



Inter-Society Color Council News

Issue 472

Fall 2015

Board of Directors Corner

This Board of Director’s Corner is being brought to you by our Secretary, Ann Laidlaw, our Treasurer, Cameron Miller, and our President, John Conant. The contents of this report come from the ISCC Business and Awards Meeting Luncheon that was held at the joint ISCC-SPE/CAD meeting on Tuesday, October 6, 2015 at the Westin Hotel in Indianapolis, IN.



Ann’s Secretary Report began with an overview of the ISCC organization. The Board of Directors, including officers, meets approximately bi-monthly by teleconference. Dues have been reduced for members, reflecting the efficiency of

electronic communication and the elimination of our office staff position. Member Bodies are no longer

charged for membership. Member Bodies, like SPE/CAD, provide a liaison contact and keep ISCC informed about activities, which we promote in the ISCC Newsletter, website and other sites. Member Bodies also promote ISCC activities of interest to their members. ISCC asks former Member Body delegates to join ISCC as Individual Members and to update their contact information. Your ISCC membership may be updated at <http://www.iscc.org/>.

Ann’s report then moved on to a summary of ISCC activities. The ISCC launched a quarterly webinar program, to promote the ISCC and to provide educational content related to color. The first webinar was offered in September 2015 on “Color and Lighting: Control, Efficiency, and Compliance”. More details of this first webinar can be found in this newsletter on page 9. The ISCC has a Wikipedia page and a Linked-In group in addition to our web page at <http://www.iscc.org/>. A Member Survey indicated that there is still strong interest in attending physical meetings though travel is often difficult; we have been testing our ability to augment them by providing presentations over the web.

The ISCC, which was formed in 1931, is uniquely able to provide historical resources related to color and color research. ISCC has posted back issues of the ISCC Newsletters on the website from 1933-2013. ISCC is assisting in finding homes for legacy materials owned by Richard and Marjorie Ingalls, including a COMIC I colorant-mixing analog computer which was donated to the Computer History Museum in Mountain View, CA. An inventory of what is left can be found in this newsletter on page 16. Rolf Kuehni’s collection of historical letters from more than 17 notable color scientists and practitioners have been posted on our website. The ISCC has a very large historical collection at the Hagley Museum and Library in Wilmington, DE. The collection contains 166.5 linear feet of material dating from 1879 to 2000. The collection contains letters, color samples, instruments and papers from ISCC members like Dorothy Nickerson, David MacAdam, Deane B. Judd, Ralph Evans, etc. Cataloging of the

continued on next page

Table of Contents

Board of Directors Corner.....	1
ISCC Board of Directors	2
Highlights of SPE/CAD-ISCC Joint Meeting.....	3
2015 Nickerson Award Presented to Rolf Kuehni...5	
AIC 2016 Meeting – Call For Papers.....	6
IES Research Symposium- Call For Poster Papers..7	
A Blast from the Past: ISCC Newsletter 50 Years Ago, Number 179 November-December 1965 ...8	
Meet Your Fellow ISCC Members	9
ISCC’s First Successful Webinar!	9
Attend ISCC’s Second Webinar	9
Metameric Blacks: A Color Curious Column	
<i>Ever wonder... “Do you attribute the incredibly complex workings of the eye to evolution or creation?”</i>	10
Thank you Mark Fairchild!!!.....	11
Call for Nominations for 2016 Macbeth Award ...	11
In Memory of	12
AATCC Announces New Book	13
Hue Angles: <i>How do slow visual signals keep up with fast ones from a moving object?</i>	14
Color Research and Application: In this Issue.....	15
Inventory of Artifacts from the Ingalls	16
ISCC Calendar	17
ISCC Sustaining Members & Member Bodies	18

ISCC EXECUTIVE OFFICERS

Terms end 2016

President	Mr. John Conant Aerodyne Research, Inc. 45 Manning Road Billerica MA 01821-3976 USA 978-663-9500 fax: 978-663-4918 jconant@aerodyne.com
Secretary	Ms. Ann Laidlaw ACL Color Consulting LLC 136 E. Hill St Decatur, GA 30030 336-420-1998 acl99colors@yahoo.com
Treasurer	Dr. C. Cameron Miller Nat'l Inst. of Standards and Technology 100 Bureau Drive, Stop 8442 Gaithersburg, MD 20899 301-845-4767 fax:301-975-4713 c.miller@nist.gov
President Elect	Vacant
Past President	Mr. Scot R. Fernandez Hallmark Card Inc. 2501 McGee Kansas City MO 64141 USA 816-545-2462 fax: 816-274-7367 scot.fernandez@hallmark.com

ISCC BOARD OF DIRECTORS

Term ends 2015

Dr. Art Springsteen	Avian Technologies LLC P.O. Box 716 Sunapee NH 03782-0716 USA 603-526-2420 fax: 603-526-2729 arts@aviantechnologies.com
---------------------	---

Terms end 2016

Ms. Paula J. Alessi	Retired Color Scientist 126 Gnage Lane Rochester, NY 14612 585-225-4614 geinhaus@frontiernet.net
---------------------	--

Mr. Kim Vlaun	Artist/Educator kvlauncolor@verizon.net
---------------	---

Terms end 2017

Mr. Jack Ladson	Color Science Consultancy 1000 Plowshare Rd. Suite B-1 Yardley, PA 29067 USA 267-98-7112 jack.ladson@verizon.net
-----------------	---

Dr. Renzo Shamey	North Carolina State University College of Textiles rshamey@ncsu.edu
------------------	--

Dr. Dave Wyble	Avian Rochester, LLC dave@avianrochester.com
----------------	--

Board of Directors Corner continued
collection is underway.



Cameron's Treasurer Report assured us that the financial health of the ISCC is very good. Our income currently exceeds our outgoing fees. Here is an accounting of our assets:

Current Balances

Suntrust	\$57,519
Paypal	\$6,712

Here is an accounting of our income:

2015 Membership Dues Collected

- Individual \$3845
- Sustaining \$1500

Total Annual Income = \$5345

Here is an accounting of our 2015 annual expenses:

- Banking Fees
 - o Credit card capabilities \$360
 - o Credit card fees \$120
- AIC Membership Fee \$200*
- Newsletter publication \$1000
- Mailbox \$160
- Webpage \$240
- Phone line \$303

* Australian Dollars

Total Annual Expenses = \$2290



John's report from the podium started with a special thanks to our one outgoing Director, Art Springsteen, whose excellent service on the Board of Directors will be ending on December 31, 2015. John extended a sincere congratulations to our three new Directors, Jack Ladson, Dave Wyble and Renzo Shamey, who just joined the Board of Directors at the beginning of 2015. John then mentioned that we are always in the process of recruiting new Individual Members and he welcomed SPE/CAD members to join after they had a chance to learn more about us by reading the new brochure that was available at the meeting in hardcopy. The contents of this brochure can be seen under What's New on the front page of our website at www.iscc.org. Currently, ISCC is looking for candidates to serve as Directors, Treasurer and President-Elect. A milestone worthy of note was that our 2014 Macbeth Award recipient, Dr. Françoise Viénot from the French National History Museum of Natural History, gave a keynote talk on the physiologically significant cone fundamental work for which she won the Award. John ended his talk by

continued on next page

Board of Directors Corner continued

reminding SPE/CAD members where they could find more information about us. Besides our website, there is the Following Linked-In page:

<http://www.linkedin.com/groups/ISCC-InterSociety-Color-Council-3869270>.

