Inter-Society Color Council *News*

Issue 471 Summer 2015

Board of Directors Corner

Hi, I am Paula J. Alessi and I am bringing you this issue's Board of Director's Corner. I joined ISCC in 1979, served on its Board of Directors from 1986-1989, and served as President from 1992-1994. I am currently serving on the Board for a second term (until 2016) and I am Editor of ISCC *News*.

After 32 years of an extremely rewarding and fulfilling career as a color scientist at Eastman Kodak Company, I retired in 2012. For a change, I wanted to give back to my community, so I am volunteering as an English, language arts, and science tutor at the local elementary school. I wanted to continue to be involved in color in some way so I decided to delve into ISCC activities. I volunteered to be ISCC *News* Editor. Thank you so much to Dave Wyble, who dedicated his time to this effort for many years before me! I also volunteered to take on the job of being ISCC historian because our past is very rich in colorful culture that should be preserved and archived for easy recall. Anyone wishing to assist in this effort is encouraged to contact me at geinhaus@frontiernet.net.

The ISCC Board of Directors is working on some new things to benefit its membership. The Social Network Presence Committee chaired by our past President, Scot Fernandez, is developing an updated membership directory that will be useful to all. This committee also posts new items pertinent to color on our LinkedIn online community about every other week. If you have not yet had a chance to join our LinkedIn community, I encourage you to do so using the link on our webpage at www.iscc.org. In September, we will be starting a quarterly one-hour online seminar series given by color experts on topics of interest to you. Details regarding the first presentation in this series are given later in this newsletter. (page 3)

Did you know that ISCC's newest member body is the AIC Environmental Colour Design Study Group? Please see page 5 of this newsletter for more details. Is your calendar marked for October 4-6 to attend the joint ISCC-SPE/CAD meeting in Indianapolis? Please see page 2 of this newsletter for more details. **Registration must occur by September 4, 2015 or the rate ($340) will increase by $100.**

In closing, the passion for color science that I had in 1977, when I studied under Professor Fred W. Billmeyer, Jr., still burns in my heart today. I, like all Board members, am committed to you, the membership. We can serve you best if we hear your ideas and needs. Please contact any of us using the information on page 2 so that we can make ISCC the best it possibly can be in the 21st century!

Paula J. Alessi
ISCC News Editor, ISCC BOD

Table of Contents

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SPE Color & Appearance Division

Joint Technical Conference: SPE/CAD 2015 RETEC® and ISCC Conference

Mark your calendar and plan to attend the joint conference of the SPE (Society of Plastic Engineers) / CAD (Color and Appearance Division) RETEC (Regional Technical Conference) and the ISCC, Inter-Society Color Council in Indianapolis, IN on October 4-6. The meeting begins on Sunday, Oct. 4 with a day-long seminar on the "Coloring of Plastics", followed in the evening by a gala Welcoming Reception. The technical program on Oct. 5 and 6 includes research presentations, a panel discussion on "Color Trend for 2016 and Beyond", and a remote presentation by ISCC Macbeth Award recipient Françoise Viénot on "Color Vision Fundamentals: A Model for the Future of Colorimetry."

Who should attend?
Anyone interested in plastics, coloring of plastics, industrial color control, color vision, pigments, color difference, or other interesting color topics.

What is on the program?
http://specad.org/index.php?navid=164 (scroll down to program details)

Where? Westin Indianapolis, Indianapolis, Indiana, 50 S. Capitol Ave. Toll Free: 800-916-4339. Discounted Conference Room Rate: $165/night-single occupancy, $165/night-double occupancy
Note: Book your room by September 2nd in order to secure this discounted room rate!
https://www.starwoodmeeting.com/events/start.action?id=1504200829&key=179BB459

When? Oct 4-6, 2015.
Note: discount for advance registration by September 4, 2015.

How to register?
http://www.eventbee.com/v/specad/event?eid=121235862
Advance registration (by Sept 4) for members of SPE/CAD or ISCC is $340 for the conference, including the receptions Sunday and Monday, and the luncheon on Tuesday. Students with valid ID may register for $50.

ISCC Online Seminar Series Begins

The ISCC will be starting a quarterly online seminar series on Thursday, September 10th from 2:00-3:00 EDT. Our first presentation will be given by Ann Laidlaw. Ann received her BS in Textile Science from Univ. California, Davis, and MS in Color Science from Clemson University. She is interested in color communication, color difference metrics, sample measurement issues, and how to leverage maximum benefit out of these solutions for retailers and their supply chains.

Ann works with manufacturing and retail supply chain accounts at ACL Color Consulting LLC. Her industrial career includes X-Rite Inc, GretagMacbeth, SheLyn, and Burlington Industries. Throughout these companies, Ann worked to investigate innovative applications of color management for textiles and other industries. She is an active member of several color-related organizations, including ISCC, CORM, SPE, and DCC. She has served on ISCC, AATCC, and CORM Boards in the past, and currently serves as the ISCC Secretary. She is active in AATCC, and is a former chair of both the Color Measurement Test Methods (RA36) committee and the C2C (Concept to Consumer) Interest Group, and currently serves on the AATCC board. She received the ISCC Nickerson Award and the AATCC Chapin Award for service.

