RECONNAISSANCE

OPTICAL DOCUMENT SECURITY™

24–26 JANUARY 2018

Palace Hotel
San Francisco, USA

Discover the latest developments in security features, imaging technologies, smart printing, optically variable devices, micro- and nano-optics and optical examination methods for secured documents.

**www.opticaldocument
security.com**

Welcome

Since 1996 the **Optical Document Security** conference has served as the forum for the introduction and discussion of new optical methods of protecting secured documents. This has paralleled – even contributed to – optical security features becoming an established component of such documents, so that now they are an integral part of banknotes, identity cards and documents, tax stamps and other documents of value which need to be protected against criminal fraud.

Optical security devices have proved their efficacy as overt and covert protection methods, available to the public and specialists as key examination elements. The papers to be given at the 2018 ODS conference show that this field remains inventive, innovative and imaginative, continuing to devise new approaches to defeat the criminals' efforts to defraud and deceive. Yet secured documents now face perhaps their greatest challenge, not from criminals but from new electronic devices that are being increasingly used as a cash substitute, as a means of identification and a method of authentication. Will these replace or complement physical documents and their optical features?

Join us at ODS 2018 to learn about optical security innovations, the use of smartphones as a means of authentication and to consider the implications of these technologies and other new approaches.

Ian Lancaster, Conference Chairman

Who Should Attend

The conference provides information, insight and guidance on future developments to around 250 delegates including:

- Specifiers and designers of banknotes, ID documents, tax documents, breeder documents such as birth certificates and other secured government-issued documents
- Specifiers and designers of commercial or private sector secured documents including those issued by banks and financial institutions, educational institutions, retailers, transportation companies, concert and sports events promoters
- Specifiers and designers of personnel access and identity documents
- Producers and suppliers of security-printed documents
- Producers and suppliers of components for security-printed documents
- Designers and producers of document examination equipment, including smartphones, apps, ATMs, counting and sorting equipment
- Researchers in the security component, biometrics and security printing fields

Thursday 25 January *(morning)*

Digital vs Physical: A Watershed in Document Security?

Ian Lancaster, Chairman, Optical Document Security Conference

Since the previous ODS conference there has been a marked acceleration in the adoption of electronic devices as means of payment and carriers of identity information. How secure are these systems, what will be their relationship to physical security items such as documents and cards, what does this mean for document security? Are we at a watershed in the document security field, which will see 1400 years of paper use replaced by digital records and electronic transactions? What might this mean for the future of the secured document sector and, indeed, for the ODS Conference?

Human Factors and Design

As People Do Not Check, Counterfeiters Settle for 50%

Hans de Heij, De Nederlandsche Bank

The concept of public features as a first line of defence was introduced in the 1980s. This policy needs to be reviewed, as interest in public authenticity features of banknotes is declining. Two recent studies conducted in the Netherlands point in this direction. A third study reveals that the counterfeiter anticipates and settles for a 'medium' reproduction quality.

Lab-Based Perception Studies: Ten Years of Experimentation

Badr Omrane and others, Bank of Canada

This presentation highlights the Bank of Canada's experience with perception studies over the last ten years, describing how those methods have evolved to provide valuable insights into the understanding of human authentication behaviours and better information for developing banknotes. This progression of lab-based methodologies has highlighted a number of interesting factors in authentication, including the importance of 'first glance' evaluation, the extent of the role played by intuitiveness and perceptual quality, as well as the effects of training, external instruction, and multiple decisional choices on human authentication behaviour.

Computer-assisted Visual Perception to Enhance Banknote Design

Heinrich Terborg, Banco de México

Using traditional methods to assess the functionality of a new banknote involves a series of time consuming and costly studies such as surveys, focus groups, eye tracking, EEG, which require the production of specimen banknotes with the further downside of having to disclose unissued note designs. As explained in this paper, Banco de México has developed and implemented a series of computer algorithms as a first attempt to mimic human perception, to promote an in-house iterative design process and better integration of banknote security features.

