



# Inter-Society Color Council News

Issue 478

Spring 2017

## Board of Directors Corner

Greetings, my fellow ISCC members. I'm Jerald (Jerry) Dimas. Last September I was asked to consider serving as ISCC President. I was greatly



honored and humbled by this request. As I thought about it, one of the first things to go through my mind was the names of the many giants in color who have held this office before me. Wonderful people, many of whom I've had the pleasure to meet and develop relationships with,

thanks to my involvement over the past 30 years.

### Table of Contents

Board of Directors Corner.....	1
ISCC Board of Directors.....	2
Online Membership Management System .....	2
2017 Nickerson Service Award Announcement .....	3
CORM/ISCC 2017 Joint Technical Conference .....	3
Call for Nominations for 2017 Godlove Award.....	4
AIC Announces Student Paper Awards .....	4
Summary of ISCC March Webinar.....	5
Books on Color 1495-2015 .....	6
ISCC-AIC 2018 Event - Munsell Centennial.....	8
Neil Harbisson Listens to Color.....	9
Meet Your Fellow ISCC Members .....	10
AIC 2017 Congress & 50 <sup>th</sup> Anniversary .....	11
A Blast from the Past: ISCC Newsletter 50 Years Ago, Number 188 May - June 1967.....	12
AIC Lisboa 2018 Color & Human Comfort .....	13
Refractions: seemingly random musings on color	
<i>There is a Word for That</i> .....	14
Hue Angles: <i>Recollections of a Vanishing Art</i> .....	16
Color Research and Application: In this Issue .....	17
Editorial Changes at	
Color Research and Application. ....	19
CAUS Archiving Project .....	19
Crayola Announces Dandelion Out New Blue In...20	
ISCC Calendar .....	20
ISCC Sustaining Members & Member Bodies .....	21

I'd like to ask each member to consider reaching out to a colleague, friend or acquaintance - anyone you have come in contact with in the context of color - and invite them to consider becoming a member of our esteemed organization. I've always seemed to get out of this organization what I've been willing to put in as far as time and effort. Hopefully your experience as a member has been, or will be, as positive as mine.

I am currently Vice President, Technical for Color Communications Inc. in Chicago, Illinois where I've been "Making Color Sell" for 33 years. Most of my professional efforts are spent toward applying color science to the manufacture of color samples for color marketing purposes such as Color Cards, Color Tools, Color Systems, POS Displays and Color Control Programs for the paint, coatings and fabrication industries. My direct responsibilities include Technical Support, Research and New Product Development. My passion for the technical side of color came to me while studying Graphic Arts during my college years. I spent much of my professional career helping both technical and non-technical people to find best practices for color tolerancing and to develop a better understanding of applying psychophysics to point-of-sale color sampling and color selection tools for the automotive refinish industry.

Keeping up with advancements in color technology has become increasingly important to everyday life in the color sampling industry. Being involved in organizations like the ISCC is a vital part of having unbridled access to the latest information in color research, color webinars and color meetings around the world.

I'm also a member of the Detroit Color Council, ASTM Committees E12 and D01 on Color and Appearance and Paint and Related Coatings, respectively. My other professional affiliations are with the Chicago Paint and Coatings Association and the Council for Optical Radiation Measurements. I served the ISCC as a member of the Board of Direc-

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**ISCC EXECUTIVE OFFICERS**

Terms end 2018

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**ISCC BOARD OF DIRECTORS**

Terms end 2017

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*Board of Director's Corner continued*

tors from 2005-2008.

I'd like to close by thanking all the ISCC members, past and present, that have impacted me along the way, both as a professional and in my personal life. I look forward to serving the ISCC as President for the next two years and hope I can count on your involvement.

Jerald A. Dimas, *Color Communications, Inc.*,  
*ISCC President*

**Online Membership Management System**

The ISCC is switching to the Wild Apricot online membership management system, which will integrate our member contact database with automated invoices, easy member payments, event registrations, and even a website. It will simplify the work currently needed to maintain the member database and to send out yearly invoices. In particular, it will allow members to manage and update their own contact information. Note that we plan to migrate or merge the current [iscc.org](http://iscc.org) website and the membership website.

As part of our 2017 membership drive, we will be asking you to create an account on our new membership site. Membership dues can then be paid with a credit card via PayPal through the system. The system will generate an invoice and receipt for membership dues.

Please be on the lookout for an email in the near future from <https://iscc22.wildapricot.org/> that prompts you to log into the system and to set a password. Note that if you add this Wild Apricot address to your email address/contact list right away, it will help to avoid having the email go by mistake to a junk mail or being blocked. If you need help with this you will find useful instructions at this site: <http://www.whatcounts.com/how-to-whitelist-emails/>

An added benefit of the new system is that members will be able to publish their contact information to the rest of the membership, and will have full control of which information to make public (or none).

The ISCC Board of Directors looks forward to providing additional services to our membership through this software and the website change. We think that it will reduce management work for us all, leaving more time for the color work that we really love.

## 2017 Nickerson Service Award Announcement

ISCC is proud to announce that John Conant is the 2017 Nickerson Service Award recipient! John is currently serving as ISCC Past-President, and his steady support of ISCC has insured our successful navigation of many changes. John's steady stewardship and management of technical details have helped the ISCC membership transition to a largely-



electronic delivery of membership services. John has helped serve the members of the ISCC in micro ways (by managing the details of email management) and macro ways (by guiding the Board of Directors in a transparent process of determining value for members in a changed environment for technical color organizations). John's dedication to ISCC extends beyond the workplace as he somehow finds the time to do detailed ISCC business on his own personal time late at night and on weekends. These extra efforts have helped ISCC thrive.

John will receive the 2017 ISCC Nickerson Service Award at the Business Meeting during the joint ISCC/CORM meeting to be held from July 31-August 2.

Ann Laidlaw, *ACL Color Consulting, LLC*  
*Nickerson Service Awards Committee Chair*



## CORM/ISCC 2017 Joint Technical Conference

Mark your calendars now and plan to attend the joint CORM and ISCC conference at the Lighting Research Center at Rensselaer Polytechnic Institute (RPI) in Troy, NY on July 30 – August 2, 2017. The conference schedule will begin with a welcoming reception on Sunday, July 30<sup>th</sup>, followed by technical sessions on Monday-Wednesday, July 31-Aug 2. ISCC's Business Meeting on August 1<sup>st</sup> will be expanded to include a general membership meeting. The evening of August 1<sup>st</sup> will include The Grum Banquet; an annual dinner event that features a lec-

ture from a distinguished member of the lighting community. August 2<sup>nd</sup> will feature a morning session of Emerging Professionals, and tours of the RPI Lighting Research Center in the afternoon.

This joint conference will feature the following six sessions:

- Session 1 Display Metrology
- Session 2 Topics in SSL Metrology
- Session 3 UV Radiometry
- Session 4 Optical Properties of Materials
- Session 5 Current Research at NMI (Nat'l Metrology Institutes: CENAM, NIST, etc)
- Session 6 Emerging Professionals

Some of the confirmed presentations include:

- *Characterization and Control of the Dynamic Visual Adaptation Lab*, Michael J. Murdoch, Munsell Color Science Laboratory RIT
- *Dependence of Bidirectional Instrument Performance on Sample BRDF Properties*, David R Wyble, Avian Rochester, LLC
- *Reflectance Measurements with the Robotic Optical Scatter Instrument (ROSI)*, Heather Patrick, NIST
- *Uncertainty and Performance Results From a Component by Component Upgrade to the Visible Comparator Facility*, Jeanne M. Houston, Howard W. Yoon, Thomas C. Larason, NIST
- *Improvements in the Spectral Irradiance Calibrations Performed in the Visible Comparator Facility*, Jeanne M. Houston, Howard W. Yoon, Yuqin Zong, NIST
- *Towards a new absolute diffuse reflectance instrument at the NRC*, Luke Sandilands, National Research Council of Canada
- *Ray Tracing Tools for Ultraviolet Fluence Rate Simulations in Photoreactors*, Yousra Ahmed, Purdue University
- *The Effect of the Spectral Content of a Glare Source and its Background on Discomfort Glare*, Rohan Nagare, Rensselaer Polytechnic Institute

Accommodations will be available on campus in student housing (dorm rooms). ISCC members who are not able to attend the entire conference may opt to register for August 1<sup>st</sup>, only. The Grum banquet is not included in the 1-day registration, so you will want to purchase a separate banquet ticket. Registration information will be posted on the CORM ([www.cormusa.org](http://www.cormusa.org)) and ISCC ([www.iscc.org](http://www.iscc.org)) web-

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*CORM/ISCC Joint Conference continued*

sites in May. The conference registration fee is \$495 for "early bird" (before 6/26) registrants. This includes the Sunday reception, lunch on Monday and Tuesday, and the Grum Banquet on Tuesday night. The late registration fee (on and after 6/26) is \$595. Dormitory accommodations are \$50/night (book for 2 nights or 3 nights). Attendees who don't wish to stay in the dormitory can find their favorite nearby hotel. If you would like to register with the "early bird" pricing before June 26, please do so by visiting: <https://www.eventbrite.com/e/cormiscc-2017-annual-conference-tickets-33524798575> (click on "tickets").