The title of Ann's presentation is *The Future of Lighting: Color, Efficiency, and Compliance*. Here is the abstract for Ann's presentation:

> Light sources are changing. Regulations around the world are driving improved energy efficiency, technological developments result in more choices, and businesses respond to on-going pressure to reduce their operating costs. In the past, the choice of commercial lighting technologies was mostly limited to incandescent bulbs, CWF-style fluorescent tubes, tri-phosphor fluorescent tubes, and various forms of natural or simulated daylight. Today, residential and commercial customers have far more choices, with additional technologies becoming commercially viable in the near future. This presentation will review various current and emerging lighting technologies, our methods for assessing them, and the practical implications of using the technologies to view colored objects.

This seminar will be given using the GoToMeeting online presentation tools. It is free for all participants! In order to participate, you will need access to an internet browser with moderate bandwidth capability. For more information and connection details, please see www.iscc.org/resources/SeminarSeries.php.

2014 Macbeth Award Presented to Françoise Viénot

The Macbeth Award was established by Mr. Norman Macbeth, Jr. in honor of the memory of his father, Mr. Norman Macbeth. The award is usually, but not necessarily, presented biennially in even-numbered years.

The Macbeth Award is given for one or more recent outstanding contributions in the field of color. It is to be presented to a member, or former member, of the Council. The contributions shall have advanced the field of color, interpreted broadly as in the objectives of the Council as defined in Article II of the Constitution. The merit of a candidate shall be judged by his or her contributions to any of the fields of interest related to color whether or not it is represented by a Member-Body. The contribution to color may be direct, it may be in the active practical stimulation of the application of color, or it may be an outstanding dissemination of knowledge of color by writing or lecturing. The candidates for the Macbeth Award need not have been active in the affairs of the Council.

Some previous Macbeth awardees are David Brainard (2006), Harold Van Aken (2008) and Joanne Zwinkels (2010). For a complete listing of all awardees dating back to 1972, please see http://iscc.org/functions/PastMacbeth.php.

Nominations were received and Dr. Françoise Viénot, Professor Emeritus from the French National Museum of Natural History in Paris was selected to be the 2014 Macbeth Award recipient.

Her accomplishments leading to the Macbeth Award:

Dr. Françoise Viénot, a trained physicist, is being recognized for her leadership of CIE Technical Committee TC1-36 in the development of a "Fundamental chromaticity diagram with physiologically significant axes". In 1991, Françoise agreed to chair CIE TC1-36 whose terms of reference were "to establish a fundamental chromaticity diagram of which the co-ordinates correspond to physiologically significant axes". Eleven committee members and three consultants from eight different countries were assembled under the leadership of Dr. Viénot. Part 1 of their report, *CIE 170-1:2006 Fundamental Chromaticity Diagram with Physiological Axes – Part 1*, was published in 2006. This very extensive report describes how to obtain color-matching functions

continued on the next page

2014 Macbeth Award Presentation continued

and the corresponding cone fundamental estimates for a normal observer, ranging in viewing angle from 1 to 10 degrees. Part 2 will be published in 2015. It outlines photometric aspects including the choice of the spectral luminous efficiency functions $V_{LM}(\lambda)$ and $V_{LM,10}(\lambda)$. It also discusses the development of XYZ representations of the cone fundamentals based upon the principles of the CIE standard colorimetric systems. For over 20 years, Dr. Viénot has marshalled all her considerable tact, patience and precision to bring to its conclusion CIE Technical Committee 1-36, the result being a physiologically-based system of colorimetry.

This ground-breaking work will allow researchers in color vision and color technology to begin modeling perceptual phenomenon based not on the mixtures of imaginary primaries but on the known responses of the cone fundamentals for any field size. This is a highly significant advance in making the science of color vision available to the color engineering community. The work of Dr. Viénot's committee is an exciting and unprecedented achievement in the field of color vision and provides color science researchers with a framework for examining many longstanding questions in applied color technology. The ISCC is proud to honor Dr. Françoise Viénot with the 2014 Macbeth Award for her recent contributions to the field of color vision.

The Award Presentation:

Since it was not possible for ISCC to present this award to Dr. Viénot at our Annual Meeting in 2014, Mr. Jack Ladson presented the award to her at the 2015 CIE Quadrennial Meeting in Manchester in July. Other ISCC members attended the informal ceremony and enjoyed dinner together.

Here is an account of the award presentation as reported by Chloe Ladson, Mr. Jack Ladson's granddaughter:

Aunt Kim, Mimi, and I toured Manchester, England while Papa attended the 24th CIE Session in the International Year of Light. On the evening of June 29, 2015, we met him at "Mr. Cooper's House and Garden," but we mostly saw Mr. Cooper's dining room. Papa introduced us to Dr. Françoise Viénot, Dr. Gaël Obein, Dr. Joanne Zwinkels and two Drs. Carter. Papa explained to me that these are color doctors, and I suppose you could judge a person's health by their color. The dinner party included three Past Presidents of ISCC (Dr. Ellen Carter, Mr. Jack Ladson and Dr. Joanne Zwinkels). Dr. Obein was Dr. Viénot's student, but he looks old enough now to be a teacher. At dinner I was seated across the table from Dr. Viénot (between Aunt Kim and Mimi, so I could keep my eye on them), and Papa sat next to Dr. Viénot. She is a very kind and gracious lady; she smiled at me often and asked me about things I wanted to talk about. Papa interrupted us to read a very impressive list of Dr. Viénot's accomplishments. She must be very smart and have worked hard for a long time to have done all that! Later I heard Papa whisper to Mimi that the person who wrote about the accomplishments is Dr. Danny Rich – I haven't met him, although I have heard Papa talk admiringly about him. Anyway, he uses long words, and must have known Dr. Viénot since they were my age, 9. After the reading of the accomplishment list, Dr. Ellen Carter passed a box to Papa, who opened it and gave the biggest medal I've ever seen to Dr. Viénot. He said that the award was given for her recent outstanding contributions in the field of color. Dr. Viénot seemed pleased. She thanked the Inter-Society Color Council for recognizing her. She told us about having met Dr. Ellen Carter at Fred Billmeyer's laboratory in 1971, and about her fond memories of attending ISCC meetings during her studies in the USA. After dinner we took pictures in Mr. Cooper's garden.

