TOPICALITIES

Edited by Markéta Držková

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News & more

Recent changes in ISO standards for graphic technology

This regular summary is focused on standards developed under the direct responsibility of ISO/TC 130 and brings an overview of the changes that have, or have not, taken place during the last year.

Based on the systematic review made every five years, six standards were reconfirmed and thus remain current, although published more than ten years ago. All deal either with printing inks or prepress data. Namely, they include ISO 2834-3:2008 Graphic technology – Laboratory preparation of test prints – Part 3: Screen printing inks, ISO 12040:1997 Graphic technology – Prints and printing inks – Assessment of light fastness using filtered xenon arc light, ISO 12640-4:2011 Graphic technology – Prepress digital data exchange – Part 4: Wide gamut display-referred standard colour image data [Adobe RGB (1998)/SCID], ISO 12642-1:2011 Graphic technology – Input data for characterization of four-colour process printing – Part 1: Initial data set, ISO 12644:1996 Graphic technology – Determination of rheological properties of paste inks and vehicles by the falling rod viscometer, and ISO 15930-1:2001 Graphic technology – Prepress digital data exchange – Use of PDF – Part 1: Complete exchange using CMYK data (PDF/X-1 and PDF/X-1a). The oldest one from this list, ISO 12644, was confirmed for the fifth time.

The more recent standards, which were confirmed for the first time, include ISO 12646:2015 Graphic technology – Displays for colour proofing – Characteristics, ISO 12647-7:2016 Graphic technology – Process control for the production of halftone colour separations, proof and production prints – Part 7: Proofing processes working directly from digital data, ISO 16762:2016 Graphic technology – Post-press – General requirements for transfer, handling and storage, ISO 17972-2:2016 Graphic technology – Colour data exchange format (CxF/X) – Part 2: Scanner target data (CxF/X-2), ISO 18620:2016 Graphic technology – Prepress data exchange – Tone adjustment curves exchange, ISO 19594:2017 Graphic technology – Test method for the determination of the binding strength for perfect-bound products – Page-pull test working upwards, and also two Technical Specification documents, ISO/TS 15311-2:2018 Graphic technology – Print quality requirements for printed matter – Part 2: Commercial print applications utilizing digital printing technologies, and ISO/TS 21830:2018 Image technology colour management – Black point compensation for n-colour ICC profiles.

In addition, two standards were confirmed, but soon the committee decided on their revision. For ISO 12641-1:2016 Graphic technology – Prepress digital data exchange – Colour targets for input scanner calibration – Part 1: Colour targets for input scanner calibration, the second edition is now in the draft stage. In the case of ISO 19445:2016 Graphic technology – Metadata for graphic arts workflow – XMP metadata for image and document proofing, the process was quick, and the second edition was published in 2022; see the next page.

Among more than 20 standards in different stages of development, a new project dealing with the evaluation of colour graininess was registered in September 2021 to be published as Part 22 within the ISO/TS 18621 series.

The 8th edition of the drupa Global Trends report

This series of reports that monitor key developments across the print industry was regularly published each year in spring from 2014 to 2020 and then had to be paused as a consequence of the COVID-19 pandemic. Now, after two and a half years, the 8th drupa Global Trends report was published at the end of this September. Due to the lack of opportunity to recruit panel members among visitors of the drupa fair, the number of printers and suppliers participating in the survey has noticeably decreased. The analysis is based on the answers of over 500 senior decision makers who completed the expanded online survey in spring 2022. The reliability of regional results for North America and Africa is low, and in the case of Australia/Oceania and the Middle East, the data sets were too small; however, overall, the report again brings valuable insight.

In spite of many significant and unexpected disruptions, the global net balance of economic confidence remained positive. That is also true when examining the expectations for the next year, but in this case, the European printers are considerably more cautious. The finding that stands out from the previous trends is the unprecedented number of printers raising prices in most regions and markets, and the result is similar among suppliers. When comparing the major printing technologies, the volume of commercial print produced by sheetfed offset strongly decreased, but it was almost compensated by a growth in packaging print, which also shows a clear growth for flexography. In addition, electrophotography gained a significant share increase in commercial print and publishing markets. The investments are planned to return to greater growth after the current slowdown.