There were many potential Sustaining Members in the audience, who were reminded that becoming an ISCC Sustaining Member would include one Individual Membership as well as advertisements in our newsletter and at our meetings.

Ann Laidlaw, *ACL Color Consulting LLC*

C. Cameron Miller, *NIST*

John Conant, *Aerodyne Research, Inc.*



Highlights of the Joint ISCC-SPE/CAD Meeting



For those of you who were not able to attend the joint meeting of the Society of Plastic Engineers Color and Appearance Division (SPE/CAD) RETEC (Regional Technical Conference) and the ISCC, Inter-Society Color Council in Indianapolis, IN on October 4-6, here are some highlights of the technical talks that were given.



Our own Dr. Ellen Carter helped open the meeting giving an excellent overview of the ISCC to a very diverse audience. (About 450 people attended this meeting).

Then a fascinating keynote presentation was given by Ron Beck from Americhem discussing “3D Printing: The Disruptive Technology”. 3D printing technology (also known as additive manufacturing) is disruptive in that current forming technologies such as molding and extrusion may not be able to adapt and compete with the new markets that 3D printing will create. 3D printing is accomplished by “using software that can ‘slice’ a digital 3D image into a stack of 2D layers, and then use a digitally controlled apparatus to build the object by depositing successive layers of material”. The seven different types of 3D printing methods (see ASTM 2792) along with their limitations were discussed. Many different types of applications for 3D printing



were also given. A car can be made via 3D printing, but it currently takes 44 hours to complete the job. The goal is to reduce that time to 24 hours. By far, the biggest application for 3D printing is in the medical field. Hearing aids, dental crowns, bones, kidney tissue and other human body parts can be made via 3D printing. Research is ongoing. While the talk was being given, the audience saw a chess piece being made by a 3D printer. It was completed in approximately 50 minutes.

A former ISCC President and Board of Directors Member, Dr. Michael Brill, gave a talk entitled



“*What is the Shape of a Color-Tolerance Surface?*”. Mike defined a color-tolerance surface as “a surface in color space that is a constant color difference from a target color”. It is

common in the field to refer to color-tolerance shapes of color-difference formulae as ellipsoids. Mike showed that for small color differences (on the order of one color difference unit), the tolerance shapes can be approximated by ellipsoids. As the size of the CMC (2:1) and DE2000 color differences increases, the tolerance shapes are not ellipsoids at all, in fact sometimes they are not even convex. Illustrative examples were shown of some tolerance surfaces that had weird non-symmetrical oval shapes and others that were ellipsoid-like but their centers were not in the middle of the shape. Mike called for the community to be more careful about nomenclature for the shapes of color-tolerance surfaces.

Another ISCC member, Dr. Paul Centore, gave a paper entitled “*Enforcing Constraints in Kubelka-*



Munk Calculations”. In this paper, Paul proposed modifications to the Ordinary Least Squares (OLS) Kubelka-Munk algorithms in order to avoid negative concentrations.

Paul elegantly showed how a geometric reformulation of the Kubelka-Munk equations and constraints could lead to a convex polytope. He then illustrated how the Gilbert-Johnson-Keerthi algorithm could be used to find the point on the polytope that is closest to the target. The closest point is expressed in terms of generating vectors for the polytope. It is then possible to work backwards for the proper values of K, S, and positive concentrations. Paul has open source software on his website (www.MunsellColorScienceForPainters.com) that implements this approach in MATLAB.

continued on next page

Highlights of the ISCC-SPE/CAD Mtg. continued

There was a fascinating panel discussion on “Color Trends for 2016 and Beyond”. The four panelists were Doreen Becker, Global Color Strategist from A. Schulman Inc., Linda Carroll, Color Insight Manager from Ampacet Corporation, George Ianuzzi, Key Account Manager from Sudarshan and our own ISCC member, Danny Rich, Senior Color Physicist from Sun Chemical Corporation. The discussion began with each panelist sharing their thoughts on what color trends we should look for starting next year and into the future. Then, the audience was asked to answer a series of color questions like “What car color will be most popular in 2016?” with



Seated from left to right: Doreen Baker and Linda Carroll
Standing from left to right: Danny Rich and George Ianuzzi

multiple choice answers. After the answers were instantaneously tallied, the panelists commented on the results. It was refreshing to hear the comments of such a diverse panel.

The next presentation was given by Dr. Romesh Kumar from Clariant Corporation. The title of his talk was “Creating Appearance – Polymers and Pigments”. There are thousands of pigments and



hundreds of polymers. How does one decide which pigment/polymer combination to use when making a product out of such materials as paints and plastics? The decision is based largely on the application and

performance requirements, such as appearance, gamut, heat stability, light stability, federal compliance factors, etc. It was illustrated that companies like John Deere must go through a process to select pigment/polymer combinations for their famous green and yellow lawnmowers and tractors, where excellent heat stability is of the utmost importance. Sometimes companies want appearance matches across all their system platforms. That can be a challenging goal in 2015, but may be achievable as new pigments and polymers become available in the future.

Dr. Danny Rich gave a talk posing the question: “Will Color Engineering Ever be a Reality?” Be-

fore this question could be answered, three questions must be addressed. First, “given a single material, will it ever be possible that two labs can achieve identical results?” The answer to this is usually no because it is extremely difficult to get two labs to agree on the measurement protocol. One very common problem is that they both use different white references. Second, “given a single appearance aim, will it ever be possible that two labs can produce identical compositions?” In this case, in order to get an accurate match, both labs will probably use Kubelka-Munk turbid medium theory, which assumes that the samples emulate Beer’s Law. Beer’s Law works nicely for solutions, but it does not apply to plastic samples. New models, which can be found in the literature, must be used. The problem is not enough people are aware of these new models and how to use them so they are rarely used today. Third, “given a product reference and a production sample, will it ever be possible for the engineering assessment to agree with the observations?” The answer to this is most likely no. One of the key reasons is because instrument bandpasses are too large to accurately capture the integral of the spectral stimulus function, which when combined with an illuminant and observer will agree with the observer’s perception. Danny urged the audience to listen very carefully to Françoise Viénot’s talk on color-matching functions developed from physiologically-based cone fundamentals because he thinks that the future of colorimetry and appearance matching starts with the work that she will describe.



