Inter - Society Color Council

Quarterly Newsletter

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Director's Corner

Mary Mello

A Lifelong Journey with Color

My love for color began in childhood, chasing rainbows with my father near Lake Michigan, after summer rains. In grade school, I connected with physics and the science of color. When my father passed in 2017, a rainbow appeared, a poignant reminder of our shared moments and a symbol of comfort.

A Career in Color

In 1993, I started my career as a color technician at Sherwin-Williams, where I worked with Dr. Francis O'Donnell, a key mentor. This is where I learned all about color science and technology. With limited resources at the time, much of my knowledge came from specialized courses and hands-on learning. I gained experience in data interpretation, spectral analysis, and creating color databases. I also pioneered the use of digital imaging technology to identify effect pigments, streamlining color matching and troubleshooting processes. One summer, I built an in-house effect pigment library, a major achievement showcased during customer tours.

In 2001, I joined Accurate-Dispersions to develop colorant databases for architectural paints. By 2016, I returned to the automotive industry, formulating coatings for European automakers at Worwag. Today, as a Science and Technology Color Specialist at PPG in Oak Creek, Wisconsin, I design effect color formulations for a major Milwaukee-based client, continuing my passion for innovation in color.

Throughout my 35-year career, I've worked with amazing companies, collaborated with high-profile clients, and created unique products—building lifelong friendships through the unifying power of color.

Healing with Meditation and Color

The pandemic brought deep personal challenges, including family loss, leading me to find healing through color and nature. I spent hours in my garden creating floating flower mandalas, a practice that helped me navigate chaos and loss.

Now called "Fleurish," I teach this meditative experience, guiding participants to create floating flower mandalas in water, engaging their senses with touch, texture, color, and scent, alongside soothing sounds. In 2022, my work was featured in Spiritual Botany's Creative Works, Issue 8, celebrating the intersection of art, nature, and healing. Inspired, I pursued certifications in the healing arts and launched Botanic Flora Apothecary, offering holistic products, meditation services, and pressed flower artwork.

Finding My Color Tribe

Attending the 2018 Munsell Color Symposium, I found my tribe and reignited my passion for color. Now, as a board member, I'm honored to advance color education and grow the ISCC community. In 2022, I contributed to the Fluorescent Fridays talk, focusing on color and industry. My role involved helping students gain insights into practical applications, such as batch control, liquid color shading, and leveraging data to achieve optimal results. I am pleased to continue collaborating with the Fluorescent Fridays team, and I am confident that this ongoing partnership will be highly impactful and rewarding.

Color has been a lifelong source of joy, inspiration, and healing, and I'm excited to continue exploring its endless possibilities.

Let's Connect!

Mary Mello

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A Blast from the Past: ISCC Newsletters 50 Years Ago

Dave Wyble

Issue 236, from May-June 1975, includes a thorough report of the inner workings of the ISCC as well as all the Member Bodies at the time.

Careful readers will recall that in the previous issue I reviewed the ISCC Newsletter No. 234, published for January-February 1975. Unfortunately, Issue 235 is missing from our archives, so I will move on to Issue 236, May-June 1975. This issue is a long one, being the annual report issue for the council. Short reports are included from each member of the executive committee, each of the numerous subcommittees, as well as each of the Member Bodies. Remember that at this time, Member Bodies were dues-paying organizations who sent voting delegates to the Council. These organizations, by virtue of these voting delegates, made all major decisions regarding the Council and its activities.

After the initial reports by the officers and treasurer, including every line in the budgets for 1975 and 1976, we see that Dr. David Macadam was appointed an Honorary Member of the Council. I include just the first paragraph of his accomplishments that led the Board to come to this unanimous decision:

> Dr. D. L. MacAdam has devoted his life to the advancement of color science. After his graduation from MIT, he joined the Research Laboratories of the Eastman Kodak Company, where he made contributions in depth to the fields of colorimetry, color photography, color television, camouflage detection, and color standardization. He obtained basic data on visual sensitivities to color differences in use by most color industries and laboratories throughout the world.

These "visual sensitivities to color differences" are what we now refer to as Macadam Ellipses [1], work he published three decades prior to Issue 236, in 1942. These ellipses represent a foundational basis of much of the color difference research going on today, more than 80 years later.

Following the Macadam announcement, we learn that Dr. Vincent C. Vesce was to be the next recipient of the Godlove Award.

[1] For an in-depth discussion on Macadam Ellipses, refer to "Pebbles on the Beach" in issue 509.

What is most remarkable about this is that Dr. Vesce was nominated by five Member Bodies: American Artists Professional League, Dry Color Manufacturers' Association, Federation of Societies for Coatings Technology, National Paint and Coatings Association, and Society of Plastics Engineers. He truly represented the breadth of the ISCC, as it was then, and as it still is today.

The next section included reports from each of the active Problem Committees. To reinforce the breadth of these investigations, and therefore that of the interests of the Council in general, here are the Problems that were reported:

- Survey of Color Terms
- Survey of American Color Specifications
- Color Aptitude Test
- Colorimetry of Fluorescent Materials
- Procedure and Materials for Accurate Color Measurements
- Strengths of Colorants: Dyes
- Strengths of Colorants: Mass-Colored Fabrics
- Strengths of Colorants: Pigments
- Indices of Metamerism
- Color in the Building Industry
- Photography and Printing
- Human Response to Color
- Color Difference Problems
- Color and Appearance Matching of Living Tissue

Of these I will highlight one: Color and Appearance Matching of Living Tissue. It seems that the work that this committee was performing was, in part, based on the Master's thesis of Stephen Bergen (later, Dr. Stephen Bergen). Steve is still active in the Council, being the keeper of the physical Nickerson Awards, although his ISCC resume is much longer than that! To recognize his contributions, Steve was granted Honorary Membership in 2014.

What follows are the individual reports from the Member Bodies. I will not list all of these individually, but what struck me most are that the names I see associated with the Member Bodies are in so many cases the same names I see on the ISCC awards pages. Franc Grum, Louis Graham, Cal McCamy, Harry Hammond, Waldron Faulkner, to cite just a few. These names, and many others, are on the list of Honorary Members, Godlove award recipients, and past Presidents. I can think of no clearer indication of how the ISCC was truly an organization of organizations!

ISCC Webinar Report

Ann Laidlaw

May Webinar

On May 13, John Seed and Gabrielle Selz will give a joint presentation on Sam Francis and Color.

John Seed and Gabrielle Selz

Sam Francis (1923-1994) was an internationally acclaimed Abstract Expressionist who spoke of color as a “kind of holy substance” and “receptacle of a feeling.” In this webinar, art historian John Seed and Francis’s biographer Gabrielle Selz will explore the artist’s fascination with color, and the varied effects and meanings he generated with it over the span of his career. They will also talk about his collaborations with Daniel Cytron, a studio assistant who for three decades manufactured custom acrylic color dispersions and printing inks to Francis’s specifications.

John Seed is professor emeritus of art and art history at Mount San Jacinto College in Southern California. Seed has written about art and artists for publications including The Huffington Post, Arts of Asia, and Hyperallergic, and is the author of Disrupted Realism: Paintings for a Distracted World.

For over a decade Seed has also served as a board member for the Los Angeles-based Sam Francis Foundation.