Seated left to right: Jack Ladson, Françoise Viénot, Rob Carter, standing Ellen Carter, Gaël Obein, Joanne Zwinkels.

Dr. Viénot explained to me that sometimes the French kiss once, or twice, once each cheek, and sometimes three times! Dr. Viénot is an inspiring lady; I hope I can grow up to be like her!

2016 AIC Interim Meeting, Santiago, Chile
Date: October 18-22, 2016
Theme: Color in Urban Life: Usability in Images, Objects and Space
Host: The Chilean Color Association
Info: www.aic2016.org

Study Group on Environmental Colour Design (ECD) of the Association Internationale de la Couleur (AIC)

The Study Group on Environmental Colour Design (ECD) of the International Colour Association (AIC) is an international group of colour designers, colourists, colour consultants, artists, designers, architects, urban designers and planners, interior architects, lighting designers, art and architectural historians, psychologists, scientists, educators and other professionals with a specific interest in colour as a means of environmental design and exploring the effects of colour upon human emotions, cognition and behaviour. At present the ECD study group includes approximately 190 members from 37 countries.

Beginnings

In 1981, on the occasion of the 4th AIC Congress in Berlin, Professor Antal Nemcsics (Hungary) proposed the creation of a study group on colour dynamics, which was consolidated the following year as the Study Group on Environmental Colour Design at the AIC Interim Meeting on Colour Dynamics held 8–10 June 1982 in Budapest. The Study Group is celebrating its 33rd anniversary in 2015!

From Colour Dynamics to Environmental Colour Design

In 1981 Antal Nemcsics believed that architectural colour was being applied in a more conscious way than ever. As well, at that time it seemed to him that many professionals, such as physiologists, psychologists, anthropologists and sociologists, were investigating the effects of environmental colour on humans and in other disciplines, e.g., physics and aesthetics, the relationship between colour sensation and colour composition and harmony was being newly investigated. Nemcsics thought that this variety of points of view and heterogeneous research results should diverge into a new science that he suggested calling Colour Dynamics. This new science was to gather together insights from different disciplines to create a theoretical and practical basis for the study of the relationship between colour, the environment and human response.

Inherent in the word 'dynamics', which derives from the Greek term *dynamikos* and means 'powerful', is the notion of motion. In general implying anything induced by a force that moves, flows and changes, in mechanics to study dynamics means to explore the causes and effects of forces. In music, on the other hand, dynamics refers to the volume of a sound or note, in particular to a sudden or gradual change. The German psychologist and zoologist Heinrich Frieling (1910–1996), who participated in the International Colour Conference in Lucerne in 1965, had also used the notion of Farbdynamik [Colour Dynamics] to refer to the psychology of colour and the strong interaction of colour with human beings and their surrounds.

Colour Dynamics however was not adopted as the name of the newly-founded study group because there was a concern that it might be misunderstood as meaning 'Colours in Movement'. The name 'Environmental Colour Design' seemed more appropriate for describing the aims and scope of the study group. Here it is interesting to note how the concept of 'environmental design' has undergone a change in semantics since its initial appearance in the 1940s. Originally and in the decades following its further development, it encompassed processes of human interaction with surrounding natural factors (e.g., geographical, solar, climatic, etc.) through the built environment, such as master plans, architecture, landscape architecture or product design. It was also used to refer to aims and results in the applied arts and sciences in the creation of immediate man-made environments, such as interior design and lighting design. More recently, however, the term implies ecological and sustainable design efforts including nature-friendly strategies as well as means of producing energy which are self-generating and non-polluting.

At the ECD study group meeting held during the AIC 2011 in Zurich, the Chair raised the following question: 'How do we define Environmental Colour Design today with respect to colour, sustainability, ecology and well-being, to re-frame it in terms of these serious concerns of today's society?' There were many responses from the ECD study group members including: Karin Fridell Anter (Sweden) and Doreen Balabanoff (Canada) related this topic to colour and health; Tatiana Semenova (Russia) raised the further question: 'How do we avoid visual pollution in urban space?'; Jean-Luc Capron (Belgium) was concerned about light and green economic lighting policy; Piyanan Prasarnrajkit (Thailand) shared her experience of regularly leading workshops addressing the issue 'What colour is green?'; Cristina Boeri (Italy) expressed her interest in the chromatic integration of industrial sites in urban planning; Leonhard Oberascher (Austria) pointed out Roger Garlock Barker's *Ecological Psychology* (1968), James J. Gibson's *The Ecological Approach to Vis-*

continued on next page

Study Group Environmental Color Design continued

ual Perception (1979) and Edward S. Reed's *Encountering the World: Toward Ecological Psychology* (1996) and the ecological attitude of industrial designers; and María Luisa Musso (Argentina) reminded us that already in the 1980s and 1990s ecology was a major concern, quoting the example of the Earth Summit 1992.