Design Considerations for Integration of OVD Security Features

Tyra McConnell, U.S. Department of State Counterfeit Deterrence Laboratory

The effectiveness of a security feature depends on the availability of the technology in commercial markets, ease of feature recognition and inspection by both trained and untrained viewers. Equally important is how the feature is integrated into the document to maximise its value. There are different strategies to make any patch security feature more resistant to transplantation from a genuine document into a counterfeit document. OVD images from various genuine security documents will be provided to show a range of different design executions to demonstrate different strategies applied in issued security documents.

Neurometrics Applied to Banknote Design Perception: a First Validation Study

José María Sánchez Echave and others, Banco de España; **Mariano Alcañiz Raya,** Universitat Politècnica de València, Institute for Research and Innovation in Bioengineering

The objective of this study is to validate a new methodology that help us to understand how we perceive banknotes. To do this, we will make use of the latest neuroscience techniques and the measurement of human behavior towards different banknotes designs. Parsing several physiological responses along with the subject conscious assessment while they feel and look at the banknote, we will analyse the existence of patterns in unconscious responses and potential correlations between the obtained neurometrics and the final design evaluation in order to be able to establish a new type of banknote design perception test.

Validation of Laser Engraved Floating Portraits as a Means for Document Authentication

Christopher Haas, Gemalto

We conducted human trials to test the accuracy of the authentication process across different laser-engraved floating image (LEFI) ghost portrait sizes and levels of matching difficulty. Subjects analysed many pairs of 2D and LEFI portraits. Results suggested that these ghost portraits can be compared to 2D portraits as a means of document authentication even in small sizes and under difficult discrimination conditions. However, size is even more critical for LEFI portraits than for conventional ghost images in terms of authentication accuracy and time taken. Based on this, we identified a minimum acceptable LEFI size that allows optimal authentication.

For any changes and additions
to the programme, visit
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Thursday 25 January *(afternoon)*

Window Features

Colourful Images for Secure Windows from Thin-Film Coated Micro-Mirrors

Christian Fuhse, Papierfabrik Louisenthal

It is well-known that various optical effects viewed in reflected light can be generated by combining micro-mirrors with thin-film interference coatings. But this technology can also be adapted to generate impressive optical effects in transmitted light. A semi-transparent interference coating shows different colours in transmitted and in reflected light. For example, it may appear golden in reflection and blue in transmission. Since the colour in transmission depends on the viewing angle it can be controlled via the inclination of the micro-mirrors. This enables the generation of multi-colour transmission images where the colours change when the sample is tilted.

Moiré in Transmission – an Eye-catching Window Effect

Harald Walter, OVD Kinegram

We present novel security features based on moiré magnification but without the need for micro-lenses. Instead, demetallisation patterns are used as the magnifying element. The micro-images are a de-metallised pattern in a second layer, separated from the demetallised magnifying element by transparent polymer. The demetallised detail size needed is on the order of 5µm. This is achievable in roll-to-roll mass production with an in-house developed, extremely high-resolution, demetallisation technology. The moiré movement effect is seen in transmission. Additionally both metal layers possess different KINEGRAM designs in reflection.

A Transparent OVD Based on the Combination of Novel Origination Technology with Wet Index Coatings

Marcus Koch, Sectago

A transparent DOVID based on a mask-less lithographic origination process is described. All gratings are individually generated at highly variable parameter settings regarding pitch, depth, contour and vector orientation, resulting in unique optical feature characteristics at optimised diffraction efficiencies. For transmission viewing, more than four times the gratings' depth of reflective devices had to be realised without loss in high spatial resolution. Sealing of the gratings was well achieved by wet coating of HRI or LRI polymers. Technical details will be presented and samples will demonstrate the great potential for transparent OVD applications in documents.

Lensless Security Feature Printed on Transparent Substrate

Sylvain Chosson, Orell Füssli

This paper describes an optical variable security feature which is not based on lenses nor on diffractive structure. This is composed of a three-layer structure: a mirroring layer, such as a foil or a metallic print, is applied on one side of a transparent substrate, such as the window of a banknote. On the other side of the transparent substrate, a thin structure is printed. Only the printed structure carries the information to be revealed. At least two images are embedded into the printed structure. Those two images are seen by rotating the feature. It can be used for banknote individualisation.