We look forward to seeing you there!

Ann Laidlaw  
ACL Color Consulting, LLC

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### Call for Nominations for the 2017 ISCC Godlove Award

The Godlove Award was established by Mrs. Margaret N. Godlove in memory of her husband, Dr. Isaac H. Godlove. The fund was presented to and accepted by the ISCC during the 25th Anniversary Meeting of April 6, 1956. The award is usually, but not necessarily, presented biennially in odd-numbered years. The last Godlove recipient was the late Anna Campbell Bliss in 2015. (Thankfully she received it before she passed away!)

The Godlove Award is the most prestigious award bestowed by the Inter-Society Color Council, and honors long term contributions in the field of color. Candidates will be judged by their contribution to any of the fields of interest related to color, whether or not it is represented by a Member-Body. A candidate's contribution is to be considered in the light of the objectives of the Council as defined in Article II of the Constitution. This 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 knowledge of color by writing or lecturing, based upon original contributions of the nominee. **The candidate need not have been active in the affairs of the Council, but they must be current or former members of the ISCC. All candidates must have had at least five years' experience in their particular field of color.**

Nominations should include the following information:

1. The name and full address of the nominee.
2. A sentence or two giving the specific reason for the award's bestowal. This will normally

form the basis for the citation presented to the successful nominee.

3. A narrative (up to one-page) of the nominee's contribution and its significance.
4. A curriculum vitae or the nominee, as well as any other material deemed useful.
5. The name of the person or Member Body or Award Committee who prepared the nomination with appropriate contact information.

*Note: Confidentiality of the nomination is of the utmost importance. The nominating individual/group must ensure that the nomination is not disclosed to the proposed nominee. If any of the above information cannot be obtained without risking disclosure, then the information should be omitted from the nominating letter.*

Nominations should be submitted using the form, <http://www.iscc.org/UniversalNominationForm.pdf>. This form can be filled out, scanned and emailed to [isccoffice@iscc.org](mailto:isccoffice@iscc.org) or printed, completed and sent to: ISCC Secretary, 7820B Wormans Rd. Suite #115, Frederick, MD 21701.



### AIC Announces Student Paper Awards

The goal of the AIC Student Research Paper Awards is to encourage students to present their work at the AIC meetings and to benefit from interaction with the international colour community. Applications must be substantially related to the subject of colour, but may be based in any discipline or mix of disciplines. Both research-based and practice-based work will be considered.

The AIC Student Paper Awards are for final year undergraduates and post graduates only and will run every two years in conjunction with the AIC Interim Meetings. Accepted abstracts with a student being the first author will be eligible to be considered for the Awards. Only one accepted abstract from the same student first author will be considered. Three prizes, agreed by the AIC Student Paper Awards Panel, will be awarded to students on the basis of the quality of their full papers published in the AIC proceedings. The top, first runner-up and second runner-up prizes will be awarded with a monetary prize. An extended version of the awarded papers will be published in a special issue of the Journal of the International Colour Association (JAIC). The awards will be announced and presented at the AIC Interim Meetings. In addition to the three awarded papers, three student papers from the same

*continued on page 13*



## Summary of ISCC March Webinar held on International Colour Day



INTERNATIONAL COLOUR DAY

21 MARCH

ESTABLISHED BY AIC - INTERNATIONAL COLOUR ASSOCIATION

This year the ISCC celebrated International Colour Day with a webinar given by Mark Fairchild on 21 March 2017 from 2 to 3PM EST. The working title of Mark's talk was "From Photon to Brain: The



Perception of Color," but his slides omitted the subtitle, probably because his actual subject area was somewhat broader than the subtitle's restriction implies.

In the first slide, Mark gave homage to *From Neuron to Brain* by John G. Nicholls et al. (5<sup>th</sup> Ed., Oxford U. Press, 2011), from which he borrowed several figures for his slides. Another, more subtle, influence is also possible: The scientific documentary, *Powers of Ten* (1977, directed by Ray and Charles Eames, narrated by Philip Morrison), which started with a human-scale scene, zoomed out in powers of 10 to the limits of the universe, and then zoomed in in powers of 10 to a subatomic particle within the human-scale scene.

The first part of Mark's talk started big and zoomed in. His overriding question was whether, given the total rate of photon emission by the Sun, we have enough left at the end for seeing a blade of grass, even in twilight. And so he started: "A photon leaves the Sun...What are the chances we detect it?" Then he made us all groan with "Don't worry...it's traveling light". From sun to grass to eye to brain, Mark did a "back of the napkin" calculation--- the



napkin also being included as a slide. Each 0.1 second,  $\sim 10^{44}$  optical photons leave the sun. About 0.043% are within half a nanometer of 555 nm (the peak of our photopic sensitivity). That leaves about  $4.3 \times 10^{40}$  of these special photons leaving the Sun per 0.1 sec. Of these, only  $2.1 \times 10^{35}$  strike the Earth's atmosphere, that atmosphere lets in  $1.4 \times 10^{35}$  to the surface of the Earth, and a 2mm square of grass at noon gets apportioned  $6.5 \times 10^{15}$  photons. Despite the dizzying number of powers of ten that were shaved away, even this light would hurt our eyes, Mark said.

Because the grass (assumed Lambertian) has a reflectance factor about 18%, there are  $1.2 \times 10^{15}$  photons reflected from the grass, and of this light  $2 \times 10^8$  photons could arrive at a 2mm pupil of an eye 3.4 meters away. The cornea, aqueous humor, and other intra-ocular media remove all but  $6.2 \times 10^7$  photons, which proceed to strike the retina. The percents of light to be absorbed by L, M, and S cones are then 13%, 13%, and .005%. (Of course, there are certain simplifying assumptions, such as uniform cone population weighting and the 555 nm restriction.) That means the L cones absorb 8 million photons, and M cones do the same, and the S cones absorb 3 thousand photons. Then Mark cited Hecht, Schlaer and Pirenne, who say that 9 photons are needed to be detected by rods, and about 100 for cones. After showing these authors' classic threshold curves, Mark concluded about the light availability, "Yay, we have enough!"

Now, a dramatic pause: The photons are gone. So what happened? Now Mark started zooming in further, continuing a sort of rough parallel with the *Powers of Ten* documentary. There's phototransduction by the cones and rods: absorption by photopigments, conversion to chemical energy, conversion to electrical energy, and ultimate dissipation as mostly heat. At this point, Mark cut over to a figure from *From Neuron to Brain*, capturing the phototransduction. One has to mention here that it is the metabolic

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*Summary of ISCC March Webinar continued*

energy stored in the unbleached photopigment, not the energy in the incident light, that is the primary source of energy that turns into heat (and perception). Further figures from *From Neuron to Brain* show the electrical response to the amplified signal from the photons, and a retinal neural network to process the information in the photon pattern. Then Mark discussed the spatial organization of visual receptive fields (excitatory center, inhibitory surround, or the reverse), and then transitioned to a functional map of the retina and lateral geniculate nucleus, which sought to impress us with its complexity, and succeeded in at least one case [MHB].

Finally, Mark demonstrated certain visual effects that show the result of the complex neural processing. He started off easily, with Mach bands: light regions look lighter when they are placed next to dark regions. These can be explained in simple center-surround terms. Slightly more challenging is the Hermann grid, which shows the grid intersections as darker than the other parts of the grid. An interlude on color induction and chromatic adaptation added the dimensions of time and color to the picture. Finally, there were the Adelson diamonds, presented with thoroughness and wonder but no compelling explanation. A final picture of a cliff climber on a brick wall showed metaphorically that



our understanding is underway, but not yet complete.

Michael H. Brill, *Datacolor*

## **Books on Color 1495-2015: History and Bibliography by Roy Osborne**

**Interview by Maggie Maggio**

### **A Story**

I remember finding Roy Osborne's first book "Lights and Pigments: Colour Principles for Artists" (1980) about ten years ago when I was browsing through the used books on color at Powell's Books

in Portland, Oregon. I stood in the aisle and quickly read the short Introduction. It was one of those rare moments of absolute recognition. I kept saying to myself "My thoughts exactly! My thoughts exactly." As a teacher, I was struggling with integrating light as an art medium into my color classes and was stunned to find a book written over twenty-five years before about the same subject. In fact, Osborne's book was the first to link traditional with emerging art media, including plastics, holography, video and light. I bought the book, went home, did some research and ordered two more of Osborne's books, "Colour Influencing Form" (2004) and the first edition of "Books on Colour" (2004).

