## Inter - Society Color Council

# Quarterly Newsletter

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*Photo by Felix Dubois-Robert, Unsplash*

# ISCC Board of Directors Corner

## *Ellen Divers*

Hi, everyone. I'm Ellen Divers. The Munsell 2018 conference was my first introduction to ISCC and, like so many others, I was drawn to the rich multi-disciplinary character of the organization. Last year I was honored to be nominated to the ISCC Board by one of my colleagues to represent concerns of interest to architectural designers.

I have come to the study of architectural color design later in life. Since my youth, however, I have been intrigued by two parallel interests: the workings of the mind and the secrets of good design. I started off by earning an undergraduate degree in Psychology and then an MEd which launched me into the world of instructional design and facilitation. I nurtured my design side through graphic communications that are useful in teaching tools and materials. Eventually my interest began to shift to color design and I registered for the IACC-NA (International Association of Color Consultants and Designers) seminars, seeing architectural color consulting as my obvious next step. But a trip to the university library to research color and dementia after my mother was transferred to a memory care unit changed everything; I found myself enthralled by the process of gathering and processing what I was reading, much more excited about understanding the "big picture" than I was about building a practice around regular client appointments. What I gleaned from my reading was that there were no color standards in place for therapeutic spaces, and I decided I wanted to be part of solving that puzzle so that people like my mother and the staff who cared for her could at minimum be assured of a welcoming environment. With that goal in mind, I returned to school to earn a BS in Interior Design and a minor in Studio Art. By the end of that program, my suspicion was confirmed that designers are, for the most part, flying by the seat of their pants when it comes to evidence-based color decisions! I was fortunate to be able to conduct a study while in school which challenges traditional generalizations about how people respond emotionally to colors, and those findings have fueled my efforts to develop an evidence-based method for color decision-making. Stay tuned!

One thing I concluded from my foray into color research methodology is that color researchers and designers are not talking to each other, resulting in studies with limited application for color design. As an organization that draws from multiple disciplines, we at ISCC have an opportunity to model a new way of doing things by looking for opportunities to view color through each other's eyes, and perhaps even pave the way to research collaboration. Some minds excel at "doing things right," others minds excel at asking if we are "on the right track." Members in science and technology fields and those who work in design and education bring different points of view, assumptions and experiences to the table. I was gratified to experience a cross-discipline effort to communicate on the Visual Identity

Project (VIP) Student Competition. This project is a major undertaking by ISCC as it rebrands itself and retools with technology to reach a wider audience, while at the same time providing learning opportunities for students. It has recruited my skills in branding, process facilitation, graphic communication and website design. The VIP team, composed of designers/educators, went through a structured branding process as we formulated our recommendations for moving forward, but when we presented it to Dave (Wyble), he was very clear that the information would need to be packaged differently if we wanted science folks to understand what the project was about. So we went back to the drawing board and came up with something he thought would work. This is an example of how projects can be "test labs" for practicing communication between diverse disciplines.

They say that volunteering is the best way to get to know an organization. In addition to the VIP Project, since joining the Board I've also had the privilege of working alongside talented colleagues on the Color Impact 2020 and Color Impact 2021 conferences, where I've enjoyed reading and culling abstracts for presentations, designing publicity, and generally hashing out the logistics of organizing a conference. I love that we are a learning organization and that we build bridges of knowledge to bring people in, rather than walls of knowledge to keep people out. Preserving this openness will keep us relevant as we seek to establish ourselves internationally as a premiere color resource. This also benefits members like me as we seek to make progress toward our own goals. For instance, early on in my membership I had an opportunity to present a webinar on architectural color designed to surface some "hidden" assumptions (e.g., that interior designers receive special training in color). Also, as a new researcher, I reached out and found members willing to read and offer feedback on my study, and then was alerted about the RUCOLOR 2020 conference where I had the opportunity to present and have my article published in the proceedings.

In summary, the wide diversity of our membership is both a challenge and opportunity as we seek to make an impact on how color is understood and applied in the world. It just takes a willingness to listen with an open mind. Fortunately, the ISCC is full of people with open minds and a willingness to help, so don't be shy about reaching out for help or getting involved in a project. You would be surprised at how useful even a small contribution can be for a project-- and how being part of a team can enrich your own color journey.

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# Hue Angles

## Into Something Rich and Strange

*Michael H. Brill, Datacolor*

About 30 years ago [1] I encountered aerial photographs that were captivating, rich and strange. The photographs were acquired with a camera geometry similar to that of a flash-attached pinhole camera. The light flashed, reflected off the surface of the Earth, and then returned to the camera, all via straight-line paths. But such an image didn't look at all like it came from a pinhole camera. Most of the spatial features were familiar, but long black shadows appeared between them. We don't usually see cast shadows in flash-attached-camera images, because any object producing such a shadow hides it from sight. That's why the contrasts are so low and unappealing in photographs from an old-style flash camera. But the new image broke that rule, exhibiting shadows as if they were cast by a setting sun in the evening: a romantic image, as it were.

What were these strange cameras? To answer the "what" question, I must first answer "why," and that will break the romantic thrall. In the last century, interest in viewing the Earth from space was beset by the problem that most of the Earth is having a cloudy day just now (for any now). To see through the clouds, you need to use light with long wavelengths. Microwaves worked, and they became the basis of imaging radar systems.

Could you make a pinhole camera system with a microwave light source? No—you couldn't focus the beam or tell where it was coming from when it returned. The designers of this camera had to give up on the conventional idea of capturing on a flat film the direction of a viewed object on the Earth (called a world point). Instead, they did a clever thing. They flashed a complicated microwave pulse (called a chirp) in all directions, and then captured reflected returns. They sorted the light-intensity returns according to their time delay from the source (proportional to the range of the world point) and also according to their time scaling (proportional to Doppler effect). Oh yes, I must mention that the new camera had to be moving relative to the Earth, and its velocity had to be known, whereupon this second piece of information became proportional to the cosine of the angle from the vehicle direction and that of the world point. If you know the range of a world point, then that locates it on a sphere centered on the camera. If you know the vehicle direction, then you know the angle between the velocity and the direction to the world point, and that places the world point on a cone with its vertex at the camera. Knowing the world point's range sphere and Doppler cone means that you have identified a circle in space on which the world point must lie. Such circles are called projection circles.

Now let's return to a comparison of our new camera with a pinhole camera. If you look at a world point along a line of sight through a pinhole camera, you can tell what line the world point is on (identified by direction), but you can't tell how far along the line the world point resides. If you look at a world point for the new camera, you know which projection circle the world point is on, but you can't tell which point on the circle is occupied by the world point. Somehow in this imaging system, even though the light still travels in straight lines, the part of the 3D world point location that is inaccessible on a 2D image is a circle and not one of those straight lines. The romantic thrall has ended, but for me the mathematical thrall has begun!

The new camera, by the way, is called a synthetic-aperture-radar (SAR) system [2]. And that brings me to another comparison with a conventional camera. Instead of ending up in a light-sensitive medium such as film, the SAR's rays enter a localized receiver and are mathematically sorted to provide the coordinate locations (range and Doppler) in a mathematically defined structure called a synthetic aperture. That plane does not correspond to a physical object, but is a mathematical structure in 3D. It's not so strange, really. That kind of structure is common in holography, hence the term "quasi-holographic" that is used to describe the SAR technology.

Of course, you will need to know how the conventional and new cameras work together to reconstruct the three dimensions of a world point. The answer is: quite well. It is common [3] to solve for a 3D point using a camera image and a SAR image (see Fig. 1). The process is similar to triangulation as used by pairs of conventional cameras.

