



IS&T

# REPORTER

"THE WINDOW ON IMAGING"

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## NIP/Digital Fabrication 2014

### BEST INTERACTIVE PAPER AWARD

#### Printing Quality Enhancement by Detection of Printhead Defects in Single-Pass Inkjet Printing

Yongtai Zhang, Shihong Deng, Zhihong Liu, and Minhui Wu, Peking University (China)

**Abstract:** Banding and doubling are two of the most common problems in inkjet printing, which are caused by printhead defects including blocked nozzle and poor registration. It is expensive and inefficient to solve the problems by enhancing device accuracy or replacing the defective printhead, since the device or printhead may degrade over time. In this paper, we propose an economical and efficient method for banding and doubling reduction by detection of printhead defects without requirement of hardware renewal. We design a test pattern composed of specially organized dots to diagnose status of each nozzle by image processing. Specifically, after analyzing the printed and scanned test pattern, halftone images are modified according to the detected information for banding and doubling reduction. We adjust the size and placement of dots based on human perception in order to improve the printing quality. The detection and reduction are carried out in CMYK printing colorant channels separately. Thus, it could overcome the inter-channel interference which may affect the detection accuracy. Experimental results show that the proposed technique is flexible, highly precise and has extensive self-adaptability for various devices, halftone styles, substrates and inks.

### BEST INTERACTIVE PAPER AWARD

#### Large-Scale Fabrication of All-Inkjet Printed Organic Thin Film Transistors: A Quantitative Study

Eloi Ramon, Carme Martínez-Domingo, Ana Alcalde-Aragonés, and Jordi Carrabina, CAIAC, Universitat Autònoma de Barcelona; and Adrià Conde, Jofre Pallarès, and Lluís Terés, Institut de Microelectrònica de Barcelona, IMB-CNM (CSIC), (Spain)

**Abstract:** In recent years inkjet printing technology has been increasingly applied as advanced deposition technology in the field of printed electronics. The reasons for the awakening interest to use inkjet printing are the high flexibility in terms of patterns (mask-

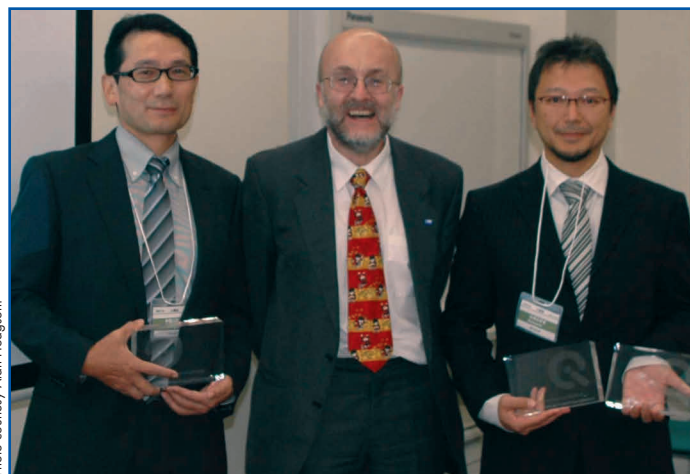


Photo courtesy Alan Hodgson.

IS&T President Alan Hodgson presents the Image Engineering Innovation Award to Masahiro Suzuki (left), Yoichi Iwasaki (right), and Takashi Aoki (not pictured) for the development of hybrid autofocus image sensors and cameras. The Image Engineering Innovation Award is sponsored by Image Engineering GmbH & Co. KG for efforts that lead to quality improvements or major positive changes in handling digital cameras and images through new technological features of cameras, innovative image processing, renewal of existing camera features, optimization of the user interface and camera handling, and/or simplifying or enhancing the use of images.

less) and materials, and the low cost approach as only a small amount of materials is required in comparison to other solution-based deposition techniques. Most of research works are based on laboratory inkjet equipment for manufacturing using single nozzle systems or small printheads and fabricating small numbers of devices. Therefore, the variability and mismatch of large quantities of printed devices are underrepresented in literature and are key factors towards commercialization of printed electronics. Our work focuses on the manufacturing of hundreds of all inkjet printed

To view the full papers of these abstracts for no fee go to  
[www.imaging.org/ist/publications/reporter/index.cfm](http://www.imaging.org/ist/publications/reporter/index.cfm)

\* Papers were presented at Archiving 2014, held May 13-16, 2014, in Berlin Germany.

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Organic Thin Film Transistors (OTFTs) in A4 flexible foils using small R&D printheads. Electrical and morphological characterizations were performed in order to obtain device statistics to investigate the origins of the failures responsible for the decreasing yields. The statistical results of such characterization are studied and presented..