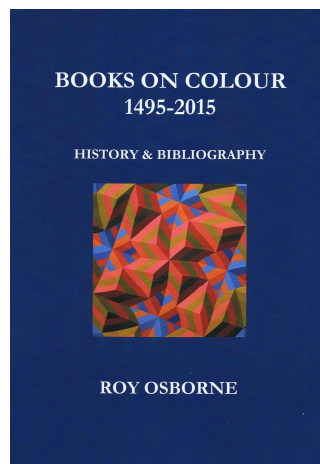
Three years ago, I had the pleasure of visiting Roy and Don Pavey while in London on a business trip. We spent a lovely afternoon upstairs in Don's library surrounded by what seemed like thousands of books on color. We talked about color for hours over tea and biscuits and eventually ordered pizza so we could continue talking through the early evening. As Don pulled down one book after another, we discovered a shared passion for collecting books about color. Sadly, Don died one year later, aged 92, and our meeting remains a cherished memory. When Roy and I met again at the PICS (Progress in Color Studies) 2016 conference in London, I was happy and relieved to hear that Don passed his collection on to Roy.

### **A Book Review**

Roy Osborne's "Books on Colour 1495-2015" (ISBN 978-1-326-45971-0) is an inexpensive 290-page paperback offering quick and easy reference to 2,500 authors and editors and over 3,200 titles. Cross-references are offered for many of the entries.

Since my first copy of "Books on Color" arrived ten years ago, Osborne has expanded and reprinted his annotated bibliography a number of times. Recent editions include an introduction that he wrote partly in response to Michael Brill's ISCC newsletter review of his second edition. (July-August 2007)

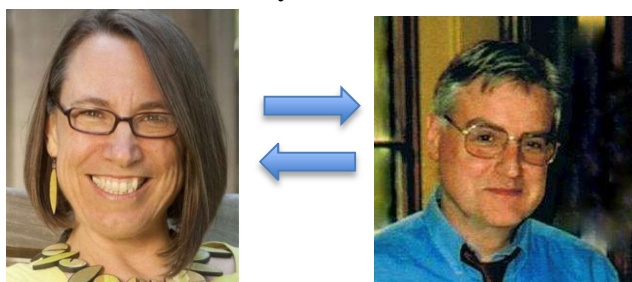
As a passionate but not very organized collector of books on color, I find each edition invaluable. The translations of non-English titles and the alphabetical listing of authors make books easy to find. "Books on Color" *continued on next page*





*Books on Color 1495-2015 continued*

1495-2015: History and Bibliography”, is not only a definitive reference, it is also a treasure trove of color arcana. Dig deep into the chronological introductory chapter titled “A History of Color Literature” and you will be rewarded with such gems as: “With very few exceptions (Chevreul, Kandinsky, and perhaps Albers) the authors of some 250 teaching books for artists are conspicuously absent from writings by art historians.” This discouraging sentence spotlights Osborne’s reason for publishing a biography of books on color. He is committed to recording the names, famous and not so famous, of authors who wrote about color. Even though they are not mentioned in art history books, they will not be lost and forgotten.

**An Interview with Roy Osborne**

*When, and why, did you start pulling together this comprehensive, cross-disciplinary, annotated bibliography of books on color?*

I began assembling a list of colour books in 1975, when I started writing ‘Lights and Pigments’ (published 1980). Two years later I discovered the colour-book collection installed by Hans Brill at the Royal College of Art (RCA) Colour Reference Library, London. My interest in colour books was revived when I typed and edited Don Pavey’s ‘Colour and Humanism’ (which referred to about 200 books) for publication in 2003. The first edition was first published in 2004 as ‘Books on Colour 1500-2000’ and updated in 2007. It was re-edited again for publication in 2013 with the addition of the introductory chapter. The book was revised again in its present edition in October 2015. Since it is now self-published, it has been updated a few times since then. The latest revision was issued on April 1, 2017.

*The introductory chapter, “A History of Color Literature”, is a fascinating read. It feels like a download from your brain - a stream of consciousness piece of writing from someone who knows his subject so well that he can stitch it all together from memory.*

This was quite a major undertaking during the winter of 2012-13. It’s not intended as a good literary read, it’s just as an alternative grouping of the titles for periodic consultation. I condensed it as much as possible to keep it down to 10,000 words. It’s unlikely many will read it more than once from beginning to end!

*How did you find the books to include in the first edition?*

Initially they were copied from the long list of the Royal College of Art colour-book collection originally made by Stuart Durant in 1976. At the core of this list were titles collected by Don Pavey in the 1950’s when a sixteenth century book on color could be had for a few dollars. The list of 226 colour books that Faber Birren (1900-88) donated to Yale University Library in 1971 was very useful. There is also the Werner Spillman collection in Switzerland and the Robert L. Herbert collection that was donated to the Washington National Gallery of Art a few years ago. The most recent books are found in journals. Collecting all the necessary details (dates of birth and death, etc) could not have been done without the internet and its millions of data sites.

*What criteria do you use for choosing books?*

I’ve compiled the books I wish I had when I started getting interested in colour about 1970. Now I choose books that I think will be useful to others researching the subject. I’ve tried to include all the most important contributors to a history of colour. I’ve mostly excluded texts under 50 pages unless they are of historical significance. Each chronological index at the front offers a mini-history of each of the categories.

Publications are categorized under 27 general headings: Architecture, Chemistry, Classification, Colorants, Computing & Television, Decoration, Design, Dress & Cosmetics, Dyeing, Flora & Fauna, Food, Glass, History, Lighting, Metrology, Music, Optics, Painting, Perception, Philosophy, Photography & Cinema, Printing, Psychology, Symbolism, Terminology, Therapy, and Vision. The most rapidly expanding category relates to digital media.

*Apart from books, you include some papers from journals and conference proceedings. What criteria do you use to decide what to include/not include?*

I added a few from journals (and the Royal Society archives) because they are key papers that seem to have historical significance. Many are by important contributors who never published a full-scale book. I wanted their names to be remembered.

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*Books on Color 1495-2015 continued*

The book started off as a bibliography of publications, and the emphasis gradually transferred to recording the people who wrote them, who they were, when they lived, and what they did. With some authors, the only thing we now know about them is that they once published a book on color. If there is anyone you think I've left out, please let me know.

*Have you read all the books?*

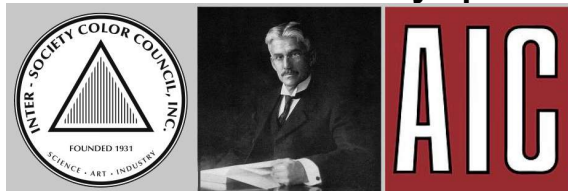
No. But I've consulted a large number of them at different times over the last 40 years. Right now, I probably have over 300 titles in my own library, ranging from 1612 to the present time. Many prime examples are also accessible on the internet on [archive.org](http://archive.org). It may be interesting to note that the number of titles published from about 1950 to 2015 equals the number published between 1495 (the Sicily Herald) to 1950. We know of only 40 books published in the 1500's and now it's more than two dozen a year!

I recently visited the [Smithsonian Library Exhibit Color in A New Light](#). The 20 or so books in the exhibit were chosen by [Jennifer Cohlman Bracchi](#), a reference librarian at the Cooper Union Smithsonian Design Museum. Which books would make your top 20 list?

I'll have to leave this till later though I am probably in a good position to do it. I would most likely be biased from a painter-teacher's point of view. Albers, for example, has never influenced my colour teaching, but no one can deny his influence elsewhere. Munsell had far less influence than Ostwald in Europe, and both have now been displaced in Europe by the Swedish NCS. I'm pretty sure Chevreul, Ruskin and Rood would be there. The Sargent (a Dover reprint) is a very good teaching book as is Paul Renner's from 1964. Gartside (1805) is highly innovative, Thomas Young writes beautifully, and Helmholtz and Maxwell were geniuses too.

Maggie Maggio  
*Smashing Color*

## Joint ISCC - AIC Special Event The Munsell Centennial Symposium



## Celebrating the Past | Envisioning the Future June 11-15, 2018

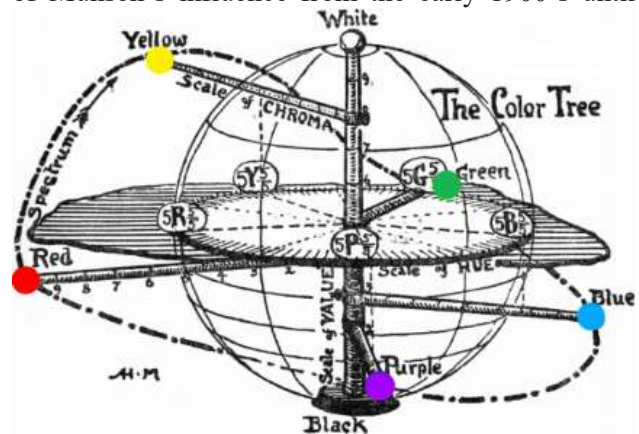
Massachusetts College of Art and Design  
(MassArt) | Boston, MA USA

### Bridging Science, Art and Industry

The Munsell Centennial Symposium in June of 2018 will be a cross-disciplinary event hosted by the Inter-Society Color Council and the International Color Association to honor the pioneering contributions of Albert H. Munsell to the world of color. This special ISCC/AIC centennial symposium celebrates the past 100 years of the Munsell Color Company's history since its foundation in Boston in February of 1918 and commemorates the 100th anniversary of the death of Albert Munsell in June of 1918.