What is Environmental Colour Design?

Poignant answers to this question can be gleaned from various papers that have been submitted over the years and which have been published in the AIC Proceedings and are acknowledged partly at the AIC website. The themes range from discussing theoretical and methodological approaches to presenting artistically oriented ways of how colour is put into practice and applied within real urban environments, architecture and interiors. The subjects also range from exploring the specificity of a single aspect of colour to investigating elements and complex effects of colour in natural and built environments. Other papers focus on presenting key results of systematic research projects carried out in artificial environments, e.g., colour laboratories. Conducted on an international level the exchange shows how the ways that colour is defined not only depend on geographical and climatic factors, but foremost on cultural, social, economic and political aspects and meanings.

Aims

As originally defined in 1981 and still maintained today, the main goal of the ECD study group is to disseminate knowledge about experiences made in the process of integrating colour in the planning, design and realization of the built environment. The activities and events of the ECD study group have opened up exchanges between experts working in diverse countries around the world. Means of exchange include meetings, a website and publications, as well as collaborations with other groups and organizations to stimulate research and teaching. An ECD study group report is published in the AIC Annual Report (Newsletter).

AIC ECD Study Group Meeting at the 2015 AIC Midterm Meeting in Tokyo, Japan

Chair: Verena M. Schindler, Art and Architectural Historian (Zollikon) and Atelier Cler Etudes Chromatiques (Paris); Member of ad-chroma, pro/colore and Centre français de la couleur
ecd.studygroup@yahoo.com
http://www.aic-color.org/sgroups.htm

Meet Your Fellow ISCC Members

It is always an interesting question for me when asked to introduce myself to others; do I start at the beginning or at the end? This time I will start at the end, mostly because the beginning goes back 35 years! Today as the Director of The Color Association of the United States, I work with industry professionals to forecast consumer color preferences 24 months in advance. And while color forecasting has always been an important part of my work portfolio, it has only been a thin slice of my life-long commitment to color. My core purpose has been to increase awareness for the value of color within business, and help companies improve their value to users and overall competitive performance by making creative, substantiated and informed color decisions. To this end I earned a PhD in 2006 publishing a thesis on the value color adds to products and brands. To further my pursuit I recently co-founded a Color Big Data company that amasses colors from multiple verticals including beauty, fashion, home, auto, brands, and others, as well as academic research in the field, providing color analytics that enable better color predictions and overall evidenced-based decisions. If this is something that you are interested in, see the value of, or want to contribute to, we should talk! There is a whole new future for color on the horizon, and it is exciting, at least to me!

Leslie Harrington Ph.D,
The Color Association of the United States
leslie@colorassociation.com

ARCHIVING 2016 – April 19-22, 2016
National Archives, Washington D.C.
Sponsored by IS&T with American Institute for Conservation & ISCC as cooperating societies
Please see Call for Papers due October 4,2015 at
www.imaging.org/archiving

Metameric Blacks: A Color Curious Column

Ever wonder ... "How does the light affect how bright a color appears?"

There are two general ways that lighting influences the apparent colors of objects. These are due to changes in the color of the light and changes in the amount of light. Color changes can have very strange effects. For example, if you were to illuminate a scene with red light, then red objects in the scene would appear brighter while blue or green objects might appear darker, or even black. In general, when the color of the illumination changes, objects of color similar to the illumination color become brighter.

More commonly we observe changes due to the amount of light. Think about how a room in your home appears in bright daylight, at dusk, and with lights on at night. If it didn't change in appearance, we wouldn't be able to figure out what time of day it was without looking at a clock! In general, when there is more light falling on a scene, it appears brighter, more colorful, more contrasty (the differences between colors show up more), sharper (more in focus), and less noisy (or grainy). You can observe all of these changes if you look closely.

Parts of these changes are due to the transition between rod vision and cone vision. Rod vision serves us in very low light levels. In order to gain that sensitivity to light, the rods collect light over larger areas and this results in less sharpness. Things also look more noisy, or grainy, because detecting such low amounts of light is difficult for the rod photoreceptors. When we are using our cones, we collect light over smaller areas so everything is sharper. It is also less noisy because there is plenty of light to capture. Rods can only produce black-and-white vision, so as the light increases and we transition to cone vision, the world starts to appear more colorful. As the light level increases further, the differences between colors become much easier to discriminate and everything looks more contrasty (bright and colorful). Also our pupils can close down when there is more light and that can help make the world appear more in focus.

These pictures illustrate how brightness and colorfulness change with the amount of light. On the left the scene is shown as it would appear on a rather dim (perhaps hazy) day. Some might even call that a dull day. On the right is the same scene as it might appear on a bright sunny day. Notice that the colors are both brighter and more colorful when there is more illumination. Also, the scene appears to be of greater contrast and sharpness when there is more light. Pay close attention to how things look throughout the day from early morning, through noon sunlight, to dusk and you will witness these sorts of changes in color appearance.