### Development of New Inkjet Head Applying MEMS Technology and Thin Film Actuator

Kenji Mawatari, Koich Sameshima, Mitsuyoshi Miyai, and Shinya Matsuda, Konica Minolta, Inc. (Japan)

**Abstract:** We developed a new inkjet head by applying MEMS technology and thin film piezo actuator. Jetting properties of inkjet heads were calculated by the simulation method of the equivalent circuit model generated from actuator properties and ink flow channels of the inkjet head.

We manufactured a test piece to investigate the jetting properties and oscillation forms of the actuator. As a result, our test piece was driven at maximum 70 kHz and ejected 3 pl droplet with an ink which viscosity was 10 mPa · s. We found that the experimented jetting properties and vibration forms agreed very well with the simulation.

### Multi-Material 3D Printing

Steve Ready, Gregory Whiting, and Tse Nga Ng, Palo Alto Research Center (USA)

**Abstract:** Digital manufacturing has garnered significant exposure recently with many announcements of new 3D printers, improved capabilities to print different materials, and the White House's announcement of the creation of a Digital Manufacturing Institute. These recent developments in digital manufacturing are primarily focused on techniques that create individual parts for subsequent assembly, with the most sophisticated printers allowing combinations of several similar structural materials. The most interesting application of 3D printing today is to create unique mechanical structures that cannot be obtained by other means. 3D printing is also used as a prototyping technique, the final object being manufactured by conventional means.

In order to expand 3D printing and making it more versatile, new processes are needed that are able to deposit a broader range of materials (plastics of different characteristics, as well as metals), along with embedded electronic circuits consisting of both printed and conventional components. Such printed objects go beyond conventional mechanical features by embedding optical and electrical functionalities, such as sensor; all in complex structures that are difficult to produce with existing manufacturing methods. Coupled with user-friendly design software it becomes possible to analyze complex designs in order to determine structural properties as well as model electrical and mechanical oper-

ation, explore materials compatibility and diagnose other aspects of the design which may cause fabrication problems. We have demonstrated a printed wireless sensor as an example of a complex functional object. The circuit senses pressure and temperature embedded into a shoe insert and comprises inductor and antenna structures for communication. In our presentation we will describe our progress in printing integrated multi-material objects, including a collection of our latest demonstrators.

### From Scan to Print: 3D Printing as a Means for Replication

Susanne Klein,<sup>1</sup> Michael Avery,<sup>2</sup> Guy Adams,<sup>1</sup> Stephen Pollard,<sup>1</sup> Steve Simske<sup>3</sup>; <sup>1</sup>Hewlett-Packard Labs (UK), <sup>2</sup>University of Bristol (UK), and <sup>3</sup>Hewlett-Packard Labs (USA)

**Abstract:** Replication, or making exact copies with consistent results, is at the heart of manufacturing. It is used in mass production of all kinds of items, from foodstuff to cars, from houses to books. But it is also used to reproduce already existing objects. In the 18th and 19th centuries plaster casting was used to bring the wonders of the world to private collections and museums. In the cast court of the Victoria and Albert Museum in London, a life sized replica of Trajan's column can be admired. The combination of a 3D scanner and printer offers the possibility of a new way to make a three dimensional copy of an existing object. Whereas in a plaster cast, where high fidelity is achieved by creating a physical mould from the original object, scanning does not require physical contact to the original. This can be an advantage when the object is fragile, but can lead to loss of fidelity during the reproduction process. We discuss the difficulties in achieving a truly high fidelity copy of even simple objects when a scanner and 3D printer are used for object replication.

### Tracking based Inkjet Measurement for Evaluating High Frequency Ink Jetting

Kye-Si Kwon, Min-Hyuck Jang and Hyun-Seok Ko, Soonchunhyang University (Korea)

**Abstract:** Inkjet technology has been used as a manufacturing tool for printed electronics. To increase productivity, the jetting frequency needs to be increased. When using high frequency jetting, the printed pattern quality can be non-uniform since jetting performance, including jetting speed and droplet volume, can vary significantly according to the jet frequency increase. Therefore, high frequency jetting behavior must be evaluated properly for performance improvement. However, it is difficult to measure high frequency jetting behavior using the previous vision analysis methods because subsequent droplets are very close and can even merge. In this paper, we present vision measurement techniques to evaluate the drop formation of high frequency jetting. The proposed method is based on the tracking of target droplets, and other subsequent droplets can therefore be excluded in the image analysis by focusing on the target droplet. ▲

# NIP/DIGITAL FABRICATION: A WEEK OF PRINTING TECHNOLOGY IN REVIEW

By General Chair Branka Lozo, University of Zagreb, Croatia, Faculty of Graphic Arts

**Sunday, September 7th.** NIP30 took place in the wonderful city of Philadelphia in early September this year. The Digital Fabrication and Digital Printing Conference (NIP30) started with a choice of 15 short courses on a wide range of topics, including various aspects of digital fabrication, 3D printing, nanotechnology opportunities for digital printing, and packaging and security printing. The 2014 Short Course Instructor Champion was Dynesh Tyagi (Lexmark International, Inc.), who taught three classes in a row!