Personalisation and ID Features

An Ultra-thin OVD for Personalisable Active and Passive Security Features

Peiman Hosseini and others, Bodle Technologies;
Harish Bhaskaran, University of Oxford

We present an extremely versatile type of ultra-thin coating capable of reversibly manipulating light using optical, electrical or heat excitation. Light modulation is achieved by reversibly changing the physical phase of an unstructured, ultra-thin (7-15nm) continuous layer of chalcogenide-based phase change material sandwiched between two transparent layers. The optical stack is designed to switch precisely between two states with tuneable colour and viewing angle variability, in a few microseconds, with high contrast, high reflectivity and without consuming any power once the switching is completed.

The Beauty of Light – Enhanced Usability and Multi-level Documents with Embedded Light

Joerg Fischer, Bundesdruckerei

Beside a vivid light emission, LEDs provide multi-level optical security functions, such as angle-dependent image morphing based on holographic structures, or forensic material information in the unique optical spectrum. We will unveil an ID card with on-card fingerprint sensor and attractive user guidance based on integrated LEDs. This smart ID document offers a user friendly and secure biometric identification alternative to conventional password methods. Details of the system with electronic and optical components will be discussed.

Personalised Colour-Shift in Polycarbonate

André Arsenault, Opalux

Opalux's security print technology can be thermally tuned using laser marking, allowing personalisation of identification documents with colour-shifting portraits. Previously, OpalPrint's thermal transition was well below the lamination temperatures used in polycarbonate identification documents (200°C or more), preventing its application in this platform. Now, Opalux has developed its materials to tolerate high temperature lamination while remaining laser tuneable. This talk will describe the structure/property of this material, including its conversion into foils for hot-stamping, the effect of polycarbonate lamination conditions, the effect of laser parameters on marking properties, and tolerance to a range of common circulation hazards.

Personalisation of Transmissive Security Feature

Beatriz Cerrolaza Martínez, Alise Devices

Personalised *LILIAC*® is a new generation of security features for transparent windows including the personalisation option while keeping the essence of the original solution with respect to transparency, absence of interference between the images during the verification process and low-thickness. This new functionality allows the individual personalisation of each element on one or both sides. Three alternative processes to accomplish personalisation in a cost and time efficient way will be described in detail. The possibilities for this security feature for transparent windows will be shown, from serialisation to cardholder portrait generation.

Smartphone Authentication or Smartphone Interaction

Smartphone-Based Authentication with Colour-Selective Light Steering Structures

Guillaume Basset, CSEM

We present here a novel DOVID-like feature, invisible to the human eye, to be visible and authenticated using smartphones. Using Resonant Waveguide Gratings (RWGs), we designed a diffractive pattern invisible except under a narrow viewpoint. This new feature allows colour-selective beam steering, is fully compatible with existing DOVID production infrastructures and can be embedded in any security device. The feature can work in any part of the spectrum and can direct white light from any low coherent source without the need of any additional filter or polariser. Multiple images and kinetic animation prototypes made with this technique will be presented.

Laser-Induced Illumination-Dependent PVD-coatings

Ralph Dominick, Ara Authentic

Physical vapour deposition (PVD) layer stacks with a specific composition and morphology are deposited onto flexible PET carriers. These coated PET films are placed on paper or plastic surfaces. By using a standard marking laser, the PVD layer stacks are encoded and transferred from the PET carrier onto the paper or plastic surface as 'PVD markings'. Such a PVD marking cannot be removed without destruction and shows a unique, illumination-dependent visual effect which can be authenticated with smartphones (offline) by using customised apps. In this paper the working principle is explained and examples for applications are shown.

The Modelling of Caustics to Produce a Projection Image

Luke Maguire, Reserve Bank of Australia

This technique projects a desired image when an array of micro-lenses embossed into the banknote substrate are exposed to a light source. The feature is designed computationally to make the projected image difficult to discern by inspection of the lens structures, and to accommodate a range of light sources, allowing wide accessibility to users with a mobile phone light. The projected image is formed from a collection of Gaussian-shaped caustic profiles, each arising due to light refracting through a single micro-lens.