Gabrielle Selz is an art historian, fine art appraiser, and award-winning author. Her most recent book, Light on Fire: The Art and Life of Sam Francis, was the first comprehensive biography of Sam Francis. It was awarded the Silver Medal for Best Nonfiction by the California Book Awards 2021. Her previous book, Unstill Life: Art and Love in the Age of Abstraction, received the best memoir of the year award from the American Society of Journalists and Authors (ASJA) and was listed as one of the best books of 2014 by the San Francisco Chronicle. Her essays have appeared in The New Yorker, More Magazine, The New York Times, The Los Angeles Times, The Daily Beat, Literary Hub, Berkeleyside and Newsday, among others. Her art criticism has appeared in Art Forum, Hyperallergic and Art Papers.

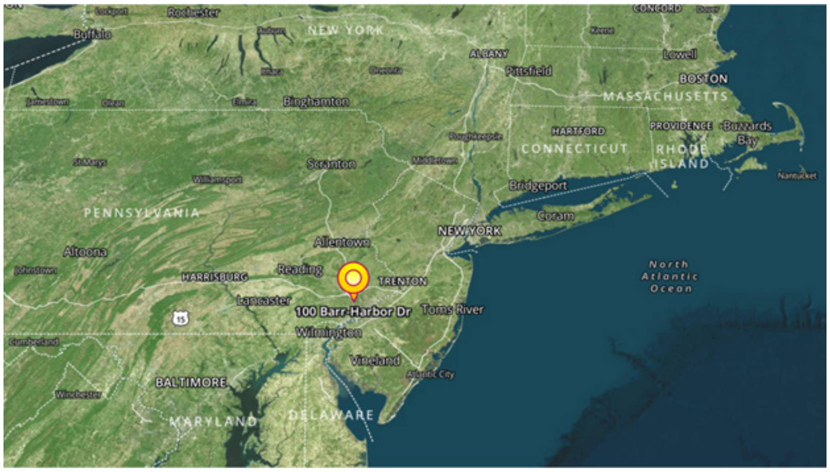
The Glamorous World of ASTM E12

Stephen Dolph

This article provides insight into some of the happenings and upcoming events of ASTM E12. More information can be found on the E12 page of the ASTM website at: https://www.astm.org/membership-participation/technical-committees/committee-e12 You can also direct questions to Jamie Huffnagle at jhuffnagle@astm.org.

ASTM E12 Main Committee Meetings

ASTM Committee E12 on Color and Appearance met January 29–30 at ASTM International in Conshohocken, PA with a hybrid component via WebEx. While many members enjoy meeting each other in person for these semiannual meetings, the hybrid option makes participation accessible for members who are reluctant or unable to travel. Our summer meeting will be conducted virtually online June 2–3 due to travel schedule restrictions of E12 members that also attend Color Impact 2025. Our winter main committee meeting will be February 2–3 in Atlanta, Georgia.



Conceptualizing Cascading Color (and Appearance) Contingencies

One of my favorite contributions from ASTM E12 is ASTM E284 Standard Terminology of Appearance. This provides a large number of definitions specific to color and appearance.

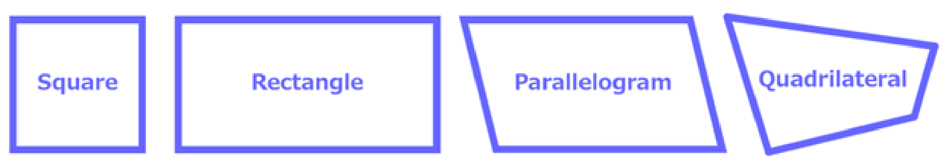
Some of my favorite color science texts (and probably your favorites too) reference ASTM E284 because the definitions therein are clear, concise, and formally standardized. I personally like to reference it to settle disputes with my colleagues.

Just the other day, I explained to my boss what an imaging spectrometer was and he didn't believe me. Opening my trusty Annual Book of ASTM Standards (Volume 06.01), I turned to E284 to prove my point. Much to my dismay, I found no entry for imaging spectrometer! Fortunately, ASTM Subcommittee E12.01 is here to save my bacon by adding a new definition of imaging spectrometer (pending subcommittee and committee approval). Yay!

As part of the team tackling work item WK85019, we proposed new definitions for imaging spectrometer. Many ideas have been brought to the table and lively discussions have ensued.

But writing definitions is rarely unexacting. Some definitions are dependent on the definitions of other terms. In this case, imaging spectrometer is a specific type of spectrometer and is dependent on the definition of spectrometer. Some of the discussion on the imaging spectrometer definition sparked reexamination and discussion of the definition of spectrometer. When we revisited spectrometer, more questions arose. This is rather similar to the nested definition of a square you learned in elementary school:

- A square is a **rectangle** with sides of equal length.
- A rectangle is an equiangular **parallelogram**.
- A parallelogram is a **quadrilateral** with two sets of parallel sides.
- A quadrilateral is a **polygon** constructed of four sides.
- Etc.



Some other definitions rely on the definition of spectrometer, and as such any changes to its definition cannot be taken lightly because the consequences of the changes with cascade down to all dependent definitions.

If you would like to become involved with this work group or Subcommittee E12.01, please contact Jim Leland at j.leland@gigahertz-optik.com.

Difference? What Difference?

> Respectful response and scornful response
> How much is the difference?
> Goodness and evil
> How much do they differ?
>
> *–Lau Tzu*

CMC Color Tolerance Equation and DIN99o Color Difference Equation
How much is the difference?

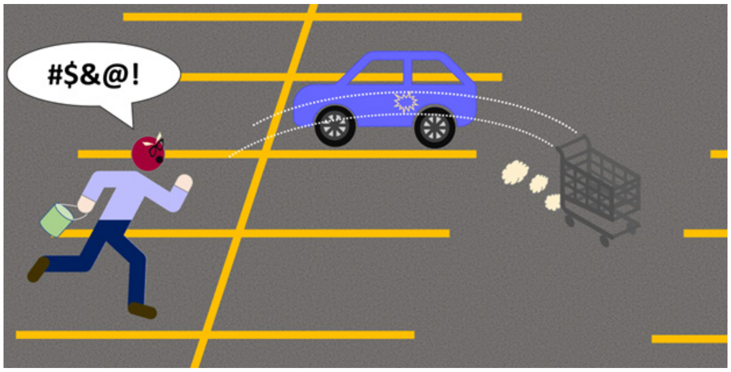
CIE94 Color Tolerance Equation and CIEDE2000 Color Difference Equation
How much do they differ?

This may be philosophical, but which of these four color difference equations standardized in D2244 should be used? This is a question that arose during the ASTM E12.04 Subcommittee meeting. Different difference formulae may perform better or worse than others, depending on the application. For example, DIN99o is commonly used for gonioapparrent colors, while CIEDE2000 has widespread use across industries that measure diffuse colors. CIE94 was developed using only semigloss coatings on metal substrates, the RIT-DuPont set, while CIEDE2000 was developed using that same set of data in addition to two others. As such, CIE94 may perform better than CIEDE2000 for specimen with similar appearance to the RIT-DuPont set. No work item is opened yet, but providing a recommendation or recommendations for color difference equations based on use case may be proposed as a new work item if interest exists.

