers at a point in time, census groupings, a musical score, dance notation, ideal human proportions, and a poem.

Each of these panels is outstanding as a graphic but each also symbolizes a body of knowledge. The design of the first mural is anchored by a panel containing a large red zero on a black background completely overlaid by a random bit stream in white. Placed at about eye level the panel symbolizes both the historic importance of zero and the current importance of digital communication. Seven of the panels in this first mural relate to the Golden Mean and the Fibonacci number sequences. The Golden Mean is a proportion based on the irrational ratio, 1 to 0.618..., or 1 to

$(1+\sqrt{5})/2$ to be more exact; and is symbolized by the Greek letter phi (ϕ). In the Fibonacci sequence each number is the sum of the two preceding numbers in the series, i.e., 1, 1, 2, 3, 5, 8, 13, 21, 34 etc. Leonardo of Pisa, called Filius Bonacci (son of Bonacci) and shortened to Fibonacci, introduced this summation series into Europe in 1175 A.D along with Hindu-Arabic numerals and the decimal system. The Golden Mean is embedded in the Fibonacci number sequence because any number in the Fibonacci series divided by the following number approximates 0.618, while any number divided by the previous one approximates 1.618. The larger the numbers are the closer the approximation is.

These particular mathematical relationships have an historic role in art. The Golden Mean and Golden Rectangle were used extensively in Greek art and architecture, had a revival during the Renaissance in Italy; and, along with the Fibonacci sequence of numbers, became popular again in the 19th century when it was discovered that the ratio is a growth relationship common in nature. The use fractions today makes this relationship seem complicated to an artist, but the proportion is easily found geometrically with a ruler and compass. In constructing temples the Greeks employed teams of men who held ropes taut and swung the curve necessary to inscribe the proportion on the ground.

This ratio is also present in the history of mathematics. In *Elements* Euclid writes, "... to divide a line segment such that the ratio of the large part to the whole is equal to the ratio of the small part to the large part..." This statement describes the Golden Mean since this relationship between the parts and the whole exists in the division of a line, in the proportions of a Golden Rectangle, and in the spiral formed by a chambered nautilus shell as it grows.

The mural in the second floor lobby deals with mathematics and nature. The panels include views from an airplane where rectangles based on multiples of the acre, and circles formed by large circular sprinkling systems, form geometrical patterns. There are several panels where fractals are used to generate tree and fern shapes. Of particular interest to me were four panels that were painted to represent water and then overprinted with two Truchet patterns shifted slightly in relation to one another, and tilted in perspective. The panels produce a strong impression of the shifting movement of water. Panels in the second floor corridor include representations of DNA and the RNA complex and a two-panel representation of the visible spectrum. Intersections with the arts include a Nigerian textile detail, a design by Indians from the Pacific Northwest, a Navaho rug design, an African wall painting, Panels on architecture begin with the construction of native habitants, proceeds through the work geometric work of Buckminster Fuller and the architects Frank Lloyd Wright and Mies van der Rohe to an exquisite example by the current architect Santiago Calatrava.

The third floor mural is devoted to the history of human understanding about outer space. These panels range

Continued on page 6

Book Review

Continued from page 5

from ones illustrating Ptolemaic theories to the Antennae galaxy as seen by the Hubble telescope, and end in the corridor with five panels reproducing the Portolan-Atlas. This is an intricate, hand-drawn and hand lettered, representation of the details of the coastlines of the Mediterranean and Black Seas overlaid by a grid of 'rumb' lines. These served as navigation guides before there were instruments that could determine longitude. It is strange to look at a map in which the landmasses are less important than the edges of the large bodies of water. It takes a few moments to recognize the different countries.

Bliss thoroughly documents her sources making the book also a guide to further information relating to the subject of each panel.

