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INTER-SOCIETY COLOR COUNCIL

Inter - Society Color Council

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ISCC Board of Directors Corner

Chris Thorstenson

When I was much younger, I was a graphic design hobbyist. I would design websites, logos, and other graphics for friends and communities in my spare time, all without any formal training or any real technical expertise. Yet, it was always intuitively clear to me that color decisions in graphics had a huge impact on the meanings they conveyed.

Fast forwarding many years to my first formal educational experiences with color, where I learned about different ways to measure and quantify color. Instead of thinking about color as just RGB triplets on a monitor, I was introduced to spectra, perceptual color spaces, and even the notion that people can perceive color in slightly, or sometimes greatly, different ways. These initial experiences triggered for me a new goal – I wanted to learn EVERYTHING about color. In hindsight, this was a laughably lofty aim, but it set me down a path of academic study that will last my conceivable lifetime.

During my graduate studies, I once again became interested in understanding the meanings that color conveyed. As a Ph.D. student at the University of Rochester, I studied how color can be used to communicate emotions and to convey other kinds of information important for social interactions.

During this time, I also discovered that another nearby university, Rochester Institute of Technology (RIT), offered the nation's sole degree granting program in Color Science. Of course, because I had to learn EVERYTHING, I decided to reach out. After meeting with the illustrious faculty there, I decided to pursue an additional M.S. degree in Color Science. While everyone involved thought I was insane for working towards multiple graduate degrees simultaneously (they were probably right, again in hindsight), I was excited about the opportunity to continue learning everything I could about color.

Eventually, I was given the incredible opportunity to join the faculty in the Program of Color Science at RIT as an Assistant Professor, where I am able to continue color research and education in this unique and collaborative environment. My research continues to investigate how color can be used to convey meaning and information in artificial social agents, such as social robots and avatars, and how color perception works in virtual and augmented reality environments.
On top of my research, I am enthusiastic about educating and mentoring our brilliant students in color science, and I relish our like-minded community all dedicated to studying color.

As an educator, and as one who spent most of my adult life as a student, I keenly appreciate that students need unique support structures, and I strive to support students in ways that help them meet their goals. As one of the newest members on the ISCC Board of Directors, I am thrilled to be involved in developing and ongoing student support initiatives that align with both ISCC's mission and my own strong beliefs regarding facilitating student success. I am particularly proud of the recent work we have done to construct a formal ISCC Student Support Award that will help provide financial support to students, which will become available for students in the upcoming calendar year!

Chris Thorstenson

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Hue Angles
Blue Book

Michael H. Brill

After 12 years of waiting, I have found the answer to the color-realism question I asked in a poem and kept on my Hue Angles blog site (https://hueangles.blogspot.com): Does color lie in the world or in the mind? *Answer*: "Blue is not out there, and it is not inside us either. The radiant blue of a cornflower is a kind of collaboration between us and the plant." The origin of this quote is Kai Kupferschmidt's book, *Blue: In Search of Nature's Rarest Color* [The Experiment, 2021], p. 7. Kupferschmidt holds a degree in molecular biomedicine from the University of Bonn, writes for *Science* magazine, and lives in Berlin. The pertinence of the sentence I quote is in no way constrained by his restrictions of subject matter to the color blue or to the reciprocal communication between humans and plants. I hope it might quiet the din of debate between realists and subjectivists in philosophy.

Heartened by the author's simple resolution of the realist question in color, I backed away, for a moment, from the book—which a close friend had just given to me. It is a small but physically dense 216 pages, adorned on the inside with color layout (mostly blue) with full-page completely blue separators between the chapters. The hard cover is entirely colored in subtly different shades of blue (except for a peacock on the front), and even the page edges are a dark blue. Receiving this object, I felt as if I were receiving a mystical talisman like David Lynch's blue key in the movie *Mulholland Drive*.

Hoping to understand this object better than I understand *Mulholland Drive*, I thought, what's the big deal about blue? Kupferschmidt made some assertions about blue that seem to be oxymorons—that blue is ubiquitous (e.g., the blue sky) and rare (e.g., blue lobsters). Then I checked how many Hue-Angles articles have "blue" in the title. The answer is four, not including the present one. In comparison, green appears in three Hue-Angles titles, seven colors appear in one or two titles, and no other color is mentioned at all. From the example of Hue Angles itself, I was forced to acknowledge the plausibility of Kupferschmidt's assertions, even if they seem self-contradictory.

So, I started to read. The five simply titled chapters are logical, clear, and interesting.

STONES deals with the development of inorganic colorants, including chemistry and historical connections. Kupferschmidt makes clear that the search for the perfect blue led not only to Prussian blue as an artist's tool, but also to discovery of hydrocyanic acid—used to kill millions of people. There is more than one side to the color blue.

SEEING discusses the anatomy, physiology, and psychophysics of color perception. The author covers a vast domain and makes the subject look easy by his clear language and organization. For example, he explains the Blue Dress by invoking color constancy. (I would have said "*failure* of color constancy," but that is a quibble.)

PLANTS discusses color as a collaborative language to communicate with animals (and with us). Also, the chapter emphasizes that most plants have colors that are determined by molecular reactions to light, not by diffraction off structures (as is more common for animals). The author observes that green light is reflected from plants, and we see the light because it is available and useless to the plants. From a plant's point of view, the green part of the spectrum is a "green gap." But still in Kupferschmidt's text, the color blue predominates, from indigo to the coal-tar blues, from cornflowers to the unattained grail of the blue rose.

SPEAKING emphasizes the cultural dependence of color-name boundaries, as studied by Berlin and Kay. The chapter begins with William Gladstone and ends with political correctness.

ANIMALS talks about structural colors, and most of the examples are birds. The chapter argues convincingly that the success of structural colors lies in their invariance with respect to lighting/viewing geometry. This is ensured if the precise diffractive structures are mixed with apparently random perturbations that have a hidden regularity. We only recently came to understand this subtlety[1].

The book has two main themes. (1) blue is a special color; and (2) one should give blue the attention, appreciation, and awe that it deserves. Much of what the author finds special in the color blue is anecdotal or otherwise not amenable to quantitative study; it certainly lacks a specific point-by-point comparison of blue with other colors. Nonetheless, he has devoted his non-working life to compiling an impressive array of historical and scientific matter that will have wide appeal. He travelled far to acquire these things.

Early in the book, the author uses a cryptic comment to command a reader's thoughtful attention (much as does a Zen koan),[2] The comment is this (p. 34): "It is [...] no accident that accidents have played such an important role in the history of color. The reason? So far it has been nearly impossible to predict with any certainty what color a particular substance will have without making it." For example, the same process and raw material can give rise to either ruby or emerald. The color can be considered an accident. But the fact is that many such accidents happen in pigment preparation; that fact by itself is no accident. It is the sensitivity of the coloration mechanism to detailed orbital energies. The author applies similar logic to explain the many years of exploration preceding the discovery of Prussian blue and later blue pigments such as YInMn as late as 2009. The author uses the device of non-accidental accidents to fortify his argument for the specialness of blue.