All that Glitters is not Gold, but Sparkliness is Still Pricey

Scenario: You find yourself lying back in the dentist chair for a root canal. (I bet you regret purchasing all that discounted candy after Easter.) While physically comfortable, you are subjected to hours of DIY home improvement programming with the advertising and product placement entering your subconscious. The next day, you have the urge to paint your kitchen a new color and pick up a few color swatches after work. You return to the store after checking the swatches under various lighting conditions – natural, artificial, and mixed – in your kitchen. After parking your brand-new car strategically far from the store entrance and any cart corrals, you enter the store to pick out your new paint for your weekend warrior project. With your 60-dollar gallon of flat paint in hand, you exit the store.

Approaching your car, expletives fly as you realize a rogue shopping cart (or a shameless vehicle operator who neglected to leave a note) managed to not only dent the rear driver side door, but also scrape along the rear quarter panel to the front door. (This really isn't your week.) You get an itemized estimate for the repair; painting alone is $2,400! Reeling from price shock, you contemplate why painting your car is 40 times more expensive than painting your kitchen.



Shortly after the collision.

The entire answer is complicated as the paints differ in formulation and constituent ingredients which produce very different chemical and mechanical properties. However, a large portion of that price disparity stems from the complex processes required to make gonio-apparent coatings look uniform over large, contoured surfaces.

For those who love etymology, gonio comes from the Greek gonia, which means angle. Apparent comes from the Old French apparent which originates from the Latin apparent, the verb form of apparere. This Latin verb was constructed from ad, meaning towards, and parere, meaning come into view. This means that gonioapparent coatings change appearance with illumination and viewing angles.

Most automotive coatings create eye-catching, gonioapparent coatings with the use of effect pigments, such as metallic flake and/or mica. Among other things, the particle size, shape and orientation can critically change the appearance of the effects at given illumination and viewing angles. This leads manufacturers to utilize specialized equipment to produce effect pigments of uniform size and shape, follow careful process control when mixing the pigments with the other constituent materials of the coating, and adhere to robust surface preparation and application procedures. All this and more is required to achieve uniformity in pigment distribution and flake orientation within the coating.


Simple "straight shade" painted kitchen (left) and gonioapparent coated vehicle (right)

The physics and perception of gonioapparent materials are complex and intriguing topics of research with evolving methods of measurement and characterization beyond the scope of a newsletter article. If you are interested in learning more or contributing to the field, you can join the ASTM task group developing work item WK84807. ASTM Subcommittee E12.12 continues developing this guide for "New spatial and color appearance attributes of gonioapparent materials." The rationale of the guide is to:

> *Establish the optical and visual principles of measuring gonioapparent colors, with special focus on the new spatial and color appearance attributes for better quality controls for industry, as for instance for sparkle and graininess.*

Collaboration is welcome. The easiest way to join the task group is to first become a member of ASTM committee E12, but membership is not required to join the task group. For more information, contact Francisco Verdu at francisco.verdu@axalta.com.

First Contact

As this is a relatively new feature in the ISCC Newsletter, I would like to give a high-level overview of the committee structure for those who are unfamiliar with ASTM International. ASTM Committees each have a defined scope that covers a general subject area, for example Committee E12 covers the areas of Color and Appearance. These committees are composed of subcommittees that address specific segments of the general subject area. In this article you may have gained a little flavor of Subcommittee E12.01 on Terminology and Subcommittee E12.12 on Gonioapparent Color. Within these technical subcommittees, work items are created to establish a means of collaboration where participants can document and discuss the topic at hand, such as creation or revision of a standard.

They may also set up virtual or in-person meetings. For example, work item WK84807 was discussed earlier which has had several virtual meetings in the past few months. This structure is simple yet practical. Working groups collaborate and propose ideas to the subcommittee. These working groups are led by a technical contact whose primary responsibilities are to author new drafts of standards or revisions of existing standards, and consider revisions needed based on inquiries. Then the subcommittee can vote to accept, reject or modify these ideas via subcommittee ballot before presenting them to the main committee. Finally, the main committee votes to accept, reject or modify any ballot measures that have passed subcommittee ballot via a main committee ballot. This ensures that any additions, removals, or changes to standards have been discussed critically before implementation.

Vulcan greeting, usually accompanied by the phrase "Live long and prosper."

Currently, ASTM Committee E12 has 11 technical subcommittees, each with a chair that helps coordinates the activities (i.e., review, revision, reapproval, withdrawal, and new work items) that fall under the subcommittee's jurisdiction. With each subcommittee, each standard and draft standard has an assigned technical contact.

Currently, Subcommittee E12.04 has an open vacancy for the technical contact of ASTM E313-20 Standard Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates. Thank you to the former technical contact, Ellen Carter, for her service. Since the standard already exists, the technical contact would primarily focus on considering revisions needed based on inquiries, as well as drafting such revisions.

The technical contact may be asked to address technical questions with respect to the standard; however, official interpretation of standards is not permitted by ASTM membership and staff. Instead, the inquiries can be handled informally by subcommittee chairs and/or technical contacts, but they must clearly indicate that their response is a personal opinion. While people may contact you as the technical contact, the role does not require you to provide a Vulcan greeting, but you can if want. If you are interested in taking on such a position or want more information about the role, contact Jamie Huffnagle at jhuffnagle@astm.org. ASTM membership is required to serve as a technical contact.

Does taking on a leadership role feel like too much of a commitment, or outside of your comfort zone?

No worries, ASTM Committee E12 can always use the help of minds interested in color and appearance. By volunteering your time and intellect, you'll help shape color and appearance standards that will ultimately help users better understand and communicate niche, yet incredibly useful color concepts.

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 (see 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.

Upcoming Forums (Save the Date)

Colour Literacy Forum #12:

Facts and Myths About Color Series - Part 2
Title TBA (will send this soon)
Saturday, May 9, 11:00 am - 12:30 pm EST (via Zoom)

Speakers:

Ellen Divers is an Independent Design Theorist and Researcher whose focus is the development of an evidence-based thought process to help color professionals use color meaningfully in their work.

Esther Hagenlocher is an Associate Professor and Head of Department of Interior Architecture in the College of Design at the University of Oregon.

Summary of Past Events

Forum #11: Facts and Myths About Color Series - Part 1
Colour Misconceptions and Their Impact in the Classroom

https://youtu.be/ALfZDCQH7GI?si=QvXev33SjrC8W0Ip

Saturday, March 1, 11 am - 12:30 pm EST

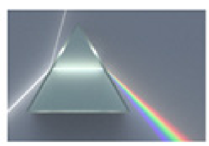
Talk 1: Colour Misconceptions . . . by Robert Hirschler

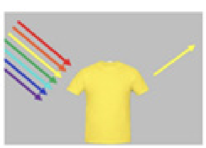
An active member of both ProCor (Brazil) and the Hungarian National Colour Committee and a past member of the AIC Executive Committee. Robert graduated from the Technical University of Budapest in chemical engineering/textile chemistry. In 1967, he presented his first paper on computerized colour matching and has been involved in colorimetry and colour science ever since. He was Co-Chair of the Study Group on Colour Education (2010-2024) and Co-Chair of the ISCC/AIC Colour Literacy Project (2019-2024). Current research interests include teaching the basics of colour science to architects, artists and designers, and the colour theory of neo-impressionist painters.

Misconception: Colours have universal symbolic meanings.

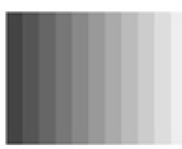

Misconception: People who are 'colour blind' see the world in black and white.