Findings from a survey among book readers and listeners

The survey was commissioned by Stora Enso, the company that develops products and technologies based on wood and biomass and contributes to a wide range of innovations towards greater sustainability. The goal was to gain insight into the current state and outlook of the book market. The results, collected this spring and published in summer, are based on the answers of 2 400 respondents from the UK, France, Germany and the USA. The key findings include the positive effect of the COVID-19 pandemic on reading, with 63 % of respondents stating they read more, the strong position of physical books, which are preferred by 65 % of respondents compared to 21 % preferring e-books and 14 % preferring audiobooks, and the concerns for carbon footprint as 61 % of all respondents and 70 % of youth would accept a higher price of carbon neutral books.

The transformation of the Ghent Workgroup specifications

The new version, GWG 2022, is available from this March. It remains based on PDF 1.6 format and PDF/X-4 standard because PDF 2.0 and PDF/X-6 are not yet sufficiently implemented and used in the industry. The major novelty is the possibility of reducing false positives in preflight results. Also, the packaging variants of the specification now permit PDF files to contain information on processing steps compliant with the corresponding standard (ISO 19593-1), defining the concept of a 'Product Type' and identifying the appropriate processing steps for different product types. The most apparent change from previous specifications, released in 2015 and later, consists in their transformation into one Google Sheet document to facilitate improving the structure and consistency in the use of terms and definitions, further development, and tracking of the changes.

ISO 12640-3:2022
Graphic technology – Prepress digital data exchange
Part 3: CIELAB standard colour image data (CIELAB/SCID)

This standard provides a set of test images with a large colour gamut related to illuminant D50 and data encoded as 16-bit CIELAB, which can be used for evaluating changes in image quality during coding, processing, displaying and printing. In August 2022, the original version from 2007 was replaced by this second edition; it reflects minor changes in the related CIE publications, such as the International Lighting Vocabulary; see also JPMTR Vol. 9, No. 4 (2020).

ISO/TS 18621-11:2022
Graphic technology – Image quality evaluation methods for printed matter
Part 11: Colour gamut analysis

The first version from 2019, see JPMTR Vol. 9, No. 3 (2020), was replaced by this technically revised edition published this April. The changes include the correction of the equation for volume computation, the clarification of conformance requirements, and the selection of example gamut volumes.

ISO 19445:2022
Graphic technology – Metadata for graphic arts workflow – XMP metadata for image and document proofing

This version from June 2022 constitutes a minor revision of the first edition from 2016, see JPMTR Vol. 5, No. 3 (2016), with updated references.

ISO/TS 21328:2022
Graphic technology — Guidelines and recommendations for multicolour (CMYKOGV) print characterization

This new standard, available from August 2022, provides guidelines and specifies requirements for colour definition, data reporting and printing for the development of characterisation data for the multicolour process using CMYK + orange, green and violet, or CMYK plus any subset of the three added colours. Also, it recommends the ink pigment selections to produce an optimum colour gamut for specific printing processes or use cases.

ISO 24487-1:2021
Graphic technology — Processless lithographic plates
Part 1: Evaluation methods for characteristics and performance

This new standard defines test procedures and assessment methods for characteristics, on-press development performance, usability and print image quality of processless lithographic plates; plates for waterless lithography are out of scope. The standard was published in November 2021; since this September, its new version has been under development.

ISO 28178:2022
Graphic technology — Exchange format for colour and process control data using XML or ASCII text

This standard is focused primarily on the exchange of spectral, densitometric and colorimetric data. The second edition released this September replaced the version from 2009; it improves the specification of printing sequence, the use of delimiters and the plausibility of the sample ID usage.