Now some of you may wonder where the shadows enter all of this. The straight-line light propagation certainly leaves cast shadows, but these shadows occupy noticeable area in a SAR image (e.g., search SAR image example). The pixels there are dark because no light intensity is directed to them by the math algorithm. The SAR shadows are called layover. It's ho-hum and official. Yet somehow, I sense we are "into something rich and strange," to offer an Ariel perspective.

This brings me to my final point. I don't believe artists have yet explored SAR technology as a medium for expression. So, following the lead of Anish Kapoor as described by Carl Jennings's essay in this issue, I hereby deny anybody but me the right to use SAR in art. So there, IP attorneys!

References

[1] Brill M, Triangulating from optical and SAR images using direct linear transformations, Photogram. Eng. & Rem. Sensing 53 (1987), 1097-1102.
[2] Ausherman, DA, et al., Developments in radar imaging, IEEE Trans. Aerospace & Electronic Sys. AES-20 (1984), 363-400.
[3] Qiu C, Schmitt M, Ziu X, Towards automatic SAR-optical stereogrammetry over urban areas using very high resolution imagery. ISPRS J Photogram & Remote Sens 138 (2018), 218-231.

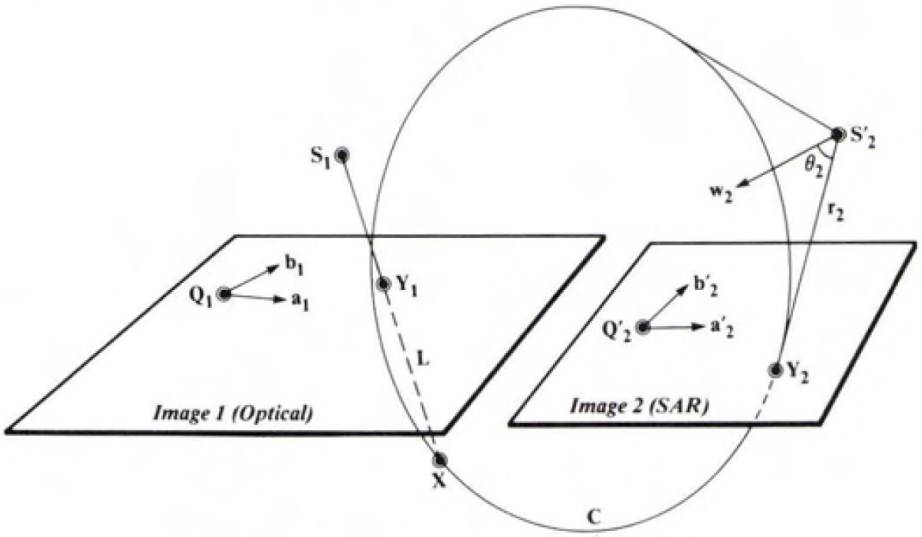


Fig. 1. Triangulation of a world point X as the intersection of camera line-of-sight L and SAR projection circle C. The quantity w2 is the velocity of the SAR sensor, and image points Y1 and Y2 are camera and SAR images of X. [adopted from Ref. 1]

**Send contributions to mbrill@datacolor.com**

**Note: This essay is dedicated to Dr. Eamon B. Barrett, my long-time friend and collaborator in imaging mathematics, who passed away March 30 after a long illness. MHB**

# AIC 14th Congress Milan 2021

## August 30 – September 3, 2021

*Paula J. Alessi, ISCC Liaison to AIC*

### AIC 2021® 14th Congress, The First Virtual Congress In AIC History

The AIC 14th Congress will be 100% virtual. The Associazione Italiana Colore further explains:

The COVID-19 pandemic imposes multiple constraints all over the world. In Italy, the laws of the state, together with the safety rules of the previously chosen venue (Ca' Granda, Università degli Studi di Milano), prohibit any socializing. This is one of the fundamental reasons for meeting in person. Therefore, due to travel-related risks and restrictions, the Gruppo del Colore – Associazione Italiana Colore, in agreement with the AIC, has decided to organize the AIC 14th Congress online. This complies with the AIC rules and includes the required program elements: Opening Ceremony, Awards, AIC General Assembly, AIC Working Groups, Workshops and Closing Ceremony. In addition, all standards required for publications and the handoff of the AIC banner to AIC-2022 will be respected. Consequently, the registration fee for the 5-day Congress has been reduced.

## Registration

Online registration will be open in late April 2021. The new registration fee is **195 Euros if you register before June 10, 2021 and 260 Euros if you register after June 10.** The registration fee covers access to the full Congress, including the Opening and Closing Ceremonies, virtual rooms for all sessions, and all AIC online events. The Book of Abstracts (in PDF format) will be emailed to all registered participants prior to the Congress. The Book of Proceedings (in PDF format) will be published within 3 months of the Congress conclusion and will be emailed to all registered participants.

## Papers

The Call for Papers closed on March 31, 2021. The response was excellent, as 260 abstracts were submitted. The International Peer Review Committee is examining the abstracts to determine which ones will be given as oral or poster presentations. So, the AIC 14th Congress is on its way toward a successful online experience!

## More Information

The Inter-Society Color Council is a collaborating organization with the Associazione Italiana Colore, the association that is organizing the **AIC 14th Congress.** We encourage our members to consider registering for this first-time 5-day online AIC Congress before the **June 10 early deadline.** For more details, see: https://www.aic2021.org/ Mark your calendars for a color-filled Olympic-type event like no other from **August 30 – September 3, 2021!**

# Color Research and Application

## From the Editor
## Vol. 46-2, April 2021
## By Ellen Carter

This second issue of the year has 15 Research Articles, a Color Forum piece, two Review articles, plus a book review and additional publications briefly mentioned. All of these items I will briefly introduce, but also please don't miss the Special Announcement about the upcoming Special Issue at the end of this article. Now let's get started with the articles.

### *Remote Colorimetric Measurements by Hyperspectral Lidar Compared to Contact Conventional Colorimetry*

New instrumentation capable of non-contact methods of color measurement are being developed for special situations, such as monitoring of cultural heritage. In the article, Remote colorimetric measurements by hyperspectral lidar compared to contact conventional colorimetry Federico Angelini, Anna Candida Felici, Martina Franchi, and Valeria Spizzichino introduce a scanning hyperspectral lidar prototype instrument. Their study compares and contrasts the results of the lidar instrument's color measurements of the X-Rite ColorChecker Classic to measurements made on traditional contact spectrophotometers and colorimeters. They conclude that the lidar prototype system obtains reliable colorimetric coordinates of remote samples and therefore is a valid tool for colorimetric analysis. Since it is a non-invasive tool, it is especially useful when contact measurements are not possible, such as in museum halls, catacombs or even open air.

### *White Appearance of Virtual Stimuli Produced by Augmented Reality*

New imaging and display systems have introduced many unusual visual opportunities for users. For example, by using a headset, a person can view a virtual reality that is entirely different than his/her current physical surroundings. The image can also be superimposed on the actual view of the current surroundings. This is called augmented reality (AR) and it adds a new challenge for color appearance characterization. Siyuan Chen and Minchen Wei have taken up the challenge. Now they report on their study of White appearance of virtual stimuli produced by augmented reality. They asked observers to adjust the color appearance of the stimulus to the whitest illuminant under the conditions with the viewing booth having different CCTs in two different situations – one with a higher color temperature than the perfect diffuser, and the other lower. They found that the effect of adapting to the CCT was smaller, suggesting a lower degree of chromatic adaptation when viewing stimuli produced by an AR graphic.

