

# NIP29

29th International Conference on Digital Printing Technologies

## Digital Fabrication 2013

September 29 – October 3, 2013 • Seattle, Washington



General Chairs:

Steve Simske, Hewlett-Packard Laboratories, and Werner Zapka, XaarJet AB

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Early Registration Deadline: September 3, 2013



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**There is still time to become an NIP29/Digital Fabrication 2013 Exhibitor and/or Sponsor. Contact Donna Smith (dsmith@imaging.org) for details.**

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We know that changes in the imaging world have put some of our loyal attendees in difficult financial situations. If you are currently unemployed, but would still like to attend this year's meeting, please contact dsmith@imaging.org to discuss your situation.

*We invite you to join us in October in the world class city of Seattle for the 29th International Conference on Digital Printing Technologies (NIP) and Digital Fabrication 2013, where Printing as Part of Something Bigger is the theme and path forward for this exciting technical conference.*

As digital printing technologies continue to evolve, incorporating more highly variable, customized, and heavily manufactured processes, we see printing as central to the connection between the cyber and the physical worlds. **Digital printing** is used to differentiate packaged goods through labeling, marketing collateral, and packaging. **Variable data printing** is used to tag individual items, connecting them to websites and other electronic workflows. **Digital fabrication technologies**—covering areas from printed functionality, printed electronics, 3D printing to biological printing and other processes—point the way to new commercial and industrial applications.

This year's conference provides a host of learning, networking, and technical knowledge enhancing opportunities. Publication Chairs Masahiko Fujii and Branka Lozo have crafted an excellent program featuring parallel technical sessions that bring cutting edge technological updates together with world-class applications and services.

Highlights of the conference include:

- A special full-day session on **Digital Biology**.
- Round table and group discussions on the **Future of Digital Fabrication, Digital Packaging, Industry/University Collaboration, Additive Manufacturing, and Late Breaking News Success Stories**.
- Opportunities to learn from 16 informative short courses on topics from **3D to cloud printing**.
- Four keynote talks from world-renowned experts in cloud and mobile printing, biological printing, 3D printing, and digital fabrication.
- The **Interactive Paper and Demonstration Session** held in the **Exhibit Hall** during a special Happy Hour.
- Exhibitors from companies providing products and services for the present and future of digital printing and fabrication.
- Four days of multi-track technical sessions, featuring the latest printing and print ecosystem technological advances.
- Three organized **tours to Microsoft, Boeing, and the University of Washington**.
- Welcome and Conference Receptions

**Details of the entire conference begin on page 3.**

—Steven J. Simske and Werner Zapka,  
General Chairs, NIP29 and Digital Fabrication 2013

# The Venue: Seattle, Washington

NIP29/Digital Fabrication 2013 will take place at the Westin Seattle Hotel in downtown Seattle, less than two blocks from the city Monorail.

Condé Nast Traveler ranked Seattle as one of top ten cities to visit in the US saying, "The 'ample' restaurants, coffee shops, music venues, and shopping, make Seattle a lively city and the views of Olympic National Park make you never feel too far from nature."

Seattle is known for its ideal location on the shores of Puget Sound, iconic Space Needle, and introducing the world to Starbucks coffee, but it is also home to other distinguished companies such as Amazon, Boeing, and Microsoft.

Locals are fanatics about their food. The city is filled with award winning chefs and restaurants whose menus span a wide range of cuisines and fusion cooking. If you crave it, you will probably find it here.

The famous Pike Place Market is less than a half mile walk from the Westin. This nine-acre historic center is internationally known for its fishmongers;

fresh, locally-produced food; and 200 independent small businesses and restaurants.

Within a mile of the Westin are the Space Needle—with its fantastic 360° views of the city and surrounding mountains—and the new and "must see" Chihuly Garden and Glass exhibition hall featuring wondrous glassworks by world-renowned glass blower Dale Chihuly. Also nearby are the Seattle Art Museum, Pacific Science Center, and Experience Music Museum.

All of this and so much more make Seattle the perfect location for NIP29/Digital Fabrication 2013—a perfect opportunity to increase your professional knowledge while seeing another cultural gem of the US. As late September weather can range from a high of 71°F/22°C to a low of 53°F/ 16°C, we suggest you bring a jacket and sweater to layer on during the evenings and an umbrella for possible showers.

For information on the conference hotel, see page 23. For more information on Seattle, visit [www.visitseattle.org](http://www.visitseattle.org).

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## Conference Committee

### General Chairs

Steven J. Simske, Hewlett-Packard Laboratories  
Werner Zapka, XaarJet AB

### Publications Chairs

Masahiko Fujii, Fuji Xerox Co., Ltd.  
Branka Lozo, University of Zagreb

### Program Chairs

Asia & Oceania  
Teruaki Mitsuya, Ricoh Co., Ltd.  
Koei Suzuki, Ricoh Co., Ltd.

### Europe/Middle East

Mark Crankshaw, Xaar plc  
Paul Drury, Xaar Technology Limited

### The Americas

Thomas Boland, University of Texas El Paso  
George A. Gibson, Xerox Corp.

### Special Papers/Topics

James W. Stasiak, Hewlett-Packard Co.  
Marie Vans, Hewlett-Packard Co.

### Publicity Chairs

Asia & Oceania  
Seogsoon Kim, Unijet Co., Ltd.  
Shuichi Maeda, Tokai University

### Europe/Middle East

Patrick Smith, University of Sheffield

### The Americas

Stan Farnsworth, NovaCentrix  
Eric Stelter, Lexmark International, Inc.

### Special Topics

Steven V. Korol, Memjet

### Interactive Session Chairs

Ligia Bejat, Lexmark International, Inc.  
Dietmar Zipperer, PolyIC GmbH & Co. KG

### Short Course Chairs

Robert Harvey, AtomJet Ltd.  
Devon J.V. Strain, Lexmark International, Inc.

### Demonstration Session

Susan Farnand, Rochester Institute of Technology  
Jolke Perelaer, Friedrich-Schiller-Universität Jena

### University Liaison Chair

Trevor Snyder, Xerox Corporation

### Audio-Visual Chair

Steven V. Korol, Memjet

### Advisory Chairs

Paul Benning, Hewlett-Packard Co.  
Hitoshi Nakai, Brother Industries, Ltd.

### Steering Committee

Reinhard Baumann, Chair, Fraunhofer Einrichtung for Electronic Nano Systems, ENAS  
Paul Benning, Hewlett-Packard Co.  
Masahiko Fujii, Fuji Xerox Co., Ltd.  
Suzanne Grinnan, IS&T  
Branka Lozo, University of Zagreb  
Steven J. Simske, Hewlett-Packard Laboratories  
Werner Zapka, XaarJet AB

# Technical and Social Program

All papers are oral unless marked as focal or interactive. Program is subject to change.

## SPECIAL EVENT: WELCOME RECEPTION

Kick off the conference by meeting friends and colleagues Sunday evening.

Sunday, September 29th

5:45 – 7:00 PM

Westin Seattle Hotel

## NEW CONFERENCE REGISTRATION OPTIONS

Contact [info@imaging.org](mailto:info@imaging.org).

You can now choose to receive complementary IS&T membership + an online subscription to JIST or JEI as one of your registration options.

See details, page 24.

## Monday September 30, 2013

### ALL TRACKS

#### OPENING CEREMONY AND KEYNOTE

Session Chairs: Steven J. Simske, Hewlett-Packard Laboratories, and Werner Zapka, Xaarjet AB

9:00 – 10:20 AM

#### Exploring the Potential of Additive Manufacturing/3D Printing and the Move to Multi-Functionality

**(Keynote)**, Richard Hague, EPSRC Centre for Innovative Manufacturing in Additive Manufacturing (UK)

### APPLICATIONS TRACK

#### 3D PRINTING

Session Chairs: Shinri Sakai, Tokyo University, and Patrick Smith, University of Sheffield

10:50 AM – 2:20 PM

#### 3D Printing: When and Where does it Make Sense? (Extended Focal),

Susanne Klein, Guy Adams, and Fraser Dickin, Hewlett-Packard Laboratories (UK), and Steven J. Simske, Hewlett-Packard Laboratories (USA)

**Printing Objects**, Steven E. Ready, Gregory Whiting, and Tsa Nga Ng, Palo Alto Research Center, Inc. (USA)

**How to Select Digital Deposition Methods to Meet 2D and 3D Application Requirements**, Vince Cahill and Patrice Giraud, VCE Solutions, and Dene Taylor, SPF, Inc. (USA)

**3D Printing of Self-Glazing Ceramic Materials: An Investigation Inspired by Ancient Egyptian Technology**, David Huson, University of the West of England (UK)

**Line-on-Line Solidified Image Formation Analysis for Inkjet and Digital Fabrication Purposes**, Trevor Snyder, Xerox Corporation, and Yongkang Chen and Mark Weislogel, Portland State University (USA)

### E-PAPER

Session Chair: Makoto Omodani, Tokai University  
2:20 – 3:20 PM

**The Effects of Tablet Devices on Reading to Support Discussion: Analyzing Conversations of Discussion**, Kentaro Takano,<sup>1,2</sup> Hirohito Shibata,<sup>1</sup> Kengo Omura,<sup>1</sup> Junko Ichino,<sup>2</sup> Tomonori Hashiyama,<sup>2</sup> and Shunichi Tano<sup>2</sup>; <sup>1</sup>Fuji Xerox Co. Ltd. and <sup>2</sup>The University of Electro-Communications (Japan)

**Reflective and Emissive Dual Mode Display Cell with Electrochromism and Electrochemiluminescence**, Norihisa Kobayashi, Yuichi Watanabe, Yukie Ibata, and Kazuki Nakamura, Chiba University (Japan)

**Thermo-Switchable Imaging Medium Achieving Both Emissive Reflective Modes**, Kazuki Nakamura, Yukino Kobayashi, Kenji Kanazawa, and Norihisa Kobayashi, Chiba University (Japan)

### DISPLAYS/SOLAR CELLS INTERACTIVE PREVIEWS

Session Chair: Shinichi Nishi, Konica Minolta II Technologies, Inc.  
3:20 – 3:30 PM

**Optimization of Titania Thickness of Dye-Sensitized Solar Cell (DSC) Utilizing Patterning with Electrostatically-Injected Droplet (PELID) Method (Interactive)**, Kyousuke Kosugi,<sup>1,2</sup> Shinjiro Umezu,<sup>1,2</sup> Yuki Shimoyama,<sup>1</sup> Yoshihito Kunugi,<sup>1</sup> and Hitoshi Ohmori<sup>2</sup>; <sup>1</sup>Tokai University and <sup>2</sup>Riken (Japan)

**Luminescent Properties of High Color Rendering Powder Electroluminescent Device (Interactive)**, Toshifumi Satoh, Moriya Nasu, Chisa Suzuki, and Takayuki Uchida, Tokyo Polytechnic University (Japan)

### ROUNDTABLE I AND II DISCUSSION

4:00 – 5:30 PM

see details page 6

**MATERIALS TRACK**

**IMAGE PERMANENCE AND PRINT QUALITY**

Session Chairs: Hitoshi Nakai, Brother Industries, Ltd.; Ingo Reinhold, Xaar Jet AB; Yoshihiko Shibahara, FUJIFILM Corporation; and Werner Zapka, XaarJet AB  
 10:50 AM – 3:05 PM

**Predicting Dynamic Characteristics of the Gear Train in Laser Printers for Mechanical Half-tone Banding Analysis**, Wonho Lee, Byoungho Yoo, Younhan Kim, Jeongmin Na, Joonseong Woo, Taehan Kim, and Changbae Park, Samsung Electronics, Inc. (Korea)

**Modeling Ink Diffusion within Paper to Achieve a Raggedness Ruler for Print Quality Control (Interactive)**, Ali Azin,<sup>1</sup> Saeideh Gorji Kandi,<sup>2</sup> and Atasheh Soleimani Gorgani<sup>1</sup>; <sup>1</sup>Institute for Color Science and Technology and <sup>2</sup>Amirkabir University of Technology (Iran)

**Introducing a New Method for Generating Test Targets to Evaluate Printing Mottle (Interactive)**, Ali Azin,<sup>1</sup> Saeideh Gorji Kandi,<sup>2</sup> and Atasheh Soleimani Gorgani<sup>1</sup>; <sup>1</sup>Institute for Color Science and Technology and <sup>2</sup>Amirkabir University of Technology (Iran)

**Mitigation of Pollution-Induced Deterioration of Inkjet Prints through Low Temperature Storage**, Daniel Burge, Nino Gordeladze, and Douglas Nishimura, Rochester Institute of Technology (USA)

**The Determination of the Minimum Force to Initiate Abrasion Damage of Digitally Printed Documents and Photographs**, Eugene Salesin and Daniel Burge, Rochester Institute of Technology (USA)

**Subjective Assessment of Color Naturalness of Objects Illuminated by LED Light Sources with Various Color Rendering Index and Color Temperature (Interactive)**, Yohei Sekita and Makoto Omodani, Tokai University (Japan)

**The Requirement of Map Digital Printing on Digital Printing Machine (Interactive)**, Qiang Su, Ruizhi Shi, and Xiao Zhou, Zhengzhou Institute of Surveying and Mapping (China)

**The Quality Control of Digital Workflow (Interactive)**, Bing Sun, Ruizhi Shi, Heng Liu, and Qiang Su, Zhengzhou Institute of Surveying and Mapping (China)

**Color Appearance and Spatial Related Color Gamut Mapping (Interactive)**, Guangxue Chen, Xiaozhou Li, Qifeng Chen, Jinglei Tai, and Hao Yin, South China University of Technology (China)

**Study on Inkjet Printed Image Quality Analysis and Evaluation System (Interactive)**, Guangxue Chen, Yan Zhong, Qifeng Chen, Xiaomeng Cui, and Chunjiang Jia, South China University of Technology (China)

**A Laser-Imageable Thin Coating Derived from Polymer Nano-Particles Containing Infrared Dye (Interactive)**, Jialing Pu, Weiwei Wang, and

**Interpreting the Schedule**

By knowing the amount of time allotted for each type of presentation, you can estimate when a particular presentation will occur. Order and times are subject to change; exact times will be published in the conference proceedings. On most days, 30-minute coffee breaks occur sometime between 10:00–11:00 AM and 3:30–4:30 PM; lunch breaks are generally from 12:30–2:00 PM. Presentation lengths include time for Q&A.

