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# HIGHLIGHTED PAPERS FROM RECENT CONFERENCES

## Color and Imaging: CIC 21

**Winner of the Cactus Award**

### Camera Color Correction Using Two-Dimensional Transforms

*Jon S. McElvain and Walter Gish, Dolby Laboratories, Inc. (USA)*

**Abstract:** For digital camera systems, transforming from the native camera RGB signals into an intermediate working space is often required, with common examples involving transformations into XYZ or the sRGB. For scene-linear camera signals, by far the most common approach utilizes 3x3 matrices. For color pipelines designed for Rec709 displays, matrix-based input transforms are capable of producing reasonable accuracy in this domain. However, the associated colorimetric errors can become significant for saturated colors, for example those beyond Rec709. To address this shortfall, a novel input color transformation method has been developed that involves the use of two-dimensional lookup tables (LUTs). Because the surfaces associated with the 2D LUTs possess many degrees of freedom, highly accurate colorimetric transformations can be achieved. For several cinematic and broadcast cameras tested, this new transformation method consistently shows a modest reduction of mean deltaE errors continues top of page 2

To view the full papers of these abstracts for no fee go to www.imaging.org/ist/publications/reporter/index.cfm

* *These papers were presented at CIC21, held November November 4 - 8, 2013 in Albuquerque, New Mexico.*

## INSIDE THIS ISSUE



## Technologies in Digital Photo Fulfillment: TDPF2014

### Archiving Family Memories — Photos, Negatives, Slides, and Movie Film

*Laurent Martin, ScanCafe (USA)*

**Abstract:** We will discuss the myriads of challenges faced by a consumer in digitization, restoration and long term archival of their personal visual assets—photos, negatives, albums, video tapes, and movie film. Special emphasis on preservation of B&W negatives and movie film which see the most abrasion damage. We will present a workflow and solution for duplication of degrading old photo albums in order to enable distribution and sharing of family legacy photos.

### Award Winning Avatrex™ Technology

*Tom Snooks, S-One Holdings (USA)*

**Abstract:** Utopia Digital Technologies, a New Berlin, Wisconsin-based division of S-One Holdings Corporation, has developed a transportable image receptive coating which incorporates both ink receptor and adhesive properties on one side and an inherent print protective layer on the other side. This patent pending technology is called Avatrex™.

A significant functional solution of this technology is the ability to print on bonded leather and produce custom hard covers for photo books and photo albums using equipment that exists in most print shops.

### Videos in Photo Books and Other Tangible Products

*Reiner Fageth, CEWE Stiftung & Co. KGaA (Germany)*

**Abstract:** This paper describes in addition to the paper presented last year how videos can be implemented into printed photo books and presents first results about the users' implementation. We will show that—surprisingly or not— continues top of page 2

To view the full papers of these abstracts for no fee go to www.imaging.org/ist/publications/reporter/index.cfm

* *These papers were presented at the International Symposium on Technologies in Digital Photo Fulfillment conference, held January 5-6, 2014, in Las Vegas, NV.*

CIC21 paper continued from page 1

for lower-saturation colors. The improvement in accuracy becomes much more significant as saturation increases, such that the mean deltaE errors are reduced by more than a factor of three.

**Winners of the MERL Best Student Paper Award**

## Perceiving Gloss in Surfaces and Images

***Adria Fores*** *and James Ferwerda, Rochester Institute of Technology, and Ingeborg Tastl and John Recker, Hewlett-Packard Laboratories (USA)*

**Abstract:** Color Appearance Models are successfully used to model the color perception differences seen when the same stimuli are presented on different media, e.g. hard copy or a self-luminous display. It is currently unknown if the similar effects are present in gloss perception and if there is need for Gloss Appearance Models.

Gloss communication, and the higher level material appearance communication is becoming more important everyday with the increase in customized manufacturing and the need for the costumer to preview a final product while short-runs, time and cost constraints prohibit the use of hard-copy proofs.

Three experiments are proposed in order to analyze this phenomenon. The Gloss matching performance of observers on real objects is first going to be studied. Then, the same experiment will be repeated with synthetic images. Finally, a cross-media matching experiment will be performed, where the observers will have to match a real material with synthetic representations.

The same trend was observed in the experiment using only real objects and in the cross-media situation, where a high matching accuracy was obtained for low gloss samples, and the gloss of mid and high gloss samples was underestimated. The same accuracy for low gloss samples was obtained for the experiment with only synthetic images, but mid and high gloss samples were overestimated. The sensitivity of the observers was higher when only real samples were used, it decreased when the display was used due the lack of visual disparity and multiple viewing conditions, and it was lowest on the last experiment, influenced by the multiple media and the above limitations.

## Observer Variability Experiment Using a Four-Primary Display and its Relationship with Physiological Factors

***Yuta Asano*** *and Mark D. Fairchild, Rochester Institute of Technology (USA), and Laurent Blondé, Technicolor (France)*

**Abstract:** There exist individual differences in color matching functions and the use of a single standard observer as a representative of a whole population often limits the accuracy of color reproduction, especially for narrowband stimuli. We conducted a paired comparison experiment for 58 color-normal people involving color difference judgments using four nearly metameric spectra pairs. The performance of observer functions: CIEPO06, Sarkar's observers, and the extended CIEPO06 incorporating peak-shift in L and M cones were investigated. Large observer variability was found in the obtained results, which is much larg er than what CIEPO06 predicts. At least two different groups were found in the experimental results, which could be explained by eye-lens and macular pigment optical density variations. We estimated the individual cone fundamentals from another experiment where observers performed five color matching, and used them to predict the paired comparison results. They gave better or at least comparable prediction to those of CIE 1964 observer and CIEPO06. ▲

TDPF papers continued from page 1

pictures from videos are similarly used such as classical images to tell compelling stories.

Videos taken with a traditional camcorder are not good candidates for implementation into photo books, as they are usually made with the intention of generating a movie. Videos taken by DSCs and smart phones are taken on the fly and are on average less than one minute in length and are the basis for the following evaluations.

## New and Coming ISO Image Permanence and Durability Standards and how They Promote the Photo Fulfillment Industry

*Joseph E. LaBarca, Pixel Preservation International (USA)*

**Abstract:** Recently published ISO permanence and durability standards, along with soon-to-publish standards in progress, will provide standardized testing and reporting of image permanence and durability performance. By using standardized methods for testing and reporting, companies can assess and promote product performance in a way that is easily comparable by both professional fulfillment laboratories and consumers. In addition, a new ISO joint working group has been formed that will mirror the ongoing convergence of printing technologies covering both the traditional photographic and graphic arts based printing. This paper will provide an overview of the new standards, the new joint working group, and the benefits these will provide in promotion of hard copy printing throughout the photo fulfillment industry. ▲

# Heavy Metal Meets Sticks, Flowers, and Fiber

## CIC21 kicked off the conference's third decade with a diverse and enlightening program

*By Jennifer Gille (Qualcomm QTI) and Vien Cheung (University of Leeds), CIC21 Program Co-chairs*

The Twenty-first Color and Imaging Conference (CIC21) was held in Albuquerque, New Mexico, 4-8 November 2013. Color and imaging experts gathered to consider a wide gamut of questions concerning cinema, multispectral imaging and spectral reproduction, high dynamic range imaging, gonioapparent materials, fine art retouching, multiprimary displays, genetic polymorphism, 3D color, and non-convexity of the spectrum locus, among others. The General Chair was Clement Fredembach (consultant), and the Technical Program Co-Chairs were Vien Cheung (University of Leeds) and Jennifer Gille (Qualcomm QTI).