### Celebrating the Past

The Symposium will look back at the milestones in color over the past century and follow the threads of Munsell's influence from the early 1900's until



today. By designing a simple, systematic way of de-

The Color Tree from *A Color Notation* (1905) with Munsell's Five Hues

fining color, Albert Munsell built a strong bridge between art and science. Over the last 100 years, his color order system has been used around the world to successfully teach color classes and communicate color specifications. The Munsell System has formed the basis for new scientific systems, and supported color research in countless studies.

### Envisioning the Future

How does the Munsell Color System relate to what is happening in the world of color today? Munsell was a teacher and artist who combined his educational philosophies with the latest color theories and then consulted with scientists to develop his color system. Is it time to repeat the process?

What are the cutting-edge areas of color explora-

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*ISCC/AIC Munsell Centennial Symposium continued*

tion? What directions might we be taking in the future? How can scientists, artists and industrialists work together to promote color literacy in the 21<sup>st</sup> century? The Symposium will invite participants to think about and discuss these questions with colleagues from around the world.

**Honoring Munsell's Legacy**

In order to honor Munsell's legacy of interdisciplinary collaboration, the Symposium will bring together color scientists, artists, industrialists from all over the world for five days of talks, seminars and workshops by invited presenters. We will look back at the last 100 years of color history and look forward to what the future might bring.

A few of the invited presenters include:

- Roy Berns, Richard S. Hunter Professor, Munsell Color Science Lab, RIT
- Paul Green-Armytage, Professor Emeritus, Curtin University. Perth Australia.
- Michael Webster, University of Nevada
- Renzo Shamey, North Carolina State University
- Roy Osborne, London
- Margaret Livingstone, Harvard University
- Osvaldo Da Pos, University of Padua
- Mark Fairchild, Director, MCSL, RIT
- Lois Swirnof, Professor Emeritus, Cooper Union, NYC
- David Briggs, Dimensions of Color, Sydney, Australia
- Graydon Parrish, Austin, Texas
- Berit Bergstrom, Natural Color System, Stockholm, Sweden
- Wendy Luedtke, RoscoSpectrum
- Tom Lianza, SequelSCI
- Don Williams, Image Science Associates
- Dave Wyble, Munsell Color Science Lab, RIT

**Contributed Poster Papers**

The Symposium will also feature Contributed Poster Paper Sessions. A Call for these will be sent out by September 1, 2017. There will be a special issue of *Color Research and Application* dedicated to papers from this conference. Those presenting posters will be eligible to submit full papers to the special issue. Publication will be dependent on successful peer review through the normal journal procedures. The submission deadline will be shortly after the conference.

**Walking in Munsell's Footsteps**

The Munsell Centennial Symposium will take place at MassArt where Munsell taught for over twenty years in Boston, Massachusetts. Munsell's studio and the original offices of the Munsell Color Company were close by in Boston's Back Bay.

The Symposium accommodations will be in the Treehouse Dorms directly across the street from MassArt. This brand new dormitory features both private and shared rooms at very affordable rates and is conveniently located on the MTA transit line.

**Crossing the River**

Munsell traveled across the Charles River often to consult with the faculty at both Harvard University in Cambridge and Massachusetts Institute of Technology (MIT). A number of optional field trips to the special collections at Harvard and MIT as well as visits to the Boston Museum of Fine Art and the Isabella Stewart Gardner museums will be scheduled during breakout sessions.

Much has changed in the fabric of Boston over the past 100 years but the spirit of academic rigor and intellectual curiosity still thrives. We are excited to be hosting the Munsell Centennial Symposium in Boston in June of 2018!

**Mark Your Calendars**

The ISCC and AIC invite you to join us in Boston next June for this not-to-be-missed special gathering to celebrate the past, present and future of the science, art, and industry of color. Your participation will be an essential part of exploring the colorful world that Munsell created and charting the future of where our journeys with color can take us in the 21<sup>st</sup> century.

If you wish to participate in the planning of this event, please contact the Co-Chairs: Maggie Maggio ([maggiemaggio@gmail.com](mailto:maggiemaggio@gmail.com)) or Paula J. Alessi ([geinhuas@frontiernet.net](mailto:geinhuas@frontiernet.net)). For Symposium information, please go to the website at [www.munsell2018.org](http://www.munsell2018.org)

Maggie Maggio, *Smashing Color*

**Neil Harbisson Listens to Color**

Neil Harbisson is an artist who was born with complete color blindness. A device attached to his head, allows color to be turned into audible frequencies. Learn more about how he can "listen to color" by

visiting:

[https://www.ted.com/talks/neil\\_harbisson\\_i\\_listen\\_to\\_color](https://www.ted.com/talks/neil_harbisson_i_listen_to_color)

## Meet Your Fellow ISCC Members

Please meet Margot Grallert.

As an artist/educator, now retired, I am interested in how the hands-on use of color in visual art-



work relates to a thinking process. It began back in the 1970's heyday of alternative schools when I worked as a consultant to integrate art in classrooms at McCarthy-Towne, a public

elementary school in Acton Massachusetts. I was "good at art" in elementary school because I could draw. The skill came naturally to me and I continued to perfect it by erasing or correcting mistakes in a conscious effort to control the lines. I went to art school, studied in Paris and Italy, became a painter and found the value of non-control by using color rather than line in starting art work.

I was at McCarthy-Towne for over 30 years, helping classroom teachers see the vital balance between control and non-control through the use of color in doing artwork. Students were asked to start with color in a process I called "working from the inside-out". They used prismacolor pencils, paint and other color media starting in the middle of what they were observing, such as a particular red on the surface of an apple, and they let their work grow from that place. I wrote two articles that describe this process: *"Working from the Inside Out; a Practical Approach to Expression"*, Harvard Educational Review and *"Catching the Light; 'Doing Art' and Education"*, **Leonardo**, MIT Press. The articles address the concept, but the relevance is in the visuals.

One third grade painter illustrates a soft blended approach, while the painting of another is deeper in color and more defined.



Eight different perceptions of first grade pineapples show object recognition as well as cognitive qualities. Some show solidity and weight, others the detail in the sections or spines or being "alive". One pineapple has a more three-dimensional perspective, another shows the leaves from a top view and the fruit from the side. Students learned from each



other's perspective without changing their own because their own was just as valid. They learned to see by starting with color "in the middle", thus eliminating the common threat of not "being able to draw." The focus was one of choice on where to begin without knowing for sure where it would go. Evaluation happened by discussing individual perception and asking simply "what did this person see."

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*Meet Your Fellow ISCC Members continued*

Most artwork needed to be two-dimensional but that made it easy to document. I have an extensive slide library (now being digitized), video tapes, audio tapes and whole class collections of actual work, all illustrating an artistic process that could change assumptions about how we see and why that's important to education. I am now writing to scientists who are researching vision as an aesthetic experience (hands off) or as a body mind connection (hands on). I think common ground can be found somewhere in the neuroscience of what goes on in the undivided brain and as described beautifully in "The Master and His Emissary" by Iain McGilchrist. Meanwhile, a flip flop between either doing art or looking at it prevails. For sure, technology will continue to be the future that gives form to color. I know very little about it and hope to collaborate with those who do. A multi-media format is the only way I can see it all coming together.

13th AIC Congress

# 2017 JEJU

## Color & Health

### AIC 2017 Congress and 50<sup>th</sup> Anniversary Celebration!

The 13<sup>th</sup> Congress of the AIC will be held in Jeju, Korea at the International Convention Center from October 16<sup>th</sup> – 20<sup>th</sup>. This Congress provides a unique forum bringing together researchers, academics, artists, architects, industrialists, engineers, designers, lighting experts and business leaders from all over the world. The host for this Congress is the Korea Society of Color Studies.

This 2017 Congress also marks the 50<sup>th</sup> Anniversary of the founding of AIC. To celebrate this Anniversary, there will be a "Memory Photo" Exhibition and a "Color and Culture" Exhibition!

Special Exhibition for the 50<sup>th</sup> Anniversary  
Brilliant Memories of AIC for last 50 Years

#### Call for "Memory Photo" Exhibition

To commemorate 50 years of AIC, there will be a history exhibition at the AIC 2017 Jeju Congress, including a display of 50 posters, one for each of the Congresses and Interim, Midterm Meetings, which will be on display throughout the week. Your help is needed to provide content for this exhibition.