**Keynote:** 50 minutes

**Extended Focal:** 40 minutes

**Focal:** 30 minutes

**Oral:** 20 minutes

**Interactive previews:** 5 minutes

Zhongxiao Li, Beijing Institute of Graphic Communication (China)

**Parallel Software Design Enabling High-Speed Reliability Testing of Inkjet Printheads**, George Ungureanu,<sup>1,2</sup> Ingo Reinhold,<sup>1,2</sup> Ingo Sander,<sup>2</sup> and Werner Zapka<sup>1,2</sup>; <sup>1</sup>XaarJet AB and <sup>2</sup>KTH Royal Institute of Technology (Sweden)

**Black-Box Models for Laser Electrophotographic Printers—Recent Progress**, Yanling Ju,<sup>1</sup> Tamar Kashti,<sup>2</sup> Tal Frank,<sup>2</sup> Dror Kella,<sup>2</sup> Doron Shaked,<sup>3</sup> Mani Fischer,<sup>3</sup> Robert Ulichney,<sup>4</sup> and Jan P. Allebach<sup>1</sup>; <sup>1</sup>Purdue University (USA), <sup>2</sup>Hewlett-Packard Indigo (Israel), <sup>3</sup>Hewlett-Packard Laboratories (Israel), and <sup>4</sup>Hewlett-Packard Laboratories (USA)

**Experimental and Analytical Study of Dot Gain between Elastic and Deformable Drums**, Tali Aqua,<sup>1</sup> Naseem Yakov,<sup>1</sup> Ido Finkelman,<sup>1</sup> Einat Tirosh,<sup>1</sup> Wael Salalha,<sup>1</sup> Eric G. Nelson,<sup>2</sup> Bruce Jackson,<sup>2</sup> Slava Reznik,<sup>3</sup> and Eyal Zuszm<sup>3</sup>; <sup>1</sup>Hewlett-Packard Indigo (Israel), <sup>2</sup>Hewlett-Packard Indigo (USA), and <sup>3</sup>Technion (Israel)

**An Investigation into the Difficulties of ISO-24790 for Print Quality Assessment (Interactive)**, Fatemeh Zeighami and Saeideh Gorji Kandi, Amirkabir University of Technology (Iran)

**FUNCTIONAL MATERIALS INTERACTIVE PREVIEW**

Session Chairs: as above  
 3:05 – 3:10 PM

**Innovative Multi-Function Printable Film for Windows (Interactive)**, Paul Heinzer, Heinzer Consulting, and Patrick Le Galudec, Sihl AG (Switzerland)

**ROUNDTABLE I AND II DISCUSSION**

4:00 – 5:30 PM  
 see details page 6

## 2013 KEYNOTES

### MONDAY

#### Exploring the Potential of Additive Manufacturing / 3D Printing and the Move to Multi-Functionality

Richard Hague, EPSRC Centre for Innovative Manufacturing in Additive Manufacturing (UK)

### TUESDAY

#### Sophisticated Point-of-Care Diagnostic Devices based on 2D Paper Networks

Paul Yager, University of Washington (USA)

### WEDNESDAY

#### Printing Evolution in a World Dominated by Mobile Devices

Phil McCoog, Hewlett-Packard Company (USA)

### THURSDAY

#### 3 Dimensional Prints (3DP) of Artificial Cell Structures

Shinjiro Umez, Tokai University (Japan)

**Effect of Nicotinic Acid as Toner on Photothermographic Materials based on Silver Benzotriazole (Interactive)**, Yao Shi, Zhi Li, Qinghua Liang, Wangjing Ma, and Xinmin Yang, Chinese Academy of Science (China)

### SECURITY PRINTING

Session Chairs: Alan Hodgson, 3M UK PLC, and Shigeru Kitakubo, Nippon Institute of Technology  
2:00 – 3:35 PM

#### Progressive Barcode Applications (Focal),

A. Marie Vans, Steven J. Simske, and Brad Loucks, Hewlett-Packard Laboratories (USA)

#### Circular Coding for Data Embedding (Focal),

Robert Ulichney, Matthew Gaubatz, and Steven J. Simske, Hewlett-Packard Company (USA)

#### Challenges in Security Printing (Focal),

Alan Hodgson, 3M UK PLC (UK), and Steven J. Simske, Hewlett-Packard Laboratories (USA)

#### Rare Earth Nanocrystals for Secure Documentation (Interactive),

Howard Bell, Josh Collins, and Thijs Spoor, Intelligent Material Solutions, Inc. (USA)

### ROUNDTABLE I AND II DISCUSSION

4:00 – 5:30 PM

see details page 6

## PROCESSES FOR APPLICATIONS TRACK

### FUSING, CURING, AND DRYING

Sponsored by 7-SIGMA, Inc.

Session Chair: Oh Hyun Baek, Samsung Electronics Co. Ltd.  
10:50 AM – 12:10 PM

**Determination of Dryness of Water-based Inkjet Ink Printing (Focal)**, Wade Eichhorn and Dave Winters, 7-SIGMA, Inc. (USA)

**Estimation of the Fusing Quality based on Simple Toner Deformation Model (Focal)**, Satoshi Hasebe and Daisuke Yoshino, Fuji Xerox Co., Ltd. (Japan)

**Surface Heating Fuser System for Laser Beam Printer**, Oh Hyun Baek, Keon Kuk, and Hee Moon Jung, Samsung Electronics Co., Ltd. (Korea)

### THERMAL PRINTING

Session Chair: Hiroto Teruo, Alps Electric Co., Ltd.  
12:10 – 12:40 PM

**Investigation of Transient Temperature Response of Papers in a Thermal Transfer Printer**, Takashi Fukue,<sup>1</sup> Hiroto Teruo,<sup>2</sup> Koichi Hirose,<sup>1</sup> Tomoko Wauke,<sup>2</sup> Hisashi Hoshino,<sup>2</sup> Risa Ito,<sup>1</sup> and Fumiya Nakagawa<sup>1</sup>; <sup>1</sup>Iwate University and <sup>2</sup>ALPS Electronic Co., Ltd. (Japan)

**New Development of Multi-Purpose Heating Head (Interactive)**, Hideo Taniguchi and Shigemasa Sunada, HIT Devices Ltd. (Japan), and Jiro Oi, HIT Devices Ltd. (USA)

## PROCESSES TRACK

### INK JET PROCESSES

Sponsored by Xaar plc.

Session Chairs: Michael Hook, Xaar Technology Ltd.; Mineo Kaneko, Canon Inc.; Hiroyuki Onishi, Seiko Epson Corporation; and Emma Talbot, University of Durham  
10:50 AM – 3:40 PM

**Development of MONOLITH Inkjet Printhead Equipped with a Large Monolithic Unimorph Piezoelectric Actuator Unit (Focal)**, Kazuya Yoshimura, Kyocera Corporation (Japan)

**Bubble Entrapment and Stability in Complex Passageways (Focal)**, Yongkang Chen,<sup>1</sup> John Geile,<sup>1</sup> Trevor Snyder,<sup>2</sup> and Mark Weislogel<sup>1</sup>; <sup>1</sup>Portland State University and <sup>2</sup>Xerox Corporation (USA)

**Novel Reactive Dyes and Their Application onto Textile Substrates by Inkjet Printing**, Saira Faisal, Long Lin, and Matthew Clark, University of Leeds (UK)

**Study of Effectors on the Tinting Strength of Water-based Digital Printing Ink (Interactive)**, Dan-Dan Wang, Xian-Fu Wei, Beijing Huang, Jiang-Hao Liu, and Ling Yang, Beijing Institute of Graphic Communication (China)

**Study on the Effect of Pigment Dispersion on Water-based Ink Rheological Property (Interactive)**, Baowei Sun, Qufu Normal University, and Xianfu Wei, Beijing Huang, Lingya Gu, Dandan Wang, and Xin Li, Beijing Institute of Graphic Communication (China)

### **Study on Abrasion Resistance of UV Curing System (Interactive),**

Zhen-xing Zhang, Qufu Normal University, and Beiqing Huang, Xian-fu Wei, and Xiao Yang, Beijing Institute of Graphic Communication (China)

### **Influence of Nozzle Characteristics and Parameters on the Drop State of UV-Curable Ink-Jet Ink (Interactive),**

Xiao Yang, Beiqing Huang, and Xianfu Wei, Beijing Institute of Graphic Communication, and Zhenxing Zhang, Qufu Normal University (China)

### **Development of Printing Method to Produce High-Glossy Images with UV Inkjet Printer (Interactive),**

Takuya Yamashita,<sup>1</sup> Hironori Hashizume,<sup>2</sup> Masaru Ohnishi,<sup>2</sup> and Takao Abe<sup>1</sup>; <sup>1</sup>Shinshu University and <sup>2</sup>Mimaki Engineering Co., Ltd. (Japan)

### **Robot Arm Printer of Electrostatic Inkjet (Interactive),**

Shigeto Kawata, Tokai University, and

Shinjiro Umezu, Riken (Japan)

### **Spontaneous Capillarity-Driven Droplet Deployment,**

Andrew Wollman,<sup>1</sup> Trevor Snyder,<sup>2</sup> Don Pettit,<sup>3</sup> and Mark Weislogel<sup>1</sup>; <sup>1</sup>Portland State University, <sup>2</sup>Xerox Corporation, and <sup>3</sup>NASA JSC (USA)

### **The Study of the Affect Factors on the Color Fastness of Inkjet Printing Ink (Interactive),**

Haiying Tian, Qufu Normal University, and Xianfu Wei and Beiqing Huang, Beijing Institute of Graphic Communication (China)

### **Study on the Curing Rate of UV-LED Inkjet Ink (Interactive),**

Beiqing Huang,<sup>1</sup> Qing Yi,<sup>2</sup> Xian-fu Wei,<sup>1</sup> and Zong-ru Li<sup>1</sup>; <sup>1</sup>Beijing Institute of Graphic Communication and <sup>2</sup>Nanjing Forestry University (China)

### **Study on Initiator Efficiency of Photoinitiator in Aerobic Environment (Interactive),**

Lingya Gu and Beiqing Huang, Beijing Institute of Graphic Communication, and Baowei Sun, Qufu Normal University (China)

### **Research on the Adherence of the Water-based Ink (Interactive),**

Fuzhong Zhang, Xianfu Wei, Beiqing Huang, and Xin Li, Beijing Institute of Graphic Communication (China)

### **Development of 16 Nozzle Electrohydrodynamic Inkjet Printing Head,**

Kyoung Il Lee,<sup>1,2</sup> Byungjik Lim,<sup>1</sup> Seong Hyun Kim,<sup>1</sup> Churl Seung Lee,<sup>1</sup> Jin Woo Cho,<sup>1</sup> and Yongtaek Hong<sup>2</sup>; <sup>1</sup>Korea Electronics Technology Institute and <sup>2</sup>Seoul National University (Korea)

### **Large Area Inkjet Printing for Organic Solar Cells and OLEDs Using Non-Halogenated Ink Formulations,**

Tamara M. Eggenhuisen,<sup>1</sup> Michiel J.J. Coenen,<sup>1</sup> Thijs W.L. Slaats,<sup>1</sup> Harrie Gorter,<sup>1</sup> Jürgen Sweelssen,<sup>2</sup> and Pim Groen<sup>1,3</sup>; <sup>1</sup>Holst Centre, <sup>2</sup>TNO, and <sup>3</sup>Delft University of Technology (the Netherlands)

### **The Dispersion and Surface Morphology of White Water-based Ink (Interactive),**

Ying Gong, Beiqing Huang, Xianfu Wei, and Jianghao Liu, Beijing Institute of Graphic Communication (China)

### **The Impact of UV Inkjet Ink's Viscosity on Line Print Quality (Interactive),**

Wan Zhang, Xianfu Wei, Beiqing Huang, and Xiao Yang, Beijing Institute of Graphic Communication (China)

### **The Impact of Fluorescent Inkjet Ink's Properties on Print Quality (Interactive),**

Wan Zhang, Xianfu Wei, Beiqing Huang, and Ling Yang, Beijing Institute of Graphic Communication (China)

## **SPECIAL EVENT: TECHNOLOGY AND APPLICATION ROUNDTABLES**

Sign up for each roundtable will occur onsite.

**Monday, September 30th, 4:00 – 5:30 PM**

### **Round Table Discussion I: The Future of Digital Fabrication**

Moderator: Marcel Slot, Océ Technologies B.V.

Discussion to be derived from/connected to the goals/work of the European-sponsored Diginova project ([www.diginova-eu.org](http://www.diginova-eu.org)), with the aim to provide input for the Roadmap for Digital Fabrication, one of the main goals of the project.