Joy Turner Luke

Members' News

AIC Judd Award 2007 to Alan Robertson

AIC has announced that Alan R. Robertson is the recipient of the AIC Judd Award 2007. The award will be presented to Robertson at the AIC Midterm Meeting in Hangzhou, China, next July 12-14, where he will deliver the special Judd lecture. Dr. Alan R. Robertson obtained his B. S. and Ph. D. degrees in physics from the University of London, England. He worked at Canada's National Research Council from 1965 until 2000 and although partly retired continues to work on various color science projects. In 2005, he received the ISCC Godlove Award.



The list of previous distinguished Judd awardees can be seen at www.aic-color.org.

DCC March Meeting Summary

The Detroit Colour Council kicked off its 2007 program theme, focusing on automotive interior and exterior harmony, on March 13 at BASF's Southfield, Michigan office.

2007 Council president, Larry DePaoli, opened the event by describing the DCC's focus on color education and encouraged the membership to become active in its participation of educational events and opportunities. He then gave a brief description of the DCC's 2007 modular training program, citing the value of perceived quality when an automobile displays perfect color harmony. The 2007 program will

include four symposiums that will discuss how manufacturers desire and create color quality and variation control. Despite the inherent variation in materials and processes, it is possible to create perfect harmony.

DCC Program Committee Chair, Christine Utter introduced the symposium entitled "Color Harmony Inside Out" with Jon Hall (Ford Motor Company) speaker. He is a strategic designer for interior and exterior color.

Mr. Hall described the need for an improvement in today's auto market as it relates to the amount of time required to design, develop and launch a new program. An element of the design and development timeline is the management of color quality (as it pertains to the designer's intent) and the need for color harmony in order to create value in the vehicle's appearance. The standard for development, Mr. Hall explained, has been trial and error sampling. While there is value in holding a part in your hands, there is room for fine tuning before an actual part is manufactured.

In today's environment there is a capability that was not available in years past through computer graphics and rendering. The characteristics considered important to a finished component can capably be duplicated using the proper computer rendering. Gloss, texture and color can be simulated with remarkable accuracy. Imagine a process where development people are not only artists but also software experts. The process of design and development would realize a significant reduction in time and cost through use of computer imaging. When it would be time to produce the component, the sampling process might require fine tuning in order to compensate for variation but the ultimate result would be within reach in a very short period of time.

Jon Hall is a strategic designer for interior and exterior color for Ford Motor Company.

Larry DePaoli, DCC Council President

ISCC Welcomes Two New Sustaining Members

Avian Technologies, LLC

Hallmark Cards, Inc.

Power to the Pupil: Color Vision, Cameras and the Energy Crisis

Remember the Energy Crisis—that fad term that fossilized after the Carter administration (Jimmy’s, not Ellen’s)? Well, it’s still with us, as current wars, global warming, and rising gas prices attest. And color/vision science has responded to it in more ways than putting sodium vapor lamps into parking lots or prime-color lamps into buildings. There’s more afoot, but you have to look for it.

How so? Well, folks who knew about visual pigment ground up octopus eyes, extracted the rhodopsin, and made batteries out of it.¹ For this purpose, another source of rhodopsin was bacteria.² And besides making batteries, they also used rhodopsin molecules as computer flip-flops.³

Far-fetched? Well, what part of an animal would you use to store energy (or information), if not retinal tissue? After all, as vision scientists have remarked over the years, gram for gram the retina is the most highly metabolic tissue in the body. In the living eye, the rhodopsin molecule is like a domino—it takes a lot of energy to set it up (provided by sugar metabolism) and very little energy to knock it down (from input light stimulus). The battery application operates the process in reverse, using the light to set up the rhodopsin “dominos” and hence to store energy.

Well, storing energy is nice, but doesn’t improve our harvest of energy in the first place. For that we can look to digital camera technology. The camera was made by Foveon, who sought to produce all three color signals at the same pixel instead of at adjacent pixels.⁴ To accomplish this goal, they created a layered light-sensitive semiconductor that, according to depth of penetration of the light into the material, generates electrical signals from short, middle, and long-wavelength components of the spectrum. In this way, red-sensitive, green-sensitive, and blue-sensitive pixels occupy the same position on the focal plane, thereby improving spatial resolution relative to other digital cameras.