The next keynote presentation was given by John Seymour from QuadTech. John called himself “the Math Guy”. The title of John’s paper was “Patenting a Color”. John gave the audience many hints on the patent process. Some helpful advice was to have some patent expert other than yourself do the prior art search. Claims, the most important part of any patent, must be specific to make enforcement easier.



continued on next page

Highlights of the ISCC-SPE/CAD Mtg. continued

People seem to patent some bizarre things these days. However, the answer to the question “Can a color be patented?” is probably not. Cadbury’s attempt to patent its color purple met with many legal challenges along the way and it wound up being a trademark. So it is more likely that a color can be successfully trademarked, which companies do all the time.

Co-authors, Dr. Zhiling Xu and Dr. Michael Brill from Datacolor gave a very interesting presentation entitled “*Second-Order-Diffraction Correction in Spectrophotometry*”. Dr. Xu discussed that photo-sensors used in spectrophotometers don’t know how to distinguish the difference between a



first-order and second-order diffraction, thus resulting in erroneous measurements. A compensation model was proposed to solve this. The compensation comes into operation

on the long wavelength end using the fact that the second-order diffraction signal on the long wavelength end is proportional to the first-order diffraction signal on the short wavelength end. The compensation method involves optical system calibration with a uv-excluded standard tile (e.g. an orange tile) and a uv-included standard tile (e.g. a white tile). Two calibrations are necessary in order to predict the relationship between the first-order-only signal and the combined first and second order signals at the photo-sensors, at the location of the second-order light. The result is a correction of the second-order diffraction error. Experiments on BCRA tiles measured uv-included and uv-excluded were shown to prove the success of this correction.

We had the honor of hearing a recorded WebEx presentation given by Dr. Françoise Viénot from the Museum National d’Histoire Naturelle. She received the 2014 ISCC Macbeth Award for her recent work on developing a fundamental chromaticity diagram with physiologically significant axes as part of her work chairing CIE TC1-36. The title of her talk was “*Color Vision Fundamentals: A Model for the Future of Colorimetry*”. This talk described how to obtain color-matching functions and the corresponding cone fundamental estimates for a normal observer, ranging in viewing angle from 1 to 10 de-



grees. She also discussed the development of XYZ representations of the cone fundamentals based upon the principles of the CIE standard colorimetric systems. After the talk was completed, Dr. Viénot was available via Skype to answer questions.

This presentation will be repeated for the ISCC second online seminar on December 8, 2015. Please see page 9 for more details.

The last color-related talk was given by Dr. Renzo Shamey entitled “*Suprathreshold Small Color Differences*”. This presentation resulted from



some work done at North Carolina State University (NCSU) by Renzo and his student, Renbo Cao. Suprathreshold color differences

are those that lie beyond the Just Noticeable Difference (JND) detection limit. Such color differences lie in the domain of CIELAB color difference $\Delta E^*_{ab} > 5$. The purpose of their work was to evaluate various “color difference equations against a combined visual color difference dataset, consisting of samples in the low and high chroma CIE blue color centers (NCSU-B1 and NCSU-B2), a black center (NCSU-BK) and a gray center (NCSU-Gr)”. Data were gathered from a color normal group of observers using the gray scale visual color difference assessment method. Results showed that for the NCSU-GR dataset, the best performing color difference equation was CIEDE2000(2:1:1). For the combined dataset of all four NCSU color centers, CAM02-UCS and CAM02-SCD were the top performers for these suprathreshold color differences.

2015 Nickerson Service Award Presented to Rolf Kuehni

The 2015 ISCC Nickerson Service award was presented to Professor Rolf Kuehni on Oct 21, 2015 at the North Carolina State University College of Textiles Color Science Laboratory. The Nickerson



Service Award is presented for outstanding, long-term contributions towards the advancement of the Council and its aims and purposes. The contri-

continued on next page

Nickerson Service Award to Rolf Kuehni continued

tribution may be in the form of organizational, clerical, technical or other services that benefit the Council and its members. Prof. Kuehni was nominated to receive the 2015 Nickerson Service Award on the basis of his substantial contributions to color education that have been posted to the ISCC website. Under Historic Translations on that website, he contributed many translations of color articles and books from German and French to English, biographical information on the authors, and often technical introductions as well. (These authors include J. H. Lambert, A. Koenig, W. Ostwald, R. Luther, E. Schrödinger, and P. Runge, as well as an anonymous French author.) In addition, Rolf edited the ISCC-posted manuscript by I. H. Godlove entitled "The Earliest People and their Colors". Rolf has touched virtually every part of the ISCC electronic presence, including a column on A. H. Munsell that he wrote for Hue Angles several years ago.

The presentation was made by Professor Renzo Shamey (ISCC Board of Directors member) and Ms. Ann Laidlaw (ISCC Secretary and Chair of the Nickerson Service Award Committee). The presentation



was attended by textile industry colleagues Maria Thiry, Jack Daniels, and Roland Connelly, some of the College of Textiles faculty as well as graduate color science students, and was followed by a reception. Prof. Kuehni provided an overview of the important contributions of Dorothy Nickerson, for whom the award is named. Prof. Kuehni also provided a lecture for students on "How many colors are distinguishable?"



The 2015 ISCC Nickerson Service Award committee was delighted to select Professor Rolf Kuehni for this richly deserved award.



AIC 2016 Meeting - Call for Papers



The Chilean Color Association is hosting the AIC 2016 Interim Meeting in Santiago, Chile from October 18th-22nd. The aim of this meeting is to share experiences regarding the use of color in images, ob-

jects and space, from different perspectives and disciplines, thus contributing to a better user experience, improving usability, and also to improve life quality in our cities. The conference theme is "Color in Urban Life: Images, Objects and Spaces". The fields of inquiry include design, art, architecture, media, lighting, as well as perception, color well-being, education, trends and culture. Therefore, this meeting will provide an opportunity for the presentation and discussion of the following topics:

- Color & Environment,
- Architectural Color Design,
- Color in Product Design,
- Color in Communication Design,
- Color in Urban Cultures,
- Color Aesthetics,
- Color Psychology,
- Color Education,
- Color & Health,
- Color & Light,
- Color Science & Technology,
- Color Physiology

ISCC Members, please consider submitting a paper!!! The Extended Abstract Submission Deadline is January 18th, 2016. For more information, please go to: <http://www.aic2016.org> or contact: info@aic2016.org.

IES Research Symposium Call For Poster Papers



IES Research Symposium III

APRIL 3 - 5, 2016 | GAITHERSBURG, MD

Important message to all ISCC Members!!!!

IES is a Member Body of our Council. Please consider submitting a poster paper to this IES Research Symposium by the **November 30, 2015 deadline**. Here are some more details:

This is a lighting research symposium organized by the Illuminating Engineering Society (IES) to broadly explore the subject of light and color. The symposium dates are April 3-5, 2016 and the venues are the Gaithersburg Hilton Hotel and the National Institute of Standards & Technology (NIST) in Gaithersburg, Maryland.

