Inter - Society Color Council
Newsletter

Summer
2019 - Issue #487

email: isccoffice@iscc.org
address: 7820B Wormans Mill Rd. Suite #115, Frederick MD 21701

Cover Photo: Robin Kingsborough and Robert Hirschler team up to test run a new color naming game by Paul Green-Armytage.

Board of Directors Corner

Hello, I am Danny Rich. I was elected to the Board of Directors last year and this is my first communication to you via the ISCC News, Board of Director's Corner.

Dr. Danny C. Rich, ISCC Director.

I became a member of the ISCC in 1976. My membership application was approved by the Board of Directors at the spring meetings in April, just prior to their Annual Meeting held at the Statler-Hilton Hotel in Manhattan, NYC. My first term on the Board ran from 1986 to 1990. Then I was elected Secretary and served four terms before I was elected President-Elect, President and Past-President. I have chaired several special topics meetings, formerly known as the Williamsburg Meetings, because they were held in historic Williamsburg, VA, and was chair of the Macbeth Award committee for several years after my 6-year term as president. So, this is my second time as a Director.

I received the Nickerson Service Award for my years as the Secretary and just last year I received the Godlove Award for my contributions to the field of color technology.

I started my professional life as a physicist, building high lasers and making holograms. While working on a Masters' degree, I met Dr. F. W. Billmeyer, Jr. who recruited me for his program in Color Science at Rensselaer Polytechnic Institute in Troy, New York. I finished my Ph.D. in 1980 and joined the Sherwin-Williams Company in Chicago, IL. Just prior to the R&D Center in Chicago being closed, I joined Applied Color Systems, in Lawrenceville, NJ. I worked with Ralph Stanziola until the purchase of ACS by the Eichhof Group of Lucerne, Switzerland. They combined ACS with a Swiss company, Datacolor, AG, and an English company, Instrumental Colour Systems, to form Datacolor International, now just Datacolor. There I led the research and advanced metrology teams. In 1998, I joined Robert (Bob) Bassemir in Sun Chemical Corp, to lead the Color Research Laboratory in Carlstadt, NJ, where I currently am located.

When I first joined the ISCC there were about 400 members and a dozen Member Bodies, that is other professional societies who were the primary members of the Inter-Society Color Council. Clearly, I have seen things change pretty dramatically over the decades.

In addition to the ISCC, I have also been active in some of the Member Bodies, ASTM, OSA, SPIE, IS&T, TAGA, IESNA, FSCT, SID and AATCC. Today, I am most active in the international standards writing committees within the ISO, CIE and ANSI. I accepted the offer to stand for election to the board of directors, because I felt that I could bring to the current Council, the sense of history and tradition that many of the new members and directors often asked about. Hopefully, with their vision for the future and my knowledge or where the ISCC has made mistakes, together we can make the Council stronger and more relevant in the 21st century.

Today, the ISCC has a better sense of aesthetics and design than it ever had in the past. But even design is accepting and adopting modern technology. Paper, pencils and pastels are giving way to graphics pads or tablets and digital inkjet printers. Film cameras are being replaced by digital CCD light sensors, and images are stored directly onto computers. So, how can the ISCC bring a better understanding of how and why technology can make the creation and display of color not only fun but more realistic, more intimately aligned with creative expression and vision? This is the goal, whether that expression is fine art or the next generation of commercial packaging. My goal is to help identify and design new webinar offerings—tutorials on the use of technology and warning about the limitations of some technologies. I look forward to working with you, my fellow members of the ISCC, over the next few

Dr. Danny C. Rich, ISCC Director.

Table of Contents

ISCC EXECUTIVE OFFICERS

Terms end 2020	**President**	Dr. Renzo Shamey North Carolina State University College of Textiles rshamey@ncsu.edu
	President Elect	Dr. David R. Wyble Avian Rochester, LLC PO Box 1210 dave@avianrochester.com
	Secretary	Dr. Jean Hoskin sjhoskin1@gmail.com
	Treasurer	Dr. Francis O´Donnell Sherwin-Williams Performance Coatings Group Global Color Technology 4440 Warrensville Center Road Warrensville Heights OH 44128 216-332-1511 fxodonnell@sherwin.com
	Past President	Mr. Jerald Dimas Color Communications, Inc. 4000 W. Filmore Street Chicago, IL 60624 USA +1 (773)-475-2575 jerdim@ccicolor.com

ISCC BOARD OF DIRECTORS

Terms end 2019	**Mr. Steve Linberg**	171 State Street Amherst, MA 01002 steve@slinberg.com
	Ms. Maggie Maggio	maggiemaggio@gmail.com
	Dr. Anthony Stanton	Carnegie Mellon University stanton@andrew.cmu.edu
Terms end 2020	**Ms. Rachel Schwen**	The Sherwin-Williams Company + 1 (612)-375-7801 rschwen@valspar.com
	Mr. John Seymour	John the Math Guy, LLC John@JohnTheMathGuy.com
Terms end 2021	**Dr. Lina Cárdenas**	Pontifical Catholic University School of Design Santiago, Chile Tel: + (569)-74786494 lina.cardenas@uc.cl
	Dr. Danny C. Rich	Senior Color Physicist Sun Chemical Corporation Color Research Laboratory 631 Central Avenue Carlstadt, NJ, 07072, USA O: +1 (201) 933 4500 x1144 M: +1 (973) 580 4326 Web: www.sunchemical.com Email: danny.rich@sunchemical.com
	Ms. Luanne Stovall	Website: Luannestovall.com contact@luannestovall.com
	Ms. Amy Woolf	Amy Woolf Color Consulting, LLC www.awcolor.com / info@awcolor.com

Board of Director Nominees Needed

It is recruiting time for our next term of membership on the Board of Directors. ISCC needs help from members as we search for new leadership to replace three outgoing Directors. Please consider nominating a fellow ISCC member who has a strong desire to help move the Council forward. Or consider volunteering yourself, if you have a passion to become more involved in the activities of our national color organization. Nominations to fill these position will be taken by Jerry Dimas, our Past-President. All terms will begin in January of 2020, and last for three years. The board of directors meets once a month. Members are expected to attend the meetings. If you have any further questions about the level of commitment please contact any of the board members.

Please send all nominations to: isccoffice@iscc.org. If you would be interested in serving on the Nominations Committee, please email Jerry Dimas at: jerdim@ccicolor.com.

Thank you to our outgoing Directors: Mr. Steve Linberg, Ms. Maggie Maggio and Dr. Anthony Stanton for their years of faithful service to the ISCC. The Council has made great progress in the last few years toward our mission of supporting and encouraging the entire color community, and all related fields: art & design, science, industry, and education. Please seriously consider who (including yourself!) you would like to see involved in continuing to move us in that direction.

Warm regards,

Jerald Dimas
ISCC Past-President
Color Communications, LLC.
Office: 773.475.2575 / Fax: 773.638.5718
4000 W. Fillmore Street Chicago, IL 60624
Director of Color Science Applications
jerdim@ccicolor.com

In Memory of Antal Nemcsics

Antal Nemcsics, Artist, Researcher, Colour Scientist, and Professor.

It is with deep sadness that we share the news that Antal Nemcsics passed away on July 12, 2019 at the age of 92. Verena M. Schindler, the Co-Chair of the AIC Study Group on Envoronmental Design wrote the following tribute to remember Professor Antal Nemcsics.

"In 2017, the AIC CADE Award honoured the work of Antal Nemcsics (1927–2019), artist, researcher, colour scientist, and professor, with a PhD in architectural sciences and a D.Sc. in colour sciences. He was Chair of the Hungarian National Colour Committee during the period 1969–2015. He obtained the International Giorgione Award (Venice) and the International Award for Colour in Environmental Design (Stuttgart). He is author of the Coloroid System, conceived on harmony thresholds. His book Colour Dynamics: Environmental Colour Design (New York: Ellis Horwood, 1993) is used as a textbook in universities worldwide. He had more than 100 colour design realizations for buildings and interior spaces, including the colour design for the Ferenc Lizst Airport, the Metropolitan Railway, and the Castle District in Budapest.