### *Illumination Correction via Support Vector Regression Based on Improved Whale Optimization*

To provide a more robust illumination color feature for computer vision applications, one needs to eliminate the influence of illumination in the scene. By using illumination correction, one can obtain true color characteristics of the surface of the object. This process is also referred to as color constancy calculation or illumination estimation. The purpose of Cho Wang, Zefei Zhu, Sheng Chen, and Junyi Yang's study is to establish an illumination estimation model with good prediction performance, few parameters, and a simple structure. To verify the performance of the illumination correction model, they carried out a large number of experiments using different algorithms on a standard dataset of 400 images. Experimental results shown in their article Illumination correction via support vector regression based on improved whale optimization demonstrate that their proposed illumination estimation algorithm met their aim and had high robustness, hence achieving high illumination estimation accuracy.

### *Subjective Evaluation of Colourized Images with Different Colorization Models*

In another image modeling study, Xiao Teng, Zhijiang Li, Quang Liu, Michael Pointer, Zheng Huang, and Hongguang Sun examined the

Subjective evaluation of colourized images with different colorization models. Two psychophysical experiments were conducted to evaluate the performance of four image colorization models, as well as test three objective image quality metrics widely adopted in greyscale image colorization. They found that the two dimensions of preference and perceived similarity gave different results that are nevertheless related. The analysis of the advantages and disadvantages of the four colorization models demonstrated that the performance of different models varied with image content. However, since none of the metrics performed well in predicting human visual perceptions, the authors suggest that in the future when evaluating and quantifying the performance of colorization models, due consideration should be given to human visual perception.

### *A Comparative Evaluation of Similarity Measurement Algorithms within a Colour Palette*

Speaking of colorization, color palettes are composed of a collection of colors and have long been used by artists, designers, industries, and even retailers. Initially the palettes were handmade, but more and more designers have used software to develop them. Their uses have widened to encompass a method of cataloging images and works of art. Depending on their use, color palettes can range from a few colors to possibly 100 or more colors. Yun Chen, Shuai Ren, Stephen Westland, and Luwen Yu report on A comparative evaluation of similarity measurement algorithms within a colour palette. They performed a study to collect human visual judgements of the self-similarity within large color palettes, suggesting that greater self-similarity might be considered to be a measure of coherence of the palette. Comparing possible algorithms, their study suggests that the Pearson Correlation Coefficient might be the most effective method for quantifying the degree of coherence of a color palette.

### *Optimal Camouflage Colors Determination Using Spectral Reflectance of Real-Scene Objects*

Another field where color similarity is important is camouflage. The article, Optimal camouflage colors determination using spectral reflectance of real-scene objects, presents a more precise approach to camouflage color selection based on the spectrophotometric data of dominant objects in a scene. Elaheh Daneshvar and Mohammad Amani Tehran propose to insert the optimal color of real-scene objects into a camouflage pattern. By first determining the most important objects in the scene and then measuring their color with a portable spectrophotometer, they determine camouflage colors more accurately because they are not averaging the colors over the whole scene, but rather focusing on the most important items. Inserting the optimal color of real-scene objects into a camouflage pattern guarantees the similarity to the real environment.

### *Conveying Colour Research to Design Practice: Design and Evaluation of a Web-Based Colour Tool*

In the next article, Seahwa Won reports on a study focused on Conveying colour research to design practice: Design and evaluation of a web-based colour tool. Although designers often have their own procedures, it has been suggested that translating and providing the findings of color research to design practice could help designers make better color selections. In this study, a prototype color tool was created with design professionals and evaluated by color, branding and graphic design experts. The evaluation covered: 1) the initial impressions of the prototype concept covering clarity, strengths and weaknesses, and usefulness, 2) useability of the prototype, and 3) comparison of the prototype to three other websites. The prototype outscored the other three websites, and the study's findings provide insight into how color research can be delivered to design practice using a web-based color tool.

### *Measuring and Describing the Discolouration of Liquid Foundation*

Moving on to the use of color in products in the beauty industry, facial cosmetic products are used for protecting the skin and enhancing beauty. While it is known and accepted that some cosmetics will wear off as time passes, there is a separate concern of darkening, particularly with regard to liquid foundations. The darkening is a topic of a study by Yuchun Yan, Juhyunn Lee, Jongin Hong, and Hyeon-Jeong Suk. From a series of measurements of test liquid foundations on both test charts and human subjects over a 24-hour period, they observed and measured the color change on the application area. In their article, Measuring and describing the discolouration of liquid foundation, they propose an alternative notation to illustrate the discoloration phenomenon. They conclude that the discoloration of foundation is kind of a phenomenon of lightness decrease and hue angle decrease.

To be specific, the foundation-coated layer becomes darker and reddish, both on test panels and on subjects with all four products tested.

### *Dyed Fabric Illumination Estimation with Regularized Random Vector Function Link Network*

In the textile field, Zhiyu Zhou, Jiushen Guo, Jianxin Zhang, Zefei Zhu, and Chao Wang report on Dyed fabric illumination estimation with regularized random vector function link network. Differences in light sources or an unstable light source in the printing and dyeing environment will change the fabric surface color, which will lead to significant errors in color difference evaluation and in turn affect the evaluation of the quality of the product. Therefore, the authors proposed a regularized random vector function link network illumination estimation algorithm to address the effect of the printing and dyeing illuminant irradiation on the color difference evaluation in the environment. In comparison to other traditional methods, their prediction protocol had the best results and the most stable performance.

### *Color Difference Classification of Dyed Fabrics via a Kernel Extreme Learning Machine based on an Improved Grasshopper Optimization Algorithm*

The use of metaheuristic intelligent optimization algorithms in parameter optimization has become increasingly widespread. A few examples of these algorithms are: the particle swarm optimization, the whale optimization, the grasshopper optimization, the moth-flame optimization, and the grey wolf optimization. Because the color difference detection of dyed products has represented a key technical breakthrough in the textile industry, Jianqiang Li, Weimin Shi, and Donghe Yang propose a color difference classification model for dyeing fabric. In their article, Color difference classification of dyed fabrics via a kernel extreme learning machine based on an improved grasshopper optimization algorithm, they discuss the development of the model and test its classification accuracy with respect to several key performance indicators on solid color dye images and images without complicated patterns. This is a step toward refining it for multi-colored dyes making it more readily applicable to industrial color difference classification detection requirements.

### *The Development of Color of Historic Buildings on the North Bund of Shanghai*

Following up on an article published in the previous issue, Aiping Gou, Lingyun Zhang, and Jiangbo Wang present The development of color of historic buildings on the North Bund of Shanghai. North Bund is an area with rich historical architecture that has developed its color through five historic periods. Prior to 1845, the traditional Chinese style residential buildings tended to be mainly light-gray and white, but the palace and temple architecture was brilliantly decorated with red, yellow, green and black. Then from 1845 to 1885, homes were colored light-yellow and tangerine with higher middle brightness, interspersed with homes that were dull neutrals (browns, dark-green and black) making up a large proportion. From 1986 to 1919 Colonial Veranda-style and classic buildings began to be made out of brick-concrete structures with the dominant colors of light-yellow, dark-red and gray-blue analogous to the neutrals. From 1920 to 1937, decorative and modernist buildings gained in popularity, and high-rise buildings sprang up dominated by the color red. From 1938 to 1949, the construction industry proved to be stagnant, and preference was normally given to more neutral colors, having no particular distinguishing features.