The organizers would like to show images, photographs, thoughts and impressions on the International Color Association (AIC) since its start in

1967. All ISCC members are encouraged to share memories and reflect on the success of AIC over the years. If you would like to contribute to this historical "memory.photo" exhibition, please download the Application Form, fill it out and email it to [aic2017@hdasan.com](mailto:aic2017@hdasan.com). You can also directly upload photos online. Exact instructions for how to share your memories and photographs can be found at [http://www.aic2017.org/sub04\\_05](http://www.aic2017.org/sub04_05). The organizers will put your names on the items you contribute for all to see during the exhibition.

**50<sup>th</sup> Anniversary of AIC**  
Call for EXHIBITION of "Color and Culture"

#### Call for Exhibition of "Color and Culture"

Also, to celebrate the 50<sup>th</sup> Anniversary of the AIC, there will be a special exhibition entitled "Color and Culture" during the AIC 2017 Jeju Congress. This exhibition will provide an opportunity for each member country, including the United States through ISCC, to bring their vision, concepts and ideas in color and culture.

Each member country is invited to submit up to three items for exhibition. These items can be images, photographs, sculptures, products, etc. The organizers will provide each member country with 3 art walls each sized 1 meter in height by 1 meter in width and a table to exhibit all items that display the color and culture of your country.

To participate in this exhibition, please download the Application Form, fill it out and email it to [aic2017@hdasan.com](mailto:aic2017@hdasan.com). Exact instructions for how to participate in this "Color and Culture" Exhibit can be found at [http://www.aic2017.org/sub04\\_04](http://www.aic2017.org/sub04_04).

#### Registration

The early registration fee is \$700 for delegates and \$420 for students. The deadline for early registration is August 30<sup>th</sup>. If you register on or after August 31<sup>st</sup>, the fee is \$800 for delegates and \$480 for students. If you wish to attend the banquet on Thursday evening, October 19<sup>th</sup>, you must pay an additional \$100. This banquet fee can be paid at the time of registration. All participants wishing to attend the Congress are kindly requested to register online through the Congress registration system at [http://www.aic2017.org/sub05\\_01](http://www.aic2017.org/sub05_01).

#### Hotels

The AIC 2017 Organizing Committee has arranged the hotels with special rates for the participants. Hotels have been selected paying careful consideration to security, moderate pricing, convenient location, etc. Soon it will be possible to make your hotel reservations online. Please visit [http://www.aic2017.org/sub05\\_02](http://www.aic2017.org/sub05_02).



## A Blast from the Past: ISCC Newsletter 50 Years Ago

Number 188 – May - June 1967 on ISCC website

This 1967 issue is 37 pages filled with an extensive summary of the 36<sup>th</sup> Annual ISCC Meeting held at the Statler Hilton Hotel in New York City! This made me very nostalgic for the “old days”! There was an “unusual tone” to this Annual Meeting because many international CIE attendees were present, giving the meeting “added stature”. This is the meeting where Ralph Evans gave his “landmark lecture” known as “The Perception of Color”. Dusty Rhodes wrote “Although many of Ralph’s precepts are unusual and controversial, his usual clear exposition and convincing illustrations are powerful persuaders”.



Although many of Ralph’s precepts are unusual and controversial, his usual clear exposition and convincing illustrations are powerful persuaders”.

Günter Wyszecki put together an enlightening symposium on Metamerism. The speakers were Walter Granville from Granville Color Service, A. Brockes from Farben Fabriken Bayer in Germany, Isadore Nimeroff from National Bureau of Standards, and Eugene Allen from American Cyanamid Company. Participants left with a clearer understanding of metamerism. Many samples illustrating metamerism were shown. This meeting marked the



distribution of the 1967 Davidson and Hemmendinger “Color Rule” that has been used ever since to illustrate observer and illuminant metamerism.

Professor W. D. Wright gave an invited lecture on Color Measurement. One of the interesting points that Professor Wright made was “that color measurement will have reached its apex when instruments agree with observation”. I think, in 2017, color



measuring instrument manufacturers are still trying to achieve the goal that Professor Wright set in 1967. As Dusty Rhodes put it, “His discussion of the complexity of visual stimuli combined with interesting mental processing made one wonder that any color measurement based on comparing two small circles could be at all useful in describing color experience.

Of course, we knew that color measurement is limited. Having heard Professor Wright, some of us suddenly realized that we were not fully conscious of how limited it really is!”

Another momentous occasion at this Annual Meeting was the Godlove Award Ceremony. Edwin I. Stearns of the American Cyanamid Company received the 6<sup>th</sup> Godlove Award for “his outstanding contributions to the science of color”. After receiving the Award, he gave a talk entitled “Dyeing for a Living”, which is recommended reading for all!

In 1967, Problems Subcommittees were an important part of the lifeblood of the ISCC. Much of their work represented state-of-the-art and advanced color science and technology not only in the United States but around the world. Four Problems Subcommittees met at this Annual Meeting:

- Subcommittee on Problem 18: Colorimetry of Fluorescent Materials chaired by Eugene Allen
- Subcommittee on Problem 21: Standard Practice for Visual Examination of Small Color Differences chaired by Sam Huey
- Subcommittee on Problem 22: Procedures and Material Standards for Accurate Color Measurement chaired by Fred W. Billmeyer, Jr.
- Subcommittee on Problem 24: Catalog of Measuring Instruments chaired by Ruth Johnston

Next came reports from the ISCC Member-Bodies, which played a significant role in ISCC membership. In 1967, there were 29 Member-Bodies, 12 of whom were represented at this Annual Meeting and reported their activities. Industrial, science and design groups represented by the Member-Bodies were tanners, illuminating engineers, packaging, interior and industrial designers, and those

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*A Blast from the Past continued*

working in the paper industry, optics, photographic science, motion picture and television, graphic arts, paints, varnishes and lacquers, printing inks, gravure printing, dry color manufacturing, oil chemistry, color marketing, testing of materials, and psychology of color.

Wow! After reading about this Annual Meeting, I could see that in 1967, when the world begged for more color science knowledge and expertise in a wide variety of applications, ISCC was truly the place to go to get it.

Paula J. Alessi, *ISCC News Editor*

*AIC Announces Student Paper Awards continued*

meeting will be invited to provide an extended version of the full paper for the JAIC special issue.

**Summary of Details for Student Paper Awards:**

1. This award will cover all academic disciplines, substantially related to the subject of colour. It will be given every two years in conjunction with the AIC Interim Meetings.
2. The timetable will incorporate the AIC Interim Meeting timetable.
  - i. Awards competition entry deadline will be consistent with the corresponding AIC Interim Meeting's abstracts submission deadline (student first author who has two or more abstract submissions should indicate which one is intended for the Awards competition).
  - ii. Eligible abstracts will be made available to Chair of Student Papers Awards Panel soon after notification of abstract acceptance.
  - iii. The Chair of Student Paper Awards Panel and the immediate Past President of the AIC will identify disciplines of the eligible abstracts and hence invite an appropriate number of Members from the JAIC Editorial Board and the AIC Education Study Group Chair for the review process
  - iv. Review process begins soon after the AIC Interim Meetings' full paper submission deadline.
  - v. The six finalists and three awards will be announced and presented at the AIC Interim Meetings.
3. To aid the process, the AIC Interim Meeting organizing team will help ensure the first au-

thor's status is identifiable at the abstracts submission stage. Then access of the eligible full papers will be given to the Student Paper Awards Panel after the full-paper submission deadline

4. The six finalists' papers to be published in the special edition of JAIC must be in English
5. Prizes:
  - i. The conference banquet will be complimentary to the top six finalists.
  - ii. The financial reward, which will be funded by the AIC, will be 1,000AUD for first prize, 600AUD for first runner up prize and 400AUD for second runner up prize
6. The Chair of the Student Paper Award Panel will be the Editor-in-Chief of the JAIC special issue. The AIC immediate Past President and the Chair of the AIC Study Group on Education will also serve on the Award Panel.

The first Student Paper Awards will be given out at the AIC 2018 Interim Meeting to be held in Lisbon, Portugal. This meeting will be hosted by the



Portuguese Colour Association. The dates for the meeting are September 25-29, 2018. **Please mark your calendars and make it a point to attend this meeting.**

The theme of this Interim Meeting is Colour and Human Comfort. The aim of this conference is to bring together an interdisciplinary group of specialists who use colour in both scientific research and professionally, addressing a key issue in the relationship of colour to the society: human comfort. Papers will be accepted on the following topics:

- Colour in the Built Environment
- Colorimetry
- Colour and Design
- Colour and Lighting
- Colour and Culture
- Colour and Health
- Colour and Physiology
- Colour & Psychology
- Digital Colour
- Colour and Landscape

For more information on this meeting, please visit the website at [www.aic2018.org](http://www.aic2018.org)

# refractions

seemingly random musings on color



## There is a Word for That What Nail Polish Can Teach Us About Color



Let's start with a simple question. What color is the square below? Is it blue or green? This question was posed to ISCC members in the Winter 2014 Issue (#465) of the *ISCC News*, and the results were interesting. Men were split 60/40 in slight favor of blue, whereas women were more in agreement – 75/25 in favor of blue. This survey points to an interesting divide, not only between men and women, but also between colors on the boundaries between color categories. Blue and green are considered primary colors in both the additive and opponent color systems, but they are often conflated and sometimes difficult to distinguish, and the reason might have something to do with language.