A crucial event securing the significance of the topic of colour in the built environment was the AIC 1976 Interim Meeting "Colour Dynamics" held June 8–11, 1976, in Budapest. This meeting was organized by the Hungarian National Colour Committee and Professor Antal Nemcsics was a member of the organizing as well as scientific committee of this important event.

Antal Nemcsics' initiative in 1981 to create a study group on colour dynamics within the International Colour Association (AIC) attracted much interest. The study group was consolidated under the name Environmental Colour Design (ECD) at the AIC 1982 Interim Meeting "Colour Dynamics" held June 8–10, 1982, in Budapest.

During the period 1990–1993, Professor Antal Nemcsics served the AIC as a member of the Executive Committee. Among the many activities of the Hungarian National Colour Committee an important international event was the organization of the Seventh Congress of the International Colour Association, June 13–18, 1993, in Budapest.

Some years later the International Conference on Colour Harmony was held in Budapest on April 24–26, 2007. I had the great pleasure of attending the conference and also visiting Professor Antal Nemcsics in his magnificent studio.

The fifth International Conference of Colour Specialists held in Hungary was the International Interdisciplinary Conference on Colour and Pattern Harmony, June 11–13, 2012, at Óbuda University in Budapest where I had the chance to meet him again.

From 2007 to 2014, he published a series of articles on colour harmony in the journal Color Research and Application, the last two ones together with Jenõ Takács. His last contribution in the same professional journal was on "Change in colour preference in 50 years duration and its dependence on age" that will be published in August 2019, Vol. 44, #4.

We will always remember his scientific work, his paintings, his contribution to the AIC. He was the founder of the AIC Study Group on Environmental Colour Design.

Antal Nemcsics will be greatly missed by the international colour community."

Thank you Verena for allowing us to publish your heartfelt tribute to this great man!

Luanne Stovall looking through her first optical glass prism! Photo: Paul Green- Armytage

Color Literacy Project

Update from the Problems Committee on Colour Literacy

"*There is a tide in the affairs of men, which taken at the flood, leads on to fortune. Omitted, all the voyage of their life is bound in shallows and in miseries. On such a full sea are we now afloat. And we must take the current when it serves, or lose our ventures.*" William Shakespeare, Julius Caesar, Act 4.

The preceding quote was recited from memory by Paul Green-Armytage at the beginning of the meeting of the ISCC Colour Literacy Problems Committee held in Portland, Oregon from June 26-28, 2019.

In November of 2018, the ISCC approved the formation of a Problems Committee on color literacy. After seven months of one-hour long phone meetings, it became clear that the committee needed more time to discuss the problems in depth. At that point, committee chair Maggie Maggio invited the committee members to come to Portland, Oregon for a face-to-face meeting.

The goals of the June meeting were to:

• Write the problem committee's report for the ISCC board

• Draft the proposal for the formation of a Color Literacy Project committee.

Five of the seven committee members attended the meeting: Robert Hirschler, Luanne Stovall, Paul Green-Armytage, Robin Kingsborough and Maggie Maggio. The other two members – David Briggs and Steven Westland –attended virtually.

On the first day of the meeting, we agreed that it was high time to tackle the problem of rampant misinformation and the lack of understanding of the interconnection of color and light. It was then that Paul remembered the quote above and Luanne declared it the rallying cry of the meeting.

The three-day meeting included opportunities to share our favorite color games and teaching exercises, play with color and light, and see a bit of Portland. But the bulk of our time together was spent researching, discussing, writing and rewriting the two documents.

To help with the research, Robert Hirschler and Paul brought a wealth of references on the history of color education. When Robert went down the list it became increasingly apparent that we are not the first to address problems in color education. As Paula Alessi wrote in the article on the short-lived ISCC Color Information Bureau in the last issue of this newsletter, there is a long history of such attempts.

Here are just a few of the historic references to be included in the problems committee report:

1. Farnum, R.B. "Results of a Questionnaire on Color in Art Education". Journal of the Optical Society of America. December 1942, Issue 12, pp 720-726.

2. Judd, D. 1942. "Color in Art Education". Journal of the Optical Society of America. 32, Issue 12. 698-698. https://doi.org/10.1364/JOSA.32.000698

3. Wright, W.D. 1963. "A Course on Color for Schools". in The Rays are not Coloured: Essays on the Science and Vision of Colour. edited by W.D Wright, 116-124. Adam Hilger Ltd. London.

4. Green-Armytage, P. 1981. "Colour in Schools: a Bridge between Art and Science". Official Journal of the Australian Institute of Art Education. 6 No. 3. 17-39

5. Howard, N. 1989. "Colour Education: Pitfalls and Progress". in Proceedings of the Sixth Congress of the International Colour Association: Colour and Textiles, 1989. 87-90. Buenos Aires, Argentina.

6. Briggs, D. 2018. "Where is Colour Education Now?" in ISCC Munsell Centennial Color Symposium, Boston. 2018.

7. Hirschler, R., Csillag, P., Manyé, P. & Neder, M. 2018. "How much colour science is not too much?". Color Res. Appl. 42 Issue 6 (December). 977-992. https://onlinelibrary.wiley.com/doi/abs/10.1002/col.22275

The conclusions of the problems committee can best be summarized by a quote from a paper by Enid Verity presented at the third AIC congress in Troy, New York in 1977. She wrote: "Surely in no other field of study are the arts and sciences so interdependent and yet so divided by lack of adequate communication."

We humbly recognize the difficulties and complexities of attempting to transform color education. Even after years of valiant efforts, the problems of misinformation and the gaps between the art and science of color education continue to grow. Why do we think now is the opportune moment?

Now is the time to try again because we have three critical advantages over those who tried in the past:

1.We can now use the viral nature of the internet to provide free, accurate, and up-to-date color information around the world.

2.We can now take advantage of new technologies including the recent availability of affordable LEDs for experiments and explorations with light.

3.We can now link color education to the expanding STEAM movement and develop curricula to integrate the science and art of color in early education programs.

Most important of all, following the success of the Munsell Centennial Symposium last year, we now have a dedicated committee willing to work on the project and many volunteers waiting in the wings to help us seize the day.

Now is the time. Stay tuned!

Maggie Maggio, Chair

Robert Hirschler (Budapest), Paul Green-Armytage (Perth), Robin Kingsborough (Toronto), Maggie Maggio (Portland) and Luanne Stovall (Austin) at the Color Literacy committee meeting in Portland, Oregon.

The committee hard at work at the table covered by the projector, computers, reference books and color exploration resources. Robert Hirschler, Maggie Maggio, Robin Hirschler, Luanne Stovall. Photo: Paul Green-Armytage.

ISCC Webinar July Summary

Fritz Horstman:
Interacting with Color: the Art and Teaching of Josef Albers

Fritz Horstman.

On July 9, we held the latest ISCC webinar, when Fritz Horstman reprised his keynote presentation from the recent IACC/TAGA Joint Meeting in Minneapolis. This was widely enjoyed, and it was well worth inviting Fritz back for all the folks who could not attend the meeting in person.