## Monday, September 8th

During the opening ceremony and welcome addresses by IS&T Executive Director Suzanne Grinnan and NIP30 General Chair Branka Lozo, the continued evolution of the conference was noted. While the event brings together industry and academia, and highlighting topics of broad interest, the focus of the technical program is on emerging technical and application innovations. This year's meeting formally merged the NIP and Digital Fabrication conferences into a single meeting. The concept of a yearly special session focused on an emerging area and overseen by a guest program chair was continued. It was introduced last year with



Photo courtesy of Masahiko Fujii.



Photo: Diana Gonzalez.

Left: NIP30 General Chair Branka Lozo and Publications Chair Masahiko Fujii. Right, IS&T President Alan Hodgson with Nobuyuki Nakayam, who accepted the Chester F. Carlson Award on behalf of Chiaki Suzuki (Fuji Xerox). Sponsored by Xerox Corporation, Wilson Center for Research and Technology, the Carlson award recognizes outstanding work in the science or technology of electrophotography. Mr. Suzuki received the award for playing a key role in developing the chemistry, commercialization, and continued improvements of "chemical" emulsion-aggregation toners for xerographic printers.

James Stasiak (Hewlett-Packard Company) chairing a special session on Digital Biology. This year's special topic session on 3D printing was chaired by Christopher Tuck (University of Nottingham).

The opening keynote was given by Kazuhiro Murata (SIJ Technology, Inc.) on Super-fine Ink-Jet Printing as a Novel Direct Patterning Process. Murata presented the amazing results in formation of fine features less than a micron in diameter using a wide variety of inks.

Monday afternoon's invited talk featured Hitoshi Ujiie, (Philadelphia University) discussing Textile Printing. Digital printing on textiles and transfer printing were recognized as fast growing markets in the printing industry.

Three Round Table Discussions were offered later in the afternoon: Recyclability and Deinkability, moderated by Axel Fischer (INGEDE e.V.); UV-Curable Printing, moderated by Henry Wilhelm (Wilhelm Imaging Research, Inc.); and Industry/ Academia Partnership mod-

## NIP30/DIGITAL FAB 2014

Attendees*:	366
Oral Papers:	98
Interactive Papers:	15
Short Courses:	15
Exhibitors:	26
Dates:	September 7 – 11, 2014
Location:	Philadelphia, Pennsylvania
*includes Short Course only and guests	

erated by Jim Mrvos (Lexmark International, Inc.).

The regular conference program was organized in three parallel tracks on topics related to inkjet processes, image permanence, UV curable inkjet, image processing, and electro-photographic and thermal printing.



Photo: Mike Moltaire.

Above, IS&T President Alan Hodgson presents a gift to outgoing IS&T Board member Makoto Omodani. Right: William Eve, winner of the Exhibit treasure hunt, receives his iPad Mini from Hodgson.



Photo: Axel Fischer.



Photo: Axel Fischer.

View of Philadelphia from the Conference Reception site.



## Tuesday, September 9th

The day began with a keynote related to the 2014 Special Topic of 3D Printing. David Rosen's (Georgia Institute of Technology) talk on High Viscosity Printing presented ultrasonic atomizer technology applied to high-viscosity print heads for polymers in fluid stage to be printed. After the keynote, the session continued as one of the four sessions of the day, with focal presentations by Chris Tuck on Multi-functional 3D printing, Steve Ready (Xerox PARC) on Multi-Material 3D Printing, and David Huson (University of the West of England) on Self-Glazing Ceramic Materials. The special session encompassed two full days of presentations, and covered areas from multifunctional materials and applications to technical areas and the arts.

The program also included presentations on inkjet processes and simulations, ink and media, image measurements, e-paper, printed electronics, electrophotography, and security printing.

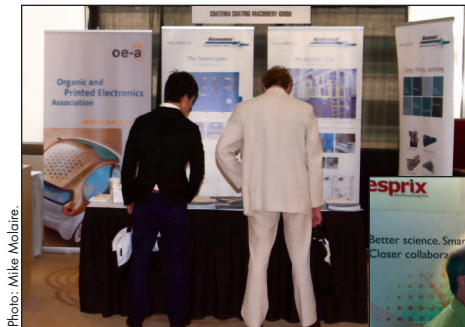
Tuesday also kicked off the Conference Exhibit, which included the Interactive Paper and Demonstration Sessions.