Micro- and Nano-Materials

Security Printing Applications Inspired from Nanotechnology: A Review

Jon Kellar and others, South Dakota School of Mines and Technology

Over the past decades, worldwide nano-scale materials development has accelerated, resulting in a staggering number of new, sometimes exotic, functional materials. These new materials have sparked considerable interest in fields such as renewable energy, biotechnology, and biomedicine, but also hold potential for security printing. This paper reviews, and offers examples of, the application of nano-scale synthesised materials for security documents. The performance of nano-scale materials on security-relevant functionality, such as photonics, wettability, and solubility, will be reviewed.

Assessing the Resistance of Micro-Lens Security Features to Reverse Engineering

Robert Stewart, KBA Notasys

Micro-lens images have been a familiar sight for several decades. Until the last decade or so their application has been limited to relatively thick polymer sheets (200 microns +) but recently they have been used in thinner banknote materials. The difficulty of acquiring or producing lens arrays of a thickness sufficiently close to that used in the banknotes; printing at a sufficiently high resolution to match the lenses, and convincing integration with other features are all deterrents to counterfeiting. These characteristics, the expertise required and the counterfeit-resistance of micro-lens features are assessed, stressing the aspects that hinder the counterfeiter.

Diffractive Lenticular Stereogram Image

Michael Hardwick, CCL Secure;
Randy James, Pacific Holographics

We combine existing diffractive and lens technology to produce a diffractive lenticular stereogram image. This is achieved through printing lenses on one side of a polymer banknote window with a holographic structure on the other side. This produces a sharp, well defined image with vibrant diffractive effects and true colour effects. The use of specialised and unique origination techniques as well as a purpose-built printing platform make this security feature a highly secure and attractive addition to polymer banknotes. This paper will cover the design, origination and manufacturing techniques, as well as obstacles overcome during the manufacturing of the feature.

Interlaced Micro-Mirrors Providing Dynamic 3D and Animation for Overt OVDs in Diffused Light

Mark Raymond, Lumenco

Revolutionary computer-aided micro-mirror technology opens the door for a new generation of visually compelling and secure overt 3D and animated features 'written' in light with voxels. While the current field of holography and micro-mirror technologies offer limited effects, especially in ambient or diffused light, this innovative technology offers the possibility of up to 100 unique image frames. The result is a continuous 3D or animation image, dynamic and secure, with infinite axes of activation in any lighting conditions without lenses.

For any changes and additions
to the programme, visit
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Friday 26 January *(afternoon)*

Production and Protection of Banknotes

Intelligent Protection and Authentication in Payment Transactions by Smart Banknotes

Volker Lohweg and others, inIT – Institute Industrial IT, Ostwestfalen-Lippe University of Applied Science; **Johannes Schaede** and others, KBA-NotaSys

We describe new, smart, banknotes which are intelligent and able to generate their own digital product memory by imprinted, dynamic control elements. As long as the banknotes are in circulation, they store different information that can be globally retrieved. Consumers and automatic teller machines may use these elements to confirm banknotes' authenticity. The goal is achieved by new methods in banknote production and new algorithms and chemo-optical devices which equip these banknotes with active, local intelligence.

Advanced UV Security Features: From Design to Product Integration

Michaël Barret, Banque de France; **Martin Egginger**, Hueck Folien

A method of printing UV-fluorescent polychromatic images which has the potential for good counterfeit resilience through advanced print characteristics and tightly controlled visual rendition is presented. Based on a patented half-toning technique, the image processing workflow simplifies colour management and enables the reproduction of sharp, brilliant images with accurate saturated colours, subtle skin tones and smooth gradients. Another benefit relates to its greater capability with regard to constant image quality making it less susceptible to the inherent variations of traditional security foil printing methods. An innovative concept of integrated design in holographic metallised foil will be presented.