As with most other webinars, there was a broad audience that included some familiar ISCC members, and some new folks drawn in by the subject. The thirty-odd attendees were largely from the US, with a strong European presence as well. Some comments by attendees:

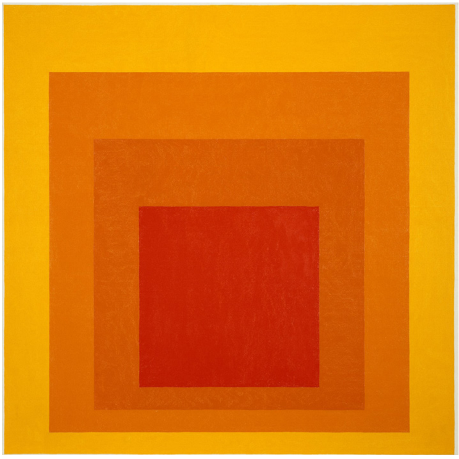
"The webinar on the art and the teaching of Josef Albers by Fritz Horstman was interesting to me. I appreciate the description that simultaneous color contrast, a color perception phenomenon, is about 'making one stimuli looks like two colors' due to the surround influence. Now, we can explain that illuminant metamerism, an interaction between light and color, is about 'making two stimuli look like one color.' Color, indeed, is fascinating!"

-Bob Chung, Rochester Institute of Technology

"I appreciated this webinar very much. At the university where I teach, the Art library has a copy of the silk-screen edition of the book – impressive! I started to measure everything a few years ago but I abandoned the project. The webinar may encourage me to complete the project after all, if only to share on the internet for those interested."

-Roger Breton, University of Quebec

Many thanks, Fritz, for giving this presentation! As with most other webinars, the session was recorded and is available for ISCC members from the "Members Only" section of the web page.



Josef Albers,
"Study for Homage to the Square"
ca 1960, 10x10",
Oil paint and pencil on blotting paper

Upcoming ISCC Webinars:

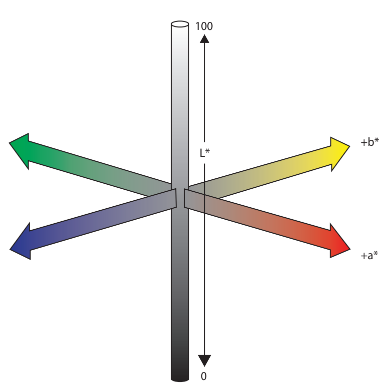
24 Sept 2019
2pm EDT

Ann Laidlaw & Jodi Baker:
*Introduction to CIEL*a*b**

Abstract:
This presentation will provide an overview of CIEL*a*b* for the description of color and color difference. Attendees who are new to the field of color and color communication will be introduced to CIELAB for numerical description of color.

Bio:
Ann Laidlaw works with manufacturing and retail supply chains at ACL Color Consulting LLC. She has accomplished and been recognized in the color industry with the ISCC Nickerson Award and the AATCC Chapin Award. Ann uses her extensive knowledge in color and textiles to teach and consult with companies and individuals to innovate with color management.

Jodi Baker provides training and applications support for color measurement equipment and software across many industries to support corporate color programs that drive process improvement and increase quality. She is an Application Engineer at Konica Minolta Sensing Americas.



22 Oct 2019
2pm EDT

Tony Stanton:
Color Management in the Graphic Arts

Abstract:
This webinar from the Inter-Society Color Council illuminates the sometimes-mystifying world of color management in the graphic arts. The term color management means different things to different industries. The color characteristics of textiles, paints, and theatrical lighting, for example, all rely on precise management of color to maintain consistency and predictability.
In the graphic arts, ICC-based color management is woven through the digital workflows that typify today's graphic production processes. In graphic media, color management describes the techniques used to produce consistent color appearance across different instances where an image is displayed.

Bio:
Anthony Stanton is a Teaching Professor and Director of Graphic Media Management for the Tepper School of Business at Carnegie Mellon University (CMU). Among some of his accomplishments, Stanton spent twelve years as Director of Process Controls for the Graphic Arts Technical Foundation. In this position, he was responsible for designing and overseeing the manufacture of quality control devices for the printing industry.

19 Nov 2019
2pm EST

Roland Connelly:
Comparison of LED Lighting Adopted by Retailers to Typical

Abstract:
Many retailers have adopted LED lighting for their stores, and many of them have different characteristics. The CIE has adopted a number of "typical" LED spectra that hopefully represents the majority of types of LEDs that retail, brands and industry are currently using.

Using both current methods, such as CRI and CCT, as well as newer TM30-18 as well as several other metrics, the variability among all these different LEDs is analyzed. This all relates to the ability of retailers and their worldwide supply chains to effectively communicate about color both visually and instrumentally.

Bio:
Roland, with RoLyn Group, is currently working part time as a consultant to industry in matters related to color, lighting and color supply chain management. He has extensive experience in the color industry includes work in Research and Development, Founder of SheLyn Incorporated that made formulation and quality control software.

He continues to work with AATCC, CIE and IES organizations. Roland's has over 40 years' experience in all aspects of color management and control. He is a frequent lecturer and author of numerous papers on such topics as Lighting, Colorant Formulation, Quality Control, Supply Chain Management, and Instrumental UV Calibration. He is a past president of AATCC and ISCC and received the AATCC Chapin Award for service.

Refractions Blog: The Dark Spectrum, Part II: Bands of color

This is a sequel to my article, "The Dark Spectrum I: Goethe and the Imaginative Interrogation of Color," which appeared in ISCC News, Issue 484. In that article, I introduced Goethe's dark spectrum and ended by proposing that such a spectrum might have something new to offer us. In this installment, I want to make good on that proposal and introduce an often, overlooked spectral phenomenon, and its connection to the dark spectrum.

To begin, we need to consider the concept of boundary colors—these are colors that appear when you look through a prism (or a transmission diffraction grating) at contrasting colors. If you hold a prism up to your eyes and view the world around you, boundary colors appear at the edges of objects and exhibit a very particular structure and color order. For purposes of simplicity, this phenomenon is most often observed by looking at the boundaries between black and white shapes.

In **Figure 2**, Image A shows three horizontal white stripes on a black background; a large (thick) stripe at the top, a small (thin) stripe at the bottom, and a medium stripe in the middle. Image B shows the same arrangement but reversed, with black stripes on white. In C and D, the same set of images are repeated, however they appear as when seen through a prism. The colors at the edges are known as boundary colors. This phenomenon is well understood in color science[1], so I'll just summarize how it works—it is the same as projecting these shapes of light and dark, through a prism, much like Newton's iconic experiment. But instead of being refracted images of a slit of collimated sunlight on a dark background, the patterns are due to the edges of dark bands on a light background. There are three important things to note about the appearance of boundary colors. First, the colors appear "banded"—they have large areas of undifferentiated hue followed by relatively abrupt visible discontinuities where the hue changes. Upon close inspection, hue gradations are clearly visible, but from farther away, or when using a smaller target image (which amounts to the same thing) the banding becomes quite distinct. Second, this phenomenon is more distinct and defined when examining dark elements on a light background (dark spectrum) as can be seen in **Figure 3**, which is a photograph of a pair of scissors seen through two prisms against a bright white sky. Though there are some artifacts that result from the camera, the image resembles what the eye actually sees. The use of a second prism made the banding even more distinct, as the image shows.

