COLOR RESEARCH AND APPLICATION
IN THIS ISSUE, February 2014

Welcome to this year's first and newly enlarged issue of Color Research and Application. In this issue there are eleven articles on a wide range of topics … something for everyone… plus in the communications section the beginnings of a discussion on a scientific topic.

We open with an article about digital imaging. Charles Poynton and Brian Funt survey perceptual uniformity in digital imaging. In their article, "Perceptual Uniformity in Digital Image Representation and Display" they clarify some widely misunderstood aspects of image coding to alleviate the modern misconceptions that have arisen in the field. They discuss the coding systems including sRGB (used in desktop graphics), BT.709 (used in high-definition television, HD), Adobe RGB (1998) (used in graphics arts), and DCI P3 RGB (used in digital cinema).

Next we move to the printing industry, where there is a demand for fast, but accurate evaluation of print quality. Evaluation is usually accomplished by an operator comparing the production print to a reference print visually or with a spectrocolorimeter. However, Eva M Valero, Yu Hu, Timo Eckhard, Javier Hernández-Andrés, Juan Luis Nieves, Javier Romero, Markus Schnitzlein, and Dietmar Nowack propose that it is an area where multispectral capture systems can be used specifically for inline colorimetric quality control of printed samples on paper. To prove this point, they report on the "Comparative performance analysis of spectral estimation algorithms and computational optimization of a multispectral imaging system for print inspection."

A new application, at least for discussion in this journal, the effect of lighting conditions for indoor display of different varieties of flowers and foliage. The "Color appearance of cut flowers under illuminants of various color temperatures and illumination levels" is discussed by Eunmi Yang, Ho-Min Kang, Chang-Soon Kim, and Chun Ho Pak. They compared the observers evaluations of floral arrangements under various fluorescent and LED lighting systems.

From the brilliant colors of flowers, we move to Hideki Sakai's discussion of "Gray and Grayness – Its Complexities in Color Appearance of Surface Colors." The opponent colors of red and green, yellow and blue, and even black and white are often considered when talking about color perception and visual color spaces. However, the achromatic area between black and white i.e., gray, also deserves special attention. The listed first author for this article is Yoshinobu Nayatani, who died in 2009. He had proposed a color system that has a common reference point of gray, which in his system is as important as the six opponent colors listed above. In the research review article in this issue Dr. Sakai discusses the Nayatani Theoretical Color Order System, the attribute of grayness based on its psychological amount in a grayish color under study, and the attribute of brightness of the grayish color under a specified amount of illuminance.

In many fields including color reproduction, image processing, computer graphics, as well as the development of cosmetics, human skin color and the way skin looks with makeup is been an important topic. If you do not have human skin color right, the images will not be accepted or the user of skin care products will not be happy. Our next article deals with the "Reflection Measurement and Visual Evaluation of the Luminosity of Skin Coated with Powder Foundation." Luminosity can have different

meanings in various disciplines, but in the cosmetic industry, luminosity refers to the state of being 'luminous', 'brilliant', or having "radiant" skin. Naoko Ikeda, Kyoko Miyashita, Rie Hikima, and Shoji Tominaga identify the essential components of the luminosity of skin, based on two processes: reflection measurement and visual evaluation of the skin surface from the point of view of optical reflection with instrumental and visual evaluation. They then use the luminosity scores, which are analyzed in color spaces, to identify the color region relating to luminosity perception.

From skin color, let's stay with the body for another article. So we move to eye color, not color as perceived with the eye, but the the color or our eyes as perceived by others. In an earlier article in this journal the comparative analysis of real irises, ocular prostheses, and colored contact lenses was discussed [See Vol 36: 373-382, 2011]. Now in this issue, Amália Moreno, Marcelo Coelho Goiato, Daniela Micheline dos Santos, Marcela Filié Haddad, Aldiéris Alves Pesqueira, and Lisiane Cristina Bannwart discuss the "Spectrophotometric evaluation of color change in ocular prostheses." The transmission and reflection properties of artificial irises are important. Making an artificial iris with an aesthetically acceptable color is an important aspect of ocular rehabilitation, but keeping the established color of the iris is also important. It has been found that the color of these prostheses change over time and with exposure to chemicals, such as disinfectants. Thus the choice of materials is important. The aim of the study reported in this issue was to evaluate the influence of different disinfecting solutions on changes to the color of the artificial irises used to make ocular prostheses.