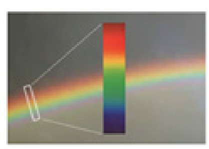

Misconception: Magenta is not a 'real' colour.


Misconception: Light rays (or their wavelengths) are coloured.


Misconception: Yellow objects reflect only yellow wavelengths.


Misconception: Colour and hue mean the same thing.


Misconception: Black, white and grey are not colours.


Misconception: The rainbow (or spectrum) contains all the colours we can see.

Color misconceptions on Colour Literacy Project website:
https://colourliteracy.org/fundamentals-1

Robert Hirschler invited the audience to visit the Colour Literacy Project website to learn about the deeply entrenched color misconceptions that permeate color education in the classroom. He singled out four common misconceptions to discuss in his talk.

Misconception #1. The first misconception he addressed is that all colors can be mixed using a set of three primaries, a notion with deep roots.

He emphasized that color is a perception, and colors cannot be mixed; but you can mix lights and paints and inks and other materials. Then he took a step back to 1664 when Robert Boyle formulated that a few simple and primary colors can mix all the hues and warned that these basic colors often fail to imitate the splendor of the colors that we see.

One reason this misconception is so widespread is that Johannes Itten published his influential book *The Art of Color* in 1961 and never provided a precise definition of primary colors. In fact, Hirschler added, if we analyze Itten's book with a spectrophotometer, you can easily see that Itten's color wheel was not constructed with red, yellow, blue primary colors. Instead, it was based on the CMYK printing inks. Other color models like Munsell, the Natural Colour System (NCS), and CIELAB have four or more primary colors. And additive systems like human color vision and digital media are based on red, green, and blue. High resolution printers can use six or more colors for a wider color gamut, and painters use as many colors as they need.

Misconception #2. The entrenched idea that a simple color wheel is all we need to illustrate all of the color relationships. Robert described the first hint of a three-dimensional color space in 1758, when Tobias Meyer realized that a simple color wheel needed to extend to lighter colors by mixing with white and darker colors by mixing with black. In 1905, Albert Munsell came up with the idea of a color solid based on Otto Runge's 1810 color sphere. A few years later, Munsell realized a three-dimensional model would need to have an irregular shape to account for significant differences in the lightness and chroma of the hues.

Misconception #3. There are simple rules that guarantee color harmony. Over the centuries, the audience learned that many authors proposed their version of the rules. But we can see that the rules are biased to the aesthetics of the times and have become outdated. Robert quoted Robert McDonald as a prime example of this deep-seated misconception.

> Thirty years of practice as a designer and colorist have convinced me that there are no absolute rules for color harmony which govern either quantity or quality.

–Robert McDonald, Color Harmony (1949)

Misconception #4. Colors have universal symbolic meanings. Many books deal with the subject of color preferences and make sweeping generalizations about color categories without referencing the total experience that color evokes. He pointed out numerous examples, like the Luscher Colour Test that claims to provide insights into someone's color preferences, and linked this approach to the philosophy of P.T. Barnum, the so-called Prince of Humbug, who understood that certain results may appear effective because they could fit almost anyone.

Next, he shared the work of Ellen Divers, a design theorist and researcher. Divers' work is focused on the development of an evidence-based process based not on the Hue Paradigm––where each color is limited to a saturated version––but on an expanded Lightness/Chroma Paradigm. Her research studies the impact of the lightness and brightness on our psychological response to color. What might be considered harmonious in one context can be entirely different in another. This subjectivity challenges the notion of universal color rules and emphasizes the importance of individual experience and perception.

Robert ended his presentation on an upbeat note, stating that color education should break away from the shackles of traditional color theory and treat color as a dynamic phenomenon to be experienced, explored, and enjoyed!

Talk 2: . . . and Their Impact in the Classroom by Andreas Schwartz

A teacher of Art and English at the municipal girls' high school in Essen-Borbeck and a member of the Association for Art Education NRW (BDK) and the Color Literacy Project. Andreas' research focuses on the didactics and methodology of color in art classes, the history of color in art education, the cultural history of colors, the history and theory of color systems, and the history of doctrines of color harmony. He is the author of several colour articles and books, such as *Farbkompetenz, Orientierungshilfen für eine Didaktik zum Umgang mit Farbe im Kunstunterricht*, published in 2022 (in English, *Colour competence - Orientation aids for didactics for dealing with colour in art teaching*).

What happens when the traditional color theory is applied in arts lessons at school?

This question fueled the presentation by Andreas Schwartz, as he challenged conventional color theory education and shared two examples from his research about the ways that current color theory instruction transforms the vibrant world of color into a sterile, mechanical process that stifles students' natural creative abilities and rich, nuanced instincts. For decades, art teachers have systematically undermined students' creative potential by applying outdated theories that reduce color exploration to a restrictive two-dimensional color wheel with predetermined mixing rules.

Andreas began his talk by sharing examples from his experience as a researcher observing students in a classroom setting. The first story involved fifth graders in a German comprehensive school, where they were initially very excited about working with the colorful array of colors in their paint boxes; but their enthusiasm was quashed by the dogmatic rules that the teacher insisted on enforcing in the project. This included only mixing with the "primary colors" red, yellow and blue, which do not make the vibrant greens and purples that are already in the set. The teacher briefly explained color theory and asked which colors can be mixed? One student answered that you can mix all colors, triggering a strong reaction from the teacher, who firmly replied "No, you can't!" Now the class was completely silent, and the way was paved for color theory.

Another example involved a science and physics-oriented sequence on color with students in the eleventh grade.

The lesson started with elaborately prepared learning stations that included a prism experiment, color wheel mixing and additive light mixing using color transparencies, which, in theory, would produce white. But not in this case. Three students switched on the projectors and started discussing what they noticed. One girl hesitantly reported that she saw a lightish shade. Another student firmly disagreed, saying, "No, I don't see that." The first student insisted that's what they learned in physics.
Then, the teacher explained that, theoretically, the color they see should be white, but the transparencies were not all the same thickness, and in addition, one transparency had broken, and he hadn't been able to find a suitable replacement.

Once again, theory was placed above one's own perception and experience. Through these examples, Andreas showed that children are trained to learn what they should see and not what they really see. He shared a quote from the mid-20th century that is still remarkably valid today.

> The teaching of colour by means of the color wheel, color harmonies, and scales, as an end in itself, if of very doubtful value in art education, and the progressive teacher has abandoned this method as harmful since it tends to inhibit the use of color, rather than to develop color consciousness. The reason is that it does not depend on visual experience, but on logic. The memory, and not emotions, control the process.
>
> *-Victor D'Amico 1942*

Andreas concluded his talk with an example of a successful classroom project that provided an opportunity for the students to exercise their pronounced color perception and joy of experimentation. He emphasized the vital role of educators to allow young people the freedom they need and encourage their abilities instead of ignoring or even suppressing them. By embracing color's complexity and recognizing the vitality of our sensory nature, he argued that educators and practitioners can unlock more creative and meaningful approaches to teaching color in the classroom.

Color Research and Application

Michael J. Murdoch

In this month's column, I am highlighting two recent articles in Color Research & Application. Both address aspects of individual differences in color vision sensitivity, but each chooses a different approach to this complex topic. Just like hair color and height, color sensitivity varies between individuals, even between individuals with "normal" color vision. Color matching and color appearance differences show promise for estimating individual color sensitivity, which might be applied in image color reproduction.