And finally, the colors responsible for the banding effect in both the RGB and CMY images **(Figure 2, C and D)** appear to be formed by the presence and additive overlapping of three basic components; red, green and blue (for an explanation of the CMY effect, see the previous article in Issue 484)

The banding appears much more distinct with the dark on light and can be easily observed by looking at a thin dark shape, like a light pole, against a bright sky. This is probably because the visible CMY bands contain twice as much light as the RGB bands (yellow = red + green, magenta = red + blue, and cyan = green + blue). This banding phenomenon, as simple and obvious as it is, has been insufficiently addressed in the literature. If we consider that boundary colors are basic spectral phenomena[2], and obey the same rules of generation, then it is all the more surprising. One explanation of this oversight could be due to the size and orientation of the original light source used to produce a spectrum. If the source is relatively wide with respect to the axis or direction of refraction (of the prism) and the degree of dispersion (like a wide slit or stripe), then the refracted components will overlap and superimpose each other a lot. This displays a more gradual and continuous gradient for the spectrum. However, reducing the width of the image in relation to the angle and direction of refraction, like with a thin vertical slit, reduces overlap and superimposition of the perceptual colors and the banding pattern becomes much more visible, like the bottom stripe in D **(Figure 2)**. Alternatively, you can see the banding in the light spectrum, as in the high resolution spectral image of the sun in **Figure 1**, if you change the orientation of the image. To see this clearly, rotate the image 90 degrees so it looks like a vertical rectangle. Then the pattern of red, green and blue bands, with a thin yellow band will become more apparent. We are used to seeing the spectrum as a thin gradual band along the direction of refraction. This orientation foregrounds the gradual change between long and short wavelengths of the visible spectrum. However, it also hides its clearly banded macro-structure, which can be seen by altering the orientation or pattern of the incoming light source. A paper by Adams and Jennings[3] lays out the first real colorimetric analysis of the phenomenon, analyzing both the presence of constant hue bands and their relationship/interaction with each other. They hypothesize a simple model to explain the phenomenon, based on the perception and overlap of red, green and blue refracted components (bands). This, however, runs counter to our current understanding which views color perception as an essentially opponent process, based on four primary colors. And even at the receptor level, where we do have three overlapping components, the S, M and L response curves do not correspond to red, green and blue. Until now, no other explanation has been put forward to explain this simple, and easy to observe phenomenon. Though the visible portion of the spectrum is continuous, it only appears that way under specific viewing conditions. In other circumstances, like the dark spectrum, it appears discontinuous, banded and composed of three basic colors: red, green and blue.

Goethe may have been wrong about the answers, but he was right about the questions—questions we need to ask about the simple phenomenology of colors.

Carl Jennings
University of Hawai'i

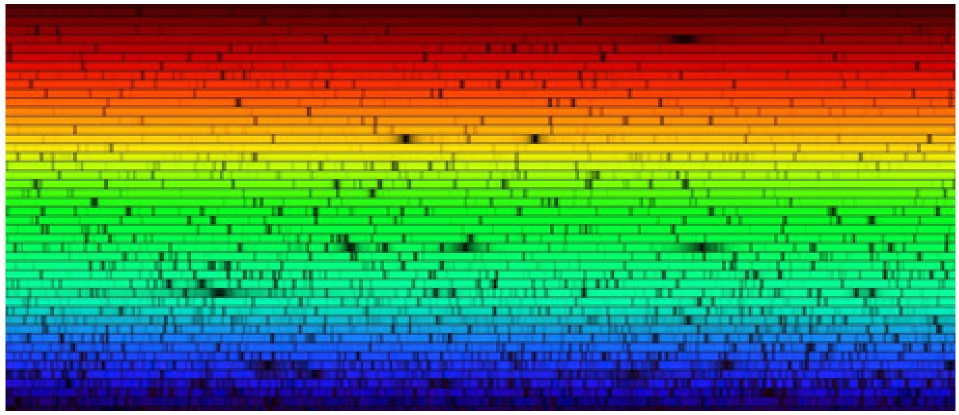


Figure 1. ***Solar spectrum produced with echelle spectrography, 10 m Keck telescope, Hawaii. (Source: Vik Dhillon, 2011, retrieved from: http://www.vikdhillon.staff.shef.ac.uk/teaching/phy217/instruments/phy217_inst_echelle.html)***

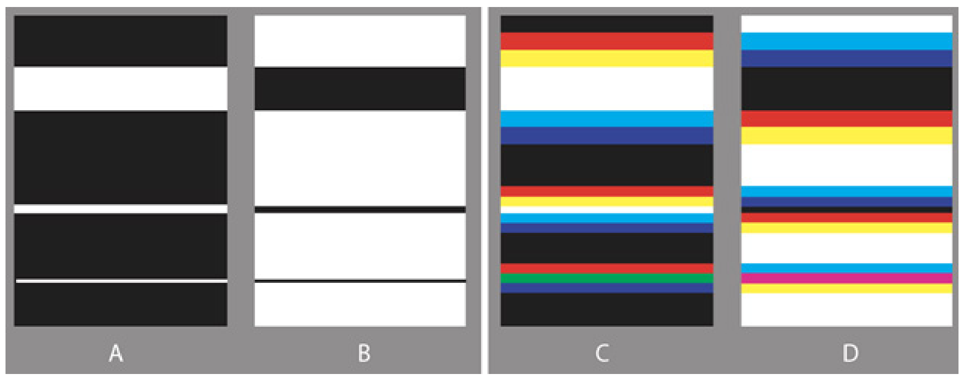


Figure 2. ***Image A is a series of white stripes of various widths, ranging from wide at the top to narrow at the bottom. Image B is the same array but with dark stripes on a white background. Images C and D are schematic diagrams of the preceding images when viewed through a prism, with the axis of the prism horizontal (parallel) to the stripes. (Source: author)***

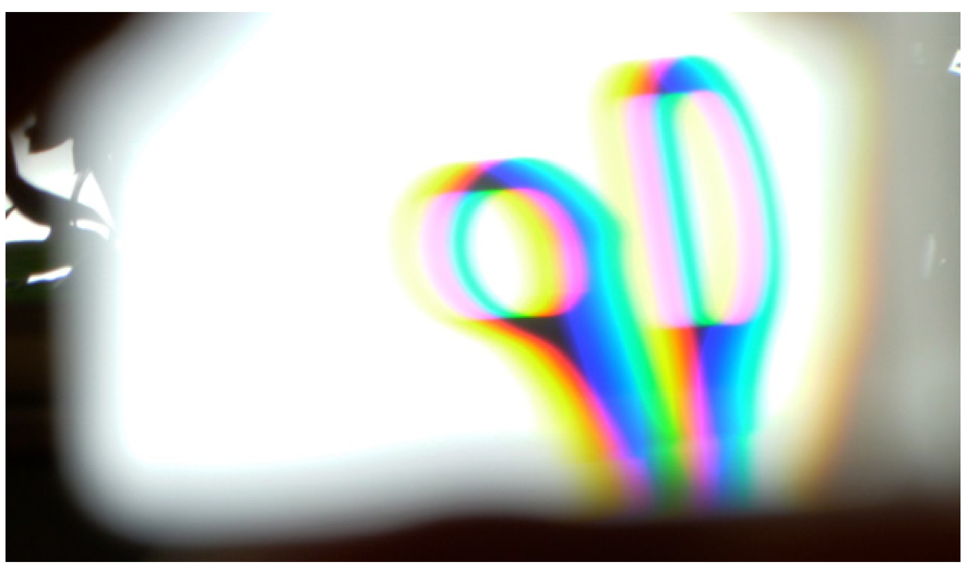


Figure 3. ***A pair of scissors against a bright white winter sky in Munich, photographed through two prisms simultaneously. (Source: author)***

[1] Bouma P. J. (1947). Physical Aspects of Colour. Eindhoven; N. V. Philips Gloeilampenfabrieken

[2] See Koenderick, J. J. (2010). Color for the Sciences. Cambridge, MA; MIT; Bouma P. J. (1947). Physical Aspects of Colour. Eindhoven; N. V. Philips Gloeilampenfabrieken; Newton, I. (1730). Opticks: Or, a treatise of the reflections, refractions, inflections and colours of light. The fourth edition, corrected. By Sir Isaac Newton, Knt. London: Printed for William Innys.

[3] Adams, L. W. and Jennings, C. (2015), Constant hue bands in boundary colors discovered using a new appearance model. Color Research and Application, 40: 135-146. doi:10.1002/col.21871

Hue Angles:
Reflection on "Dark Spectrum, Part II"

As a new experiment for ISCC News, my column here, together with that of Carl Jennings, comprise an interdisciplinary dialogue within a single issue.