### *Development of a Low-Cost Food Color Monitoring System*

In the application area of foods, there are four articles in this issue. Color is often used for shoppers to aid in the selection of fruits and vegetable and for companies to monitor the quality of a food item or the consistency of the processing system. While this was originally done by careful inspectors, it increasingly involves using instrumental measurements and associated software to monitor or control the processes. The first of these articles describes the Development of a low-cost food color monitoring system. Ankit Jain, Bikash Kumar Pradhan, Sumit Chakravarty, and Kunal Pal have designed a low-cost color measurement system that uses a webcam as the imaging system and a cool white LED as the lighting source. The device can be used either as a standalone instrument for quality testing, a single-node process monitoring system, or a multi-node process monitoring system. Their choice of a star topology wireless sensor network for process monitoring applications allows the user to monitor the process at different locations simultaneously.

### *Interpretation of the Color Due to the Ubiquitous Nonenzymatic Browning Phenomena in Foods*

In our interpretation of color in the context of foods, consider the color brown. Many foods are subject to browning by heat treatment (a desirable feature) or by long-term storage (a sign of decreasing quality). In their article Interpretation of the color due to the ubiquitous nonenzymatic browning phenomena in foods, Lorena Sofia Pepa, Silvio David Rodriguez, Christina Isabel dos Dantos, and Pilar Buera define three stages of browning in foods, ranging from yellow to reddish-brown to dark brown. They discuss some of the uses and limits for the appropriate use of the several indexes and also define them according to the browning stage. Finally, they recommend the use of an index to characterize browning fully in three dimensions of color spaces.

### *The Enhancement of Appetite through the Use of Colored Light in Case of a Cake: Preliminary Evidence from Event Related Potentials*

Both restaurants and caterers have observed that color can affect brain perception and change a person's appetite. Ching-Yi Wang discusses The enhancement of appetite through the use of colored light in case of a cake: Preliminary evidence from Event related Potentials. Event-related potential measures the brain's response to stimuli-induced information. The brain transforms the energy and signals received from the external world through the senses into electrophysiological signals, which then become conscious thought, which better reflect the temporal flow of neural activity. So, Wang used this as a research tool to determine whether consumers' response to food can be affected by lighting with different color temperatures. Assuming that color may affect appetite and if the food is deemed to be appealing, the brainwaves should be more powerful. From the study, he concludes that an appropriate, well-thought-out combination of color will result in customers enjoying their experience, and will be left with a good impression of the product, thereby promoting purchase behavior.

### *Correlating the Natural Color of Tropical Fruit Juice with its pH*

Color plays another major role in the food industry, particularly to predict the taste and quality of fruits. In addition to color, soluble solid content is another useful parameter, which is related to the sugar content, that increases as a fruit ripens. Focusing on mangos and carambolas, the pH value in the fruits is usually the lowest at the unripe stage, increasing significantly during the ripening stage. It gives rise to the reduction in acidity and the sweetness and is responsible for taste perception. In the last article of the food section, Siti Anis Dalila Muhammad Zahir, Ommi Kalsom Mardziah Yahaya and Ahmad Fairuz Omar aimed to establish a correlation between the color components of natural and untreated tropical fruit juice. In their article, Correlating the Natural Color of Tropical Fruit Juice with its pH, they report that color properties of images of natural and untreated tropical fruit juices predict the intrinsic quality of the juice and the blue component of the RGB dataset showed a promising ability to profile correctly the pH of the juices.

### *Chasing Colors*

In the Color Forum, Shankhya Debnath has been Chasing colors in graphic arts. Color is perhaps quite elusive in the sense that it is a perception and does not represent any tangible experience, and is made even more elusive by the variety of illuminants, the varying viewing conditions, the different media, and the way the human visual system differs across individuals. Dr. Debnath tries to summarize a few centuries of work to understand the journey of defining colors. What is fascinating to note here is the fact that these scientific efforts fundamentally changed how colors are measured and transmitted from one device or platform to the other and helped us model its appearance with accuracy. It has also created in us a new understanding and appreciation of the science behind color.

### *Complementary Colors: A Literature Review*

In the Review Section of this issue, Ralph W. Pridmore presents Complementary colors: A literature review. Although Isaac Newton did not actually use the term, he gave the first description of complementary colors by showing a planar diagram as opposite colors in a color circle showing spectral colors on the circumference and white in the circle center in his book Opticks in 1704. In Pridmore's review and the literature he cites, one learns about 40 specific roles of complementary colors. These roles are placed into three categories of color science: color mixture, color constancy (or chromatic adaptation) and color perception (or appearance). Pridmore concludes that since complementary colors play a role in most or all aspects of color, the subject promises to be an interesting area of research in the future.

### *Surface Analysis of Polymer Films for Wettability and Ink Adhesion Methods and Ink Modification*

The second review article is specific to the field of printing. In the printing industry successful products involve much more than the simple action of putting the ink on the paper. In the article Surface analysis of polymer films for wettability and ink adhesion methods and ink modification. Cem Aydemir, and Bilge Nazli Altay point out that making successful print materials requires an understanding of the chemistry and physics relating to the interaction of the inks and substrates. In their review, they examine the topics of water contact angle measurement and determination of surface energy, surface tension, and using a sessile drop method for the wettability and ink adhesion of polymer films. Information on structural and chemical processes are given that assist obtaining wettable film surfaces. Recommendations are made for good adhesion and printability based on surface treatment methods and ink modification.

### *Book Reviews and new Publications*

Closing the issue, Abhay Sharma reviews the new book Printing-Process Control and Standardization by Robert W. Chung. Also, three new CIE publications are introduced in the section "Publications Briefly Mentioned." They are: CIE TN-11:2020 What to document and report in studies of ipRGC-influenced responses to light; CIE 242:2020 - Photometry of Curved and Flexible OLED and LED Sources; and the 2nd Edition of the International Lighting Vocabulary (CIE S 017/E:2020).

### Special Announcement – Open Access to Upcoming Issue April 13-May 13

The June issue of Color Research and Application will be a Special Issue titled "Natural Colour-Digital Color." It features selected article related to the 2020 AIC Conference. Because of its special issue designation, open access is available to all readers to the full articles for the first month after its publication online. https://onlinelibrary.wiley.com/journal/15206378

# Color Impact 2021

## Pre - Conference Events

*Maggie Maggio*

**Color Cocktail Happy Hour!**
Saturday, 5:00 – 6:00 PM (Eastern)
All registrants will be invited to the Saturday evening social – It's Color Cocktail Time!
Bring your favorite beverage and enjoy networking with your fellow color colleagues in small group Zoom rooms. Recipes for cocktails in all the colors of the rainbow will be provided ahead of time!

Short Course #1 - Architectural Color Consulting
Saturday, 10:00 AM - 12:30 PM (Eastern)
**What Nature Can Teach Us About Creating Humane Architectural Environments**

Jason Bemis, IACC

In this experiential workshop presented by the IACC, you will learn a systematic approach for extracting color information from a natural system to create a color palette that can be adapted for use in product design, communications and architectural environments.

Short Course #2 - Architectural Lighting Design
Saturday, 2:00 – 4:30 PM (Eastern)
**A Hands-On Workshop on Lighting Design**

Andrea Hartranft, FIALD

This workshop will explore the role of light in design using a pre-purchased kit of tools. An interactive discussion of the principles of light and color will lead into a collaborative lighting design challenge. Participants will be placed in teams and given a design problem to solve. Teams will then present their designs, and design decisions will be assessed and critiqued as part of the learning process.