Individual color matching functions from cross-media color-matching experiment

Che Shen | Mark D. Fairchild
https://doi.org/10.1002/col.22960

Looking for a simple[r] way to estimate individual observer sensitivities? Shen and Fairchild explain their investigation of cross-media color matches, utilizing an RGB display to generate matches to illuminated painted samples. The point of using two media is for the spectral variation, which can cause individuals with different color sensitivity to use different combinations of RGB to match the referenced painted samples. In other words, each individual participant adjusts the RGB values to reach their own personal metameric match. The paper's introduction points out the difference between the color-matching experiments that led to the 1931 Standard Observer – painstaking matches of mixtures of narrowband RGB primaries to a series of monochromatic wavelengths – and recent work that uses parametric models of color sensitivity. The more recent methods also use narrowband RGB primaries (or other colors in some cases), but they are used to match broadband colors, meaning samples with energy at many or most wavelengths. The authors also explain the concept of categorical observers, which are essentially a set of representative sensitivities that cover the range of expected variation.

With a concise visual experiment, an individual can be roughly placed in the nearest observer category, which can be useful even without determining their precise color matching functions.

For reference samples, Shen and Fairchild then created ten spectral reflectance profiles using Golden artist pigments. The chosen reflectances, illuminated in a Macbeth D65 daylight simulator, resulted in broadband samples for the matches arranged on a large disk that could be rotated via a servo motor. For matching, each successive sample was rotated to be side-by-side with part of the display, and the participants adjusted the display color to make a visual match. The authors used the very accurate and narrowband RGB primaries of a mini-LED LCD (Apple XDR) display for the matching experiment, and provided knobs for participants to adjust lightness, chroma and hue (LCh) parameters. Seventeen participants repeated each of the ten matches three times, yielding enough data to assess statistically if the experiment could unambiguously place each observer in an observer category.

The analysis compared the participants' matches to what would be expected from each of the ten categorical observers – essentially, the expectation was that the color difference from the perspective of the categorical observer would be smallest for the category that is a best match for a given participant. In practice, the experiment did not fully succeed in assigning each participant to a single best observer category. But for most participants, it did show that at least one observer category performed better than the 1931 Standard Observer in predicting their visual matches. This small win remains quite valuable in the ongoing search for feasible observer measurement and categorization.

Correcting images for individual differences in color appearance
Camilla Simoncelli | Michael A. Webster
https://doi.org/10.1002/col.22963

Would you like images with color tailored to your individual color sensitivity? Providing a completely different approach to individual differences, Simoncelli and Webster focus on color appearance rather than color matching. They provide an extensive review of previous work on variations in color sensitivity, including some important earlier work from Webster's group developing the concept that the effective result of color sensitivity differences is attenuated by each individual's experience with their own visual system and its adaptations to its input.

They show through simulation that when extreme differences in cone sensitivity are "normalized out" by averaging to gray, each of these simulated individuals would perceive color appearance similarly, but with some variation in hue. The authors review data from a related previous study (Emery et al., Proc Natl Acad Sci., 2023) that shows even wider variation in hue perception than the simulations predicted. The previous study found that when participants scaled hues in terms of combinations of unique hues (red, yellow, green, blue), individual differences in hue scaling were significantly different from the overall pattern.

Simoncelli and Webster repurposed these individual hue scales with the idea that an intended hue percept could be created by compensating for an individual's known perception pattern. In some ways, this is like color management in a display or printer: after determining how the device translates RGB input to measured output, that relationship is inverted to figure out what RGB input is needed to get to an intended output. In an interesting connection, the authors cite an earlier Shen and Fairchild paper (Proc IS&T Electronic Imaging, 2024) that attempted a similar idea, based on individuals' unique hues. Using this hue compensation paradigm, the authors show a set of example images that are customized for individuals' hue perception. To the reader, the result is not so much about correct hue reproduction, but seeing the range of hues that, through perceptual measurements of individuals, are predicted to appear the same for each individual. The differences are not subtle!

The authors follow with a discussion of the potential usefulness of their approach, which would be more valuable with synthetic imagery or data visualization than in reproduction of natural scenes. The distinction is important, because if every individual develops their visual sense in a real environment with percepts tuned to their sensations of the physical world, compensating the physical input may result in unfamiliar perceptions. Nonetheless, this is a fascinating investigation that provides yet another way to discover and illustrate differences in visual perception.

Fluorescent Fridays

Luanne Stovall

Recent Event

Creating Color Stories in Printed Layers

Friday, May 2, 1pm EST via Zoom

Speakers:

- **Laura Crehuet Berman**, Visual Artist, Professor in the Printmaking Department, Kansas City Art Institute (KCAI) USA; Fulbright Senior Scholar (2024), University of Canberra, Australia, where she furthered her research on printmaking and color
- **Esther Bach**, BFA student, printmaker, graduating senior, KCAI
- **Hannah Dixon**, BFA student, printmaker, graduating senior, KCAI
- **Analee Hyacinthe**, BFA student, printmaker, graduating senior, KCAI
- **Sarah Manuel**, BFA student, printmaker and graduating senior, KCAI

This presentation focused on printed color through story and form with Kansas City Art Institute Professor Laura Berman and senior printmaking department students. Esther Bach, Hannah Dixon, Analee Hyacinthe, and Sarah Manuel will share their BFA thesis work in relation to color, process, form and narrative.

The KCAI Printmaking Department teaches a unique course, “Color in Printmaking,” developed by Laura, in which students determine and define their own color story within their artwork.

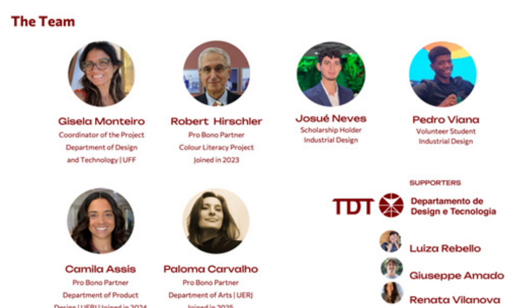
Left to Right: Analee Hyacinthe, Sarah Manuel, Laura Crehuet Berman, Esther Bach, Hannah Dixon

Recent Event

Colour with Purpose in Product Design

On March 21, Fluorescent Friday celebrated International Colour Day by spotlighting Industrial students and faculty from the Department of Design and Technology at Fluminense Federal University in Rio de Janeiro, Brazil.