[1] The rainbow colors that we see when we look at a diffraction grating (like a CD) are one type of simple structural color. But they are very sensitive to the angles of lighting and viewing. Peacocks and Morphos butterflies pull some three-dimensional tricks with their structural color so that the color is constant over some range of angles. [John Seymour]

[2] A paradox to be meditated upon that is used to train Zen Buddhist monks to abandon ultimate dependence on reason and to force them into gaining sudden intuitive enlightenment.
"Koan." Merriam-Webster.com Dictionary, Merriam-Webster, https://www.merriam-webster.com/

At the start of the SEEING chapter, Kupferschmidt delivers his over-arching message through reference to a scene from the TV show *The Simpsons*. Homer Simpson, after declaring himself "not easily impressed," lets his attention wander and exclaims, "Whoa! A blue car." Although Kupferschmidt acknowledges the humor, he muses that "even the sight of a blue car ought to amaze us" (p. 53). To end the SEEING chapter, he echoes "Whoa! A blue sky." The substitution of "sky" for "car" recalls the opening lines of the book, recounting the Apollo 17 astronauts' awe upon seeing the Earth from space. The ensuing photograph of the Earth (called *The Blue Marble*) is famous and is often a point of departure for a lecture warning us that we have a clear responsibility to save our planet. Kupferschmidt does not give this lecture, but instead determines "to look out into the world more often, as if I were seeing all its colors for the first time, and to say to myself, 'Whoa! A blue sky.'" (p. 82)

Having solved one philosophical problem to my satisfaction, Kupferschmidt's book raises other questions: How can one sustain the enthusiasm of seeing colors as if for the first time? Why is blue so special?

I see this book as a report of and homage to Kupferschmidt's personal spiritual journey in search of blue. For more about this journey, please read the final section, HERE WAS BLUE. I won't spoil it for you. I also wish him well.

Michael H. Brill

A Blast from the Past: ISCC Newsletters 50 Years Ago

ISCC Newsletter Nos. 226 and 227 Sept. – Oct. – Nov. – Dec. 1973

John Seymour

Note: John Seymour kindly offered to write the Blast from the Past on behalf of Paula J. Alessi who was unavailable this month.

In the previous Blast from the Past, Paula reported on *ISCC News* No. 225, which had an article about the recently deceased Pablo Picasso. I reprise this article just enough to set the stage for the response to this article in ISCC News No. 227. *ISCC News* No. 226 reported on the retirement of W.D. Wirght. I fill in just a bit for those who don't immediately recognize the name. Issue No. 226 gives a summary of the color science education that was happening in 1973. I compare this a bit to what we see today. Finally, when Issue No. 227 started talking about problem committees, I needed to go back to Issue No. 224 to find out just what the problem was and advise readers to stay tuned to future Blast from the Past articles as this story plays out

WHY ARE THERE SO MANY SONGS ABOUT RAINBOWS, AND WHAT'S ON THE OTHER SIDE OF THE MOON?

The year 1973 was a big year for rainbows in the world of rock music. Most notable was a favorite of mine, *Dark Side of the Moon*, which featured an anatomically incorrect diagram of a white beam of light being refracted into a rainbow by a prism. (How many of you noticed that the angles are just wrong?)

That year also saw the album *Spectrum* by Billy Cobham, and *At the Rainbow* by Focus. Who can forget other albums with color-themed titles, like Elton John's *Goodbye Yellow Brick Road*, Jimmy Buffet's A *White Sport Coat and a Pink Crustacean*, *Cyan by Three Dog Night*, and *The Adventures of Panama Red* by New Riders of the Purple Sage. It goes without saying that albums were released that year by several groups with colorful names: Electric Light Orchestra, King Crimson, Barry White, Tangerine Dream, Black Oak Arkansas, Al Green, Golden Earring, and Black Sabbath.

BUT THAT IS A WHITER SHADE OF PALE COMPARED TO WHAT WAS GOING ON IN THE ISCC NEWSLETTER.

For the first storyline, we start with the passing of Pablo Picasso on April 8, 1973. *ISCC News* No. 225 had a short review of a recent bibliography about the artist, and also a letter to the editor penned by Jeffery St. John of CBS Radio. The letter was not what you might call a love letter. Most love letters avoid comments like this one: "No man in modern time did more to undermine aesthetic beauty and flowing form than Picasso." A few more scattered endearments included "a special breed of artist hypocrites," "the way he managed to con the whole world," and "the P.T. Barnum of the art world." St. John ends by aiming his diatribe at those who would eulogize Picasso: "Those bowing down to Picasso and praising him as great at his death are bowing down to intellectual barbarism and are paying homage to institutionalized insanity."

I find this hard to imagine, but some ISCC readers apparently took umbrage at these disparaging comments about Picasso. One of those readers, Herb Aach, a professor of art at Queen's College, said in a letter to the editor in ISCC 227 "I was deeply shocked that you should find it fitting to reprint those ill-tempered remarks of Jeffrey St. John's commentary at the death of Picasso."

A second letter to the editor was equally aghast. Rolf Kuehni's entire letter is pithy, but this line is the best of the pith: "If Picasso helped to destroy painting, then Stravinsky helped destroy music, Joyce literature and Planck and Einstein physical science." I guess we will see whether anyone remembers the name Picasso in another 50 years.
Rolf Kuehni, by the way, can be found elsewhere in this newsletter for receiving some coveted award or other. To the best of my knowledge Jeffery St. John has not received any awards from any color-related organizations.

GETTING ON THE WRIGHT SIDE OF THE RAINBOW

Loudon Wainwright III released his album *Attempted Moustache* in 1973, which included the hit *Clockwork Chartreuse*. Well, it would have been a hit if lots of people had listened to it. And if it got played a lot on the radio. And then if people bought the album. How is this relevant? Chartreuse is one of the few moderately common color names that gets its name from something you drink, which in turn got its name from the French word for Charterhouse, which is the place where the monks made this sweet herbaceous liquor that, confusingly, can either be yellowish-green yellow or greenish-yellow.
I have not been able to establish whether Loudon Wainwright III was any relation to W.D. Wright. *ISCC News* No. 226 tells me that the latter retired in 1973. Neither have I been able to determine a lineage between W.D. Wright and Gary Wright, who was to release *Dreamweaver* just two years later.

Any of the readers who paid attention in Colorimetry 101 will, of course, recognize the name W. David Wright from that incredibly talented duo, Guild and Wright, who published the 1931 chart-topper The *Standard Observer in* 1931 on the CIE label. Any serious color aficionado needs to have this in the original vinyl.
Wright was a student at Imperial College in England when he received a grant from the Medical Research Council to work on color vision. In his words “although I had got the grant and I knew what the project was called, I really hadn’t a clue what it was about except that my first job, I knew, was to build a colorimeter.” [quoted in Kaiser and Boynton]

The colorimeter that Wright had to build was a trichromatic color mixing comparator. This device would combine controlled amounts of red, green and blue light and present this mixture in a field next to something else. The observer could then fiddle with the apertures for the three stimuli (the *tristimulus*) to achieve a color match to that other field.

