

Digital Fabrication 2006



Preliminary Programs

September 17-22, 2006
Denver, Colorado

NIP22



22nd International Conference on
Digital Printing Technologies



Sponsored by the
Society for Imaging Science and Technology (IS&T)
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Join us in Denver for the second Digital Fabrication Conference and NIP22!

The colocation of NIP22 and Digital Fabrication 2006 offers a unique opportunity for attendees to take advantage of two great conferences by mixing and matching technical sessions of interest. We're making it easier to do so this year by decreasing the number of NIP sessions on Tuesday thru Thursday to accommodate the Digital Fabrication technical sessions and encourage more "cross fertilization." We hope that this alteration in the program from last year, combined with all technical events taking place in a single venue, makes it easier for attendees of both conferences to listen to papers on a wide variety of topics.

Colocation of the conferences also allows IS&T to provide participants with a

- rich array of informative tutorials
- high-quality exhibits
- timely keynotes
- special panel on intellectual property
- Welcome and Conference Receptions
- opening at Walker Fine Art featuring the work of speakers from the Digital Art Session just for NIP/DF attendees, as well as the yearly NIP Print and Art Gallery
- Tour and BBQ at iTi Corp.'s headquarters
- Thursday Luncheon Interactive Session
- Friday morning Breakfast Plenary

When you register for either conference, you gain admission to the other. This year we're also offering a specially-scheduled series of tutorials that save attendees at least 25% off those purchased singly. See details on pages 3 and 32.

To facilitate planning your time, we've color coded the technical sessions of this booklet as shown below. Joint events are noted as such and both those of a technical and social nature are found within the technical program in boxes marked "Special Event."

 Digital Fabrication 2006 Session/Focus

 NIP22 Session/Focus

If you work in the fields of digital fabrication, non-impact printing, or any related technology, Digital Fabrication 2006 and NIP22 are the conferences to attend!

We look forward to seeing you in Denver!

—James Stasiak, DF2006 General Chair, and Eric Stelter, NIP22 General Chair

The Venue: Denver, Colorado

The dynamic city of Denver, Colorado—and the newly-completed, architecturally-exciting Hyatt Denver Convention Center Hotel—will host this year's conferences. Located where the midwest plains meet the Continental Divide, Denver offers a thriving, culturally-rich downtown with more than 300 days of sunshine per year, breathtaking mountain views, and ample opportunity to enjoy the outdoors.

Denver's proximity to the rich mineral wealth of the Rocky Mountains brought the railroad in 1870, and the area blossomed into an elegant metropolis still known as "The Queen City of the Plains." Denver is a commodities/high-tech hub, second only to Washington, DC, in the number of federal employees it houses. Oil, gas, and mining firms reside here. Denver is the world's largest telecommunications center; and its Mint is

the largest coin producer on earth. The University of Colorado and many sophisticated federal scientific agencies are located in nearby Boulder.

Despite its relatively small size, Denver is home to five major league sports teams and is the site of the renowned Red Rocks amphitheatre, the Six Flags Elitch Gardens amusement park, and 'LoDo,' a trendy dining and shopping district. The Denver Hyatt Regency—located just off the 16th Street Pedestrian Mall, which boasts shopping and entertainment opportunities galore—will be your portal to a unique high-country experience. To learn more about the city and the opportunities for fun and exploration it and its environs have to offer, visit www.denver.org.

Information about getting to/from the airport to the hotel can be found on page 33.

NIP 22/Digital Fabrication 2006 Exhibitors*

The exhibit hall will be open on Tuesday, September 19th from 9:00 am to 5:00 pm and Wednesday, September 20th from 9:00 am to 4:00 pm. Please join us and visit these exhibitors.

7-Sigma, Inc.
Advanced NuMicro Systems
Anchorage Convention & Visitors Bureau
Baker Petrolite Polymers Group
Buhler, Inc.
Clariant Corporation
Degussa AG
Digital Print CIC
Dimatix, Inc.
Emerson and Cuming
Epping GmbH
Esprit Technologies
Flow Science, Inc.
Galliford Consulting & Marketing
Grace Davison
H.W. Sands Corporation
Hewlett-Packard Company
Hodogaya Chemical
ImageXpert, Inc.
INEOS Silicas
Integration Technology Ltd.
International Specialty Products (ISP)

iTi - imaging Technology international
Kyocera
Membrana
MicroFab Technologies
Orient Chemical Industries, Ltd.
Pall Corporation
Quality Engineering Associates (QEA), Inc.
Rogers Hill Associates, Inc.
Saint-Gobain Performance Plastics
Sentient Imaging Technologies
Tayca Corporation
Trek Inc./Trek Japan KK
Wacker Chemie AG/Wacker Chemical Corporation

For further information about exhibiting at NIP22 contact Donna Smith at dsmith@imaging.org or 703/642-9090 x107.

** As of June 30, 2006*

NIP 22/Digital Fabrication 2006 Conference Sponsors*

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** As of June 30, 2006*

Tutorial Program

This year's NIP/DF Tutorial Program offers a wide range of introductory and advanced topics in the fields of non-impact printing and digital fabrication. Most of the tutorial instructors are internationally recognized experts in their field and are dedicated to promoting the understanding and advancement of imaging science and technology. Attendees have found these condensed courses to be of high value as an introduction, a refresher, or an in-depth information source for their technology of interest. Over the years, IS&T has received a great deal of positive feedback from attendees as illustrated by the comment found on this page and throughout the tutorial descriptions.

These as well as other comments by attendees validate the usefulness of the courses. In addition being able to ask questions during the oral presentation, every attendee will receive a copy of the instructor's notes/slides to take home. IS&T members and non-members are encouraged to sign up in advance for one or more of the tutorials that may be of interest.

Special Tutorial Series at Special Rates: Save a minimum of 25%

For the first time, this year IS&T is offering several series of tutorials focused on a particular topic or set of related topics that allow the attendee to significantly broaden their knowledge base. The series offered this year includes:

General Technology Series: T1, T6 & T14

The General Technology Series provides a comprehensive introduction to key aspects of non-impact printing technologies and will be of great value to attendees who are new to or reentering the field of non-impact printing. The three tutorials in this series are Introduction to Electrophotography, Evaluating Ink Jet Technology, and Imaging Science/Image Quality Seminar.

Electrophotography Series: T1, T7 & T15

The Electrophotography Series includes Introduction to Electrophotography, Introduction to Toner Technology, and Electrostatics and Particle Adhesion in Electrophotography. It will serve well as an introduction or an update for those interested in learning about electrophotography.

"I learned more in four hours than I had in three months of internet and library work."

Ink Jet Series: T2, T6 & T19

This series focuses on three aspects of the technology through the Desktop Ink Jet Performance Study, Evaluating Ink Jet Technology, and Fabrication Materials and Processes of Ink Jet Print Heads courses. The series is slightly more advanced in that it assumes a basic knowledge of ink jet. It provides a sound foundation for those interested in competitive product evaluation, an overall understanding of ink jet technology, and material and processes for print head fabrication.

Image Quality Series: T4, T9 & T14

The Image Quality Series will provide the attendee with a solid foundation for understanding digital image quality from inception to finished output. Courses included are Light-Paper Interaction in Print Color Reproduction; Papermaking, Coating Fundamentals, and Media for Digital Printing; and Imaging Science/Image Quality Seminar.

Digital Fabrication Series: T5, T10 & T17

Find out what all the buzz is about. How are today's analog manufacturing processes being converted by the digital revolution? The Digital Fabrication Series includes Direct-Write Technologies for Prototyping Applications, Electrophotographic Manufacturing Technology for Low-cost Printable Electronics, and Industrial Ink Jet: An Introduction to Printing and Fabrication Applications.

Business Series: T3, T8 & T13

Learn how potential markets are sized, how to protect your intellectual property and all about doing business in Japan with Predicting the Future of Ink Jet, Intellectual Property Primer for Imaging, Printing, Digital Fabrication, and Nanotechnology, and Business in Japan.

These series of tutorials have been scheduled such that there is no overlap in time and each attendee will be able to attend the full set. IS&T is offering a special discounted price—a minimum 25% savings, which in some cases is three for the price of two—

members and non-members who sign up for any complete series. In addition, attendees may construct their own series of any three tutorials that do not overlap and receive the same special discount. Please refer to the registration form for details.

Note: IS&T reserves the right to cancel tutorials in the event of insufficient advance registration. Please indicate your interest early. Any prerequisites are noted in the description.

Sunday, September 17, 2006

T1: Introduction to Electrophotography

Sunday 8:00 am to 12:00 noon (4 hours)
Instructor: Lawrence B. Schein, consultant

Electrophotography is the primary technology used in copiers and laser printers. In this introductory course, the fundamentals of the technology will be discussed, from the basic six steps to the underlying physics of the process. Discussions will include the physics of development and transfer, our current understanding of toner charging, and the challenges of color electrophotography. The architecture of some commercial color electrophotography applications will be examined.

Benefits

This tutorial will enable the attendee to:

- Understand the basic principles of the electrophotographic process
- Explain the more important advances that have occurred in electrophotography historically
- Compare the architecture of several mid-range copy machines
- Explain how a copier is converted into a printer
- Understand the physics of toner development, toner charging, and the transfer process
- Appreciate the technical challenges in making a color copier or printer
- Summarize commercially available color copier and printer architectures

Intended Audience: anyone working in the field of digital printing technologies

Lawrence B. Schein received his PhD in solid state experimental physics from the University of Illinois (1970), and worked at Xerox Corp. from 1970 to 1983 and IBM Corp. from 1983 to 1994. He is now an independent consultant. He has helped implement development sys-

tems in IBM laser printers, proposed theories of most of the known electrophotographic development systems, and contributed to our understanding of toner charging, toner adhesion, and charge transport mechanisms in photoreceptors. He is the author of "Electrophotography and Development Physics," an IS&T Fellow, recipient of the Carlson Memorial Award (1993), Senior Member of IEEE, and a member APS and the Electrostatics Society of America.

T2: Desktop Ink Jet Products Performance Study

Sunday 8:00 am to 12:00 noon (4 hours)
Instructor: Rob Beeson, Hewlett-Packard Co.

This tutorial begins by describing how thermal and piezo ink jet operate and continues with an examination of products from HP, Canon, Epson, Lexmark, Sony, BenQ, Fuji-Xerox, and Brother. Printhead performance parameters and ink/media interactions will be discussed with appropriate reverse engineering data from the HP labs. Although the discussion is primarily around desktop products, commercial and industrial ink jet head technologies will also be briefly discussed. A few examples of how ink jet compares with competing technologies such as dye diffusion thermal transfer and color laser are also covered.

Benefits

This tutorial will enable the attendee to:

- Understand printhead firing frequency, drop volume, velocity, and drop shape tradeoffs from the principal desktop ink jet printer manufacturers.
- Examine key differences in piezo and thermal ink jet printhead performance characteristics.
- Look at some patents for future direction

Intended Audience: those unfamiliar with ink jet printing technology who want a better understanding of the differences of how it works and on printhead output parameters from the popular manufacturers.

Rob Beeson is a senior member of the technical staff in the Inkjet Technology Platforms Unit of the Hewlett-Packard Company. He has held several management and engineering positions in thermal ink jet technology since 1985, and is currently the R&D Competitive Intelligence Team Leader. He holds 12 ink jet patents, has a BS/MS in Mechanical Engineering from Colorado State University, and has worked with several divisions in HP since 1966. Beeson has presented many ink jet papers worldwide since 1998.

T3: Predicting the Future of Ink Jet: Technology vs. Demand

Sunday 8:00 am to 12:00 noon (4 hours)
Instructor: Mark Hanley, IT Strategies Inc.

The objective of this semi-technical seminar is to project both the future of ink jet in the areas of high-volume solutions in pure graphics print (display, decorative, packaging, and document printing) and its utilization as a deposition and manufacturing mode (printed electronics, materials deposition, etc.).

Our thesis is that where demand is perceived to exceed the current capabilities of ink jet technology the technology can still satisfy some of the immediate needs, gain a commercial beachhead, and evolve into a more complete solution. This leads to a development and maturing of markets that could not otherwise have been predicted by more traditional linear projection methods. While quantifications and models of the possible future will be provided in consistent and detailed fashion during the seminar, another objective is to explain and illustrate the correct methods appropriate to this analysis in order to confer credibility on the analysis. These methods require a close knowledge of user markets, ink jet technology itself, and the core technical and economic factors that drive both from an independent point of departure through an increasing interdependence as the involvement of users with technologies goes forward over time. Such analysis is capable of predicting where technology and investment can and probably will be directed in the future.

Benefits

This tutorial will enable the attendee to:

- Understand where demand (including economic conditions) and technology capability currently and prospectively meet over the next five+ years for all ink jet's projected future markets
- Access a quantified model and rationale for specific market development
- Evaluate realistic goals for ink jet technology development over the next five years
- Review the competitive positioning of available ink jet technologies

Intended Audience: intended for those who wish to gain an understanding of the status of competitive ink jet technology offerings, the potential demand for available technology in new markets over the next 5 years,

and the methodology which may be applied to gain this understanding.

Mark Hanley is president of IT Strategies, Inc., founded in 1992 as a strategic consultancy specializing in industrial digital printing, ink jet technology, and early market development practices. Based in Boston and Tokyo, ITS is a confidential practice focusing on technology and market analysis with no publishing function. Prior to ITS, Hanley worked for BIS Strategic Decisions, founding their operations in Europe. Hanley came to consulting through the paper industry where he began his career in Germany, subsequently working in most of the major European continental countries. He is fluent in German, French, and Italian and has an honors degree in History from the University of Manchester, UK.

“I was amazed at the depth and breadth of the instructor’s knowledge of the topic.”

T4: Light-Paper Interaction in Print Color Reproduction: Model and Experiment

Sunday 8:00 am to 12:00 noon (4 hours)
Instructor: Li Yang, Karlstad University

This course gives an overview of research on light-paper interaction in print color reproduction. It begins with fundamentals on light absorption, scattering, and fluorescence, and follows with the state-of-the-art status of research activities. Physical descriptions (modeling) and experimental measurements of optical dot gain, physical dot gain, and fluorescence are discussed in detail. In addition, a newly developed model—the revised Kubelka-Munk theory describing light propagation in turbid media—is also discussed.

Benefits

This tutorial will enable the attendee to:

- Gain an overview of research on light-paper interaction: absorption, scattering, surface reflection, and fluorescence
- Recognize physical models dealing with physical- and optical-dot-gain, surface reflection, and fluorescence
- Gain insight into the fundamentals of the physical models and experimental methods
- Appreciate the background (physical considerations and assumptions) of the original (K-M) theory
- Understand how the theoretical models are applied to determine the optical properties of materials
- Identify how to predict the optical presentation of an optical system.

Intended Audience: engineers and scientists working in areas related to print color reproduction, optical properties, or color of materials and composites

Li Yang is an associate professor in the Department of Graphic Technology, Karlstad University, Sweden. His research activities cover broad areas, such as paper optics, prepress, ink-paper interaction, and light-paper interaction. He initiated and is the main contributor to the work revising the Kubelka-Munk theory. He has more than 40 journal publications and many conference reports.