Check out the video on the ISCC YouTube channel: https://www.youtube.com/watch?v=pwfDuzkLu7o



Speakers:

- **Gisela Costa Pinheiro Monteiro**, Associate Professor, Industrial Design, Department of Design and Technology, Fluminense Federal University (UFF), Rio de Janeiro, Brazil
- **Josué Neves**, Industrial Design student, UFF
- **Pedro Viana**, Industrial Design student, UFF

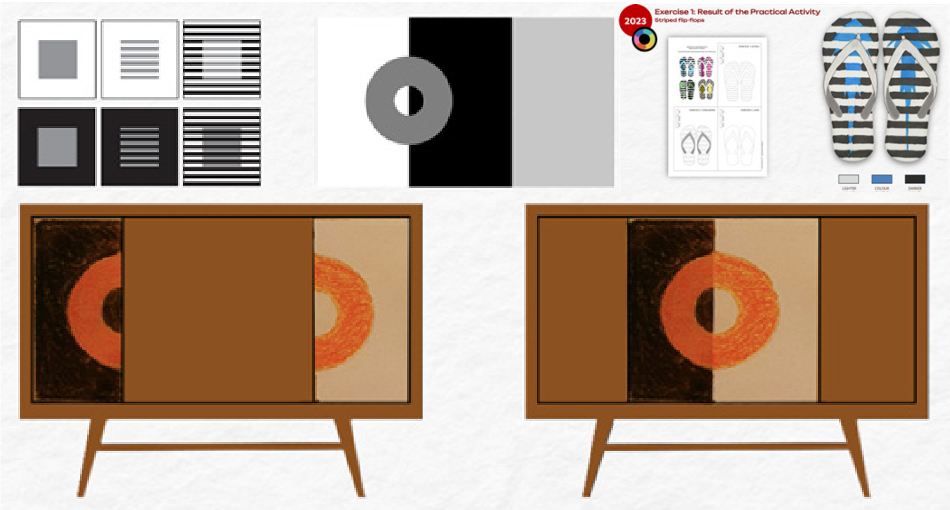
In celebration of International Colour Day, the Fluorescent Friday spotlight illuminated Industrial Design professor Gisela Monteiro and her students Josué Neves and Pedro Viana as they presented Colour with a Purpose, A New Approach in Colour Teaching, an exciting collaborative project aimed at integrating 21st century color literacy skills into the product design process.

Fluminense Federal University and was surprised to find that across the entire university, there were no courses dedicated to studying color. So, she invited Dr. Robert Hirschler, Co-Chair of the Colour Literacy Project (CLP) to work together to create Colours Applied to Design, a rigorous six-month course focused on learning about the fundamental roles that color plays throughout the design process, and exploring the perceptual, cultural, and technical aspects in a series of student-led workshops.

The team grew to include Josué Neves and Pedro Viana, two dynamic student leaders, pro-bono partners from two Brazilian universities, and supporters from the Department of Design and Technology. Online classes were established with Robert Hirschler, where Gisela and her students worked the CLP Eye Opener Exercises, part of an extensive collection of hands-on, experiential exercises that introduce fundamental concepts for exploring color in the 21st century. They also studied the book Colours in the Visual World, by Harald Arnkil, a member of the CLP team from Helsinki. It was exciting to learn that the team was also engaged in translating Arnkil's book into Portuguese!

Hands-on Color Design Workshops

Next, Josué Neves highlighted two of the foundational CLP exercises that were central to the workshops: the Munker-White Illusion and the Koffka Ring. He explained that the object of the exercises was to empower students to use their new skills to justify color choices in future industrial design projects, combining intuition and objectivity in the process. Josué shared examples of how fellow students incorporated color interaction knowledge into their work, applying new color design ideas to enhance the visual appearance of specific products such as the soles of flip-flops.



Munker-White Illusion, Koffka Ring exercises, student color design

The third speaker was Pedro Viana, who described how the students applied insights gained from their experience with the Koffka Ring into class projects, with precise placement of the colors in products like edgy athletic wear and a modernist bookcase. After sharing how this new approach was incorporated into the classroom environment, Pedro and Josué shared behind-the-scenes insights about the process—from working with the initial hands-on exercises to application in the studio—with the goal of applying their knowledge to products destined to be shared with the greater community.

During the last 30 minutes of the event, Josué and Pedro were joined by Professor Monteiro in a lively Q & A conversation with the audience. They shared the excitement that this new approach to color design generated in all of the students, who were thrilled to be part of such an inspiring and empowering color-focused project. They plan to continue developing this new approach to color design as professional designers and 21st century color ambassadors!

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.

John Seymour

Nowadays, you just don't see many new colors being developed. Yes, every few years you will see more colors added to the Pantone book, but those are not fundamentally any different from the colors in the antiquated Pantone books from last year.

Recent years have seen a few fundamentally new colors. In 2016, Surrey Nanosystems filed a patent for VANTA black (McKenna et al.). This coating took a cue from the vertical fibers of velvet which capture nearly all of the surface-reflected light to create a really black fabric. Surrey did this with vertically aligned carbon nanotubes and achieved what was at the time the blackest surface ever created.

VANTA black is technically not a pigment; it can't be just painted onto a surface. There is a complicated process where it is grown on a surface. The most recent new pigment, YInMn, was created by accident by researchers investigating ferro-magnetic materials (Smith). YInMn is a brilliant shade of blue.

But these achievements pale (in the literal sense) when compared to last week's announcement of a new color. Not just a new formulation of existing pigments or even a new pigment, but a fundamentally new color experience. And not just a new color experience, but an impossible new color experience. Are you intrigued?

Impossible colors

The figure below shows the spectral response of the three cones in the human eye. This is the typical response for a 32-year-old individual. The cones are colloquially known as red, green and blue.

The name is fitting for the blue cones, but the broadband nature and overlap between the other two cones makes the name red and green inappropriate. So, color scientists who are properly pretentious call the different flavors of cones L, M and S (for long, medium and short).

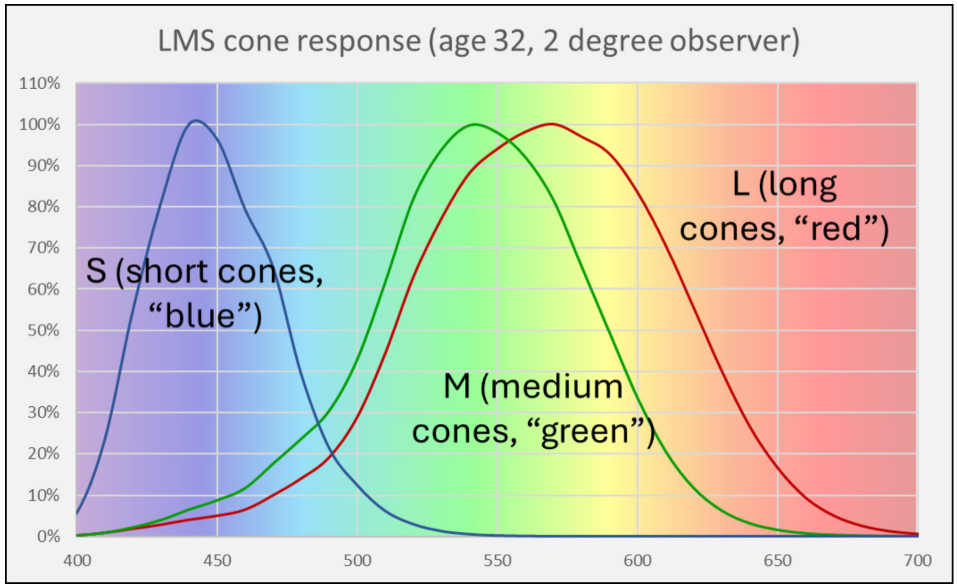


Figure 1 – Spectral response of the three cones in the eye

Let's just say that a human eye views exclusively 400 nm light. Such light sources exist – common violet laser pointers are tuned to 405 nm, and UV LEDs commonly found in flashlights emit light in a similar range. The far-left part of Figure 1 shows that the S cones are stimulated, but the L and M cones are not. This produces a "pure" violet color.

Sliding over to the other end of the spectrum, we can see a similar phenomenon a bit to the right of 650 nm. Again, such a light source is readily available in 670 nm LEDs. If a 670 nm LED is used as an illuminator, the L cones will be stimulated without stimulation of the M and S cones. It is possible to perceive a "pure" red color.