## Wednesday, September 9th

The morning keynote by MacArthur Fellow Marin Soljacic (MIT) on Nano-photonics Over Macroscopic Scales and its Associated Fabrication Challenges, revealed novel phenomena like glasses modified as mirrors in selective angles or transparent monitors.

The Awards Ceremony followed the talk. IS&T President Alan Hodgson

managed to create a simultaneously classy, but relaxed atmosphere for the awardees. The audience gave a warm welcome to awardees: Eloi Ramon (Universitat Autònoma de Barcelona) for the Charles E. Ives/Journal Award; Chiaki Suzuki (Fuji Xerox, accepted by Nobuyuki Nakayama) for the Chester F. Carlson Award; Jun-ichi Hanna (Tokyo Institute of Tech.) for Senior Membership; Chung-Hui Kuo (Eastman Kodak) for a Service Award; and Yoshihiko Hotta (Ricoh Company, Ltd.) for the Gutenberg Award. Makoto Omodani (Tokai University) and Marcel Slot (Oce Technologies) were also



This page: Scenes from the Exhibit Hall and the Interactive Paper and Demonstration Session. Next page: Colleagues and friends.



recognized for their service to the IS&T Board.

The conference program continued in four tracks, on ink and media, printed electronics, printing systems, and 3D printing. Within this last session Michel C. McAlpine (Princeton University) presented on Bionic Nano-Printing, explaining the use of polymers and conductive inks in the creation of an ear-shell with integrated antenna. There was the wrap-up talk by Jens Hammerschmidt (Chemnitz University of Technology) on micro-sieves, including inkjet printing on water surfaces among other material.

The second set of Round Table discussions included: 3D Printing: The Hype and the Future, moderated by Chris Tuck; Digital Textile Printing, moderated by Hitoshi Ujiie; and Packaging in the Digital

World, moderated by Eric Stelter (consultant).

The Conference Reception was held in the Horizons Rooftop Ballroom. The event provided wonderful views of the city, delicious food, and fine wines. Relaxed discussions dominated the ballroom much longer than the official reception hours.

### Thursday, September 10th

The closing keynote was given by Stan Farnsworth (NovaCentrix) on the Recent Technology and Business Developments in Printed Electronics and Implications for InkJet. In a friendly way, Farnsworth presented a selection of up-to-date applications in several areas and industries. The conference program continued in three tracks on; Ink and Substrates, 3D Workflows and Printed Electronics. The final formal conference activity was Late Breaking News

and Success Stories, moderated by Werner Zapka (XaarJet AB). The goal of the session was to exchange



Photo courtesy of Axel Fisher.

### Roundtable discussion on recycling and de-inking.

ideas and best practices, as well as things that did not go well or as planned.

After the official closing of the conference, some attendees took part in a special tour to the Center of Excellence in Surface Imaging at Philadelphia University School of Design and Engineering, organized by Hitoshi Ujiie.

The Conference Committee, under the guidance of this year's Publication Chair and next year's General Chair Masahiko Fujii (Fuji Xerox), prepared an excellent program. With the guidance, dedication and hard work of the IS&T staff, support of sponsors and exhibitors, and the participation of authors, presenters, speakers and reviewers, the 2014 conference became much more than printing—it was a beneficial and enjoyable event!

We're very much looking forward to meeting again in Portland, Oregon, in 2015. ▲



All photos this page: Alex Fisher.

# The Standards Roundup: Imaging and Graphic Arts

by Ann L. McCarthy, IS&T Standards Coordinator

## Imaging Standards News

This part of the Roundup is focused on both US national and international standards applicable to photographic imaging, including analog, digital, and print concerns. For information on the 2015 ISO/TC 42 Plenary and ISO/TC 42 Working Groups, contact the ISO/TC 42 Secretariat at [isotc42@ansi.org](mailto:isotc42@ansi.org).

### ISO/TC 42/WG 3 Projects: Sensitometry, image measurement and viewing

Current print quality measurement methods are under investigation in WG 3—particularly with regard to photo books, digital print products, and non-white substrates. For example, standards for measuring color gamut, the stability and repeatability of color reproduction, the effects of ambient light on color reproduction, and the glossiness (gloss and image clarity) of the physical surface have not yet been revisited with the new digital media and print systems in mind.

### ISO/TC 42/WG 5 Projects: Physical properties and image permanence

Given the extensive suite of standards under the purview of WG 5, it is not possible to review them all here. In particular, the progress on ISO 18948, *Test methods for Permanence and Durability of Photo Books*, is noted. An ISO/TC 42 ballot was recently approved to combine previous work on parts 1 and 2 into a single standard. A combined working draft was reviewed at the fall meeting and the response to comments from that review will be available in spring 2015. Stuart Gordon (Kodak Alaris) is the project leader.