Landmark-Based Template Grouping to Speedup Media Recognition

Yun-Qian Miao, Gary Ross, NCR

In processing interactive currency transactions, such as at an ATM or SCoT, the customers' convenience is a core focus. To achieve this, not only is accuracy essential but quick throughput is also of high concern to the banknote authentication module. At NCR we have developed a fast banknote recognition method based on an efficient landmark-based template grouping technology. The presentation will explain the details and report results of our comparative study. It will address such question as: What are landmarks and how are currency templates grouped? How much does it boost the recognition process speed?

The Use of Spray Pyrolysis Technology in Security Materials Production

Pascal Pinceloup, STA Technologies, a SICPA company

The performance and reliability of anti-counterfeiting solutions incorporating security taggants and particles depend on the uniform properties of security materials. The use of the spray pyrolysis manufacturing process, characterised by high-precision batch-to-batch reproducibility, ensures the effective recognition of these particles specifically generated for machine-readable functionalities and forensic applications. The new developments of luminescent, magnetic and forensic taggant materials made by spray pyrolysis have opened up a realm of innovative solutions for issuing authorities and appointed laboratories.

Accurate Plate-to-Plate Registration for Multicolour Lens-Array Banknote Security Patterns

Jacques Perrier, KBA-Notasys

Multi-colour lens-array-based banknote security patterns require the highest registration between colours. A new plate alignment technique based on the banknote constituent patterns is presented. Most banknote security patterns are made of lines. These lines can be used to infer the plates' mis-registration as their nominal relative positions are known from the design data. Plate-to-plate registration can thus be measured at multiple locations within the printed sheet. Optimal plate positions are derived from the registration maps and fed back to the press. The image processing, optimisation methods, and the result consistency are discussed as well as an automatic measurement table.

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The Short Course

A Review of OVDs and the use Digital Electronic Devices

The ODS Short Course is recognised as a valuable introduction for people new to the field, whether working as a specifier, designer, producer or examiner, as well as providing a useful up-dating survey for optical document security veterans. The 2018 Short Course maintains this function, but in recognition of developments in the field it is in two parts. Part one provides a technical overview of the features that qualify in providing optical security for documents and how they are used to authenticate genuine documents or reveal fraud. The course will show how optical and material science can be combined to create OVDs that are opaque, translucent or transparent, reflective or transmissive, to be used as patches, stripes, threads or overlays, and how the latest developments allows OVDs to be more integrated into the design of the document they are protecting.

The course will also cover the latest trends and innovations in optical technologies such as micro- and nano-technologies and the use of window features.

Part two gives an insight into the use of electronic vision systems, such as smartphones, as authentication solutions and examination tools. This new section summarises the underpinning technologies to identify the opportunities for authentication. Topics covered include: machine vision, image capture devices and systems, camera testing, smartphone developments plus the risks and benefits of a smartphone platform for feature authentication.

The course has three presenters who have experience of OVD's for banknotes, payment cards, tax stamps, brand, ID documents and digital authentication devices.

Dr Mark Deakes, Director of Optical and Authentication Technologies for Reconnaissance International, is also the General Secretary of the International Hologram Manufacturers Association (IHMA) and the Editor of *Holography News®* and *Authentication News®*. Prior to joining Reconnaissance, he spent 15 years at De La Rue in various roles including Process and Technology Development Manager for Holographics and Technical Sales Manager for Solutions.

During his time at De La Rue, Mark was involved in the production and development of over 30 hologram products, and co-led the development of optically variable magnetic stripe. Mark also spent time in holographic production where he was heavily involved in improving aspects of the surface relief production processes. He has both a technical (BSC and PhD in Chemistry) and a business education (MBA).

Dr Alan Hodgson has a background in the optics of silver halide holography and optical data storage from over 20 years' in the photographic manufacturing industry. Spending seven years at 3M, specialising in print solutions for high security documents such as passports and identity cards, Alan recently returned to his consultancy business, working on projects in security printing, optical sensors and wearable devices.