This is not true of the M cones. Any wavelength of light that excites the M cones will also excite either the L cones or the S cones. It is not possible to see a "pure" green!

Figure 2 illustrates the range of impossible green colors. The diagram is a box that represents all possible outputs from the cones. It is possible to create pure black, red, violet, magenta, yellow, cyan and white colors. Unfortunately, the Samurai of the Overlapping Nature of the Spectral Responses of the Cones pulled out his sword and sliced off one corner of the cubical box, giving us what us mathematicians call a truncated cube[2].

[2] The truncated cube image implies that the samurai lopped off a section that was a perfect tetrahedron. I am enough of a mathematician to know that the shape of the impossible greens is more complicated than that. On the other hand, I am too lazy to figure out exactly what the shape is. And as I write this, the new research is 7 days old, and this article was due last week. This is a "stop the presses" moment.

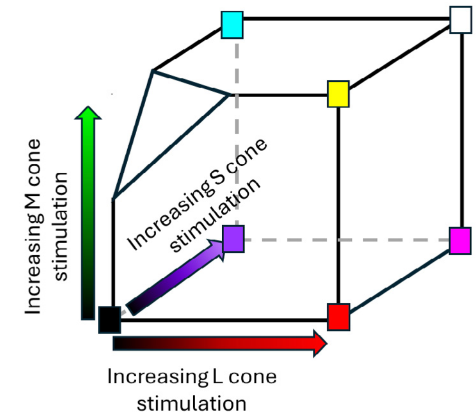


Figure 2 – A stylized view of all possible cone outputs

Thinking outside the box

Needless to say, when physics says, "it can't be done," creative people look for ways to thumb their nose at the authority of physics. One example of creative nose-thumbing is from a blog by a world-renowned color scientist (Seymour) who recognized that negative amounts of light at strategic wavelengths

(through the use of darkons – anti-photons) can be used to erase the L cone and S cone signals. With a clever combination of infraviolet and ultrared light, this incredible guy introduced the world to a color he dubbed ubergreen. This (literally) unbelievable work of science fiction was published on the first of April in 2018.

Crawling inside the box and pushing out the sides

Here comes the interactive part of today's lecture. Please stare at the magenta circle in Figure 3. Focus on the plus sign so that all that mellifluous magenta stays focused on the same cones of your retina. Slowly count to 30. Don't worry. I'll wait. I'm just grabbing a little lunch. When you finish counting, quicky switch to staring at the plus sign in the center of the green circle in Figure 4.

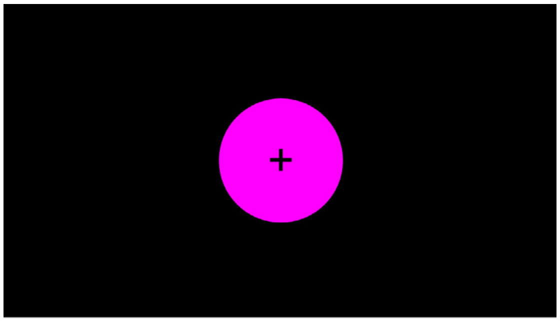


Figure 3 – Mellifluous magenta mark to melt into your retina

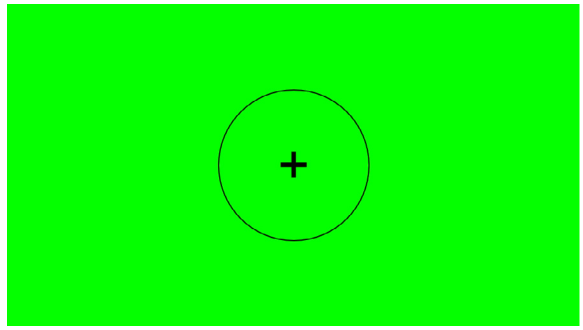


Figure 4 – The nemesis of magenta

When I do this exercise with my classes, those who actually gave up 30 seconds of scrolling on Instagram to stare at the magenta circle will invariably say "whoa" or will laugh. Those individuals just participated in the life-altering ubergreen experience. They saw a richer green circle around the plus sign that was greener than the full-on green in the background. This afterimage gradually dimmed over tens of seconds.

Let me explain.

Take out your cell phone and turn on the live camera. Point the camera at something dark, like my living room with the shades pulled. While watching your live screen, quickly switch the camera to point at something really bright, like any of my students. If there aren't any of my students handy, then point your camera out the window to one of the glorious sunny South Carolinian days. If you don't have a glorious sunny South Carolinian day outside, then I would recommend moving to South Carolina.

I will assume that you have done this little experiment and noted that the live image on your phone was initially way overexposed when the camera was pointed at something very bright, but after a few moments, it adjusted its gain, and the image once again was properly balanced. Cell phone cameras have a feature called auto-gain control (AGC) that continuously adjusts some combination of aperture, exposure time and electrical gain to always provide a perfectly balanced image[3]. If you watch carefully, you will note that the camera also adjusts for color temperature. Under warm lighting, the gain on the blue channel is bumped up to keep the image close to that of "white" illumination.

Our eyes have that same AGC feature, installed in the factory and set to default without a "Settings" screen to disable this feature. The iris provides a mechanical adjustment of gain for AGC, but the heavy lifting is done by a chemical adjustment in the individual cones[4].

[3] Unless you are a real videographer, your cellphone camera will still be in the default "AGC on" mode. For those of you who are real videographers, I suggest borrowing a cell phone from your nebbish cousin.

[4] The chemical AGC mechanism in the cones is fascinating. If you want an explanation of this, send an email to john@johnthemathguy.com and the fascinating cones will be the subject of a future pebble.

Turning back to Figure 3, while you were staring at the mellifluous magenta, your cones were actively adjusting their gains. Magenta is made of red and violet/blue light. Those corresponding L (red) and S (violet) cones who were OD-ing on magenta had their gains turned way down. Since there is a relative scarcity of green light in magenta, the M cones had their gains turned up to eleven.

When you switched to Figure 4, the L and S cones (who had low gain) were suddenly looking at green light, which they are not terribly responsive to anyway. The combination of low gain and relative insensitivity means that these cones were not catching a whole lot of light. The opposite happened with the M cones. When these cones started looking at Figure 4, their gains were relatively high. This effect was emphasized by the fact that the M cones are very responsive to green light. Hence, the overall effect is a green that is impossibly saturated – ubergreen.

Singling out an individual cone

So far, I have explained two ways to see ubergreen. The first makes a "simple" assumption – that you can create negative light. That's great if you are writing color science fiction – which is a great new literary genre that really needs to be exploited. The second is kind of a hack, and to be honest, I'm not as incredibly impressed as I really want to be.

I third technique for creating ubergreen was first explored in (apparently) 2005. The paper that was published last week has this 2005 paper (Hoffer et al.) as a reference. A very tiny beam of light is pointed into a person's eye. The beam will be refracted in the lens and wind up hitting some tiny area of the retina. The magic happens when the beam is smaller than the size of a cone and it only excites one cone. When the beam is moved around, the subjects report the color changing to red and green and occasionally, blue. If the beam happens to hit an M cone, then we have undeniable ubergreen.

This experiment definitely sounds cool but is limited by the fact that only one cone at a time can see this new color, ubergreen.

