Inter-Society Color Council *News*

Issue 460 Nov-Dec 2012

Successful Annual Meeting

The 2012 ISCC Annual Meeting was held on October 16 in Manchester, NH. There were no weak talks across the set of 10 excellent presentations. These covered the full gamut of ISCC interest. Topics ranged from the history of dye color discovery and invention to technical specifics on Lightness Perception and Chromatic Adaptation, to the quantification of color effectiveness in designed environments, and through the complex economics of working towards sustainable color. Several ISCC Sustaining Members showcased their products as well. A unique part of this meeting was the showing of the movie *ARC OF LIGHT: A Portrait of Anna Campbell Bliss*, a fascinating account of a remarkable woman and longtime member and friend of the ISCC. The 225 or so ISCC members who did not attend really missed out on a great conference!

In the business meeting outgoing President Frank O'Donnell passed the gavel to Scot Fernandez. We all join in thanking Frank for his fine work during the last two years. The Nickerson Service Award was given to Rob Buckley for his long-time service to the organization on many fronts. Rob received the award from a family vacation in Saskatchewan; fortunately technology cooperated!

Many thanks to the session chairs for maintaining order in a very a full schedule, as well as to Sheryl Metevier of the Radisson for making the trains all run on time.

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The ISCC Godlove Award

The Godlove Award is the most prestigious award bestowed by the Inter-Society Color Council (ISCC) to honor long-term contributions in the field of color. The Award was established in 1955 in memory of Dr. I. H. Godlove. Usually awarded biannually at the Annual Meeting, time constraints have extended the nomination period through August 2013.

Godlove candidates will be judged by their contribution to any field of interest related to color. The candidate's contribution may be direct, it may be in the active practical stimulation of the application of color, or it may be an outstanding dissemination of the knowledge of color by writing or lecturing, based on original contributions. Candidates need not have been active in the affairs of the ISCC, but they must be either current or former ISCC members. All candidates must have at least five (5) years of experience in their particular field.

A Godlove Award Nomination form may be obtained from the ISCC office. The past and present membership of the ISCC boasts a number of individuals deserving of such recognition and this award requires your participation in the process. Please take the time to consider and nominate a worthy candidate for this honor.

Download: `www.iscc.org/pdf/2102godlove.pdf`

Included in the nomination should be:

1. The nominee's name and contact information.
2. A citation giving in a sentence or two the specific reason for the award's bestowal.
3. A narrative up to one page in length covering the nominee's contribution and its significance.
4. A resume or vita and a publication list for the nominee, as well as any other useful material.
5. Source of the nomination. Give the name and contact information of the person(s) who prepared the nomination.

Note: Confidentiality is of the utmost importance. The nominee should be unaware of the nomination.

Eric Zeise
Godlove Award Chair *eric.zeise@kodak.com*

International Colour Association
12th AIC Congress
July 8-12, 2013: The Sage: Gatehead, UK

The AIC Congress is held every four years and is the only international color conference that promotes all facets of color.

The main theme of the 2013 conference will be *Bringing Colour to Life*, in the practical sense of color production and reproduction, in the sense of color in nature, and the ways in which color can be used sustainably now and in the future.

For the latest details and information, visit `www.aic2013.org` or email `info@aic2013.org`.

25th AIC Annual Report Online

The AIC Annual Report 2012 is online.
`www.aic-color.org/news/news25-12.pdf`

Sustaining Member News
Datacolor Color Management Seminars

Datacolor announces the "Essentials of Color Management" seminar which explores the color process and best practices for color evaluation and communication. "Designing this seminar, I wanted to reduce the complexity of most '*color theory*' courses and focus on the most practical, useful lessons learned over 27 years in this field," said Kenny Thomas, of Datacolor Educational Services. He adds, "I think of this introduction as a '*reboot*' -- an opportunity to re-discover the basics, update outdated ideas and correct common misconceptions." Seminar page, or view a complete 2012-2013 schedule here:

`industrial.datacolor.com/`
click Events → Seminars

A Color-Related Cryptogram

JQARQE MGHY XQZBAQOB JQXX, VBYRCVI,
CI IGHDBEQYI ZYGO NQIACEA IHEI
PB SCYYQBN PCST AG BCYAR IGOB OCVI
GZ VXCEBAI CEN MGH'XX ZQEN ARCA GEB'I
IG RCYN AG SGXGY ARCA MGH'DB KGA
AG HIB ZQDB SYCMGEI. OCMPB, EGA.