WG 5 has requested that the TC 42 Secretariat move forward to establish a joint working group (tentatively designated JWG 27) on the permanence and durability of commercial prints. The interest is to engage with commercial print experts from ISO/TC 130/JWG 14 and from ISO/TC 130. Based on guidance from ISO, Jürgen Jung (Agfa Gevaert NV), WG 5 Convenor, has drafted a structure and scope for JWG 27 as a basis for discussion with TC 130 WG 3 and JWG 14. ISO/TC 130/WG 3 and ISO/TC 130/JWG 14 have indicated support of the joint work, recognizing immediately the importance of specifying appropriate permanence endpoints and the use of test targets applicable to each commercial print use case. An ad-hoc team has formed to begin talks.

With publication of both ISO 18936, *Imaging materials — Processed colour photographs — Methods for measuring thermal stability*, and ISO 18937, *Imaging materials — Photographic reflection prints — Methods for measuring indoor light stability*, consideration is being given to retiring ISO 18909, *Photography — Processed photographic colour films and paper prints — Methods for measuring image stability*, the workhorse standard that

preceded those newer standards. Despite coverage of materials such as transparency film in the newer standards, WG 5 members are concerned that there are still products being produced that historically have referenced ISO 18909 for tests and claims. In light of that, one alternative is to modernize ISO 18909, while maintaining its relevance for those established products.

In recent years, WG 5 has published the fundamental test method standards called for in the permanence testing lexicon, quantifying the effects of light, heat, humidity and water, and ozone. With those in hand, WG 5 looks now to develop application based specifications that can be used to compare the capabilities of products and print systems. One need only observe the significant improvements in ink fastness over the past ten years to understand that competitive comparison in this regard serves the interests of users, and thereby the industry. At the heart of the specification task is the interest of users, for example artists and family memory keepers, who will seek out long lasting materials for the purpose of their expressions. WG 5 wrestles with bridging between these users and the technical uncertainties that cannot be avoided in permanence testing: differences between accelerated testing and real time effects, inconsistencies between test conditions and real world conditions, and the language to be used for comparison and ranking. Practically, testing that runs to a finite degree of image loss (referred to as an endpoint) relies on an assessment of loss acceptability and may require an extended time commitment of testing resources. Conversely, testing that runs for a finite period of time consumes a well-defined set of testing resources but may become obsolete as products improve, or may not detect effects that occur later in a product life. In addition, WG 5 is cognizant of the fact that users are familiar, to some extent, with older metrics and thus have expectations in that regard. At the heart of the matter, the question is: can the specification quantify permanence and inform user choices such that one hundred years or more from now the art, the family memories, the historical records, will be available to that generation?

### ISO/TC 42/WG 18 Projects: Electronic still picture imaging

WG 18 hosts joint meetings with JWG 20, *Digital Still Cameras*, JWG 23, *Extended colour encodings for digital image storage, manipulation and interchange*, and JWG 25, *Use of XMP for digital photography*, providing an umbrella for these closely related work efforts. Within this umbrella, various ad-hoc groups and project teams are conducting seventeen active standards projects and a number of preparatory activities concerning potential future projects. In addition, published standards are reviewed and revisions are planned as improvement opportunities come to light.

During the recent meeting in Cologne, Germany, a recom-



mended technical correction to the recently published ISO 12233:2014, *Photography — Electronic still-picture cameras — Resolution measurements*, was discussed. National bodies are asked to complete their reviews following the meeting. The content of the correction will be available on imaging.org after it is approved.

Improvements toward a perceptually calibrated objective metric of image noise has been an essential work in WG 18, with ISO 15739, *Photography — Electronic still picture imaging — Noise measurements*, published in 2013. In discussion in Cologne, the well-known ISO 20462-3, *Photography — Psychophysical experimental methods for estimating image quality — Part 3: Quality ruler method*, was used to compare three methods: the aforementioned ISO 15739, a proposal from CPIQ (IEEE Camera Phone Image Quality working group), and a proprietary metric put forward from Aptina Imaging. In each case the objective metric of the method was evaluated in a subjective correlation against the SQS2 Overall Quality JNDs of ISO 20462-3. Ideally, the results of a selected objective metric would delineate quality over the significant range of the subjective metric, with perceptible subjective differences between each objective metric value. An ad-hoc group was formed to continue the assessment and to look ahead to the next revision of ISO 15739.

In an ad-hoc session in Cologne, Michael Steidl, Managing Director IPTC (International Press Telecommunications Council, www.iptc.org) and Photo Metadata Working Group lead, discussed IPTC, essentially the organization of the news industry for technical standards, and their maintenance of the news industry photo metadata standard. Steidl noted the IPTC work tackling the implementation of IPTC Photo Metadata into XMP (concerning the ISO 12234-3 project), with challenges including: overlapping values for semantically matching properties in various technical formats (e.g., IPTC IIM, EXIF, XMP), globally unique identifiers for entities, metadata about a region in an image, metadata about a time segment in a video, and other practical implementation concerns.