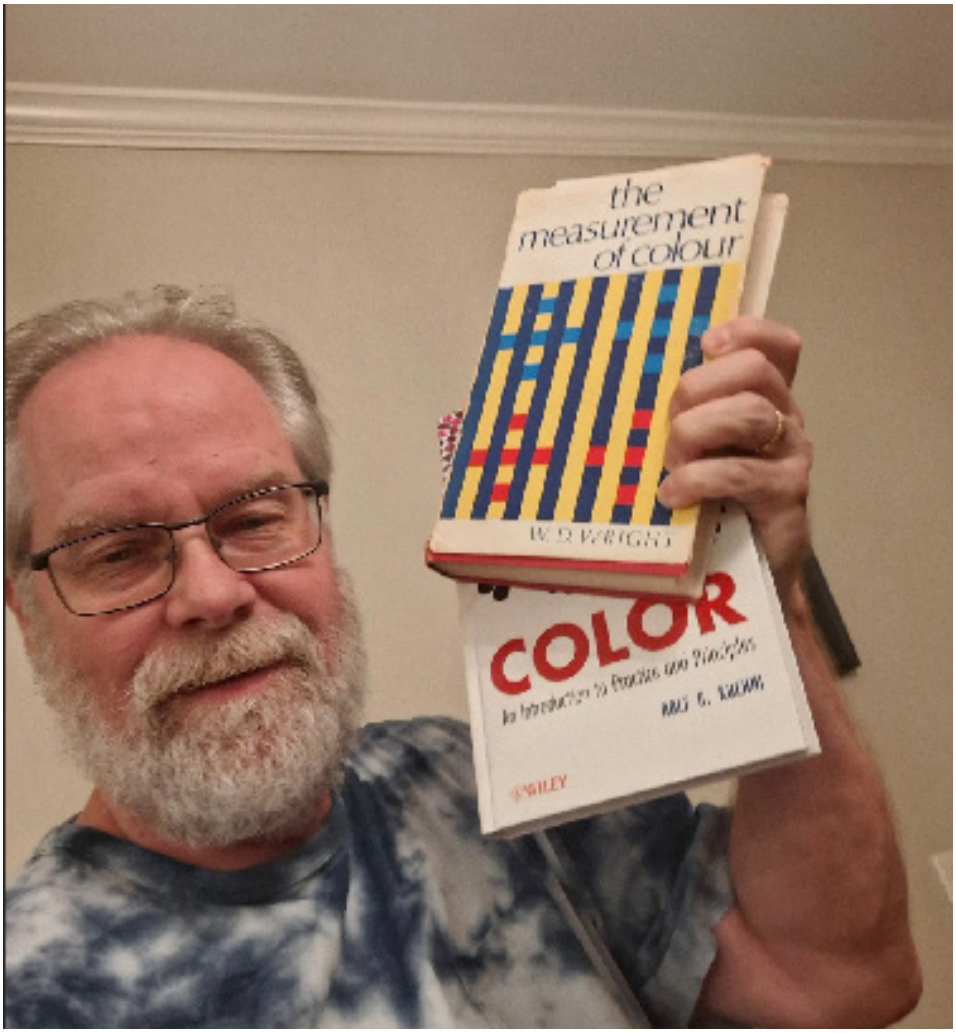
Wright sat ten volunteers in front of this apparatus and had them find the RGB values that matched monochromatic light at 410 nm, 430 nm, and so on up to 690 nm. He was indirectly measuring something related to the spectral response of the eyes of his ten observers.

A similar composition was performed by John Guild at the National Physics Lab in England a few years prior to Wright's experiments. Guild used different versions of red, green and blue than what had been used by Wright, and he performed the same test at ten nm intervals with seven volunteers.

The two scientists conferred and found that, once they averaged all the volunteer's responses, and then accounted for the differences in red, green and blue, the agreement between them was pretty darn good.

This was an important result. With their combined data, it was possible to use a spectrometer to emulate the readings that a trained operator would make with a trichromatic color mixing comparator. This was not about trying to automate the color matcher's job. This solved the very real problem of reproducibility. Any two operators and any two trichromatic color mixing comparators would vary by a larger amount than we would like. The averaged data became the basis for the 1931 2° observer which is still in use today for measuring color. [see Seymour]

Any time you are in a soulful mood just slip your spectrophotometer over to the 2° Observer and you can hear how well their melodies harmonize.



Books by Kuehni and Wright are found in his personal library.

GO TIGERS!

In the Director's Corner of this newsletter, Christopher Thorstenson introduces himself and the college where he teaches. The college, Rochester Institute of Technology, needs no introduction since they hosted the Color Impact 2023 conference earlier this year. And further, we are told by Chris that RIT is the only place in the United Stated to get a degree with "Color Science" written on it.

But that was not always the case. *ISCC News* No. 226 reports on the ISCC Symposium on Professional Education in Color for Art and Technology. The newsletter includes abstracts that discuss the programs at RIT, Queens College, Rensselaer Polytechnic Institute (presented by none other than Fred Billmeyer), the University of Cincinnati, the University of Pennsylvania (some of you may recall the name Leo Hurvich who has done a lot to further our understanding of how we see color), the Ontario College of Art, Colorado State University, the University of Massachusetts, and finally, Clemson University (presented by Fred T. Simon).

Not all of these colleges had degrees in Color Science, but it's clear that there was a lot of color learning going down in 1973 all over the country!

On a personal note, I started teaching color science in the Graphic Communications Department at Clemson in 2019. My first class, which I called "Color Science" was being taught in the same time slot as a course called "Color Science" which was offered by Phil Brown in the School of Materials Science and Engineering. I would have liked to sit in on his class, but…I see that it is being offered next spring semester…hmm.

According to Simon's article in the ISCC newsletter, Clemson had been teaching color science since the early 1900s. In 1956, they started a Color Measurements Lab. As of 1973, the Clemson Color Science Center was offering three classes in color science. In an eight-year period, four students received master's degrees for work in color science.

At the time, North and South Carolina had been an epicenter for textile research. But jobs shifted overseas. In 2010, Clemson decided to phase out the school of textiles. By 2013, the department had been subsumed into Materials Science and Engineering. And the Graphic Communication department (where I teach) is now in what was the Textile Building.
Oh…I also included North Carolina in the textile belt. North Carolina State University still has the Wilson School of Textiles. Renzo Shamey (formerly a president of ISCC) has ushered his share of students through graduate degrees in Textile Science, which (shhhh!!! please don't share this with anyone) are really degrees in color science. Keep that under your hat.

And let me tie one more thing back to the start. Remember that pithy fellow who wrote the letter to the editor? And who has received the Armin J. Brunig Award from the Federation of Societies for Coatings Technology, the Godlove Award from the ISCC, the Olney Medal from the American Association of Textile Chemists and Colorists, and the Nickerson Award also from ISCC? And who just received the AIC Judd award? You know, Rolf Kuehni? He has been an adjunct professor of color science at NC State since 2002.

BOY IS THAT EVER A PROBLEM COMMITTEE!

The year 1973 didn't seem to have much in the way of problems having to do with music. A single was released under the name *J'ai un problème* by a duo going by the name of Sylvie and Johnny. Did well on the French charts, probably because the French were able to translate the French lyrics into their native language. No problem. Other than that? I can't think of any problematic music from that year. (Jay-Z didn't come out with his *99 Problems* until 2004. And Guy Mitchell's *Heartaches by the Number* actually enumerates his heartaches, but that came out in 1959.)

But you wanna talk problems? Talk to the color metrologists of 1973! We see in *ISCC News* No. 227 that they had a whole problem committee group with 35 subcommittees for each of the different problems! In this issue, we have short updates from Problems Subcommittees 18, 22, 24, 27, 34, and 35. One of those problem children, Problem 34, caught my eye:

> *Problem 34 held a successful meeting on November 8, 1973, with 12 people in attendance. At this meeting, the working program was set up. The Subcommittee will soon initiate a test for gathering observer data on seven sets of samples.*

Ohhh!!! Daaaattttaaaa! Nothing can make an applied mathematician's mouth drool like raw data! And guess who the chair is of this subcommittee? None other than Rolf Kuehni! His name might just be starting to sound familiar by now.