In the course of writing "Dark Spectrum Part II" for the current ISCC issue, Carl Jennings asked me for comments. In response, I began to think about the optics of Newton's vs. Goethe's experiment. My thought process changed through the dialogue, especially as it related to Figure 3 of Carl's essay. This Hue Angles summarizes the essentials of our email discussion, which seems to reveal some heretofore unremarked differences between the experiments of Newton and Goethe.

I started off with the idea that Newton's prism experiment passes collimated (uni-directional) light from the Sun through a hole in a light-blocking shade (like a window shade), and through a prism. The prism disperses the sunlight into a spectrum according to the various refrangibilities of the wavelength components of the light. Then, in one version of the experiment, the dispersed spectrum hits a screen, and is reflected as a multicolored pattern to the observer. Collimation is necessary because light from two directions incident on the same point will provide different banding, and the bands from multiple directions will superimpose to wash out the pattern. I was convinced that collimation, being essential to Newton's experiment, also figured in Goethe's experiment. The only difference, I thought, was that Newton looked at a narrow beam through a hole or slit, and Goethe looked at a broad beam with narrow blocking elements that would cast shadows the prism would refract differently according to wavelength. Accordingly, I reacted as follows to Carl's Figure 3 and its caption:

Mike: The caption of Figure 3 states: "A pair of scissors against a bright white winter sky in Munich, through two prisms simultaneously. (Source: author)." A bright white winter sky is about as non-collimated as you can get, and on the face of it this seems incompatible with color bands. The only way to assure collimation is to position the prisms on the light path that includes the scissors and the eye. In that case, if the distance between the prisms is long enough, only light going nearly parallel in one direction through the first prism will intercept the second prism and hence get to the camera.

Carl: You discuss the color bands in the scissor image (Fig.3) as being incompatible with non-collimated light—but that is exactly the point—it happens when it shouldn't! None of the banding should happen, collimated or non-collimated, but the fact is it is there and is easily observable. Both prisms used in the photo were between the camera and the scissors, so no light was collimated. I found that two prisms made the banding more distinct, though it is observable with one, if you use a good prism

Mike: I now think the paradox of color-banding with light from a white winter sky is not a paradox after all. Newton needed collimated light because Newton's prism images the spectrum directly on a screen. In Goethe's geometry, there is another element that must be in the optical train: a lens. A lens provides a point-to-point transfer from an object to an image (in respective object and image planes), whether or not the light is diffuse.

The plane of Goethe's shadowing components was the object plane, the lens was in his eye, and the image plane was his retina (or a tangent plane thereof). In your scissors example, the lens was that of the camera. Of course, the eye's lens is implicit in all these demonstrations, but it is physically essential in Goethe's experiment in which the eye looks directly at the diffuse light through the prism(s). Newton's experiment does not have the eye looking directly at the light through the prism, and no lenses are needed between the slit and the screen, so collimation of the spectrum-separated light is essential.

In other words, a lens (be it eye or camera) is essential for the diffuse white sky light to show bands when it passes the scissors (which should be in the object plane of the camera lens). That role of the lens is essential to Goethe's experiment. A lens is also part of Newton's experiment because Newton used his eye to see the card-reflected spectrum, but the lens plays a different role here. It is a subtle point but should be understood.

Incidentally, Figure 3 suggests to me that, although a diffuse white sky exists in front of the camera, there must be very little light from behind the camera or there would be a white desaturating reflection from the front surface of the scissors.

The discreteness you have noted of the band colors—as opposed to their presence at all—is still a perceptual effect, as you have said before. I have no further thoughts on this matter now.

Carl: That is very interesting—I have never come across a description of boundary colors (even colorimetric ones, as in Koenderink or Bouma) that discusses the role of the lens. This is certainly a key feature to Goethe's phenomenological approach, but as far as I can tell does not exist in the literature.

One more question. Would sunlight passing through a hole in a window shade be already collimated? I ask because in Newton's own diagram of his experiment you can see that he has placed a lens in front of the prism, presumably to collimate the light.

Mike: Good question. The Sun is very far away (93 million miles), but it has a diameter of 0.864 million miles, which causes the Sun to subtend about half a degree of visual angle. The Sun's rays depart from collimation by as much as ¼ degree. Collimation is almost—but not quite—completed without the lens, and Newton obviously sought to do better.

Michael H. Brill
Datacolor
Send contributions to mbrill@datacolor.com

Save the Date for 2020

Color Impact 2020: Education, Enviroment and 21st Century.

This event is co-organized by ISCC and IACC-NA. (International Association of Color Consultants – North America).

We will be meeting in the eastern USA in early June, 2020

Two days of speakers and breakout sessions with pre- and post- conference workshops and tours.

Color Education will include The Bauhaus, Creativity, Art and Design.

Color Environment will provide inspiration, information on color and well-being, plus new lighting technology.

Each afternoon small group sessions will provide hands-on experiences relevant to the morning topics.

You can participate by submitting a poster of your paper or project. More information will follow.

Our logo competition and website will be announced soon with links from ISCC.org and IACCNA.com

Colour Education: Colour Made Simple

An Example of a Colourful Image from CMS: A Provocative Image from Valparaíso, Chile

Colour Made Simple is a holistic and practical online approach to colour theory designed to teach the fundamentals of visual colour assessment and instrumental colour measurement. Colour Made Simple (CMS) is based on the seminar that Nick Harkness has been presenting for over 20 years to well over 1,000 attendees from a broad range of industries and research institutions. CMS comprises approximately 600 PowerPoint slides, all with voice overs. There are 18 chapters plus Introduction and Conclusions. Professor Stephen Westland and Dr Vien Cheung from the School of Design, University of Leeds have produced the online colour exercises which are an integral component of the seminar and are designed to colourfully describe the fundamentals of colour language plus compulsory end of chapter quizzes and animations.

Colour Made Simple is ideal for:

1.Large, medium-sized, small organizations and individuals. It enables good colour understanding and the ability to communicate colour issues within a range of departments, e.g. Design, Marketing, Production, Research and Development, plus Sales.

2.Speaking the same colour language and using the same terminology. Both are critical for product development, creative projects, IP and brand management when colour issues occur.

3.Newcomers to an organisation. CMS represents a fast track into the world of colour measurement for a wide range of applications.

4.Universities looking to augment course material or university students seeking to deepen their knowledge on this subject over a wide range of academic disciplines.

5.People with a passion for colour.

There are many advantages to an online platform, for example:

1.Available anytime from anywhere, no need to wait until a face-to-face seminar is planned for your location.

2.No time-out for travel with related expense.

3.No time restraints, fits in with busy schedules.

4.Students can work at their own pace without distractions.

Nick Harkness

Nick Harkness is a technical colour consultant who is an expert in colour, quality and appearance testing for the design and manufacturing industries. (**www.nhplcolour.com**) Nick is from Australia. He is currently Past President of the International Colour Association (AIC), after having served as President from 2016-2017.

I have had the pleasure of reviewing this Online Colour Theory Course and was very impressed! It is a beautiful piece of work! I found it refreshing because it does exactly what the title says. It makes colour theory simple to learn through the power of words and images. The reader can clearly understand all concepts presented. I highly recommend CMS to all ISCC members!

Paula J. Alessi, Color Scientist

If you would like to know more, click on the following link for the free preview.

CMS
colour made simple

Follow them on Instagram: colourmadesimple

Color Research and Application IN THIS ISSUE Vol. 44 Issue #4, August 2019 By Ellen Carter

Investigating Color Appearance in Optical See Through Augmented Reality

People have been using optical devices for centuries to aid their vision of the surrounding world. First, eyeglasses, telescopes, and microscopes were used to expand the range and clarity of objects viewed. Then with the advent of electronics, other information was added to the field of vision. For example, it became a common practice first for fighter jets, then other aircraft and automobiles, to superimpose other needed information for pilots on the surface of their vehicle window. However, it is only in this century that augmented reality (AR) has really come into its own for a wide range of people, in particular with the use of heads-up displays for the user's immersive experience. This issue opens with Nargess Hassani and Michael J. Murdoch's "Investigating Color Appearance in Optical See Through Augmented Reality." They describe two of their experiments that are designed to study color appearance in augmented reality and evaluate the accuracy of the current color appearance models in an AR environment. In their studies, they evaluated the color appearance of simple test images in the foreground and background by color matching and then applying CAM16, a recent upgrade to the Color Appearance model CIECAM02, to model the findings.