Short Course #3 - The Natural Colour System (NCS)
Sunday, 10:00 AM – 12:30 PM (Eastern)
**The Importance of Colour Perception and Colour Communication in the Design Process**

Berit Bergstrom, NCS

This introductory course on the Natural Colour System (NCS) of Sweden will include segments on the following topics: the complexity of color communication, determining color differences, experimenting with color combinations, and factors to consider in the design process. Learn how to develop your color concept by observing what the colors look like and how they relate visually to each other.

See www.colorimpact2021.com for more details.

# 2nd ISCC Symposium on Colour Education

**Saturday, June 26, 2021**
The AIC/ISCC Colour Literacy Project will host a one-day virtual event focused on Perspectives in Colour Education. This will be a follow-up to the first ISCC Symposium on Colour Education held in June of 2020.

**First Session**
Welcome and Announcements
Keynote: Why Colour: David Batchelor

Presentations:
- Applying Albers Concepts to Visualizations by Theresa-Marie Rhyne
- Insight On Site by Jennifer Logun
- Connecting Optics Learning Outcomes Through Color by Use of a Monochrometer by Jennifer Kruschwitz
- Subtractive Color Mixing as a Support for Color Memory by Agata Kwiatowska-Lubanska
- The Art of the Three-Color Process by Rebecca Michaels

Moderated Breakout Sessions for Q&A and Discussion
Break

**Second Session**
Keynote: Bauhaus Influence on Colour Education: A Critical Homage by Robert Hirschler

Presentations:
- Colour Education in Design – Research and Training Itinerary by Ingrid Calvo Ivanovic
- Update on the ISCC/AIC Colour Literacy Project by Maggie Maggio

Moderated Breakout Sessions for Q&A and Discussion
Closing

See www.colorimpact2021.com for more details.

## Update on the ISCC/AIC Joint Color Literacy Project

**The Joint ISCC/AIC Student Poster Competition on the theme of "The Perception of Colour" is postponed until 2022.**

**This decision was made to give priority to the student competition for 2021 – the ISCC Visual Identity Project.**

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

## ISCC Newsletter No. 212 May-June 1971

*Paula J. Alessi, Senior Color Scientist*

The focus of this column is to familiarize our readers with how the ISCC "looked" in 1971. Use of the word "look" refers to the work and membership composition of ISCC fifty years ago. The 24-page *ISCC News* #212 Annual Report Issue featured detailed reports from Executive Officers, Problems Committees and Member Bodies. It is instructive to study some tidbits from this Issue to better understand our historical roots.

## Membership

Fred W. Billmeyer, Jr. reported that there were 665 paying Individual Members as well as the following groups that paid no dues: 239 Member-Body Delegates, 30 Member-Body Officials, and 18 Honorary Members. Non-paying dues memberships were extended to any national color organizations that belonged to the International Color Association (AIC). Many organizations around the world took advantage of this generous offer, but the exact number was not quoted by Billmeyer. It was also noted that many Member-Body Delegates were also Individual Members! Another fact worthy of mention is that in 1971, there was an Individual Members Committee, chaired by Nick Hale, with the purpose of representing the interests, recommendations and rights of the Individual Members.

## Problems Committees

Reports of each Problem Subcommittee were included in this newsletter. Here is a list of the Problem Subcommittees that were active at the time:

- Problem 7: Survey of American Color Specifications, Robert F. Hoban, Chairman
- Problem 10: Color Aptitude Test, Lou Graham and Angela Little, Co-Chairmen
- Problem 18: Colorimetry of Fluorescent Materials, Franc Grum, Chairman
- Problem 22: Procedures and Material Standards for Accurate Color Measurement, Joseph Atkins, Chairman
- Problem 24: Catalog of Color Measuring Instruments, Harry Hammond, III Chairman

- Problem 25: Strength of Colorants-Pigment Section, Richard Harold, Co-Chairman
- Problem 25: Strength of Colorants-Dye Section, Rolf Kuehni, Co-Chairman
- Problem 27: Metamerism Indices, Henry Hemmendinger, Chairman
- Problem 30: Color in the Building Industry, Milo Folley, Chairman
- Problem 31: Standard Methods of Measuring and Specifying the Color of Exposed and Processed Color Transparencies, John Smith, Chairman

It is very instructive to read the diverse activities of the above technical color-related committees that were active in 1971 (http://www.iscc-archive.org/Newsletters/ISCCNews212.pdf).

Today in 2021, ISCC has one committee known as the Color Literacy Project. It began as an ISCC initiative and is now a joint effort between ISCC and AIC. One might speculate why ISCC had more than 30 Problems Committees in 1971 and only one large and diverse Committee now. Is it because color science and technology has matured over the past 50 years and there are fewer color problems to be solved in the 21st century? Or is it because most current color problems are being solved internally rather than going to a multi-disciplinary organization like ISCC for solutions? What are your thoughts on this matter?

## Member-Bodies

The remaining 14 pages of this 1971 newsletter featured reports from the ISCC Member-Bodies. The ISCC By-Laws state that a Member-Body is "any non-profit society, association or organization of national scope, interested in color and desirous of participating in the activities of the Council for the furtherance of its aims and purposes…." Here is a listing of the Member-Bodies that were active 50 years ago.

- American Artists Professional League (AAPL)
- American Association of Textile Chemists and Colorists (AATCC)
- American Ceramic Society (ACerS)
- American Chemical Society (ACS)
- American Institute of Architects (AIA)
- American Institute of Interior Designers (AIID)
- American Oil Chemists Society (AOCS)
- American Psychological Association (APA)
- American Society of Photogrammetry (ASP)
- American Society for Testing and Materials (ASTM)
- Color Association of the United States (CAUS)
- Color Marketing Group (CMG)
- Dry Color Manufacturers' Association (DCMA) – no logo found
- Federation of Societies for Paint Technology (FSPT) – no logo found

- Graphic Arts Technical Foundation (GATF)
- Gravure Technical Association (GTA) – no logo found
- Illuminating Engineering Society (IES)
- Industrial Designers Society of America (IDSA)
- Institute of Food Technologists (IFT)
- National Association of Printing Ink Manufacturers (NAPIM)
- National Paint, Varnish and Lacquer Association (NPVLA) – no logo found
- National Society of Interior Designers (NSID)
- Optical Society of America (OSA)
- Package Designers Council (PDC)
- Paperboard Packaging Council (PPC)
- Society of Motion Picture Television and Engineers (SMPTE)
- Society of Photographic Scientists and Engineers (SPSE) – no logo found, but now known as Society for Imaging Science & Technology (IS&T)
- Society of Plastics Engineers (SPE)
- Technical Association of the Graphic Arts (TAGA)
- Technical Association of the Pulp and Paper Industry (TAPPI)

*Member-Body Logos*

*More Member-Body Logos*

The logos for most of the Member-Bodies that belonged to ISCC in 1971 are shown in the preceding two figures. Many of the logos are from present day, while some of them are from 1971. Although Individual Members were gaining in numbers relative to Member-Body delegates in 1971, ISCC membership was heavily influenced by voting Member-Body delegations and the diverse color problems they brought to the multi-disciplinary ISCC! Today, we have approximately 10 Member-Bodies and they have been not very active in the affairs of the Council. Often, we have joint meetings with some of our Member-Bodies, where the ISCC portion is a half- to a full-day of presentations related to a specific color topic. The remainder of these joint meetings are Member-Bodies' presentations, which are usually not color-related.