I had to do some digging to find a more complete description of what problem had been assigned to the Problem 34 subcommittee. I found a great description in *ISCC News* No. 224 (May-June of 1973). This newsletter states that "The work of the Subcommittee on color difference problems will involve a careful comparative study of color difference formulas in existence." (Note to self: Those ISCC newsletters might be a good source of historical information about color stuff.)

Spoiler alert! For those who want to wait until the 2025 and 2026 Blast from the Past columns to find out how the story of CIELAB plays out, stop reading here. But I will give a bit of an idea about what Problem Committee 34 found. In 1973, Rolf Kuehni surveyed 73 manufacturers and found that they were computing color differences 13 different ways. Richard Hunter listed the efforts toward color tolerancing that were made prior to the publication of his 1975 blockbuster book *The Measurement of Appearance*. He counted ten distinct color spaces, and twenty-four different ways to compute the difference between two colors. We had a colorimetric Tower of Babel.

In 1965, Burt Bacharach wrote these prophetic words:

- What the world needs now is a universal standard for measuring color differences.
- It's the only thing that there's just too many of.
- What the world needs now is one stinkin' formula to assess color tolerance.
- No not just for 1 deltaE, but for every deltaE.

Bacharach was way ahead of his time, especially for a guy who never went to RIT or Clemson or NC State!

Bibliography

Peter Kaiser and Robert M. Boynton, Human Color Vision, 2nd ed. Optical Society of America, 1996, p. 537
John Seymour, Response to Hue Angles ISCC 498, ISCC Issue 499

Image of Clemson's Color Sciences PhD in 1968.

Apes and many Old World monkeys have trichromatic vision very similar to that of humans.

Color Research and Application Highlights

Michael J. Murdoch

In this column, I highlight articles by ISCC authors in Color Research & Application. The most recent issue 48(5), a Special Issue on Environmental Color Design, includes one Applied Theory Article and two Research Articles by ISCC members.

Theory to practice: Pleasure-Arousal-Dominance (PAD) theory for architectural color design

Ellen Divers
https://doi.org/10.1002/col.22847

How do architects choose colors in the design process? How do they purposefully design color usage to elicit the affect (or, perhaps, "feeling") they want people to experience when they enter a space? This article brings science to the design process, specifically using the Pleasure-Arousal-Dominance (PAD) theory and reminds readers that when it comes to PAD affect responses, value and chroma have stronger effects than hue.

Divers provides context to the design process, the joining of function and form, and the role of color trends, which currently tend toward achromatism. (Achromatism refers to the use of only neutral colors—black, white, and gray—being used in decorating.) She points out that much of the most familiar guidance on the use of color in design is oversimplified to ascribe meaning to hue, often based loosely on studies that only included high-chroma samples of different hues. Countering this approach, PAD theory, well known in psychology, was applied to color by Valdez & Mehrabian (V & M) in their article, *Effects of Color on Emotion*, which appeared in 1994 in the Journal of Experimental Psychology. Importantly, V & M included variations of value and chroma and found that these shifts drastically altered the "meaning" of hues. Reinforcing this way of thinking, Divers includes a table of seven more recent publications that also found value and chroma to drive emotional responses.

The relationships of the PAD dimensions to color are illustrated nicely, including a figure showing a red-hued color grid, apparently from Munsell, in which the value dimension is correlated with Dominance, with high Dominance at low value; the chroma dimension is correlated with Arousal, with Arousal increasing with chroma; and Pleasure is indicated along the top edge of the grid of colors, including the lighter and more chromatic colors ranging from the whiter, paler examples toward the purest red hue sample.

Discussing how architectural designers might use the PAD theory in their color choice process, the article describes several examples and the importance of warm versus cool.

Highlighted is a study that compared mixed-hue color palettes varying in levels of value and chroma, with perceptual emotional responses listed. Clear effects are visible here, and Divers describes a designer combining colors drawn from these palettes with a delightful analogy of a chef blending basic flavors like salty and sweet. Similarly, the designer may find themselves making adjustments in the design process to get the final result they desire. Bon appétit!

Color induction in the restoration of architecture in historic city centers

Juan Serra, Ignacio Cabodevilla-Artieda, Ana Torres-Barchino, Jorge Llopis
https://doi.org/10.1002/col.22856

You have undoubtedly noticed that the color of an object can depend on the color of its surroundings. This effect, known as *simultaneous contrast or chromatic induction*, is a frequently used demonstration in art education and color science classrooms, and many artists have taken advantage of this effect in their work. In this paper, authors Serra, Cabodevilla-Artieda, Torres-Barchino, and Llopis address chromatic induction in historic Spanish architecture, focusing on the perceived color of ornamental elements as affected by the main color of the building façade.

In the buildings studied, the façade colors were predominantly warm, medium-chroma colors. The ornamental elements were nominally light and low-chroma, when viewed in isolation, but appeared lighter and cooler due to the induction effect of the warm surrounding facades.

The paper begins with some excellent context, explaining how interpretations of Modernism in the past century have led to lower chroma in newer architecture and contributed to the degradation of historic buildings in city centers. A 30-year effort on the part of the authors' institution, Universitat Politècnica de València (UPV) has systematically researched and restored the historic colors in Spanish cities and provided color plans and regulations to steer development and restoration back to historical accuracy and cultural value. Building on this previous effort with an objective of making color selection easier in the restoration of historic buildings, the authors undertook a focused study on chromatic induction with historically relevant colors.

A systematic study was executed using nine typical ornamental colors and with twelve historical background (façade) colors, all tabulated with their NCS color specifications. All possible combinations of ornamental, as a smaller figure rectangle, and large background colors were arranged on boards for visual evaluation and color matching.

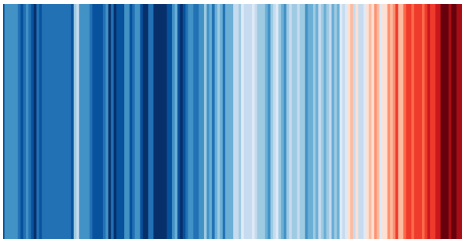
Observers viewed these boards at a distance and selected the best matching color for each figure color from an NCS atlas on a table in front of them. As expected, the observers' perceptual matches were physically different from the nominal figure colors, due to the chromatic induction effect, and the results of the study demonstrate the difference between nominal and induced colors. The authors explain a range of observed effects, including one key finding that was a[nother] confirmation of the expected "direction law" of Ekroll and Faul's 2012 paper "New laws of simultaneous contrast?" which says that the figure color is perceived as shifted further away from the background color along a line connecting them in color space, especially when the color pair are opposing each other in the color circle, for example warm and cool. Another interesting finding is that the similarity in hue between the figure and background was not indicative of the size of the induction effect, which appears to refute some previous work. In any case, the results are especially valuable in the limited domain of historical color combinations but may not generalize to all color combinations. What colors will you paint your building?

Environmental color interventions on a macro scale: Tactical urbanism and issues of global concern

Zena O'Connor
https://doi.org/10.1002/col.22845

What's with the red and blue stripes? Why are we seeing Ukrainian blue and yellow on international monuments? In this article, Zena O'Connor addresses "tactical urbanism," which might be thought of as a subtle form of activism, in which color is used in a surprising way to create awareness about current events and cultural change. In general, tactical urbanism can refer to intentional changes to the visual landscape to communicate something specific, ranging from localized identity and wayfinding to geopolitical statements. Tactical urbanism may be an unofficial, guerilla-style intervention or one organized by a municipality or private entity. O'Connor here focuses on a global trend of coordinated visual changes occurring in multiple localities simultaneously, bringing two case studies: climate change and support for Ukraine.