Even though our perception of color from our surroundings comes to most people through the system of three types of cones in our retina, for many scientific and industrial uses, knowing the spectral reflectance of objects improves the accuracy of the color rendition or calculations. Over the years, many techniques have been developed to determine the spectral composition of images. However, areas such as the color reproduction of traditional printing, color management in publishing, digital archiving of artworks, and digital compositing in film making require increased accuracy of the recovered spectral data.

Recovering Spectral Reflectance Based on Natural Neighbor Interpolation with Model-based Metameric Spectra of Extreme Points

The next article describes the new method of "Recovering Spectral Reflectance Based on Natural Neighbor Interpolation with Model-based Metameric Spectra of Extreme Points." As Tzren-Ru Chou, Chi-Heng Hsieh, and En Chen explain, they first focus on a new interpolation strategy for the recovery of spectral reflectance from the sRGB channel values by the introduction of the concept of model color gamut, based on metameric spectra of eight vertices of the sRGB color cube, thus avoiding the need for extrapolation, which is where most errors occur. When they compared the spectral reflectance of objects calculated from an image captured by a traditional RGB digital camera using their proposed method to those curves calculated from various principal component type analyses, they found their strategy had an enlarged applicable domain and offered spectra with superior feasibility and naturalness. colors, and the result is compared with those obtained using random selection or a traditional culling algorithm. In a simulation study, the GA gives better results.

Reflective Color Reduction Using Genetic Algorithm Optimization

The next article also pertains to spectral estimation. In "Reflective Color Reduction Using Genetic Algorithm Optimization," Zhiling Xu and Michael H. Brill describe a new algorithm for selecting representative reflectance spectra from a larger set, the goal being to use this subset to calibrate a sensor system. In one such application, a multiband color sensor is used to measure reflective color samples, and a matrix transformation is then applied to recover the reflectance spectrum of any subsequently measured sample. To calculate the transformation matrix, a modest-sized set of training colors (with known sensor and reflectance values) is selected from a larger set. A genetic algorithm (GA) has been developed to optimize the selection of the training colors, and the result is compared with those obtained using random selection or a traditional culling algorithm. In a simulation study, the GA gives better results.

Digital Color Reconstructions of Cultural Heritage Using Color-Managed Imaging and Small-Aperture Spectrophotometry

Lightfastness Assessment of Levantine Rock Art by Means of Microfading Spectrometry

The next two articles deal with the reconstruction or assessment of very old artwork. Moving backward in time, we first look at a research project by Roy Berns, in which he produced digital reconstructions of works by van Gogh and Seurat, and was exemplified by the Chicago version of Vincent van Gogh's Bedroom. The purpose of reconstructions is to provide an informed impression of how a work of art may have looked at the time of its creation before the color changes that occurred over time. Prof. Berns describes a method of producing digital reconstructions that relies on a color- managed RGB image, and involves spectral reflectance factor measurements of the object, an optical model of colorant mixing, an optical database of artist materials, spreadsheet software, and image editing software. The techniques used in "Digital Color Reconstructions of Cultural Heritage Using Color-Managed Imaging and Small-Aperture Spectrophotometry" are discussed and compared with the technique used in a three-part series of articles in this journal last year, "Digitally reconstructing Van Gogh's Field with Irises near Arles" by Eric Kirchner et al.

Instead of considering artwork from 1889, we make a really big leap backward to prehistoric art located in the Cova Remígia rock art shelter, Castellón, Spain, which was designated a World Heritage Site by UNESCO in 1998. The Spanish Levantine rock art is generally on vertical walls inside shelters, but is subject to deterioration mainly by weathering, damp conditions, lichens, vandalism, and specific local elements, which accelerate its degradation. To monitor the degradation, Julio M del Hoyo-Meléndez, Berta Carrión-Ruiz, Gebriel Riutort-Mayol, and Jose Luis Lerma describe "Lightfastness Assessment of Levantine Rock Art by Means of Microfading Spectrometry." Using a microfade testing device, measurements were taken to analyze the spectral characteristics and the aging properties of the colorant system and various substrates on site. Two scenarios were identified depending on whether the lightness parameter of the rocky substrate changes or not in relation to the painted motifs. The increase in pigment actually seemed to stabilize the system in a protective way.

Application of ant colony optimization to color matching of dyed cotton fabrics with direct dyestuffs mixtures

In the textile industry, as in many other industries such as paints and plastics, the color is a very important element. Algorithms for managing the exact color are necessary for the initial recipe formulation, shading, as well as production control. Traditionally, the methods for predicting color were based on Kubelka-Munk type models. However, with the growth of computing capacity, other methods have also been considered, and some have gained usage with various degrees of success. In very recent times, attempts to model what has been observed in nature have provided a source of inspiration. The thought behind this is that procedures found in nature have been optimized over time. In this vein, Sabrine Chaouch, Ali Moussa, Imed Ben Marzoug, and Neji Ladhari considered how work is organized in colonies of ants. The article "Application of ant colony optimization to color matching of dyed cotton fabrics with direct dyestuffs mixtures" describes the development of scientific methods in calculating color recipes efficiently. The CMC color differences, whether theoretical or experimental, between different color targets and colors reproduced using recipes proposed by the ant colony algorithm were lower than the textile threshold of one unit of CMC color difference.

Associations of visual forms with colors: The minor role of emotion as the mediator

In the human sense of vision, color is sometimes related to perceptions of other senses or dimensions. For example, a heavy object might be associated with a dark color or the reverse, or color is associated with musical sounds. It has been reported that some geometric figures are associated preferentially with certain colors. Two suggestions by earlier researchers in this area are that the feeling of warmness and lightness mediates color-shape associations and that a visual form reminds us of an object and a typical color for the object is associated with the form. Following these ideas, Mitsuhiko Hanada designed an experiment using 50 forms which asked the participants to choose the appropriate color for each form and also to relate each color to an emotion. The purpose of his study was 3-fold: to (a) explore associations of various visual forms, including complex figures, (b) test Kandinsky's color-form assignment, and (c) determine the mediators of color-form associations. The article "Associations of visual forms with colors: The minor role of emotion as the mediator" gives the details and results of this study.

Color Image Knowledge Model Construction Based on Ontology

We know that color often has a big influence on consumers' purchase decisions. Xinxin Zhang and Minggang Yang decided to study specifically what in a color image goes into the decision by using data mining. In "Color Image Knowledge Model Construction Based on Ontology," they describe how they mined the data and constructed and visualized a color image ontology model. Further examination of the color brand images was used to obtain the ideas concepts of "Stylish" and "Nature."

Examining the color, size, and packaging design of wireless-mouse products

The influence of color on the purchase decision of customers is not limited to the color of the product, but also the color image of the packaging and advertising of the product. The next article is an exemplification of studying all the aspects of color in the design and packaging of a specific product: "Examining the color, size, and packaging design of wireless-mouse products."Lungwen Kuo and Chih-Chun Lai investigated the optimal size, color, and packaging style for various mouse products, and then conducted an experiment investigating the optimal size, color, and packaging style for various mouse products.

Why do I recall the Indian village as colourful when I know that it is not really?