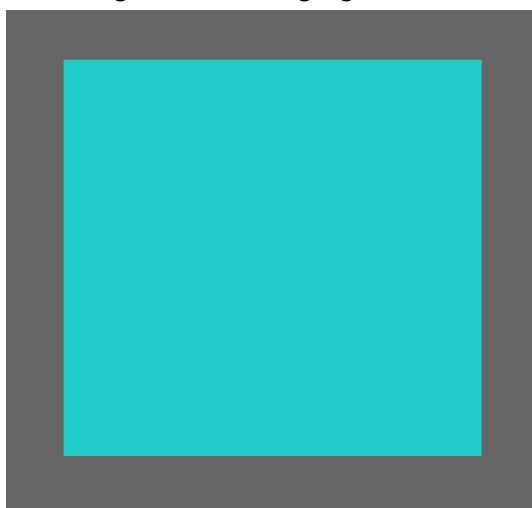


Fig. 1 Image: *ISCC News* #465

Research has found that women have, on average, a richer and more descriptive color vocabulary than men; they identify and match names to colors quicker and more accurately<sup>1</sup>. Whereas men might

identify something as green, women are more apt to add modifiers such as chartreuse, moss, olive and emerald; what men might call purple, women identify as maroon, eggplant, lilac and lavender etc. (A fun and interactive data display can be found online<sup>2</sup>.) It is suggested that such gender differences in color identification and description are a result of socialization in traditional feminine behaviors associated with fashion, hair color, nail polish and make-up. But does the ability to identify and describe such differences amount to any qualitative differences in perception? Does language affect color perception?

A longstanding debate in linguistics, psychology and color science, involves the *Whorf-Sapir* hypothesis, which states that our language shapes how we perceive (categorize) the world. People who have different semantic categories experience and perceive the world differently. This position is contrasted with the more widely accepted position that our categories and language are shaped by experience, not the other way around. In the field of color studies, this more *universalist* approach, was established in Berlin and Kay's landmark study, *Basic Color Terms* (1969).

However, researchers are finding that the distinction between these two positions might not be so cut and dry. There is now considerable evidence that language has some effect on the perception of color. Research based on *categorical perception*, the ability to distinguish colors more easily when they are cross-category (such as 'blue' and 'green') than when they are within-category (different shades of the same color), is well established. Tests of English, which distinguishes blue from green, and Tarahumara, an Uto-Aztec language of Northwest Mexico, which has only one term for both, show that "The presence of the blue-green lexical category boundary appears to cause speakers of English to exaggerate the subjective distances of colors close to this boundary. Tarahumara, which does not lexicalize the blue-green contrast, does not show this distorting effect"<sup>3</sup>. If a language has separate names for blue and green, then their differences will be exaggerated in terms of psychological distance. On the other hand, if a language has only one term covering both, such as Tarahumara, Himba or Berinmo, then those differences are less pronounced<sup>4</sup>.

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### Refractions: There is a Word for That continued

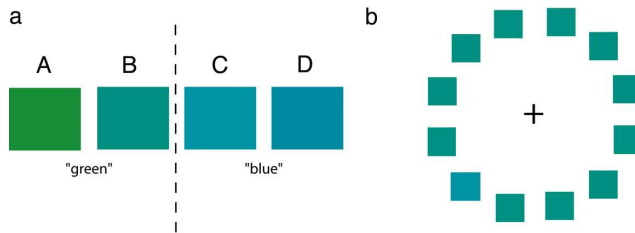


Fig. 2: Lexical categories influence perception. (a) Print-rendered versions of the four colors used. (b) Sample display for the visual search task. Image source: Aubrey L. Gilbert et al. PNAS 2006;103:489-494

This was followed up with examining reaction times to identify color targets embedded within a circular tile array (Fig. 2)<sup>5</sup>. Researchers found that if target was cross-category (B and C), it was easier to identify than if it was within-category (A and B). This same dynamic has also been demonstrated in languages that have more basic categories than English, such as Korean<sup>6</sup> and Russian<sup>7</sup>, both of which have two separate categories for 'blue'.

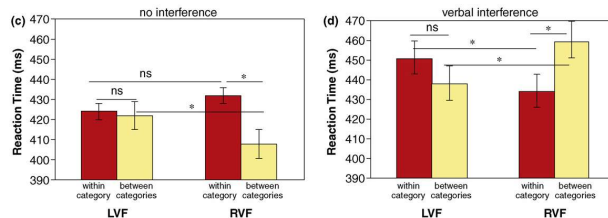


Fig.3: (c) In the no-interference condition, RTs were faster for the between-category pair and slower for the within-category pairs when targets appeared in the RVF compared with when they appeared in the LVF. (d) Effects were reversed with verbal interference. \*,  $P < 0.05$ , two-tailed  $t$  test,  $df = 10$ ; ns, non-significant. Values are mean  $\pm$  SEM. Image source: Aubrey L. Gilbert et al. PNAS 2006;103:489-494

But then something funny happened. Researchers noticed that the difference in reaction times differed remarkably depending on which side of the display the target was on<sup>8</sup>. Categorical perception occurred faster in the right visual field (RVF) than in the left (Fig.3c). Since the right visual field is lateralized to the Left Hemisphere of the brain – responsible for the lion's share of verbal processing, it stood to reason that language was involved. When a standard interference task, requiring verbal resources, was applied (memorizing an eight digit number) the relationship reversed itself (Fig. 3d), reinforcing the idea that the quicker response times in the RVF have a verbal basis. For Paul Kay, of Berlin and Kay fame, these results suggest that language does play a role, at least in half of what we

see, or that the *Whorf-Sapir* hypothesis is half right!<sup>9</sup> Mike Brill's *Hue Angles* included a column by Kay and Regier on this very topic in the ISCC News for Mar/April 2009 (#438a).

So how does this relate to male-female color experience? I am not aware of any similar studies that test for a gender-based categorical perception. But if women have a more descriptive vocabulary for color and more words lead to a more nuanced perception, then it stands to reason that if you want to develop your powers of color perception, then it might be prudent to invest in some nail polish - at least for the *right side* of your hands!

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Carl Jennings

University of Hawai'i

Please visit Carl's blog at

<http://cjennings.wix.com/refractions> for comments and feedback on his articles!

## HUE ANGLES

(Send contributions to [mbrill@datacolor.com](mailto:mbrill@datacolor.com) and see <http://hueangles.blogspot.com> )

*In this column, Hugh Fairman, whom we know for his deep expertise in color and the paint industry, shares...*

### Recollections of a Vanishing Art

There was a time, within the span of my participation in the color field, when it was common for



colorists to practice visual identification of colorants by their curve shapes. With the advent of computer control of color, the capability to identify colorants by shape has

become mostly a lost art. I can remember when persons such as Henry Hemmendinger and Hugh Davidson might be holding quite fascinating conversations on the subject at a wine and cheese hour of an ISCC meeting with people like Jackie Welker, who was an absolute devotee of visual identification of colorants. She would go so far as to prepare a colored specimen with an off-beat color combination in advance of a meeting and bring its spectrophotometric curve to the meeting. Then she would go around the room asking others "What is it?". Your expected answer was to take the form, "Molybdate orange, phthalo blue and rutile." If you didn't have at least one modifier for each color name, you were rated an amateur.

It may be of interest to look back at the kind of thing that was considered in identifying colorants. The item best remembered by me is that of the difference between the curve shapes of the rutile and the anatase crystal forms of titanium dioxide. Rutile has a deep absorption trough in the low wave region between 360 (or lower) and 420 nm. Anatase has none, and its curve is thus level with the rest of the high reflectance curve through all of this region. This was of importance in those days, because anatase had an additional property that it chalked upon exterior exposure so effectively that a hard rain would wash it clean. It was thus the preferred white pigment for outside exposure of straight white colors, while rutile was used indoors and in tinted colors outdoors. Thus, an immediate and definitive distinction identifying each crystal positively was useful. Times have changed. Today vehicles have improved for outdoor endurance, and the same material that is used for white is tinted to colors in the store. Anatase is no longer used. In fact, I am told it is no

longer made in the United States. It can, however, still be obtained from China and India.