Bookshelf

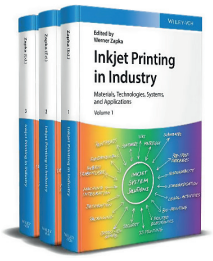
Inkjet Printing in Industry
Materials, Technologies, Systems, and Applications
3 Volumes

Gathering the knowledge and experience of many experts from different fields, three volumes of this new, extensive handbook cover a wide range of topics relevant to various applications of inkjet printing in the industry, from the basic considerations of the technology and materials to advanced processes and formulations, up to standardisation, legislation and licensing.

The first volume is organised into five parts and begins with the part introducing the content of individual chapters. Part II discusses wood-graining effects and reliable jetting performance, and the next one reviews the advantages and limitations of inkjet printing in comparison with other printing processes, especially screen printing. Part IV is dedicated to inks. It provides the fundamental background on inkjet ink formulations and details the monomers, oligomers, photoinitiators and formulations of UV-curable inkjet inks, including the inks for food packaging and label printing, as well as the inks and coatings cured by electron beam; further, it presents the dye-sublimation inks, ceramic inks, inks for security printing, conductive inks for digital-printed electronics, advanced formulations for optoelectronics and related applications, formulation of inks for regulated markets, the approaches to deinking and factors influencing deinkability. Part V brings an overview of printhead technologies from HP, Konica Minolta, Dimatix, Xaar, Seiko, Toshiba Tec, and Memjet.

The second volume also contains five parts. Part VI describes glass as well as paper and paper-based substrates for industrial inkjet applications together with their appropriate coating. Part VII deals with metrology, discussing the measurement of complex rheology and jettability of inkjet inks, inkjet droplet size, velocity, and angle of trajectory, the drop watcher technology and print quality analysis, measurement automation, print quality control, considerations for UV radiation measurement, and testing of printheads. Part VIII reviews different pre- and post-processes, including UV curing, priming for inkjet printing on textiles, UV lamps and UV-LED technology, the UV Direct Cure technology, electron-beam curing and processing, IR drying and processing, and photonic curing. Part IX describes software options for colour management and data handling, including the specifics of security printing. Part X presents several examples of machine integration.

In the third volume, four parts focus on printed electronics, the use of robotics, 3D printing and bioprinting, two parts describe selected case studies or examples and printing strategies, and the remaining four parts deal with the inkjet-related standards, regulatory requirements, ecological aspects and patents.



Editor: Werner Zapka

Publisher: Wiley-VCH
1st ed., August 2022
ISBN: 978-3-527-34780-3
1872 pages
Hardcover
Available also as an eBook

3D Imaging Technologies
Multidimensional Signal Processing and Deep Learning Volume 1: Mathematical Approaches and Applications

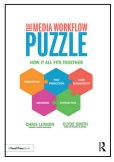
Editors: Lakhmi C. Jain, Roumen Kountchev, Junsheng Shi

Publisher: Springer
1st ed., October 2021
ISBN: 978-9811633904
360 pages, 165 images
Hardcover
Also as an eBook

This collection of selected papers presented at the 2nd International Conference on 3D Imaging Technologies – Multidimensional Signal Processing and Deep Learning (11–13 December 2020, Kunming, China) deals, for example, with digital camera spectral reconstruction, image recognition based on super-resolution nets, low-resolution image matching and recognition, digital watermarking, and 6D controller for mobile augmented reality. In addition, Volume 2: Methods, Algorithms and Applications is available and includes, among others, studies on spectral reflectance reconstruction and digital 3D representation of printing gamuts.

The Media Workflow Puzzle
How It All Fits Together

Editors: Clyde Smith, Chris Lennon

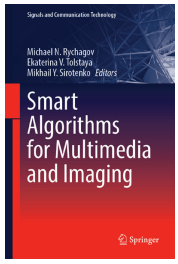


Publisher: Routledge
1st ed., March 2021
ISBN: 978-0815392897
272 pages
Hardcover
Also as an eBook

This book provides a comprehensive insight into evolving tools, processes and approaches used in electronic audiovisual media workflow, combining the technical information on resources and systems with practical advice, discussion of creative and quality aspects, future outlook, and also management and business context. It covers production, post-production, media assets and workflows management, distribution, archiving and preservation.