The four-day event started with a day of short courses, organized by Co-chairs Alex Forsythe (Academy of Motion Picture Arts and Sciences) Jérémie Gerhardt (Fraunhofer Focus), and taught by leading color and imaging scientists and engineers. Sixteen classes in four tracks comprised topics that continue to interest students, such as high dynamic range imaging, motion pictures, lighting, digital cameras, and color gamut mapping, as well as new topics such as perception and aesthetic preference, and normal and defective color vision. A full listing of the courses and their instructors can be found at www.imaging.org/ist/conferences/cic/CIC21_Preliminary_Program.pdf.

Photo: Suzanne Grinnan.

Albuquerque, New Mexico, and its world famous balloons welcomed this year's CIC attendees.

The conference committee put together a unique technical program of keynotes, oral papers, discussion panels, and interactive papers. Along with the full daily schedules, participants had ample time for in-depth discussion and networking. An ice-breaker welcome reception and a conference reception, Tuesday and Thursday evenings, respectively, were highly commended. Some of the speakers were presenting at CIC for the first time, which added a fresh and exciting dimension to the conference.

### CIC 21

| | |
|---|---|
| Attendees*: | 142 |
| Oral Papers and Keynotes: | 31 |
| Interactive Papers: | 15 |
| Short Courses: | 15 |
| Exhibitors: | 3 |
| Dates: | Nov. 5-8, 2013 |
| Location: | Albuquerque, New Mexico |

*includes Short Course only and guests

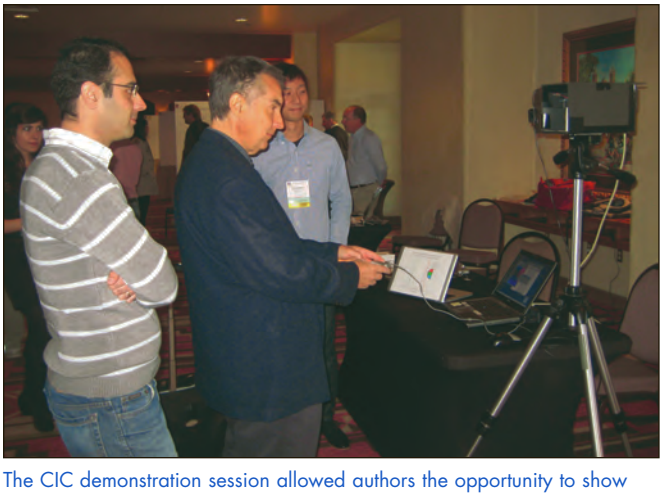

Photo: Suzanne Grinnan.

The CIC demonstration session allowed authors the opportunity to show the work behind their talks. Here Shahram Peyvandi (Rutgers University) (far left) and author Yuta Asano (RIT) (far right) watch Gabriel Marcu (Apple) interact with his observer metamerism device.

### Keynotes Add Perspective

Keynotes added perspective, and this year five highly distinguished individuals presented work on diverse topics. Wednesday morning, Graham Finlayson, professor of computer science at University of East Anglia (UK), spoke on Illuminant Estimation: Back to the Future; that evening, paleobotanist and retired New Mexico State Archaeologist Glenna Dean of Abiquiu Dye Studios (USA) presented Sticks, Flowers, Fibers: In the Footsteps of New Mexico's Prehistoric and Colonial Color Engineers. Thursday morning heard Shawn Belston, senior vice president of library and technical services at 20th Century Fox (USA), discuss The Art and Science of Film Restoration, and Friday morning Roger Hersch, professor of computer science at École Polytechnique

Photo: Suzanne Grinnan.

Ingeborg Tastl (Hewlett-Packard Laboratories) learns about Contrast Optical's state-of-the-art HDR video camera and display system from Tania Pouli (Max Planck Institute for Informatics).

Fédérale de Lausanne (EPFL, Switzerland), spoke on Color Reproduction and Beyond. Sabine Süsstrunk, professor for images and visual representation, also at EPFL, wrapped up the conference with her presentation, Controversial Color.

## Cactus and MERL Best Paper Awards

Sponsored by Mitsubishi Electric Research Laboratories, the MERL Best Student Paper award is voted on by all CIC attendees. This year the recipients were Yuta Asano and Adria Fores, both from the Munsell Color Science Laboratory at RIT.

Asano was given the award for his presentation, Observer Variability Experiment Using a Four-Primary Display and its Relationship with Physiological Factors. Using a Sharp Quattron display to produce metameric spectra for experimental stimuli, he found greater-than-expected variability among observers in their color difference judgments, despite using CIEPO 06, which can take into account observer age (and the significant factor of lens yellowing) and a field size. Calculating individualized cone fundamentals produced better predictions.

Fores won for his presentation, Perceiving Gloss in Surfaces and Images. This paper was motivated by the question of whether or not there is a need for a gloss (or surface) appearance model along the lines of the various color appearance models. In three gloss-matching experiments, cylinders wrapped with various papers of different glosses were compared: real scene/real scene, synthetic scene/real scene, and synthetic scene/synthetic scene.

The winner of the 2014 Cactus Award for Best Interactive Paper was Jon McElvain of Dolby Laboratories (USA) for his paper, Camera Color Correction Using Two-dimensional Transforms. Cinema, professional and prosumer cameras, and ultimately wide-gamut displays all require input color transforms that are beyond the standard 3x3 matrix. Other methods, such as 3D LUTs or the use of higher-order polynomials are improvements, but come at the cost of higher computational complexity. This paper describes a novel input color transformation method using two-dimensional lookup tables (LUTs). The method allows improvement in accuracy particularly significant for saturated colors, with a smaller footprint than 3D LUTs. It is suggested that such type of higher complexity camera transform method will be crucial for workflows intended for wide gamut display systems such as those compatible with ITU recommendation 2020.

Photos: Suzanne Grinnan.

Above: Wei-Chung Cheng (US Food and Drug Administration) discusses color matching and targets with exhibitor Don Williams (Image Science Associates). Right: Howard Stein (consultant), John McCann (McCann Imaging), and Po-Chieh Hung (Konica-Minolta) view samples related to Roger Hersch's (EPFL) keynote on color reproduction.

## Heavy Metal and Hardcore Theory

Two panel sessions brought focus to particular topics. Heavy Metal, organized by Danny Rich (Sun Chemical Corporation), discussed gonioapparent materials such as automotive paints (think metallic candy apple red and beyond) and the characterization of their color and appearance. Participants Mike Nofi (Flex Products / JDS Uniphase Custom Color Solutions), Greg Shrider (Byk-Gardner), and Rich Knapp (X-Rite, Inc.) addressed solutions for the difficulties of measuring and describing in objective terms the complex interactions of light and materials that produce beautiful and surprising effects that vary substantially with lighting and viewing angle.