SYMPOSIUM SCOPE

This international lighting research and application symposium will draw on the talents and expertise of the researcher, the technologist and the design professional to better understand the growing role of color in lighting from the standpoints of color vision, color perception, color preference, color metrics and color technology.

CALL FOR POSTER PAPERS

Researchers and designers actively involved in the study of light and color and how it applies to lighting from the research, technology, design and application standpoints are invited to submit poster papers describing their work. Topics of interest include:

- Color vision
- Color perception
- Technology and application of color and light
- Color metrics and measurements

Poster papers, whether focused on research or design applications, will be an integral part of this symposium supplementing the case studies, research findings and demonstrations organized by the invited speakers. Of particular interest will be examples that help

explain why the use of color is thought to make certain designs more successful than others or research that confirms or contradicts common practice. Ample time is being built into the program and both venues for poster viewing and discussion.

The number of symposium attendees is being limited so that all will have an opportunity to interact with the authors as well as experience the comprehensive SSL color demonstration facilities at NIST and the special color experiences being planned by the invited speakers. Authors of accepted poster papers will be invited to submit their papers for publication in the IESNA Journal **Leukos** and all papers will be included in the Symposium Final Report which will be available as an electronic publication of the IESNA. **Authors of accepted poster papers are entitled to free symposium registration (one registration per paper) and may apply for a stipend for partial reimbursement of travel and hotel expenses. Reimbursement funds are limited.**

Prospective authors should submit a title and abstract (1/2 page maximum) in PDF format together with their contact and bibliographic information no later than 30 November, 2015 using the submission portal of the Symposium web site:

<http://www.ies.org/symposium/call4posters.cfm>

POSTER PAPERS - IMPORTANT DATES

- 4 May, 2015: Call for poster papers issued
- 30 November, 2015: Title, author information and abstract submission deadline
- 4 December, 2015: Authors notified of acceptance
- 1 March, 2016: Deadline for electronic submission of completed papers
- 3-4-5 April, 2016: Light+ Color Symposium and Poster Papers Exhibit – Symposium Venues

SYMPOSIUM VENUES

The Gaithersburg Hilton Hotel and the National Institute of Standards and Technology (NIST) which are near Washington, DC. Authors of accepted poster papers will have the unusual opportunity of exhibiting and discussing their papers at both venues.

POSTER PAPERS CHAIR

Terry McGowan, lighting@ieee.org

SYMPOSIUM CHAIR

Pamela Horner, pam@massx2.com

GENERAL SYMPOSIUM INFORMATION & INQUIRIES

Valerie Landers, IESNA vlanders@iesna.org

SYMPOSIUM WEBSITE

<http://www.ies.org/symposium/index.cfm>

A Blast from the Past: ISCC Newsletter 50 Years Ago

Number 179 – November - December 1965 on ISCC website

This last issue from the year 1965 is 22 pages long. It features an Election section for the offices of President, President-Elect, Secretary, Treasurer and Board of Director. The pictures of the people who were running are fascinating. They are some of the most well-known color experts from the United States in 1965. In 2015, we still recognize many of these people as “the ones who started it all”, our mentors, the ones to whom we still refer today when we are trying to answer some key color questions. So try yourself on the following test. How many of these color experts can you accurately recognize?

(Please see the bottom of page 11 for the answers.)



1



2



3



4



5



6



7

If you would prefer a hint, please match each numbered picture with the following names of some of our most treasured colleagues from the past: Ralph Evans, Fred W. Billmeyer Jr., Warren “Dusty” Rhodes, Lenny Davidson, Eugene Allen, Norman Macbeth, and Max Saltzman.

This newsletter announces Instrumental Approaches to Colorant Formulation as the topic of the February, 1966 Williamsburg Meeting.

Deane B. Judd was honored for having received the 1965 Samuel Wesley Stratton Award of the National Bureau of Standards, U. S. Department of Commerce. He was the recipient for his “major basic contributions to the science of color measurement and color vision and the development of color standards for business, science and industry.”

Another highlight of this issue is the contents of the Newton Lecture that was given in 1965 by W. A. H. Rushton, F. R. S. (Fellow of the Royal Society) when he received the Newton Medal from The Colour Group of Great Britain. Rushton was a physiology professor at Trinity College in Cambridge. His area of expertise was color vision and he developed a “Principle of Univariance” that was of key importance to his study of perception. The title of his Newton Lecture was “The Chemical Basis of Colour Vision and Colour Blindness” and the contents of his lecture (about 5.25 pages) is a fascinating and edifying read.

There is also an interesting article about the work of Dr. Sidney Edelstein confirming that ancient Hebrews and Mexican Indians used the same types of dyestuffs. Some of the common dyes were a **blue** dye from an indigo plant, a **red** dye from the cochineal bug and a **purple** dye from a shellfish in the Pacific Ocean.

Learn how Dr. George Quigley, a poultry scientist from the University of Maryland, painted chickens’ nests and found that they “tend to like bright colors and dislike dull or drab colors, including black” when they lay their eggs. He also found that chickens see better in **red** light and worse in **blue** light than humans do.

Paula J. Alessi, *ISCC News Editor*

Meet Your Fellow ISCC Members

I am Paul Centore. My interest in colour began with a practical question. As a fourth-year art student, I wanted to paint some shadows from my imagination, but could not find satisfactory information on the colours of an object in shadow, in relation to its colour in light. The problem was moved to the back burner, as I pursued a doctorate in mathematics



and started working as a mathematician. About six years ago, I revisited the shadow question, which of course involved colour science. Close study of colour, however, opened up unanticipated areas. I was surprised to realize that object colour solids have an unnoticed zonohedral structure,

whose construction follows naturally when a reflectance spectrum is considered as the “sum,” in the Minkowski sense, of the reflectances at individual wavelengths. These ideas sound complicated, but are actually rather intuitive from the geometric point of view. My insight led me to further applications. For example, electronic display gamuts have the same structure as object colour solids (but a smaller generating set) which implies results about metamerism and energy consumption. My new viewpoint also clarified the importance (and indeed the meaning) of the convexity in the spectrum locus and chromaticity diagram.

Apart from this mathematical vein, the shadow problem's artistic setting led naturally to the Munsell system. Computer tools for the Munsell system were limited, so I started an open-source project (now available on my website as the Munsell and Kubelka-Munk Toolbox), which has grown to about 100 Matlab/Octave routines, and many non-Munsell colour science applications. Others have found it useful, and are porting parts of it to Python and R. At the same time, advances in spectrophotometer and printer technology---and falling equipment prices---made it feasible for me to produce a colour-accurate Munsell book from my home. The book, *Controlling Colour with the Munsell System*, is now available through Amazon.com for \$75. It is hoped that the low price will make the Munsell system more accessible, especially to artists, graphics people, and fashion designers. Shadow colours, for example, have a simple form in terms of the Munsell system, which should be helpful to painters.