In case you are not an expert, here is a hint: X stands for L. A second clue: the poet was a mathematics professor at Case Western Reserve.

Answer in the next newsletter.

Courtesy of Mike Brill

HUE ANGLES

(Send contributions to mbrill@datacolor.com)

Autumn Contrasts

Once in a while, deference to the season is good for us…

I just returned from the Manchester, NH, ISCC meeting, and from some leaf-peeking in the windy (in both senses) corridor from Saratoga Springs, NY to Manchester. Based on the season and on the picturesque meeting venue, I thought it might be time to talk about autumn colors, in a slightly more speculative vein than Mark Fairchild's Metameric Blacks column two autumns ago (see ISCC News # 448 p. 5). The dance of autumn leaf colors as a kind of co-evolution among species seemed sufficiently provocative. Consider the words of Michael Pollan [1]: "We're prone to overestimate our own agency in nature. […] In a coevolutionary relationship every subject is also an object, every object a subject. That's why it makes just as much sense to think of agriculture as something the grasses did to people as a way to conquer the trees."

How do autumn leaves participate in co-evolution? For one thing, there's foliar fruit flagging [2]: bright leaf colors call attention to berries containing seeds that birds and other animals can disperse (by the usual "indoor" route). And there seems to be a code whereby insects recognize which trees will tolerate them as parasites through the winter. That code is mediated by chemicals called anthocyanins (typically red), which unlike yellow and orange carotenoids, are not present in a leaf throughout the year but appear in particular plants at the time of chlorophyll depletion. The balance between anthocyanins and carotenoids leads to quite a large palette of colors that could guide an insect or other color-perceiving animal. In addition to waving a "red flag" at aphids and other parasites to repel them, the anthocyanins in maple trees also seem to stunt the growth of nearby shrubbery, hence adding still more survival potential to the maple [3].

The trouble with this interesting dance is that it is hard to prove the cause-and-effect relationship of co-evolution. Oddly, one counter-question is "Do the dancers *mean* it?" It doesn't take much metabolic expense for maples to make anthocyanins, because the pigments evolve from direct reaction between sunlight and other leaf chemicals when the chlorophyll depletes and with it the phosphate supply. So maybe the trees aren't *intending* the color code, and are therefore the signal isn't *honest* [4]—or one might say, is insincere. In counterargument, the maples are paying an opportunity cost in shedding their chlorophyll early, thereby allowing the red to happen when there is a maximal contrast with surrounding green plants.

Faced with learned arguments about the sincerity (or lack of it) in plants, I have to retreat to the more familiar territory of vision science. Fortunately, my Manchester trip rewarded me with a vision science epiphany in a steam bath in Saratoga Springs. Upon entering the steam bath, I was unable to see anything but white steam. But in a minute or so, some ghostly shapes emerged and I could see other occupants and even a vacant place to sit down. The light was such that I might even have been able to read a newspaper—or maybe just the headlines! Such adaptation to fog (low contrast) was not exactly a textbook visual effect. It even raised some interesting questions about a paper I was to co-author with Rob Carter, in Manchester ("The incredible lightness of the power law"). The Weber-law behavior we were describing had some interesting experimental quirks, but none exactly like the fog-adaptation I was now experiencing.

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COLOR research and application

Color Research and Application

IN THIS ISSUE, November 2012

We open this issue with two articles written by James A. Worthey. In the 1980s and later, it was Jim's good fortune to know William A. Thornton and Jozef B. Cohen, two creative thinkers. Now in two new articles "Vectorial Color" and "Applications of Vectorial Color", Jim combines the opponent-color model with Cohen's ideas of fundamental metamers and Matrix R, keeping in mind Thornton's insights about lighting, color-matching experiments, and prime colors. The ideas click. The whole is greater than the sum of the parts. In the first article Worthey uses a set of orthonormal color matching functions (the first is an all-positive achromatic function, the second is red-green, and the third can be loosely described as blue yellow) to compute the tristimulus vectors of narrow-band lights at unit power. Then in the second article he applies the functions and related vector methods to fundamental problems in signal transmission and propagation-of-errors with six worked out examples. To quote Jim, "Tristimulus colorimetry gives each vector its length and direction in the invariant color space, revealing similarity and differences in one self-consistent presentation. In most areas of engineering, self-consistent methods are taken for granted and allow complex systems to be analyzed. Vectorial color methods can bring new clarity to color rendering and other applications."