T5: Direct-Write Technologies for Rapid Prototyping Applications: Sensors, Electronics, and Power Sources

Sunday 8:00 am to 12:00 noon (4 hours)

Instructor: Douglas B. Chrisey,
Rensselaer Polytechnic Institute

Direct writing describes any technique or process capable of depositing, dispensing, or processing (including removing) different types of materials over various surfaces following a preset computer-generated pattern or layout. Direct writing allows designers and manufacturers to bypass the traditional staged assembly process and/or part specific tooling and “grow prototypes” that will operate as a final product. There is a strong need in the electronics industry to reduce product design and development times and to adaptively produce small lots at a competitive cost. Conventional thick film techniques like screen printing and low resolution lithography often require several iterations of the development cycle—circuit design, mask fabrication, prototype manufacture, testing and evaluation, iterate design, repeat—before a new electronic device or subsystem can go to market. The materials, processes, and systems for direct write are at various stages of maturity with some off-the-shelf, fully-integrated systems available, but in many cases further development will be required before implementation in a production line. This course will give an overview of direct-write technology with examples of its benefits and barriers, especially in terms of how it is affecting the world of electronics, sensors, and power sources.

Benefits

This tutorial will enable the attendee to:

- Understand attributes of different direct-write techniques
- Compare direct-write materials and substrates

- Overview of the technological issues and challenges for direct writing
- Recognize the market issues in electronics direct writing
- Learn about examples of direct writing electronics, sensors, power sources, and biomaterials

Intended Audience: engineers and scientists working or interested in entering the areas of direct-writing conformal electronics, sensors, and power sources.

Douglas B. Chrisey received a BS (Honors) from SUNY at Binghamton (1983) and PhD in Engineering Physics from the University of Virginia (1987). He joined the US Naval Research Laboratory as a staff member and became head of the Plasma Processing Section. He was the deputy director of the Center for Nanoscale Science and Engineering at North Dakota State University before joining the Materials Science Department of Rensselaer Polytechnic Institute. His past research has focused on novel laser fabrication of thin films and coatings of advanced electronic, sensor, and biomaterials. More recently his research interests have focused on novel approaches, materials, and devices fabricated by direct-write fabrication. He holds 18 patents and has edited or co-edited 10 books, written eight book chapters and more than 400 publications, and has 5,000 citations.

T6: Evaluating Ink Jet Technology

Sunday 1:30 to 5:30 pm (4 hours)

Instructor: Ross N. Mills,
imaging Technology international (iTi) Corp.

This course will provide the background needed for evaluating and selecting the correct type of ink jet technology needed for digital materials deposition in printing, scientific, and manufacturing applications. In addition to an advanced introduction to the different types of ink jet, the fundamental advantages and disadvantages of each type will be discussed. Topics such as the influence of throughput parameters, morphology, ink and substrate physical properties, maintenance, and reliability on print head selection for these applications will be presented. Business and technical issues such as make or buy, do-it-yourself or hire-it-done, availability and cost of print heads, and time-cost tradeoffs to complete the application will be covered.

Benefits

This tutorial will enable the attendee to:

- Understand how to balance throughput parameters, materials physical properties,

- and operating environment with print head selection for a given application
- Select measurement and development tools for process and performance analysis on ink jet print heads
- Recognize the basics of how to integrate print head technology into an application
- Make technical and business assessments for program and product planning

Intended Audience: those who have a basic understanding of ink jet technology and who wish to expand their knowledge base in both the technology and applications.

Ross N. Mills is currently chairman of the Board and chief technical officer of imaging Technology international (iTi) Corp. He received his BS in Aerospace Engineering from the University of Texas at Austin and his MS and PhD in Engineering Science from the University of California at Berkeley. Since 1978 he has worked as a research, development, and manufacturing engineer in both staff and management capacities in the areas of piezoelectric and thermal ink jet printers and electrophotographic printers for IBM, Lexmark International, and Topaz Technologies, as well as iTi. He founded iTi Corp. in 1992 in Boulder, Colorado, as an ink jet consulting and development firm, and an integration facility for advanced applications in ink jet and imaging technology. Mills holds 12 patents in this field and is the inventor of iTi's proprietary ESIJET™ technology.

T7: Introduction to Toner Technology

Sunday 1:30 to 5:30 pm (4 hours)
Instructor: George Marshall,
Lexmark International, Inc.

This course includes an introduction to electronic printing technologies and defines the place of electrophotography in its various embodiments. One common element—toner—will be discussed in terms of architecture, formulation, and implementation in each of these embodiments, as will various toner design criteria and performance requirements. Analytical and measurement techniques will be surveyed, including size, shape, charge and rheological attributes. Recent product introductions and future trends in toner technology will be reviewed and presented. A glossary and bibliography for future reference will also be provided.

Benefits

- This tutorial will enable the 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 EP 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 will be presumed nor is required.

George P. Marshall is a member of senior technical staff at Lexmark International's Boulder, Colorado facility. He has been involved in many aspects of printer and copier development, including development of toner formulations for IBM and Lexmark printers, and is a recognized figure in the area of electrophotography and supplies-related disciplines. Marshall received a PhD in organic chemistry from the University of Arizona (1978), and worked for IBM's Office Products Division, from 1978 until 1991, at which time a divisional sale created Lexmark. He has worked in the toner development group since 1978. Marshall has served on the IS&T Board of Directors, edited several IS&T books, and is a member of the Particulate Science and Technology: An International Journal Editorial Review Board. In 1996, he received Lexmark's highest employee honor: the Customer for Life Award.

“My manager made me sign up and now I realize he’s a little smarter than I thought.”

T8: Intellectual Property Primer for Imaging, Printing, Digital Fabrication, and Nanotechnology

Sunday 1:30 to 5:30 pm (4 hours)
Instructor: Russell Barron and Steven Rutt,
Foley & Lardner LLP

This course will provide practical knowledge regarding critical intellectual property issues for non-legal business and technical professionals in the imaging, printing, digital fabrication, and nanotechnology industries. The basic principles of intellectual property in the US, Europe, and Asia will be described in practical terms. Techniques for making IP decisions for executives, managers, and marketing and development personnel will be explained using checklists. Methods for re-

viewing the work product of legal personnel will also be described. An introduction to IP quality and performance measurement principles will be included. The presenters have a great deal of experience translating IP concepts into useful business action.

Benefits

This tutorial will enable the attendee to:

- Understand the sources and character of the basic principles of intellectual property, especially patents and trade secrets
- Formulate basic business decisions incorporating IP as a business tool/asset
- Define principles of evaluating IP issues and making (or recommending) IP actions consistent with the business goals of the company
- Identify principles of reviewing the work product of IP legal services providers and making (or recommending) actions consistent with the business goals of the company
- Explain and use basic measurement techniques for IP quality and performance
- Communicate on a level basis with IP legal professionals, including acquiring a sound grasp of the technical vocabulary of IP
- Discuss special issues of IP in the imaging, printing, digital fabrication, and nanotechnology technical/business spaces

Intended Audience: The course is intended for non-IP personnel who have not had special IP training and whose work involves or may involve IP awareness, recommendations, or decision making. The course content will include information pertinent to executive, marketing management, and R&D management personnel.

Russell Barron is an IP partner in the Milwaukee office of Foley & Lardner. He has 31 years of experience as an IP trial lawyer and in advising clients regarding the business and economics of intellectual property. Barron is a former chair of the firm's IP litigation practice and now chairs its IP Best Practices initiative. He is a member of the firm's Nanotechnology and Medical Devices practices. Barron earned his degrees at Princeton and NYU; he has been an adjunct faculty member at Northwestern University.

Steven Rutt is a senior counsel in Foley & Lardner's Washington, DC office. Educated at Goshen College, Pennsylvania State University, and Georgetown University, he is a member of the firm's Nanotechnology practice.

"I enjoyed the interactive nature and openness of the class."

T9: Papermaking, Coating Fundamentals, and Media for Digital Printing

Sunday 1:30 to 5:30 (4 hours)

Instructor: Sen Yang, International Paper

This tutorial includes an introduction to papermaking and coating technologies, as well as a discussion of media requirements for digital printing with an emphasis on electrophotographic (EP) and ink jet printing applications. Paper attributes that are important for color EP and ink jet printing will be reviewed and discussed.

Benefits

This tutorial will enable the 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 EP and ink jet printing

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

Sen Yang is manager of Surface Science and Digital Printing in the corporate research center of the International Paper Company. He received his PhD in polymer science from Brown University. Since 1990, he has worked in the field of specialty paper and film coatings for digital imaging applications. Prior to joining International Paper, Yang worked for Océ-Arkwright and Champion International Corp. where he led and contributed to a number of successful specialty paper and coated film products both for private label and OEM businesses. He has several patents in the area of coated ink jet paper and specialty films.

T10: Electrographic Manufacturing Technology for Low-Cost Printable Electronics

Sunday 1:30 to 5:30 pm (4 hours)

Instructor: Robert Detig, Electrox Corp.

This course will discuss fundamental concepts of electronic manufacturing such as serial versus parallel printing processes; additive versus subtractive processes; ink/toner pathology; printed layer thickness requirements; and electronic addressability (tool-less manufacture). The course will review the current dominant manufac-

turing process—photo lithography—and its strengths and weaknesses, as well as current markets and new market opportunities that can be met by new processes. It will also review the exact components to be printed and suggest which processes best meet these needs, before providing examples of the successful application of electrographic systems to electronic manufactures such as electrographic printing of an etch resistant toner; printing solder powder for silicon wafer bumping; printing of metal toners on glass for plasma display panels; and a hybrid process for the manufacture of inexpensive, active matrix, flat panel display backplanes

Benefits

This tutorial will enable the attendee to:

- Identify some of the fundamental concepts that comprise an attractive manufacturing process
- Understand the current production process, photolithography, and its limitations
- Learn the size of the markets to be served
- Discover many of the electronic components to be printed
- Recognize the present obstacles that prevent widespread acceptance of printing as an electronic manufacturing process
- Project near term (2-3 years) milestones that need to be accomplished before printable electronic manufacture is widely accepted

Intended Audience: intended for electrographic engineers and scientists who want to learn about the needs of the electronics industries and the relevant electrographic technologies to meet these needs. This presentation is also for electronics manufacturing engineers who want to learn about electrographic printing technologies and how they can solve their manufacturing issues.

Robert H. Detig founded Electrox Corp. in 1992 to apply electrographic imaging technology as a manufacturing tool for various industries. He holds some of the fundamental patents on the photo-polymer electrostatic printing plate, and pioneered the concept of functional toners made of high-density materials like metals and glasses used as means for printing electronic products. He holds a PhD in Electrical Engineering from Carnegie-Mellon University.

LOOKING FOR DIGITAL PRINT/ART GALLERY PARTICIPANTS

As in years past, NIP/DF will be hosting a digital print/art gallery, running from Monday morning thru Thursday afternoon.

Those interested in participating should contact Print Gallery Co-chairs

- Lori Clifton (lori_clifton@hp.com; 208/396-3422)
- Peter Roth for Industrial Applications (peterhroth@aol.com; 781/929-3356)
- Hitoshi Ujiiie for Textile Applications (UjiiieH@philau.edu; 215/951-2682)

T11: External Additives for Xerographic Toners

Sunday 1:30 to 5:30 pm (4 hours)

Instructor: Robert J. Nash, Hafren Associates

With few exceptions, present-day xerographic toners are surface-coated with sub-micron particulates, such as fumed silicas, titanias, etc. These surface additives, which are typically dry-blended onto the toner particles in the final stage of toner production, enhance toner performance in key process steps such as development and transfer. In particular, external additives are especially important in full-color toner applications, for performance optimization of four individual toner types. This course will provide an overview of toner external additives and their effective application to single and dual-component toners.

Benefits

This tutorial will enable the attendee to:

- Review the range of materials currently used as external additives
- Identify future trends in external additive technologies and applications
- Understand the impact on toner performance of key additive properties such as size and surface composition
- Compare the various processes used to blend external additives onto toner surfaces
- Identify and quantify the effect of toner external additives on key toner development characteristics such as charge level, polarity, charging rate, powder flow, etc., and developer properties such as conductivity
- Evaluate the effect of toner external additives on the response of xerographic

- developers to changes ambient humidity
- Describe the impact of external additives on toner charging in terms of a simple model

Intended Audience: scientists involved in pure xerographic materials research, and scientists and engineers active in applied toner concept development or toner manufacturing technologies. This course is intended to provide a quantitative review of toner external additive effects.

Robert Nash received his PhD in physical chemistry from the University of Bristol, England. He joined Xerox Corp. in 1970, where his research and modeling studies focused on the design and evaluation of xerographic toners, carriers, and developers, with special emphasis on "aging" mechanisms and additive effects. From 1998 until 2000, he served as the senior manager, resident for the Xerox Supplies Development, Manufacturing, and Supply Chain Operations at Fuji Xerox in Japan. Nash retired in 2002, and currently consults on a variety of subjects, ranging from xerographic materials to cross-cultural interactions with Japan. Starting with the 4th International NIP Congress in 1988, he has presented the results of his studies at NIP yearly. In 1990, Nash served as Publication Chair for NIP6, and in 1992 he was chair of the IS&T Honors & Awards Committee. In 1999, he was named an IS&T Fellow, and in 2002 he, along with long-time colleague, J.T. Bickmore, received the Chester Carlson Award.

T12: Direct-Written Semiconducting Polymers and Polysilicon

Sunday 3:30 to 5:30 pm (2 hours)

Instructor: Douglas B. Chrisey,
Rensselaer Polytechnic Institute

Direct writing has become synonymous with passive electronic components and even biological materials, but recently active materials such as semiconducting polymers and silicon have been direct written with surprising good properties, e.g., mobility's of 100 cm²/Vs. Direct writing of transistors will allow designers and manufacturers to build entire circuits that will operate as a final product. Moreover, the ability to direct write transistors would drastically lower the cost of semiconductor fabrication because it would eliminate large vacuum deposition equipment from the production line. The quality of the semiconductor and the final transistor is a strong function of the polymer and the processing of the semiconducting precursor material used. With respect to the latter, Seiko Epson Corp. with JSR Corp. has

just announced a novel liquid cyclopentasilane precursor. This precursor is polymerized by exposing it to ultraviolet light. The highly pure polysilane liquid becomes a polysilicon film by coating for ink jet printing in a nitrogenous atmosphere followed by baking at 500°C and excimer laser annealing. While in this study the direct written mobility is not as high (6.8 cm²/Vs), with process optimization that should improve. This course will give an overview of direct write technology, with examples of its benefits and barriers, especially how it is affecting the world of electronics, sensors, and power sources.