Smart Algorithms for Multimedia and Imaging

This book presents an overview of solutions developed by the contributors as a part of their industrial research in the field of multimedia processing, especially for imaging technology. Among five chapters dealing with image and video conversion, two explain different approaches for super-resolution, one based on multi-frames and the other on machine learning. Next two focus on 3D signal processing, namely the algorithms for estimating and controlling depth and semi-automatic 2D to 3D video conversion. The fifth chapter is dedicated to visually lossless colour compression technology. Three chapters on TV and display applications present the solutions for automatic video editing, real-time detection of sports broadcasts using video content analysis, and the generation and reproduction of natural effects. The following four chapters describe the use of machine learning and artificial intelligence in image classification provided as a service, mobile user profiling and two methods employed in magnetic resonance imaging – automatic view planning and dictionary-based compressed sensing. The last four chapters deal with algorithms for mobile devices, including a depth camera based on colour-coded aperture, an animated graphical abstract for an image, real-time video frame-rate conversion and iris recognition.



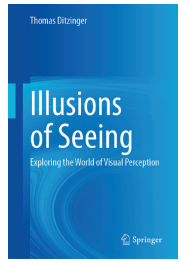
Editors: Michael N. Rychagov, Ekaterina V. Tolstaya, Mikhail Y. Sirotenko

Publisher: Springer
1st ed., May 2021
ISBN: 978-3-030-66740-5
447 pages, 278 images
Hardcover
Available also as an eBook

Illusions of Seeing
Exploring the World of Visual Perception

In this book, the author shares with readers his fascination with the human system of perception, in particular, colour vision. The content is organised into eight chapters. The first one provides the background on light, perception and the laws of seeing. The following chapters are dedicated to geometrical-optical illusions, perception of forms and brightness, ambiguous perception, colour vision, spatial perception, and perception of motion with illusions of movement. The eighth chapter illustrates the described phenomena with various examples from everyday life. The book demonstrates, among other things, many aspects worth considering or exploiting in graphic design and media production, such as why lighting conditions are essential for legibility and why the choice of colours is important for conveying the basic picture in the case of insufficient illumination.

Author: Thomas Ditzinger



Publisher: Springer
1st ed., July 2021
ISBN: 978-3-030-63634-0
291 pages, 243 images
Hardcover
Available also as an eBook

Prints as Agents of Global Exchange: 1500–1800

This collection of essays is part of the established scholarly series on Visual and Material Culture, 1300–1700. It explores the significance of printmaking in the early modern period in terms of the dissemination of prints beyond the borders of Europe shortly after the invention of the letterpress and considers the impact of spreading written and visual knowledge to the rest of the world mostly for conversion and didactic purposes with frequent modifications and meaning shifting in local conditions. The authors studied the influence on depicting the female body in Mughal paintings in India and the Ottoman sultan portraiture, the collection of Persianate calligraphies, drawings and paintings also containing two German engravings, the dissemination of Christian iconography to Armenia, the use and adaptations of the Jesuit printed materials in Japan, the evolution of the iconography of the Virgin of Guadalupe in Mexico City, the engravings of Indigenous culture adapted to Catholic education in New Spain, the use of auxiliary plastic models and prints in Italy, Spain and Peru, and the role of prints in the crafting of Mexican featherwork. While focused on specific cases, the contributions to this book also reveal broader trends.

Editor: Heather Madar

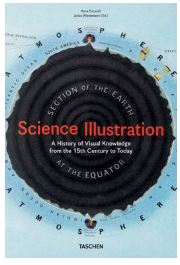
Publisher: Amsterdam University Press
1st ed., November 2021
ISBN: 978-94-6298-790-6
322 pages
Hardcover
Available also as an eBook

Science Illustration
A History of Visual Knowledge from the 15th Century to Today

In large format, this book showcases illustrations of significant scientific discoveries from the early modern period to the present day, accompanied by textual information. The selection of about 300 discoveries presents the work of more than 700 scientists in various fields, which include geography, astronomy, physics, chemistry, and biology. In addition to graphics explaining new theories and inventions or detailing the subjects explored, from living matter to the universe, the illustrations in the book encompass statistical graphics visualising quantitative information and other graphical approaches to communicating information. The collection is organised chronologically into chapters from Copernicus's heliocentrism to Newton's law of gravitation, from Watt's steam engine to Lavoisier's synthesis of water, from Darwin's theory of evolution to Edison's light bulbs, and from Einstein's relativity theory to CERN's Large Hadron Collider.