It is the Individual Members made up of artists, scientists, designers, educators and industrialists, who are the lifeblood of ISCC in 2021! Only after taking a look back at history can we gain an appreciation for how far ISCC has come in the last 50 years! We have adapted beautifully with the times and we should be proud of our progress!

# Visual Identity Project (VIP) Student Design Competition

In this exciting competition, university design students accept the challenge to create the color palette (and other design elements) to update the ISCC visual identity. The submission period begins December 1, 2021 and ends at midnight ET on December 12, 2021. A panel of international judges from design professions will select finalists. For more information, go to https://iscc.org/resources/Pictures/Visual Identity Project/ISCC VIP Brief.pdf and view the video at: https://iscc.org/events/VIP. If you have any questions, contact Dr. Lina Cardenas at: iscc.visual.identity@iscc.org.

# Fluorescent Fridays

## Key to the ISCC Future: Building an International Student Chapter

Planning team: Jean Hoskin, Maggie Maggio, John Seymour, Mike Murdoch, Lina Cardenas, Luanne Stovall, Jennifer Kruschwitz

### NEXT GENERATION COLOR!

2021 marks the roll out of ISCC's long-term goal to cultivate an interdisciplinary student chapter as a key to the organization's future. 21st century color communication requires a commitment to building bridges for sharing resources, cultivating mentors, and creating new opportunities. With up-to-date information and useful tools, students become the next generation of leaders in ever-evolving color related disciplines. Two new ISCC projects have been created with this goal front and center: Fluorescent Fridays and the VIP Student Design Competition.

**FLUORESCENT FRIDAYS** was created in the fall of 2020 as a platform for university students from all disciplines to network with color professionals and fellow students, and to explore cutting-edge information about color's role in our lives and applications in the world. The long-range goal is to build a global student chapter that positions color as a multi-dimensional STEAM model (Science, Technology, Engineering, Arts, Math), sharing up-to-date color research by scientists, artists, designers, industry professionals and university students.

***April 23 marks FLUORESCENT FRIDAYS first series of MiniTalks by university students working in science, art, design and communications. The event is free and open to students, faculty and interested color enthusiasts.***

WHAT: NEXT GENERATION COLOR – 6 MiniTalks

WHEN: Friday, April 23, 2021, 3:00 – 4:00 pm ET

WHERE: Zoom Link to be announced – Stay tuned!

WHO: Olivia Kuzio, Rochester Institute of Technology; Bill Rios, University of Texas; Soojin Lee, University of Leeds, School of Design; Francis Pellegrino, University of Rochester; Nian Xiong, North Carolina State University; Sofia Hinostroza, Pontificia Universidad Católica de Chile.

## BUILDING THE MASTER LIST

**Next Steps:** To accomplish ISCC's goal for an interdisciplinary global student chapter, a continually updated Master List of contacts from colleges and universities around the world is essential. The Master List is the key to the future. This project has already begun to take shape! Tamara Santibanez, a student intern of Dr. Lina Cardenas, is compiling a comprehensive document that includes major design departments with key contact emails. Tamara is halfway through the process, with over 100 schools identified. Information about the VIP Student Design Competition is being emailed to each department.

**Outreach:** In addition to the major art and design departments, we recognize the vital need to connect with community colleges and smaller universities, not just in design but also in the sciences and humanities. The comprehensive master list will be essential for future ISCC student projects (including abstract proposals for Fluorescent Fridays Student MiniTalks).

**Call to Action:** We are looking to connect with colleagues who have a passion for organization building and data collection. We invite you to bring your expertise to lead this important ongoing initiative that is fundamental to the growth and sustainability of the ISCC. The Master List is conceived as a living database for future projects, competitions and events.

**FLUOR-ESCENT FRIDAYS**

# ISCC Webinar Report

*Dr. Andy Towns*

The most recent presentation in the ISCC webinar series was *Now You See It, Now You Don't: Industrial Chromism*, by Dr. Andy Towns. Dr. Towns is an industrial organic chemist, working for the past 20+ years largely on the synthesis and application of substances that are useful because of their interaction with light. As Senior Development Chemist at the headquarters of Arkema UK Ltd in northern England, he is helping to grow the company's photoinitiator business. Since gaining a PhD in applied color chemistry, Andy has enjoyed working in the UK, India and South Korea at enterprises related to coloration, speciality chemicals, He has worked on conventional dyes for textiles, thermopolymers and hair, as well as functional colorants, including fluorescents, infra-red absorbers, organic semiconductors, and particularly photochromic dyes. For the last ten years, Andy has been Editor-in-Chief of Coloration Technology.

His presentation was enjoyed by 95 attendees from 15 countries, including US, Canada, Italy, UK, Iran, Germany, Mexico, Switzerland, Brazil, Finland, Spain, Hungary, Belgium, Slovenia, and Denmark. The presentation described multiple examples of color-changing materials and products in various industries. Attendee comments included, "It was FASCINATING!!!!! Thank you!" and "Fantastic. I worked in fashion product development for years with major department stores … it is all in the 'eyes' for color, then the mind tells you 'this or that' … And all over the world, 'people' view color differently."

Please check the ISCC website at www.iscc.org for upcoming events.

# Fluorescent Black?

*Carl Jennings*

Fluorescent black? Except for the futuristic comic of the same name, it's an oxymoron of sorts. Technically speaking, black can't fluoresce because it's the opposite of a fluorescent color— abnormally absorptive rather than reflective. But could it appear to act like a fluorescent color? In other words, could it stick out from the visual world in the same unusual way that fluorescent colors appear to? Could it appear alien and of another color dimension in our visual landscape?

I am a painter, and this idea intrigued me. Recently I purchased what is probably the blackest black pigment currently available to oil painters, a nano-carbon pigment known as Gravity Black. I wondered what a true black might actually look like in a painting and if such a color would stand out in the same uncanny way that fluorescent colors do. And if so, would it be the equivalent of painting a black hole – a bottomless void that would play tricks with the viewer's perception.

The science behind fluorescent colors is well understood; they absorb and emit more photons in the visible part of the spectrum than conventional colors. This makes them appear to emit, or radiate, more light (color) than their surroundings. When we perceive colors in the everyday world, we draw unconscious conclusions about the luminance levels of the overall light source based on their relative reflectance levels. That's why a black in sunlight can actually reflect more light than a white in shadow, yet we still see it as black.  We perceive colors in context and the illumination level is an important overall relationship that our brains use to make sense of the world. If a color appears to be emitting more light than the others, especially when compared to a white surface under similar illumination, then it appears brighter, and it stands out.

In the language of color science, the relative brightness of fluorescent colors is greater than the colors surrounding them. As this relative brightness increases, they appear more luminous and, at a certain point, appear fluorescent. If this increases further, then they will eventually appear as an independent light source[1]. Brightness is that property of color perception that is being manipulated when colors appear fluorescent.

This got me wondering – could this happen in reverse? Could relative brightness work in the opposite direction? What if a surface reflected less light relative to a black surface under similar illumination than its environment? And what if that relative lack of reflection was extreme? Would it then have the same otherworldly effect? Would it appear to stand out by virtue of the fact that it absorbs too much light compared to its environment? Would such a black appear to pop out, just like a fluorescent one?