Benefits

This tutorial will enable the attendee to:

- Understand the basics of semiconducting polymers and polysilicon
- Obtain an overview of the technological issues and challenges for direct writing semiconductors, including starting material and post-deposition processing
- Recognize the market issues in electronic direct writing of semiconductors
- Examples of direct written semiconducting polymers and polysilicon

Intended Audience: engineers and scientists working in or interested in entering the areas of direct-writing conformal electronics, sensors, and power sources

See bio under T5.

Monday, September 18, 2006

T13: Business in Japan

Monday 1:30 to 5:30 pm (4 hours)

Instructor: Robert J. Nash, Hafren Associates

Since Japan continues to be an active center for research, development, and marketing for non-impact marking technologies, travel to Japan has become a routine event for many Western engineers, technologists, and business professionals involved in such work. For many Westerners, repeated travel to Japan does not eliminate the strong feeling of being a foreigner in a distinctly non-Western environment. Though survival in such an environment can be eased thanks to written instructions provided by thoughtful Japanese hosts and the willingness of Japanese counterparts to use English as a common language, for exam-

ple, subtle cross-cultural issues still remain as cause for unease in the Western mind.

Unfortunately, such issues tend to increase as a result of repeated visits—gradually, an observant Western visitor will begin to comprehend some of the unwritten rules that govern life in Japan, and in retrospect will appreciate just how many social gaffes can be made during initial, casual visits. While such gaffes may be viewed as minor embarrassments by some Westerners, it is important to realize, from a working relationship viewpoint, that Japanese hosts will evaluate Western visitors on the basis of how they behave—it is human nature to use “internal” benchmarks to form opinions, and since the Japanese “rules of behavior” are significantly non-Western, there are great opportunities for misunderstandings and erroneous judgments. From problems with footwear, chopsticks, forms of verbal address, overall decorum, etc., the possibilities for transgressions seem endless, even if the “cures” are often trivial. Accordingly, I hope to provide an “inside” Western perspective on some of the more baffling aspects of interactions in a Japanese environment, and offer some pointers for behavior that will delight and impress Japanese hosts and colleagues.

This course will focus on general cultural and interpersonal topics. It will not cover advanced business-oriented topics such as Western versus Japanese negotiation strategies, Japanese financial systems, Japanese labor rules, etc.

Benefits

This tutorial will enable the attendee to:

- Learn about Japanese life through the experiences of a resident foreigner living daily in a Japanese environment and provide a chance to ask questions without embarrassment
- Handle the logistics of everyday life in Japan from travel by train to dining in restaurants
- Use and comprehend key, short Japanese phrases, such as greetings, questions, and expressions of thanks
- Develop a clear and understandable pronunciation of common Japanese words and phrases
- Understand the historical and cultural framework of life in Japan
- Appreciate the importance of introductions, gift-giving, etc.
- Identify and interpret the “Japanese Unwritten Rules of Behavior,” *i.e.*, body

language, “code words,” expected responses, etc.

- Recognize the need for harmony, a quiet self-effacing demeanor, patience, apologies, etc.
- Recognize the style of business interactions: consensus, teamwork, attention to detail, devotion to company, etc.

Intended Audience: all “foreigners” who travel to Japan on business, especially those who still feel confused and uncomfortable even after repeated short-term visits. Japanese nationals might also appreciate a “foreigner’s view” of their homeland presented in the tutorial; such a perspective might help explain some of the puzzling behavior typically shown by visiting foreigners.

See bio under T11.

“If I had known the value before attending, I would have signed up for more.”

T14: Image Science/Image Quality Seminar

Monday 1:30 to 5:30 pm (4 hours)

Instructor: Bror Hultgren, Image Integration, Inc.

The perceived quality of images is a primary determinant of the success of an imaging system. This course introduces attendees to the tools required to integrate psychovisual image quality assessment and image science concepts into a framework that facilitates product development. The seminar teaches attendees techniques for measuring image quality, process by which high-quality images are obtained, and methods by which image quality predictive metrics provide a rational design optimization process. While many of these tools and concepts are available individually, the unique strength of the course is the presentation of a unifying framework that integrates the measurement of image quality with the tools, modeling, and analyses of image science.

Benefits

This tutorial will enable the attendee to:

- Learn how to measure psychovisual image quality using category scaling techniques
- Discover the fundamental relations between image science and image quality

- Overview of aspects of image science and its integration into the product development cycle
 - Understand the components of image quality; the characterization of color and micro image content and their reproduction in the image
 - Recognize the role of the observer in the imaging process
 - Demonstrate how psychovisually based metrics are constructed from image system primitive measurements such as SFR, NPS, and CIELab color errors.
- Comprehend the role of electrostatics in the electrophotographic process
 - Describe different methods for charging or neutralizing an insulative layer
 - Identify different methods for charging powder (toner)
 - Explain techniques for measuring the charge on an insulative layer and powder
 - Appreciate how the maximum electric field for air breakdown depends on the air gap and particle size
 - Illustrate the importance of charged particle adhesion in electrophotography
 - Develop model descriptions of charged particle adhesion due to Van der Waals and electrostatics forces for both uniformly and nonuniformly charged particles
 - Understand adhesion and electric field detachment measurement methods and results for triboelectric and ion charged particles

Intended Audience: technical and non-technical project managers and engineers looking for critical information. Familiarity with integral calculus and Fourier Analysis is helpful, but not required.

Bror Hultgren is currently the president and chief scientist of Image Integration, a consulting firm providing tools and services to digital imaging manufacturers. He has 32 years of professional experience, 26 years of which were spent in the Research Division of Polaroid. In this capacity, Hultgren was responsible for the implementation of image science based product development analyses for both photographic and digital imaging systems. He has made significant contributions to film and thermal media programs, and digital still camera, scanner, and printer hardware programs. At his retirement, Hultgren held the position of distinguished scientist. He holds degrees from MIT and Boston University.

T15: Electrostatics and Particle Adhesion in Electrophotography

Monday 1:30 to 5:30 pm (4 hours)
Instructor: Dan A. Hays, Xerox Corp.

Electrophotography is widely used in digital copiers and printers to produce high-quality documents for office and production markets. Over the years, continual advances in the technology have enabled high-speed printing and excellent image quality for both mono and full-color printing. This tutorial provides a foundation for understanding various electrostatics phenomena that are exploited in the electrophotographic process and serves as an introduction to electrostatics topics covered in other related tutorials on electrophotography.

Benefits

This tutorial will enable the attendee to:

- Understand basic concepts regarding electrostatic forces, electric fields, electrostatic potential, and energy

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

Dan A. Hays recently retired as senior fellow from Xerox Corp.'s Wilson Center for Research & Technology. His research and technology contributions in the field of electrophotography have spanned the areas of triboelectricity, charged particle adhesion, and xerographic development systems. Hays has published 57 scientific papers and holds 64 US patents. Prior to joining Xerox in 1968, he received a BS from Iowa State University and a PhD in physics from Rutgers University.

T16: Liquid Toner Printing: Technology and Applications

Monday 1:30 to 5:30 pm (4 hours)
Instructor: George Gibson, Xerox Corp.

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. This course will cover 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 used. The course will include an analysis of improvements of liq-

uid toner systems found in recent technical literature and patents. Much of this material will be new and has not been included in previous versions of this course.

Benefits

This tutorial will enable the 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 employed today
- Learn about recent innovations in liquid toner technology

Intended Audience: technical professionals who want to become more knowledgeable about non-impact printing technology

George Gibson is manager, Research & Development Portfolio in the Xerox Innovation Group. Previously he has held research and manufacturing management positions for Savin and AM Graphics. Gibson holds more than 40 patents in non-impact printing and has published ~20 papers. He holds an MS in chemistry from Binghamton University and an MBA from the University of Rochester's Simon Graduate School of Business.

T17: Industrial Ink Jet: An Introduction to Printing and Fabrication Applications

Monday 1:30 to 5:30 pm (4 hours)

Instructor: Alan Hodgson, Alan Hodgson Consulting

This course was conceived as a bridge between the NIP and Digital Fabrication conferences as it covers both traditional printing and new fabrication applications. It achieves this by providing an overview of current industrial ink jet technology and applications. It considers the commercial, environmental, and regulatory drivers for these and their contribution to the future direction of technological development. It compares and contrasts the developments in both application areas, but shows the interdependence between them. In particular it shows areas where the two applications areas may yet converge in the longer term. Case studies and market research data for both are included.

Benefits

This tutorial will enable the attendee to:

- List and explain the market drivers for ink jet in digital industrial printing for

“A great introduction to the technology, I had no idea.”

both imaging and digital fabrication application areas

- Identify the conferences one should attend to gain further awareness of the topics
- Provide an overview of current and future applications of industrial ink jet technology
- Summarize the technology of ink jet printing and how this can be leveraged to best effect in the future.
- Learn how new technology is affecting both fabrication and “traditional” printing applications. Look out for the opportunities this presents!

Intended Audience: aimed at executives or scientists working in organizations considering accessing new opportunities in industrial ink jet, either as a supplier or user. It is particularly appropriate for those considering the further potential of ink jet who would like a holistic overview of ink jet in both traditional printing and fabrication applications. As such it aims to be equally accessible to the target audiences of the NIP and Digital Fabrication conferences.

Alan Hodgson is an independent consultant with more than 20 years experience in printed hard copy and a background in radio frequency electronics and image physics. With a combined marketing and technical background he can give technical issues a commercial perspective.

T18: Colorant Chemistry

Monday 1:30 to 5:30 pm (4 hours)

Instructor: Jeffery Banning, Xerox Corp.

Very little work is being conducted in the area of new chromophore research in the dye industry. Instead, most dye research effort is being done in the modification or “tuning” of existing dyes, or dye classes in terms of shade, solubility, and/or reactivity for “custom” applications. This tutorial will help attendees understand such tuning and custom processes through instruction in color chemistry. Starting with the concept of light interacting with a prism, attendees will be guided from an understanding of additive and subtractive coloration, to further explanation of the cause of coloration of a dye or pigment, and continuing on to

Tuesday, September 19, 2006

the area of structure/property (color) relationships. An understanding of how one develops strategies for tuning/tailoring the shade and other physical and chemical properties of a dye for custom applications will emerge throughout the course of the tutorial.

Benefits

This tutorial will enable the attendee to:

- Understand the concept of additive and subtractive coloration
- Recognize common terms employed by color chemists and their literature and comprehend the four classes that dyes can be divided into based on the electronic origin of the color
- Identify the concept of structure/color relationship, in the major classes of colorants
- Understand the major classes of chromophores employed in making dyes of various hues and predict shifts in shades (bathochromic/hypsochromic) based on structural changes/modifications within the chromophore
- Locate commercially available dyes and preps for synthetic strategies for many of them
- Employ the aforementioned benefits to expand one's understanding (and capability) in developing strategies to tune/tailor dyes for virtually any "custom" application the attendee may have in mind

Intended Audience: scientists, engineers, technicians, or technical marketing persons with a chemistry/science background who needs to know about the chemistry of colorants and who are likely to be new to the field. A year of general and organic chemistry is recommended.

Jeff Banning is a principal scientist in the Xerox Office Group (XOG), formerly Tektronix Color Printing and Imaging Division (CPID). He has worked in the areas of dye, polymer, and organic synthesis as well as coatings and ink formulation at Milliken Chemicals, the BIC Corp., Tektronix Inc., and Xerox Corp. Banning holds 65 US patents in these areas and has scaled-up many dye intermediates and dyes, leading to many commercial products and several product lines with the various companies he has worked for. He began his career in color chemistry at Milliken Chemicals. It was there that he learned the "tricks of the trade" under many outstanding organic dye and textile chemists, as well as with frequent interactions with two world renowned dye consultants: Max Weaver of Eastman Chemicals (retired) and John Griffiths of the University of Leeds. His educational background includes a PhD in organic chemistry from the University of North Dakota (1987).

T19: Fabrication Materials and Processes of Ink Jet Printheads

Tuesday 1:30 to 3:30 pm
Instructor: Hue Le, Picojet, Inc.

In recent years, enormous progress has been made in the design, fabrication, and commercialization of ink jet printing systems. This tutorial describes the materials and processes that have been used to produce various ink jet printheads, which are the core component of these 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 discussed, as are issues associated with integrating ink jet printheads into printing systems.

Benefits

This tutorial will enable the attendee 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
- Gain insight into the potentials and limitations of different types of printheads

Intended Audience: scientist, engineers, product managers, and others charged with development or manufacture of ink jet printing systems

Hue Le is the CEO/president of PicoJet, Inc., which designs and fabricates fluid jetting devices for industrial printing applications. He has more than 25 years of experience in developing and commercializing ink jet printing systems and holds 20 US patents in the field of ink jet printing technology. Prior to forming PicoJet in 1997, Le was director of technology development for Tektronix, Inc.'s Printing and Imaging Division. He received his BS in Chemistry from the University of Iowa (1979) and MS in Chemistry from New Mexico State University (1981).

T20: Paper-like Displays

Tuesday 1:30 to 5:30 pm (4 hours)
Instructor: Tom Ashley, Pivotal Resources US

The terms "paper-like displays" and "electronic paper" can be used to describe key

technologies in a new generation of visual displays based on the development and convergence of several technologies that are targeted at a wide range of applications—from microdisplays for mobile phones to very large panels for electronic billboards. This course will present an overview of the technologies and applications of these displays, which are expected to have a major impact on our future personal and business lives as they displace print and enable new products and applications that are not served by current paper-based and electronics technologies. Paper-like displays represent both a threat to traditional print technologies and an opportunity for newly developing printed electronic techniques.

Benefits

This tutorial will enable the attendee to:

- Grasp the bitable, reflective display technologies that form the basis for paper-like displays
- Compare these technologies with other existing and emerging display technologies
- Comprehend the applications for paper-like displays and understand the merits and disadvantages of each technology
- Understand the supporting technologies that will enable paper-like displays to meet the requirements of these applications
- See how the development of printed electronics is vital to the future of paper-like displays
- Understand how such displays may impact printing and paper

Intended Audience: engineers and scientists working in the areas of printing, paper, and consumables and in the design and development of printed electronics

Tom Ashley has worked in the field of digital printing for more than 35 years. Since 1984, he has been a digital printing consultant for Dataquest, BIS Strategic Decisions, CAP Ventures, and Pivotal Resources, all consulting firms specializing in digital printing and imaging. Ashley began his career with IBM, where he managed groups developing photoreceptors, inks, ribbons, and toners for IBM's first copier, laser printer, ink jet printer and thermal transfer printer. His interest in paper-like displays dates to 1979, when he sat on an IBM committee studying the threat posed by the paperless office. Ashley holds an AB in chemistry from Transylvania University and an MS in organic chemistry from Marshall University, with additional graduate work in management at the University of Kentucky.

T21: Managing R&D Projects for Value

Tuesday 1:30 to 5:30 pm (4 hours)
Instructors: George Gibson, Xerox Corp.

