COLOR RESEARCH AND APPLICATION
IN THIS ISSUE, AUGUST 2014

We open this issue with an article by Roy S. Berns, in which he introduces three new terms to enhance our communications of color changes using the CIELAB color space. Early after the adoption of rectangular coordinate system L^*, a^*, and b^*, CIELAB in 1976, the cylindrical system using L^*, C^*_{ab} and h_{ab}, was also adopted. These variables, while based on the same CIELAB color space, related more directly to common ideas of lightness, chroma, and hue. Now Prof. Berns suggests two additional coordinates: vividness and depth, that more directly describe color changes that occur in both lightness and chroma. He adds an additional dimension, clarity, to describe the effect of a color change as related to its background. The article, "Vividness, V^*_{ab}, Depth, D^*_{ab}, and Clarity, T^*_{ab} provides the mathematical expressions for these new terms as well as visualizations to demonstrate how changes in these variables led to color changes more representative of our daily experiences .

Our next article, "Color reproduction of authenticable luminescent backlit transmissive color images" aims at producing faithful full color images under luminescent backlighting. Luminescent backlit color images are used as high anti-counterfeiting security to verify the authenticity of documents because they not easily reproduced. The authors, Julien Andres and Roger David Hersch, propose a new approach for creating color halftone images to be viewed under UV excitation light that incorporates printing an invisible luminescent white emissive ink layer on the back side of a transmissive substrate and a classical *cmy* image on the front side of the substrate.

While we are talking about the color we see, let us take a step back to see colors at a distance. Although we are not usually aware of it, the scattering and absorption of the atmosphere affects the colors we see. Raul Luzon, Sergio M.C. Nascimento, Osamu Masuda, and Javier Romero discuss the "Chromatic losses in natural scenes with viewing distance." Based on their study color changes in real atmospheres, they propose simple exponential models to determine the chromatic loss that then can be applied to make realistic visual simulations, such as those used when training pilots.

Our next article reports on a series of studies investigating whether the presence of a familiar object in a scene helps the visual system stabilize the color appearance of other objects with respect to changes in illumination. In natural daylight the actual spectrum of light is ever changing. Yet our perception of the color of objects stays fairly constant. The degree to which an object color percept is relatively stable across changes of illumination is called color constancy. Yet in their studies Erika Kanematsu and David Brainard found very little or "No Effect of Familiar Contextual Object on Color Constancy," although it might reasonably have been hypothesized to have an effect.

Next we have a two part series on "Use of Basic Color Terms by red-green dichromats" by the same four authors. Julio Lillo is the first author of "Part 1. General description," and he is joined by Humberto Moreira, Leticia Álvaro, and Ian Davies. Humberto Moreira leads "Part 2. Models." Part 1 describes a study involving trichromats, protanopes, and deuteranopes, which revealed that dichromats differ from trichromats in the number and nature of the dimensions needed for describing the basic color terms. In Part 2, two alternative models of the mechanisms underlying the use of Basic Color Terms are described and compared. This series of articles provides a

comprehensive and detailed overview of how R-G dichromats use basic color terms to categorize surface colors. The results can integrate some of the results of and explain some of the conclusions obtained in earlier research.

Last December Part 7 of the series "Experimental determination of laws of color harmony" was published. Now Professors Antal Nemcsics and Jenö Takács are presenting "Part 8: Harmony content versus relative surface coverage." Whether a color composition appears harmonious to an observer depends not only on the colors included in the composition, but also on the relative amounts of the different colors. Previous research on this topic has been based on two different principles: color vision mechanisms and analysis of coverage area of the different colors in the composition. In this article, harmony based on the relative surface area was studied. Nemcsics and Takács found that the primary factor in the measure of harmony content is the relative surface coverage of the highly saturated colors present.

Moving on to the field of architecture, Juan Serra discusses the "Color Composition Features in Postmodern Architecture." Following the formal classification developed by JA. Ramírez, Dr. Serra discusses four trends: 1) the new utopias of the 1960s, the neo-iluminist rationalism of the 1970s, 3) 1980's figurative postmodernity, and 4) deconstructivism in the 1990s. For each of these trends, he examines the color composition features and analyzes a case study building. Then he reflects on how these influences lead us to the contemporary colored architecture.

In the modern world, increasingly enjoying music can be a personal event listening with earphones, rather than the communal event at a concert. Music evokes different moods, and different colors can be associated with different moods. Chang Bae Moon, HyunSoo Kim, Hyun Ah Lee, and Byeong Man Kim explain that listening to music with colored illumination can provide a deeper appreciation of the music than listening without the added color experience, but there are questions. How does one choose the illuminating color? Do different listeners agree with the mood and color evoked by the musical piece? And does this depend on the listener's preference for that musical genre? In our concluding article the authors above discuss their study "Analyzing relation between mood and color for different musical preference."

We also have two book reviews plus some publications briefly mentioned in this issue. In the review entitled "When Color Meets Computer Vision, Alessandro Rizzi reviews the book *Color in Computer Vision: Fundamentals and Applications b*y Theo Gevers, Arjan Gijsenij, Joost van de Weijer, and Jan-Mark Geusebroek. Then *Value Metrics for Better Lighting* by Mark S.Rea is reviewed by Janos Schanda. The publications are: ISO/CIE 11664-6:2014 Colorimetry – Part 6 CIEDE2000, CIE 207: 2014 The Effect of Spectral Power Distribution on Lighting for Urban and Pedestrian Areas; and CIE 207:2014 Sensitivity of Human Skin to Ultra-violet Radiation.