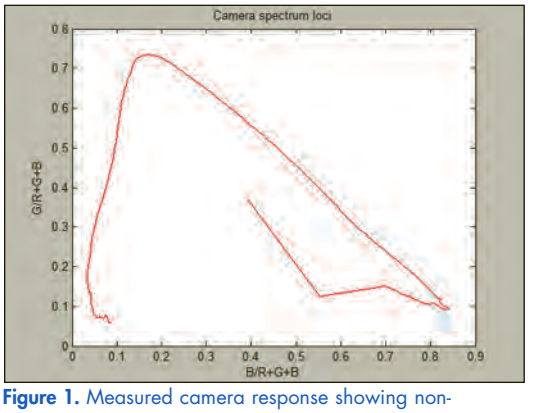


**Figure 1.** Measured camera response showing non-convexity over much of the spectrum locus.

From M. H. Brill (2013), Spectrum-locus convexity: A metric for cameras? The 21st Color and Imaging Conference: Color Science and Engineering Systems, Technologies and Applications, 227-230.

Hardcore Color Theory, organized by Mike Brill (Datacolor) and introduced by his paper, Convexity of the Spectrum Locus, a Metric for Cameras?, asked the question, "What color management problems happen when a camera's spectrum locus is non-convex?" His answer noted that, for a human or camera with a convex spectrum locus, a triad of spectral reflectances that are well behaved in a certain way will keep their chromaticity ordering (clockwise vs. counter-clockwise) under illuminant change. Panel members Pouya Bastani (Simon-Fraser University), Mark Fairchild (RIT), Brian Funt (Simon-Fraser University), Po-Chieh Hung (Konica-Minolta), Ján Morovič (Hewlett-Packard Company), and Eric Walowit (consultant) discussed non-convexity of the spectrum locus for both humans and cameras. At the end, the human spectrum locus was deemed to have only trivial non-convexities, but many camera spectrum loci were shown to be quite non-convex (see Figure 1), continues on page 8

# New Products Build Profits—Customers Respond to Innovation

*Ann L. McCarthy, IS&T TDPF Coordinator*

The Fifth International Symposium on Technologies for Digital Photo Fulfillment (TDPF) conference showcased a diverse collection of product commercialization success stories in the developing digital photo market. Partnered with the Digital Imaging Marketing Association (DIMA) conference and collocated with the Consumer Electronics Show (CES), TDPF2014 provided a venue to highlight new products and new technology, and opportunity for networking with others in the industry.

*One message came through loud and clear at this year's conference: one size does not fit all, and so the industry is responding with technical advances to satisfy a range of customer and market needs.*

## Preserving Memories

Family memories, cultural heritage, artistic expression, all of these rely on the growth and entrepreneurial spirit found today among digital imaging companies. Digital fulfillment takes consumers' precious memories from the realm of perishable digital files and converts them to tangible human viewable objects, making them immune to the ongoing advances in digital imaging technologies. On the flip side, digital capture recovers and preserves historic and legacy photos, documents, and works of art from the physical ravages of time. One message came through loud and clear at this year's conference: one size does not fit all, and so the industry is responding with technical advances to satisfy a range of customer and market needs.

We also glimpsed the accomplishments and ongoing work underway in the ISO committee for print image permanence, tasked with providing test methods and specification.

Henry Wilhelm and Harold Fuson (The Center for the Image. org with Wilhelm Imaging Research, Inc.) presented a keynote "Personal and Family Archives: A Simplified Approach to Collecting, Organizing, and Preserving Analog and Digital Photographs, Movies, Videos, Letters, and Other Documents," calling for the market to provide systems that ordinary individuals and families—the creators—can use to organize, share, and perpetuate family histories and stories.

In their assessment, a successful system has these qualities:

- Can be implemented over the lifetime of the creator.
- Can form a natural part of the creator's habits and routine activities from an early age.
- Includes protocols for preserving materials and protecting them from physical damage.
- Includes organizational methodologies that are flexible, easy to master, adaptable to technology changes over long periods of time.
- Allows easy access to its informational content, by the creator and others chosen.
- Allows easy transfer to the next generation archivist when the prior generation caretaker passes it on.
- Incorporates authentication procedures.

Wilhelm made the point that cultural norms have shifted. Today, we do not have physical objects for images or for many of our documents. And in this case we are speaking of a norm of the worldwide youth culture, not a limited geopolitical culture. For long-term storage, he recommended against using proprietary libraries or cloud systems. Operating system file storage is least likely to become unreadable over generations, and search capabilities will continue to improve. At the other end of the spectrum, with physical image materials, Wilhelm cautioned us to retain the originals after digitization. As technology progresses, improved methods of digitization may warrant repeating the process.

Joe LaBarca (Pixel Preservation International) discussed the challenge of bringing the millennial generation back to print. They have seen their parents' photo albums, and LaBarca posited that given sufficiently easy, compatible avenues for sorting their flood of digital captures to find the sprinkling of print-worthy images, they too would print.

Photo: Ann McCarthy.

In his talk "Videos in Photo Books and Other Tangible Products," Reiner Fageth (CEWE Stiftung & Co. KGaA) reported strong growth in the German photo book market and discussed photo book enhancements such as cloud storage, QR Codes technology, and videos in printed photo book products.

### TDPF 2014

| | |
|---|---|
| Attendees: | varied by session |
| Oral Papers: | 15 |
| Dates: | Jan. 5-6, 2014 |
| Location: | Las Vegas, NV |

## Inserting Video into Photo Books

This idea "they too would print" was borne out in the talk given by Reiner Fageth (CEWE Stiftung & Co. KGaA), reporting strong growth in Germany in

the photo book market. Fageth presented a fascinating photo book enhancement, combining cloud storage, QR Code technology, and printed photo books. CEWE offers videos in printed photo book products, linking classical printed media with online media. Based on their customer observations, CEWE finds that digital camera and smartphone videos are taken spontaneously and average less than one minute in length. Prior to this innovation, these videos could not be combined with the current state-of-the-art for storytelling: printed photo books. CEWE has implemented an easy-to-use method whereby customers may select scenes out of a video to use in their photo books, and further, may then create an even more compelling story by adding the videos to the photo book via automatically generated QR codes that are printed in the photo book. More than 75% of CEWE photo book customers currently use the feature to implement QR codes and scenes from videos so that videos play in their photo books. With that feature they pay for cloud storage of the video so that it can be served whenever the book is 'read'. Fageth noted that the data uploaded are growing to significantly higher volumes, the videos normally at least double the amount of data transferred to the online storage per customer.

## Books in Two Minutes

Several presenters raised the importance of marketing for today's photo products. Products introduced within the past four or five years account for a significant portion of profits. Continuing innovation and bringing those innovations to customers in accessible and friendly ways invites those customers to try new products, and they do.

Brigitte Peleman-Vantieghem (Peleman Industries, Inc.) described the uniBind custom photo book solution for retail. She emphasized the point that different regions of the world are interested in different photo product features. Because they serve customers worldwide, a key part of uniBind's practice is to listen to the unique needs of each customer. One of their recent projects tackled the question of "How to conquer the retail world?" A retail customer came to them interested in capturing in-store a portion of the photo book business. The requirements from this retailer are: low cost equipment, no skill required to operate, and fast production—so that the end-customer has at most a two minute wait. uniBind created an impressive solution, the CaseMaker 350 Combo, which satisfies the retail requirements and produces a hardcover photo book with the option of a custom photo on the cover.