New products are one of the most powerful drivers of corporate performance. Companies' fates rise and fall based on their ability to deliver innovation to the marketplace. Success at innovation is, however, the exception not the rule. Writing in the December 2005 issue of *Harvard Business Review*, Clayton Christensen says, "Thirty thousand new consumer products are launched each year. But over 90% of them fail . . ." These failures have sometimes devastating effects. Robert Cooper, writing in "The PDMA handbook of New Product Development," shows that firms with superior profitability simply out execute average or poor performing counterparts in new product development. Leading firms introduce more new products and those new products are more likely to come with the sort of advantages that bring substantial new customer value, not just "me too" or incremental improvement. With so much on the line you'd think the best and brightest would be focused on this issue, and indeed they often are. So what keeps companies from improving their success rate? Two issues stand out: it is sometimes very difficult to identify which of many potential new products should actually be taken forward and the various groups required to drive a successful new product into the customer's hands speak different languages. An analogy to the Tower of Babel is apt: so many specialists, so many disciplines and, too often, no central organizing language or framework. Valuation of R&D Projects™, takes the participant on a step by step journey to the development of new products, with each step rooted in the well-head of new product development success, the creation of customer value.

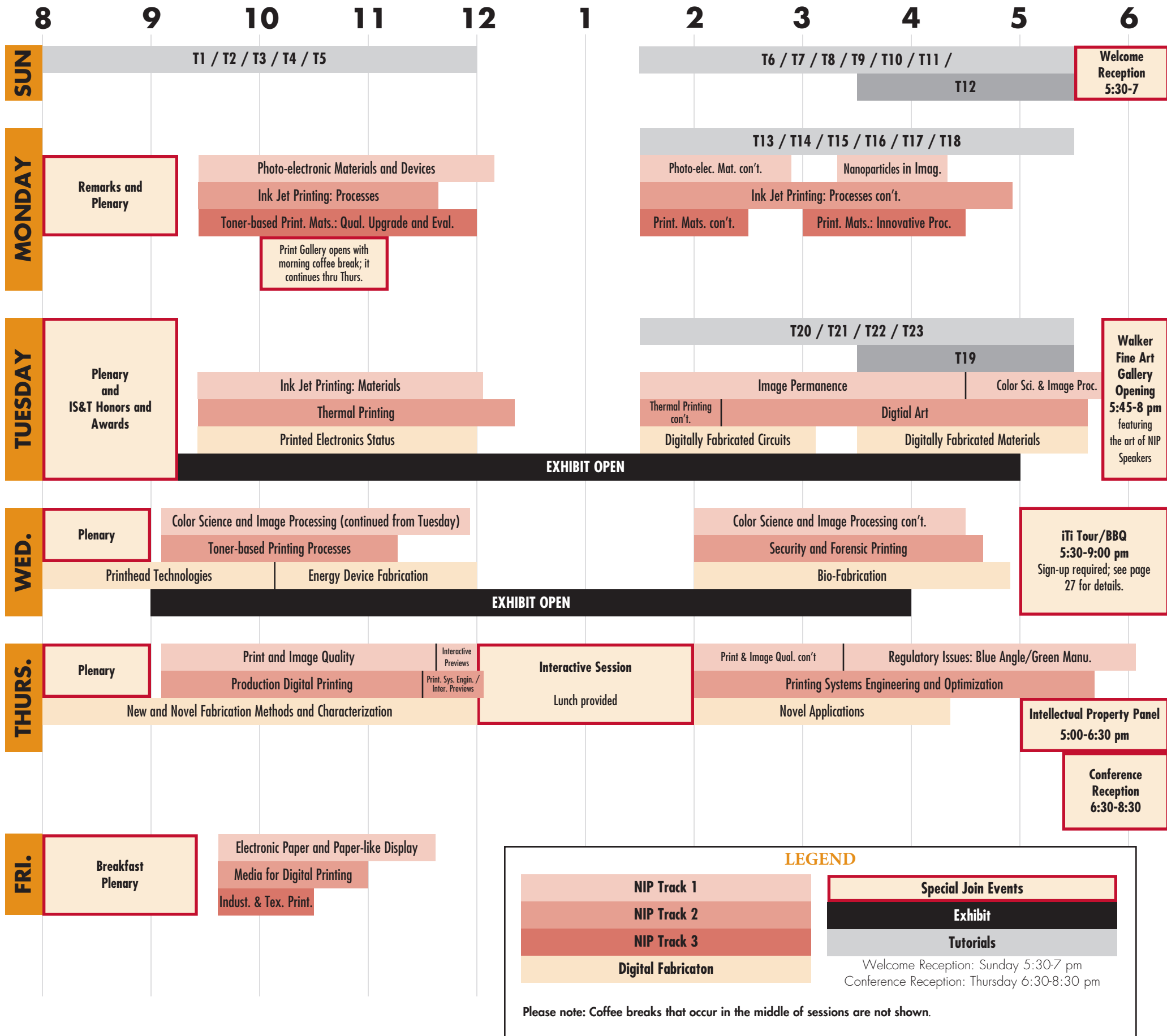
Benefits

This tutorial will enable the attendee to:

- Characterize target markets
- Distinguish new entrants and defenders
- Define the offering, not just the "product"
- Model and value customer benefits
- Forecast market penetration and uncertainties
- Estimate delivery costs and risks
- Calculate measures of economic return, including the effects of managing in a multi-project environment

Continued on page 18

NIP22/Digital Fabrication 2006 Week At-a-Glance



Intended Audience: technical professionals who need to interact with the business community in deciding among projects or technologies including managers, consultants, and potential entrepreneurs.

See bio under T17.

T22: Chemistry and Physics of Organic Electrophotographic Photoreceptors

Tuesday 1:30 to 5:30 pm (4 hours)

Instructors: David Weiss and Andrew Melnyk,
NexPress Solutions, Inc.

Organic photoreceptors are large-area photoelectric devices that are at the heart of today's digital electrophotographic printers. This tutorial provides attendees with a comprehensive understanding of organic pho-

toceptors in this important technology. Topics include photoreceptor architecture, system functions and requirements, formulation chemistry, physics, manufacturing technologies, system interactions, failure modes, and testing. Discussions center on current trends in organic photoreceptor technology and the unique requirements of digital printing that must be satisfied.

Benefits

This tutorial will enable the attendee to:

- Understand the design and function of organic photoreceptors in an electrophotographic printer
- Discuss the interplay between photoreceptor architecture and electrophotographic function
- Understand the relationship between chemical make up and the function of the various layers in an organic photoreceptor
- Describe the technologies involved in the manufacturing and testing of organic photoreceptors
- Describe how organic photoreceptors are studied and characterized
- Understand the mechanisms of charge generation and transport in organic photoreceptors
- Identify photoreceptor failure modes and diagnose problems
- Appreciate photoreceptor interaction issues in the design of an electrophotographic system

Intended Audience: those interested in understanding organic photoreceptors and how they function in modern digital electrophotographic printers, including students, sales and marketing personnel, technicians, engineers, and scientists. A general background in chemistry, physics, and the electrophotographic process is helpful, but not essential.

David S. Weiss, scientist fellow at NexPress Digital, Inc. (a Kodak Company) received his PhD in chemistry from Columbia University (1969). His work focuses on electrophotographic technologies with emphasis on organic photoreceptors. Weiss holds 17 US patents and is author on more than 90 publications. He is co-author of Organic Photoreceptors for Imaging Systems (Marcel Dekker, Inc., 1993), Organic Photoreceptors for Xerography (Marcel Dekker, Inc., 1998), and co-editor of the Handbook of Imaging Materials, Second Edition (Marcel Dekker, Inc., 2002). Weiss has been an associate editor of the Journal of Imaging Science and Technology since 1988 and has served as general chair for NIP17 and in many other NIP committee assignments. In 1999 he received the Carlson Memorial Award, in 2004 he was named an IS&T Senior Member, and in 2006 he

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was elected to the IS&T board as a vice-president.

Andrew R. Melnyk (retired 2002) was principal scientist at Xerox Corp. in Webster, NY. He received his PhD in theoretical solid-state physics from Michigan State University (1967). Following a NRC postdoctoral fellowship at the NBS Labs in Boulder, Colo., Melnyk joined Xerox in 1969, where he pursued research in photoconductors and imaging technologies. His primary research interests are in the areas of electro-optical properties and electronic processes of organic materials, their measurement and modeling, and the design of electrophotographic printers. He holds several dozen patents and has published journal articles and book chapters on photoconductors; he has taught short courses on photoconductors at Xerox and NIP conferences. Since its inception, Melnyk has been an active participant in NIP, serving in various capacities, ranging from session to general chair (NIP12).

T23: Digital Technology, Security of Documents and Brand Protection

Tuesday 1:30 to 5:30 pm (4 hours)

Instructor: Annette B. Jaffe, Consultant

This tutorial will cover the field of security devices ranging from optical security features to classic features such as watermarks. It will explore how they protect documents and packaging, as well as their effectiveness. The course will explore how digital technology has changed the problems involved with security and explore solutions for the future. Recent developments in color print technologies will also be reviewed. Use of security devices for brand protection will be given as examples.

Benefits

This tutorial will enable the attendee to:

- Learn the basics of security devices
- Explore the advantages and disadvantages of security devices
- Learn how digital technologies such as ink jet and electrophotography interact with security and security features
- Discover new inks, toners, etc. being used for security
- Speculate on the future

Intended Audience: scientists and engineers are interested in security and implications for digital printing

Annette Jaffe received a BA in chemistry and a PhD in physical chemistry. For more than 25 years she has worked on printing technologies at IBM Research, Apple Computer, and Texas Instruments. She is currently a consultant in digital color imaging, security printing, and digital anti-counterfeiting.

PLEASE READ!

SPECIAL NOTICE ABOUT PROCEEDINGS

This year attendees will be asked to choose from the following:

- **NIP22 Proceedings (hard copy)**
A stand-alone book containing the technical papers from NIP22, as well as information on the program and exhibit, as in years past.
- **DF2006 Proceedings (hard copy)**
A stand-alone book containing the technical papers from Digital Fabrication 2006, as well as information on the program and exhibit, as in years past.
- **NIP22/DF2006 Proceedings CD and Abstract book**
A booklet containing the abstract of each paper from NIP22 and DF2006, with the full technical papers from both conferences on a CD. The booklet also contains information on the program and exhibit.

One of the above is included in your registration fee, but you must indicate the format you prefer when registering. Those who do not indicate a preference will be given the CD version. Additional copies and copies of other formats are available for advance or onsite purchase at a special rate. See the registration form on page 32 for details.

Technical and Social Program

All papers are oral unless marked as focal or interactive (either beside the paper or in the heading). Those papers with red titles are part of the NIP22 program; those with orange are Digital Fabrication 2006 papers.

Monday September 18, 2006

8:00 - 9:15 am

PLENARY SESSION

Session Chair: Eric Stelter, NexPress

Diverging Ink Jet Technologies and Applications, Martin Schoeppler, Dimatix, Inc. (USA)

TRACK 1

9:25 am - 2:50 pm

PHOTO-ELECTRONIC MATERIALS AND DEVICES

Session Chairs: Hans-Josef Humpert, AEG-Elektrophotographie GmbH, and Michel Molaire, NexPress

Development of a High-Durability OPC Having a Protection Layer (Focal), Shinji Nohsho, Ryohichi Kitajima, Takaaki Ikegami, Tetsuro Suzuki, Tatsuya Niimi, and Narihito Kojima, Ricoh Co., Ltd. (Japan)

Field Emission with High Performance from MgO-Coated Carbon Nanotubes, Y. Nakayama, L. Pan, Y. Konishi, and H. Tanaka, Osaka Prefecture University; and S. Chakrabarti, CREATE (Japan)

Newtonian, Colloidally Stable, Ultrasonic-Insensitive, Charge Generating Layer Dispersion Compositions with Instantly Tunable Photosensitivity, Michel F. Molaire, Lloyd Lobo, Theodore Zubil, Lori Vanepps, and Michael Sykes, Nexpress Solutions (USA)

The Optical-Drive Type Organic Field Effect Transistor Utilizing the Organic Photoreceptor, Norio Nagayama, Jin Yoshikawa, and Masaaki Yokoyama, Osaka University (Japan)

Novel Aromatic Amines for Photoconductor and Organic Electronic Applications (Focal), Klaus Kreger, Martin Sonntag, and Peter Strohsriegel, University of Bayreuth, (Germany)

Indirect Charge Generation in OPC, Saburo Yokota, Samsung Electronics Co., Ltd. (Korea)

A Study on Positive Hole Injection from Electrode to Liquid-crystalline Semiconductor, T. Toda, J. Hanna, and T. Tani, Tokyo Institute of Technology (Japan)

Strikingly Different Luminescent Properties Arising from Single Crystals Grown from the Vapor Phase or from Solution in a Diketopyrrolopyrrole Analog, Tomohiko Imoda and Jin Mizuguchi, Yokohama National University (Japan)

SPECIAL EVENT

Kick off the conference by meeting up with friends and colleagues after a day of tutorials at the

NIP/DF Welcome Reception
Sunday, September 17
5:30-7:00 pm

Polymorph of 2,9-Dichloroquinacridone and Their Electronic Properties, Takatoshi Senju, Naoko Nishimura, Jin Mizuguchi, Yokohama National University (Japan)

Cohesion of Gamma-Quinacridone and 2,9-Dimethylquinacridone in the Solid State, Takatoshi Senju and Jin Mizuguchi, Yokohama National University (Japan)

3:20 - 4:20 pm

NANOPARTICLES IN IMAGING

Session Chairs: Norio Nagayama, Osaka University, and Sanjay Monie, Grace Davison

Nano Particle Applications in Material Development for Non-Impact Printing: A Preliminary Study (Focal), Keith Murphy and Wade Eichhorn, Z-Sigma, Inc.; Dehua Yang and Thomas Wyrobek, Hysitron, Inc. (USA)

Application-Optimized Processing of Nano-Dispersions with Micro Beads (Focal), Norbert Stehr, Bühler GmbH (Germany)

TRACK 2

9:25 am - 4:35 pm

INK JET PRINTING: PROCESSES

Session Chairs: Werner Zapka, Xaar; Mineo Kaneko, Canon Inc.; and Yong Zhou, Trident

The Practical Relevance of Solid State UV LED's for the Curing of Inks in Contemporary Ink Jet Applications (Focal), Adrian Lockwood, Integration Technology, Ltd. (UK)

Alternative UV Radiometry and Exposure Verification for UV Ink Jet Printing, R. W. Stowe, Fusion UV Systems, Inc. (USA)

Effects of Thin Film Layers on Actuating Performance of Micro Heaters, Min Soo Kim, Bang Won Lee, Yong Soo Lee, and Keon Kuk, Samsung Advanced Institute of Technology (Korea)

Cross-Talk of Multi-Nozzle in Electrostatic Ink Jet System, Shinjiro Umezue, Ryosuke Nakazawa, and Hiroyuki Kawamoto, Waseda University (Japan)

Minimizing Residual Vibrations and Cross-Talk for Ink Jet Printheads Using ILC Designed Simplified Actuation Pulses,