Content of this column is derived from *The Color Curiosity Shop*, an interactive website, 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 <*mark.fairchild@rit.edu*> or use the feedback form at <*whyiscolor.org*>. This specific topic can be found at <*http://whyiscolor.org/Questions/1-6.html*>.

Mark D. Fairchild
Rochester Institute of Technology

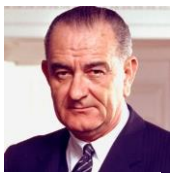
The COMIC I Found a Home

Many thanks to those who expressed an interest in the Davidson and Hemmendinger COMIC I, the first automated color-matching system. We are happy to announce that the COMIC I's new home will be the **Computer History Museum** in Mountain View, California. The museum is very excited about having this classic colorant mixture analog computer join it's collection!

A Blast from the Past: ISCC Newsletter 50 Years Ago

Number 177-178 – July, August, September, October 1965 on ISCC website

This is a two issue combination covering four months of activity from July through October 1965. It is 20 pages long. This column will highlight the formation of a new society and some quotes about color words that we use every day.



http://www.biography.com/people/lyndon-b-johnson-9356122

President Lyndon B. Johnson commemorated the formation of the new Industrial Designers' Society of America (IDSA). Specifically, he congratulated the Association of American Society of Industrial Designers (ASID) and the Induatrial Designers' Institute (IDI) on combining their efforts into the formation of a single joint society (IDSA). As the IDSA President, Henry Dreyfuss put it, "We have come so very far, for all the tragedies and strange new devices that have appeared in just this century. We have come far, but we know – our public leaders have pledged our national energies to this purpose – that we must build and improve upon what we already have. In any age, but particularly in the mid-20th century, to stand still is to slip backward. And of course this is what the profession of industrial designers is dedicated to – to take what is good today and make it better for more people tomorrow, because making anything better is the only road to human happiness." Please enjoy the fascinating read on page 7 about how IDSA formed in 1965 with the blessing of President Johnson.

Charles Schulz had a great quote about blue sky. This newsletter misquotes Charlie Brown as Peanuts. As most of you know, Peanuts was the name of the comic strip. There was no character in the comic strip named "Peanuts". So the recounting here will correct the errors in newsletter 177. Charlie Brown says "I have never seen the sky as blue as it is today." Lucy responds saying, " Oh, I have, I remember back on July 14, 1959, the sky was real blue. Oh, yes, it was much bluer that day. And then and then I remember on September 2, 1961, the sky was a very deep blue: and on June 1 of the very next year, the sky was….." Of course a frustrated Charlie Brown responds, "I can't stand it!"

http://littlesusiehomemaker-lilsusiehomaker.blogspot.com/2012/07/charlie-browm-lucy-bubble-bath-fun.html

What color is wisteria? According to Webster's Third New International Dictionary, Unabridged, 1961, the definition is

"wisteria…2a a pale purple that is redder and paler than average lavender, bluer and lighter than phlox pink, and bluer, lighter and stronger than floss-flower blue. b: a light violet that is redder, less strong, and slightly redder than the average periwinkle." Well that definition makes it very clear or does it?

Here are some examples of what Google gives if you ask "what color is wisteria?"

The patch in the left is from colors.findthedata.com. The patch in the center is from colorcombos.com and the patch on the right is from sherwin - williams.com.

An inspiring poem was written by a blind fifth grade girl, Mary Joyce Pritchard, to describe the color blue. This poem was published in a book entitled Elementary English:

"Blue is the sky over your head.
Blue is the blanket that's on a bed.
It's blueberry pie and juicy sweet plums.
It's the ink with which you write your sums.
It's water lapping the distant shore.
It's fresh paint on the front door.
The air in spring is the smell of blue."

Believe it or not, Playboy, in October of 1965 (page 24) published the following names that Eagle Shirtmakers used for men's dress shirts:

"Long John Silver	Rip out the front Beige
Done Up Brown	High-pitched Wine
Everything went Black	Mind over Madder
Minoan Maize	Toots Wheat
In Violet	Extweme White
Yuca Tan	Saratochre
Count to Tan	Up to Snuff
Ant Teak	George Scandals White"

To test the concept that we may be tired of black and white highways, read about how some roadways in New York State were paved red, green, blue, orange and yellow. How would these colored roadways do for traffic control and visibility?

Paula J. Alessi, *ISCC News Editor*

HUE ANGLES

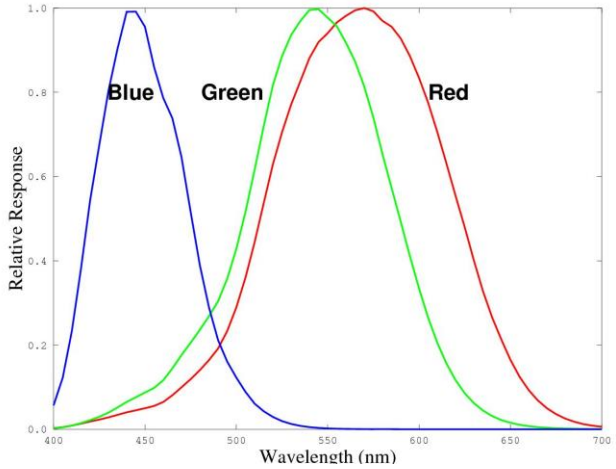
(Send contributions to mbrill@datacolor.com and see http://hueangles.blogspot.com))

Red Like You've Never Seen it Before

In his recent book, *The Tell-Tale Brain*, V. S. Ramachandran describes some cases of synesthesia. A synesthete's reaction to a stimulus can involve multiple senses. If the stimulus is the sound of a trombone, for example, a synesthete hears the trombone, but might also *see* a colour, such as light blue. While synesthetic cross-sensory effects are well known, p. 114 of the book reports a lesser-known phenomenon: some synesthetes see colours that are "unreal" or "Martian," colours they have never seen previously. This Hue Angles column hypothesizes a plausible cause and speculates about its implications.