For most people, and even artists, black is black – many would be hard-pressed to distinguish an Ivory Black from a Mars Black, for example. But spectral reflectance curves of black pigments do vary, and their appearance is also affected by how glossy or matte they are as well as the angle of the incident light when viewing. A perfect black, however, would be a black that absorbs 100% of the visible spectrum and reflects absolutely nothing. It would be devoid of all properties except blackness. In a past issue of this newsletter (#488), Mike Brill's Hue Angles column discussed the properties and development of some of these blacks as well as their potential uses in industrial coatings, optical equipment, etc. According to Brill, one such black, known as Vantablack, had "a reflectance as low as 0.045 percent (three times darker than any previous material) and a refractive index that could theoretically be as low as 1.0"[2].

Though not yet a true black from a technical point of view (0% reflectance), it is pretty close! Essentially such colors are a collection of carbon nanotubes that either stand up in a vertical alignment or overlap in a chaotic mess, a bit like fur. Either way, they act as dense forests of tubes that trap all incoming photons before eventually absorbing them. But none of these attempts are anywhere close to being available or affordable to the average person. They often require costly coating applications (as much as 60 coats), as well as heating, and even then, the result is a brittle and fragile surface, unsuitable for the everyday world. In the case of Vantablack, the rights to use this color have actually been acquired by the British sculptor Anish Kapoor. Only Kapoor is allowed to use this color— he literally owns this black! This has led to a great deal of anger and indignation in the arts community, leading one company to develop an affordable acrylic super black called Black 3.0[3]. This particular black can only be purchased

online, and you must agree to the terms and conditions before you complete the purchase process. What are they, you might ask? Well, you must acknowledge that you are not Anish Kapoor and that you are not purchasing it on his behalf!

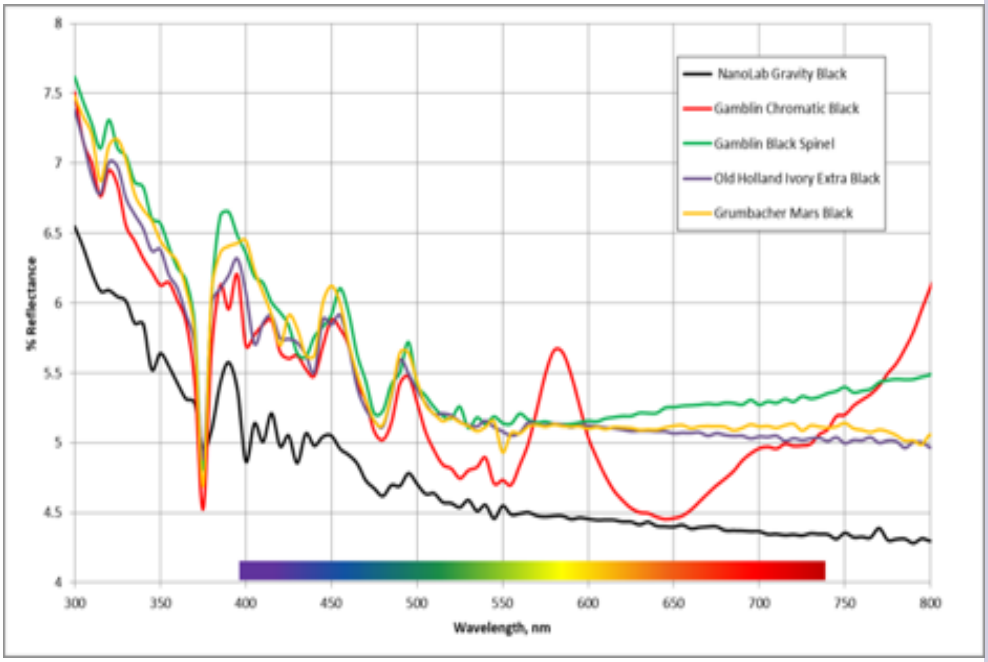


Fig. 1 Reflectance curves of various black pigments

Another company, NanoLab Inc. in Massachusetts, developed a similar black for NASA called Singularity Black. Like Vantablack, it can make three-dimensional objects appear completely flat because of the lack of edge reflection. NanoLab recently produced the somewhat affordable ($155 for 37ml tube) and workable super black mentioned above. Gravity Black comes in a paint tube and is applied just like regular pigment. Its spectral reflectance profile is the least reflective of black oil pigments currently on the market (fig.1). This is the color I purchased. Unfortunately, however, with the eye being the finely tuned instrument that it is, it can distinguish nuances between blacks with great subtlety. Though Gravity Black is extremely matte and black, at 4% reflectance, it is a long way from the .045% of Vantablack.

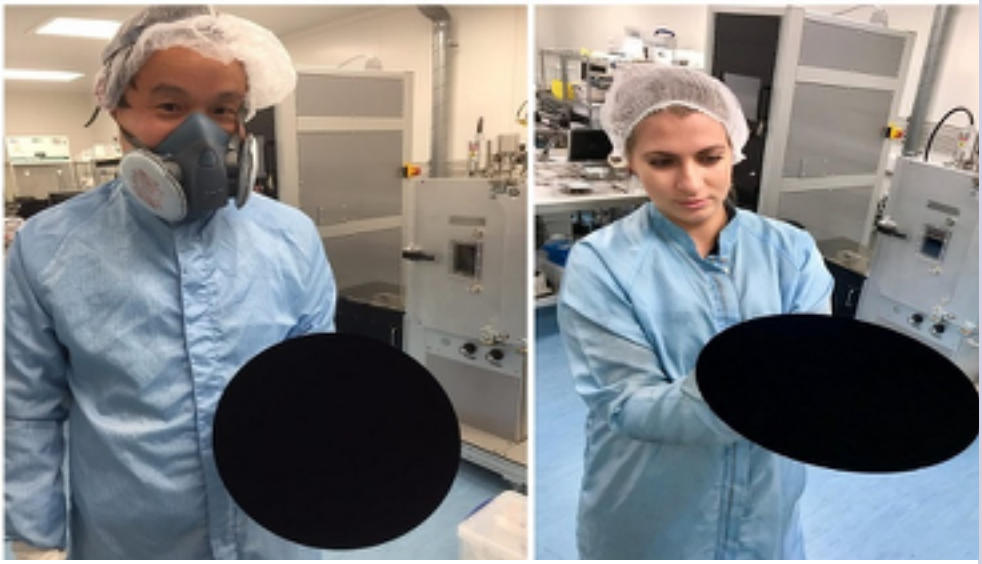

Fig. 2 Surrey NanoSystems. Black disc sprayed with Vantablack

Though I have never seen Singularity or Vantablack in person, I have seen images, and they do hold out the promise of crossing a visual threshold and standing out from the crowd, as can be seen from the painted discs in Fig.2, that appear like shapes collaged or superimposed on the pictures.

Fluorescents and nano blacks are colors that humans have historically never seen. They usher in an exciting and brave new world of color that just might represent the tip of the iceberg – who knows what's next! In the meantime, I will bide my time and wait for the day that I can get my hands on a black hole in a tube!