M.B. Groot Wassink and O.H. Bosgra, Delft University of Technology; and S.H. Koekbakker, and M. Slot, Océ-Technologies B.V. (The Netherlands)

Acoustic Analyses of Oscillatory Behaviors in Piezoelectric Ink Jet Printhead, *Shin Ishikura, Kyocera Corp. (Japan)*

Manipulating Drop Formation in Piezo Acoustic Ink Jet, *Herman Wijshoff, Océ-Technologies B.V. (The Netherlands)*

Jetting and Imaging Performance of Spectra M-300 Jet Module, *Will Letendre, Bailey Smith, and Shubb Halwawala, Dimatix, Inc. (USA)*

Simulations of Viscoelastic Ink Droplet Ejections Using the Finite Difference Level Set Method and Equivalent Circuit, *Jiun-Der Yu and Shinri Sakai, Epson, Inc. (USA)*

High-Speed Imaging and Analysis of Jet and Drop Formation, *I. M. Hutchings, G. D. Martin, S. D. Hoath, and R. H. Morgan, University of Cambridge (UK)*

Jet Formation and Late-Stage Ligament Instability in Drop-on-Demand Printing, *Graham D. Martin, Ian M. Hutchings, Steve D. Hoath, and Rhys H. Morgan, University of Cambridge (UK)*

Improving Quality of Ink Jet Printed Metal Nano-Particle Conductors, *Liisa Hakola, VTT - Technical Research Centre of Finland (Finland)*

Addressable Waveform Modulation for Ink Jet Printing Realized by Electrical Close Loop Feedback (Interactive), *Hsiang-Pei Ou, Chih-Jian Lin, Yung-Kuo Ho, and Kevin Cheng, DTC/Industrial Technology Research Institute (Taiwan)*

The Mechanical Assignment and Real-Time Measurement for Multiple Print Heads Manufacturing System (Interactive), *Cheng-Yi Wang, Kevin Cheng, Wanda W.W. Chiu, and Chen-Chu Tsai, DTC/Industrial Technology Research Institute (Taiwan)*

Polymeric Film Technology for the Jettable Fluid Delivery Assembly and Harsh Environment Protection (Interactive), *Susan Krawiec, Vivian Chan, Robert Frimanson and Robert Palmer, Emerson & Cuming, Inc. (USA)*

Continuous Pattern Transfer and Arbitrable Piping Process for Ink Jet Fabrication (Interactive), *Hung-Pin Shih, Chieh-Yi Huang, and*

Interpreting the Schedule

By knowing the amount of time allotted for each type of presentation, you can get a rough estimate of when a particular presentation will occur. Exact times will be published in the conference proceedings. Coffee breaks are scheduled to occur mid-morning and mid-afternoon, with lunch scheduled each day around the noon hour. Presentation length includes time for Q&A at the end of the talk.

Plenary: 60 minutes

Focal: 30 minutes

Oral: 20 minutes

Interactive (preview): 5 minutes

Kevin Cheng, DTC/Industrial Technology Research Institute (Taiwan)

Dynamic Management for Multiple Rotation Print Heads with Interlace Printing: Part I: Flow & Memory Arbitration (Interactive), *Chia-Ming Chang, Chih-Jian Lin, and Kevin Cheng, DTC/Industrial Technology Research Institute (Taiwan)*

Dynamic Management for Multiple Rotation Print Heads with Interlace Printing: Part II: Patterning Algorithm (Interactive), *Chia-Ming Chang, Chih-Jian Lin, and Kevin Cheng, DTC/Industrial Technology Research Institute (Taiwan)*

Test Pattern and Drop Tracing for Nozzle Healthy Diagnostic (Interactive), *Chen-Chu Tsai, Chih-Hsuan Chiu, Chih-Jian Lin, Cheng-Yi Wang, Wanda W. W. Chiu, and Kevin Cheng, DTC/Industrial Technology Research Institute (Taiwan)*

TRACK 3

9:25 am - 2:30 pm

TONER BASED PRINTING MATERIALS - QUALITY UPGRADE AND EVALUATION

Session Chairs: Detlef Schulze-Hagenest, NexPres, Manabu Takeuchi, Ibaraki University; and Scott Silence, Xerox Corp.

Understanding the Influence of Surface Acid and Base Properties and Water on Work Functions and Triboelectric Charging Using Inverse Gas Chromatograph (Focal), *Rick Veregin, Maria McDougall, Mike Hawkins, Cuong Vong, and Vlad Skorokhod, Xerox Research Centre of Canada; and Henry Schreiber, École Polytechnique, Université de Montréal (Canada)*

Treated Colloidal Silica Particles for Toners, *Joachim Floess, Dmitry Fomitchev, Adam MacKay, Hairuo Tu, Doug West, and William Williams, Cabot Corp. (USA)*

SPECIAL EVENT

The Print Gallery will open with the Monday morning coffee break and will be available for viewing until Thursday afternoon.

See page 19 for information on participating in this year's galleries.

Tuesday September 19, 2006

8:00 - 9:15 am

PLENARY SESSION

Session Chairs: James Stasiak, Hewlett-Packard Co.,
and Eric Steller, NexPress

Ink Jet Printing of Functional Materials for Electronic Applications (Plenary), Ulrich S. Schubert, Eindhoven University of Technology (The Netherlands)

Honors and Awards Presentations

TRACK 1

9:25 am - 12:05 pm

INK JET PRINTING - MATERIALS

Session Chairs: Hugh Allen, Coates;
Shinichi Kato, Epson Research and Development Inc.;
and Caroline Hayes, Cabot Corp

The Effect of Properties of Encapsulated Pigment Inks on Optical Density, Yasuhiro Doi, Hiroyuki Yoshida, and Isao Tsuru, Kao Corp. (Japan)

Basic Principles of Ink Jet Pigment Dispersion, Hernán Murúa, Ink Press do Brasil Ltda. (Brazil)

Pigment Surface Modification via Nucleophilic Treating Agents, Yuan Yu, Cabot Corp. (USA)
A New Aqueous Ink Jet Ink for Plain Paper Printing, Hirotaka Iijima and Yasuhiko Kawashima, Konica Minolta IJ Technologies, Inc. (Japan)

Balancing Stability and Cure in Cationic UV Jet-Inks (Focal), Alexander Grant and Hugh Allen, SunJet (England)

Stacking Behavior of Carbon Black on Cellulose Surface (Interactive), Jong In Lee, Seung Min Ryu, Hyuk Soon Choi, Kwang Hee Kim, Hyo Sug Lee, and Jai Kwang Shin, Samsung Electronics Co., Ltd. (Korea)

The Optimization of Pigment Ink Set for Large Format Printer (Interactive), Tsuyoshi Sano, Shinichi Kato, Shuichi Kataoka, and Kiyohiko Takemoto, Seiko Epson Corp. (Japan)
New Black Dye for Ink Jet Application (Interactive), Hsiao-San Chen, Mike Yang, and Jeng-Fang Lin, Everlight Chemical Industry Corp. (Taiwan)

Treated Fumed Alumina Particles for Toners with Improved Humidity Stability, Dmitry Fomichev, Adam MacKay, Casey Whicher, and William Williams, Cabot Corp. (USA)

Superior Technology to Make the Advanced Full-Color Toner for Fine Image Quality, Shinichiro Omatsu, Shunji Arita, Akihiro Eida, and Jun Shimizu, Kao Corp. (Japan)

Toner Particle Shape Characterization by FE-SEM Image Analysis, Dustin M. Earnhardt, Mark W. Cummings, and Kenzo Ogata, Mitsubishi Kagaku Imaging Corp. (USA)

Study of Possibility to Realize Long Life and Low Energy Fusing Toner Predicted from Highly Safe Cyclic Olefin Copolymer Resin, Atsuo Miyamoto, Tomoegawa Paper Co., Ltd. (Japan)

Periodic Development of Xerographic Background: A Case History (Focal), Robert J. Nash, Bruce E. Cray, Leonard E. Brendlinger, Mary L. Ott, and Richard J. Hodgson, Xerox Corp. (USA)

Time Discrimination of Coulter Recount Artifact, Kevin Lofftus, NexPress Solutions, Inc., (USA)

Evaluation of Toner Charging Capability of Trianilino-Triphenylmethane Layer Coated on Toner or Carrier Surface (Interactive), Atsushi Suka and Manabu Takeuchi, Ibaraki University; and Keiki Suganami and Toshihiko Oguchi, Morimura Chemicals Ltd. (Japan)

Tribo-Charging Characteristics on Pulverized Toner Particles in Two-Component Developer (Interactive), Youichi Nakamura and Yutaka Terao, Nippon Institute of Technology (Japan)

3:00 - 4:30 pm

TONER BASED PRINTING MATERIALS - INNOVATIVE PROCESSES

Session Chairs: Gerhard Bartscher, Böttcher Systems;
Shunji Nakamura, Canon Inc.; and
Grazyna Kmiecik-Lawrynowicz, Xerox Corp.

Polyester vs. Styrene: Binder Choice for Toners in Digital Printing (Focal), Dinesh Tyagi, NexPress Solutions, Inc., (USA)

Electrostatic Manipulation of Particle, Hiroyuki Kawamoto, Hiroki Ando, and Shinjiro Umezu, Waseda University (Japan)

Advantages of Form Adjustment in Xeikon FA-Toner for High-Speed Digital Color Printing, Lode Deprez, Sabine Vanhee, and Dirk Gijsbrechts, Punch Graphix International NV (Belgium)

Development of Chemically Prepared Toner Using Macromonomers, Chang Kook Hong, Min Young Cheong, Yoda Shin, Hyunju Kim, and Kyung-Yol Yon, Samsung Electronics (Korea)

SPECIAL EVENT

IS&T will present many of its 2006 Honors and Awards at the conclusion of Tuesday's plenary talk.

Please join us as we pay tribute to this year's awardees.

1:30 - 4:30 pm

IMAGE PERMANENCE

Session Chairs: Alan Hodgson, Alan Hodgson Consulting; Takao Abe, Shinshu University; and Mark Mizen, Creative Memories

Pigment Selection for an Ink Jet Ink Set with Balanced Lightfade Performance (Focal),

Howard Doumaux, Katie Burns, and David Mahli, Hewlett-Packard Co. (USA)

Effects of Molecular Substituents of Copper Phthalocyanine Dyes on Ozone Fading,

Fariza B. Hasan, Michael P. Filosa, and Zbigniew J. Hinz, ZINK Imaging, LLC (USA)

Effect of Optical Brightening Agents and Protective Coating on Print Stability of Fine

Art Substrates for Ink Jet, *Veronika Chovan-cova-Lovell, Paul D. Fleming, III, and Ralph Roessler, Western Michigan University (USA)*

Rf Method of Reciprocity Performance

Testing, Part II – Long Term Performance

Verification, *Adam Bush, Douglas Bugner, Joseph LaBarca, Jon Kapecki, and Brian Lindstrom, Eastman Kodak Co. (USA)*

Correlation of Ozone Test Chamber Data with Real-Life Permanence of Ink Jet Prints, *Juerg Reber and Rita Hofmann, Ilford Imaging Switzerland GmbH (Switzerland)*

Further Investigations into Accelerated Light Fade Reciprocity of Ink Jet Photographic

Prints, *Brian L. Lindstrom and Douglas E. Bugner, Eastman Kodak Co. (USA)*

4:30 - 6:00 pm

COLOR SCIENCE AND IMAGE PROCESSING

Session Chairs: Joan Uroz, Hewlett-Packard Española SL; Yasushi Hoshino, Nippon Institute of Technology; and Chai Wah Wu, IBM

Fast Error Diffusion and Digital Halftoning Algorithms Using Look-up Tables,

Chai Wah Wu, Mikel Stanich, Yue Qiao, Hong Li, and Larry Ernst, IBM Corp. (USA)

Comparative Study of Search Strategies for the Direct Binary Search Image Halftoning

Algorithm, *Sagar Bhatt, Rice University; John Harlim, University of Maryland; Joel Lepak, University of Michigan; Robert Ronkese, University of Delaware; John Sabino, Rice University; and Chai Wah Wu, IBM T. J. Watson Research Center (USA)*

Hybrid Error Diffusion Scheme by Mask Perturbation,

Jun-Hak Lee, Takahiko Horiuchi, and Hiroaki Kotera, Chiba University (Japan)

Reflection Microdensitometry in the Digital

Age, *Alan Hodgson, Alan Hodgson Consulting (UK)*

A New Edge-Dependent Error Diffusion (Interactive),

Ahmed Eid and Mohamed

SPECIAL EVENT

NIP/DF Gallery Reception Tuesday, September 19 5:45–8:00 pm

In conjunction with the
NIP Digital Art Session

Walker Fine Art
The Prado
300 W. 11th Avenue, Suite A
Denver, CO

presents the Digital Atelier Group Show
featuring the work of speakers
Dorothy Simpson Krause and
Bonny Pierce Lhotka,
as well as member Karen Schminke

Nooman Ahmed, Lexmark International (USA)
Wavelet-Based Document Enhancement (Interactive), *Mohamed Nooman Ahmed, and Ahmed Eid, Lexmark International (USA)*

TRACK 2

9:25 am - 2:15 pm THERMAL PRINTING

Session Chairs: Ian Stephenson, ICI Image Data; Hirotooshi Terao, Alps Electric Co., Ltd.; and Wendell Brattlie, Eastman Kodak Co.

Recent Developments in Thermal Dye Transfer Prints (Focal), *Masafumi Hayashi and Kazuya Yoshida, Dai Nippon Printing Co., Ltd. (Japan)*

Importance of Dye Partition Coefficient in Thermal Dye Transfer Printing Efficiency, *Dennis J. Massa, Eastman Kodak Co. (USA)*

New Intelligent Thermal Printing Technology, *Itaru Fukushima, Cyber Imaging Corp. (Japan)*

Correction of High Frequency Smear in Thermal Printers, *Raymond W. Ptucha, Eastman Kodak Co. (USA)*

Development of Low-Power Thermal Printing Technology, *Hisashi Hoshino, Yuuji Nagahamaya, and Hirotooshi Terao, Alps Electric Co., Ltd. (Japan)*

Model and Temperature Measurement of Dye-Diffusion Thermal-Transfer Media Scanning Past a Resistive Printhead,

Daniel D. Haas, Consultant and David A. Johnson, Eastman Kodak Co. (USA)

D2T2 Printing after Two Decades, *Richard P. Henzel, Eastman Kodak Co. (USA)*

Development of 600dpi U-shape Heater Thermal Print Head, *Yoshinori Muya, Masato Ooba, and Tadahiro Fukazawa, Toshiba Hokuto Electronic Corp. (Japan)*

Coupled Thermal-Structural Nip Analysis of Thermal Dye Transfer Printing, Po-Jen Shih and Teh-Ming Kung, Eastman Kodak Co. (USA)

New Erase Head for Thermal Rewritable Media (Interactive), Jiro Oi, HIT Devices Ltd. (USA)

**2:15 - 5:40 pm
DIGITAL ART**

Session Chair: Michael Berger,
Wilhelm Imaging Research

The Diversity of Digital Print Technologies Used in the Creation of High Quality Fine Art (Focal), Stephen Hoskins, University of the West of England (England)

The Intersecting Roles of Digital Printing Technology and Image Permanence in the Evolution of the Digital Fine Art Field (Focal), Henry Wilhelm, Wilhelm Imaging Research, Inc. (USA)

Digitally Print Technologies and Their Relation to Vitreous Enamel on Metal for the Visual Artist (Focal), Stephen Hoskins and Elizabeth Turrell, University of the West of England (England)

Digital Art Studio: Techniques for Combining Inkjet Printing with Traditional Art Materials (Focal), Dorothy Simpson Krause, Digital Atelier (USA)

The Future is Here: UV Flatbed Printing for Fine Art (Focal), Bonny Pierce Lhotka, Digital Atelier (USA)

Substrate Developments in Fine Art Media (Focal), Ray A. Work, III, Work Associates, Inc. (USA)

DIGITAL FABRICATION

9:25 am - 12:00 pm

PRINTED ELECTRONICS STATUS

Session Chairs: Toshihiko Oguchi, Morimura Chemicals, Ltd.; Dieter Schroth, EMD Chemicals, Inc.; and Gregory S. Herman, Hewlett-Packard Co.