A commonly suggested explanation for synesthesia is "cross-wiring" in the brain. The idea is that certain stimuli activate not only the receptors they should activate, but also some that they shouldn't. The sound of a trombone, for example, ordinarily affects only the aural apparatus and related brain regions. In a synesthete, however, the signal pathway for a trombone's sound might overlap with the signal pathway for light blue, or the trombone circuit might cause activity in the light blue circuit, as if the two circuits were linked by a relay.

Such a linkage might explain the perception of unreal colours. The figure shows the Stockman-Sharpe cone fundamentals for the eye's red, green, and blue receptor cones.



Colorimetry is based on the colour-matching functions which, at least in theory, are linear transformations of these fundamentals, so ultimately these response curves determine human colour perceptions. In particular, the overlaps in the response curves limit our perceptions. For all light stimuli, except those very near the infra-red, the green cones will respond only if the red cones also respond. Similarly, a physical stimulus cannot excite the blue cones appreciably without also exciting the red and green cones slightly.

If, however, cone combinations were not limited by physical stimuli, colours could be produced that were outside our usual perceptual limits. Synesthesia, it is suggested, can produce cone combinations that could not be produced by physical light sources, so the resulting colours are physically unreal. Suppose, for example, your brain was wired so that only the red cone response was received. Then the red signal would exist without the green signal, which, as we have seen, is an impossibility for physical stimuli. You would see only a red, but since the red was unadulterated with other signals, it would be a red like you've never seen red before.

Any attempts to find such a red in the real world would be doomed to failure. Whether the stimulus came directly from a light source, or indirectly, after reflection off an object colour, none of its wavelengths would be able to stimulate just the red cone any significant amount, without stimulating the other cones, too. The new red would be "unreal," because it could never have the same colour as any physical stimulus.

A similar unreality occurs with so-called "supersaturated" colours, discussed by Glenn Fry, and also by Hurvich and Jameson. A receptor can be temporarily adapted so that it is not responsive; this adaptation is often offered as an explanation for complementary afterimages. If the green receptor were briefly inactive, then a stimulus between 550 and 700 nm would produce a red that was more chromatic than any real red.

An interesting question is the hue of a synesthetic or supersaturated colour. The chromaticity of a pure red cone perception would be a point R outside the standard chromaticity diagram. Suppose a neutral chromaticity N is chosen in the chromaticity diagram. Join R and N by a straight line, that intersects the spectrum locus (which, along with the purple line, makes up the diagram's boundary) at some point D. By definition, D would give the dominant wavelength of the perception R. Dominant wave-

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Hue Angles continued

length is roughly equivalent to hue, but the two are not identical. In fact, lines of constant hue curve noticeably as they radiate outward from N. If R is far enough outside the diagram, then the curving might be significant, so D might not be a very good hue indicator at all. It is possible, perhaps, that the perception resulting from a pure red cone might actually be an orange or a purple---which would be a whole new hue angle.

Paul Centore

Dr. Centore is a freelance colour scientist who is available for colour-related projects. He combines technical ability with an art/design/graphics background. For more information, see www.99main.com/~centore or send an email to centore@99main.com .

COLOR research and application

IN THIS ISSUE, August 2015

Before I begin talking about the articles in this issue, I have the sad duty to tell you that we lost one of our original Editorial Board members, János Schanda, in March. More about János can be found in this issue.

Our first two articles are about color in the printing industry. First, Mathieu Hebert and Roger David Hersch provide a "Review of spectral reflectance models for halftone prints: principles, calibration, and prediction accuracy." In their experiments, the prediction accuracy of the different models was tested using several sets of printed colors on different supports, with different printing systems, different inks and different halftoning methods. They found that the performance and model parameters vary by printing setups.

Traditionally printers have used a proofing chart with a large number of printed patches to evaluate the gamut of the printing device. However, Kiran Deshpande, Phil Green, and Michael Pointer wondered if the evaluation can be effective with a significantly smaller number of printed patches. Their study evaluated several spectral printer models using a 7-color printing process. In the article "Gamut evaluation of an n-colour printing process with the minimum number of measurements" they report that a combination of the Kubelka-Munk (KM) and YNSN models performed well with the fewest input measurements. This procedure can significantly reduce the time and cost of printing and materials for n-color printing.

Moving on to the field of imaging we have two more articles. Shoji Tominaga, Daisuke Nishioka, and Takahiko Horiuchi introduce "An integrated spectral imaging system for producing accurate color images of static and moving objects." The CIE-XYZ display involves synchronizing a programmable light source with a high-speed monochrome camera and a display device to produce tristimulus images of both static and moving objects in real time. In their article in this issue they not only describe the system, but also examine its performance.