## Like Kids in a Candy Store

Certainly print media can be a determining factor in the customer appeal of print products. Debate concerning print media technology and one-sided versus two-sided advantages occurred at several points during the conference. On one point all agreed: attendees at the conference felt like kids in a candy store with their hands on the new transparent conformable media, Avatrex™, demonstrated by Tom Snooks (S-One Holdings Corporation). Attendees passed around rocks, boards, photo albums, and other sample products demonstrating applications for this breakthrough material. The Avatrex technology is a nano metallic transportable graphic system with a metallically infused target surface adhesion layer that is thermally bonded to a metallically infused protection layer. The metal nanoparticles create a nanoionic bond force field which enables the nano metallic graphic apparatus to adhere to any substantially uniform surface capable of forming a uniform surface bond. The image is printed in reverse and then adhered to a display surface with the printed colorants protected on the inside. This is the first printable laminate that is not a PVC material and is not a film but a composite of three different water-based coating layers. Avatrex can be printed by virtually all digital and traditional methods and is applicable to industrial, commercial and consumer print applications.

Avatrex is perfectly clear until printed. Heat and in some cases primers are used to bond the printed laminate to the final support/display materials. Avatrex has no shape memory and so conforms to the display surface—presenting the texture of the material it is placed on. The Avatrex printed images appeared to be embedded in the rocks and boards on display during the session. Currently the majority of the product sells to photo book manufacturers to bond printed photographs to photo book covers. In this way, the resulting custom covers are scuff resistant, water resistant, and UV protected.

## Telling Tales from "Digital Clutter"

ScanCafe has tackled the challenge of improving the 'create' experience in the photo book workflow. As asserted by Laurent Martin (ScanCafe), we take photos to tell stories. The average number of photos taken at life events has exploded, in part because the cost of capture is $0. Whereas in the past an event might have had one photographer, now everyone can and does take photos—and in some cases a single person might use multiple devices. The result is that many images on multiple devices are captured for each event. And then people do nothing with them. Martin asked "How do we get people to do something with them?"

Such digital clutter is a barrier in print fulfillment and in the amateur photographer's enjoyment of photos. ScanCafe has industrialized the artistic photo book creation processes through a careful combination of technology and human decision-making. This solution, which is a combination of technology and the trained human eye, can take a "heap" of digital photos and transform them into a beautifully laid out "photo story"—which can then be printed or enjoyed via a digital display or mobile device—with zero work from the user. Conversion rates with the ScanCafe photo book solution (from photo upload to print) are in excess of 75%, in comparison to average conversion rates for photo book tools in the range of 30%.

The art of storytelling resides at the heart of the ScanCafe photo book creation process: to create meaningful groupings of photos of scenes, select the most relevant/

best, extract and focus on the beauty from each photo, and then compose these selections into a meaningful layout. ScanCafe sees digital imaging as a multi-step system challenge—capture, aggregate, cloud, access, share, and buy products, all to answer peoples' desire for personal storytelling. Currently ScanCafe has a centralized repository for capture, with rich metadata. This is combined with human design to create meaningful photo stories without consumer involvement—and to provide maximum ease of use to obtain a personal storytelling photo book. Martin believes that without this conversion from pull to push—the majority of people will not do anything with their photos. A manual photo to book creation process is too time-consuming and difficult for most.

### Enabling Artistic Creation

In the second conference keynote, Emerging Opportunities for Commercial Digital Printing Processes in the Fine Arts, Frank Cost (Rochester Institute of Technology), spoke on embracing the creative and artistic opportunities that arise with the internet and digital media, encouraging us to "think of the internet as a giant box of crayons." Unexpectedly, the ease of replication afforded by digital technology creates a challenge for artists. There is only one Mona Lisa. In the case of print art, the plate or master is used only a limited number of times. This creates scarcity and hence value; e.g., the practice of numbered reproductions, each signed by the artist. Common historical practice in making print art is to make the numbered reproductions and then strike (destroy) the master / plate to prevent additional reproductions. This ensures the value of the numbered reproduction for the buyer. Moving forward, how can artists manufacture scarcity in a digital world? How can they "destroy" the original? This open question in the art market stands in contrast with digital preservation practice, focused on creating archives that will survive for hundreds of years.

Cost described his experiences with creating innovative print formats, building excitement in the art community through display forms made possible by digital print. For example, in a joint project with a Rochester gallery, Cost and Merlin Digital Printing Solutions printed panoramas in five minutes—120 feet of continuous printing —that with another technology would have taken weeks. People attending the subsequent art show loved the brilliant color gamut and the continuous print form wrapped around the walls of the display room. Cost has also experimented with other unusual forms: e.g., a 19" square book, and an accordion book. From the print shop perspective—seeking to engage artists, he has been concerned with artists' willingness to use digital press technology. In his experience, print technology innovation can enable artistic expression. If a print provider can create a form for an artist that they cannot get anywhere else, their technology prejudices will give way. ▲

# In Appreciation of Steve Puglia, Digital Preservation Pioneer

*by Ann L. McCarthy, IS&T Standards Coordinator*

On Sunday, January 12, 2014, photograph conservators, archivists, image standards experts, and colleagues joined family and friends to honor long-time IS&T member, Steven T. Puglia. An instructor, presenter, session chair, and reviewer, Puglia was an active member of the IS&T Archiving Conference community.

Puglia devoted his professional life to the challenges of preserving our cultural heritage. He understood and worked tirelessly to address the preservation of, and access to, at-risk photographic print, negative, and digital image collections that document history, connect cultures, educate generations, and embody beauty. He took the long view, knowing that "preservation is a long-term management process, and digital preservation requires a life-cycle perspective and active management."

Photos: Barry Wheeler, Library of Congress.

Puglia started his preservation career duplicating historical negative collections for the Northeast Document Conservation Center in Andover, Massachusetts. After studying photography at Rochester Institute of Technology and the University of Delaware, he worked as a preservation and imaging specialist in the reformatting labs at NARA, the National Archives & Records Administration (1988 to 2011). There he set up and became manager of the first digital imaging department, working on the preservation of government records, setting standards, and developing new methods. During that time Puglia led a task group within the International Standards Organization Technical Committee 42 – Photography (ISO/TC 42), developing print image permanence test method standards.

In 2011, Puglia joined the US Library of Congress as digital conversion services manager in the Office of Strategic Initiatives. In this role, he provided technical leadership for a wide range of projects involving the conversion continues on page 14

continues from page 4

and the conclusion was that potential color management problems akin to metamerism might arise from camera non-convexity.

## Rainbows, Bright Ideas, Perception, Skin Tones, and Material Appearance Highlight Technical Sessions

The technical paper program of oral presentations at CIC is single track. The first two sessions on Wednesday, Inside the Rainbow and Beyond the Rainbow, examined spectral issues in color science. For some applications, retaining more complete spectral information, beyond the typical constrained RGB gamut, is desirable. For instance, Shrestha and Hardeberg, in Multispectral Imaging Using LED Illumination and an RGB Camera, described a method for multispectral imaging under controlled illumination, using two or three combinations of light sources with two or three captures, that is simple, inexpensive, and fast, suitable for applications such as documenting cultural and heritage artworks.

Wednesday continued with the Bright Ideas and Heavy Metal sessions, looking at the interactions between illuminants, surface properties such as gloss, and appearance. McCann, Vonikakis, Bonanomi, and Rizzi, in Chromaticity Limits in Color Constancy Calculations, pulled together complexities of non-uniform illumination, camera "chromaticity" limitations, color masking within cameras, and scene-dependent veiling glare,to argue that what they call "computer vision color constancy," as distinguished from color constancy in human vision, is best evaluated in real scenes (not the laboratory) using actual reflectance measurements from a spot meter as ground truth.