Large Area Printing of Organic Electronics (Focal), G. Blanchet, C. Nuckolls, H.H. Lee, M. Strano, and J. Rogers, DuPont (USA)

All-Printed Electronics and Its Applications: A Status Report (Focal), M. Bartzsch, N. Brandt, U. Fuegmann, T. Fischer, U. Hahn, A. Huebler, H. Kempa, K. Preissler, and G. Schmidt, Chemnitz University of Technology (Germany)

Toolset for Printed Electronics (Focal), S.E. Ready, W.S. Wong, A. Arias, M.L. Chabinye, and R.A. Street, Palo Alto Research Center, Inc., and A. Salleo, Stanford University (USA)

All-Printed Electronics: Materials, Devices,

and Circuit Implications (Focal), Vivek Subramanian, Josephine Chang, Steven Molesa, David Redinger, and Steven Volkman, University of California, Berkeley (USA)

1:30 - 3:10 pm

DIGITALLY FABRICATED CIRCUITS

Session Chairs: Toshihiko Oguchi, Morimura Chemicals, Ltd.; Arved Huebler, University of Chemnitz; and Thomas Boland, Clemson University

Integrated Circuits Made of Printable Polymers (Focal), Alexander Knobloch, PolyIC GmbH & Co. KG (Germany)

A General and Low-Cost Route to Printable High-Mobility Inorganic Thin Film Transistors (Focal), Chih-hung Chang, Doo-Hyoung Lee, Yu-Jen Chang, Oregon State University; and Gregory S. Herman, Hewlett-Packard Co. (USA)

High Resolution Electrodes Fabrication for OTFT by Using Microcontact Printing Process, Jeongdai Jo, Taik-Min Lee, Choong-Hwan Kim, Dong-Soo Kimm, Kwang-Young Kim, and Masayoshi Esashi, Korea Institute of Machinery and Materials (Korea)

Ink Jet Printing of Non-Volatile Rewritable Memory Arrays, Wolfgang Voit and Werner Zapka, Xaarjet AB; and Peter Dyreklev and Rolf Aberg, Thin Film Electronics AB (Sweden)

3:30 - 5:40 pm

DIGITAL FABRICATION MATERIALS

Session Chairs: Toshihiko Oguchi, Morimura Chemicals, Ltd.; Arved Huebler, University of Chemnitz; and Thomas Boland, Clemson University

Variable Droplet Size Molten Solder Ejection Tool for Microelectronics Packaging, Hiroshi Fukumoto, Yoshinori Yokoyama, Kazuyo Endo, Yoshio Fujii, and Munehisa Takeda, Mitsubishi Electric Corp. (Japan)

Intellectual Property Issues Affecting Nano Particles Used in Digital Fabrication Materials, Russell J. Barron, Stephen B. Maebius, and J. Steven Rutt, Foley and Lardner LLP (USA)

Surface Modification Technology for Ink Jet Industry (Focal), Toshimitsu Hirai and Hiroshi Kiguchi, Seiko Epson Corp. (Japan)

Coated Media for Digital Fabrication: Lessons from the Photo Industry, Alan Hodgson, Alan Hodgson Consulting (UK)

Digital Printing of Digital Materials, Patrik Künzler, George Popescu, and Neil Gershenfeld, Massachusetts Institute of Technology (USA)

Digital Materials for Digital Printing, George A. Popescu and Neil Gershenfeld, Massachusetts Institute of Technology (USA)

Wednesday September 20, 2006

8:00 - 9:00 am PLENARY SESSION

Session Chair: Eric Stelter, NexPress

Beyond R.G.B.: Spectrum-Based Color Imaging Technology, Masahiro Yamaguchi, Tokyo Institute of Technology (Japan)

TRACK 1

9:10 am - 4:30 pm COLOR SCIENCE AND IMAGE PROCESSING

(continued from Tuesday)

Session Chairs: Joan Uroz, Hewlett-Packard Española SL; Yasushi Hoshino, Nippon Institute of Technology; and Chai Wah Wu, IBM

Image-Processing for the Digital Consumer Market (Focal), Rodney Shaw and Paul Johnson, White Rose Digital (USA)

Optical Simulation of Integral Photography Using Computer Graphics, Kazuhisa Yanaka, Yuki Takahashi, and Hideo Kasuga, Kanagawa Institute of Technology (Japan)

HDR Image Compression by Integrated Surround Retinex Model, Lijie Wang, Takahiko Horiuchi, and Hiroaki Kotera, Chiba University (Japan)

Improved Resolution Synthesis Algorithm for Image Interpolation, Buyue Zhang and Jan P. Allebach, Purdue University; and Jay Gondek and Morgan T. Schramm, Hewlett-Packard Co. (USA)

High-Quality Raster Image Resizing Using Linear Weighted Manipulation (Interactive), Gian-Hung Liu, Xiao-Yu Han, Yung-Kuo Ho, Chieh-Yi Huang, Hung-Pin Shih, and Kevin Cheng, Industrial Technology Research Institute (Taiwan)

Contour Perception Condition of Half-Toned Density Jump Image (Interactive), Pichit Kajondecha, Hongmei Cheng, Su Huang, and Yasushi Hoshino, Nippon Institute of Technology (Japan)

Color Reproduction for a Wide Gamut Space (Interactive), Yousun Bang, Yuntae Kim, and Heui-Keun Choh, Samsung Advanced Institute of Technology (South Korea)

Optimal Reproduction of Spot Colors on a Digital Press, John Setchell, Pantone, Inc. (USA)

Quality Analysis of Spot Color Reproduction with an Ink Jet Printer, Yu Ju Wu, Miro Suchy, Paul D. Fleming III, and Alexandra Pekarovicova, Western Michigan University (USA)

Studies on Additivity Failure of Subtractive Primaries for Digital Printer Characterization, Swati Bandyopadhyay, Tapan Paul, and Sivaji Bandyopadhyay, Jadavpur University (India)

SPECIAL EVENT

A minimum of two hours between tracks in the middle of the day is scheduled as

Exhibit Only Time Wednesday, September 20

Be sure to visit the NIP/DF exhibit hall at this time, as well as during open hours Tuesday (9–5) and Wednesday (9–4)

Optimization of Color Dyes for Spectral and Colorimetric Color Reproduction, Takayuki Ogasahara, Canon Inc. (Japan)

Developing Computational Radial Basis Functions (RBFs) Architecture for Nonlinear Scattered Color Data, Yue Qiao, Michael Kirby, and Larry Ernst, IBM Corp, Colorado State University (USA)

Scene Color Interchange Using Histogram Rescaling, Ryoichi Saito, Takahiko Horiuchi, and Hiroaki Kotera, Chiba University (Japan)

Examination on Pseudo-Spectral Color Reproduction of Facial Image Using Spectral Skin Color Palette, Sousuke Kagaya, Takahiko Horiuchi, Ryoichi Saito, and Hiroaki Kotera, Chiba University (Japan)

Colorization for Monochrome Motion Pictures By Using Reliable Displacement Vectors, Tomoyuki Murakami, Takahiko Horiuchi, and Hiroaki Kotera, Chiba University (Japan)

Color-Based Maximal GCR for Electrophotography (Interactive), L. Yang, Karlstad University; and S. Gooran, M. Eriksen, and T. Johansson, Linköping University (Sweden)

Tone Reproduction of Displayed and Printed Images Predicted by Using CIECAM02 (Interactive), Toyoshi Morioka, Masao Inui, Yoshihiko Azuma, and Tomotaka Hirokawa, Tokyo Polytechnic University (Japan)

TRACK 2

9:10 - 11:15 am TONER BASED PRINTING PROCESSES

Session Chairs: Volkhard Maess, Océ Printing Systems GmbH; Yusuke Takeda, Ricoh Co., Ltd.; and Larry Schein, Consultant

Some Fundamental Performance Aspects of the Xerox iGen3 Development System (Focal), Mark J. Hirsch, Xerox Corp. (USA)

Development of Smart LED-Printhead, Mitsuhiro Ogihara, Hiroyuki Fujiwara, Masataka Mutoh, Takahito Suzuki, Tomohiko Sagimori, Hiroshi Kurokawa, Tomoki Igari,

Taishi Kaneto, and Hironori Furuta, Oki Digital Imaging Corp. (Japan)

On Counter Charges in Development Rollers for Electrophotography, Inan Chen and Ming-Kai Tse, Quality Engineering Associates, Inc. (USA)

The Relationship Between Paper Properties and Fuser Oil Uptake in High-Speed Xerographic Printing, Patricia Lai and Ning Yan, University of Toronto; Gordon Sisler, Xerox Research Center of Canada; and Jay Song, International Paper (Canada)

Analysis of the Magnetic Force Acting on the Toner in the Black Image Area and White Image Area in Longitudinal Recording Magnetography (2) (Interactive), Norio Kokaji, Meisei University (Japan)

Control Characteristic of Conductive Toner Cloud by an Aperture Electrode (Interactive), Toshinori Seki, Ye Zhou, Hong Wu, and Yasushi Hoshino, Nippon Institute of Technology (Japan)

Corona Discharge Characteristics in Airflow Containing Siloxane Vapor (Interactive), Song Jiang, Xiaoxian Wang, Tsunenori Nakanishi, and Yasushi Hoshino, Nippon Institute of Technology (Japan)

2:00 - 4:40 pm
SECURITY AND FORENSIC PRINTING

Session Chairs: Gaurav Sharma, University of Rochester, and Annette Jaffe, Annette Jaffe Consulting

Ink Jet Printing for Anti-Counterfeit/Brand Protection Applications (Focal), Long Lin, University of Leeds (UK)

Ink Jet Printing Discrimination Based on Invariant Moment, Vanessa Talbot, Patrick Perrot, and Cyril Murie, IRCGN (France)

Extrinsic Signatures Embedding and Detection in Electrophotographic Halftone Images through Laser Intensity Modulation, Pei-Ju Chiang, Aravind K. Mikkilineni, Sunjoo Suh, George T.-C. Chiu, Edward J. Delp, III, and Jan P. Allebach, Purdue University (USA)

Printer Mechanism – Level Data Hiding for Halftone Documents, Sungjoo Suh, Jan P. Allebach, George T. Chiu, and Edward J. Delp, III, Purdue University (USA)

Ink-Specific Handheld Readers and Security Variable Data Printing (SVDPI), Steven J. Simske, Hewlett-Packard Laboratories; and John R. Hattersley, InData Systems (USA)

Data Hiding Capacity and Embedding Techniques for Printed Text Documents, Aravind K. Mikkilineni, Pei-Ju Chiang, George T.-C. Chiu, Jan P. Allebach, and Edward J. Delp, III, Purdue University (USA)

DIGITAL FABRICATION

8:00 - 10:10 am

PRINthead TECHNOLOGIES

Session Chairs: Masaya Ishida Cambridge Research Laboratory of EPSON; Dieter Schroth, EMD Chemicals, Inc.; and Linda T. Creagh, Dimatix, Inc.

Thermal Ink Jet System to Enable Non-Traditional Applications (Focal), Jeff Nielsen, Hewlett-Packard Co.(USA)

Fabricating Molecular Organic LED with a MoJet Printer, Jianglong Chen, Valerie Leblanc, Peter Mardilovich, Martin Schmidt, and Vladimir Bulovic, Massachusetts Institute of Technology (USA)

Piezoelectric Ink Jet Print Head Technology for Precision Dispensing Application, Ty Chen, Trident, an ITW Co. (USA)

Solder Jet Printhead for Deposition of Metallic Materials (Focal), Alfred Pan, Eric Hanson, and Michael Lee, Hewlett-Packard Co. (USA)

A Micromachined Printhead for the Direct Evaporative Patterning of Organic Materials, Valérie Leblanc, Jianglong (Gerry) Chen, Vladimir Bulovic, and Martin A. Schmidt, Massachusetts Institute of Technology (USA)

10:30 am- 12:00 pm

ENERGY DEVICE FABRICATION

Session Chairs: Masaya Ishida Cambridge Research Laboratory of EPSON; Dieter Schroth, EMD Chemicals, Inc.; and Linda T. Creagh, Dimatix, Inc.