### Updates from current ISO/TC 42 Projects

Recent progress in standards development is reported for the following projects:

- ISO 18938:2014 (Ed. 2), *Imaging materials — Optical discs — Care and handling for extended storage*, is published.
- ISO 18935:2005 (Ed.1), *Imaging materials — Colour images on paper prints — Determination of indoor water resistance of printed colour images*, revision has been initiated and the new project is approved.
- ISO 15781:2013 (Ed. 1), *Photography — Digital still cameras — Measuring shooting time lag, shutter release time lag, shooting rate, and start-up time*, revision has been initiated, and an FDIS ballot is closed.
- The JWG 26 project, ISO 19262, *Photography — Archiving Systems — Vocabulary*, has completed the Committee Draft stage and the DIS draft has been registered.

- A new project has been approved for ISO/NP 20087, *Photography — Digital still cameras — Battery life measurement*.
- The new project ballot has been initiated for ISO/NP TS 20328, *Imaging materials — Lenticular lens sheet — Measurements and specifications of dimensions*, with ballot closing in early January 2015.

### Updates from CIE Division 8

CIE Division 8 over the years has brought us the eminently useful CIE S 017/E:2011, *ILV: International Lighting Vocabulary*, CIE 199:2011, *Methods for Evaluating Colour Differences in Images*, CIE 162:2010, *Chromatic Adaptation under Mixed Illumination Condition when Comparing Softcopy and Hardcopy Images*, and CIE 159:2004, *A Colour Appearance Model for Colour Management Systems: CIECAM02*, among a number of other notable works. Currently the active projects in Division 8 include additional work on CIECAM02, Image and Video Compression Assessment, Colour Gamuts for Output Media, Archival Colour Imaging, Full-Reference Image Quality Metrics: Classification and Evaluation, and Colour Image Reproduction for 3D Printing.

The officers of Division 8 are: Dr. Po-Chieh Hung (Konica Minolta, JP, USA), Division Director, Dr. Alessandro Rizzi (Università degli Studi di Milano, Italy), Division Secretary, and Dr. Danny Rich (Sun Chemical, USA), Division Editor.

Division 8 members are invited to attend the Division 8 web meeting on December 9th. For information, contact Dr. Rizzi.

Persons interested in contributing to the work of the CIE can connect with their national CIE organization using the links to each CIE National Committee found at [www.cie.co.at/index.php](http://www.cie.co.at/index.php).

### Graphic Arts Standards News\*

**G**raphic Arts Standards News covers US national and international standards applicable to the graphic arts industry.

### JOINT CGATS/USTAG/ IDEAlliance PPC Activities

Within the US, positions and contributions for ISO/TC 130 are coordinated through joint meetings of CGATS (Committee for Graphic Arts Technology Standards), the ISO/TC 130/US TAG, and the Print Properties & Colorimetrics (PPC) Committee, a working group of the IDEAlliance.

A variety of topics of interest to the industry were discussed during the recent CGATS/USTAG/ IDEAlliance PPC meeting in Hanover Park, IL, October 13 –15, 2014.

As noted in activities of other committees, there is strong industry interest in measuring and providing color quality

\* This standards news is brought to you in collaboration with NPES, The Association for Suppliers of Printing, Publishing and Converting Technologies. NPES serves as the Secretariat for the US TAG to ISO/TC 130 (Graphic Technology). The Secretariat for ISO/TC 130 is held by China. For details pertaining to ISO/TC 130 working groups contact the Secretariat through your national standards organization.

assessment for print systems that are capable of extended color gamut. The GRACoL<sup>plus</sup> research program, under the wing of IDEAlliance, is targeted to explore and standardize expanded-gamut 4-color offset lithography. Unlike other expanded-gamut litho programs, GRACoL<sup>plus</sup> uses just the basic four CMYK (cyan, magenta, yellow, black) inks. In comparison, ISO 12647-2, *Graphic technology — Process control for the production of half-tone colour separations, proof and production prints — Part 2: Offset lithographic processes*, and the related GRACoL and Fogra39 gamut references, address standard ink levels and average commercial offset printing. Other systems address extending offset print gamut using additional inks, and while certainly serving the needs of a portion of the market, these additional inks add cost and may require complex workflow extensions. In principle, GRACoL<sup>plus</sup> aims to standardize the methods and materials most effective to deliver expanded color gamut results using CMYK inks printed at higher densities, with both regular inks and inks with higher pigment loading. Preliminary results shown at the meeting indicate extended color gamut is achieved in each L\* slice. Benefits of GRACoL<sup>plus</sup> are that it helps offset compete with inkjet, gravure, flexo, and digital print systems, it is much easier than extra plates and special inks, and it improves process ink simulation of more spot colors. Negatives include the requirements for top-quality inks, papers, press, and operators, increased ink consumption, and the potential effect on press speeds and run length optimization.