Now the same is being done with solar cells. Late last year, Boeing offered a solar cell with nearly twice the efficiency of ordinary solar cells, by using the same principle as the Foveon camera uses: Allow solar radiation to penetrate the depths of a layered semiconductor, and harvest energy from different wavelength ranges as the light penetrates in depth.⁵ In this way, wasted light is dramatically reduced. There are hopes to increase the efficiency of photovoltaic cells to 45%, which would vastly increase the harvest of energy directly from the sun (without generating greenhouse gases).

I don’t know about other ISCC members, but I was beginning to feel very far removed from solutions to burning (or burned-out) resource issues we face today. Perhaps we can turn our eyes productively to the future, then—at least the highly metabolic parts of our eyes...

1. Nicolini, C., *Biosensor and Bioelectronics*, 10, 105-111 (1995)

2. Nicolini C., Erokhin V., Paddeu S., Paternolli C., Ram M.K., *Toward bacteriorhodopsin based photocells*, *Biosensors & Bioelectronics* 14, 427-433, 1999.

3. Sivozhelezov V., Nicolini C., *Prospects for Octopus Rhodopsin utilization in Optical and Quantum computation*, *Physics of Particles and Nuclei Letters* 4, 189-196 (2007).

4. Lyon, R. F. and Hubel, P. M., *Eyeing the camera: into the next century*, *Proc. 10th IS&T/SID Color Imaging Conference* (2002), 349-355.

5. *Scientific American*, News, December 8, 2006. *Super-efficient, cost-effective solar cell breaks conversion records*
Michael H. Brill, Datacolor

Avian Technologies LLC

Avian Technologies LLC specializes in the production of diffuse optical coatings and materials, integrating spheres, and other components for the color measurement, pharmaceutical, agricultural, and remote sensing industries. The company also provides measurement services and artifact standards for reflectance, transmittance, and color in its two NIST/NRC-traceable laboratories.

Dr. Art Springsteen founded Avian Technologies in August 1999 in New London, NH. The company offices moved to its current home in Wilmington, Ohio in June 2001. A second laboratory and production facility for optical materials were added in New Hampshire in 2005, with expansion continuing in 2007-8. Avian Technologies’ sister company, AvianGroupUSA, acts as a consulting clearinghouse for optical design and development and is also the North American representative for Murakami Color Research Laboratory (goniophotometers and goniospectrophotometers), Zehntner GmbH (gloss, paint, retroreflectance measurements), and Axiphos GmbH (color and optical brightness measurement instrumentation). The two entities of the Avian companies employ three full time and seven part time employees in 5 locations, with sales representatives worldwide.

Avian Technologies flagship products are its Fluorilon™ FW-99 white standards, materials and targets, FGS series grey scale, Avian-B and Avian-D white reflectance coatings, and Avian Black-S diffuse black coating. Recently, the company has introduced an ambitious 48 color tile set that allows for a more accurate profiling of color instruments. It is the most complete of its type available. Expansion of the set into matte and textured tiles is in process. Avian Technologies products and services can be seen at our web sites, www.aviantechologies.com and www.aviangroupusa.com. We can be reached by phone at 937-655-8767 or by fax at 937-655-8765.

Art Springsteen, Avian Technologies

COLOR RESEARCH AND APPLICATION

In This Issue, Volume 32 June 2007

This issue begins with an emphasis on color measurement. Our first two articles are by David R. Wyble and Danny C. Rich on the "Evaluation of Methods for Verifying the Performance of Color-Measuring Instruments." In Part I, which is on Repeatability, Wyble and Rich present repeatability results from a long-term study of twelve commercial spectrophotometers. The focus of the article is the use of the procedures specified in the relatively recent ASTM publication E2214-02 Standard Practice for Specifying and Verifying the Performance of Color-Measuring Instruments, which provides a uniform procedure for manufacturers and users when quantifying the performance of their instruments. Part I of the article compares the traditional color difference metrics with the more complex multi-dimensional methods specified in E2214. The results show that instruments' relative performance changes somewhat depending on which metric is selected. More in-depth analysis would require examining replicate measurement including moving the specimen, which is not allowed in the definition of E2214 short-term repeatability. Even without doing that, they note that the rank ordering is a reasonably good correlate with the instrument geometry and price.