### **Round Table Discussion II: Digital Packaging**

Moderator: George Gibson, Xerox Corporation, and Omer Gila, Hewlett-Packard Company

Digital packaging is a major growth area and its huge market size attracts a lot of activities and innovations from the marking engine providers. We will discuss current activities, challenges, trends, products, and needs, and compare the different technologies for flexible packaging, folding cartons, and corrugated.

**Wednesday, October 2nd, 4:00 – 5:30 PM**

### **Round Table Discussion III: Additive Manufacturing**

Moderator: Luis Baldez, Hewlett-Packard Company

### **Round Table Discussion IV: University/Industry Collaboration**

Moderator: Trevor Snyder, Xerox Corporation



## ROUNDTABLE I AND II DISCUSSION

4:00 – 5:30 PM

see details page 6

**Tuesday October 1, 2013**

### ALL TRACKS

#### TUESDAY KEYNOTE

Session Chair: Werner Zapka, Xaarjet AB

9:00 – 10:00 AM

**Sophisticated Point-of-Care Diagnostic Devices based on 2D Paper Networks**, Paul Yager, University of Washington (USA)

### SPECIAL TOPICS TRACK DIGITAL BIOLOGY

Session Chairs: James Stasiak, Hewlett-Packard Company; Jolke Perelaer, Friedrich-Schiller-Universität Jena; and Shinjiro Umez, Tokai University

10:00 AM – 3:35 PM

**Bioink Development for Additive Manufacturing of Artificial Soft Tissue (Focal)**, K. Borchers,<sup>2</sup> C.

Bierwisch,<sup>5</sup> S. Engelhardt,<sup>3</sup> C. Graf,<sup>4</sup> E. Hoch,<sup>6</sup>

R. Jaeger,<sup>5</sup> P. Kluger,<sup>2</sup> H. Krüger,<sup>1</sup> W. Meyer,<sup>1</sup>

E. Novosel,<sup>2</sup> O. Refle,<sup>4</sup> C. Schuh,<sup>2</sup> N. Seiler,<sup>3</sup>

G. Tovar,<sup>2,6</sup> M. Wegener,<sup>1</sup> and T. Ziegler<sup>5</sup>;

<sup>1</sup>Fraunhofer Institutes for Functional Polymersystems

IAP, <sup>2</sup>Interfacial Engineering and Biotechnology

IGB, <sup>3</sup>Laser Technology ILT, <sup>4</sup>Manufacturing

Engineering and Production IPA, <sup>5</sup>Mechanics of

Materials IVW, and <sup>6</sup>University of Stuttgart

(Germany)

**Bio-3D Printing: Challenges and Opportunities for Digital Biofabrication (Focal)**, Wei Sun, Drexel University (USA) and Tsinghua University (China)

**Inkjet Printed Structures for Smart Lab-on-Chip Systems (Focal)**, Erik Beckert,<sup>1</sup> Oliver Pabst,<sup>2</sup>

Zhe Shu,<sup>2</sup> Jolke Perelaer,<sup>2</sup> Christin Herzog,<sup>3</sup> and

Stefan Nagel<sup>3</sup>; <sup>1</sup>Fraunhofer IOF, <sup>2</sup>Friedrich-Schiller-

University Jena, and <sup>3</sup>University of Leipzig

(Germany)

**Macromolecular Imprinting by Sol-Gel Silica in the Presence of Polymer Grafted Carbon Black (Focal)**, Julio Rincon, Paulina Almada, Doug M.

Watts, and Thomas Boland, University of Texas at

El Paso (USA)

**Computer Aided Design and Manufacturing of Soft, Three-Dimensional, Multi-Layer, Biological Constructs via Laser Printing onto Laser Machined Composite Biopapers (Focal)**, Russell K. Pirlo,<sup>1</sup>

Peter Wu,<sup>2</sup> and Brad Ringeisen<sup>1</sup>; <sup>1</sup>US Naval

Research Laboratory, <sup>2</sup>University of Southern

Oregon (USA)

**Paper as a Versatile Platform for Low-Cost**

**Diagnostics (Focal)**, Jason Rolland, Diagnostics For All (USA)

### SPECIAL EVENT: INTERACTIVE PAPER AND DEMONSTRATION SESSION WITH EXHIBIT HALL HAPPY HOUR

Session Chairs: Ligia Bejat, Lexmark International, Inc.;

Dietmar Zipper, PolyIC GmbH & Co. KG;

Susan Farnand, Rochester Institute of Technology; and

Jolke Perelaer, Friedrich-Schiller-Universität Jena

4:00 – 6:00 PM

**Fabrication of Printed Drug-Delivery Systems**

**(Focal)**, Natalja Genina, Ruzica Kolakovic, Mirja

Palo, Daniela Fors, Helka Juvonen, Petri Ihalainen,

Jouko Peltonen, and Niklas Sandler, Abo Akademi

University (Finland)

**Inkjet Bioprinting of Solid Peroxide Microparticles**

**for Constructing Oxygen-Generating Scaffolds**

**(Interactive)**, Daniel Reyna-Soriano, Jorge

Rodriguez-Devara, and Thomas Boland, University

of Texas at El Paso (USA)

**INTERACTIVE PAPER AND DEMONSTRATION SESSION, WITH EXHIBIT HALL HAPPY HOUR**

4:00 – 6:00 PM

### APPLICATIONS TRACK DIGITAL FULFILLMENT

Session Chair: Takao Abe, Shinshu University

2:30 – 3:55 PM

**Index-based Digital Texture Printing Workflow,**

Chunghui Kuo, Eastman Kodak Company (USA)

**Automated Surface Texture Classification of Inkjet**

**and Photographic Media, Textiles, and Surfaces**

**for Printing with UV-Curable Inks**, Paul Messier,

Paul Messier LLC; Richard Johnson, Cornell

University; and Henry Wilhelm, Wilhelm Imaging

Research, Inc. (USA)

**Xerox's High Temperature, Increased Fluid**

**Latitude, High Performance Print Head,**

David A. Tence, Xerox Corporation (USA)

**The Impact of the Electrical Properties of Carbon**

**Black based Polyurethane Rollers on Print Quality/**

**Innovative Manufacturing Approach to the**

**Production (Interactive)**, Krishna Chaurasia, Fenner

Precision, Inc. (USA)

**Devolving Automation Tools for Conformal**

**Cooling Channels in 3D Printed Plastic Injection**

**Molds (Interactive)**, Christopher D. Mullens and

Bart C. Massey, Portland State University, and

David L. Shapiro, RapidMade LLC (USA)

**A New Approach Colour Picker Tool Design**

**(Interactive)**, Phil Henry, University of Leeds (UK)

**Map Customization Service based on User Interest**

**(Interactive)**, Qiang Su, Ruizhi Shi, and Xiao Zhou,

Zhengzhou Institute of Surveying and Mapping (China)

**Solutions of JDF-Workflow Scheduling Problem**

**Using Genetic Algorithm (Interactive)**, Hao Yin and Guangxue Chen, South China University of Technology (China), and Mirko Segelnek, Hochschule der Medien (Germany)

**INTERACTIVE PAPER AND DEMONSTRATION SESSION, WITH EXHIBIT HALL HAPPY HOUR**  
4:00 – 6:00 PM

### COMBINATIONS AND OPTIMIZATIONS TRACK

#### HYBRID PRINTING

Session Chairs: Trevor Elworthy, LumeJet Limited, and Yasushi Hoshino, Tokyo Denki University  
10:00 – 11:45 AM

**Continuous Tone Colour Printing in Two and a Half Dimensions through a Combination of 19th Century Analogue Methodologies and 3D Printing (Focal)**, Stephen Hoskins and Peter McCallion, University of the West of England (UK)

**Study of Sulfide Solutions as Inkjet Inks for Color-Changeable Ag Films**, Shuichi Maeda, Taito Sugiura, and Yohei Ito, Tokai University (Japan)

**VOC Elimination in Printers by Means of Thermally Activated Oxide Semiconductors (Interactive)**, Y. Tsukada, Y. Suzuki, H. Takahashi, and J. Mizuguchi, Shinshu University (Japan)

**Digital Quasi-Embossing Technology with an Inkjet Printer-2 (Interactive)**, Naoki Matsumae,<sup>1</sup> Masaru Ohnishi,<sup>2</sup> Hironori Hashizume,<sup>2</sup> and Takao Abe<sup>1</sup>; <sup>1</sup>Shinshu University and <sup>2</sup>Mimaki Engineering Co., Ltd. (Japan)

**Novel Paper Sheets Containing Kapok Fibers (Interactive)**, Motochika Yukawa, Hayata Aoki, and Shuichi Maeda, Tokai University (Japan)

**LumeJet—A New Photonic 'Inkless' Printing Technology (Interactive)**, Trevor P. Elworthy, LumeJet Limited (UK)

#### MATHEMATICAL MODELING

Session Chairs: Oliver Harlen, University of Leeds, and Tomoyuki Ito, Fuji Xerox Co., Ltd.  
11:45 AM – 2:40 PM

**The Research of the Best Ink Mount based on Gray Balance Optimization Process Calibration (Interactive)**, Xiangyang Xu and Guangxue Chen, South China University of Technology (China)

**Modeling the Electrostatic Component of Toner Adhesion and Detachment**, Brandon A. Kemp, Arkansas State University (USA)

**Drop-on-Demand Printing of Complex Liquids**, Neil F. Morrison and Oliver G. Harlen, University of Leeds (UK)

**Asymmetric Detachment from Angled Nozzles Plates in Drop-on-Demand Inkjet Printing**,

Oliver G. Harlen, University of Leeds, and J. Rafael

### LOOKING FOR DEMONSTRATION SESSION PARTICIPANTS

**Interested?** Free space is available for authors to **show programs, products, and/or prints** related to presented papers. Others may also participate for a small fee. Contact nip\_df@imaging.org for details.

Castrejón-Pita and Alfonso A. Castrejon-Pita, University of Cambridge (UK)

#### Laser Scanner Jitter Characterization,

Yi-Ting Chen,<sup>1</sup> Terry Nelson,<sup>2</sup> Tami Ogle,<sup>2</sup> Hong Ren,<sup>2</sup> Mark Shaw,<sup>2</sup> and Jan P. Allebach<sup>1</sup>; <sup>1</sup>Purdue University and <sup>2</sup>Hewlett-Packard Company (USA)

#### SPECIAL NETWORKING SESSION

Moderator: Marie Vans, Hewlett-Packard Company  
2:50 – 4:00 PM

Join us for a brainstorming experience: A number of technical challenges will be identified, followed by small group discussions on finding solutions to the identified problems. Details will be sent closer to the conference.

**INTERACTIVE PAPER AND DEMONSTRATION SESSION, WITH EXHIBIT HALL HAPPY HOUR**  
4:00 – 6:00 PM

### PROCESSES/MATERIALS TRACK INK JET PROCESSES CONT'D.

Session Chairs: Mineo Kaneko, Canon Inc.; Hiroyuki Onishi, Seiko Epson Corporation; and Anthony Saughey, Xaar Technology Limited  
10:00 AM – 2:55 PM

**Captive Continuous Inkjet (Focal)**, Carolyn Ellinger and Yonglin Xie, Eastman Kodak Company (USA)

**Drying Technology Using Laser Exposure for High-Speed Inkjet Printing (Focal)**, Manabu Numata, Akira Sakamoto, Yasuhiro Ogasawara, Mami Hatanaka, Yukari Motosugi, and Naoki Morita, Fuji Xerox Co., Ltd. (Japan)

**Research on the Jetting Process and Hydrokinetics of Ink Droplets in Inkjet Imaging System (Interactive)**, Qifeng Chen, Guangxue Chen, and Jinglei Tai, South China University of Technology (China)

**An Experimental Study of the Folding Cracks of Cardboard Coating Layer (Interactive)**, Jinglei Tai, Guangxue Chen, and Qifeng Chen, South China University of Technology (China)

**Experimental and Numerical Study of Coalescence between Two Droplets at Pico-Liter Scale on Substrate**, Takahiko Matsumoto and Manabu Seo, Ricoh Company, Ltd. (Japan)

**Aerodynamic Effect on Printing Quality in**

## SPECIAL EVENT: CONFERENCE EXHIBIT

Tuesday: 10:00 AM – 6:00 PM

Wednesday: 10:30 AM – 4:00 PM

Please visit our exhibitors! See list inside cover.

**Simulated Web Printing**, *W.K Hsiao, S.D. Hoath, G.D. Martin, and I.M. Hutchings, University of Cambridge, and M. Hook, Xaar Technology Ltd. (UK)*

**Internal Flows and Particle Transport Inside Picoliter Droplets of Binary Solvent Mixtures (Focal)**, *E.L. Talbot, A. Berson, L. Yang, and C.D. Bain, Durham University (UK)*

**Pulse Voltage Shape Effects on Electrohydrodynamic Jets**, *Kye-Si Kwon, Soonchunhyang University (Korea)*

**Imaging Models for Robust Single-pass Printing Using SAMBA™ Piezo Drop-on-Demand Silicon MEMS (Si-MEMS) Inkjet Printheads**, *Hrishikesh V. Panchawagh, FUJIFILM Dimatix (Japan)*

**Effect of Monomer on Printing Quality of UV LED Inkjet Ink (Interactive)**, *Qing Yi and Qi Wang, Nanjing Forestry University, and Xian-fu Wei and Beiqing Huang, Beijing Institute of Graphic Communication (China)*

**Research on the Relationship between Properties of Printing Paper and UV Inkjet Printing (Interactive)**, *Jing Zhang and Guangxue Chen, South China University of Technology (China)*

**The Research on Fluorescence Intensity Attenuation of UV Fluorescent Inkjet Ink (Interactive)**, *Ling Yang, Xianfu Wei, Beiqing Huang, Wan Zhang, and Dandan Wang, Beijing Institute of Graphic Communication (China)*

## TONER-BASED PROCESSES/MATERIALS

*Sponsored by Cabot Corporation*

Session Chairs: Yoshihiro Hattori, Konica Minolta Business Technologies Inc.; Koji Hirakura, HiRAK; and Nobuyuki Nakayama, Fuji Xerox Co., Ltd.