An Ink Approach to CuInSe₂ Based Photovoltaics (Focal), David S. Ginley, Calvin J. Curtis, Maikel F.A.M. van Hest, and Alex Miedaner, National Renewable Energy Laboratory; and Jennifer Nakuda and Dennis Readey, Colorado School of Mines (USA)

A General Method for Ink Jet Printing Patterns of Metal Oxides for Combinatorial Searches and Optimization, Michael Woodhouse and Bruce Parkinson, Colorado State University (USA)

Thermal and Electrical Properties of "Liquid" Nano Carbon and Its Applications in Fuel Cell Technology, Khe C. Nguyen, Sinh T. Do, Thong V. Le, Tay T. Nguyen, and Anh T. Nguyen, Saigon Hi-Tech Park Research Laboratories (Vietnam)

Title TBA (focal), John Szczech, Motorola Labs (USA)

For biographical information on speakers and abstracts of specific papers/talks, please visit
www.imaging.org/conferences/DF2006
and
www.imaging.org/conferences/NIP22

2:00 - 4:50 pm

BIO-FABRICATION

Session Chairs: Masaya Ishida Cambridge Research Laboratory of EPSON; Alexander Knobloch, PolyIC; and Calvin J. Curtis, National Renewable Energy Laboratory

Printing of Structured Biomaterials for Realizing Complex 3D Cardiovascular Constructs

(Focal), Thomas Boland, Xiaofeng Cui, Michael Aho, Catalin Baicu, and Michael Zile, Clemson University (USA)

Ink Jet Bioprinting as an Effective Tool for Tissue Fabrication

M. Nakamura,^{1, 2} Y. Nishiyama,¹ C. Henmi,¹ K. Yamaguchi,^{1, 2} H. Nakagawa,¹ S. Mochizuki,¹ and K. Takiura;¹
¹Kanagawa Academy of Science & Technology and ²Tokyo Medical & Dental University (Japan)

Digital Printing of Bioinks

Jan Sumerel and John Higginson, Dimatix, Inc. (USA)

Supramolecular NanoStamping (Focal)

Arum Amy Yu and Francesco Stellacci, Massachusetts Institute of Technology (USA)

Ink Jet Printing of Biosensors for Medical Diagnostic Devices

Long Lin, University of Leeds (UK)

Inkjet Printing of Biopolymer Substrates for Cell Growth (Focal)

Skander Litem and Paul Calvert, Department of Materials and Textiles, College of Engineering, University of Massachusetts Dartmouth; and Hyeon Joo Kim and David L. Kaplan, Tufts University (USA)

Thursday September 21, 2006

8:00 - 9:00 am

PLENARY SESSION

Session Chair: Eric Stelter, NexPress

Fumed Metal Oxides for Non-Impact Printing Applications (NIP)

Mario Heinemann, Wacker Chemie AG (Germany)

TRACK 1

9:10 - 11:40 am

PRINT AND IMAGE QUALITY

Session Chairs: Martin Smallegange, Stork; Koji Hirakura, Ricoh Co., Ltd.; and Chunghui Kuo, NexPress

Influence of Paper Structure on Printability: Characterisation Using X-Ray Synchrotron Microtomography

Jean-François Bloch, Sabine Rolland du Roscoat, Pierre Verhnes, Christophe Mercier, Bernard Pineaux, and Anne Blayo, EFPG (France)

The Impact of Halftone Screen on Color

SPECIAL EVENT

iTi Open House & Western BBQ Wednesday, September 20 5:30–9:00 pm

imaging Technology international (iTi), a global enterprise focused on the design and manufacturing of development tools and industrial ink jet systems, will host an Open House & BBQ on Wednesday evening for NIP/DF attendees.

The festivities will begin at 6:00 pm with food and entertainment. iTi's facilities will be open and tours will be provided. Tickets will be available on a first come/first serve basis. Anyone who has registered for NIP/DF by the early registration deadline will receive a notice telling them how to sign-up for this event. Space is limited to the first 200 respondents. Buses will leave the Hyatt at 5:30 and 6:00 pm for iTi; return transportation will be available at 7:30 and 8:30 pm.

Register today and join iTi in the festivities! For additional information or specific requests for demonstrations or discussions, contact Cindy Morgan, cmorgan@iticorp.com, 303/443-1036.

Graininess

Chunghui Kuo and Yee Ng, NexPress Solutions Inc., (USA)

A New Approach to Image Fixing Quality Assessment - A Pen Offset Apparatus and Image Processing Analyzer

Charlie M. Mao and Alex Ozerov, Research Laboratories of Australia (Australia)

Improvement of Digital Print in Preference by Adding 1/f⁻¹ Noise (Interactive)

Kenji Ogihara, Hiroyasu Kitagawa, Hiroyuki Kobayashi, and Naokazu Aoki, Chiba University; and Masao Inui, Tokyo Polytechnic University (Japan)

A Web-Based Self-Diagnosis Tool to Solve Print Quality Issues (Focal)

Hyung Jun Park, Hector Santos, Chulwoo Kim, Pilsung Choe, Roy Kumontoy, Kainlu Low, Kristian Oldenberger, Maria Ortiz, Xinran Lehto, Mark Lehto, Jan Allebach, Purdue University, (USA)

High Image Quality Achieved through High-Precision Measurements (Focal)

Howard Mizes, Xerox Corp. (USA)

11:40 am - 12:00 pm

INTERACTIVE PRESENTATIONS:

Electronic Paper and Paper-like Display Electrochromic Characteristic of TiO₂ Particle in Melted Wax (Interactive), Takeshi Hasegawa, Ryusho KumeKawa, Takayuki Sano, and Yasushi Hoshino, Nippon Institute of Technology (Japan)

Reexamination of Origin of Electric Charge on Migration Particles Used for Electrophoretic Displays (Interactive),

Kazuhiro Nakayama and Makoto Omodani, Tokai University (Japan)

Behavior of Fine Particles Depend on Cell Structures in Mobile Fine Particle Display Cells (Interactive),

Taiju Takahashi, Kazunori Shimoyama, and Susumu Saito, Kogakuin University; and Yasuo Toko, Stanley Electric Co., Ltd. (Japan)

Regulatory Issues: The Blue Angel and Green Manufacturing

Deinking of Dry-Toned Prints from NexPress Digital Production Presses (Interactive),

Detlef Schulze-Hagenest and Johann Weigert, NexPress GmbH, (Germany)

12:00 - 2:00 pm

INTERACTIVE SESSION

pizza/soda lunch provided

papers as noted throughout listings

2:00 - 3:20 pm

PRINT AND IMAGE QUALITY (continued)

Simulation of Prints Made with Océ's 7 Color Direct Imaging Printing Technology, J. Brok,

Océ Technologies B.V. (The Netherlands)

Can Surface Analysis Predict Ink Jet Print Performance?, Annmarie Superka and Ali R. Bashey,

Specialty Minerals Inc. (USA)

A New Class of Print Quality Tests,

David A. Johnson and Steve Kang,

QualityLogic, Inc. (USA)

Hardcopy Characterization of Banding in Secondary Colors in Color Electrophotographic Processes, Mu-Chih Chen and George T.C. Chiu,

Purdue University (USA)

3:20 - 6:10 pm

REGULATORY ISSUES: THE BLUE ANGEL AND GREEN MANUFACTURING

Session Chair: Eric Stelter, NexPress

Environmental and Regulatory Aspects of Dry Toners (Focal), Klaus Berger and Toru Nakamura,

Topas Advanced Polymers GmbH (Germany)

Printing Systems: Meeting Market Demands for Healthy Indoor Environments (Focal),

Marilyn Black, Air Quality Sciences, Inc. (USA)

What Makes a Digital Print Recyclable? Results of a European Survey (Focal),

Axel Fischer, INGEDE (International Association of the Deinking Industry) (Germany)

Optimization of Process Condition for Perfect

SPECIAL EVENT

This year NIP and DF are holding a joint Interactive Paper Session so that all attendees can learn from these interesting technical presentations.

To facilitate a productive session a pizza and soda lunch will be provided as part of the registration fee.

**Interactive Papers Session
Thursday, September 21
12:00-2:00 pm**

Erasing Machine for Decolorable Toner

(Focal), Takeshi Gotanda, Sano Kenji, Kengo Furusawa, Sekiguchi Yumiko, and Takayama Satoshi, Toshiba Corp. (Japan)

Ensuring Compliance to the RoHS & WEEE

Directives (Focal), Todd Seeley, Intertek (USA)

TRACK 2

9:10 - 11:30 am

PRODUCTION DIGITAL PRINTING

Session Chair: Marcel Slot, Océ Printing Systems GmbH

Realizing Digital Profitability with Unified Workflow (Focal),

Chris Bondy, Kodak's Graphic Communications Group (USA)

NexPress Moves to Modularity and Upgradeability and Improves Productivity

(Focal), Detlef Schulze-Hagenest, NexPress GmbH, (Germany)

Ultra-Slim Developing Unit Design for Continuous-Feed Production Laser Printers

(Focal), Kaoru Kataoka, Yasuo Takuma, Heigo Ueki, Tomio Sugaya, and Teruaki Mitsuya, Ricoh Printing Systems, Ltd. (Japan)

Digital Offset Printing – Going Beyond 4 Colors

(Focal), Galia Golodetz, HP Indigo Division (Israel); and Ehud Chatow, Kok-Wei Koh and Ingeborg Tastl, Hewlett-Packard Laboratories (USA)

11:30 - 11:50 am

PRINTING SYSTEMS ENGINEERING AND OPTIMIZATION

Session Chairs: Xavier Bruch, Hewlett-Packard Española SL; Teruaki Mitsuya, Ricoh Printing Systems, Ltd.; and George Chiu, Purdue University

Linear Dynamic for Refractive Index Material Compensation Film Thickness (Interactive),

Chang Chia-Fu, Chan Chia-Hi, and Wan Zou-ni, Kun Shan University of Technology (Taiwan)

Improving the Accuracy of Inexpensive Sen-

sors for Optical Density Measurement (Interactive), Behnam Bastani and Bill Cressman, Hewlett-Packard Co. (USA)

A Novel Image Trimming Algorithm for IJP Fabrication in Line Width and Layer Thickness Compromise (Interactive), Chih-Hsuan Chiu, Chih-Jian Lin, Chia-Ming Chang, Ming-Huan Yang, Chung-Wei Wang, Wanda W. W. Chiu, and Kevin Cheng, DTC/Industrial Technology Research Institute (Taiwan)

Head Maintain Function and Low-Fluctuation Ink Supply for Pilot-Run IJP Platform (Interactive), Guo-Hua Wu, Kevin Cheng, Chih-Jian Lin, Chien-Kai Chang, Cheng-Yi Wang, Chen-Chu Tsai, and Wanda W. W. Chiu, DTC/Industrial Technology Research Institute (Taiwan)

11:50 am - 12:05 pm
INTERACTIVE PREVIEWS:
Media for Digital Printing

The Effect of Cross-Linking Agent on the Image Quality of Alumina Sol Coated Ink Jet Paper (Interactive), Tai Sung Kang and Myung Cheon Lee, SNS Photo Co., Ltd. (Korea)

Optimization of Vaterite Synthesis for Application to Coating Pigment of Ink Jet Paper (Interactive), Yohta Mori, Toshiharu Enomae, and Akira Isogai, The University of Tokyo (Japan)

Industrial and Textile Printing

From Die- to Dye-Cutting of Paper: Bringing Cheap Laser Cutting Power Into Printing Terminals (Interactive), O. Acher and H. Piombini, CEA Le Ripault (France); D. Persico and A. Bobrow, HW Sands Corp. (USA)

12:05 - 2:00 pm
INTERACTIVE SESSION
lunch provided
papers as noted throughout listings

2:00 - 5:40 pm
PRINTING SYSTEMS
ENGINEERING AND OPTIMIZATION
(continued)

Coupled Analysis of Toner Charging and Development Processes in a Laser Printer (Focal), Akin Ecer and Vladimir Rubek, Technalysis Inc. (USA)

Minimizing Toner Stress Using DEM Simulation, Rainer Hoffmann, Océ Printing Systems (Germany)

Modeling and Control of a Two-Component Xerography Development Process Using an Aggregate Control Oriented Development Model, Feng Liu and George T.-C. Chiu,

SPECIAL EVENT

NIP/DF Intellectual Property Panel

Session Chair: Ming Xu,
Sawgrass Systems, Inc.

Moderated by Russell Barron, IP partner, Foley & Lardner LLP, (see bio on page 8), who will also speak on advances in measuring IP performance.

Speakers

- Li Deshan, head, Electrical Dept., CCPIT Patent and Trademark Law Office, on the current status on IP in China
- Chun Y. Yang, Foreign Legal Consultant, Kim & Chang, on the basics of Korean patent law
- Hernán G. Murúa, chemical engineer, Eng Horacio Adrian (Brazil) on IP, false cartridges, and free competition in South America
- Stephen P. Fox, counsel, Foley & Lardner (former vice president and deputy general counsel for the IP Dept. at Hewlett-Packard, on IP Lessons Learned at the Hewlett-Packard Co.

Thursday, September 21
5:00–6:30 pm

For a complete listing of presenters, as well as bios and abstracts of presentations for those above, please visit the conference website.

Purdue University; and Eric S. Hamby, Xerox Corp. (USA)

A Technical Overview of Optical Unit for Tandem Color, Kohji Sakai, Ricoh Co., Ltd. (Japan)

High Image Quality and Stability of Full Color Digital Electrophotographic System, Masumi Sato, Jun Shiori, and Megumi Ohtoshi, Ricoh Co. Ltd. (Japan)

State of the Art in Elastomeric Rollers for Printing (Focal), Gerhard Bartscher, Johann Weinert, Uwe Zettl, and Barbara Vogt, Felix Boettcher GmbH & Co. KG (Germany)

Study on Modeling of Fuser-Generated Curled Sheet and Prediction of Dog-Eared Defect in Sheet Feeding Unit Using 3D Sheet Feeding Simulation, Shogo Matsumoto and Hiroyuki Seki, Ricoh Printing Systems, Ltd. (Japan)

Optimal Time-Sequential Sampling of the Color Reproduction Characteristic Function, Teck Ping Sim and Perry Y. Li, University of Minnesota (USA)

A Large MEMS Scanning Mirror for Laser Printing Application, Yee-Chung Fu, Advanced Numicorn Systems (USA)

DIGITAL FABRICATION

8:00 am - 12:00 pm

NEW AND NOVEL FABRICATION METHODS AND CHARACTERIZATION

Session Chairs: Shinri Sakai, Seiko Epson Corp.; Arved Huebler, University of Chemnitz; and Gregory S. Herman, Hewlett-Packard Co

Electrokinetic Imaging, a New Electrostatic Printing Process for Liquid Toners (Focal), Robert H. Detig and Dietmar C. Eberlien, Electrox Corp. (USA)

Gravure Printability of Conductive Polymer Inks, Erika Hrehorova, Alexandra Pekarovicova, and Paul D. Fleming, Western Michigan University (USA)

Near-Field Scanning Optical Nanolithography with Surface-Wave Enhanced Probes (Focal), Reuben T. Collins, Ian C. Schick, P. David Flammer, and Cecile Veauvy, Colorado School of Mines; and Russell E. Hollingsworth and Gregory J. Nuebel, ITN Energy Systems, Inc. (USA)

Electrospray for Digital Microfabrication (Focal), John A. Rogers, University of Illinois (USA)

Direct-Write Thermal Spray for Sensors and Electronics: An Overview (Focal), J.P. Longtin, S. Sampath, and R. Gambino, SUNY-Stony Brook; and R. Greenlaw and J. Brogan, MesoScribe Technologies, Inc. (USA)

A Combined Ink Jet Printing/Photoreduction Process for the Fabrication of μ m-size Conductive Tracks, Jonathan Stringer and Brian Derby, University of Manchester (UK)

Drop Placement Error Analysis for Ink Jet Deposition (Focal), Ross N. Mills, Gregory D. Gates, and Shawn Santana, imaging Technology international (iTi) Corp. (USA)

The Impact and Spreading of Ink Jet Printed Droplets, Jonathan Stringer and Brian Derby, University of Manchester (UK)

12:00 - 2:00 pm

INTERACTIVE SESSION

lunch provided

Session Chairs: Masahiro Hosoya, Toshiba Corp.; Alexander Knobloch, PolyIC; and Alfred Pan, Hewlett-Packard Labs.