Part II focuses on Inter-Instrument Reproducibility. In this part Wyble and Rich report on a medium-term study of ten commercial spectrophotometers. This article shows that at present the residual systematic differences within and between instrument families are statistically more significant than the precision of any single instrument. The results confirm the common understanding that hemispherical diffuse instruments exhibit a higher level of inter-instrument agreement than do bidirectional (45:0) instruments, but more importantly it provides a challenge to the instrument manufacturers to identify and re-engineer or model and correct the remaining systematic differences between instruments.

Our next article is also on color measurement, but this article discusses a measurement procedure when fluorescence is involved. Kenji Imura discusses a "New Method for Measuring an Optical Property of a Sample Treated by FWA." The color one observes when looking at a product that includes a fluorescent component is really a combination of the fluoresced light and the reflected light. Thus traditional colorimetric spectrophotometers are actually measuring the total reflectance. Agreement between instruments is possible only to the extent that they have the exactly same illumination or are successfully corrected to a standard source. By using two different lamps, the method described by Imura allows the synthesis of a virtual illumination presenting

the identical spectral radiance factor to that presented by a standard illuminant.

Next let's take time out for some review. We look at methods predicting the colors resulting for certain colorant systems. Kubelka Munk turbid media theory is commonly used to model optical mixing behavior of materials. Textbooks often use a paint example, where each pigment has both scattering and absorption, is included for the two-constant approach and a textile example where the scattering is assumed to be due to the substrate as the example for a one-constant approach. But what are the differences between a single constant approach for paints and textiles? In this review article Roy S. Berns and Mahnaz Mohammadi compare the various approaches for "Single-Constant Simplification of Kubelka-Munk Turbid-Media Theory for Paint Systems."

While we are reviewing, our next article looks at the "Effects of luminance, wavelength and purity on the color attributes." The subtitle of the next article is "A Mini-Review with New Data and Perspectives." In this article Ralph Pridmore briefly reviews 15 of the most common effects on color perception and their inter-relationships. Seldom do you have such a summary together in one place.

From color perceptions we move to feelings with "Analysis of Cross-cultural Color Emotion." In this case we have a team of ten people from seven countries who worked together on a research project. The lead author is Xiao-Ping Gao. We also have John H. Xin and Shing-sheng Guan from Taiwan. Tetsuya Sato and Kanji Kajiwara are from Japan, Aran Hansuebsai from Thailand, Marcello Scalzo from Italy, J. Valldeperas and Manuel José Lis from Spain, and Monica Billger from Sweden. In this truly international effort, the relationship between color perceptual attributes and color emotions is examined including the influence of different cultural backgrounds.

Our last article related to a paper in the last issue. Hideki Sakai and Yoshinobu Nayatani proposed a new concept in color-appearance modeling. In this issue a Note, "A Comment to the Chroma Scale of Nayatani Theoretical Color Order System" is added. In this note the same authors discuss the scale differences between the Nayatani Theoretical Color System and CIELUV color space. The Nayatani space predicts surface colors with the same tone, or the same values of whiteness-blackness and chroma, under a reference illuminant.

In the Communications and Comments column, we have three letters to the editor.

Two of the letters are from János Schanda. The first, entitled "Light and Colour, some Ethical Issues" is in response to the Talking about Color column in which John Hutchings brought up the issue of ethics in the field of color science. Schanda extends this discussion to the positives and negatives of lighting in the environment. The second letter discusses alternative definitions to those pro-

posed in Roberto Daniel Lozano's article entitled "A new approach to appearance characterization" (COLOR Res. & Appl. 31 164-167 2006). In our the third letter, "Camera Color Gamut: Spray-Painting the Invisible Definition," Michael H. Brill raises the question of whether a camera can have a color gamut.