The first case study shows some of the many uses of the color motif *Warming Stripes*, a data visualization image of the Earth's warming trend, created in 2016 by Ed Hawkins of Reading University (pictured below). This compelling graphic, using a palette of cool and warm colors to represent actual global temperature over a century, has appeared in popular media, fashion design, climate activism communication, and of course urban installations. The steep reddening at the rightmost stripes has a visual impact that clearly communicates the recency and urgency of climate change. O'Connor shows several examples of the stripes reproduced on urban buildings and walls, both as light – projected or self-illuminated – and as painted murals. Examples in the paper include photos of stripe installations taken in multiple countries in Europe as well as Australia.



Warming Stripes, by Ed Hawkins of Reading University: https://showyourstripes.info/ (CC by 4.0 license)

O'Connor's second case study looks at the recent prevalence of the bold blue-over-yellow color combination – said to represent blue sky over wheat fields – of the Ukrainian flag as a visible sign of support for the beleaguered nation. Like the climate stripes, the blue and yellow colors have been used throughout the world. O'Connor includes photos of projected colors on renowned international monuments such as the Eiffel Tower and Sydney opera house as well as painted mural installations on multiple continents, and she points out the prolific display of actual Ukrainian flags in many places. This visible support may have influenced political support for Ukraine's defense.

These two case studies illustrate how distinct color combinations, used throughout the globe in urban environments, can become recognizable symbols for important geopolitical issues, communicating support and raising awareness. Something like a viral trend, the graphic color patterns have been adopted in many cities and countries without any specific coordination, just based on the interest and motivation of local people. The power of color!

ISCC Webinars Report

November Webinar: The Power of Color, Changing Perceptions

Mark your calendar now to register and attend our next webinar on November 7, 2023 at 1:00 pm EST.

Judith van Vliet will present "The Power of Color." With a background as a Product Planning Specialist at Kawasaki Motors, Senior Color Designer at Avient ColorWorks, and Creative Director of ColorForward, Judith van Vliet has traveled globally, presenting color intelligence to various industries, designers and marketers. As the founder of The Authority, she provides color intelligence and serves as Vice President of Membership at the Color Marketing Group, holding various leadership positions for over fifteen years.

Abstract: Color is primal, color is persuasive, and color is powerful. In branding it can affect not just what we buy but how we buy; in architecture it can shape how we navigate an environment; and in clothing it can even determine our productivity. But understanding its influence – and its applications – means understanding its psychology.

Please register at ISCC.org. Our webinars are free and open to anyone interested in attending.

Judith Van Vliet

Fluorescent Fridays

Luanne Stovall

Upcoming Fall Event

The Fluorescent Fridays team is currently working on the Fall schedule of events. Stay tuned for the next event planned for October 27, 2023.

Recent Event

Friday, October 27
Lighting the Way: 21st Century Tools for Digital Color Design.

Speakers:
Dr. Petronio Bendito, Associate Professor, Rueff School of Design, Art, and Performance, Purdue University; Félicia Barrett, (MFA 2022), Rueff School of Design, Art, and Performance, Purdue University; Stevi Eggers, MFA candidate, Rueff School of Design, Art, and Performance, Purdue University.

Petronio Bendito will introduce aspects of the curriculum and will present on digital color literacy, including practical tools for application in the classroom, such as the RGB and HSB color models and an experiment with Augmented Reality (AR).

Félicia Barret (Graphis New Talent Silver Award 2023) will discuss color design aspects of her award-winning MFA project MOTIV. Stevi Eggers will present her color story project Rooted in Friendship, which won the Inaugural Color Design Scholarship Competition held by the International Association of Color Consultants/Designers.

The Inter-Society Color Council created FLUORESCENT FRIDAYS as an online platform for international university students from diverse color-related disciplines to share their research and network with color professionals. The goal is to build a global student chapter that positions color as a multidisciplinary STEAM model (Science, Technology, Engineering, Arts, Math) and provides state-of-the-art color research by scientists, artists, designers, industry professionals, and university students.

FLUOR-
ESCENT
FRIDAYS

Colour Literacy Forum

Luanne Stovall

The Colour Literacy Forum is a virtual platform featuring presentations and interactive conversations focused on updating and expanding 21st century color education at the university level. The Forum is an international, collaborative effort of the joint ISCC/AIC Colour Literacy Project and Cumulus (https://cumulusassociation.org/), the leading global association of art and design research.

The goal of this global collaboration is to align higher level color education with current design needs in the culture and develop an interdisciplinary STEAM (Science, Technology, Engineering, Arts, Math) model that aligns color education with current needs in the culture, provides cutting-edge resources, and offers dynamic networking opportunities for all stakeholders. For more information, see https://colourliteracy.org/colour-literacy-forum.

Colour & the Perceiver II: Colour Vision
Friday, September 29, 11am - 12:30pm EST (via Zoom)

Register at Colour Literacy.org: https://colourliteracy.org/

Colour Literacy Forum #6, Evolution of Colour Vision took place (via Zoom) on Friday, September 29. This forum is the fourth in a 4-part series about color perception. (The first focused on color and light, the second on color and materials, and the third on color and the perceiver).

Three Talks and a Panel Discussion

Forum #6 kicks off with zoologist (and artist) Andrew Parker, who draws on evidence from biology, geology, physics, chemistry, history, and art to guide us through over 500 million years of evolution in the great multiplicity of life forms that developed color vision. Next, Dr. Jay Neitz shines light on the ways that color vision continues to evolve, and the implications of relevant research to our lives, drawing parallels to non-human primates. Dr. Kimberly A. Jameson, whose trailblazing work with new evolutions in color vision involves perceiving a broader spectrum with tetrachromacy, highlights the importance of investigating visual processing variation and alternative observer models for medical, industrial and design applications.

Talk 1: Colour Vision Evolution: In the Blink of an Eye by Andrew Parker

Artist and biologist **Andrew Parker** completed a Ph.D. at Macquarie University, Australia, and worked in the U.S. at the Los Angeles County Museum of Art, Massachusetts Institute of Technology (MIT), and the Smithsonian Institution. In 1999, he moved to Oxford University in the U.K. to further study the science of the natural "technologies" behind the brightest colors he had found on coral reefs and in rainforests. He wrote the popular science books In the Blink of an Eye and *Seven Deadly Colours* based on his "Light Switch Theory," which conceives that the evolution of the eye triggered the Big Bang of evolution.

Talk 2: In Some Ways We See Colours Remarkably the Same; In Others, We Are Remarkably Different by Dr. Jay Neitz

Jay Neitz holds the Bishop Professorship in Ophthalmology at the University of Washington in Seattle, Washington. He works with his wife, Maureen, to answer questions about the biological mechanisms responsible for vision. They are interested in how neural circuits process signals initiated in the cone photoreceptors to provide vision, control axial growth of the eye during development, and modulate activity rhythms and mood. They use a multidisciplinary approach that includes molecular genetics, electrophysiology, light and electron microscopy, and psychophysics.