I should add a note here that this article is followed by a brief poetic communication from Michael H. Brill entitled "Fit-first to be tied."

Next we move to the perception of color. In "On the relationship between wavelength and perceived hue," Rolf Kuehni explores the relationship between the perceptual Munsell hue scale and the related dominant wavelengths of the color chips and then proposes a hypothesis about the immediate cause of the nonlinearity in the relationship.

Imagining color in a three-dimensional space is an expression of our yearning for a consistent arithmetic of color differences. It is not enough to be able to compute a distance between any two colors. Wouldn't it be nice if there were a path between the two colors along which the distances add? And wouldn't it be nice if that path comprised the shortest distance between the colors (which after all is what we want a distance to be)? Although distances in CIELAB have this property (the shortest-distance paths being straight lines, hence CIELAB is Euclidean), color-difference formulas such as CIEDE2000 do not define such paths, and there is no guarantee that additive-difference DE2000 paths would be the shortest-distance paths. To ameliorate that situation, "Riemannian Formulation and Comparison of Color Difference Formulas," by Dibakar Raj Pant and Ivar Farup, offers a process of "Riemannization" to convert some widely used color-difference formulas to ones with shortest-distance paths that support additive distances. The authors Riemannize CIEDE2000 and OSA UCS, and show that small distances remain the same as before, although large distances are changed. They also provide a framework for efficient comparison of different Riemannized color-difference formulas.

Already this year in two earlier issues, we have had articles relating to the color rendition of white-light sources, and now we have another. Dissatisfaction with the current Commission Internationale de l'Éclairage (CIE) Color Rendering Index has stimulated a great deal of research to look for other methods of evaluating color rendition. Some researchers have proposed that the area in color space (or color gamut) that can be discriminated using a particular source could be a measure of the quality of color rendition of that source. This may be true for fairly smooth continuous sources, but is it true for sources that have a lot of structure in their spectrum? In "Color Discrimination Capability Under Highly Structured Spectra" Michael P. Royer, Kevin W. Houser, and Andrea M. Wilkerson report on an experiment to test the capability of measures of gamut area to predict the color discrimination capability of lamps with highly structured spectra. Using observers' scores on the Farnsworth Munsell 100 Hue Test taken under different lighting conditions, they considered Color Rendering Index, Color-Discrimination Index, or Farnsworth Munsell Gamut Area as possible components of an evaluation metric for the light sources, and found that none of these measures was able to order correctly, let alone correlate with, the color discrimination capability of the four lamps tested.

Our next article also deals with light sources. In "Effects of Correlated Color Temperature on Spatial Brightness Perception," Jiaqi Ju, Dahua Chen, and Yandan Lin report on an experiment examining nine lighting environments that vary in correlated color temperature (3000K, 5000K, 8000K) and illuminance (1000lx, 300lx, 100lx). In their experiments,

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the subjects evaluated the brightness of the each lighting environment individually and then adjusted each lighting condition so that the brightness of a work plane in the test booth matched that of the reference. They found that lighting with high correlated color temperature will have stronger spatial brightness perception than lower ones.

Artist Albert Munsell created his color order system over a hundred years ago, and it has been used widely ever since then. In the 1930s the CIE developed the numerical system for specifying color. This has been the internationally accepted basis for instrumental measurements specifications. Since the creation of the CIE system, people have used various methods (graphical or algorithmic) to convert from one notation system to the other. In this issue, Paul Centore presents "An Open-Source Inversion Algorithm for the Munsell Renotation." Generally this publically available algorithm relies on interpolation between data within the system, but extrapolation is used near the MacAdam limits.

Since many of the articles in this issue are lighting oriented, it is only appropriate that our final article for this issue looks at how lighting affects consumer behavior. We close with Önder Barlı, Mehmet Aktan, Bilsen Bilgili, and Şeno Dane discussing "Lighting, Indoor Color, Buying Behavior and Time Spent in a Store."

We conclude the issue with Robert Carter reviewing "La Tienda de las Cusiosidades Sobre El Color," a book giving Spanish-speaking students (and readers of all ages) access to the website, a Color Curiosity Shop.