The sessions Colorful Language and Picture Perfect started Thursday's lineup, looking into the ways color is communicated verbally, and into color in the fine and graphic arts. Tominaga, Imai, Saito, and Horiuchi looked at color analysis of fine-art paintings in Extraction of Artists' Color Features of Art Paintings and Its Application to Color Image Correction. They described a method for analyzing an artist's color distribution from a very large database of paintings and extracting his or her color features, and then applying a color correction algorithm using those features to the captured image of a work of that artist such that color mismatches due to museum lighting, image acquisition, printing or display are corrected. Figure 2 shows an example of various renderings of a single image, Manet's "The Fife Player". How correct is each?

From Tominaga et al. (2013), Extraction of artists' color features of art paintings and its application to color image correction. The 21st Color and Imaging Conference: Color Science and Engineering Systems, Technologies and Applications, 79-84.

**Figure 2.** Three samples of color-mismatched images.

High-quality interactions among participants are a hallmark of CIC with the Interactive Paper Session. Interest was piqued in the Spotlight Session, with each author giving a two-minute paper preview. In the afternoon, the sessions Do you see what I see? and Playing with Color examined questions of perception such as observer variability and metamerism. The Interactive Session followed.

Friday's sessions, The Skinny on Color, Putting Color to Work, and Hard Core Color Theory looked at the reproduction of skin color, color in printers and displays, and spectrum locus convexity (see above), respectively. Morovič et al. described 8 Vertex HANS: An Ultra-simple Printer Color Architecture. In this architecture, an entire printing system can be characterized using just eight halftone patterns and the system's dot gain. The system shows the potential for great accuracy and consistency with minimal color set-up requirements.

The technical program concluded with a Late-Breaking-News session featuring recent discoveries in color imaging, and the final keynote address.

The 2014 CIC will take place in Boston, Massachusetts, November 3-7. Collocated with CIC22 will be the 2nd International Congress of the International Academy of Digital Pathology, ICC DevCon, and the Medical Imaging Working Group. Details on CIC22 and CIC21 can be found at www.imaging.org. ▲

**IS&T REPORTER**

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IS&T focuses on all aspects of imaging, with particular emphasis on digital printing, electronic imaging, image perception, photo fulfillment, color imaging, image preservation, digital fabrication, and the physics and chemistry of imaging processes. For more information, visit imaging.org. IS&T publishes the *Journal of Imaging Science & Technology* and *Journal of Electronic Imaging* (with SPIE).

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# The Standards Roundup: Imaging and Graphic Arts

*by Ann L. McCarthy, IS&T Standards Coordinator*

## *Imaging Standards News*

This *Imaging Standards News* is focused on both U.S. national and international standards applicable to photographic imaging, including analog, digital and print concerns. IS&T imaging standards encompass the capture, communication, and display of a photographer's desired image content, the advancement and maintenance of analog photographic imaging technologies, and the preservation of physical imaging materials; all practices essential to everyday enjoyment of photography and to our photographic heritage.

### ISO/TC 42: Working Groups

TC 42 and its contributing experts are conducting current projects within the following working groups and joint working groups. In each of these areas, experts are welcome to contribute through their corresponding national committees. For meeting details for the working groups listed below, please contact the Secretariat, isotc42@ansi.org.

— *WG 3, Sensitometry, image measurement and viewing;* next meeting in Gunnersbury, West London, May 12-14, 2014, hosted by BSI.
— *WG 5, Physical properties and image permanence of photographic materials;* next meeting in Gunnersbury, West London, May 12-14, 2014, hosted by BSI.
— *WG 18, Electronic still picture imaging;* next meeting in San Diego, CA, June 24-27, 2014.

Working Groups with current projects, joint with other ISO and IEC committees:

— *WG 8, Joint with TC 6, Photographic film and paper products – Dimensions;* next meeting in Gunnersbury, West London, May 12-14, 2014, hosted by BSI.
— *JWG 20, Joint with IEC, Digital Still Cameras;* next meeting in San Diego, CA, June 24-27, 2014.
— *JWG 23, Joint with TC 130 and CIE, Extended colour encodings for digital image storage, manipulation and interchange;* next meeting in San Diego, CA, June 24-27, 2014.
— *WG 25, TC 42/WG 18 joint with TC 130, Use of XMP for digital photography;* next meeting in San Diego, CA, June 24-27, 2014.
— *JWG 26, Joint with TC 46/SC 11 and TC 171, Imaging system capability qualification for archival recording and approval;* next meeting in Berlin, Germany, May 12th, 2014.

### IS&T Standards Website update

With the publication of ISO 12233:2014, *Photography — Electronic still picture imaging — Resolution and spatial frequency responses*, the webpage for the related Digital Camera Resolution Measurement Tools has been updated to include a link to the ANSI Standards web store.

### News from recent ISO TC 42 WG Meetings

*ISO/TC42 WG 18, JWG 20, JWG23, and JWG25 Meetings, February 12 –14, 2014, Yokohama, Japan*

Forty-three representatives from four countries gathered at the Pacifico Yokohama in Yokohama, Japan.

Often in standards development, the critical foundation of a standard depends upon agreement among the experts on the fundamental imaging concepts and definitions that underlie the work. Not only must a standard provide terminology that is clear to practitioners of the science, a standard must then provide practical methods based on that terminology. Two topics from the Yokohama meeting demonstrate the importance of unambiguous and consistent use of terms.

ISO/AWI 18844, *Electronic still picture imaging — Flare measurement techniques for digital camera systems,* will specify the definition of image flare for digital cameras, and provide test patterns, measurement conditions, and methods, so as to enable the comparison of the results of measurement. In Yokohama, an improved definition of image flare was presented: "unwanted increase in signal resulting from light incident on an image sensor that does not emanate from a corresponding subject point". The project team will continue development of the related testing methods.

ISO 3664, *Viewing conditions — Graphic technology and photography,* and the e-ILV term list standardized in the CIE (available at http://eilv.cie.co.at/), provide the definition of veiling glare: "light, reflected from an imaging medium, that has not been modulated by the means used to produce the image", with notes that "Veiling glare lightens and reduces the contrast of the darker parts of an image. The veiling glare is sometimes referred to as 'ambient flare'." The understanding of veiling glare has particular importance in the application of standardized color encodings, particularly those intended for softcopy display viewing. For example, in IEC61966-2-1, *Colour measurement and management — Part 2-1: Colour management — Default RGB colour space — sRGB,* veiling glare is defined by reference to ISO 3664. Veiling glare, in turn, guides the understanding of the practical concept of medium black point, useful in color management, which is defined in the above mentioned e-ILV term list as "neutral colour with the lowest luminance that can be produced by an imaging medium in normal use, measured using the specified measurement geometry". With a self-luminant softcopy display, the lowest luminance that can be produced and measured can be

attributed to veiling glare (neglecting any internal flare). Over time, as the application and use of sRGB have become widespread, and because the veiling glare of the sRGB standard is specified to be measured on the faceplate of the display, recommendations for treatment of medium black point that differ from the reference veiling glare defined in the sRGB standard have become widespread. These recommendations can be a concern with regard to the maintenance of the sRGB standard as an underpinning to its many applications. ISO 22028-1, *Photography and graphic technology — Extended colour encodings for digital image storage, manipulation and interchange — Part 1: Architecture and requirements,* contains one such differing recommendation, to utilize a reference medium black point luminance measured from the point of an observer rather than at the faceplate of the display. Action was taken at the Yokohama meeting to work with IEC/TC100/TA2 to address the concerns.