3:00 – 4:00 PM

**Study of Seed Polymerized Polyester Emulsion for Chemically Prepared Toner**, *Yuta Matsumoto, Nobumichi Kamiyoshi, Yoshiaki Ban, and Eiji Shirai, Kao Corporation (Japan)*

**Paper Modeling in Transfer Process Simulation**, *Seishirou Nasu, Toyoshige Sasaki, Yasuo Yoda, and Yuusuke Torimaru, Canon Inc. (Japan)*

**Photoreceptor Defects, Surface Hardness and Image Quality (Interactive)**, *S.K. Ahuja, Xerox Corporation (USA)*

**Simulation Model to Predict Paper Wrinkle by Transportation Force Analysis (Interactive)**, *Ryosuke Takahashi and Tomoyuki Ito, Fuji Xerox Co., Ltd. (Japan)*

**A Study of Mottled Image in an Intermediate Transfer Belt System (Interactive)**, *Yasunari Kobaru, Yoshiki Kudo, Yasuo Yoda, Toyoshige Sasaki, and Yasunobu Murofushi, Canon Inc. (Japan)*

**Effect of Rounding Surface Treatment Process on Electrical Characteristic of RST Toner (Interactive)**, *Yi-Wei Chen, Johnny Wang, and Victor Huang, Trend Tone Imaging, Inc. (Taiwan)*

## INTERACTIVE PAPER AND DEMONSTRATION SESSION, WITH EXHIBIT HALL HAPPY HOUR

4:00 – 6:00 PM

## Wednesday October 2, 2013

### ALL TRACKS

#### KEYNOTE AND AWARDS

Session Chair: Steven J. Simske, Hewlett-Packard Laboratories

9:00 – 10:30 AM

**Printing Evolution in a World Dominated by Mobile Devices**, *Phillip McCoog, Hewlett-Packard Company (USA)*

### APPLICATIONS TRACK

#### PRINTED ELECTRONICS

Session Chairs: Klaus Kruger, University of the Federal Armed Forces; Key-Si Kwon, Soonchunhyang University; Sebastian Schaefer, PolyIC GmbH & Co. KG; and Koei Suzuki, Ricoh Co., Ltd.

10:50 AM – 3:20 PM

**Analysis of Formation of an Individual Droplet Using a High-Resolution Multi-Exposure Imaging System (Focal)**, *Ingo Reinhold,<sup>1,2</sup> Karsten Sitterberg,<sup>1</sup> Matthias Müller,<sup>1</sup> Mamat Abdulla,<sup>3</sup> Sergei Popov,<sup>3</sup> Wolfgang Voit,<sup>1</sup> and Werner Zapka<sup>1</sup>; <sup>1</sup>XaarJet AB, <sup>2</sup>KTH Royal Institute of Technology, and <sup>3</sup>Royal Institute of Technology (Sweden)*

**Low Temperature Sintering (LOTUS) of Inkjet Printed Metal Precursor Inks for Organic Electronic Applications (Focal)**, *Jolke Perelaer,<sup>1</sup> Sebastian Wünsch,<sup>1</sup> Franziska M. Wolf,<sup>1</sup> Robert Abbel,<sup>2</sup> Michael Groucho,<sup>3</sup> Shlomo Magdassi,<sup>3</sup> and Ulrich S. Schubert<sup>1</sup>; <sup>1</sup>Friedrich-Schiller-University Jena (Germany), <sup>2</sup>Holst Centre (the Netherlands), and <sup>3</sup>The Hebrew University of Jerusalem (Israel)*

**Rapid Two-Step Metallization for Highly Conductive Black Electrodes**, *Dong-Youn Shin, Pukyong National University, and Sangki Chun, LG Chem Research Park (Korea)*

**High Accuracy Single Layer Touch Sensors Roll to Roll Processed on Plastic Substrates**, *Sebastian Schaefer and Dietmar Zipperer, PolyIC GmbH & Co. KG (Germany)*

**IEC TC119—International Standards for Printed Electronics**, *Alan Hodgson, 3M UK PLC (UK)*

**UHF Electromagnetic Structures Inkjet Printed on Temperature Sensitive Substrates: A Comparative Study of Conductive Inks and Sintering Methods,**

Veronica Sanchez-Romaguera,<sup>1</sup> Sebastian Wünschen,<sup>2</sup> Robert J. Abbel,<sup>3</sup> Dumtoochukwu Oyeka,<sup>4</sup> Badredin M. M. Turki,<sup>4</sup> Mohamed A. Ziai,<sup>4</sup> and Stephen G. Yeates<sup>1</sup>; <sup>1</sup>The University of Manchester (UK), <sup>2</sup>Freidrich-Schiller-University Jena (Germany), <sup>3</sup>Holst Centre (the Netherlands), and <sup>4</sup>Kent Universtity (UK)

**Inkjet Printing of Vertically Integrated RC-Circuits,** Dietrich Jeschke and Klaus Krüger, University of the Federal Armed Forces (Germany)

**A Study of Inkjet Printed Line Morphology Using Volatile Ink with Non-Zero Receding Contact Angle for Conductive Trace Fabrication,**

Chenchao Shou, Patrick McCarthy, George T.-C. Chiu, and Timothy S. Fisher, Purdue University (USA)

**Production Technologies for Large Area Flexible Electronics,** Thomas Kolbusch and Klaus Crone, Coatema Coating Machinery GmbH (Germany)

**ROUNDTABLE III AND IV DISCUSSION**

4:00 – 5:30 PM

see details page 6

**MATERIALS TRACK**

**ENVIRONMENTAL SUSTAINABILITY**

Session Chair: Axel Fischer, INGEDE e.V.

10:50 AM – 12:10 PM

**Sustainability of Printing Techniques: Potentials and Incomparable Aspects,** Matthias Hausmann, CeWe Color AG & Co. OHG (Germany)

**The New EU Ecolabel for Printed Products and its Requirements for Deinkability,** Axel Fischer, INGEDE e.V (Germany)

**Deinking of Inkjet Prints,** Wolfgang Rauh and Alexander Schiller, Fogra Graphic Technology Research Association, and Thomas Kuen, University of Applied Sciences Munich (Germany)

**Laboratory Scale Two-Loop Deinking Trials,** Wenjia Zhang, Manoj Bhattacharyya, Laurie S. Mittelstadt, Hou T. Ng, and Nils P. Miller, Hewlett-Packard Company (USA), and Marc Aronhime, Hewlett-Packard Indigo (Israel)

**INK FORMULATION**

Session Chairs: Julie Cross, Domino UK, Ltd., and Norio Nagayama, Ricoh Co., Ltd.

12:10 – 3:30 PM

**A New UV Curable Inkjet Ink: Follow-up Report,** Yasuo Yoshihiro, Takao Hiraoka, Mitunobu Morita, and Soh Noguchi, Ricoh Company, Ltd. (Japan)

**The Use of Saccharides in DOD Inks to Improve Printing Performance,** Julie Cross and Andy Noble, Domino UK Limited (UK)

**Effect of Span-80 in n-Hexadecane on Surface Tensions at High Temperatures,** Yufei Duana,<sup>1</sup>

Srinivasa R. Deshikanb,<sup>2</sup> and Kyriakos D. Papadopoulos<sup>1</sup>; <sup>1</sup>Tuland University and <sup>2</sup>Xerox Corporation (USA)

**Key Innovations that Allow Low Migration Digital Printing with UV-Curable Inks,** Roel De Mondt and Johan Locuffier, Agfa-Gevaert N.V. (Belgium)

**Low Migration UV-Curable Inkjet for Food Packaging (Focal),** Derek R. Illsley, Sun Chemical (UK)

**ROUNDTABLE III AND IV DISCUSSION**

4:00 – 5:30 PM

see details page 6

**PROCESSES/MATERIALS TRACK**

**TONER-BASED PROCESSES/MATERIALS CONT'D.**

Session Chairs: Yoshihiro Hattori, Konica Minolta Business Technologies Inc.; Koji Hirakura, HIRAK; and Nobuyuki Nakayama, Fuji Xerox Co., Ltd.

10:50 AM – 3:20 PM

**Theory of Ink Transfer in HP-Indigo Digital Press Machines (Focal),** Peter Forgacs, Hewlett-Packard Indigo (Israel)

**Electrostatic Adhesion Force Measurement of the Partially Charged Toner (Focal),** Takayuki Tanaka, Canon Inc. (Japan)

**Fusing Quality of Toner with Tunable Thermal Properties,** Nahyoung Kim, Samsung Fine Chemicals (Korea)

**New Submicron Silica Produced by Hybrid Production Process,** Yusuke Tosaki, Yuki Amano, and Yukiya Yamashita, Nippon Aerosil Co., Ltd. (Japan), and Paul Brandl, Evonik Degussa Co., Ltd. (China)

**Charged Particle Adhesion Internal to and External to an Electrostatic Field,** Julie Gordon Whitney, Lexmark International (USA)

**Silica-Polymer Composite Particles for Toners: Print Performance,** Hajime Kambara, Dmitry Fomichev, Hairuo Tu, Li Cheng, and Geoffrey Moeser, Cabot Corporation (USA)

**Interfacial Water and Triboelectric Charging: A Theoretical Study of the Role of Water on the PMMA/Silica Tribo-Pair,** Qingbin Li,<sup>1</sup> Sergey Gusarov,<sup>1</sup> Andriy Kovalenko,<sup>1,2</sup> and Richard Veregin<sup>3</sup>; <sup>1</sup>National Institute for Nanotechnology, <sup>2</sup>University of Alberta, and <sup>3</sup>Xerox Research Centre of Canada (Canada)

**Novel Toners for Providing Metallic Effects,** Dinesh Tyagi, Louise Granica, and Kevin Lofftus, Eastman Kodak Company (USA)

**ROUNDTABLE III AND IV DISCUSSION**

4:00 – 5:30 PM

see details page 6

**SPECIAL EVENT:  
CONFERENCE RECEPTION**

Wednesday, October 2nd  
7:00 – 9:30 PM  
Westin Seattle Hotel

**SPECIAL EVENT: GROUP DISCUSSION OF  
LATE BREAKING NEWS/SUCCESS STORIES**

Thursday, October 3rd  
2:00 – 3:00 PM  
**Moderators:** James Stasiak, Hewlett-Packard  
Company, and Werner Zapka, XaarJet AB

**Call for Participation:** Please send information  
on recent company news and/or success  
stories to be presented/discussed during this  
session to Werner.Zapka@Xaar.com.

**Thursday October 3, 2013**

**ALL TRACKS**

**THURSDAY KEYNOTE**

Session Chair: Masahiko Fujii, Fuji Xerox Co., Ltd.  
9:00 – 10:00 AM

**3 Dimensional Prints (3DP) of Artificial Cell  
Structures**, Shinjiro Umez, Tokai University (Japan)

**APPLICATIONS TRACK  
DISPLAYS/SOLAR CELLS**

Session Chairs: Shinichi Nishi, Konica Minolta IJ Technolo-  
gies, Inc.; Ingo Reinhold, Xaar Jet AB; and David Stuewe,  
Fraunhofer Institut für Solare Energiesysteme  
10:00 AM – 1:50 PM

**Inkjet Printed Seed-Layer for Front Side Metalliza-  
tion of Crystalline Silicon Solar Cells (Focal)**,  
Uwe Buerklin, Schmid Technology GmbH  
(Germany)

**Novel Developments in Photonic Sintering of  
Inkjet Printed Functional Inks**, Ingo Reinhold,<sup>1,2</sup>  
Wolfgang Voit,<sup>1</sup> Ian Rawson,<sup>3</sup> Karl Martin,<sup>3</sup>  
Dave Pope,<sup>3</sup> Stan Farnsworth,<sup>3</sup> Werner Zapka,<sup>1,2</sup>  
and Charles Munson<sup>3</sup>; <sup>1</sup>XaarJet AB (Sweden),  
<sup>2</sup>KTH Royal Institute of Technology (Sweden), and  
<sup>3</sup>NovaCentrix (USA)

**Direct Etching of Sputtered Metal Layers Using  
Inkjet-Printing for Contact Separation for Silicon  
Solar Cells**, David Stüwe,<sup>1</sup> Philip Hartmann,<sup>1</sup>  
Roman Keding,<sup>1</sup> Pascal Fastnacht,<sup>2</sup> Steven  
Prokopiak,<sup>3</sup> Florian Clement,<sup>1</sup> Reik Jesswein,<sup>2</sup>  
Torsten Geppert,<sup>2</sup> Robert Woehl,<sup>1</sup> Jan G. Korvink,<sup>4</sup>  
and Daniel Biro<sup>1</sup>; <sup>1</sup>Fraunhofer Institute for Solar  
Energy Systems ISE, <sup>2</sup>Bosch Solar Energy AG,  
<sup>3</sup>Alpha, and <sup>4</sup>University of Freiburg (Germany)