We close this issue with two book reviews and two meeting reports. Francisco Imai reviews Reinhart's *High Dynamic Range Imaging*, and Kurt Nassau comments on Parker's *Seven Deadly Colors*. Nakauchi reports on the Vision Science & Technology Symposium focusing on Universal Design for Visual Communications that was held in Japan, and Michael H. Brill and Jack Ladson team up to report on the 14th IS&T/SID Color Imaging Conference in Scottsdale, Arizona.

*Ellen Carter, Editor,
Color Research and Application*

R•I•T to Offer Ph.D. in Color Science

This fall, Rochester Institute of Technology will offer a new doctoral degree in color science, the only one of its kind in the United States. This specialized field blends physics, chemistry and visual perception, among other sciences, to quantify how the human eye perceives color — to translate color into scientific data.

"You look around and you see a chromatic world," says Roy Berns, program coordinator and the Richard S. Hunter Professor of Color Science, Appearance and Technology at RIT. "We put numbers on those perceptions important for commerce as well as for using color as scientific data. We study how changes in the building blocks of color — such as lighting, materials and the observer — change those perceptions and change those numbers."

The doctorate in color science is an extension of the existing graduate program offered by R•I•T's Chester F. Carlson Center for Imaging Science. It is designed for students with undergraduate majors in physics, chemistry, mathematics, computer science, engineering, experimental psychology, and imaging, as well as textiles, graphic arts, animation, material science and polymer science. Students will learn how to address problems in the measurement, production, formulation, reproduction and perception of color. The curriculum combines required courses in color science, elective courses, a research project during the second year of study and a dissertation.

Applicants to the doctoral program in color science are being accepted for fall 2007.

WWW.cis.rit.edu/files/Color_PhD_Program.pdf has additional details.

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CALENDAR

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2007

- Jun 4-6** **Color Cosmetics Summit 2007**, Intertech-Pira, Hilton Singapore Hotel, Singapore, 207-781-9617, www.intertechpira.com
- Jun 27-29** **ASTM E12 Color and Appearance**, Waterside Convention Center; Norfolk, VA, 610-832-9585, www.astm.org
- Jul 4-6** **11th International Conference on Information Visualisation - IV07**, ETH Zurich, Switzerland, Ebad Banissi, 44-171.815.7476, email, banisse@lsbu.ac.uk, www.graphicslink.co.uk/IV07/
- Jul 4-11** **The 26th Session of the CIE**, Beijing, China, www.cie.co.at/news/news76.pdf
- Jul 12-14** **AIC 2007 "Color Science for Industry, "Midterm Meeting of the International Color Association**, Hangzhou, China, www.aic07.com
- Jul 27-31** **19th Symposium of the International Colour Vision Society**. University of Pará, Belém, Brazil, www.cultura.ufpa.br/icvs2007
- Sep 5-7** **2007 Technical Conference, Inkmakers and Printers – A Partnership for Success**, National Association of Printing Ink Manufacturers, Itasca, IL, 732-855-1525, www.napim.org
- Sep 16-20** **Frontiers in Optics 2007, Laser Science XXIII**, Joint Optical Society of America (OSA) and American Physical Society (APS) Technical Conference, Fairmont Hotel, San Jose, California, 202-223-8130, www.osa.org/meetings/annual/default.aspx
- Sep 20-21** **The Color Now! Symposium of the Color Association**, 212-947-7774, ecaus@colorassociation.com, www.colorassociation.com
- Sep 23-26** **IESNA Street & Area Lighting Conference**, The Illuminating Engineering Society of North America, Westin Seattle Hotel, Seattle, WA, 212-248-5000, www.iesna.org
- Oct 2-4** **2007 AATCC International Conference and Exhibition (IC&E)**, Francis Marion Hotel in Charleston, SC, 919-549-8141, www.aatcc.org/ice/gen_info.cfm
- Oct 3-5** **2007 International Coating Expo**, Federation of Societies for Coatings Technology, Metro Toronto Convention Centre, Toronto, Ont., Canada, 610-940-0777, www.coatingstech.org/Programs/index.cfm?event=ICE
- Oct 12-16** **Color Marketing Group, Fall International Conference**, Tampa Florida, 703-329-8500, www.colormarketing.org
- Nov 5-9** **IS&T/SID's Fifteenth Color Imaging Conference**, Hotel Albuquerque, Albuquerque, NM, 703-642-9090, www.imaging.org/conferences/cic15/