Ellen Carter
Editor, Color Research and Application

"Hue Angles" continued from page 3

Upon returning to New Jersey, I found a 2005 CIC13 paper by Mark Fairchild (yes, the same Mark Fairchild) called "On the salience of novel stimuli: adaptation and image noise." Adaptation to persistent features of an image (such as blur, horizontal striations, or point-like noise) seems to be similar to chromatic adaptation, but it affects spatio-temporal as well as color channels. Could this kind of mechanism be responsible for fog adaptation? I must defer any answer, or risk missing the deadline of this column.

Meanwhile, the rest of my trip (after the steam room) amply confirmed that fog-adaptation is not a universal law. After a spectacular sunlit view of fall foliage in Saratoga Springs, we drove across Vermont and New Hampshire in a dismal, fog-beset drizzle. The brightest anthocyanin in the world could not have provided signal or cheer in that miasma. And it didn't get better with the passing hours.

After a while I gave up, and—lo and behold—the leaves had fallen. I had missed my opportunity. If I had been a bug or a squirrel, I would have fallen all over the dance-floor of co-evolution, unable to reap its benefits but completely sincere.

Michael H. Brill
Datacolor

1. Pollan M, *The Botany of Desire: A Plant's-Eye View of the World*. Random House, 2001, p. xxi.
2. Stiles, EW, Fruit flags: two hypotheses. The American Naturalist 120, 500-509 (1982).
   See also wikipedia.org/wiki/Nyssa_sylvatica
3. wikipedia.org/wiki/Autumn_leaf_color
4. Archetti M, Brown SP, The coevolution of autumn colors. *Proc. Roy. Soc. Lond. B* **271**, 1219-1223 (2004).

Article: How a colour-blind person sees the world

The Daily Mail Online
By Eddie Wrenn 28 August 2012
Full article: `www.dailymail.co.uk/sciencetech/article-2194293/`

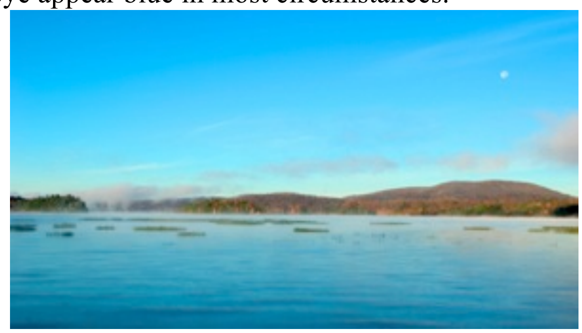
This article presents the work of Kazunori Asad, including an interesting look at color deficiency (a prefered term over "color blind") and the simulation of some images to visualize how color deficient people might see the world. In particular, how they might see the artwork of Van Gogh. One premise of the article is that if Van Gogh was color deficient, color deficiency is required to see his work as he intended. Fascinating!

The top (unaltered) and bottom (altered) demonstrate the application of the model simulating the apparance when viewed by a color deficient observer.

Metameric Blacks: A Color Curious Column

Ever wonder ... "Why is the sky blue?"

The direct answer is that the sky is blue because that is how we perceive it. Remember, color is a perception and not directly a property of objects. However, the way objects interact with light provide much of the information our visual systems use to determine what color we perceive. Thus, there is something about the sky that makes the light that reaches our eye appear blue in most circumstances.



That something is the fact that the light we see in the sky has not come to us directly from the sun, but it has been scattered by gasses and particles in the Earth's atmosphere. (Consider that in space the "sky" is black because there are no gasses or particles to scatter light and astronauts can only see light directly from the sun and objects that reflect the sun's light.) The kind of scattering that produces the blue sky is called Rayleigh scattering. That is named after a British scientist, Lord Rayleigh (his actual name was John William Strutt), who is considered the first scientist to describe this type of light scattering.

Rayleigh scattering has the property that, for particles of the size typically found in the clear sky, blue light will scatter much more than red light. When we look at the sky away from the sun, we can only see scattered light (light that has bounced around the atmosphere and not passed straight through) and since Lord Rayleigh figured out and explained that blue light will be scattered the most in the atmosphere, it is blue that we see when we look at the sky. It is for this same reason that sunsets appear red. In the case of sunsets, we are seeing the light that passes straight through the atmosphere and not the scattered blue light. In the associated image, the sun is behind the photographer, so the red light that passes straight through the atmosphere just keeps on going away from the camera while blue light is scattered back. Clouds look white (or gray when little light passes through them) because the condensed water or ice particles in clouds are much larger than the wavelength of light and therefore they scatter all colors equally.