As colour projects multiplied, expanding to in-

clude colorant formulation and colour reproduction, colour science took up increasingly more time. In August 2014, I quit my job as a mathematician to become a full-time freelance colour scientist. Initiatives so far have included producing colour-accurate fashion palettes, designing colour guides for artist's pastels, and making a colour-mixing guide for artist's paints. These endeavors draw equally on technical knowledge, sometimes involving sophisticated mathematics, and an artistic outlook, grounded in practical experience. The results so far have been personally gratifying, and hopefully provide unique colour resources for others. As a self-employed freelancer, I am available and eager to work with others on their own colour endeavors. More information can be found on my website, www.MunsellColorScienceForPainters.com, or I can be contacted directly at centore@99main.com.

Paul Centore, Ph.D, *self-employed color scientist*

ISCC's First Successful Webinar!

ISCC held the first in a series of quarterly educational webinars on September 10, 2015. The topic was “Color and Lighting: Control, Efficiency, and Compliance”, by Ann Laidlaw.

This first webinar was a great success both nationally and internationally! There were 47 people registered for the webinar, of whom 35 attended. The attendees were from around the world, including India, Philippines, China, Israel, Europe, and the US.

Attendance at the ISCC webinars are open to anyone. Although it is not necessary to be an ISCC member to attend, joining ISCC is the best way to be aware of upcoming events. For more information on joining ISCC, please visit our website at www.iscc.org. Application forms can be found at <http://iscc.org/applicationForm.php>

We invite you to participate in this survey <https://www.surveymonkey.com/r/PXQHBQ8> to provide ideas for future webinar topics and feedback on the user experience.

Attend ISCC's Second Webinar

The ISCC's second webinar will be held on Tuesday, December 8th from 2:00-3:00 EST. Our second presentation will be given by Dr. Françoise Viénot. Dr. Viénot is Professor Emeritus from the French National Museum of Natural History in Paris. She is a trained physicist. Dr. Viénot was introduced to the mysteries of color science by Yves Le Grand and she has carried forward his distinguished tradition. She has published a textbook on color

continued on page 13

Metameric Blacks: A Color Curious Column

Ever wonder ... "Do you attribute the incredibly complex workings of the eye to evolution or creation?"

This question is one of the most intriguing, and perhaps most important, I have received amongst the thousands that have been submitted by students. For me, there is no question that the preponderance of the scientific evidence points to evolution as the source of our species and our amazing visual system. I say that with full sensitivity that some religious traditions teach, and believe, otherwise. That is their right and privilege, but it is not science. Science and religion should not be confused and they both have a place in society and education. This project is about science.

Scientists use a well-established, self-regulated, and imperfect procedure to observe the natural world and attempt to figure out how it works for a variety of reasons. The process involves first making careful observations of the world and its behavior. The scientist then makes a hypothesis about how the observed phenomena might work. Then careful experiments are designed and performed to test the hypothesis through more careful observations and objective measurements. This process is then iterated upon to refine the original hypothesis and perform more tests. Once consistent, and repeatable, results are obtained, scientists then form a theory that might gain support through consensus of the scientific community. Theories are continually tested and expanded upon through the scientific process and almost all are subject to improvement. Occasionally theories are so well established and agreed upon that they are called scientific laws (like the law of conservation of energy).

Every step in the scientific process has uncertainty associated with it and good scientists do not hesitate to report the degree of uncertainty. Unfortunately, some with political or business agendas see these statements of uncertainty and use them for their personal gain. This has led to baseless attacks on science in recent times. For example some claim there has been no warming of the global climate in recent decades even though the data are unequivocal. They then take small uncertainties in the results and say that those minute possibilities prove there is no climate change and that, even if there was, it is not caused by human impact on the environment. They are correct about only one point; there is uncertainty. However the uncertainty is so tiny, and the scientific consensus so strong (yes, science does actually work by consensus), that I have no doubt that both the

climate is warming and it is due to human activities (and I have personally examined both the data and theories to strengthen my conclusions). I encourage everyone to study for themselves, look at original results and analysis, and draw your own conclusions. Simultaneously investigate the motivations (and funding sources) of those doing writing (present company included).



Unfortunately, the same sort of attacks have happened in the field of evolution science. There is little scientific doubt that evolution (both micro and macro) has taken place on earth and these conclusions are backed by countless theories and observations. Evolution theory is a scientific fact, and rightfully belongs in science classes unless, and until, new science supplants it. All that said, yes, there is very clear evidence that our human vision system has evolved. And it is likely that it has evolved to help us identify healthy mates, good food, and potential danger; all key elements of survival and the natural selection that helps drive evolution.

In closing, this is my final of 26 columns and I thank you all for your attention and comments. I leave you with

If we shadows have offended,
Think but this, and all is mended,
That you have but slumbered here
While these visions did appear.
And this weak and idle theme,
No more yielding but a dream,
Gentles, do not reprehend:
If you pardon, we will mend:
And, as I am an honest Puck,
If we have unearned luck
Now to 'scape the serpent's tongue,
We will make amends ere long;
Else the Puck a liar call;

continued on next page

Metameric Blacks continued

So, good night unto you all.
 Give me your hands, if we be friends,
 And Robin shall restore amends.
 — William Shakespeare, *A Midsummer
 Night's Dream*

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>>. Click there to find out what the normal and amelanistic Burmese pythons from the Rochester zoo have to do with evolution.

Mark D. Fairchild
 Rochester Institute of Technology

Thank You Mark Fairchild !!!

Dear Mark,
 We are so grateful to you for your contribution of 26 Metameric Blacks columns. We have enjoyed and learned new color treasures from every single one. Thank you for enlightening and educating us on some very curious color topics. Thank you for your outstanding picture illustrations that were always filled with beauty and helped us really understand your solutions to the questions posed! Thank you for dedicating your time to ISCC! We wish you well and hope to hear from you, on occasion, in the future!

Sincerely,
 Your ISCC Friends

Call for Nominations for the 2016 Macbeth Award

The Macbeth Award was established by Mr. Norman Macbeth, Jr. in honor of the memory of his father, Mr. Norman Macbeth. The award is presented biennially in even-numbered years, when deserving candidates have been nominated.

The Macbeth Award is given for one or more **recent** outstanding contributions in the field of col-

or. **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 **recent** contributions to any of the fields of interest related to color whether or not it is represented by a Member-Body. The **recent** 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.**

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 for 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 found at

<http://www.iscc.org/UniversalNominationForm.pdf>.