The use of multispectral imaging has spread from initial applications in the fields of astrophysics and remote sensing to fields such as medicine, biometrics, environmental sciences, pharmacology, food and agriculture. In recent years it has also become a valuable tool for use in cultural heritage and artwork conservation. In "Artwork imaging from 370 nm to 1630 nm using a novel multispectral system based on LEDs" Jorge Alexis Herrera, Meritxell Vilaseca, Francisco Javier Burgos, Lídia Font, Rosa Senserrich, and Jaume Pujol report on the use of an LED-based multispectral system for imaging of paintings. In order to show the potential of the system, they describe the methods used for spectral reconstruction as well as the metrics for performance evaluation.

"Do the short-wave cones signal blueness?" That is the question that Sungmi Oh and Katsuaki Sakata investigate in our next article. Current theories of vision suggest that the cones in the observers eye i.e., the first stage response, do not represent the spectral composition of the stimulus. The spectral definition begins in the second stage where the outputs of the cones are compared, and the response is transmitted in two chromatic channels: red-green and yellow-blue. The short-wavelength sensitive (S) cone has traditionally been thought to mediate the sensation of blueness via the S-cone driven, "blue-yellow" chromatic pathway. However, this has been questioned more and more recently. In their study, Drs. Oh and Sakata made measurements of color appearance in order to identify a direct correspondence between S-cone excitation and perceived hue strength. Their results showed that blueness did not increase monotonically with increasing S-cone excitation, and thus it was impossible to conclude that blueness is determined in a simple way by the level of S-cone excitation.

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CR&A In This Issue August 2015 continued

Renzo Shamey, Weethima Sawatwarakul, and Fu Sha ask a different question: "Does hue affect the perception of grayness?" It has been know that subjects tend to select a slightly bluish or slightly blue-greenish white as the preferred white. Also an earlier article in this journal examined the effect of hue on the perception of blackness and found that the preferred black is a colorimetrically slightly bluish black. These earlier findings inspired the current experimentation with middle grays. Weakly bluish-green gray samples were selected as "most" gray by the majority of subjects in this study.

Our next article adds another language to those studied to determine the number of basic color names. Saeideh Gorji Kandi, Mohammad Amani Tehran, Nargess Hassani, and Amir Jarrahi carried out a study of the Persian color names in the cities of Tehran, Isfahan, Mashhad, Yazd, Rasht and Shiraz all in Iran. While they found a high level of agreement with Berlin & Kay's 11 basic terms in English, some cities used deviations of one or more basic color terms that included colors such as Cream, Navy, and Quince flower. Four of the cities had 11 basic terms and the other 2 had 10. For the complete report see "Color naming for the Persian language."

In our next article we see how the naming of colors and their interaction is crucial in color-based image retrieval. When the images are complex and colorful the chromatic contrast between the focus colors and background plays in important role. Xiaohong Wang Gao, Yuanlei Wang, Yu Qian, and Alice Gao developed a new color model including the chromatic contrast. The model, designated CAMcc, focuses more on foreground color sand maintaining the balance between both foreground and background colors. In "Modelling of chromatic contrast for retrieval of wallpaper images," the authors describe their model and the results of testing it as compared to CIECAM02, HSI, and RGB models for the retrieval of wallpapers when querying by color.

Enlarging our focus from wallpaper to other color selection in a person's house, next we have a study of color preferences for interior design in the home as a function of personal background of the occupant. Mahshid Baniani and Sari Yamamoto organized a study, which spans the globe by involving three populations: native Japanese students, foreign students living in Japan, and Iranian students living in Iran. They report on the results of their work in "A comparative study on correlation between personal background and residential color preference."

For out final study in this issue we move from the environmental color of individuals to the color of commodities that people purchase. Manufacturers have long known that color can influence the sale of various items from cars to kitchen appliances, but it also provides an important first impression. The color has to feel right to be effective. What feels right depends on the person's background and environment, i.e., the culture. The culture involves unique ethnic characteristics, ethnic fusion, historical evolution and transformation over time. The culture of a group has its own development potential in terms of its artifacts or commercial products. In "A study on the application of an artificial neural algorithm in the color matching of Taiwanese cultural and creative commodities" Shih-Wen Hsiao, Ming-Feng Wang, Dai-Jung Lee, and Chien-Wei Chen explore how the colors of culture assist the designer to develop products with Taiwanese cultural and creative elements.

We close this issue with a news item about the International Colour Association (AIC) Study Group on the Language of Colour.