References

1 Briggs, D. The Scale of Brilliance, The Dimensions of Color retrieved from: http://www.huevaluechroma.com/103.php

2 Brill, M. (2019) Black to the Future Redux, Hue Angles Nov. 15 Retrieved from: http://hueangles.blogspot.com/2019/11/black-to-future-redux.html

3 Black 3.0 by Stuart Semple. https://www.culturehustleusa.com/products/black-3-0-the-worlds-blackest-black-acrylic-paint-150ml

# Calendar 2021 - 2022

| 2021 | |
|---|---|
| May 4-5 | New York Society of Cosmetic Chemists Supplier Day<br>Info: https://nyscc.org/suppliers-day/ |
| May 9-14 | CLEO 2021<br>https://www.cleoconference.org/home/ |
| May 11 | AATCC Committee Meetings<br>Info: https://www.aatcc.org/events/ |
| May 11-12 | CMG 2021 Virtual ChromaZone® Latin America<br>Info: https://colormarketing.org/event/virtual-chromazone-may-11-and-12/ |
| May 13-14 | CMG 2021 Virtual ChromaZone® North America<br>Info: https://colormarketing.org/event/cmg-virtual-chromazone-may-13-and-14/ |
| May 13 | GIA Alumni Chapter Monterrey Mexico Chapter: All about Silver<br>https://www.gia.edu/alumni-event-monterrey-mexico-chapter-all-about-silver |
| May 14 | End to End Solution: Processing To Waste Management SDC EC (India) webinar 5:30-7:30pm<br>marketing@sdc.org.in |
| May 17-21 | Display Week 2021 |
| May 18-19 | NAPIM Digital & Emerging Techologies Conference<br>Info: https://www.napim.org/index.php?option=com |
| May 20 | ASPRS Pacific Southwest Region Spring Technical Meeting #2 7:00 – 8:30 PM EDT<br>https://www.asprs.org/event/psw-region-spring-technical-meeting-2 |
| May 20-21 | CMG 2021 Virtual ChromaZone® North America<br>Info: https://colormarketing.org/event/cmg-virtual-chromazone-may-20-and-21/ |
| May 25-26 | CMG 2021 Virtual ChromaZone® North America<br>Info: https://colormarketing.org/event/virtual-chromazone-may-25-and-26/ |

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| **May 26-27** | CMG 2021 Virtual ChromaZone® European Region<br>Info: https://colormarketing.org/event/chromazone-may-26-and-27-europe-2/ |
| **June 6-11** | Optical Fiber Communications Conference and Exhibition (OFC) |
| **June 8-24** | IST Archiving 2021<br>https://www.imaging.org/site/IST/Conferences/Archiving/IST/Conferences/Archiving/Archiving_Home.aspx |
| **June 10-11** | CMG 2021 Virtual ChromaZone® North America<br>Info: https://colormarketing.org/event/cmg-virtual-chromazone-june-10-and-11/ |
| **June 13-15** | Color impact 2021 for the Built Enviroment<br>Info: https://colorimpact2021.com/ |
| **June 16** | Fondation Lascaux Event, Bruttisellen, Switzerland 7pm<br>fondation-lascaux.com |
| **June 17** | ASPRS 10th UF/FL – ASPRS Joint LiDAR Workshop 8:00 am -5:00PM EDT<br>https://www.asprs.org/event/10th-uf-fl-asprs-joint-lidar-workshop |
| **June 18-20** | Fondation Lascaux Event, Fex, Switzerland<br>fondation-lascaux.com |
| **June 19-25** | CVPR Virtual<br>Info: http://cvpr2021.thecvf.com/ |
| **June 19** | Virtual New Trends in Image Restoration and Enhancement workshop and challenges on image and video processing<br>Info: https://data.vision.ee.ethz.ch/cvl/ntire21// |
| **June 20-24** | Conference on Laser and Electro Optics<br>https://www.osa.org/en-us/meetings/global_calendar/events/conference_on_lasers_and_electro-optics_europe_%e2%80%93_e/ |

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|---|---|
| **July 19-23** | OSA Optical Sensors and Sensing Congress<br>https://www.osa.org/en-us/meetings/osa_meetings/optical_sensors_and_sensing_congress/ |
| **Aug 2-6** | NAPIM Summer Courses 12 PM – 5 PM CDT<br>https://www.napim.org/index.php?option=com_jevents&task=icalrepeat.detail&evid=19&Itemid=150&year=2021&month=08&day=02&title=napim-summer-course-2021&uid=6a53ce60d3f8f5ef1ddf6f37940b0102 |
| **Aug 5-7** | Illumination Engineering Society Annual Conference, Virtual<br>Info: https://www.ies.org/events/annual-conference/ |
| **Aug 26-27** | Farbe, Raum und Gesundheit (Color, Space and Health), Berlin, Germany<br>Organization: Deuetsches Farbenzentrume.V. Zentralinstitut Fur Farbe in Wissenschaft und Gestaltung<br>deutsches-farbenzentrum.de |
| **Aug 30-Sept 3** | AIC 2021 14th Congress<br>Info: https://www.aic2021.org/program-at-a-glance/ |
| **Aug 6-7** | Illuminating Engineering Society Annual Conference<br>https://www.ies.org/events/annual-conference/ |
| **Aug 5-7** | Illumination Engineering Society Annual Conference, New Orleans, Louisiana<br>Info: https://www.ies.org/events/annual-conference/ |
| **Aug 23-25** | Techtextil, North America, Raleigh, NC, 2021<br>Info: https://techtextil-north-america.us.messefrankfurt.com/us/en.html?us/en.html |
| **Aug 30-Sept 3** | AIC 14th Congress Milano, Italy 2021<br>Info: https://www.aic2021.org/ |
| **Sept 8,9,10** | Sexo, Color y Erotismo, Mexico City, Mexico<br>II Congresso International y V Encuento Mexicano del Color<br>amexinc.mx |
| **Sept 10-11** | SCAD 2021 Annual Conference<br>Info: http://www.scadent.org/events/chicago-2021 |

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|---|---|
| **Sept 19-22** | SPE CAD RETEC Color On My Mind<br>Info: Coloring the World of Plastics™ https://specad.org/cad_retec_2021_homepage/ |
| **Sept 20-22** | IST London Imaging Meeting 2021<br>https://www.imaging.org/site/IST/IST/Conferences/LIM/LIM_Home.aspx |
| **Oct 11-15** | NAPIM Fall Technical Conference 8:00 AM – 5:00 PM<br>https://www.napim.org/napim-event-list |
| **Oct 20-22** | SOCMA Week 2021 New Orleans, LA<br>https://www.socma.org/events-meetings/socma-week-2021/ |
| **Oct 22-24** | Dye Chem World  Tirupurr, Tamil Nadu, India<br>https://sdc.org.uk/event/dye-chem-world/ |
| **Early Nov** | IST CIC29<br>https://www.imaging.org/site/IST/IST/Conferences/CIC/CIC_Home.aspx |
| **Nov 10-11**<br>**Virtual day: Nov 12** | NYSCC Supplier's Day, New York, NY<br>https://nyscc.org/suppliers-day/ |
| **Nov 12-13** | SCAD 2021 Conference<br>http://www.scadent.org/events/chicago-2021 |
| **Dec 9** | ASTM Retroflection December 2021 Committee Week E12 Meeting<br>Atlanta, GA |
| **Jan 26 2022** | ASTM Color and Appearance E12 mrrting<br>Houston, TX<br>https://www.astm.org/MEETINGS/ |

# 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.

## Datacolor

5 Princess Rd
Lawrenceville, NJ 08648
**Website:** https://www.datacolor.com/
**Contact:** Mike Brill
**Email:** MBrill@datacolor.com

## Avian Technologies LLC

P.O. Box 716
Sunapee, NH 03254
**Website:** https://aviantechnologies.com
**Contact:** Art Springsteen
**Email:** arts@aviantechnologies.com

## Radiant Vision Systems LLC

18640 NE 67th Court
Redmond, WA 98052-6728
**Website:** www.RadiantVisionSystems.com
**Contact:** Shaina Warner
**Email:** info@radiantvs.com

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

**ISCC Newsletter Issue #494, Spring 2021**

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# Quarterly Newsletter

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