This form can be filled out, scanned and emailed to danny.rich@sunchemical.com or printed, completed and sent to:

Danny C. Rich, ISCC Macbeth Award Chair
 86 Joni Avenue
 Trenton, NJ 08690

**The deadline for receipt of nominations is
 April 1, 2016.**

**Note: Nominations received after April 1,
 2016 will be retained for future consideration.**

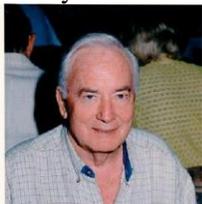
Answers to questions from page 8

1=Warren "Dusty" Rhodes, 2=Fred W. Billmeyer, Jr., 3=Ralph Evans, 4=Norman Macbeth, 5=Max Saltzman, 6=Lenny Davidson, 7=Eugene Allen

In Memory of.....

Sadly, ISCC lost three of its long time members over the past three months. This column is written in their memory.

Mrs. Herta Ouellette passed away in the August/September 2015 timeframe. She joined ISCC in 1977 and was a paid member in good standing through 2008. Her color interests centered around psychology, chemistry, interior design, selections of colors and combinations thereof, color systems and the relationship of color with artificial light. She was also a member of the American Society of Interior Designers (ASID). Our condolences go out to her family members. Rest in peace.



Our good friend, William Nicoll Hale, Jr. (Nick) passed away peacefully on September 10, 2015 at the age of 90. He is survived by his wife, Denise of 38 years. He was a decorated World War II veteran. After his service in the U. S. Army, he graduated from the University of Maryland with a BA in psychology and began working in the field of color science. In 1951, he became President of the Munsell Corporation and remained in that position for 22 years. In 1973, Nick opened his own consulting service, Hale Color Consultants. His specialty was solving complex color and safety problems for the Federal Aviation Administration (FAA), the Food and Drug Administration (FDA), the United States Postal Service (USPS), the Department of Transportation (DOT), Continental Baking Co., Minolta Corporation and 3M Company. Nick joined ISCC in 1954 and served on the Board of Directors twice, from 1968 – 1970 and from 1988 – 1991. He remained an ISCC member through 2009. Nick was a member of ISCC Problem Committee No. 22 on Material Standards for the Colorimetry of Opaque, Translucent and Transparent Materials. As a participant in Problem Committee No. 2 on Color Names, Nick helped produce the ISCC-NBS Centroid Color Charts. Nick also participated in ISCC Problem Committee No. 7 on Survey of American Color Specifications. He hosted and organized an ISCC Annual Meeting held in Baltimore, Maryland. Nick was liaison to the Individual Member Group in 1969 and has served on many other ISCC committees throughout his 55 year membership. Nick also became a member of the American Society for Testing and Materials (ASTM) in 1960. His activity centered around ASTM Committee E12 on Color and Appearance. This committee honored Nick with the coveted Richard S. Hunter Award in 2003. Nick

served as chairman of ASTM E12 from 1982 to 1988 and 1992 to 1994, and vice chairman from 1976 to 1982. Throughout his ASTM E12 membership, he was a member and a chair of many different subcommittees. Nick also was a member of the U.S. National Committee of the CIE (Commission Internationale de l'Eclairage). Nick wrote substantial portions of the color science text in the book entitled "Gemstone Color Measurements and Specifications" by Dr. Joel Arem. Nick and J. Rennilson developed a portable gemstone colorimeter to accurately deal with the unique color properties of gems. Nick was a significant contributor who helped advance color science over his working career that spanned about 55 years. We will deeply miss Nick and his contributions to ISCC!



Salt Lake Tribune File Photo: Anna pictured by her piece, "Tsunami" oil on rives paper in 2009

Sadly, we also lost one of our acclaimed artist friends. On October 12, 2015, Anna Campbell Bliss passed away in her Salt Lake City home. ISCC recently honored Anna with the 2015 Godlove Award. She was very appreciative to receive this most prestigious award from the ISCC. Anna's career in art and design spanned over 5 decades where her work in the areas of color, art design, computer modeling and their interactions has received national and international acclaim. Anna was a longtime member of ISCC. She received a Bachelor of Arts from Wellesley College and a Master of Architecture from Harvard's Graduate School of Design. She studied color theory and design with György Kepes at MIT and with Josef Albers. With this vast educational background, she had a profound impact on the color and design world through her explorations of the connections between poetry and mathematics, nature and the constructed environment. The excitement in her art and design pieces came from the intersection where more than one discipline meets. As an artist/designer, Anna was unique because she

continued on next page

In Memory of..... continued

was a pioneer with computer modeling to create shapes, colors and patterns that we have never seen in design spaces before.

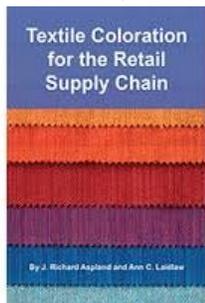
There is a miraculous story to tell regarding Anna's vision. She was diagnosed with macular degeneration and participated in early trials of a treatment program that involved injections in her eyeballs once every 6 weeks for 6 months. Thankfully after this rigorous treatment, her vision was restored!

Anna's work garnered many awards for her solo exhibits spanning U.S. galleries from San Francisco to New York City, with an emphasis on galleries in her home state of Utah. Internationally, her work can be found at the Minami Gallery in Tokyo and she participated in computer design exhibits at the Stuttgart Design Center in Germany.

Anna's many silkscreen contributions are highly regarded by the artistic community, but the wider color community will honor for her contributions combining the use of computers, mathematics, science, and color studies into her artistic creations. Anna will be sorely missed, but her spirit will live on in her art and design work that is still exhibited worldwide! Rest in peace Anna!

AATCC Announces New Book on Textile Coloration – Featuring Ann Laidlaw as Co-Author

RESEARCH TRIANGLE PARK, NC, USA, September 24, 2015—AATCC announces the release of a new book entitled, *Textile Coloration for the Retail Supply Chain*, co-authored by J. Richard Aspland and Ann C. Laidlaw.



Dr. Peter Hauser, professor and interim head of the Textile Engineering, Chemistry and Science Department at North Carolina State University, recently reviewed the book. His comments were that the “Two distinguished color scientists (Aspland and **Laidlaw**) have collaborated in producing a volume that has fulfilled a long needed requirement—a comprehensive account of textile coloration that addresses the needs of both scientists and nonscientists.”

The book is divided into multiple sections, for easy reference:

- A discussion of textile coloration designed for a non-technical audience
- A glossary of textile terminology

- A technical supplement for the more technically oriented reader
- An appendix that summarizes in a single table the advantages and disadvantages of colorant-fiber combinations.

Hauser summarizes his review by stating that “all textile professionals, be they in retail, marketing, design, product development, or manufacturing, will find *Textile Coloration for the Retail Supply Chain* a very useful addition to their library.”

About J. Richard Aspland: An AATCC member since 1971, Dr. Aspland is professor emeritus at Clemson University, and has published numerous books, book chapters, and peer-reviewed papers on color, dyeing, and textile chemistry. He is the 2013 recipient of the AATCC Olney Medal for outstanding achievement in the field of textile chemistry, and the AATCC Harold C. Chapin Award for service to AATCC in 1999. In 2005, he received the AATCC William J. Weaver Paper of the Year Award for his contributions to textile science literature.