Ellen Carter
Editor, Color Research and Application

Inventory of Artifacts from the Ingalls

Marjorie and Richard Ingalls are taking down their color science shingle. They have gathered so much equipment and archival materials over the years. Before they dispose of their collection, they would like to offer it to ISCC members. So here is an inventory (see www.iscc.org/resources/IngallsInventory.php):

1. Color Eye Color Analysis Computer (17"x20"x20")
2. Color Eye Chromaticity Display Computer (17"x20"x20")
3. Color Eye Specular Machine (24"x28"22")
4. Cast Iron Spectrophotometer (14"x20"x30")
5. Very Large Spectrophotometer (20"x45"x34")
6. Digital Recorder (14"x10"x20")
7. Box from Fred W. Billmeyer. Jr., including Paula Alessi's thesis & other papers, fuses, color standards, SIN lens, Fluorescent samples
8. Tel-A-Color Color Selector (26"x20"x16")
9. Photo enlarger (9"x20"x14")
10. Box with portfolio of color samples (12"x16") & notebooks filled with computer print-outs
11. Small box with color samples & measurements
12. Box marked Rensselaer with color chip sets, notebooks & books on color

continued on next page

Inventory of Artifacts from Ingalls continued

13. Color samples & lenses box with printing inks, light trap, & a black light bulb
14. Box with various lenses
15. Box with Marjorie's color notebooks
16. Box with ISCC Binders
17. Box with Hardy Spectrophotometer lab work & notebooks
18. Box with black notebooks (1983 – 1986 slides & test results)
19. Box with files on Turnkey system & ratio differences
20. Box with Marjorie's Prototype Boards
21. Box with files, notebook and lab notes
22. Digital Densitometer
23. Power Line Monitor
24. Tel-a-Color Color Selector lighting rectifier
25. Sargent-Welch Densichrometer
26. Gardner Multi-Angle Glossmeter
27. Sargent-Welch Densichron – Model DT63
28. Box of Hunter Tapes for Spectrophotometer
29. Hunter Spectrophotometer in 3 big boxes
30. Olite Light Source
31. Bound Applied Optics Journals from 1963 - 1984

Pictures of all items will be available soon on this inventory page of the ISCC website. If you are interested in any of these items, please contact the Editor at geinhaus@frontiernet.net or 585-225-4614.

Calendar

2015

Aug 23-27 **38th European Conference on Visual Perception (ECVP),** Liverpool, UK, http://www.ecvp.org/2015 or ecvp2015info@gmail.com

Aug 25-26 **Colour and Visual Computing Symposium 2015 (CVCS 2015) Gjøvik, Norway** http://www.colourlab.no/events/cvcs2015

Sep 2-4 **Computer Analysis of Images and Patterns (CAIP) 2015,** Mediterranean Conference Center, Valletta (Malta), http://caip.eu.org/caip2015/

Sep 9-11 **The Eye, The Brain, & The Auto International Conference,** Dearborn, MI, Info: Carolyn Barth, clbarth@dioeyes.org

Sep 13-14 **ACM Symposium on Applied Perception (ACM SAP), formerly APGV,** Tuebingen, Germany, http://sap.acm.org/2015/

Oct 2-4 **11th National Conference of the American Synesthesia Association Inc.,** University of Miami, Miami, FL, Info: http://www.synesthesia.info/upcoming

Oct 4-6 **SPE/CAD RETEC & ISCC, Show Your Colors,** Westin Hotel, Indianapolis, IN, Info: http://specad.org/index.php?navid=164

Oct 8-9 **Pigment and Colour Science ForumTiO_2World Summit,** Hilton Prague, Czech Republic, Info: http://www.pigmentmarkets.com/pigment-color-science-forum

Oct 19-23 **Imaging Science and Technology (IS&T), Color and Imaging Conference CIC 23,** Darmstadt, Germany, http://www.imaging.org/ist/conferences/cic/

Oct 21-22 **AATCC Color Management Workshop ,** Research Triangle Park, Durham, NC, Info: pickettp@aatcc.org

Oct 23-25 **OSA Vision Meeting,** The Fairmont San José, San José, CA, Info: http://www.globaleventslist.elsevier.com/events/2015/10/osa-fall-vision-meeting/

Oct 25-28 **32nd Biennial Western Coatings Symposium (WCS),** Paris Hotel, Las Vegas, NV, Info: http://www.westerncoatings.org

Nov 4 **AATCC RA-36 Color Measurement Test Methods,** Doubletree Hotel, Raleigh-Durham Airport- Research Triangle Park, Durham, NC, Info: www.aatcc.org/evnt/meetings or diana@aatcc.org

Nov 23-27 **Color and Multispectral Imaging Workshop (IEEE–SITIS'15),** Bangkok, Thailand, Info: http://www.sitis-conf.org/en/workshops.php

Dec 3-5 **First International Workshop on Computational Models of the Visual Cortex (CMVC)** New York City, http://bionetics.org/2015/show/home

Dec 5-8 **Color '15, Printing Industries of America,** Pointe Hilton Squaw Peak, Phoenix, AZ, Info: http://cmc.printing.org/

2016

Jan 27-28 **ASTM E12 Color and Appearance,** Grand Hyatt, San Antonio,TX

Mar 3-5 **CIE 2016 Lighting Quality and Energy Efficiency,** Melbourne, Australia, Info: ciecb@cie.co.at

Apr 3-5 **IES Research Symposium III: Light + Color,** Gaithersburg, MD, Info:

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
Datacolor	www.datacolor.com	609-895-7432
Hallmark	www.hallmark.com	816-274-5111
Hunter Associates Laboratory, Inc.	www.hunterlab.com	703-471-6870

We could still use your help!

ISCC has positions in the organization that need filling. We can help identify a place for you depending on your skills and desires. Contact Nomination Chair Scot Fernandez, scot.fernandez@hallmark.com

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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 maintain 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 Colour Association Environmental Colour Design Study Group (AIC – ECD)
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)