2008

- Jan 23-25** **ASTM E12 Color and Appearance**, Embassy Suites Hotel; Ft. Lauderdale, FL, www.astm.org

2008, Continued

- Jan 26-31** **19th Annual Electronic Imaging Symposium**, IS&T and SPIE, San Jose, CA, 703-642-9090, electronicimaging.org
- Mar 15-19** **TAGA 2008**, Technical Association of Graphic Arts, Sheraton Fisherman's Wharf Hotel, San Francisco, California, www.gain.net/eweb/
- May 18-23** **SID 2008**, Los Angeles, CA, www.sid.org/conf/sid2008/sid2008.html
- Apr 27-May 2** **2008 ASPRS Annual Conference**, The Imaging and Geospatial Information Society, Oregon Convention Center, Doubletree Hotel Lloyd Center, Portland, Oregon, 301-493-0290, www.asprs.org/
- Jun 15-18** **AIC Interim Meeting, Colour – Effects and Affect**, in Stockholm, Sweden, Swedish Colour Centre Foundation, Contact: Berit Bergström, berit.bergstrom@ncscolor.com, www.aic2008.org

2009

- Sept 27-Oct 2** **AIC 11th Congress**, Sydney, Australia, Organizer: Colour Society of Australia, Contact: Nick Harkness, www.aic2009.org

Photography Credit: Pictures from the Annual Meeting were provided by Jim Roberts, BYK-Gardner USA.

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

ISCC 75th Anniversary Commemorative CD and Pin \$30*

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

*Plus shipping and handling

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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.

ISCC Sustaining Members

Avian Technologies	www.aviantechnologies.com	937-655-8767
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Ciba Specialty Chemicals	www.cibasc.com	302-633-2042
Color Communications, Inc.	www.ccicolor.com	773-638-1400
Datacolor	www.datacolor.com	609-895-7432
DuPont Performance Coatings	www.dupont.com	248-583-8345
Flex Products, Inc.	www.colorshift.com	707-525-7337
X-Rite	www.x-rite.com	800-248-9748
Hallmark	www.hallmark.com	816-545-2462
Hewlett-Packard Company	www.hp.com	650-857-6713
Hunter Associates Laboratory, Inc.	www.hunterlab.com	703-471-6870
IsoColor Inc.	www.spc-software.com	201-935-4494
Konica Minolta	www.konicaminolta.us	201-574-4000
Pantone, Inc.	www.pantone.com	201-935-5500
PPG Industries, Inc.	www.ppg.com	724-274-3532

ISCC Member Bodies

American Association of Textile Chemists and Colorists (AATCC)
 American Society for Testing and Materials International (ASTM)
 American Society for Photogrammetry & Remote Sensing (ASPRS)
 The Color Association of the United States, Inc. (CAUS)
 Color Marketing Group (CMG)
 Color Pigments Manufacturing Association (CPMA)
 Council on Optical Radiation Measurements (CORM)
 Detroit Colour Council (DCC)
 Federation of Societies for Coatings Technology (FSCT)
 Gemological Institute of America (GIA)
 Graphic Arts Technical Foundation (GATF)
 Illumination Engineering Society of N. America (IESNA)
 International Color Consortium (ICC)
 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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