Author: Anna Escardó
Editor: Julius Wiedemann

Publisher: Taschen
September 2021
Multilingual Edition: English, French, German
ISBN: 978-3-8365-7332-0
436 pages
Hardcover



The Contemporary Small Press
Making Publishing Visible

Editors: Georgina Colby, Kaja Marczewska, Leigh Wilson

Publisher:
Palgrave Macmillan
1st ed., January 2021
ISBN: 978-3030487836
298 pages, Hardcover
Also as an eBook

In this title, published in the New Directions in Book History series, the authors explore the effects of publishing on literary writing with the rise of small literary presses in the Anglo-American publishing industry since the economic crash 15 years ago, two historical small presses that influenced modernist aesthetics, differences in poetry collections design across three different publishers, material forms of the small press, its gentrification, the ethical and financial implications of its professionalisation, the praxis of self-publishing, reader communities, the role of women-led small presses in the inclusive youth literature movement, editorial choice-making, the importance of evaluative judgement, and the small press as a space for radical politics.

Visible Signs
An Introduction to Semiotics in the Visual Arts

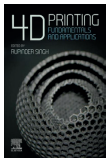
Author: David Crow

Publisher:
Bloomsbury Visual Arts
4th ed., August 2022
ISBN: 978-1350164932
192 pages, Softcover
Also as an eBook

The intention of this book is to help understand key concepts of semiotic theory, thus increasing the ability to analyse how visual communication works or why the message is biased. The fourth edition includes new illustrations, extended captions and updated exercises. In addition, it covers propaganda, emojis and other 'neutral' communication, as well as social media representation specifics.

4D Printing
Fundamentals and Applications

Editor: Rupinder Singh



Publisher: Elsevier
1st ed., January 2022
ISBN: 978-0128237250
194 pages
Softcover
Also as an eBook

Contributed solely by authors affiliated with universities and institutes in India, this book presents a selection of materials for 4D applications. These include different multi-material and hybrid-blended polylactic acid (PLA) composites, graphene-reinforced acrylonitrile butadiene styrene (ABS) and polyvinylidene fluoride (PVDF) composites, composite matrices combining ABS/PLA and high-impact polystyrene, PVDF with graphene and $BaTiO_3$, and PLA with ZnO. It also describes two-way programming of secondary recycled PLA composite matrix using a magnetic field, hydrothermal stimulus for 4D capabilities of composite based on PA6 polyamide with Al and Al_2O_3, and characterisation of rechargeable, flexible electrochemical energy storage device.

Recent Advances and Applications of Thermoset Resins

Author: Debdatta Ratna

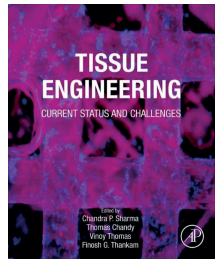
Publisher: Elsevier
2nd ed., February 2022
ISBN: 978-0323856645
612 pages
Softcover
Also as an eBook

This book is an extensive revision of the original edition, Handbook of Thermoset Resins. It covers the chemistry and applications of thermoset resins, their properties and processing, including 3D printing, toughened resins, composites and nanocomposites. Also, it deals with characterisation, performance evaluation and lifetime analysis of thermoset resins.