Talk 3: Is Human Colour Vision Scalable? by Dr. Kimberly A. Jameson

Kimberly Jameson is a cognitive scientist conducting research at the Institute for Mathematical Behavioral Sciences at the University of California, Irvine. Color plays a prominent role in her empirical and theoretical work, which includes research on the mathematical modeling of color category evolution among communicating artificial agents; individual variation and universals in human color cognition and perception; empirical work on the genetic basis of human color perception and the correlated sensory consequences; and comparative investigations of the ways the world's cultures name and conceptualize environmental color. She directs the Color Cognition Laboratory at UC Irvine, and is the lead researcher responsible for the preservation, transcription, digitalization, and public-access dissemination of the ColCat Research Platform that includes the Robert E. MacLaury cross-cultural color categorization archive. Following the three talks is a 30-minute moderated panel discussion with the speakers and the audience.

The Colour Literacy Forum is a virtual platform featuring presentations and interactive conversations focused on updating and expanding 21st century color education at the university and post-secondary level. The Forum is an international effort of the joint ISCC/AIC Colour Literacy Project and Cumulus Association, the leading global association of art and design education and research.

The goal of this global collaboration is to develop an interdisciplinary STEAM (Science, Technology, Engineering, Arts, Math) model that aligns color education with current research and design needs, provides cutting-edge resources, and offers dynamic networking opportunities for all stakeholders. For more information, see https://colourliteracy.org/colour-literacy-forum.

Note: The ISCC is a U.S.-based organization and the terms in its newsletter follow the rules of American English unless a specific word appears in a title. For instance, in the name of the initiative "Colour Literacy" the word "Colour" follows the British spelling, because it's the official name of the project.

Nominating Committee Report

We would like to express our sincere gratitude for the work and service of our colleagues: outgoing Directors Shoshana Burgett, Ellen Divers, and Kate Edwards (all with a term of service of 2021- 2023). We wish them success and hope to have their continued support, counsel, and assistance.

The nomination committee, consisting of Jennifer Kruschwitz, Ellen Divers, Rachel Schwen, Renzo Shamey, and Dave Wyble (chair), considered several potential nominees for the Board of Directors elections and recommended the individuals named below.

In 30 days, the ballot will be sent as a link via email to all members capable of receiving it. Ballots shall be due on the following January 2. On January 16, the secretary shall report the results of the election to the Board of Directors. Please support the activities of the council by participating in the elections and let us know how best we can serve you. This serves as the report of the Nominating Committee to the membership.

From the By-Laws

The report of the Nominating Committee shall be sent to all voting members at least thirty (30) days before the date on which ballots are provided to the voting members. Additional nominations may be made at the request of five (5) voting members, provided they are forwarded to the Secretary within twenty (20) days after the report of the Nominating Committee is sent out. The Secretary shall give notice of all additional nominations to all voting members at least ten (10) days before the ballot is provided to the membership at large.

Sandra Sampson

Sandra is an independent designer with over three decades of experience in graphic, color, product, and materials design. Sandra founded a multi-disciplinary design studio, Simple Modern Style, in 2001 that focuses on transforming color, trend, consumer preferences, and market research into engaging color designs. She has volunteered continuously throughout her 18 years at CMG and is currently Vice President of Education where she brings color education opportunities to the members. At CMG she helped launch Variable's Color Muse, CMG edition, to color design professionals. She works as a CMF Design Lead bridging the gap between color scientists and designers opening doors to unique material colors and applications. She is an alumnus of Art Center College of Design, Eiseman Center for Color Information and Training, and Oregon College of Art. In addition to ISCC, she is a member of the Colour Society of Australia, Detroit Colour Council, CAUS, Industrial Designers Society of America, and the Royal Society for Arts, Manufactures and Commerce. Sandra's ongoing passion for knowledge and innovations in color, materials, and design continually transforms the color design thinking that she applies throughout her work.

Justin Laird

My name is Justin and I'm a color scientist at Apple working on surface color appearance within Operations. Currently, I'm focusing on longer term design projects, determining the best metrology aligning to perception of novel material and parts. My work blends color science with manufacturing principles in order to achieve successful launch of products in multiple fields such as wood coatings, anodized aluminum, PVD, ink and paint coatings.
Prior to Apple, I worked for Gunlocke as a color scientist and manager and established methods for color managing wood and incoming coating materials. Before my career in manufacturing, I worked at Philips as a color researcher investigating wide gamut algorithms for LCD and LED displays. I received my Master's degree in Color Science at the Munsell Lab at RIT in 2005. Prior to RIT I was in the USAF and NYANG for 10.5 years. Outside of work I spend time with family, ride motorcycles and manage a hobby farm growing coffee in a greenhouse.

Robin Kingsburgh

Robin Kingsburgh is a trained astronomer and painter. Her background in science comes from the University of Toronto (B.Sc. 1988) and University College London (Ph.D. in Astronomy, 1992). She worked as a postdoctoral fellow in Baja California at the University of México from 1993-1996. Her painting experience comes from studies in Toronto (University of Toronto), France (Aix-en-Provençe) the U.K. (continuing education at the Slade School, London), and Haliburton (Haliburton School for the Arts), and has paralleled her scientific development. She has longstanding interests in the intersections of art, science and education. Robin currently teaches various natural science courses at York University, including Understanding Colour, Astronomy, and The Nature of Time. She has curated numerous shows and events in the Toronto area, featuring artwork inspired by the ideas and methodologies of science. She is President of the Colour Research Society of Canada, and has served on the CRSC Board for 10 years. She was Co-chair and also Program Co-chair for AIC 2022 held (online) in Toronto. She has been a member of the Colour Literacy Project since 2018, and recently completed a sabbatical year devoted to developing educational materials for teachers, including Teacher Guides and foundational material for the CLP website. She is a member of the Ontario Society of Artists and exhibits regularly in southern Ontario.

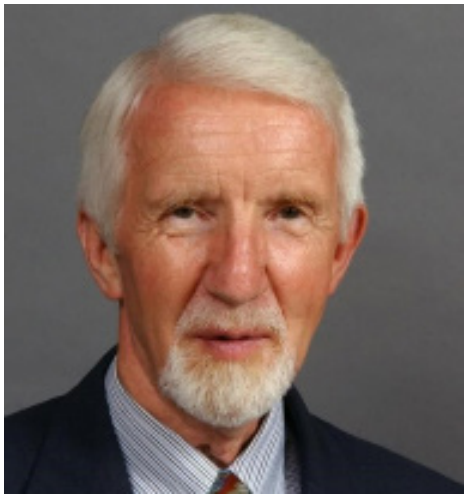
AIC 15th Congress

Chiang Rai, Thailand, November 28 - December 2, 2023

AIC Judd Award Citation for Professor Rolf Georg Kuehni

Renzo Shamey[1,2], Paula J. Alessi[1] and Roy S. Berns[1]

ISCC is proud to highlight that one of our most prestigious members, Professor Rolf G. Kuehni, has received the coveted AIC 2023 Judd Award. Enjoy reading the citation that was written to honor his life-long career dedicated to color science.



Biography

Rolf Georg Kuehni is a member of an old family of citizens in Switzerland. He received his basic education in the town of Schoenenwerd, where his father worked as a shoe designer in the Bally Shoe factory. He then moved to Krefeld in Germany for his education and obtained a degree in textile chemistry from Fachhochschule Niederrhein in 1961.