About Ann Campbell Laidlaw: A member of AATCC since 1979, Laidlaw is the 2011 recipient of the AATCC Harold C. Chapin Award for service to AATCC. She has served with honor and distinction in the research, education, and outreach functions of AATCC. A world-renowned color scientist, Laidlaw is owner of [ACL Color Consulting LLC](#) and is affiliated with RoLyn Group Color Consulting.

For more information, please visit [AATCC's website](#).

Attend ISCC's Second Webinar continued

science, as well as important papers on Maxwell's spot and macular pigment, on mesopic photometry, on the perception of gloss, and on the Benham-Fechner colors.

The title of Dr. Viénot's presentation is *Color Vision Fundamentals: A Model for the Future of Colorimetry*. (This is the same talk that was given to commemorate her receipt of the 2014 Macbeth Award at the Indianapolis meeting.) Here is the abstract for her presentation:

“Since the establishment of the 1931 standard colorimetric observer, considerable knowledge on colour vision mechanisms has been acquired. Establishing colorimetry directly on Physiology is a new CIE approach to colour specification.”

This webinar is free for all participants! In order to participate, you will need access to an internet browser with moderate bandwidth capability. To sign up and get connection details, please see <http://iscc.org/resources/SeminarSeries.php>.

HUE ANGLES

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

How do slow visual signals keep up with fast ones from a moving object?

The Pith and the Pendulum

When we watch a moving object, we experience at least two visual signals: A fast one due to luminance contrasts (which also brings with it a high spatial resolution) and a slow one due to chromatic contrasts (which has much lower spatial resolution). It is interesting--and functionally necessary--that we see an object in motion as recognizable and locatable, without any chromatic blur due to the slow visual mechanism's failure to catch up with the fast one.

Chromatic blur is just one aspect of the visual signal that is suppressed when we look at a moving object. Also suppressed is our awareness of the persistent motion of the eye itself; despite this motion, we see the motion of, say a thrown baseball, as a simple arc.

Despite the general suppression of the chromatic blur, there is a simple demonstration that shows the chromatic signal sluggishly and fuzzily lagging the luminance signal. (I did this experiment at MIT about 40 years ago.) Set up a pendulum in a generally well illuminated room, in front of a white wall. Now illuminate the scene with a diffuse blue light that nonetheless has a localized source. An example of such light is a slide projector without its lens, illuminating through a Kodak Wratten 98 filter. The pendulum should be between the projector and the wall. The viewer should sit in such a way as to see simultaneously the pendulum and its shadow on the wall. If the room is brightly enough lit and the shadow is well defined, the blue light will be almost invisible, but the shadow will appear a rather intense yellow. Because the shadow (illuminated only by the white light) is almost the same luminance as the background (illuminated by white and blue lights together), the shadow will appear quite blurry. To see that it is the visual system that is creating the blur, replace the blue filter by a filter of another color and see the shadow appear as a relatively sharp image. The shadow edge is indeed exciting chromatic contrast with very low luminance contrast. (Note: If we instead had contrived the contrast edge to be truly isoluminous and restricted to excitation differences of the blue-sensitive cones, the edge would be completely invisible [1]. To quote Boynton [1], "The blue-sensitive cones [...] seem to

be free of any serious spatial or temporal responsibilities in vision.")



© The Exploratorium, www.exploratorium.edu
Colored shadows. The yellow hand is the one that waves to you most slowly.

Given our stationary shadow-casting pendulum, now set the pendulum in motion. You will notice immediately that the shadow lags the motion of the pendulum. At first it will seem to be an independent object, but then a weird thing happens. With each cycle, the shadow of the pendulum somehow reasserts its phase relative to the pendulum itself. If this were an independent object, the phase difference would continue to pile on, for the two pendula would have different frequencies. Eventually the pendula would be in counterphase, and then beyond counterphase. But this doesn't happen. Instead, each time the real pendulum reaches its turning point, the shadow reaches a turning point a fixed time thereafter. If you try to stare down the shadow pendulum to capture what should be a progressive phase lag, you will notice the shadow getting blurrier as your eye's involuntary motion takes over.

At this point, present and future vision scientists should take over. It should be possible to extract some scientific pith from this pendulum.

[1] R. M. Boynton, Ten years of research with the minimally distinct border. In J. C. Armington, J. Krauskopf, and B. R. Wooten (eds.), *Visual Psychophysics and Physiology*. Academic, New York (1978).

Michael H. Brill
Datacolor



IN THIS ISSUE, December 2015

Over the years we have had many articles in this journal that discuss color appearance models and the use of color appearance transformations (CATs), in which constant color appearance is the goal. Our first two articles by Maxim Derhak and Roy S. Berns will introduce a new concept, waypoint and then extend its use to a material color equivalency space. In the first article, “Introducing Wpt (Waypoint) – a Color Equivalency Representation for defining a Material Adjustment Transform” they presented a classification system of Sensor Adjustment Transforms (SATs), which include tristimulus values, cone excitations or sensor, but they make a distinction between Chromatic Adaptation Transforms (CATs) and Material Adjustment Transforms (MATs). In contrast to CATs which have the goal of color constancy, MATs have the goal of least dissimilar color matching.

In the second article, “Introducing WLab – Going from Wpt (Waypoint) to a Uniform Material Color Equivalency Space,” Derhak and Berns introduce perceptually more uniform coordinate system, WLab. WLab, more properly referred to as a “perceptually uniform material color equivalency space” with both perceptive aspects of color (lightness, chroma, and hue) and color differences (DE_w), represents material color differences defined relative to the reference observing conditions such as objects, observers, and/or illuminants. They show that WLab is a reasonably uniform material color equivalency space, and the color differences in WLab with small Euclidean WLab distances are not statistically different from DE*94, DE00, and Euclidean distances of DIN990 and CAM02- UCS under reference observing conditions.

Above we mentioned models for color appearance using CATs in which constant color appearance is the goal. In these CATs, spectral sharpening is commonly used to reduce color constancy errors. However, Mohamed Abdellatif notes that earlier CATs improved color precision when the illuminant color is changed, but they overlooked the color distinction. In the next article in this issue, he introduces a “Physics-Based Spectral Sharpening through Filter-Chart Calibration.” In his method, the spectral overlap is measured through observing a gray reference chart with a set of real and spectrally disjoint filters selected by the user. The new sharpening

method enables the user to sharpen colors obtained by a sensor without knowing the camera response functions.

Our next article introduces a new issue in color management digital images, i.e., from bright-field transmission microscope images. The proper color management of microscope images is of particular importance in the medical world, where there is increasing use of telemedicine. Michael H Brill, Hong Wei, and Taeyoung Park discuss the calibration of digital microscope images of stained biological slides in our next article, “Evaluation of Targets for Color Calibrating Digital Images from an Optical Bright-Field Transmission Microscope.” They proposed the use of a reference slide composed of 20 colors spanning the gamut of colors produced by a particular kind of stain (hematoxylin and eosin (H&E) stain). The performance of the slide is robust to change of microscope and illumination and meets the requirements of the ICC Medical Image Working Group as a test for microscope color-management systems.