Content of this column is derived from The Color Curiosity Shop, an interactive website, now also available as both English-language and Spanish-language books, allowing curious students from pre-school to grad-school to explore color and perhaps become interested in pursuing a science education along the way. Please send any comments or suggestions on either the column or the webpage to me at <*mdf@cis.rit.edu*> or use the feedback form at <*whyiscolor.org*>.

Mark D. Fairchild
Rochester Institute of Technology

Calendar

Nov 12-16 **IS&T** Color Imaging Conference, Los Angeles, CA www.imaging.org/ist/conferences/

2013

Jan 30-31	**ASTM E12** meeting at Hyatt Regency Riverfront in Jacksonville, FL.
Feb 3-6	**IS&T/SPIE** Electronic Imaging Symposium, San Francisco, CA www.imaging.org/ist/conferences/
Feb 4-7	**25th Annual Conference on Human Vision and Electronic Imaging,** San Francisco CA hvei.eecs.northwestern.edu/
Mar 4-5	**4th IAPR Computational Color Imaging Workshop**, Chiba, Japan dippix.tp.chiba-u.jp/CCIW2013/
Apr 2-5	**IS&T Archiving Conference**, Washington, DC www.imaging.org/ist/conferences/archiving
May 19-24	**SID's Display Week 2013**, Vancouver BC, www.displayweek.org
Jun 26-27	**ASTM E12** meeting at NIST HQ in Gaithersburg, MD
Jul 8-12	**AIC Colour 2013** "Bringing Colour to Life" in Newcastle Gateshead, United Kingdom
Dec 5-6	**AATCC Textile Testing Workshop** Research Triangle Park, N.C. aatcc.org/events/workshops/ITT.htm
Dec 12-13	**ASTM E12** meeting at Hyatt Regency Riverfront in Jacksonville FL

Member Body News: AATCC 2012 Awards

Congratulations to all, and especially to our ISCC members who are active and recognized in the AATCC.

ISCC Secretary Ann Laidlaw (right) receives the Chapin Award Scroll from AATCC President Mike Tyndall

Rachel Lessne (left) receives the Young Entrepreneur Award from Young Entrepreneur Committee Chair Bert Truesdale

Olney committee chair David Fenstermaker (right) presents the Olney Medal to Martin Bide.

Renzo Shamey (left) receives the J. Weaver Paper of the Year Award presented by Publications Committee Chair Harrie Shoots. Renzy shared the award with Chianghai Xu and David Hinks.

ISCC Sustaining Members

Sustaining Members of the ISCC are organizations who support the mission and goals of the ISCC through financial or other support. With our Member Bodies, Sustaining Members also provide a critical connection to the color community. If you feel your company or organization should support the ISCC in this way, please contact the office for more information about member benefits.

Avian Technologies	www.aviantechnologies.com	603-526-2420
BYK-Gardner USA	www.byk.com/instruments	301-483-6500
CERAM Research Ltd.	www.ceram.com	+44(0)1782 764428
Datacolor	www.datacolor.com	609-895-7432
Gamma Scientific	www.gamma-sci.com	800-637-2758
Hallmark	www.hallmark.com	816-274-5111
Hunter Associates Laboratory, Inc.	www.hunterlab.com	703-471-6870
IsoColor Inc.	www.isocolor.com	201-935-4494
Chester F. Carlson Center for Imaging Science	www.cis.rit.edu	585-475-5944
X-Rite Incorporated	www.xrite.com	616-803-2113

Thank You!

ISCC News Issue #460 Nov/Dec 2012

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ISCC Member Bodies

At its foundation, the ISCC is composed of many related societies. These societies, our Member Bodies, help the ISCC through small annual dues as well as maintaining a relationship with each organization's individual members. We frequently hold joint meetings to further the technical cross-pollination between the organizations.

If you belong to one of our member body organizations, we encourage you to work with ISCC and your society to further the connection. Contacting the ISCC President is a good place to start. If your organization is not on this list and you think it should be, the ISCC office can provide you with details about membership.

Or use our new online application: www.iscc.org /applicationForm.php

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)
Gemological Institute of America (GIA)
Illumination Engineering Society of North America (IESNA)
International Color Consortium (ICC)
National Association of Printing Ink Manufacturers (NAPIM)
Optical Society of America (OSA)
The Society for Color and Appearance in Dentistry (SCAD)
Society for Information Display (SID)
Society for Imaging Science and Technology (IS&T)
Society of Plastics Engineers Color and Appearance Division (SPE/CAD)