**Towards High Speed Inkjet Printed Electronics—  
Technology Transfer from S2S to R2R Production**,  
Pit Teunissen,<sup>1</sup> Eric Rubingh,<sup>1</sup> Tim van Lammeren,<sup>1</sup>  
Robert Abbel,<sup>1</sup> Sjoerd van de Geijn,<sup>2</sup> Pim Groen<sup>1,3</sup>;  
<sup>1</sup>Holst Centre, <sup>2</sup>Stork Prints B.V., and <sup>3</sup>Delft  
University of Technology (the Netherlands)

**High-Resolution Patterning Technologies Using  
Ink-Jet Printing and Laser Processing for Organic  
TFT Array**, Koei Suzuki, Kazuaki Tsuji, Aisushi  
Onodera, Takeshi Shibuya, Takanori Tano, and  
Hiroshi Miura, Ricoh Co., Ltd. (Japan)

**Photonic Sintering of Inkjet Printed Copper Oxide**

**Layer**, Hyunkyoo Kang,<sup>1</sup> Enrico Sowade,<sup>1</sup> and  
Reinhard R. Baumann<sup>1,2</sup>; <sup>1</sup>Chemnitz University of  
Technology and <sup>2</sup>Fraunhofer Research Institute for  
Electronic Nano Systems (Germany)

**GROUP DISCUSSION: LATE BREAKING  
NEWS/SUCCESS STORIES**

2:00 – 3:00 PM  
**see details above**

**OPTIONAL TOURS**

**see details page 14**

**MATERIALS TRACK  
FUNCTIONAL MATERIALS**

Session Chairs: Masahiko Fujii, Fuji Xerox Co., Ltd.; Liisa  
Hakola, VTT Technical Research Centre of Finland; Masaaki  
Oda, Ulvac, Inc.; and Patrick Smith, University of Sheffield  
10:00 AM – 1:50 PM

**New Methods for Improving Food Product Safety  
and Communication (Focal)**, Liisa Hakola, Jonas  
Hartman, Kaisu Honkapää, Petri Laakso, Raimo  
Penttilä, Marja Pitkänen, Elina Rusko, Thea  
Sipiläinen-Malm, and Ilkka Vantaja, VTT Technical  
Research Centre of Finland (Finland)

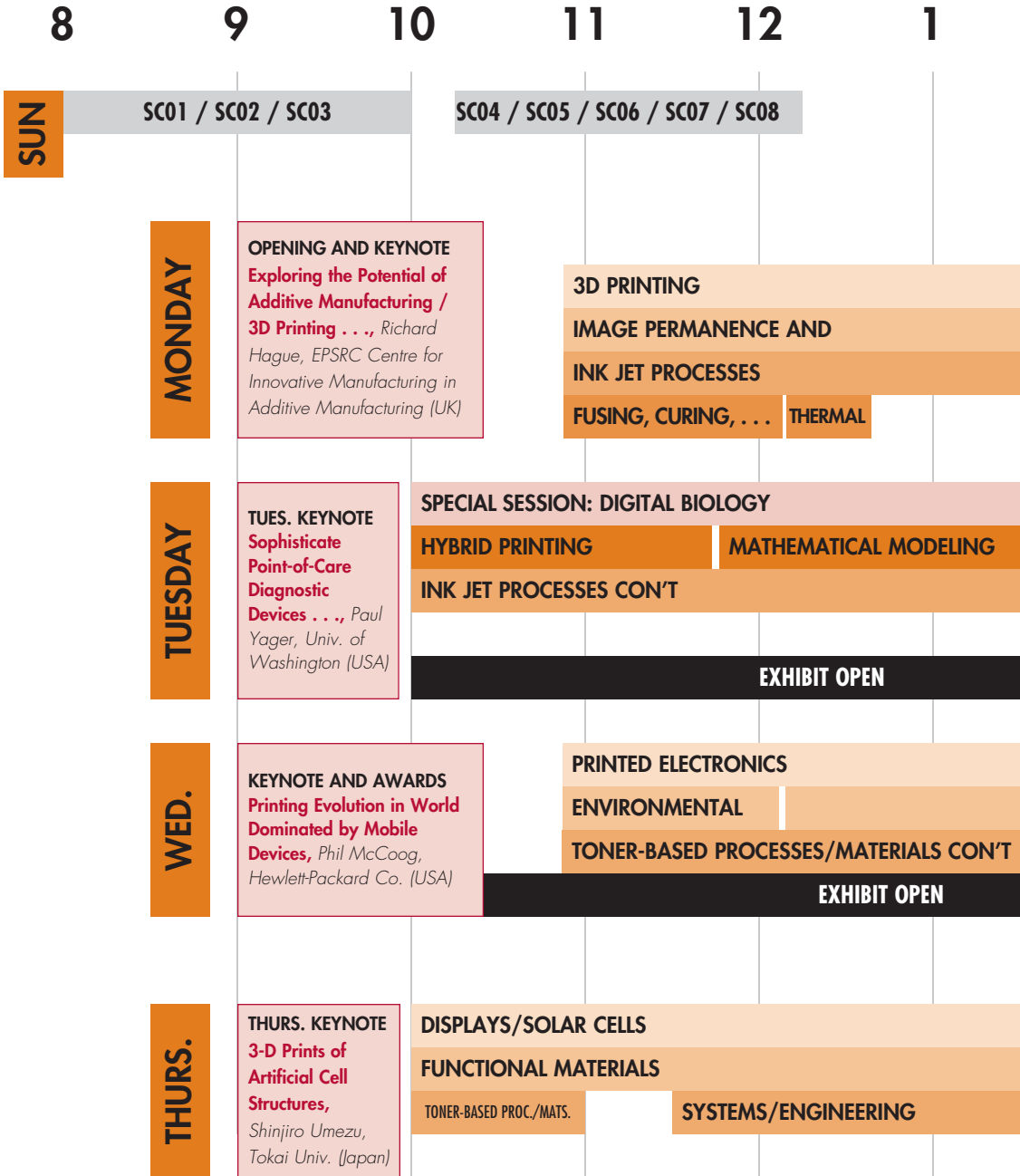
**Patterning of Functional Ceramic Oxides on  
Metallic Substrates by Inkjet Printing (Focal)**,  
Marta Vilardell, Susagna Ricart, Xavier Granados,  
Albert Calleja, Teresa Puig, and Xavier Obradors,  
Autonomous University of Barcelona (Spain)

**Inkjet Printing as a Reactive Synthesis Technique**,  
Jonathan Stringer,<sup>1</sup> Aoife Morrin,<sup>2</sup> and Patrick J.  
Smith<sup>1</sup>; <sup>1</sup>The University of Sheffield (UK) and  
<sup>2</sup>Dublin City University (Ireland)

**The Role of Coalescence in Inkjet Printing  
Functional Films: An Experimental Study**,  
J. William Boley, ChenChao Shou, Patrick  
McCarthy, Timothy Fisher, and George T.-C. Chiu,  
Purdue University (USA)

**The Effect of Print Masks on Functional Perform-  
ance**, J. William Boley, ChenChao Shou, Patrick  
McCarthy, Timothy Fisher, and George T.-C. Chiu,  
Purdue University (USA)

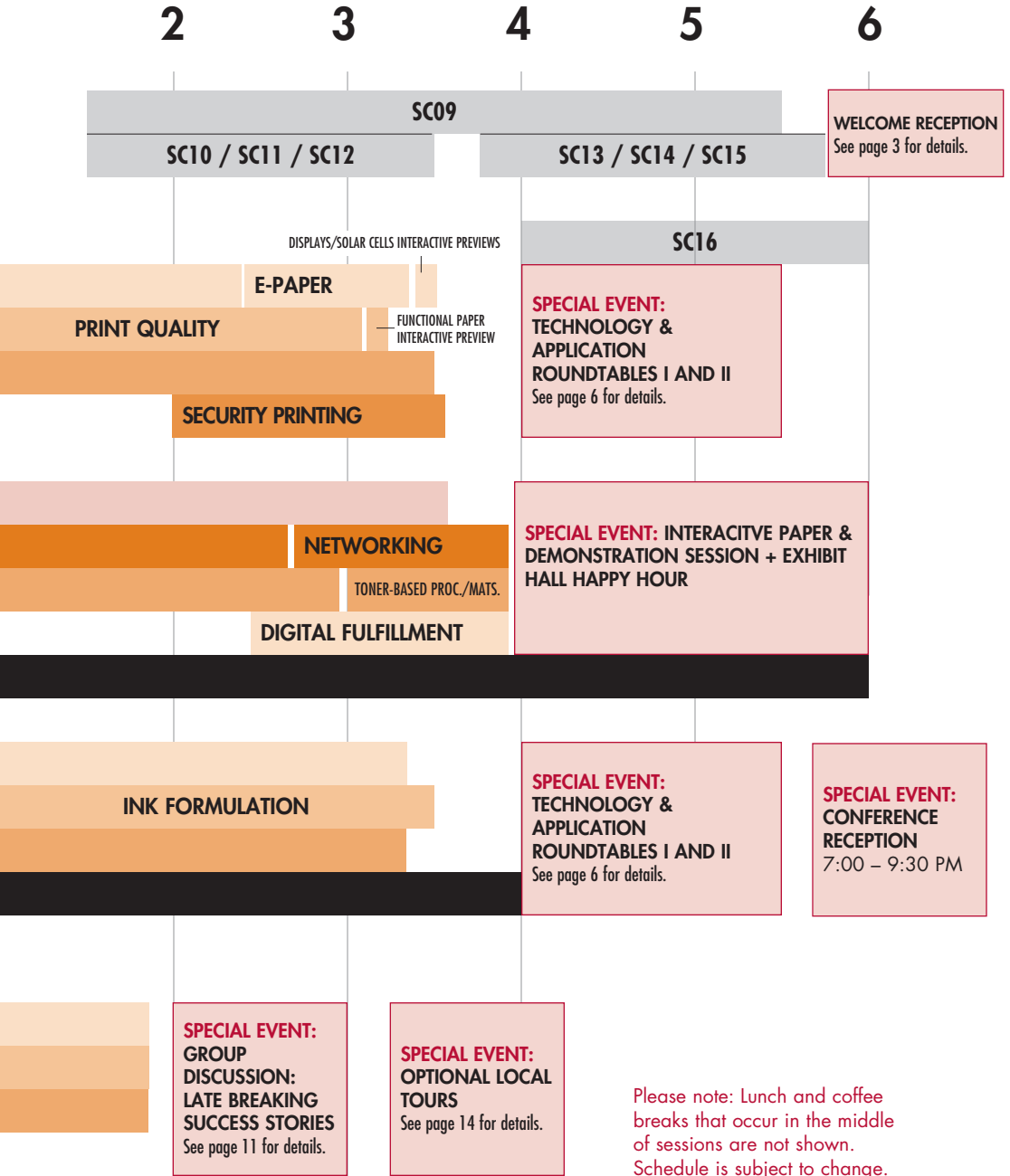
# NIP29/Digital Fabrication 2013 Week



**LEGEND**

APPLICATIONS TRACK	PROCESSES or PROCESSES/MATERIALS TRACK
MATERIALS TRACK	PROCESSES FOR APPLICATIONS TRACK

# At-a-Glance



COMBINATIONS AND OPTIMIZATIONS TRACK  
SHORT COURSE

SPECIAL EVENT  
EXHIBIT

**Inkjet Delivered Polymeric Agents between Composite Plies**, Patrick J. Smith, Yi Zhang, Jonathan Stringer, Tim Swait, Richard Grainger, and Alma Hodzic, *The University of Sheffield (UK)*

**GROUP DISCUSSION: LATE BREAKING NEWS/SUCCESS STORIES**

2:00 – 3:00 PM  
[see details page 11](#)

**OPTIONAL TOURS**  
[see details at right](#)

**PROCESSES/MATERIALS TRACK  
TONER-BASED PROCESSES/MATERIALS  
CONT'D.**

Session Chairs: Yoshihiro Hattori, Konica Minolta Business Technologies Inc.; Koji Hirakura, HiRAK; and Nobuyuki Nakayama, Fuji Xerox Co., Ltd.  
10:00 – 11:00 AM

**Eco-Friendly Aqueous-based Polyester Chemically Prepared Toner Including Crystalline Polyester**, Manabu Suzuki, Shouichi Murata, Hiroshi Mizuhata, and Akihiro Eida, *Kao Corporation (Japan)*

**Comparison between Resin Sphere and Film Charging by Various Charging Characteristic Carrier**, Yasushi Hoshino, *Tokyo Denki University*, and Disna Karunanayake, *Nippon Institute of Technology (Japan)*

**Balanced Aggregation—Snow Man Shaper Tripod-Like (Fumed) Particles that Allow for Better Fixation on Toner Resin Surface**, Andreas Hille,<sup>1</sup> Naohiro Naito,<sup>2</sup> Yuki Amano,<sup>2</sup> Yusuke Tosaki,<sup>2</sup> Akira Inoue,<sup>2</sup> and Robert E. Johnson<sup>3</sup>; <sup>1</sup>Evonik Industries AG (Germany), <sup>2</sup>Nippon AEROSIL CO., LTD. (Japan), and <sup>3</sup>Evonik Degussa Corporation (USA)

**SYSTEMS/ENGINEERING**

**Sponsored by Ricoh Company Ltd.**  
Session Chair: Teruaki Mitsuya, Ricoh Co., Ltd.  
11:30 AM – 1:50 PM

**New Technology for Improving Image Density Uniformity in Electrophotographic Process (Focal)**, Satoshi Kaneko, Shinji Kato, Hitoshi Ishibashi, Shuji Hirai, Koichi Kudo, Jun Yamane, and Shingo Suzuki, *Ricoh Company, Ltd. (Japan)*  
**System Level Inkjet Reliability Customer Needs and Innovations from Xerox (Focal)**, Trevor Snyder, Howard Mizes, Doug Darling, and John Brookfield, *Xerox Corporation*, and Steve Kroon, *HCL America (USA)*

**New Effect of AC High Field on Toner Transfer**, Shinji Aoki, Haruo Iimura, Yasuhiko Ogino, Keigo Nakamura, Ichiro Maeda, Naomi Sugimoto, and Shinya Tanaka, *Ricoh Company, Ltd. (Japan)*

**GROUP DISCUSSION: LATE BREAKING NEWS/SUCCESS STORIES**

2:00 – 3:00 PM  
[see details page 11](#)

**OPTIONAL TOURS**  
[see details below](#)

**SPECIAL EVENT: OFFSITE TOURS**

Registration for offsite tours will be sent immediately following the pre-registration deadline for those registered by that date, or immediately following registration, whichever is sooner. Please note that there will be a small fee for transportation to/from tours. Details will be provided with the registration form.