### *Progress in JWG26, Imaging system capability qualification for archival recording and approval*

JWG 26 has produced a working draft of TS 19264, *Photography — Electronic still-picture imaging — Image Quality Analysis.* Perusal of the draft brings to light a key difference between this Technical Specification and other image quality standards. While other image quality standards are intended for use in evaluating image products themselves, the intent of this work is to develop methods for assessing the systems that produce image reproductions. In particular this project is concerned with the high quality scan reproduction that is underway in the world's museums and historical records organizations. In such context, accuracy is the key objective necessary to fulfill our collective obligation to succeeding generations. Standardized tools and methods whereby archivists can evaluate and compare the available equipment will be widely appreciated.

The introduction of the TS 19264 draft makes several interesting points, setting the stage for the work. Image quality analysis is applicable in developing and evaluating imaging systems, in calibrating and setting up imaging systems, and in process control of the systems over time. The particular attributes of image quality that factor in a given situation depend significantly on the originals to be digitized. One key challenge in the method of applying 'original vs. reproduction' image quality analysis is that the test originals must be of such quality, and have such attributes, that collectively they can a) represent the valued originals, and b) exceed the quality reproduction capability of the reproduction systems. In particular, it is useful for the image quality characteristics and metrics used in the analysis to yield quantified values applicable to discriminating fine differences in imaging system behavior. Knowledge of the weaknesses in current systems also factors in developing appropriate test originals.

### *Next ISO/TC42 WG 5, WG 3, and WG 8 Meetings, May 12 – 15, 2014, Gunnersbury, West London, hosted by BSI*

The completion of ISO 18940, *Imaging Materials — Reflection colour photographic images — Indoor stability specifications for consumers,* will provide the necessary umbrella specification to direct the use of the individual image print stability attribute test methods. Now that the four core attribute test methods are published (ISO 18936 thermal, ISO 18937 light, ISO 18941 ozone, ISO 18946 humidity), work is accelerating on the overarching consumer specification standard.

In preparation for the ISO18940 discussion in Gunnersbury, committee members will collect and examine performance data from existing products. A short round robin is being considered to provide additional data. The challenge inherent in ISO 18940 is considerable. ISO 18940 will standardize the presentation of image print stability test results to consumers and must be straightforward in conveying print product capabilities, while not inhibiting the evolution and improvement of print technologies going forward. The objective is to standardize consumer facing terminology in a way that will pertain correctly to a variety of print technologies now and in years to come. We must keep in mind that standards can have a positive impact on print technology development. In the time that has elapsed while WG5 has refined and published the four core attribute test method standards, the image print stability of typical photo print materials has improved significantly.

The NP ballots have been issued for ISO/NP 18948-1, *Imaging Materials — Photo Books – Test Methods for Permanence and Durability Part 1 — Photo Book Materials and Construction Test Methods,* and ISO/NP 18948-2, *Imaging Materials — Photo Books — Test Methods for Permanence and Durability — Part 2: Open and Closed Book Image Permanence and Physical Durability Test Methods*. This series of standards includes test methods to assess the permanence and durability of photo books, including cover and pages, with associated requirements for permitted reporting. The test methods pertain to color hardcopy materials of a variety of different print methods and the performance tests do not differentiate according to print technology.

## Preview the CIE 2014 Lighting Quality & Energy Efficiency Conference

**Kuala Lumpur, MALAYSIA, 23-26 April, 2014**

A quiet revolution is underway in the world of lighting and this conference promises to be a seminal gathering of researchers and practitioners. A wide range of topics, such as "What is Colour Fidelity in Museum Lighting?", "The Impact of the Luminance Levels and Color Temperature on Viewing Fine Art Under LED Lighting," "The Preference of Colour Temperature Depending on Daylight and Weather," "Whiteness Metric for Light Sources," "Specifications for the Chromaticity of White Light Sources," and many others will be of interest to IS&T members and members of the imaging standards community. Conference details are available at http://malaysia2014.cie.co.at/.

In Part 1, the focus is on assessing the quality of the materials and the processes used to produce a photo book. Part 2 specifies test methods to assess the image permanence of photo books that are displayed or left open, exposed to light, humidity, and ozone. Part 2 separately defines test methods pertinent to books kept in a closed state, such as when photo books are stored in a book case. A discussion of testing to evaluate how well a photo book holds up under special environmental stress, such as in the heat of a car in summer is also included.

Photo book durability concerns a wide range of topics beyond the image permanence of the photo book pages. For example, because of the durability questions related to PVC and PVC compounds, these materials are not recommended in ISO 18902, *Imaging materials — Processed imaging materials — Albums, framing and storage materials,* or in ISO 18920, *Imaging materials — Reflection prints — Storage practices.* However, today, certain photo book manufacturers use PVC materials in photo book covers and have presented evidence supporting the durability of specialized PVC materials for such use. As a result, PVC materials stability testing conducted by the committee will be discussed at the Gunnersbury meeting.

## Graphic Arts Standards News

*Graphic Arts Standards News* covers US national and international standards applicable to the graphic arts industry, developed by ISO Technical Committee 130 (Graphic Technology). This is brought to you in collaboration with the Association for Suppliers of Printing, Publishing, and Converting Technologies (NPES), which serves as the Secretariat for the US TAG to ISO TC 130.

### ISO/TC 130: Working Groups

TC 130 is organized into working groups with convener and assistant convener responsibilities assigned to national bodies. The U.S. serves as the convener of four working groups. In each of these areas, experts are welcome to contribute through their corresponding national committees. For meeting details for the working groups listed below, please contact the ISO/TC 130 US TAG Secretariat at: http://www.npes.org/programs/standardsworkroom/tc130theustag.aspx. Working Groups with current projects within TC 130 are:

- TF3 "Workflow standards roadmap".
- WG 1 "Terminology".
- WG 2 "Prepress data exchange".
- WG 2/TF2 "Prepress data exchange – PDF/X".
- WG 2/TF3 "Prepress data exchange – Variable Data Exchange (VDF)".
- WG 2/TF4 "Prepress data exchange – XMP".
- WG 3 "Process control and related metrology".
- WG 4 "Media and materials".
- WG 5 "Ergonomics and Safety".
- WG 7 "Color management (JWG ISO/TC 130 and ICC)".
- JWG 8 "Joint TC 130-TC 42 WG for revision of ISO 13655".
- WG 9 "Joint TC 130-TC 42 WG for development of ISO 12640-5".
- WG 10 "Joint between ISO/TC 130 and ISO/TC 247 for standards addressing management of security printing processes".
- WG 11 "Environmental impact of graphics technology".
- WG 12 "Postpress".
- WG 13 "Printing conformity assessment requirements".
- JWG 14 "Joint ISO/TC 130-ISO/IEC JTC 1/SC 28 WG, Print Quality Measurement Methods".

### 27th TC 130 Plenary Meeting, December 2013

In addition to the Plenary meeting, 93 experts representing 17 countries participated in 12 WG and TF meetings. The following are a subset of the resolutions from the Plenary meeting:

- **496:** ISO/TC 130 resolves to initiate work, at Stage 0, to develop a new standard to associate processing steps and content data information in a PDF file. The proposed title is:

## IEC TC 119 (Printed Electronics)

The work of TC119 is progressing well and the Committee is starting to establish some formal structure. TC119 now has 4 Working Groups with 3 other groups that could yet achieve that status. These working groups are now active and conducting meetings separate to the Plenary sessions. As an example WG3 (Equipment) and WG4 (Printability) have arranged a meeting together at a common location in Tokyo.