While we are talking about color in the medical field, we have an article from a seldom researched area, “Colour and Spectral Reflectance of Infant Stool” by Lewis Griffin, Alastair Sutcliffe, Kimberley Bradbury, Smitha Kumble, Dimitris Mylonas, and Alastair Baker. In this article the authors present quantitative data on the spectral reflectance of stools from normal infants, concentrating on the immediate post-natal period when a range of colors are observed, and a model of the distribution of spectral reflectances that are observed, which characterize and explain the range of stool colors observed in the days following birth.

Our next three articles deal with the natural color of objects in one way or another. First, we have a “Cross-Cultural Comparison of Color Terms and Preference of Persimmon-Dyed Fabric, Galchon. Galchon is a traditional fabric dyed with unripe persimmon juice in some regions of Korea including Jeju Island. It has cultural importance in Korea because of its color range and unique place in fashion. In this article Eunjou Yi and Renzo Shamey team together in a cross-cultural study aimed at correlating color emotions and preference of Galchon.

Ichiro Kasajima and Katsutomo Sasaki discuss how “Dichromatism causes colour variations in leaves and spices.” They explained that dichromatism in plant leaves and red spices can be observed by extraction and dilution of pigments with dimethylformamide. Hue of pigment solutions gradually changes with dilution from green to yellow-green for leaves, and from red to yellow for spices. These

continued on next page

CR&A In This Issue December 2015 continued

changes were also explained by changes in absorbance spectra with dilution. However, the absorption spectra were stable.

We often use the colors and forms of nature to enhance a wide range of created objects from houses to clothing. Shih- Wen Hsiao and Cheng-Ju Tsai wanted to take color selection a step further and thought it was now possible with more advanced computer applications. Therefore they developed a system to assist the designer in product color planning. This system converts the descriptive design processes into a systematic design model using three modules: 1) Natural coloring module, 2) Fuzzy recognition module, and 3) Image evaluation module. See the applications the colors of Taiwanese butterflies to the color-planning of volleyball shoes in their article, "Transforming the Natural Colors of an Image into Product Design—A Computer-Aided Color Planning System Based on Fuzzy Pattern Recognition."

In our final article of this issue Jie Zhang, Ruru Pan, and Weidong Gao use a fuzzy C-means clustering (FCM) algorithm to help textile manufacturers identify the structure parameters (colors and layout) of the fabric sample from the client's sample. This is necessary so that the design can be transferred from the sample to large scale production in the textile plant. In "Automatic detection of layout of color yarns of yarn-dyed fabric Part I: single-system-mêlange color fabrics," a novel FCM-based stepwise classification method is proposed. The method consists of three steps: (1) warp yarn segmentation, (2) weft color recognition and (3) layout of color warp recognition.

We close the issue with a letter to the editor from RWG Hunt. Dr. Hunt discusses "Unique hue data and CIECAM02: a comment on Xiao et al." [Col. Res. Appl. 40, 256-263 (2015)] in our Communications and Comments section. Also, we have a brief erratum from Ralph Pridmore concerning an equation in his article, Chromatic Luminance, Colorimetric Purity, and Optimal Aperture-Color Stimuli [Vol 2007; 32: 469-476].

Ellen Carter
Editor, *Color Research and Application*

Inventory of Artifacts from the Ingalls

Thank you to ISCC members who helped give a home to many of the treasures from the Marjorie and Richard Ingalls' artifact inventory. The count

has gone from 32 items down to 23 items left. Please look over the list of remaining equipment and archival materials to see if you might be able to use them in your work or laboratory. Please note that the original item numbers are being maintained for book-keeping purposes. Before the Ingalls dispose of their collection, they would like to offer it to ISCC members. So here is the current 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"x22")
4. Cast Iron Spectrophotometer (14"x20"x30")
5. Very Large Spectrophotometer (20"x45"x34")
6. Digital Recorder (14"x10"x20")
9. Photo enlarger (9"x20"x14")
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
30. Olite Light Source – some items gone
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

- Nov 23-26** CIE Expert Tutorial and Symposium on CIE S 025 LED Lamps, LED Luminaires and LED Test Modules Test Standard, PTB, Braunschweig, Germany, Info: ciecb@cie.co.at
- 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/>
- Dec 9-10** AATCC Introduction to Textile Testing Workshop, AATCC Headquarters, Research Triangle Park, NC, Info: nicholk@aatcc.org or www.aatcc.org

2016

- Jan 27-28** ASTM E12 Color and Appearance, Grand Hyatt, San Antonio, TX
- Feb 3-5** Computer Vision Winter Workshop, Rimske Toplice, Slovenia, Info: <http://cvww2016.vicos.si>
- Mar 3-5** CIE 2016 Lighting Quality and Energy Efficiency, Melbourne, Australia, Info: ciecb@cie.co.at
- Mar 7-9** CIE Divisions 2,4, & 5 Meetings, Melbourne, Australia, Info: ciecb@cie.co.at
- Apr 3-5** IES Research Symposium III: Light + Color, Gaithersburg, MD, Info: <http://www.ies.org/symposium/index.cfm>
- Apr 19-22** Archiving 2016, National Archives, Washington, D.C., Info: www.imaging.org/archiving
- May 13-18** 16th Annual Vision Sciences Society Meeting, TradeWinds Islands Resort, St. Pete Beach, FL, Info: <http://www.visionosciences.org/myvss>
- Jun 29-30** ASTM E12 Color and Appearance, Chicago Marriott, Chicago, IL
- Aug 19-22** Archiving 2016, National Archives, Washington, D.C., Info: www.imaging.org/archiving
- Aug 25-Sep2** CIE Expert Symposium on Appearance and CIE Division 1 Meeting, Prague, Czech Republic, Info: ciecb@cie.co.at
- Aug 28-Sep1** 39th European Conference on Visual Perception (ECVP), Barcelona, Spain, Info: <http://www.ub.edu/ecvp>
- Sep 14-16** 4th Progress in Colour Studies Conference (PICS2016), University College London, London, UK., Info: lindsay.macdonald@ucl.ac.uk
- Oct 18-22** AIC Interim Meeting Color in Urban Life: Images, Objects, and Spaces, Santiago Chile, Info: www.aic2016.org

2017

- Oct 16-20** AIC 13th Congress, International Convention Center, Jeju, Korea, Info: www.color.or.kr

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

ISCC News Issue #472, Fall 2015

Editor: Paula J. Alessi

(585)225-4614 geinhaus@frontiernet.net

Editor Emeritus: Prof. Gultekin Celikiz

(215)836-5729 gcelikiz@yahoo.com

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)