If we are covering many field of color in this issue, we do not want to miss textiles. Awais Khatri, Max White, Rajiv Padhye, and Nasar Harun Momin report on a new, simple, non-destructive and relatively faster method for determining the extent of dye diffusion by using K/S values.   In the article, "The use of reflectance measurements to determination of diffusion of reactive dyes into cellulosic fiber," they describe the method and its validation by conformation to a microscopic analysis of dyed fiber cross-section. Their method can be used in industrial dyehouses for precise determination of the dye efficiency to improve dyeing results and assisting in finding cost reductions.

Our next article is aimed at artists and designers. Guosheng Hu, Zhigeng Pan, Mingmin Zhang, De Chen, WenZhen Yang, and Jian Chen introduce "An Interactive Method for Harmonious Color Scheme Generation" using a visualization tool. They designed an interactive tool for color scheme generation that allows both novice and professional designers to attain variable combinational relationships based on users' harmonious compositional schemes. The tool also supports various methods of adjusting the colors. In evaluating the tool, novices found it easy to use and professional designers reported that the tool also provided ease-of-use user interface for harmonic color design.

It has long been known that acceptance and enjoyment of food and beverages is influenced by its presentation. What looks beautiful is perceived as tasting better.   Our next article reports on an experiment testing whether the color of the container also can affect the perceived temperature of a warmth beverage inside. Nicolas Guéguen and Céline Jacob report statistically significant differences is observers' responses in "Coffee Cup Color and Evaluation of a Beverage's "Warmth Quality"? In their experiment with 120 participants, the beverage in red cups was evaluated as being the warmest. They note that the common associations between warm versus cool colors can explain the results they found.

When trying to repair and preserve historical buildings and monuments it is important to determine not only what looks correct at the time of repair, but also materials which will keep a continuity of appearance as they age and are exposed to the natural elements. However, how to predict what materials will work well is a difficult problem. Often accelerated ageing techniques in a controlled climate chamber are used to test the different variables of cycles moisture, heat, and pollution materials. But how to analyze the results can be an issue. Our next article describes "Canonical Biplot statistical analysis to detect the magnitude of the effects of phosphates crystallization aging on the color in siliceous conglomerates." Adolfo Carlos Iñigo, Jacinta Garcia-Talegon, and Santiago Vicente-Tavera report that the Canonical Biplot statistical method allowed them to determine the effects on the color of the accelerated ageing. Changes in color can be determined by the trends of the different groupings according to the positions of the variables in each cycle of artificial aging. The Canonical Biplot also determines the direction of the magnitude of the effects on the analyzed variables.

In our Industrial Applications section Eric Kirchner and Jyotsna Ravi discuss "Setting tolerances on color and texture for automotive coatings." They describe how color tolerances are set in specifications to suppliers of add-on parts and to paint suppliers and introduce some of the important issues. They identify several factors that can lead to unrealistically tight tolerance settings, and therefore to incorrect rejections and unnecessary high productions costs. They suggest situations in which the tolerance should be widened and point out that instrumental color tolerances should not be tighter than what is allowed by instrumental reproducibility, repeatability and inter-instrument agreement. Finally accounting for these factors, they suggest a set of reasonable values for tolerances on color and on visual texture parameters, based on their own practical experience.

Our Communications and Comments section brings us full circle back to an issue mentioned in the first article. Michael H. Brill and Robert C. Carter pose the question " Does lightness obey a log or a power law? Or is that the right question?" Rolf G. Kuehni adds "Modeling lightness perception - another point of view." This is followed by "Modeling lightness perception---a response to Kuehni" from Drs. Carter and Brill. More about this discussion will follow in future issues.