There are two working groups that should be of particular interest to the NIP/DF community within the IS&T.

WG2 (Materials) is currently working in two major areas. The first is standards for Printed Electronics substrates with the focus currently being on glass and polymer media. I would urge readers with interest in other substrates such as paper and inkjet media to look into this work and consider involvement.

WG3 (Equipment) is setting standards for both contact and non-contact fabrication. In particular this group is looking to develop performance metrics for inkjet heads in Printed Electronics applications, interpreting work previously presented at NIP/Digital Fabrication.

Involvement in International Standards activity is organised by country. TC119 currently has 12 nations actively participating with 1 more currently seeking association. There are also seven nations observing this work. Two of these have significant Printed Electronics programs so it is hoped that they will soon apply for P member status.

The next full meeting of TC119 takes place March 17-19 in Cambridge, United Kingdom. It is followed by a one day meeting "Manufacturing for Printed Electronics" on the 20th and visits to local institutions on the 21st.

*—Alan Hodgson, Chair IEC TC 119*

Graphic Technology — Use of PDF to associate processing steps and content data. This work is to be done within WG2/TF2. The proposed document editor is Lieven Plettinck.

- **497:** ISO/TC 130 resolves to initiate work, at Stage 0, to develop a new part of ISO 16612 to enable the use of the PDF placeholder architecture to accomplish content substitution. The tentative title of the new Part is: *Graphic technology — Variable data exchange — Part 3: Use of PDF/X-4 for content substitution*. This work is to be done within WG2/TF3. The proposed document editor is Christoph Oeters.
- **498:** ISO/TC 130 requests its secretariat to advise interested parties that resolution 435, which temporarily restricted the addition of new work in WG 3 due to the group's heavy workload, can now be rescinded.
- **499:** ISO/TC 130 at the request of WG 3 instructs its secretariat to change the development track and the title of ISO 15311-1 *"Graphic Technology — Requirements for printed matter for the commercial and industrial production — Part 1: Parameters and measurements measures"* to TS (Technical Specification) at stage 30.00.
- **500:** ISO/TC 130 at the request of WG 3 instructs its secretariat to initiate NWIs for ISO/TS 15311-2 *"Graphic Technology — Requirements for printed matter for the commercial and industrial production — Part 2: Commercial Production Printing"* and ISO/TS 15311-3 *"Graphic Technology — Requirements for printed matter for the commercial and industrial production — Part 3: Large Format Signage Printing"* and adjust the titles accordingly.
- **501:** ISO/TC 130 at the request of WG 3 instructs its secretariat to initiate work at stage 0 to revise ISO 13655 and to reactivate JWG 8 to accomplish this task. The TC 130 secretariat is also requested to notify TC 42 of this activity and invite their continued participation in JWG 8. The proposed convener of JWG 8 and editor of this work is Danny C. Rich, with secretariat support provided by US national body.
- **505:** ISO/TC 130 requests the Chairman, the secretary and the convenor of WG 11 to start the dialogue required to create a JWG with IEC TC 100/TA 13 for the development of a standard with the preliminary title of *"Calculating the carbon footprint of electronic media"*. Proposed are Laurel Brunner as Convenor and Hiroyuki Nakamura as Deputy Convenor.
- **506:** ISO/TC 130 resolves to initiate work at stage 0 to develop an International Standard to define a test method on page pull under the following working title: *"Page pull test to determine book binding quality"*. This work is assigned to TC 130 WG 12. The proposed project leader is Uwe Bertholdt.
- **507:** ISO/TC 130 requests its secretariat to inform ISO/CS that the following parts of ISO/PWI 18621 "Graphic Technology - Measurement of visual attributes of printed materials" have been identified: Part 11 *"Method for computing and analysing colour gamut"*. The proposed document editor is Phil Green. Part 21 *"M-Score test method for evaluation of macroscopic uniformity"*. The proposed document editor is Andreas Kraushaar. Part 31 *"L-Score method for perceived resolution evaluation utilizing a contrast resolution target"*. The proposed document editors are Thomas Liensberger and Eric Zeise.
- **510:** ISO/TC 130 resolves, in response to TC 42 Resolution 2013-12, to invite TC 42 to join in the work of and become a participant in TC 130 JWG 14, which currently includes JTC 1 SC 28. TC 130 requests its secretariat to communicate this decision to JTC 1 SC 28 to ensure their concurrence and to notify ISO/CS of this decision.

On a personal note, in resolution 512, ISO/TC 130 acknowldeges the retirement of William K. (Kip) Smythe from NPES and his withdrawal from the US and International Standards activities. He is one of the few current members of TC 130 that participated in the reactivation of TC 130 in Berlin in 1989, and has been the convenor of WG5 since its inception. His involvement and leadership will be sorely missed within TC 130 and within the ICC where he served as Secretary.

IS&T joins TC 130 in wishing Kip well in his retirement.

## News from current ISO/TC 130 Projects

### *January 2014 publications announcements*

For your information the following ISO standards have been published and are available for purchase from ISO, ANSI and other national bodies. These standards can also be purchased from NPES.

- ISO 12640-5:2013, *Graphic technology — Prepress digital data exchange – Part 5: Scene-referred standard colour image data (RIMM/SCID)*
- ISO 12647-1:2013, *Graphic technology — Process control for the production of half-tone colour separations, proof and production prints — Part 1: Parameters and measurement methods*
- ISO 12647-2:2013, *Graphic technology — Process control for the production of half-tone colour separations, proof and production prints — Part 2: Offset lithographic processes*
- ISO 12647-2:2013, *Graphic technology — Process control for the production of half-tone colour separations, proof and production prints — Part3: Coldset offset lithography on newsprint*

### *Recent progress in standards development*

- The DIS ballot for ISO/DIS 16760, *Graphic technology — Prepress data exchange — Preparation and visualization of RGB images to be used in RGB-based graphics arts workflows,* was approved with one negative vote and a range of editorial and technical comments. One concern revolves around the standardization of an ICC perceptual rendering intent image conversion for RGB images in such workflows.

- The NP/CD ballot for ISO/CD 18620, *Graphic technology — Prepress data exchange — Tone adjustment curves exchange,* was approved unanimously, with comments. The ability to be able to provide calibration data for printing plates in a standard form to ensure easy and accurate exchange of data is and is becoming more important as printing moves towards a manufacturing process. This standard will enable such exchanges to take place. The standard will define the minimum set of data required by all of today's applications and provide a format that is easily extensible so that additional metadata can be included when agreed on between the parties.
- The DIS ballot for ISO/DIS 17972-1, *Graphic technology — Colour data exchange format — Part 1: Relationship to CxF3 (CxF/X),* was approved unanimously with editorial and minor technical comments.
- Revision of ISO 13655, *Graphic technology — Spectral measurement and colorimetric computation for graphic arts images,* is underway. Danny C. Rich, JWG8 Convenor and ISO 13655 editor, reported that the first draft of ISO 13655 with his proposed revisions was discussed during a teleconference on January 31 where many of the proposed changes were approved.

## News from CGATS/USTAG TC 130 Projects

### *On the topic of Print Characterization Targets*

Proposals are under consideration for a new target IT8.7/5. The target development will assess the problems of printing to different substrates and considerations of what problems may occur in the future with new print technologies. Spectral data capture will be considered as this aids in looking at new methods of substrate correction and aligns with International Color Consortium (ICC) goal to move to a spectral model.