**MICROSOFT VISITOR'S CENTER**

Departure\* 3:15 PM; tour 4:00-6:00 PM; return by 7:00 PM Limit: 50 people

*From the Microsoft website: "[E]xplore the vision, products, culture, and history of Microsoft . . . from the latest [r]esearch innovations to the very first personal computer."*

**BOEING 'FUTURE OF FLIGHT' AVIATION CENTER & EVERETT FACTORY TOUR:**

Departure\* 3:15 PM; return ~7:00 PM

*Explore the dynamics of flight and experience new aviation innovations. Design and virtually test your own jet. Strap yourself into the Innovator for an exhilarating trip to virtual destinations. Go behind the scenes and watch actual jets being assembled.*

**UNIVERSITY OF WASHINGTON:  
PAUL YAGER LABS**

Times TBA Limit: 10 people

*The Yager Labs in the UW Department of Bioengineering focuses primarily on the fabrication and testing of paper-based diagnostic tests. The labs include facilities for 1) fabrication using laser-cutting, 3D printing, and piezoelectric reagent deposition; 2) fundamental paper characterization including capillary pressure and a variety of flow properties; and 3) the testing of diagnostic tests operation and performance including optical and chemical quantification.*

\* times are approximate; exact times TBD



# Short Course Program

The NIP/Digital Fabrication Short Course Program offers a wide range of introductory and advanced classes in the fields of digital printing and fabrication given by internationally recognized experts. Attendees receive copies of the instructor's notes with course registration. We encourage you to sign up for short courses by the early registration deadline to ensure that a course runs.

**Special Offers:** Sign up for 3 or more short courses and receive 15% off your total short course fee. Students may take any short course for \$50, but are not eligible for the discount.

*Please Note: IS&T reserves the right to cancel short courses in the event of insufficient advance registration. Please indicate your interest early.*

## Sunday September 29, 2013

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### SC01-S1: Laser Printer Fundamentals and Trends

Sunday 8:00 – 10:00 AM (2 hours)

Instructor: Marc Cousoulis, Lexmark International, Inc.

While the physics of electrophotography have been studied for more than 60 years, market challenges are still providing opportunities for technical innovation. This course provides an insight into how industry demands are driving scientific advancements within the established technological boundaries of the modern laser printer. After the physics of electrophotography are reviewed, with an emphasis on current challenges being placed on component technologies, a comprehensive review of some of the most important technical innovations recently introduced to the market is given.

#### Benefits

This course enables an attendee to:

- Identify and explain the six fundamental steps of electrophotography.
- Understand the primary failure modes of modern laser printers.
- Understand how the industry is adapting designs to new energy and cost constraints.
- Distinguish between the different technology choices currently being used.

**Intended Audience:** any individual who works directly or indirectly with the toner based imaging industry should benefit from this course.

*Marc Cousoulis has more than 15 years of electrophotographic experience across three market segments, holding the positions of senior scientist at Moore Business Forms developing ultra high speed toner based imaging systems, senior electrophotographic engineer at Aetas Technology developing low end color laser printer technologies, and is currently electrophotographic technology team lead for high end color laser printers for Lexmark International. He holds separate degrees in physics and imaging science from Rochester Institute of Technology.*

Short Course Monitors are needed to help with classes. Monitors take courses for free. Interested? Contact Diana Gonzalez at [nip\\_df@imaging.org](mailto:nip_df@imaging.org). Priority given to students.

### SC02-S1: An Introduction to Digital Fabrication: Methods, Materials, and Applications

Sunday 8:00 – 10:00 AM (2 hours)

Instructor: James W. Stasiak, Hewlett-Packard Company

During the past decade, there has been a remarkable convergence of two disparate technologies: digital printing of text and images and the fabrication of physical objects. This convergence, a blending of traditional printing methods with recent advances in materials science and with established manufacturing methods, has brought about the foundation of a new technology: digital fabrication. Already, digital fabrication approaches are enabling new discoveries at the laboratory bench and are beginning to provide new efficiencies and unprecedented product customization on the manufacturing floor. In the near future, digital fabrication methods—along with the development of “functional inks”—will make it possible to print complete electronic circuits, optical devices, mechanical structures, and even new biological materials. The objective of this short course is to provide an introduction to the rapidly emerging science and technology of digital fabrication. The course includes an up-to-date overview of the methods, materials, and processes that are reshaping manufacturing and enabling new commercial applications in electronics, MEMS, and the life sciences. Finally, the class examines factors that are moving digital fabrication from a niche technology toward a new manufacturing paradigm.

#### Benefits

This course enables an attendee to:

- Develop an understanding of different digital fabrication methods and materials.
- List and compare different applications that

- range from printed electronics to the life sciences.
- Evaluate the technological issues and challenges of digital fabrication.
- Develop an understanding of the technology landscape, key players, and practitioners.
- Recognize the market opportunities addressed by this emerging technology.

**Intended Audience:** this is a survey course for engineers, scientists, and technical marketing professionals who are working or are interested in digital fabrication and printed electronics.

*James Stasiak is currently a principal scientist in Hewlett-Packard's Technology Development Laboratory in Corvallis, Oregon. He is actively involved in developing new digital fabrication methods and applications. In a career spanning more than 30 years, he has made contributions in the fields of device physics, molecular electronics, non-impact printing technologies, and, more recently, the emerging fields of flexible electronics and digital fabrication. In 2005 and 2006, he served as the General Chair for the Digital Fabrication Conference and now serves on the Digital Fabrication Conference Advisory Committee. He holds more than 14 issued US patents and is the author or editor of numerous technical articles and proceedings.*

### SC03-S1: Cloud Printing

Sunday 8:00 – 10:00 AM (2 hours)  
Instructor: Phil McCoog, Hewlett-Packard Company

Cloud Printing has moved from an interesting technology to a major part of the printing landscape. Its symbiotic relationship with cloud computing and mobility as well as enabling “driverless” printing has driven explosive growth. Cloud computing is a broad topic area that spans many market segments and has multiple embodiments. The needs for scalability, reliability, security demands some technologies not typical to the printing industries. This course benefits the printer developer and cloud developer alike. The course is presented in a way that enables developers to have a working understanding of the needed architecture components as well as marketing and business participants to have a working understanding of the terminology and technology. Several market deployments are compared and contrasted.

#### Benefits

This course enables an attendee to:

- Understand the various types of cloud print solutions: consumer/public; public print locations; enterprise/private cloud solutions.
- Develop an understanding of the business challenges shared by the three solutions and the challenges unique to each.

- Have a basic understanding of the basic technology elements that are used to create cloud print solutions.

**Intended Audience:** printing professionals interested in understanding the business and technology challenges and various solutions across the spectrum of cloud print solutions.

*Phil McCoog has more than 24 years of experience in HP printing business across multiple technologies and market segments. He is the technology strategist and senior architect for HP Mobile and Web-Enabled Printing Solutions. McCoog has driven the technology and partnerships that have yielded HP ePrint, HP ePrint Enterprise, HP ePrint On-the-Go (Public Print location), HP integration with Google Cloud Print, and HP deployment of Apple AirPrint. He holds an undergraduate degree in computer engineering from University of California San Diego and a MS in computer engineering from Columbia University.*

### SC04-S2: Introduction to Toner Technology

Sunday 10:15 AM – 12:15 PM (2 hours)  
Instructor: Jodi Lynn Walsh, Lexmark International, Inc.

This course is a general introduction to toner formulation. Formulation disciplines, material selection and function, and particle architecture implications are summarized. Various toner design criteria and performance requirements in multiple embodiments are also discussed. Analytical and measurement techniques are surveyed including size, shape, charge, flow, and rheological attributes. A glossary and bibliography for future reference are provided.

#### Benefits

This course enables an attendee to:

- Understand the various implementations of electrophotographic printing and the role that toner plays in each.
- Recognize the design criteria and performance requirements of toner in an electrophotographic printing subsystem.
- Comprehend toner manufacturing alternatives for commercial devices.
- Compare the market implementation of the various toner technologies, and the potential for future market domination.

**Intended Audience:** anyone seeking an introduction to electrophotography, electrophotographic printing, supplies technology, or related development activities; an interest in toner or carrier is helpful, but no working knowledge of electrophotography is presumed nor required.

*Jodi Walsh is the CPT Engineering Manager in the Imaging Solutions and Services Division of Lexmark International. She has*

*been involved broadly across the toner business for 18 years in toner manufacturing, support, and CPT Engineering. Walsh began her career as a formulator under the tutelage of George Marshall and was a technical leader in Lexmark's first color milled toner products and has published multiple toner related patents. Walsh received her PhD in physical organic chemistry from Northwestern University (1994).*

*"I really enjoyed the class & learned a lot of great information! Thank you."*

### **SC05-S2: Intro to 3D Ink Jet Printing**

Sunday 10:15 AM – 12:15 PM (2 hours)

Instructor: Sascha de Peña, Hewlett-Packard Company

3D printing or additive manufacturing technologies in general, is an expected future growth area, with a wide variety of different technologies available. Some of the fundamental technologies have been around for a while but the latest enhancements in equipments, performance and materials are now making them a compelling alternative for a diverse range of applications, some of them unique. Also the emergence of low cost 3D printers is contributing to the popularity of the subject. This course provides an overview of the existing 3D printing technologies, materials, their fundamentals, current performance, relative strengths and weaknesses. An overview of the 3D printing overall ecosystem, market, players, applications, software, trends, and news is included.

#### **Benefits**

This course enables an attendee to:

- Get up to speed on 3D printing (additive manufacturing) fundamentals in a short time.
- Have a clear view of different existing approaches to create 3D parts by means of additive manufacturing.
- Understand the fundamentals of the underlying technologies and the materials used to work with each of those.
- Learn the pros and cons of each technology and the challenges ahead. Also, an overview of some public research projects being conducted in 3D around the world.
- Appreciate a broad view of the key players in the market, the verticals being addressed, a rough idea of the market potential, and thoughts on how the industry may evolve and the barriers to mass adoption.

**Intended Audience:** anyone interested in getting up to date in regards to 3D printing, with none or

little previous exposure to it (this is where the gain/time is maximized).

*Sascha de Peña is a physicist with an MBA, ESADE, and a PhD in plasma physics conducting research at the Max-Planck-Institute for Plasma Physics (IPP) concerned with the investigation of the physical basis of a fusion power plant. Currently, he is master technologist and R&D Chief Engineer at HP's Printing and Personal Systems Group, responsible for the technical direction of several large format printers and in charge of the evaluation and development of technologies for rapid prototyping.*

### **SC06-S2: Fluid Dynamics and Acoustics of Ink Jet Printing**

Sunday 10:15 AM – 12:15 PM (2 hours)

Instructor: J. Frits Dijkman, University of Twente

Ink jet printing is a process of depositing on demand droplets with a well-defined volume on a precisely given location on a substrate. The course is restricted to piezo driven print heads. A piezo driven print head is a set of acoustic cavities, the behaviour of which can be presented in the time and frequency domain. Based on the acoustical characteristics of the print head, conditions for stable droplet formation can be explained. Droplet landing is a highly dynamic phenomenon. A too high landing speed leads to splashing, and consequently to poor printing quality. Therefore the landing speed should be limited.

The aim of this course is to couple the characteristics of droplet formation and landing to the acoustics of the fluidics of the print head behind the nozzle all the way up into the ink supply. A few examples of applications of ink jet printing other than document printing are given.

#### **Benefits**

This course enables an attendee to:

- Understand the basic acoustical principles related to piezo driven ink jet print heads.
- Comprehend the concepts of responses in the frequency and time domain.
- Explain the importance of pulse shaping on droplet generation.
- Identify key parameters that control droplet formation and impact.
- Describe and explain the relation between print head acoustics, droplet formation, and droplet impact.
- List and explain acoustically related causes for missing droplets.

**Intended Audience:** engineers and scientists involved and interested in piezo print head design, ink formulation and testing. Familiarity with

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**Take 3 or more short courses and take 15% off your total short course registration fee!**

**See registration form for details.**

**You may also take advantage of this when you register online.**

piezo ink jet technology and college-level physics are recommended.