Among the IDEAlliance Certification Programs, the Hard Copy Proofing Systems certification was presented for review and approval. This program is geared to certify systems capability via certifying vendors. The certification handles proofing on non-brightened and brightened stocks, multiple measurement conditions, and provides three levels of certification, depending on results. In the current version, permanence, repeatability, and spot color simulation are not included.

In a late addition to the agenda, a proposed research project to test the effects of optical brightening agents (OBAs) on proof-to-print match was considered. OBAs add to the apparent reflectance of a print medium in the blue and blue-green regions and can significantly alter computed print colorimetry. It was agreed to proceed with the research, testing a number of different stocks and print conditions, and recording the OBA effects. The OBA effects will be assessed using a comparison of M1 and M2 measurements. These measurement acronyms refer to measurement conditions standardized in ISO 13655:2009, *Graphic technology — Spectral measurement and colorimetric computation for graphic arts images*, and widely used in the industry. Measurement condition M1 includes specified UV content (by requiring the light source to conform to CIE Illuminant D50). Condition M2 is casually referred to as “UV-cut” and excludes fluorescence. IDEAlliance will take the lead on streamlining the necessary data collection process, later to be offered as a methodology.

## ISO/TC 130/JWG 7 “Colour management (JWG ISO/TC 130 and ICC)”

The publication draft of ISO 18619, *Image technology colour management — Black point compensation*, has recently been distributed with the proposed resolution of comments from the DIS ballot incorporated. Annex A of that soon-to-be standard provides a straightforward pictorial depiction describing the advantage of combining both white point and black point compensation when mapping image content between dissimilar source and destination gamuts. In his presentation at the ICC meeting in Heidelberg, 2014, Andreas Kraushaar (Fogra) discussed black point compensation implementation issues, given current workflows in which the source content is often encoded in RGB and delivered for separation with only a reference to a standard print condition. Current “media-relative” colorimetry typically scales only the white point. Adding the expectation for black point compensation (BPC) raises interesting questions: Will media relative with BPC always be preferred over without BPC? Will the computed BPC result always yield the optimal black point for a given print condition? How accurate should black point compensation be, in order to be acceptable for print conformance testing?

## ISO/TC 130/JWG 15: Call for Experts

The secretariat of ISO/TC 130 has issued a call for experts for ISO/TC 130/JWG 15 “Joint ISO/TC 130 - IEC/TC 100/TA 13 WG, Development of ISO 20294”. ISO/TC 130 has resolved to add a preliminary work item for the development of an International Standard titled “Graphic technology — Quantification and communication for calculating the carbon footprint of e-media” to JWG15’s program of work. The PWI has been registered as ISO/PWI 20294. This JWG will develop a document that establishes the parameters for calculating the carbon footprint of electronic media. The document will provide specifications for the basis of calculations including the viewing hardware and data load associated with the creation, publication, distribution, storage, archiving and use of electronic media on any digital device. This work is expected to depend on expertise sourced from the electronics and graphic arts industries. Experts specialized in data, server, network and content management, and publishing are requested to express their interest to participate in this work and to join JWG 15. Please note that the call-for-experts is launched concurrently in ISO/TC 130 and IEC/TC 100. Those interested should work through their national standards body to join JWG 15 and to be added the ISO Global Directory for JWG 15.

## JWG 14: Joint between TC 130, TC 42, JTC 1/SC 28/WG 4

ISO TS 18621 will be a multipart ISO specification organized to address gaps in the available standardized quality measurement methods relevant to commercial print.

Table 1 shows an overview of quality measurement methods of interest to JWG 14. In the case of existing standards, JWG 14 will collaborate with the originating committees to work toward a consistent, encompassing, measurement system. One key point



of investigation is to compare current industry practice to the available standards, and to each proposed standard.

In the proposed ISO TS 18621-11, *Method for computing and analyzing Colour Gamut*, a key part of the challenge is to evaluate the color capabilities of devices whose gamut extends beyond the historic test charts and metrics. The ISO 12640-3 *Reference Colour Gamut* (ICC PRMG) is an example of a standardized gamut that extends sufficiently to provide a testing basis for extended color print devices. Of note for printer manufacturers, ink suppliers, and other purveyors of printing system components, measurement methods that highlight larger color gamut capabilities can be advantageous.

Development of a second part, ISO TS 18621-21, *M-score test method for evaluation of Macroscopic Uniformity*, has been initially based on software and a process in use at Fogra. However, JWG 14 is concerned that 18621 metrics should not be complex, rather should be simple reference metrics and procedures.