Color Characteristics of Beijing's Regional Woody Vegetation Based on Natural Color System

Colour in Urban Places: A Case Study of Leicester City Football Club Blue

The next three articles examine the use of color in population centers, but each article focuses on very different aspects: the creation of overall impressions, the dynamics of natural color in an urban setting, and man-made identity and place-making. First, Dianne Smith, while looking back at her visits to the rural area in the North over the last decade, asks the question "Why do I recall the Indian village as colourful when I know that it is not really?" She is referring to the village of Laknu, in northern India. Consequently, she deliberately sets out to experience the village's palette and to explore how the perception and memory were formed. The answers are found in her visual essay "Colourful Questions of an Indian Village."

Next, Xiaoyi Xing, Peiyao Hao, and Li Dong explore the composition and dynamic characteristics of plant color by going to the Beijing Botanical Garden. In "Color Characteristics of Beijing's Regional Woody Vegetation Based on Natural Color System," they collect data from 177 woody plant species throughout the seasonal cycles. They then analyze and report on (a) plant color composition; (b) temporal dynamics of overall color; (c) cluster analysis of tree species based on typical growing-leaf color, based on typical senescent-leaf color, and based on typical flower and fruit color; and (d) color diversity evaluation of various tree species using principal component analysis.

Finally, we move to the other side of the globe to the city of Leicester, England and from color in nature to man-made color with an article on "Colour in Urban Places: A Case Study of Leicester City Football Club Blue." In this case study, Jie Xu demonstrates how color acting as a medium and agent creates an intimacy and loyalty between the different ethnic and social groups locally, regionally, and globally. The use of the specific blue of the sponsor for the stadium, the team logo, and merchandise sold by the team maintains the consistency and continuity of blue as part of the club's heritage and culture. This consistent sharing of the team blue extends to the community, giving a place-making to the whole area with a sense of common unity. It promotes tolerance and embraces combining multiple identities for the homogeneity of collective identity.

Change in colour preference in 50 years duration and its dependence on age

The façade decorations of the tenement houses in Olsztyn's Old Town before and after the Second World War

Next are two articles that could be considered follow-ups to articles published in the first issue of this year. In issue #1, Antal Nemcsics and Jeno Takacs reported on a unique longitudinal study of the "Preference and harmony of neutral colours in 50-year apart" [2019;44:98-105]. Now, in this issue, they follow up with a parallel article studying chromatic colors, rather than neutrals. In "Change in colour preference in 50 years duration and its dependence on age," Profs. Antal Nemcsics and Jenő Takács report on their comparison using identical color samples, done under identical experimental circumstances and by using experimental subjects selected from an identical population group. A great deal of data was collected in these combined studies. Over 50,000 observers were grouped in age by decades from 10 to 80 years. While the difference between the measures of preference of the various colors in 1967 was greater than in 2017 (could this be due to the aging of the samples?), the actual preferences as a function of observer's age were very similar. The cool colors of violet, blue, and green were more highly preferred in 1967, and green was more preferred than any other color by people older than 50 years both then and now.

Also, in the first issue this year, Ewa Doleżyńska-Sewerniak introduced the readers to the "Color of the façades of historic buildings from the turn of 19th and 20th centuries in northeast Poland" [2019;44:139-149]. In this issue, Dr. Doleżyńska-Sewerniak details the investigation and repair of damage to "The façade decorations of the tenement houses in Olsztyn's Old Town before and after the Second World War." In the reconstruction of the city after the Second World War, many of the original buildings were side by side with those rebuilt after the war. The repair of the artwork on the façades required individual analysis and decisions based on the art work itself, the amount of damage to the façade, the pigments and other material available, the individual local artists doing the reconstruction or replacement, and the time necessary to complete the task. The details of the studies and techniques for a number of the façades are given in this article.

Communication from the CIE, a book review, and an erratum

This issue closes with three items: a Communication from the CIE, a book review, and an erratum. The Communication is the CIE Position Statement on the Blue Light Hazard. Mark Fairchild reviews the 2018 Edition of the technical report, CIE 152018 Colorimetry, 4th edition. The report collects in one place summaries of the many fundamental documents and recommendations from the CIE on the topic of color. Each edition adds to the previous edition—in the case of the 4th edition, those practices and information since 2004. Finally, there is a short erratum to the book review, Progress in Color Studies: Cognition, Language, and Beyond, which was published in the previous issue of the journal.

A Blast from the Past: ISCC Newsletters 50 Years Ago

ISCC *News* Issue no. 201

ISCC *News* Issue no. 201 (July – August 1969) begins with color definitions from the 17th century given by a friend and tutor of Sir Isaac Newton, Dr. Isaac Barrow. These definitions can be found in ***Experimental Spectroscopy*** (3rd ed., Dover, 1963) by R.A. Sawyer.

"White: that which discharges a copious light equally clear in every direction.

Black: that which does not emit light at all or which does it very sparingly.

Red: that which emits a light more clear than usual but interrupted by shady interstices.

Blue: that which discharges a rarefied light, as in bodies which consist of white and black particles arranged alternately. Note: The blue of the sea arises from the whiteness of the salt mixed with the blackness of pure water.

Green: nearly allied to blue.

Yellow: a mixture of much white and little red.

Purple: a mixture of a great deal of blue and a small portion of red."

Next, there was a study by R. J. Pickford ,*"The frequency of colour vision defective students in a school of art and the influence of their defects"* published in the *Journal of Biosocial Science*, Issue 1, Volume 1, Jan. 1969, p.3-13. He studied the frequency of red-green deficiency among art students compared to those with normal color vision. Out of 223 art students, one woman and six men were found to be color defective (deuteranope, deuteranomalous, or protanomalous). These students were not always aware of their defect. Amazingly, their keen adaptation powers allowed them to consciously realize the colors that gave them difficulties and avoid them in their paintings. When interviewed, these art students shared their views on how they accomplished their color selections. A male, who had simple deuteranomaly and did not know about the defect until he was tested, had an oil painting of a landscape with warm browns and grey in it and a little bit of green. "*When asked to point out the green, the student indicated a fawn-coloured area. When he was asked about his choice of ideal colouring in a painting, he selected a landscape which contained no green.*" The extremely protanomalous female showed an oil painting containing a brown pear, which she called 'pale green'.

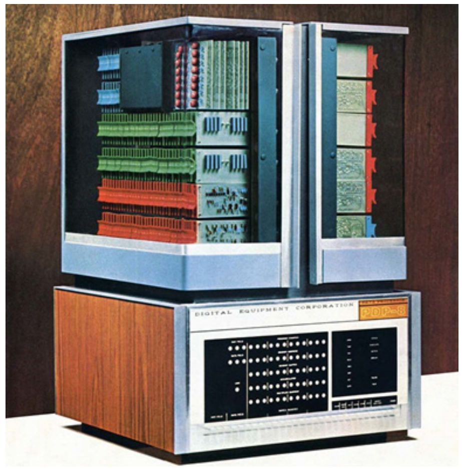
Another interesting feature of this newsletter was the "Letters to the Editor" section. This section cataloged correspondence from companies to the ISCC newsletter editor regarding color usage in their industries. I found this to be a fascinating read. A few examples are given here. The year 1969 was the height of the use of the color avocado, especially in the home, and especially for appliances. Arthur L. Harshman from Indiana Glass Company sent a letter stating that "Avocado continues a phenomenal run in the industry with, as yet, no perceivable replacement." Here is an example of a vintage piece from the 1960s Indiana Glass Company collection:

Indiana Glass Company Avocado Candy Dish

J. E. Kipilla from SCM Corporation discussed the color trends in office equipment. He described them as bright but soft metallics as you can see from this vintage Smith Corona typewriter from the 1960s:

1960s Vintage Smith Carona Typewriter

James B. Jordan from Digital Equipment Corporation (DEC) wrote in about their unique way of using color, hoping to modify industrial color selection trends. They coded product lines by using a distinct color for each product line. Small computer products featured yellow-browns. Blues and reds were saved for medium size computer products and blue-greens were used for large computer products. If a bright green was spotted on a DEC product, it was a computer peripheral. When DEC introduced new product lines, they began mixing colors like olive greens mixed with magentas. They also tried to distinguish functionality through varying color usage. Thus, switch functions on consoles had their own distinct color different from anything else on the console. In spite of the fact that DEC was using different colors for different product lines, their goal was consistent use of color to create the same distinctive DEC look that would resonate with the public. Here is an image of a very colorful DEC PDP 8 Computer vintage from the 1960s:



Vintage DEC PDP8 Computer

There are many 21st century companies that employ similar color marketing strategies to those innovated by DEC in 1969.