The fundamental concept of a standard target is under examination. Will future print systems be best served by continued use of a fixed target? Can we improve the applicability of a universal target or must we create targets that are more process specific? Is a dynamic target that would be adjustable to the printing process essential? Such a dynamic target would alter the fundamental paradigm. Members noted that digital manufacturers are creating intelligent devices that will have the ability to make adjustments on the fly and that manufacturers in Europe are asking for this type of capability today.

Target use case recommendations should also be clarified. For example, the same characterization data used to create an ICC profile should not be used to validate the resultant profile.

During the development of the next generation target, test results will include gamut mapping information showing data from each candidate characterization target for each printing condition. This will allow examination of the challenges inherent in creating a standard print target for the wide range of print technologies and print conditions in use today and anticipated in the future.

### *On the topic of ISO 15339,* Graphic technology — Printing from digital data across multiple technologies

Background: The ISO 15339, *Graphic technology — Printing from digital data across multiple technologies,* project objective is to define printing process control by means of standardized print characterization data sets.

Recently ISO ballots were conducted for ISO/DIS 15339-1, *Part 1: Principles,* and ISO/DIS 15339-2, *Part 2: Characterized printing conditions.* The two ballots were approved, however with negative votes and comments ranging from editorial to fundamental technical concerns. The proposed FDIS versions of both standards, with accompanying proposed resolution of comments from the DIS ballot, have been circulated.

### *On the topic of Substrate Correction*

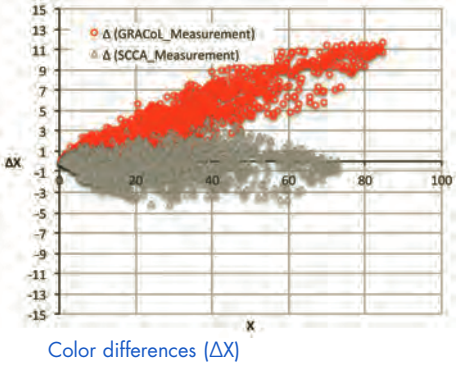
During the Joint CGATS/USTAG/PPC meeting, February 4-6, in Portland, Oregon, a presentation was given by Robert Chung and Li Wu (RIT School of Media Sciences), on the topic of *"The Effect of Substrate Correction on Printing Conformity"*. The presentation opened with a restatement of the well-known dichotomy, that when printing is managed as a graphic arts process acceptability is ranked by subjective customer approval, whereas when printing is managed as a manufacturing process, acceptability is ranked using objective standards. In the manufacturing process case, a number of supporting standards are required.

Customer preference for printing on bright papers creates a dilemma for print manufacturing standardization, given that these customer-preferred substrates do not conform to the standards and are not stable over time. A method to apply substrate-corrected colorimetric aims (SCCA) to meet printing specifications has been developed (Tristimulus linear correction method, ISO13655; extended to correct paper color difference, McDowell 2011), but is not widely understood and adopted in the printing industry. The research presented examined the question: "What is the effect of substrate correction on dataset conformity for a large number of offset, digital printing, and proofing jobs?"

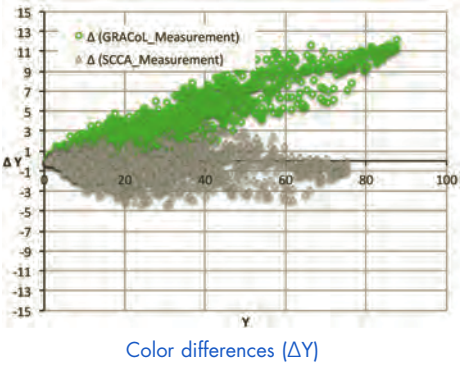
Three cases were examined with regard to the efficacy of the SCCA method:

- Jobs Using Conforming Paper when the Press Is Calibrated
- Jobs Using Non-conforming Paper when the Press Is Calibrated
- Job Using Conforming Paper when the Press Is Not Calibrated

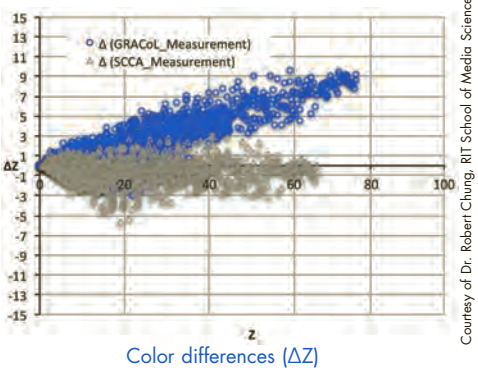
The study results clearly show that in the two cases in which the press is calibrated, which should be the case in a print manufacturing process, the SCCA method removes the paper color difference and improves the outcome of conformity assessment. For example, the graphs on page 14 show the conformity obtained with SCCA in jobs with non-conforming paper (low L*) when the press is calibrated. The color plots show the color differences (ΔX, ΔY, ΔZ) between measurement and the uncorrected data set aims. The grey plots show the color differences (ΔX, ΔY, ΔZ) between measurement and the SCCA data set aims.



Color differences (ΔX)



Color differences (ΔY)



Color differences (ΔZ)

Courtesy of Dr. Robert Chung, RIT School of Media Sciences.

SCCA removes the paper color difference and changes the outcome of the conformity assessment. Note: the conformity assessment in the study was based on all 10 normative requirements according to CGATS TR016 (2012). CGATS TR016 is currently under revision.

*For questions about the activities of TC 42, for suggestions for (or input to) future updates, or standards questions in general, please contact the IS&T Standards Coordinator at standards@imaging.org.*

continues from page 7

of analog materials to digital, while he continued his support of imaging standards. He was well known to, and respected by, members of the American Institute for Conservation (AIC) Photographic Materials Group, AIC Electronic Media Group, ISO/TC 42, and conservation professionals working in libraries and archives around the world. Through this work, Puglia became a technical conduit between conservators, preservation managers, and the information technology communities.

Puglia was a quiet, effective leader with extraordinary diplomatic skills and a keen sense of humor. Many remember his presentations on cost-benefit studies, imaging performance, and reformatting of photographic collections. These were aimed at providing museum and library administrators with the information required to develop sound, sustainable preservation strategies.

Puglia was a driving force in creating guidelines to steer cultural heritage institutions toward standard methods for digitizing their treasures. While at NARA, he was the primary author of Technical Guidelines for Digitizing Cultural Heritage Materials: Creation of Raster Image Master Files. This 2004 document continues to serve as a valuable teaching tool and reference. In 2007, Puglia joined the Federal Agencies Digitization Guidelines Initiatives (FADGI) Still Images Working Group and participated as a key technical member, providing invaluable input on imaging technique and workflow.

Puglia introduced improved imaging techniques, ensuring these methods were practical, cost-effective, and consistently of high quality. He shared his knowledge generously, inspiring and teaching generations of emerging conservators, collection care professionals, and photographers about traditional and borne-digital reproduction techniques. In recognition of his professional contributions, Puglia received the prestigious HP Image Permanence Award in 2009 from IS&T, and AIC's Special Recognition for Allied Professionals in 2013.

Puglia is remembered beyond the technical nitty gritty of his work. A good listener, Puglia invested in people. He was that rare person devoted not only to developing his own expertise, but also willing to generously share his understanding of the world with others—whether through photography or his love of music, art, nature, automobiles, and timber framing.

He will be missed. ▲