ISO TS 18621-12, *Method for computing the number of effective tonal steps*, and ISO TS 18621-31, *L-score method for Perceived Resolution evaluation utilizing a Contrast Resolution Target*, are also in development.

Membership in JWG 14 brings together significant expertise from across the print quality spectrum, much to the benefit of the industry.

### Updates from ISO/TC 130 Projects

Recent progress in standards development is reported for the following projects. Published standards can also be purchased from NPES.

- Voting has closed on the CD ballot for ISO 12647-7:2014 (Ed. 3), *Graphic technology — Process control for the production of half-tone colour separations, proof and production prints — Part 7: Proofing processes working directly from digital data*. Significant technical and editorial comments from Brazil, China, France, Germany, Japan, Switzerland, and the US remain to be addressed. Part 7 is one of 8 process control standards developed in TC 130. Part 1 defines generally applicable parameters and measurement methods and Parts 2 – 8 each deal with a specific distinct print technology. Another part, ISO 12647-5 (Ed. 2), *Graphic technology — Process control for the manufacture of half-tone colour separations, proof and production prints — Part 5: Screen printing*, is under publication.
- ISO 16760, *Graphic technology — Prepress data exchange — Preparation and visualization of RGB images to be used in RGB-based graphics arts workflows*, is under publication.

Characteristic	Attribute	Measurement	Standard
Color and tone reproduction and surface finish	color accuracy	absolute color reproduction	ISO 12647-8
		media relative color reproduction	
		common appearance color reproduction	
	tone smoothness		ISO 12647-8
	number of effective tonal steps	Fogra P-score	
	color gamut	outer gamut color accuracy	ISO 12647-8
		computing color gamut	CIE TC8-13
		spot color coverage	
	gloss	differential gloss	ISO/IEC 19799
Uniformity	macro uniformity	Fogra M-score	
		banding (monochrome)	TS 24790
		large area uniformity	ISO 12647-8
		banding (color extension)	
		RIT Uniformity framework	
		Macro uniformity	ISO 19751
	micro uniformity	mottle (monochrome)	TS 24790
		graininess	TS 24790
		mottle (color extension)	
		graininess (color extension)	
Detail rendition capabilities	line and edge quality	line width	TS 24790
		line darkness	TS 24790
		line blurriness	TS 24790
		line raggedness	TS 24790
	color registration		ISO 12647-8
	contrast and resolution	RIT contrast -- resolution evaluation	
		Fogra L-score	

Table 1: Example quality standards of interest to ISO/TC 130/JWG 14.

- A CD ballot is underway for ISO/DTR 19300, *Graphic technology — Guidelines for the use of standards for print media production workflows*, closing early January 2015. This guideline is of particular interest to those seeking a broader understanding of available standards pertinent to print media production workflows, as the purpose of this technical report is to provide a guide to the use and applicability of those standards.
- Two projects, parts of a multipart standard, ISO/NP 16761-1, *Graphic Technology — Printing workflows definition, requirements and testing conditions — Part 1: Commercial printing*, and ISO/NP 16761-2, *Graphic Technology — Printing workflows definition, requirements and testing conditions — Part 2: Packaging printing*, have been approved to begin. These projects will be conducted in WG 13. The new project ballot is yet

in progress for the third part, ISO/NP 16761-3, *Graphic Technology — Printing workflows definition, requirements and testing conditions — Part 3: Colour quality management certification scheme*, with ballot closing in January 2015.

- ISO 16684-2, *Graphic technology — Extensible metadata platform (XMP) — Part 2: Description of XMP schemas using Relax NG*, is under publication.

In a surprising outcome given the significant heavy-lifting that has gone into developing both of these standards, the FDIS ballots for ISO/FDIS 15339-1, *Graphic technology — Printing from digital data across multiple technologies — Part 1: Principles*, and ISO/FDIS 15339-2, *Graphic technology — Printing from digital data across multiple technologies — Part 2: Characterized reference printing conditions*, CRPC1 - CRPC7, have been

disapproved. Next steps are under consideration with the concerned national bodies.

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](mailto:standards@imaging.org).

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February 8 - 12, 2015; San Francisco, California

**Electronic Imaging 2015** Symposium Chairs: Sheila Hemami and

Choon-Woo Kim

May 19 - 22, 2015; Los Angeles, CA

**Archiving 2015** General Chair: David Walls

September 27 - October 1, 2015; Portland, Oregon

**NIP30/Digital Fabrication 2014** General Chair: Masahiko Fujii

October 19-23, 2015; Darmstadt, Germany

**23rd Color and Imaging Conference (CIC23)**

General Chair: Vien Cheung

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SCIENCE AND TECHNOLOGY

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San Francisco, California

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