Tissue Engineering
Current Status and Challenges

This volume is contributed by almost 90 experts with different backgrounds to cover diverse aspects of tissue engineering and offer a global perspective on the developments in the field. The book intends to provide a reference from the fundamentals to the latest research advances and applications of tissue-engineered devices for clinical purposes. After introducing the basic concepts and historical evolution of tissue engineering and regenerative medicine, the editors organised the remaining 26 chapters of the content into six parts dealing with regenerative technologies, relevant aspects of stem cell research and technologies for nanomedicine, soft and hard tissue engineering, and also with regulatory guidelines, modelling and ethical issues in translational tissue engineering. Among others, the book reviews various applications of 3D scaffolding and printing, for example, to cell spheroids, bone and dental pulp tissue regeneration and engineering, muscle regeneration and skin tissue engineering, myocardial tissue engineering and heart valves, nerve tissue engineering and brain organoids, stem cell therapy, and organ printing, such as artificial liver and lung construct. Also, it presents suitable printing methods and materials, including innovations related to 4D printing, in-situ bioprinting, and more.

Editors: Chandra Sharma, Thomas Chandy, Vinoy Thomas, Finosh Thankam

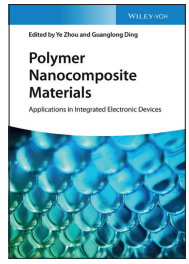


Publisher: Academic Press
1st ed., January 2022
ISBN: 978-0-12-824064-9
724 pages
Softcover
Available also as an eBook

Polymer Nanocomposite Materials
Applications in Integrated Electronic Devices

The first chapter of this concise book, reviewing the recent research on polymer nanocomposites, introduces the advantages of this rapidly developing group of materials, basic types of nanoscale fillers and properties of polymer nanocomposites, and methods for their synthesis. The following nine chapters focus on the fabrication of conductive polymer composites and their applications in various sensors, biodegradable polymer nanocomposites used in electronics, and polymer nanocomposites for specific types of devices and applications – namely photodetectors, pressure sensors, energy storage devices, triboelectric nanogenerators, resistive switching memory, temperature sensing and self-regulating heating devices, and electromagnetic interference shielding.

Editors: Ye Zhou, Guanglong Ding



Publisher: Wiley-VCH
1st ed., June 2021
ISBN: 978-3-527-34744-5
304 pages
Hardcover
Available also as an eBook

Bookshelf

Academic dissertations

Vat 3D Printable Materials and Post-3D Printing Procedures for the Development of Engineered Devices for the Biomedical Field

The concern of this thesis was to extend the range of biocompatible materials available for light-based 3D printing by developing custom-made photosensitive polymers and post-printing procedures modifying the surface of the 3D-printed parts to better meet the biomedical requirements and thus expand their applicability, especially in point-of-care testing. The approach facilitates the fabrication of more complex 3D microdevices with specific surface or bulk features.

Two chapters of the dissertation bring an overview of 3D printing fundamentals with a focus on photopolymerisation in general and biomedical vat 3D printing, especially towards the 3D-printed polymeric microfluidic devices, in particular. The experimental work is presented in three chapters. The first of them deals with the 3D printing of fluidic devices from custom-made, acrylate-based photocurable formulations and their appropriate post-printing treatment with the main objective to study and increase the cytocompatibility of 3D-printed transparent parts. The findings helped fabricate the bi-material fluidic chip by digital light processing in a single 3D printing step from two different photopolymers, one of them being acrylate–polydimethylsiloxane resin. The next chapter presents two methods for further enhancing surface properties through post-printing treatments. One makes use of the UV-induced bio-activation with selected functional groups linked by grafting polymerisation to the acrylate groups unreacted in the printing step, while the other one is based on the surface modification by microwave radiation, where both acrylate and epoxy moieties were exploited to link different amines to improve the antibacterial properties. The last experimental chapter is dedicated to tailoring optical features by adding the fluorescent dye commonly used for labelling biological units into the 3D-printable resins to increase the printing resolution and produce photoluminescent waveguides and light splitters, also applicable as solvent polarity sensors.