Dr. Paul Ulrich, a research chemist at CIBA in Basel, Switzerland, became Kuehni's supervisor after college in 1962. Ulrich had a deep and broad interest in color and at the time was working on color literature and he encouraged Mr. Kuehni to read some early psychological papers which he later said did not mean much to him at the time. Kuehni was more interested in strength determination of dyes by transmittance and reflectance to make his job easier and more productive. He quickly learned their limitations at a time when instrumentation was still in rapid development. He moved to the United States in 1963 where he eventually became a dual citizen. Being specifically involved in the subject of color matching of textiles he became interested in color technology. In 1965 he joined Verona Dyestuffs, owned by Bayer Corporation, as a Manager of Development and Color Physics. Part of his job responsibility was to try to make use of a Color Eye®. Sometime later he talked the management into acquiring an IBM 1130 computer and thereby began his involvement in computer formulation.
Color quality control, and color difference, became other subjects of

interest. A color course at Davidson and Hemmendinger and meeting Ralph Stanziola were important elements in steering him deeper into color technology.

In 1967 Kuehni became a member of the Inter-Society Color Council (ISCC). Over the course of his employment, he advanced to Vice President Marketing/Textile Products for Bayer Corp. in the USA and also was Vice President in the successor company Dystar Corp. from which he retired in 2001.

During these years he maintained a solid interest in color science, being active in the Inter-Society Color Council and in research committees of the American Association of Textile Chemists and Colorists (AATCC). From 2002 to 2018 Professor Kuehni served as an Adjunct Professor of color science at North Carolina State University in Raleigh, NC.

Contributions to the Field of Color Science and Technology

Rolf Kuehni has spent most of his life dedicated to color science. His major research contributions include color tolerances, indices of metamerism, theoretical bases of metamerism, and modeling hue perception. From 1987-89 he was the editor of the journal 'Color Research and Application' (CR&A). He translated seminal articles by German scholars including J. H. Lambert, A. Koenig, W. Ostwald, R. Luther, E. Schrödinger, and P. Runge into English, published in CR&A. He has written or co-authored nine books on diverse subjects such as computer colorant formulation, introductory color science and technology, and color order systems. During his industrial career at Bayer, he authored approximately 80 peer-reviewed scientific and technical articles as well as encyclopedia articles about color.

Professor Kuehni has mentored numerous color scientists, including Professors Roy S. Berns and Renzo Shamey. At North Carolina State University alongside Professors Shamey and Hinks, he mentored students, delivered lectures on the science of color and visual perception, and oversaw several student projects. Additionally, he co-authored several articles on unique hues and other color topics.

Professor Kuehni has actively participated in the International Commission on Illumination (CIE) as a member or advisor on technical committees, such as TC 1-55 *Uniform Colour Space for Industrial Colour Difference Evaluation*, TC 1-56 Improved Colour Matching Functions, and TC 1-76 *Unique Hue Data*. His expertise in the history of various developments has proved invaluable and assisted members of technical committees in successfully completing their tasks. Kuehni's pointed and precise questions, along with his constructive feedback, have often provided members with a fresh perspective on the problem at hand.

In 1986, he received the Armin J. Bruning award from the Federation of Societies for Coatings Technology in recognition of his significant contributions to the development of the science of colorimetry in the paint and coatings industries.

Professor Kuehni was also heavily involved in the AATCC, and chaired the RA36, Color Measurement Test Methods Committee. He regularly provided detailed information and precise answers to questions and comments related to color and associated test methods. He received the association's most prestigious scientific award, the Olney Medal, in 2005, in recognition of his significant contributions.

The Inter-Society Color Council has recognized his many achievements. He received the Godlove Award, the ISCC's most prestigious award honoring long-term contributions in the field of color in 2003, the Nickerson service award in 2015, and the Munsell Centennial Award for Science in 2018.

The breadth of his expertise and scholarship goes beyond the list of Kuehni's accomplishments as evidenced by his book publications. We will highlight several of these.

Professor Kuehni's second book was *Computer Colorant Formulation*, written in 1975. This was the first book that explained what is "under the hood" of formulation systems used in coloring industries and paint stores to produce custom colors. Kuehni believed that a better understanding of the underlying science and engineering would enable colorists to be more successful in formulating recipes that matched a standard. He introduced the term "colorant formulation" rather than "color matching" that remains in use today.

Color: An Introduction to Practices and Principles is in its third edition. Its table of contents indicates Kuehni's breadth as a color scientist, technologist, and historian:

1. Sources of Color
2. What Is Color and How Did We Come to Experience It?
3. From Light to Color
4. Color Perception Phenomena
5. Orderly Arrangements of Color
6. Defining the Color Stimulus
7. Calculating Color
8. Colorants and Their Mixture
9. Color Reproduction
10. The Web of Color 187
11. Color (Theory) in Art
12. Harmony of Colors

Appendix: Timetable of Color in Science and Art

Chapters 1 – 9 are typical color technology topics. Chapters 10 – 12 are not. These seem to be subjects addressed in color design and color and art books. Only a single author can combine these topics into a cohesive and compelling story.

Color Ordered: A Survey of Color Systems from Antiquity to the Present, cowritten with Andreas Schwarz, is, arguably, the definitive book about color order systems. Its excellence is revealed by Chapters 2–4:

1. Linear Systems
2. Color Diagrams and Color Circles
3. From Two to Three Dimensions

For centuries, color ordering was based on a single scale or described in two dimensions on a single page. However, it is now widely recognized that color ordering requires at least three dimensions. Explaining the evolution and understanding of color from one to three dimensions is a remarkable achievement.

Professor Kuehni can also be described as an expert in the history of color science and its developments. In *Pioneers of Color Science*, co-authored with Renzo Shamey and published in 2020, the achievements, and significant contributions of some 100 historic figures in the field of color science are discussed. He was also the section editor for Vison Phenomena, and Vision Physiology as well as authoring multiple entries in the *Encyclopedia of Color Science and Technology*, Shamey R. (Ed.), Springer International (2023).

Professor Kuehni has also served as an editor, editorial board member, and reviewer of several scientific journals, providing prompt and precise feedback to colleagues and guidance to the younger generation of color scientists and enthusiasts.

ISCC Nickerson Service Award

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 contribution may be in the form of organizational, clerical, technical or other services that benefit the Council and its members. Professor 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, Kuehni edited the ISCC-posted manuscript by I. H. Godlove entitled "The Earliest People and their Colors." Rolf Kuehni 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 and Ms. Ann Laidlaw (ISCC representatives). Professor Kuehni provided an overview of the important contributions of Dorothy Nickerson, for whom the award is named. Professor Kuehni also provided a lecture for students on "How many colors are distinguishable?"




Professor Kuehni receiving the 2015 ISCC Nickerson Service Award, with Professor Shamey, and Ms. Laidlaw

Munsell Centennial Award for Science

The recipient of the 2018 ISCC Munsell Centennial Award for Science was Rolf G. Kuehni. Here are some excerpts from the citation given by Paula J. Alessi:
After more than 30 years working in color for Bayer and BASF in the United States, Rolf retired and became more active than ever in the science of color. As a matter of fact, during his retirement he feels that "involving himself in color saves his sanity". One of the passions that Rolf Kuehni pursued in retirement is understanding why color space metrics like CIELAB did not always agree with visual experience. Kuehni has studied color, color differences, uniform color spaces, unique hues and color order systems both from a current technological standpoint and from a historical perspective. Throughout his career, Kuehni has been a proponent of closer ties between industrial scientists studying and applying color technology and academic scientists studying color vision and developing the foundational principles of color science. Kuehni also has a strong belief in color education as evidenced by his commitment to being an adjunct Professor at North Carolina State University in Raleigh. In his 2008 Hue Angles article, '150th Anniversary of Albert Henry Munsell's Year of Birth' Rolf stated: 'In 1918, the year of Munsell's death, the Munsell Color Company was founded, and the rest is history. Munsell's landscapes and portraits are curiosities today; his color order system is a lasting contribution to our understanding of the world of color.