The Color Marketing Group, a Member-Body of ISCC in 1969, announced its own Speakers Bureau in this newsletter. Their Speakers Bureau was created to “encourage more responsible and effective use of color.” Their speakers were professional colorists, stylists, advertising and sales promotion executives, and sales representatives talking about all aspects of color technology and color marketing.

I hope I have given you enough of a taste of this 11-page newsletter (Issue no. 201) to entice you to read more about what color was like for ISCC in the summer of 1969!

Paula J. Alessi, Color Scientist

AIC 2019

AIC Midterm Meeting 2019
Color and Landscape
14-17 October 2019
Buenos Aires, Argentina

The Grupo Argentino del Color (GAC) is hosting the AIC 2019 Midterm Meeting from October 14-17, 2019 in Buenos Aires, Argentina. This will be the spring season when the jacarda flowers and trees will be in full bloom as the AIC 2019 logo so beautifully illustrates. When the purplish blue jacarda flowers fall from the trees, they blanket the ground with their royal color.

The venue for the meeting is the Universidad de Belgrano. It is recommended that participants choose lodging near the venue in Belgrano and Palermo.
The website (**http://aic2019.org/lodging**) lists several 4-star, 3-star and 2-star locations for lodging.

The theme of the meeting is “Color and Landscape”. The fields and topics to be covered in the meeting will be:

Fields	Topics	
Landscape	Color in urban lanscapes	Crop detection by color
Architecture	Color in urban furniture	Color in aerial photography
Lighting design	Color in urban trees	Color in satellite images
Urban planning	Color in transportantion	Color in geography
Agronomy	Color in natural landscapes	Color coding in maps
Geography	Color in virtual lanscapes	Digital color
Ecology	Color and cultural landscapes	Color under the sea
Psychology	Color in industrial landscapes	Color changes according to season
Literature	Color identity & color heritage	Color changes according to latitude
Art	Color and tourism	Color changes along day and night
Engineering	Color descriptions in literature	Color in horticulture and gardening
Chemistry	Color in landscape painting	Color of flowers
Physics	Color and urban art	Color of the sky

A Call for Papers (both oral and poster) appeared in the previous issue of this Newsletter. The deadline for submission of full papers for the Proceedings is August 15.

All five AIC Study Groups will be meeting during AIC 2019. The names of the five Study Groups are Language of Color **(http://language-of-color.aic-color.org/)**, Arts and Design, Color Education, Environmental Color Design **(http://www.ad-chroma.com/index.php?article_id=1&clang=2)**, and Color Vision and Psychophysics **(http://www.okajima-lab.ynu.ac.jp/CVPSG/).**

The following plenary lectures will be given:

Lecturer	Subject
Robert Hirschler for Hungary	**"Colour theory and neo-impressionist landscapes"**
Verena M.Schidler from Switzerland	**"Jean-Philippe Lenclos' methodology of the Geography of colour: Back to the origins and its international impact"**
Ming Ronnier Luo from the UK	**"A summary of the parametric studies on colour difference evaluation"**
Paula Csillag and Ana Lucia Lupinacci from Brazil	**"Landscapes used in design and art: The work of Fred Jordan, the Brazilian master of color"**
Zena O'Connor from Australia	**"Effective environmental visual literacy: Pedestrian crossing design and the key roles of colour and contrast"**

Roy Osborne, the recipent of the AIC 2019 Color in Art and Design Award, will be giving a lecture entitled "Renaissance colour symbolism". The 2019 AIC Judd Award will be presented to Hirohisa Yaguchi. He will give a lecture on "Individual Color Vision".
All ISCC members are encouraged to attend this very exciting AIC 2019 Midterm Meeting.

The Full Registration fee is $350 and includes oral and poster presentation (printing of poster included), access to the conference, book of abstracts, proceedings (e-book), coffee breaks, certificate, welcome party and cultural event, satchel and conference materials, a magnetic card for use of public transportation, and all three lunches (15, 16, 17 October). The Basic Registration fee is $250 and differs from the Full fee in that it does not include the three lunches or the magnetic card for the public transportation. The banquet and show (Thursday, October 17), as well as the whole day excursion to Tigre (Friday, October 18) are optional, and not included in these registration fees. They can be purchased on site, at the registration desk, on Monday, October 14. For details, please visit **http://aic2019.org.**

www.aic2019.org
info@aic2019.org

INTERNATIONAL COLOR ASSOCIATION
AIC MIDTERM MEETING 2019: COLOR AND LANDSCAPE
Buenos Aires, Argentina, 14-17 October 2019

Calendar 2019 & 2020

2019

Aug 6	CMG 2019 ChromaZone® Minneapolis, Sherwin Williams, Minneapolis, Minnesota Info: https://colormarketing.org/event/chromazone-minneapolis/
Aug 8-10	Illumination Engineering Society Annual Conference, Omni Louisville Hotel, Louisville, Kentucky Info: https://www.ies.org/events/annual-conference/
Aug 14-16	From peripheral to transsaccadic and foveal perception workshop, Castle Rauischholzhausen, Germany Info: https://www.uni-marburg.de/en/fb04/team-schuetz/ptfp
Aug 21-24	Visual Science of Art Conference, Leuven, Belgium Info: https://www.vsac2019.org
Sep 2-9	18th International Conference on Computer Analysis of Images and Patterns, Salerno, Italy Info: http://caip2019.unisa.it
Sept 19-20	ACM Symposium on Applied Perception, Barcelona, Spain. Info: https://sap.acm.org/2019/
Sept 25-28	XII Spanish Color Conference, Linares, Spain Info: https://www.uni-marburg.de/en/fb04/team-schuetz/ptfp
Oct 7-9	14th International Symposium on Visual Computing, Harrah's Lake Tahoe Hotel & Casino, Lake Tahoe, Nevada. Info: http://www.isvc.net
Oct 14-17	AIC Interim Meeting on Color and Landscape, Buenos Aires, Argentina Info: http://aic2019.org/
Oct 21-25	CIC27, Paris, France Info: http://www.imaging.org/site/IST/IST/Conferences/CIC/CIC_Home.aspx
Oct 28-31	CORM 2019 Annual Technical Conference and 12th Joint USNC/CIE and CNC/CIE - NRC, Ottawa, Canada Info: Joanne.zwinkels@nrc-cnrc.gc.ca
Nov 15-17	International Summit Color Marketing Group Info: https://colormarketing.org/event/international-summit/

2020

Oct 12-16	AIC Interim Meeting, Avignon, France Info: http://aic2019.org/event-2880983

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

ISCC Newsletter Issue #487, Summer 2019

isccoffice@iscc.org

Editing: Madelaine Yafet

Layout and Design: Lina Cárdenas, Lilian Calderón, Felipe Fuentealba

Printing: Thanks to Konica Minolta in Ramsey, NJ

Newsletter Coordinator: Jodi Baker

Final Edit reviewers: Amy Woolf, Dave Wyble, Mike Brill and Paula Alessi

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

Konica Minolta Sensing Americas

101 Williams drive
Ramsey, NJ 07446
Website: https://sensing.konicaminolta.us/
Contact: Peter Roos
Email: Peter:Roos@konicaminolta.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

INTER - SOCIETY COLOR COUNCIL, INC.

FOUNDED 1931

SCIENCE · ART · INDUSTRY