*Frits Dijkman is a professor in the field of innovative biomedical applications of ink jet technology at the University of Twente, the Netherlands. He has worked with Philips Research for more than 30 years and his main area of interest has been ink jet technology for non-consumer applications, such as PolyLED display manufacturing and the printing of biomolecules. (Note: Dr. Anke Pierik, senior scientist with Philips Research Europe, contributed to this course. Her main field of interest is molecular diagnostics of infectious diseases.)*

**SC07-S2: Digital Packaging**

Sunday 10:15 AM – 12:15 PM (2 hours)  
 Instructor: George Gibson, Xerox Corporation

Increasingly the benefits of digital printing are being applied to the production of packaging. Conventional package printing techniques certainly produce the high quality demanded by brand owners but frequently this comes with significant inventory and waste. Additionally increasingly sophisticated approaches to market segmentation have shown that there is significant value to be had in tailoring offerings to an increasingly number of smaller niches. Key to unlocking this potential is the ability to produce packaging of appropriate quality and cost in a way that meets the scale and value chain requirements of the host industry.

This course covers the variety of liquid toner processes that are and have been used, including the strengths and limitations of each, and the major application areas in which these techniques are employed. The course includes an analysis of improvements of liquid toner systems found in recent technical literature and patents.

**Benefits**

This course enables an attendee to:

- Understand the forces driving adoption of digital print in various package printing segments and opportunities for market growth.

- Understand the applications and requirements for package printing in label, folding carton, corrugated packaging and flexible packaging.
- Map the technology characteristic onto the market requirements identifying the relative strengths, weaknesses, opportunities and threats of each technology in the context of packaging markets.
- Understand the current market offerings and their position to the market’s “ideal points.”

**Intended Audience:** technical professionals who want to become more knowledgeable about how digital printing is likely to fit into the package printing markets.

*George A. Gibson is the program manager for New PIJ Platforms in the Xerox Research Center Webster of the Xerox Innovation Group. He has led research, development, and manufacturing organizations involved in non-impact printing for more than 20 years. Originally trained as a chemist, he did his undergraduate and graduate work at Binghamton University. He also holds an MBA from the University of Rochester’s Simon Graduate School of Business. Gibson has 52 US patents and has written more than 20 published papers in imaging and colloid science and the management of research and development. He is a frequent lecturer in imaging technology, R&D productivity, portfolio management, and technology valuation. Recent invited lectures include “Good, Fast Cheap in New Product Development: Don’t Settle for Just Two,” and “Creative Destruction: Portfolio Renewal Rate and Returns Optimization.” He is the author of a forthcoming book: Finding the Golden Eggs: An R&D Professional’s Guide to Managing New Product Development Through Valuation.*

**SC08-S2: Papermaking, Coating Fundamentals, and Media for Digital Printing**

Sunday 10:15 AM – 12:15 PM (2 hours)  
 Instructor: Sen Yang, Avon Products

This short course includes an introduction to papermaking and coating technologies, and a discussion on media requirements for digital printing with an emphasis on electrophotographic and ink jet printing applications. Paper attributes that are important for color electrophotographic and ink jet printing are discussed. A review of recent developments of ColorLok™ Technology and “better paper for better printing” is included.

**Benefits**

This course enables an attendee to:

- Describe the basics of papermaking and paper coating processes.
- Understand paper property and testing methods.
- Comprehend key media properties for

achieving good color printing performance for electrophotographic and ink jet printing.

**Intended Audience:** anyone seeking an introduction to papermaking and paper coating fundamentals, and who wants a better understanding of the relationship of media properties, performance for electrophotographic, and ink jet printing. No working knowledge of papermaking or coating techniques is presumed or required.

*Sen Yang is currently a senior manager for Product Innovation with Avon Products. He spent 17 years with International Paper, Champion International, and Océ-Arkwright managing digital printing media R&D and new product development projects. He received his PhD in polymer science from Brown University (1990). Yang has led and contributed to a number of new-to-the-industry and commercially successful digital printing media launches for both private label and OEM brands. He has more than 10 patents in the area of coated inkjet, EP papers, and specialty media.*

### SC09-S3: Fusing Technologies and Toner Materials Relationships

Sunday 1:30 – 5:30 PM (4 hours)

Instructor: Dinesh Tyagi, Eastman Kodak Company

Most conventional electrophotographic printing systems require a fusing sub-system that takes the discrete toner particles and both fuses (coalesces) them together and fixes them to the media. This process is required to produce an attractive, durable image that is bonded tightly to the substrate. The first part of this course reviews the fundamental functions of fusing and details past and current fusing technology trends in the electrophotographic industry. The physics of each technology is discussed, with a specific focus on each technology's strengths and weaknesses. In the second part, the influence of toner components on fusing performance is described, including the underlying polymer architecture and viscoelasticity concepts that govern resin binder. Effect of pigments and other toner additives is explained. In the last part of the course, the two to three most common fusing technologies are discussed, covering the critical parameters and failure modes that govern each technology's operation, and the scientific and engineering challenges faced during both the technology and product-development cycles of a fuser.

#### Benefits

This course enables an attendee to:

- Identify and comprehend advantages and disadvantages of different fusing technologies that have been developed and used throughout the industry.

- Understand the polymeric concepts that influence fusing and various considerations necessary in toner formulations.
- Analyze the critical parameters that define the fusing process and latitude for common fusing technologies.
- Determine the critical failure modes, and the critical parameters that govern them, for conventional fusers.

**Intended Audience:** scientists and engineers in toner design as well as the selection, analysis, and evaluation of the numerous fusing technologies used in today's electrophotographic engines. A basic understanding of the electrophotographic process will be assumed; familiarity with the basics of heat transfer, and mechanics will be beneficial, but is not required.

*Dinesh Tyagi received his PhD from Virginia Tech (1985) from the Department of Chemical Engineering with a thesis titled "Structure-Property Relationships in Segmented Polymers." After a one-year post-doctoral position there, he joined Eastman Kodak Company as a research scientist where he has continued to work in the area of toner formulations and electrophotography. He was inducted into Kodak's Distinguished Inventors Gallery in 1994. In 1999, he joined NexPress Solutions, which was later absorbed back into Kodak. Tyagi has more than 80 patents worldwide. In the past, he has taught this course with David Thompson, Xerox Research Center Webster.*

### SC10-S3: Introduction to 3D Printing of Metals

Sunday 1:30 – 3:30 PM (2 hours)

Instructor: Jason Jones, University of Warwick

3D printing, also known as additive manufacturing, has recently emerged from niche engineering and hobbyist use, to be a mainstream strategic technology across a broad range of applications. Two recent developments have helped catalyse its recent growth: low cost polymer printers and high-end metal printers. The internet is saturated with information about low-cost printers, however finding reliable information about metal printing is more difficult.

This course provides insight into the existing techniques for producing metal parts directly and indirectly using 3D printing technologies, including an assessment of their relative strengths, weaknesses and costs. Additionally, the fundamentals of material preparation, how oxidation is avoided and post processing methods will be addressed. Key market players and applications (including aerospace, dental, and medical) are identified together with future growth directions and standards activities in the area.

### Benefits

This course enables an attendee to:

- Understand the state-of-the-art in metal additive manufacturing processes.
- Become conversant with the fundamentals and issues of additive metal approaches.
- Appropriately match techniques (based on their pros and cons) with a variety of applications.
- Gain a sense of the direction of future development and potential for this technology.

**Intended Audience:** anyone interested in gaining early-intermediate exposure and understanding of the 3D printing of metals. Those who want a frame of reference for comparing larger scale metal printing practices with conventional digital fabrication practices (for example comparing the production of aerospace parts with printing conductive tracks). There are no pre-requisites for this course.

*Jason Jones is co-founder and CEO of Hybrid Manufacturing Technologies, a 3D printing start-up which is equipping CNC machines with additive manufacturing capabilities. He received his MSc from De Montfort University, and completing a PhD at the University of Warwick (England). Jones serves as a task group chair for ASTM and led the development of several standards for 3D printing (ASTM F2921 and ISO 52921). He is an advisor for SME's Rapid Technologies & Additive Manufacturing Community. Prior to his research appointment, he worked as technical manager in the CNC & 3D printing industry at Unimatic Engineers Ltd. in London.*

### SC11-S3: Electrostatics and Charged Particle Deposition

Sunday 1:30 – 3:30 PM (2 hours)

Instructor: Dan A. Hays, consultant

Charged particle deposition is widely used in digital copiers and printers to produce high-quality documents. Such deposition is also being utilized to digitally fabricate various devices. This short course provides a foundation for understanding electrostatics phenomena that enable charged particle deposition.

### Benefits

This course enables an attendee to:

- Understand basic concepts regarding electrostatic forces, electric fields, electrostatic potential and energy.
- Describe different methods for charging or neutralizing an insulative layer and powder.
- Describe techniques for measuring the charge on an insulative layer and powder.
- Discuss how the maximum electric field for

air breakdown depends on the air gap and particle size.

- Understand electric field detachment of triboelectric, ion and induction charged particles.

**Intended Audience:** technicians, engineers, scientists and managers involved in electrophotography and digital fabrication research and engineering. Familiarity with college-level physics is a recommended prerequisite.

*Dan A. Hays retired from Xerox Corporation in 2006 as a Senior Research Fellow. His research contributions in the field of electrophotography have spanned the areas of triboelectricity, charged particle adhesion, and xerographic development systems. During a 38 year career, he published 57 scientific papers and obtained 79 US patents. Prior to joining Xerox in 1968, he received a BS from Iowa State University and a PhD in physics from Rutgers University.*

*“Very much liked the in class discussions.”*

### SC12-S3: Paper Recycling and Ecolabels, Deinking, and Deinkability

Sunday 1:30 – 3:30 PM (2 hours)

Instructor: Axel Fischer, INGEDE e.V

The paper recycling process has been developed to unlock the “urban forest,” the piles of read newspapers and magazines, as an inexpensive source for paper fibers. In the meantime, the recycling cycle has proven to be an essential part of sustainable handling of resources. Therefore, all members of the paper chain shall contribute to its conservation.

Digital printing has a lot of environmental benefits. But some print processes can lead to severe problems in paper recycling. This short course will— supported by videos and other descriptive material—explain deinking in the industrial paper recycling process, how this is simulated and evaluated in the lab, and how it is challenged by different printed products. It also looks into present and future European Ecolabels for printed products.

### Benefits

This course enables an attendee to:

- Identify different printed products and printing technologies.
- Understand the environmental impact of printed products after leaving the shop.
- Appreciate the paper recycling process, the importance and mechanism of deinking as the key of this process.

- Understand what European and US paper recycling have in common and how they differ.
- Learn about the different challenges of different printing processes.
- Comprehend the principles of deinking in the laboratory and how it relates to industrial practice.
- Learn how good deinkability can be achieved for different types of inks and printing processes.

**Intended Audience:** anyone interested in environmental issues and the impact related to printed products, such as product development engineers, product stewards, environmental regulatory managers, sales engineers, field application engineers, ink developers, and others.

*Axel Fischer studied chemistry at Munich Technical University. Since 1994, he is responsible for the public relations of INGEDE, the International Association of the Deinking Industry. He represents INGEDE at international events and working groups dealing with recyclability, with digital printing technologies and sustainability in the paper chain. He chairs the International Round Table on the Deinkability of Digital Prints. His teaching experience includes composing and presenting a science TV show for three years.*

### SC13-S4: Printed Electronics: A Practical Overview and Future Trends

Sunday 3:45 – 5:45 PM (2 hours)

Instructor: Steve Jones, Printed Electronics Ltd.

Printed electronics has been slow in its development due in part to the poor understanding of the science of electronically functional inks and the difficulty producing them. The interaction of complex inks with ink jet heads and substrates has compounded the problems developing a robust production process and reliable products. However, the vision of tool-less, non-contact printing to produce customized functional structures is powerful and many problems have either been eroded or circumvented. Hybrid printing and component technologies have also helped to extend production options and printed electronics is beginning to move into the mainstream. This short course will overview some of the more recent advances and speculates on some of the newer technologies.

#### Benefits

This course enables an attendee to:

- Gain an overview of ink jet electronics (Ink-Tronics), market applications and capabilities: smart packaging, medical/pharmaceutical, aerospace, and 3D structures.

- Understand electronically functional nanoparticulate inks, their rheology and interaction with ink jet heads.
- Understand functional ink interactions with substrates and image quality.
- Evaluate functionalizing printed ink structures to produce working electronics.
- Look to the future: printing 1 micron tracks and gaps; ink jet printing 100,000 Pas inks.

**Intended Audience:** attendees of all abilities who have either specific or general interests in printed electronics will find something new in this short course. A number of demonstrations will be available to show some current developments

*Steve Jones taught for eight year at the Sheffield University UK, Chemistry Department, and held senior R&D roles in several companies. For twenty years prior he worked mainly in the defense and aerospace sector developing high reliability avionic electronics for civil and defense applications. He was European Director of R&D for Viasystems Inc., the largest global manufacturer of printed circuits and one of the largest contract manufacturers of electronic systems. Jones set up Printed Electronics Ltd. in 2005 with Neil Chilton to develop ink jet and other printing technologies.*

### SC14-S4: Liquid Toner Printing: Technology and Applications

Sunday 3:45 – 5:45 PM (2 hours)

Instructor: George Gibson, Xerox Corporation

Liquid toner technologies have long been held as versatile methods for imaging in a variety of applications. Known for high image quality, especially high-quality color, liquid toners are undergoing a renaissance. Applications of current import include not only document printing, but a number of industrial printing, display, and fabrication applications. In spite of these demonstrated strengths, liquid toners are employed in a minority of printing systems today. Indeed at DRUPA last year two new companies introduced new liquid toner based products and there was a considerable expansion of the total number of commercial offerings. This course explores how the fundamental strengths of these technologies have led to this current state and project where liquid toner will continue to be a vibrant force.