Alan has a BSc in colorant chemistry and a PhD in instrumentation, both from the Department of Chemistry at the University of Manchester. He is a past President of the Society for Imaging Science and Technology and a Fellow of The Royal Photographic Society. Alan is the author of the "Printing Beyond Colour" and "Wider Eye" series of articles in Authentication News. He is a Visiting Academic at the University of Manchester Centre for Digital Fabrication, investigating routes to bring optical technologies into secure documents.

Dr David Tidmarsh has over thirty years corporate and security experience. He joined the Crane group (producers of paper for all US dollars), initially with its subsidiary Technical Graphics Security Products (the manufacturers of security threads for the US and other currencies) as director with responsibility for its overseas activities, then became Marketing Director for Crane AB – the banknote printer and papermaker which Crane bought from the Swedish government.

He previously spent ten years as chief executive of Applied Optical Technologies plc, and before that was a board director of security printers Bemrose Corp PLC. Dr Tidmarsh was the first chairman of the International Hologram Manufacturers Association (IHMA) and holds a PHD in Chemistry, as well as a degree in Business Administration.

The 2018 Conference Committee

We would like to thank the following members for their assistance in peer-reviewing this year's papers.

- **Ernesto González Candela**, Bank of Mexico
- **Paul Dunn**, OpSec (*UK*)
- **Christopher Haas**, Gemalto (*USA*)
- **Hans de Heij**, De Nederlandsche Bank
- **Pan Lihua**, Security Identification Union (*China*)
- **Narumi Pereira Lima**, Federal Police (Brazil)
- **Volker Lohweg**, INIT, Ostwestfalen-Lippe University of Applied Sciences (*Germany*)
- **John Mercer**, Document Security Alliance (*USA*)
- **Yoshiyuki Mizuguchi**, Toppan Printing (*Japan*)
- **Tony Poole**, AJW Inc (*USA*)
- **Johannes Schaede**, KBA-NotaSys (*Switzerland*)
- **Elisabeth Schulz**, European Central Bank
- **Andrey Smirnov**, Krypten Corporation (*Russia*)
- **Marc Surrency**, Federal Reserve Board (*USA*)
- **Harald Walter**, OVD Kinegram (*Switzerland*)

"Excellent comprehensive trip through the security features used on banknotes and security documents guided by two excellent presenters. Interesting and easy to follow and understand..."

Europol (on the Short Course)

Useful Information

Registration

To be part of Optical Document Security 2018, go to **www.opticaldocumentsecurity.com** to book online.

Fees

Delegate: $1,345* $1,495**

Speaker: $1,080* $1,195**
Only one presenter for each paper may claim the speaker rate.

Short Course: $565

Table Top Exhibition Space: $660* $730**

Fees do not include travel, visas, accommodation or accompanying spouse or social partner fees for the conference dinner.

*Available until 3 November 2017
**After 3 November 2017

Venue

The 2018 event will see the conference return to the Palace Hotel, San Francisco. Built in 1875 to celebrate the West Coast boom, the Palace Hotel is one of San Francisco's most treasured landmarks. The hotel is located a few blocks away from Union Square, Chinatown, the Financial District and the Moscone Convention Center.

Explore San Francisco from the convenience of a downtown location. Minutes away from the lobby you'll find iconic things to do in San Francisco, such as the Embarcadero Ferry Building, Chinatown, Union Square, cable cars, San Francisco Museum of Modern Art and much more.

Travel and Accommodation

Delegates are responsible for arranging their own travel, visas (where needed) and accommodation. Details of special hotel booking rates and how to make your hotel reservation can be found at **www.opticaldocumentsecurity.com**

Here to Help

If you have any questions about the conference, contact the conference team:

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Other Information

- **Conference Language:** The conference will be conducted in English.
- **Your Conference Organiser:** The event is organised by Reconnaissance, the leading source of business intelligence for authentication, security printing and holography. Visit **www.reconnaissance.net**
- **Release:** The organisers accept no liability for personal injury or any loss of or damage to delegates' personal effects. We reserve the right to cancel, modify or postpone the event without prior notice and to refuse admission to any person (with payments refunded).
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