Another telltale curve anomaly positively identifies phthalo blue and distinguishes it from cobalt blue. Cobalt blue can be made to be identical in color with phthalo blue and it is a lot less expensive, but phthalo blue is excellent for exterior exposure. When it is considered that it is an organic pigment, it is nothing short of phenomenal for exterior exposure properties. Cobalt blue is quite impermanent in outdoor exposures, being highly sensitive to acid rain, under whose influence it bleaches readily. Here then is the reason that we might care to identify each of these curves from each other. Phthalo blue has a pronounced secondary reflectance maximum in the 680 to 720 nm region. Cobalt blue completely lacks this hump. Virtually no other portion of the two curves are different, but identification by this difference is definitive.

Kraft paper is a word in the paper industry for that kind of brown paper we know is often used to make what we call 'brown paper bags'. Kraft paper is widely used also to make the outside surfaces of corrugated cardboard boxes, and many other uses. Kraft paper has a distinctive signature spectrophotometric curve. It is almost a straight line from low to high on a plot of reflectance on a wavelength scale ascending from left to right. Human hair and human skin have much the same property, that of the straight-line curve. This is different from colors made with red and yellow oxide whose curves are mildly spectrally selective while the same colors made with red and yellow organics are very spectrally selective. This leaves us with three distinct sets of colorations from straight line to mildly twisting selectivity to strong selectivity, and one can look at the curve of any one of these tans, or beiges, and know exactly what its pigmentation is.

I close with one additional thought. Two of the three scenarios I have presented may only be well detected by spectrophotometers with a spectral range of 360 to 750 nm, or more. Think about that when you are about to deprecate the regions outside of 400 to 700 nm as having little weight in human vision.

*continued on next page*

*Hue Angles continued*

Hugh S. Fairman, *Color Science Consultancy*

*Note: When I tried to learn this art in short courses, the instructors tended to emphasize absorption maxima, which could show up as reflectance minima (if you were lucky) or as reflectance points of inflection (for more challenging mixtures of colorants). It was not an easy art to learn! [MHB]*

**IN THIS ISSUE #3, June 2017**

Our first article in this issue is “A Comprehensive Model of Colour Appearance for Related and Unrelated Colours of Varying Size Viewed under Mesopic to Photopic Conditions.” In the effort to provide uniformity and compatibility across the industry, the International Commission on Illumination (CIE) has adopted two color appearance models, CIECAM97s and CIECAM02 up to this point. Although CIECAM97s is relatively simple and fairly complete and did contain an inverse model, it was not applicable to extremely high or low luminance levels. So, when CIECAM02 was published as a simpler and more effective model, it became widely accepted and used particularly for color management. In the article in this issue, Shuo-Ting Wei, M. Ronnier Luo, Kaide Xiao and Michael Pointer describe a new, comprehensive color appearance model, which can be used to predict the appearance of colors under various viewing conditions that include a range of stimulus sizes, levels of illumination that range from scotopic through to photopic, and related and unrelated stimuli. This model also has a uniform color space that provides a color-difference formula in terms of color appearance parameters.

In this journal, *Color Research and Application*, you, the reader, often will encounter the term *tristimulus value*. Usually the author means the CIE tristimulus values  $X$ ,  $Y$ , and  $Z$ , but more generally tristimulus values are the amounts of a set of primaries used to specify color matches and they may be transformed from one set of primaries to another. Our next article in this issue is a tutorial note from Michael H. Brill entitled “Ways to Define a Tristimulus Value.” This will give you a deeper understanding on the manipulation of tristimulus values.

Our next six articles have the common element of digital imaging and/or its applications. First, let us

apply elements of color science theory to art. As Farhad Moghareh Abed and Roy S. Berns, the authors of our next article, explain that knowledge of the specific colorants used in the painting can be used for dating, authentication, understanding an artist’s working method, conservation treatments, and visualizations of color changes in going both backward and forward in time. The identification and concentration mapping of the colorants contained in paintings often uses various forms of Kubelka-Munk theory. In their article, “Linear Modeling of Modern Artist Paints Using a Modification of the Opaque Form of Kubelka-Munk Turbid Media Theory,” they introduce a new model of turbid medium theory that combines the best parts of the opaque forms of Kubelka-Munk single and two constant models. Some of the features of the model are: an impurity index, a convex, linear dependence on colorant concentration so that it can be used for colorant identification in high-resolution images, and prediction of the absorption and scattering of paints both in mixture and pure (masstone).

While spectrophotometers are the most reliable method for capturing the data for colorimetry work, another alternative being tried in recent years is the use of the data acquired by a digital camera. For the data from a digital camera to be useful for colorimetry, the camera manufacturer must optimize the combination of the sensitivity of the camera sensor and the transmission of the optical filters located in front of the sensor. In our next article, Alireza Mahmoudi Nahavandi and Mohammad Amani Tehran describe “A New Manufacturable Filter Design Approach for Spectral Reflectance Estimation.” They show that when designing camera filters, the direct optimization of dye concentrations for the filters leads to better performance in comparison with the conventional technique.

Bin Cao, Ning Fang Liao, and Haobo Chen present a method for reconstructing spectral reflectance from RGB images without prior knowledge of the camera’s spectral responsivity. Researchers have tried many methods to recover spectral reflectance from digital camera outputs. In this article, the authors introduce another method, “Spectral Reflectance Reconstruction from RGB Images Based on Weighting Smaller Color Difference Group.” In their study, they evaluated four weighting modes and different selected numbers of training samples. Their experimental results show that all weighting modes outperform the PI method. However, the inverse square weighting mode obtained the best performance.

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*CR&A In This Issue #3, June 2017 continued*

Our next article shows an application of colorimetry using digital cameras. Przemyslaw Korytkowski and Agnieszka Olejnik-Krugly discuss the “Precise Capture of Colors in Cultural Heritage Digitization.” A major task for historians is preserving our cultural heritage. One technique is to obtain digital images of the objects to preserve not only the way they would be viewed by people, but also to save the image with accurate color of the objects. In their article, Drs. Korytkowski and Olejnik-Krugly analyzed the effect of RAW to TIFF transformation, RGB to CIE  $L^*a^*b^*$  transformation, white balancing, and the use of standard color spaces. They demonstrated that to obtain high color fidelity reproduction, white balancing and a custom ICC profile are necessary, while DCP profiling could be omitted.

Moving on to the textile industry for our last two articles relating to digital imaging, we look at the “Feasibility of Using Digital Color Imaging Devices for Determination of Cationic Dyes Compatibility.” In 2010, Khalili and Amirshahi presented “A Novel Method for Determination of Compatibility of Dyes by Means of Principal Component Analysis” in this journal [35:313-318]. Here in this issue Saeed Salimian, Haleh Khalili, Hossein Izadan, Sohail Shahamatjoo report on a study that compared the use of a colorimetrically-calibrated scanner employing the Khalili – Amirshahi method to a more traditional spectrophotometrically measured method. They concluded that the scanner method joined with the Khalili and Amirshahi proposed method can reliably be used for the determination of dye mixtures compatibility.

Our final article in this group looks at evaluation of ink-jet printing on textiles. The application of ink-jet printing is an emerging industry that has already revolutionized the traditional textile printing industry because of its potential to provide greater production flexibility and rapid responsiveness. However, the quality of the results depends not only on the printer, but also on many parameters of the fabric upon which the printing is performed. Superfine nylon is particularly difficult because of its microfibers, which produce a fabric that is waterproof, exceptionally soft and smooth with a high-density weave. Guan Fanglan, Zhang Luoyu and Li Yinghui undertook an investigation into color accuracy in digitally-printed superfine nylon under low temperature plasma pretreatment with the aim of increasing accuracy and color-increased superfine nylon digital prints. They report their results in “Colour Management for Enhancing the Performance of Superfine

Nylon Ink Jet Printing with Reactive Dyes Inks.”

Our next article covers the “Effects of Age and Ambient Illuminance on Visual Comfort for Reading on a Mobile Device,” specifically an iPad. Examining illuminance levels ranging from 50 lx to 1200 lx, Hsin-Pou Huang, Li-Chen Ou, and Yinqiu Yuan looked at the effects of observer’s age, gender, the illuminance of ambient lighting, and the background color in a document layout on visual comfort for both a group of younger (median age 24) and older (median age 66) observers. They found that all the observers felt more comfortable reading documents that had a gray background than documents with either a white or black background. However, the younger group tended to prefer reading documents that had a moderate CIELAB lightness difference between text and background, while older observers tended to prefer reading those with an extremely large lightness difference.

Our last three articles explore issues of a single color in language, architecture, and personality associations. In the field of language, the usage of the term and grouping of colors with the term “blue” is interesting and widely variable around the world. Thus, David Bimler and Mari Uusküla conducted a study to investigate linguistic and perceptual boundaries within the ‘blue’ region of the color gamut, using data from speakers of six languages (Russian, Italian, Lithuanian, Estonian, English, and Udmurt) who sorted color stimuli by similarity. Two of these languages are thought to have separate terms for a lighter blue and a darker blue, a third does not make such a distinction, and the other three languages are less studied in terms of the basicness of the term blue. They report their results in the article, “A Similarity-Based Cross-Language Comparison of Basicness and Demarcation of ‘Blue’ Terms.”