This course covers the variety of liquid toner processes that are and have been used, including the strengths and limitations of each, and the major application areas in which these techniques are employed. The course includes an analysis of improvements of liquid toner systems found in recent technical literature and patents.

### Benefits

This course enables an attendee to:

- Recognize the fundamentals of five generations of liquid toner device architectures.
- Appreciate the composition and preparation methods for liquid toners.
- Describe how the components of the toner and characteristics of the process drive print properties.
- Identify the major market applications where liquid toners are used today.
- Have a vision of where liquid toner technologies are fundamentally advantaged.
- Learn about recent innovations in liquid toner technology.

**Intended Audience:** technical professionals who want to become more knowledgeable about liquid toner printing technology.

See instructor bio under SC07-S2.

### SC15-S4: Fabrication Materials and Processes of Ink Jet Printheads

Sunday 3:45 – 5:45 PM (2 hours)

Instructor: Hue Le, Le Technologies Inc.

In recent years, enormous progress has been made in the design, fabrication, and commercialization of ink jet printing systems. This short course describes the materials and processes that have been used to produce various ink jet printheads, which are the core component of the printing systems. Methods of forming ink jet nozzle, anti-wetting coated nozzle surface, ink channel and chamber, and various bonding methods are then reviewed. Materials of thin film resistor (for thermal ink jet) and piezoelectric ceramic (for piezoelectric ink jet) are also reviewed. The course concludes with insights into the potential material interactions between the more complex jetting fluids and the printhead structures in several emerging applications such as bio-printing and printed electronics.

### Benefits

This course enables attendees to:

- Understand the basic science and technology in manufacturing methods of various types of thermal and piezoelectric ink jet printheads.
- Assess the current development in fabrication materials and processes of ink jet printheads.
- Evaluate insights into the potentials and limitations of different types of printheads.

**Intended Audience:** scientist, engineers, product

*"Very good introductory course, very clear, presenter was knowledgeable and well-prepared with his material."*

managers, and other charged with development or manufacture of ink jet printing systems will benefit from this class.

*Hue Le is an ink jet printing technologies consultant at Le Technologies Incorporation. From 1997 to 2011, he formed and worked at PicoJet Inc., Hillsboro, OR, which designed and manufactured fluid jetting devices and systems for industrial printing applications. Prior to PicoJet, Hue was Director of Technology Development for Tektronix, Inc.'s Printing and Imaging Division. He has more than 32 years of experience in developing and commercializing ink jet printing systems and holds 21 US patents. Le received a BS in chemistry, University of Iowa (1979) and MS degree in chemistry, New Mexico State University (1981).*

### Monday September 30, 2013

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### SC16-M4: Security Printing Opportunities for Digital Printing and Fabrication

Monday 4:00 – 6:00 PM (2 hours)

Instructor: Alan Hodgson, 3M UK PLC

This short course highlights the opportunities for printing and fabrication in security printing. There are specific opportunities in the technologies of physics, chemistry and material science and an ongoing market for new hardware and software applications for print inspection and verification. After a brief introduction to this market sector and the technical characteristics of the solutions, the course covers three main sections:

1. The security printing ecosystem. Here we cover the materials, printing processes, electronics and electro-optic hardware established in this sector. This section covers existing applications and current opportunities.
2. The threat from new digital printing technologies. Some of the security features that have been used for years could become compromised by digital printing. These threats are also opportunities for new printed and fabricated security features.
3. Emerging opportunities for new features. Printed electronics, mobile imaging and 3D printing are starting to find their way into this sector.

The security print application space is very much wider than the obvious ones of identifica-



tion verification documents, such as passports and identity cards. It now covers brand and asset protection plus a host of emerging actionable printing applications. Join us to explore the opportunities that exist in security printing.

### Benefits

This course enables an attendee to:

- Understand the fundamentals driving security printing opportunities.
- Identify opportunities for materials, print engines and electro-optic hardware.
- Gain an overview of how technologies such as printed electronics and mobile imaging can be used in the security print market sector.

**Intended Audience:** material scientists, print professionals and engineers who are looking for applications of their technology in the field of security printing.

*Alan Hodgson has a background in photographic hard copy and image science. He works for 3M on print solutions for high security documents such as passports and identity cards. Hodgson has a BSc in colorant chemistry and a PhD in instrumentation from the University of Manchester. He has served as session chair, short course instructor, and presenter at a number of IS&T conferences. He is Chair of IEC TC 119 (Printed Electronics) and President of IS&T.*

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## Hotel and Transportation Information

**The Westin Seattle • 1900 Fifth Avenue • Seattle, Washington 98101**

**Rate:** Single/Double \$184 +15.6% tax and \$2.00/night STIA fee

**Check in/out:** 3:00 pm/noon **Reservations Deadline:** September 6, 2013

**Online reservation code:** IS&T NIP/Digital Fabrication

**Phone reservations:** may be made by calling the hotel at +1-888-627-8513 and telling them you are with NIP29/Digital Fabrication 2013 or Society for Imaging Science and Technology.

**Cancellation Policy:** No fee if cancelled 24 hours prior to day of arrival; less than 24 hours' notice incurs a fee of one (1) room night + tax.

**Early Departure Fee:** 50% of one night's room charge.

*The discounted rate is available for 3 days prior to and 3 days after the conference dates of Sept. 27-Oct. 4, 2013, based on availability. Early reservations are assigned on a priority basis to conference attendees provided they are received by September 6, 2013. To guarantee a room, a credit card number or deposit equal to one night's housing must accompany the reservation request.*

### Airline Info

Sea-Tac International Airport (SEA) is a 30 minute drive from the hotel. There are 21 international destinations served by SEA. For more information, visit [www.portseattle.org/Sea-Tac](http://www.portseattle.org/Sea-Tac).

### Getting to Hotel from Airport (15 miles)

#### Via Light Rail

- At the airport, follow signs for the Light Rail, which will take you through the parking garage.
- Purchase a ticket at the kiosk at the base of the escalators. The fare to the Westlake Center stop is \$2.75.
- The travel time between the airport and Westlake Center is approximately 45 minutes.
- When you arrive at Westlake Center follow signs to 5th Ave (Nordstrom) to exit. Hotel is about a block and a half away.
- For more information visit <http://www.soundtransit.org/Schedules/Central-Link-light-rail>

#### Via Shuttle or Taxi

- Shuttle Express: one way fare \$18; for reservations visit <http://www.shuttleexpress.com/>.
- Taxi service is available for approximately \$45 one way.

**SAVE THE DATE!**  
**Next year's meeting**

**Sept. 7 - 11, 2014**  
**Philadelphia, PA**

# NIP29/DF 2013 Technical Registration - page 1

Register online at [www.imaging.org/ist/conferences/nip](http://www.imaging.org/ist/conferences/nip)

First/Given Name \_\_\_\_\_

Last/Family Name \_\_\_\_\_

Title/Position \_\_\_\_\_

Company \_\_\_\_\_

Complete Mailing Address \_\_\_\_\_

Telephone \_\_\_\_\_ Fax \_\_\_\_\_

Email \_\_\_\_\_

**Conference registration includes:** admission to all technical sessions for both conferences; choice of proceedings (hardcopy or abstract book + CD); entrance to the exhibit hall; coffee breaks; and the Welcome and Conference Receptions. **Separate registration fees are required for short courses.**

**I would like to reserve the following space for a print sample:\*** \_\_\_2' x 4' or \_\_\_4' x 4'

**I would like a half-table to demonstrate a program/product related to the talk I am giving:\***

(Session and Paper Title): \_\_\_\_\_

**Conference Registration** (CHECK ONE) **until 9/3** **after 9/3** **TOTAL**

**Please check ALL that apply. I am a:**

speaker     session chair     committee member     IS&T member     ISJ member

*Please note: To better serve your needs, IS&T is offering 4 full conference registration options (plus student and one-day options). One for current IS&T/ISJ members, one for non-members that includes registration only, and two options for non-members that includes IS&T membership from now until Dec. 2014, plus an online subscription to the Journal of Imaging Science and Technology (JIST) or IS&T membership plus an online subscription to the Journal of Electronic Imaging (JEI).*

___ Conference registration: IS&T/ISJ Member	\$750	\$850	\$ _____
___ Conference registration: non-member	\$875	\$975	\$ _____
___ Conference registration: non-member (with comp membership + JIST)**			
Membership begins within 2 weeks of registration and expires 12/31/14.	\$875	\$975	\$ _____
___ Conference registration: non-member (with comp membership + JEI)**			
Membership begins within 2 weeks of registration and expires 12/31/14.	\$875	\$975	\$ _____
___ IS&T/ISJ Student Member (ID required)	\$150	\$185	\$ _____
___ Student Non-member (ID required)	\$175	\$210	\$ _____
___ One-day: <input type="checkbox"/> Mon <input type="checkbox"/> Tues <input type="checkbox"/> Wed <input type="checkbox"/> Thurs	\$450	\$500	\$ _____
___ Short course only (check and proceed to short course selection area)			

**Proceedings Choice** (one copy comes with your registration; check the version you'd like)

NIP/DF Abstract Book with CD containing papers     NIP/DF Hardcopy book  
 **Extra hardcopy proceedings**     **Extra abstract book proceedings @ \$140/each**    \$ \_\_\_\_\_  
 **Extra CD** (available only as addition to Hardcopy selection/purchase) @ \$75/each    \$ \_\_\_\_\_

Page Subtotal    \$ \_\_\_\_\_

continued on next page

\* You will be contacted by the Demonstration Session chair with further details.

\*\* If you choose this option, you may register for Short Courses at the Member rate.

**NIP29/DF 2013 Technical Registration - page 2**

Short Course Registration (see page 15 for course descriptions)	until 9/3	after 9/3	
2-hour member registration	\$160	\$195	\$ ____
2-hour non-member registration	\$195	\$230	\$ ____
2-hour student* registration	\$50	\$85	\$ ____
Check all that apply: <input type="checkbox"/> SC01 <input type="checkbox"/> SC02 <input type="checkbox"/> SC03 <input type="checkbox"/> SC04 <input type="checkbox"/> SC05 <input type="checkbox"/> SC06 <input type="checkbox"/> SC07			
<input type="checkbox"/> SC08 <input type="checkbox"/> SC10 <input type="checkbox"/> SC11 <input type="checkbox"/> SC12 <input type="checkbox"/> SC13 <input type="checkbox"/> SC14 <input type="checkbox"/> SC15 <input type="checkbox"/> SC16			
Member registration for <input type="checkbox"/> SC09 (4-hr course)	\$240	\$275	\$ ____
Non-member registration for <input type="checkbox"/> SC09 (4-hr course)	\$275	\$310	\$ ____
Student* registration for <input type="checkbox"/> SC09 (4-hr course)	\$50	\$85	\$ ____
<b>SPECIAL SHORT COURSE OFFER:</b> Take three or more classes and receive 15% off the total price (enter three or more short courses on the line, fill in member or non-member price next to each, add together, and multiply by .85 to get your price; add additional lines if needed)			
SC____ \$ ____ + SC____ \$ ____ + SC____ \$ ____ = \$____ x .85 = \$ ____			
*not eligible for 3 course discount			

Membership	US Address	Non-US Address	
new membership (begins now, expires 12/31/14)	\$145	\$160	\$ ____
annual membership renewal (expires 12/31/14)	\$95	\$105	\$ ____
student membership (begins now, expires 9/30/14)	\$25	\$25	\$ ____
for all memberships select one: <input type="checkbox"/> JIST online <input type="checkbox"/> JEI online			
<b>join now and calculate fees based on member rates</b>			

Other		
____ Guest/spouse registration (Name: _____) includes breakfast on Monday and the Welcome and Conference receptions.	\$100	\$ ____
____ Extra Welcome Reception Ticket	\$40	\$ ____
____ Extra Conference Reception Ticket	\$55	\$ ____
Subtotal from previous page		\$ ____
Wire transfer fee (\$25 if applicable)		\$ ____
<b>GRAND TOTAL</b>		<b>\$ ____</b>

Payment Method:  AmEx  MasterCard  VISA  Discover  Wire Transfer  Check  
 Card#: \_\_\_\_\_ Exp. Date: \_\_\_\_\_  
 Name as it appears on card: \_\_\_\_\_  
 Authorization Signature: \_\_\_\_\_

Return this form with signed credit card authorization to  
 IS&T, 7003 Kilworth Lane, Springfield, VA 22151, fax to 703/642-9094, or  
 e-mail registration@imaging.org.

Contact registration@imaging.org for wire transfer information.

Please note, \$25 must be added to the Grand Total for wire transfer payments to cover bank costs.

**Please note: To cover bank charges and processing fees, there is a cancellation fee of \$75 until September 27, 2013. After that date, the cancellation fee is 50% of the total plus \$75. No refunds will be given after October 28, 2013. All requests for refund must be made in writing.**

\*\*\*Contact Donna Smith (dsmith@imaging.org) for Exhibitor Registration and Information\*\*\*

## NIP29/Digital Fabrication 2013



[imaging.org](http://imaging.org)

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Springfield, VA 22151 USA  
703/642-9090; 703/642-9094 (fax)

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Join us for NIP29/  
Digital Fabrication 2013  
Sept. 29 - Oct. 3, 2013 in  
Seattle, WA and  
**SAVE THE DATE**  
September 7-11, 2014  
for next year's meeting  
in Philadelphia, PA!