Singling out all the M cones

The researchers that wrote this paper from last week [5](Fong, et al.) dug deep into their bag of color science toys to create an immersive ubergreen experience for five lucky individuals. The first toy is a retinal scanner with high enough resolution to determine the locations and identities of individual cones.

[5] There were a total of 13 authors for this groundbreaking paper! One of the authors was none other than Sofie Herbeck, who is an ISCC Student Member and a grad student at RIT.

This was coupled with an eye-tracking system so the positions of those cones could be tracked in real time. Is this starting to sound cool?

The next toy they pulled out of their bag was a projector that could project an image onto the retina. That sounds really cool, but really, TVs have been doing that to my retinas for decades.

The final toy is software that has the ability to adjust the projected image based on what type of cone it is hitting. If you set up the rig to project light only to the M cones in certain areas of the image, bingo! The person sees a virtual image that includes ubergreen! Subjects did typical color matching experiments that demonstrated that this was truly a color outside the legal gamut of colors.

Here is a quote from the paper:

> We name this new color "olo," with the ideal version of olo defined as pure M activation. Subjects report that olo in our prototype system appears blue-green of unprecedented saturation, when viewed relative to a neutral gray background.

Now that is ubercool!

Addendum – Where did the name olo come from?

Here is what I think I remember reading. The name is not, as you might expect, a shortened version of the acronym for You Only Live Once. Instead, it is a clever bit of word play. Each of the three letters, O, L and O, represents the state of one of the three cones. For some reason that I can't fathom, O means there's no light at that cone and L means there is light. Hence, OLO means that the M cones are receiving light, but the others are not.

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Calendar 2025

May	
May 1-2	CMG ChromaZone North America Regions 2 day Virtual Meeting https://app.glueup.com/event/virtual-chromazone-workshop-may-01-02-2025-na-marathon-127157/
May 8	UF/FL-ASPRS Spring Geospatial Workshop 2025 Apopka, FL https://my.asprs.org/ASPRSMember/Events/Event_Display.aspx?EventKey=SPRING2025
May 11-16	Society for Information Display - Display Week Exhibition San Jose, CA https://www.displayweek.org/
May 12	AATCC Committee Meetings Raleigh, NC https://www.aatcc.org/aatcc-events/research/
May 13	ISCC Webinar Cutting Edge Color - Sam Francis and Color 2:00-3:00 PM (EST) Virtual https://iscc.org/event-5946252
May 13-15	Society for Information Display - Display Week, San Jose, CA https://www.displayweek.org/
May 15	IS&T Digitizing to International Imaging Performance Standards - Virtual Meeting https://www.imaging.org/IST/Conferences/DigiTIPS/DigiTIPS2025/DigiTIPS_Home.aspx?WebsiteKey=6d978a6f-475d-46cc-bcf2-7a9e3d5f8f82&hkey=85ba7a51-c0be-491a-809d-cdec79ab2ef2&45b5d4abd064=1#45b5d4abd064
May 20	ISCC May Colorful Connections 1:00-2:00 PM (US Eastern) Virtual https://iscc.org/event-6142753
May 29	CPMA Spring Sustainability & Innovation Forum Hatfield, PA
June	
June 1-5	Optical Society of America Optica Quantum 2.0 Conference and Exhibition San Francisco, CA https://www.optica.org/events/topical_meetings/quantum/
June 2-5	ASTM E12 Color and Appearance June 2025 Virtual Meeting ASTM International
June 16-18	ISCC Color Impact 2025 Rochester, NY https://iscc.org/Color-Impact-2025
June 17-18	AATCC Circularity Conference University of Rhode Island, Kingston, RI Circularity Conference - AATCC
June 24	Frontiers in Optics and Laser Science paper submission deadline https://www.frontiersinoptics.com/home/submissions/author-timeline/
June 24-27	IS&T Archiving 2025 Granada, Spain https://www.imaging.org/IST/Conferences/Archiving/Archiving2025/Archiving2025_Home.aspx?WebsiteKey=6d978a6f-475d-46cc-bcf2-7a9e3d5f8f82&hkey=92f0ee33-a36c-4594-be74-d70b6302df03&46c611a9cb64=1#46c611a9cb64
June 25	ASTM E12.10 Retroreflection Sheraton Centre Toronto Hotel E12.10 Retroreflection

July	
July 13-17	Optica Advanced Photonics Congress Marseille, France https://www.optica.org/events/congress/advanced_photonics_congress/
July 27	Preparations for ASPRS Certification Workshop at MAPPS Summer Conference, 1-5 EST Chautauqua Harbor Hotel, Celoron, NY https://my.asprs.org/ASPRSMember/Events/Event_Display.aspx?EventKey=MAPPS0725
August	
August 21-23	Illuminating Engineering Society(IES) IES 25 The Lighting Conference Anaheim, CA https://www.ies.org/events/ies25/
September	
Sept. 4	2025 International Summit | Chromatic Connections Part One: Virtual Summit Reveal 2025 International Summit | Color Marketing Group® on Glue Up
Sept. 7-10	GIA Converge AGS Conclave X GIA Symposium Carlsbad, CA https://www.gia.edu/event/converge
Sept. 8-11	NAPIM's Annual Convention/Technical Conference Omni Charlotte, Charlotte, NC https://www.napim.org/aws/NAPIM/pt/sp/events
Sept. 15-17	CAD RETEC Long Live Color presented by SPE Color and Appearance Division Cleveland, OH https://specad.org/2025_cadretec_homepage/
Sept. 21-24	Illuminating Engineering Society (IES) SALC Street & Area Lighting Conference New Orleans, LA https://www.ies.org/events/salc2025/
Sept. 30 - Oct. 2	CMG Chromatic Connections Dallas, TX In Person https://app.glueup.com/event/2025-international-summit-124762/
October	
Oct. 5-7	AATCC Fabricating the Future – AATCC & SEAMS Annual Conference, Savannah, GA https://www.aatcc.org/aatcc-events/summit/
Oct. 10-11	SCAD 2025 Annual Conference Novotel Miami Brickell Hotel, Miami, FL https://www.scadent.org/events
Oct. 9-23	IEALC Aviation Lighting Conference 2025 Pittsburgh, PA https://www.iesalc.org/technology-meetings-2024-fall/
Oct. 20-24	AIC 2025 Taipei 16th AIC Congress https://www.aic2025.org/
Oct. 26-30	Frontiers in Optics and Laser Science Colorado Convention Center Denver, Colorado https://www.frontiersinoptics.com/home/submissions/
Oct. 27-31	IS&T CIC 33 Color & Imaging Conference Hong Kong https://www.imaging.org/IST/Conferences/CIC/CIC2025/CIC_Home.aspx?WebsiteKey=6d978a6f-475d-46cc-bcf2-7a9e3d5f8f82&hkey=16ed013b-0198-410f-b3d2-d928e32a03d-0&8a93a38c6b0c=1#8a93a38c6b0c
Oct. 28-31	ITMA 2025 Singapore Expo https://www.aatcc.org/aatcc-events/itma2025/
November	
Nov. 5-6	Inkspired: Innovations in Textile Printing Conference StateView Hotel, Raleigh, NC Inkspired: Innovations in Textile Printing Conference - AATCC
Nov. 10-11	IS&T Advances in Printing Technology 2025 Tokyo Tokyo, Japan https://www.imaging.org/IST/Conferences/AdvPrintTech/AdvancesPrintTech_2025/PrintTech2025.aspx

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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