Our next article is “Color of Absence and Presence: Reconsidering Black in Architecture” by Ahenk Yilmaz. Is black really a color, or is it the absence of color or light? Historically black was not popular within architecture. However, in contemporary architecture, black has been used extensively for its visual qualities as a design element. Dr. Yilmaz analyzes how black is used as a design element in built environments. In examples, she shows that what black provided inside was exactly the opposite of what it created outside. In architecture, black can oscillate between two positions: one representing an absence, the other to a solid presence, and in the same structure may be used both ways. Thus, the vision of black provides architects with a wide range of potentials in creating versatile spatial qualities.

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*CR&A In This Issue #3, June 2017 continued*

Color not only has aesthetic value but also can convey specific psychological meanings. Our last article in this issue discusses “Investigating the Personality Associations Evoked by Single Colors: An Exploratory Study.” Zhiming Wu and Tao Lin propose a method of quantifying the relationships between color attributes and color-personality associations evoked by single colors. In their experiment, they identified five traits evoked by single colors: extraverted–introverted, moody–unemotional, agreeable–disagreeable, organized–disorganized, and wide interests–narrow interests. Then they used multiple linear regression analyses to predict these color-personality associations based on the three color attributes of lightness, chroma and hue. From the positive conclusions they present, they explain that study improves the understanding of how color evokes personality associations and takes the first step toward developing the method for predicting color-personality associations for multi-color combinations.

We close the issue with a review of Michael Tooms’s book *Colour Reproduction in Electronic Imaging Systems: Photography, Television, Cinematography* by Charles Poynton. Also, we report the publication of the *CIE Draft International Standard DIS 017/E:2016 ILV: International Lighting Vocabulary, 2<sup>nd</sup> Edition*.

Ellen Carter  
Editor, *Color Research and Application*



## Editorial Changes at Color Research and Application

Changes have come to the Associate Editors and Editorial Board of the journal. Following their retirement, Associate Editor from Canada, Rejéan Baribeau, and Associate Editor from Japan, Hirohisa Yaguchi, have resigned their journal posts. Also, Robert Buckley, the Associate Editor from the United States has resigned. Prof. Yaguchi-san has been an Associate Editor for 20 years. Dr. Robert Buckley became an Associate Editor in 2003 and Dr. Rejéan Baribeau in 2013. I want to thank all three of these people for the help and support of the journal.

Please welcome the new Associate Editors:

Michael H. Brill - United States  
Jeff Hovis – Canada  
Yoko Mizokami – Japan

And new Editorial Board Member:  
Renzo Shamey

Sincerely,  
Ellen C. Carter

## CAUS Archive Project: Looking for missing elements



The Color Association of the United States (CAUS) is developing an online archive of color forecasts and reports, standardization materials, and other documentation dating back to 1915 for the color community to access this rich history. Over the past century, CAUS materials were shared with the color community at large and now, we are hoping to source back some of these materials to ensure the comprehensiveness and value of the archive.

We are looking for corporate reports, color standardization materials and documents, and color forecast materials. Documents may include, but are not limited to, Board of Director (BOD) meeting minutes, membership lists, or annual reports. Documents may include either the name “The Color Association of the United States” (CAUS) or “Textile Color Card Association” (TCCA). We are also looking for color standards materials that were issued by the association for the United States Army, Navy and Air Force.

If you happen to have CAUS materials that you’d be willing to donate or share in the form of digital files or photographs, that would make an immense contribution to keeping the integrity of this great asset.

Please contact CAUS executive director, Dr. Leslie Harrington at [leslie@colorassociation.com](mailto:leslie@colorassociation.com) if you can help this effort in any way!

## Crayola Announces Dandelion Out New Blue In

In March, Crayola announced the retirement of its dandelion yellow crayon from the Crayola Box of 24 calling the color “an adventurous spirit” with a case of “wanderlust”. They are replacing it with a blue made from a blue pigment, YInMn, that was discovered by accident by chemists at Oregon State University. (Please see *ISCC News* #475 for an article that describes this new blue pigment.) The replacement is being made because a Crayola poll of North American consumers revealed that “the color blue time and again has been America’s favorite

color.” Crayola fans can help name the new blue by going to [crayola.com](http://crayola.com). The naming contest runs from May 5 to June 2. The top five color names will be announced on July 1. People will then vote for their favorite name among the five. In early September, Crayola will announce the fan-selected color name. Now is the time to make your voice heard for the new blue!



## Calendar

### 2017

- May 15-18** IS&T Archiving Conference, Riga, Latvia, Info: <http://www.imaging.org/archiving>
- May 19-24** 17<sup>th</sup> Annual Meeting of the Vision Sciences Society (VSS 2017) Trade Winds Island Resorts, St. Pete Beach, Florida, Info: <http://www.visionssciences.org>
- Jun 6-7** ASTM E-12, ASTM International Headquarters, West Conshohocken, PA, Info: [www.astm.org](http://www.astm.org)
- Jun 13-17** Vision in the Real World, Center for Vision Research (CVR), York University, Toronto, Canada, Info: <http://cvr.yorku.ca/conference2017>
- Jul 9-14** Gordon Research Conference: Eye Movements – The Oculomotor System as Model of Mind and Brain, Bates College, Lewiston, ME, Info: <https://www.grc.org/programs.aspx?id=15595>
- Jul 12-14** Medical Image Perception Society Conference XVII, Whitehall Houston Hotel, Houston, TX, Info: <http://mips.ws/>
- Jul 13-17** 13<sup>th</sup> Asia Pacific Conference on Vision, Tainan City, Taiwan, Info: <http://apcv2017.conf.tw/>
- Jul 31-Aug 2** CORM/ISCC 2017 Joint Technical Conference, Lighting Research Center, Rensselaer Polytechnic Institute, Troy, NY Info: [acl99colors@yahoo.com](mailto:acl99colors@yahoo.com)
- Aug 10-11** “The Thinking Eye... The Seeing Brain” Conference, London, UK, Info: <http://visionscience.conferenceseries.com/>
- Aug 25-27** 5<sup>th</sup> European Visual Science of Art Conference on Vision, Berlin, Germany, Info: <https://www.vsac2017.org/>
- Aug 27-31** 40<sup>th</sup> European Conference on Visual Perception (ECVP), Berlin, Germany, Info: <http://www.ecvp.org/2017/>
- Sep 11-15** 25<sup>th</sup> Color and Imaging Conference, Lillehammer, Norway, Info: [color@imaging.org](mailto:color@imaging.org)
- Sep 16-17** ACM Symposium on Applied Perception, Brandenburg University of Technology, Cottbus, Germany. Info: <http://sap.acm.org/2017/>
- Sep 17-19** SPE-CAD RETEC 2017, Hilton Milwaukee City Center, Milwaukee, WI, Info: <http://www.specad.org/2017-retec-cad-homepage/>
- Oct 3-5** Joint Meeting of CIE/USA and CIE/Canada, NIST, Gaithersburg, MD
- Oct 13-15** 17<sup>th</sup> Annual Optical Society of America Fall Vision Meeting, American University, Washington, D.C., Info: <http://www.osavisionmeeting.org/2017/conf/index.php>
- Oct 16-20** AIC 13th Congress, International Convention Center, Jeju, Korea, Info: [www.color.or.kr](http://www.color.or.kr)
- Oct 23-25** CIE 2017 Midterm Meeting, Jeju Island, Korea, Info: [www.cie.co.at](http://www.cie.co.at)
- Oct 26-28** CIE Division 1 and 2 Meetings, Jeju Island, Korea, Info: [www.cie.co.at](http://www.cie.co.at)

### 2018

- Jan 24-25** ASTM E-12, Sheraton, New Orleans, LA, Info: <http://www.astm.org>
- Jun 11-15** Joint ISCC/AIC Munsell Centennial Celebration, MassArt, Boston, MA
- Sep 25-29** AIC Interim Meeting, Colour and Human Comfort, Portuguese Colour Association, Lisbon, Portugal, Info: <https://www.facebook.com/apcor.org>



### 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	<a href="http://www.avianttechnologies.com">www.avianttechnologies.com</a>	603-526-2420
Datacolor	<a href="http://www.datacolor.com">www.datacolor.com</a>	609-895-7432
Hallmark	<a href="http://www.hallmark.com">www.hallmark.com</a>	816-274-5111
Hunter Associates Laboratory, Inc.	<a href="http://www.hunterlab.com">www.hunterlab.com</a>	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 John Conant, [jconant@aerodyne.com](mailto:jconant@aerodyne.com)

#### ISCC News Issue #478, Spring 2017

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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](http://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)