Rolf G. Kuehni early career years.

ISCC Godlove Award

Rolf G. Kuehni was presented with the prestigious Godlove Award during the ISCC Annual Meeting in Chicago, Illinois in 2003. This coveted ISCC Award was presented to Kuehni for his career-long commitment to color science. For more than two decades Kuehni has been a strong proponent of closer ties between the industrial scientists studying and applying color technology and the academic scientists studying color vision and developing the bases of color science. Below are excerpts from Professor Kuehni's acceptance speech.

The Godlove award is clearly prestigious because among its winners are some of the most important names in color science. When looking recently at the work of Dr. Godlove, I found we have a number of common interests.

…I remember fondly Max Saltzman teaching me the ropes of this [ISCC] organization. Among many other things, I also remember the sharp red pen of Deane Judd correcting our draft for a test procedure on dye strength determination.

As I advanced in managerial rank, the practical side of color more and more retreated to the background. My 3-year stint as the editor of Color Research and Application in the later 1980's was an effort to remain involved and knowledgeable. A general interest in color grew in the areas of culture and art, as well as its history, philosophy, and its role in consciousness.

During my last few months of employment at DyStar and my stint as consultant, I had relatively little meaningful work to do and involving myself in color saved my sanity. I decided to delve again into the mysteries of color space and its divisions, an effort resulting in a series of papers and now a just published book (Color Space and its Divisions, Wiley, 2003). As an Adjunct Professor at NCSU, I can share some of my experience with students and help establish color science as a solid part of the curriculum.

In the last couple of years, I have come to believe that we know in reality considerably less about color perception than is generally assumed. I have recently come across some experimental facts that are very puzzling and make me wonder how much we really know about the variability of trichromatic color perception. The first has to do with standard observers. Using an idea of mine from 1979 a student calculated what we call the transition wavelengths of gray metamers where one is maximal in terms of the square root difference from the other. These three wavelengths are independent of linear transformation of the underlying observer data and are convenient identifiers for observers. The point is that in published observer data we seem to have two distinct groups of observers. It seems important for CIE Committee TCI-56 to arrange for additional experimental data to determine the effect of methodology on the results and separately the variability of observers.

I also looked at ten sets of published unique hue data. These have been established under several different experimental paradigms, from sub-second exposure to lights with black surround to indefinite exposure to arrays of color chips. There is, in my view, no pattern in regard to experimental paradigm detectable in the results. What struck me most, however, are the surprisingly large ranges of individual unique hues. Three of these in fact overlap.

That is, unique blue for one observer can be unique green for another and unique green for one can be unique yellow for another. Most of the papers from which the data have been taken have been published in Vision Research and JOSA and I am not about to doubt their veracity. The findings raise serious questions about the meaning of unique hues as well as the usefulness of color appearance and color difference formulas. Finally, studying past large-scale efforts of determining constant chroma and constant hue differences in global color space, I found that the three largest efforts have produced considerably different results. All three involved more than 10,000 observations. I would not want to claim that one of these results is more accurate. We do not know what causes these differences. It is evident that we do not have reliable, replicated global scaling of color space. The same applies to small color differences.

I think this is good news for the younger people. There is a lot that we do not know about color perception and color science still offers many and large challenges to those wanting to take them on.

Calendar

Aug 3 - 5	IES 2023 Annual Conference, Chicagoland Renaissance Schaumburg Hotel and Convention center https://www.ies.org/events/annual-conference/
Aug 14 - 17	Optica Imaging Congress Boston, Massachusetts Hybrid evento https://www.optica.org/en-us/events/congress/imaging_and_applied_optics_congress//registration/
Aug 28 - 31	CMG Summit Reveal World Color Forecast 2025+ Virtual https://colormarketing.org/event/2023-cmg-summit-reveal/
Aug 31	AIC Full paper submission deadline for AIC 2023 Early Bird registration closes https://aic2023.org/
September 12 - 14	AATCC textile Discovery Summit Greenville, South Carolina https://www.aatcc.org/aatcc-events/summit/
September	Color Literacy Forum
September 18 - 20	Society of Plastics Engineer (SPE) CAD RETEC https://specad.org/cad_retec_2023_homepage/
September 12 - 14	National Association of Printing Ink Manufacturers (NAPIM) Fall Technical Conference, Hilton Chicago/Oak Brook Hills Resort and Conference Center https://www.napim.org/aws/NAPIM/pt/sp/falltech
September 15	Abstracts due for anual meeting of Council for Optical Radiation Measurements https://cormusa.org/second-notice/
September 20 - 21	IS&T Advances in Printing Technology Tokyo, Japan and online https://www.imaging.org/IST/Conferences/AdvPrintTech/AdvancesPrintTech_2023/PrintTech2023.aspx
Oct 4 - 5	Detroit Colour Council Understanding and control of Automotive Effect Colors VisTa Tech Center Schoolcraft College 8:30 – 4:30 https://detroitcc.org/events/dcc-understanding-and-control-of-automotive-effect-colors/

Oct 12 - 13	Internation Color Consortium (ICC) Meeting Cupertino, CA https://www.color.org/schedule.xalter
Oct 29 - Nov 1	Illuminating Engineering Society Stree and Area Lighting Conference (IES) Indianapolis, Indiana https://www.ies.org/events/street-area-lighting-conference/
Nov 6 - 8	Council for Optical Radiaion Measurements Annual meeting - Virtual https://cormusa.org/news-events-3-2/
Nov 7 - 9	AATCC Fall 2023 Research Committee Meetings https://www.aatcc.org/aatcc-events/research/
Nov 10 - 11	SCAD Annual Conference Chicago Marriott Downtown https://scadent.org/events/newportbeach-2023
Nov 13 - 17	IS & T Color and Imaging Conference Paris, France https://www.imaging.org/IST/IST/Conferences/CIC/CIC2023/CIC_Home.aspx?hkey=2b-9f077c-88d0-4baa-b55f-98ed886aba94
Nov 28 - Dec 2	AIC 2023 15th congress Chiang Rai, Thailand https://aic2023.org/
Jan 21 - 25 2024	IS&T Electronic Imaging Hyatt Regency San Francisco Airport https://www.imaging.org/IST/Conferences/EI/EI2024/EI2024.aspx
Jan 24, 2024	E12 Color and Appearance Meeting West Conshohocken, PA ASTM International
Jan 29 - 31	IS & T Advanced Ink Jet Technology 2024 Friboug, Switzerland and Online https://www.imaging.org/IST/Conferences/AdvInkjetTech/Advanced_Inkjet_Tech_2024/AdvI-JTech_Home.aspx?WebsiteKey=6d978a6f-475d-46cc-bcf2-7a9e3d5f8f82&hkey=6d559591-f2c1-4027-9b19-3d0caf378688&7e2e4e0e07d9=1#7e2e4e0e07d9
June 12, 2024	E12 Color and Appearance Meeting Philadelphia, PA ASTM International

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.

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ISCC would like to thank the following people for their time and talents to make this issue.

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Quarterly Newsletter

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