Bio-Printing of Living Organized Tissues Using an Inkjet Technology, Tao Xu, Weixin Zhao, Anthony Atala, and James Yoo, Wake Forest University School of Medicine (USA)

Building in Paper, Tyler Hinckley, stephensdynia architects pc; and Emmanouil Vermisso, Syracuse University(USA)

The Dawn of Ink-Jet Fabrication in Reel-to-Reel System, Wanda W. W. Chiu, Cheng-Yi Wang, Hsiang-Pei Ou, Chih-Hsuan Chiu, Ming-Huan Yang, and Kevin Cheng, DTC/Industrial Technology Research Institute(Taiwan)

SPECIAL EVENT

Join other attendees at a special networking event

**NIP22
Digital Fabrication
Conference
Reception**

**Thursday, September 21
6:30-8:30 pm**

Green Ink Jet Technology for Fabrication of Multilayer Flexible Curcuit Part II: Reliability Testing, Ming-Huan Yang, Chia-Chi Wu, Chung-Wei Wang, Yuh-Zheng Lee, and Kevin Cheng, DTC/Industrial Technology Research Institute; and Cheng Po Yu, Cheng Hung Yu, and Chi-Ming Chang, Unimicron Co. (Taiwan)

Green Ink Jet Technology for Fabrication of Multilayer Flexible Curcuit Part I: System Construction & Fabrication Process, Jie-Kai Chang, Kevin Cheng, Ming-Huan Yang, Chung-Wei Wang, and Fu-Kang Chen, DTC/Industrial Technology Research Institute; and Cheng Po Yu, Chang Ming Lee, and Tzyy-Jang Tseng, Unimicron Co. (Taiwan)

The Physics for Organic Thin-Film Transistors with Ink Jet Printed Metal Electrodes, Kuo-Tong Lin, Chia-Hsun Chen, Ming-Huan Yang, Yuh-Zheng Lee, and Kevin Cheng, DTC/Industrial Technology Research Institute (Taiwan)

Ring Edge in Film Morphology: Benefit or Damage for Ink Jet Fabrication of Organic TFTs, Jhih-Ping Lu, Hsuan-Ming Tsai, Yuh-Zheng Lee, Kuo-Tong Lin, and Kevin Cheng, DTC/Industrial Technology Research Institute (Taiwan)

Hybrid Stacked RFID Antenna Coil Fabricated by Ink Jet Printing of Catalyst with Self-Assembled Polyelectrolytes & Electroless Plating, Chung-Wei Wang, Chia-Chi Wu, Ming-Huan Yang, Yung-Kuo Ho, Yuh-Zheng Lee, and Kevin Cheng, DTC/Industrial Technology Research Institute (Taiwan)

Laser Direct Writing for Flexible Electronics, Ron Hellekson, Cary Addington, Chuck Metge, Carl Picciotto, and Jun Gao, Hewlett-Packard Co. (USA)

Design Rule for Integrated Ink Jet Fabrication Platform, Chih-Jian Lin, Wanda W. W. Chiu, Huo-Hua Wu, Cheng-Yi Wang, Chih-Hsuan Chiu, Chen-Chu Tsai, Chien-Kai Chang, and Kevin Cheng, DTC/Industrial Technology Research Institute (Taiwan)

2:00 - 4:20 pm

NOVEL APPLICATIONS

Session Chairs: Shirui Sakai, Seiko Epson Corp.; Alexander Knobloch, PolyIC; and Alfred Pan, Hewlett-Packard Labs.

Digital Fabrication Techniques in Art/Craft and Designer/Maker Ceramics, David Huson, University of the West of England (UK)

The Instant House: A Digital Fabrication System for Design Model and Full Scale Wood Frame Housing, Marcel Botha and Larry Sass, Massachusetts Institute of Technology (USA)

Paper Objects Made through Laser Cutting and Scoring: A Smooth Step from Digital Printing to Digital Fabrication, O. Acher, CEA Le Ripault (France); and D. Persico and A. Bobrow, H.W. Sands Corp. (USA)

Digital Printing of Optical Components: Fiber Optics to Medical Products, Donald Hayes, Ting Chen, and David Wallace, MicroFab Technologies, Inc. (USA)

The Formation of Three-Dimensional Structures on Substrates, Don McCallum, Anglia Ruskin University (UK)

Self-Assembly of 3D Magnetic Tiles, Jessica Rabl, Massachusetts Institute of Technology (USA)

Friday September 22, 2006

8:00 - 9:30 am

PLENARY SESSION

Session Chair: Eric Stelter, NexPress

Breakfast Buffet

Microprinting of Biomaterials, Ali Khademhosseini, Harvard/MIT's Division of Health Sciences and Technology and Harvard Medical School (USA)

TRACK 1

9:40 - 11:40 am

ELECTRONIC PAPER AND PAPER-LIKE DISPLAY

Session Chair: Makoto Omodani, Tokai University

Color Toner Display Based on Control of Particle Movement (Focal), Takashi Kitamura, Tetsuya Yamamoto, and Sakiko Nakamura, Chiba University (Japan)

Electro-Optical Characteristics of Mobile Fine Particle Display with Liquid Crystal (Focal), Yasuo Toko, Stanley Electric Co., Ltd. and Taiju Takahashi, Kogakuin University (Japan)

Optimization Phenomenological Quasielastic Isotropic Medium Simulation for Phenomenal Liquid Crystal (Focal), Chia-Fu Chang, Chia-Hi Chan, and Zou-ni Wan, Kun Shan

University (Taiwan)

Ink Jettable Electronic Materials for Flat Panel Display and Passive Component Manufacture (Focal), Klaus Kunze and Karel Vanheusden, Cabot Corp. (USA)

TRACK 2

9:40 - 11:00 am

MEDIA FOR DIGITAL PRINTING

Session Chairs: Petri Sirviö, StoraEnso, and Toshiharu Enomae, University of Tokyo

Monodisperse Bead Design for Ink Jet Printing Substrates, Xiaoru (Jenny) Wang, Larry DeMejo, Greg Missell, and Wanda Swartz, Eastman Kodak Co. (USA)

Micro Liquid Absorbency of Ink Jet Media, Toshiharu Enomae, Yohta Mori, and Akira Isogai, The University of Tokyo (Japan)

Novel Ink Jet Coating Silica, Arnold Storeck, Ulrich Brinkmann, Christian Goetz, and Stefan Scharfe, Degussa AG (Germany)

Effect of Silica Pore Characteristics on Ink Jet Print Attributes, Sanjay Monie, Natalia Krupkin, and Beate Stief, Grace Davison (USA)

TRACK 3

9:10 - 10:30 am

INDUSTRIAL AND TEXTILE PRINTING

Session Chairs: Ramon Borrell, Hewlett-Packard Española SL; Hiroyuki Kawamoto, Waseda University; and Peter Roth, Epic Research

From Application to Resolution (Focal), Eyal Gargir, HP-Scitex (Israel)

Jettability and Stability of Ink Jet Inks for Textile Printing, Hitoshi Morimoto, Kei Kudo, and Yasuhiko Kawashima, Konica Minolta (Japan)

SPECIAL EVENT

All attendees are invited to join us for the Friday morning plenary, which will feature a buffet breakfast beginning at 8:00 am followed by the plenary address at 8:30.

Breakfast is included in your registration fee, but you must indicate via the conference registration form that you will be at this session to receive the appropriate admission ticket.

**Breakfast Buffet and Plenary
Friday, September 22
8:00–9:30 am**

NIP22/DF 2006 Technical Registration

First/Given Name _____ Last/Family Name _____

Title/Position _____ Company _____

Mailing Address _____

Telephone _____ Fax _____ Email _____

Conference registration includes: admission to all technical sessions for both conferences, a choice of conference Proceedings, entrance to the exhibit, coffee hours, ticketed receptions, and Friday morning breakfast (you must indicate your intention to attend). Separate registration fees are required for tutorials. Guest/spouse registration includes continental breakfast Monday-Thursday and the Welcome and Conference receptions.

Please indicate the days you plan to attend:

Mon Tues Wed Thurs Fri (if you plan to attend the Friday morning breakfast, you must check here)

Please circle the NIP Track(s)/DF session you plan to attend most: NIP 1 NIP 2 NIP 3 DF

Conference Registration (CHECK ONE)	until 8/20	after 8/20	TOTAL
<input type="checkbox"/> IS&T/ISJ Member	\$570	\$615	\$ _____
<input type="checkbox"/> Non-member	\$680	\$725	\$ _____
<input type="checkbox"/> IS&T/ISJ Student (ID required) Member	\$140	\$170	\$ _____
<input type="checkbox"/> Student (ID required) Non-member	\$170	\$200	\$ _____
<input type="checkbox"/> IS&T/ISJ Speaker/Session Chair Member	\$460	\$505	\$ _____
<input type="checkbox"/> Speaker/Session Chair Non-member	\$555	\$600	\$ _____

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

<input type="checkbox"/> NIP/DF abstract book with CD (contains full proceedings for both NIP and DF on CD)	NC
<input type="checkbox"/> NIP Hardcopy book (contains proceedings for NIP only)	NC
<input type="checkbox"/> DF Hardcopy book (contains proceedings for DF only)	NC

Extra proceedings \$60/each \$ _____

(indicate number of each and multiple by special advance purchase/onsite price)

NIP22 Hardcopy DF Hardcopy NIP/DF abstract book with CD

Tutorial Registration

	Member	Non-member	
<i>(multiply number of classes by per course fee; students may register at half price)</i>			
2-hour (per class; add \$50/class after 8/20)	\$160	\$210	\$ _____
Check all that apply: <input type="checkbox"/> T12 <input type="checkbox"/> T019:			
4-hour (per class; add \$50/class after 8/20)	\$240	\$290	\$ _____
Check all that apply: <input type="checkbox"/> T1 <input type="checkbox"/> T2 <input type="checkbox"/> T3 <input type="checkbox"/> T4 <input type="checkbox"/> T5 <input type="checkbox"/> T6 <input type="checkbox"/> T7 <input type="checkbox"/> T8 <input type="checkbox"/> T9 <input type="checkbox"/> T10			
<input type="checkbox"/> T11 <input type="checkbox"/> T13 <input type="checkbox"/> T14 <input type="checkbox"/> T15 <input type="checkbox"/> T16 <input type="checkbox"/> T17 <input type="checkbox"/> T18 <input type="checkbox"/> T20 <input type="checkbox"/> T21 <input type="checkbox"/> T22 <input type="checkbox"/> T23			
Series (per series; add \$100/series after 8/20)	\$540	\$590	\$ _____
<input type="checkbox"/> General Technology <input type="checkbox"/> Electrophotography <input type="checkbox"/> Digital Fabrication <input type="checkbox"/> Business			
<input type="checkbox"/> Image Quality <input type="checkbox"/> Mix 'n' Match (you choose three) T____ T____ T____			
<input type="checkbox"/> Ink Jet Series (different price than others)	\$480	\$530	\$ _____

Other	US address	Non-US Address	
<input type="checkbox"/> IS&T half-year membership (new members only; expires 12/06):	\$47.50	\$52.50	\$ _____
<input type="checkbox"/> IS&T 8-month membership (expires 12/31/07):	\$142.50	\$157.50	\$ _____
<input type="checkbox"/> IS&T membership renewal (expires 12/31/07):	\$95	\$105	\$ _____
<input type="checkbox"/> Student membership (Oct. 1, 2006–Sept. 30, 2007)	\$25	\$25	\$ _____
<i>join now and calculate fees based on member rates</i>			
<input type="checkbox"/> Guest/spouse registration (Name: _____)		\$75	\$ _____

GRAND TOTAL \$ _____

Payment Method: Check (Check # _____) AMEX MC VISA Discover
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Return this form with signed credit card authorization or check payable in US dollars to
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Please note: To cover bank charges and processing fees, there is a cancellation fee of \$75 dollars until September 17, 2006. After that date, the cancellation fee is 50% of the total plus \$75. All requests for refund must be made in writing. No refunds will be given without a written request of after October 17, 2006.

Call for Exhibitor Registration and Information

NIP22/DF 2006 Hotel Registration and Car Rental Information

A special block of rooms at a discounted rate is being held at the Hyatt Denver Convention Center Hotel for IS&T attendees for the nights of September 17 – 22. The discounted rate will be extended for 3 days before and after these dates, based on availability. Early reservations are assigned on a priority basis to conference attendees provided they are received by August 25, 2006. To guarantee a room, a credit card number or deposit equal to one night's housing must accompany a reservation request.

Reservations may be made by calling the hotel at 800/233-1234 and letting them know you are with the 2006 Non-impact Printing Conference; by visiting <http://denverregency.hyatt.com/groupbooking/denccsist2006>; or by faxing this form to 303/436-9102.

Reservations Deadline: August 25, 2006

First/Given Name _____ Family Name _____
Title/Position _____ Company _____
Mailing Address _____

Telephone _____ Fax _____ Email _____

Arrival Date and Time _____ Departure Date _____

- Single (\$155) Double (\$165) Triple (\$195) Quadruple (\$215)
 Regency club (add \$35/day to above rate) Business Plan (add \$20/day to above rate)*
—Rates are per day; add 14.85% tax to room rates as quoted—

Special needs: _____

Deposits can be made by check or a major credit card.

Payment Method: Check (Check # _____) AMEX MC VISA Discover
Card#: _____ Exp. Date: _____
Name as it appears on card: _____
Authorization Signature: _____

Notice of cancellation must be given to the hotel 72 hours prior to arrival date to receive a full refund of deposit. Be sure to obtain a cancellation number.

Check in is 3:00 pm. Check out is 11:00 am. There is no charge for children under 18 years when sharing a room with a parent with existing bedding. Please advise the hotel of any change in date or plan.

To/From Denver International Airport (DEN)

Information on flights in/out of DEN and ground transportation to/from the airport can be accessed via the airport's very comprehensive Website at: www.flydenver.com/.

Car Rental Information

Enterprise Rent-A-Car is offering a 10% discount for NIP/DF attendees wishing to rent a car. A Colorado sales tax of 13.35% applies. IS&T does not guarantee these rates to be the lowest of any rental agency and is providing this information only as a service to attendees.

Enterprise Rent-A-Car are located at the Hyatt Denver Convention Center and Denver International Airport (DEN). Rentals from the airport incur a \$1.80/day charge and an 11.1% airport access fee. All drivers must be over the age of 21 and have a valid driver's license. Additional drivers may be added at DEN for a fee of \$4.00/day (spouses excluded). For more details, contact Enterprise directly.

To make a reservation call 800/593-0505 and reference Account Number: 12DDT08. You may also go to www.enterprise.com, enter the Account Number: 12DDT08 in the Optional Account Box and hit enter, then enter the first 3 letters of the Event Name: NIP

Please call Amy Rich at 303/925-8487 if you encounter any problems with availability or need any assistance in making the reservation.

* call for details

Digital Fabrication 2006/NIP22

Society for Imaging Science and Technology
7003 Kilworth Lane
Springfield, VA 22151 USA
703/642-9090; 703/642-9094 (fax)



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