Doctoral thesis – Summary

Author:
Gustavo Adolfo Gonzalez Flores

Speciality field:
Material Science and Technology

Supervisors:
Fabrizio C. Pirri
Annalisa Chiappone
Ignazio Roppolo

Defended:
30 March 2021,
Politecnico di Torino, Department of Applied Science and Technology
Turin, Italy

Contact:
gustavo.gonzalez@polito.it

Further reading:
http://hdl.handle.net/11583/2897002
https://orcid.org/0000-0002-0501-9494

Ukrainian Ex-libris of the Late 1980s – 2010s: Traditions, Transformation, Latest Achievements

This thesis focused on a specific area of Ukrainian graphic art in the last three decades – the bookplates. The study systematically investigated different kinds of available sources, from the art and bibliophilic literature to private collections and exhibition catalogues, and considered various aspects, such as the incorporation of new graphic technologies, the influence of topical exhibitions as well as international contacts, and the representation of Ukrainian works in major foreign ex-libris collections. The resulting work brings a comprehensive account of the topic.

The first chapter presents the bookplate art as a subject of scientific study and documents the development and growing popularity of the Ukrainian ex-libris in the studied period. Further, it introduces the organisations of book lovers in Ukraine – from the Soviet era to the new stage after the Declaration of State Sovereignty of Ukraine – and their role in popularising

Doctoral thesis – Summary

Author:
Yuliya Vyacheslavivna Kamenetska

Speciality field:
Art History – Ukrainian Graphic Art of the XX and XXI Centuries

Supervisor:
Petro Volodymyrovych Nesterenko

Defended:
26 May 2021, National Academy of Fine Arts and Architecture
Kyiv, Ukraine

Language:
Ukrainian

Original title:
Український екслібрис кінця 1980-х – 2010-х: традиції, трансформація, новітні здобутки

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kamenecka.yliya@ukr.net

Further reading:
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the bookplate, including the exhibition "Ex-libris – winners" that presented the achievements of Ukrainian bookplate artists of the 1980s to early 1990s. The chapter also discusses the source base of the era of independent Ukraine with its role in the study of modern ex-libris. The second chapter details the activities of the Ukrainian ex-libris club and the relevant publications and exhibitions, increasing the international awareness of Ukrainian bookplate art as well as creating opportunities for graphic art students. Its other sections bring the analysis of thematic facets and stylistic features of the modern bookplate, document the evolution of graphic concepts, various techniques and genres, and review the accomplishments of Ukrainian artists in the field of ex-libris, including the contributions of artistic families. The third chapter focuses on the materials demonstrating the international recognition of Ukrainian ex-libris, which is reflected in the successful participation of Ukrainian artists at dedicated international congresses, exhibitions and competitions, as well as in the representation of their works in collections of many museums in the world, including the largest and oldest one, the Frederikshavn Art Museum Exlibris Collection. Overall, the analysis of the works of the last 30 years reveals specific features of Ukrainian ex-libris and a growing expression of the national spirit.

Doctoral thesis – Summary

Author:
Mohammad Usman Waheed

Speciality field:
Design Engineering

Supervisors:
Connor Myant
Peter Childs

Degree conferral:
1 January 2022, Imperial College London, Dyson School of Design Engineering
London, United Kingdom

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Further reading:
DOI: 10.25560/95429

Functional Mechanical Metamaterials: Development of Programmable Mechanical Structures

This thesis contributed to the research into engineering the materials that can form devices with desired functionality thanks to their appropriate, programmable mechanical behaviour. The work aimed to investigate the possibility of designing mechanical metamaterials computing Boolean logic, developing a mechanical metamaterial control system, integrating the mechanical metamaterial device into a larger morphological system, and achieving a multi-plane programmable behaviour. Such metamaterials could be beneficial in all industrial applications where electronic solutions can fail.

The dissertation provides the background on different types of mechanical metamaterials, namely the auxetic, origami and kirigami, multistable, topological, and combinatorial ones. For functional metamaterials, it discusses non-mechanical stimuli, mechanical metamaterials exhibiting Boolean logic, and selected industrial applications. Also, it presents the chosen manufacturing options, which included material jetting, stereolithography, and fused deposition modelling. The main part documents a step-by-step approach to accomplishing the objectives. It begins with the chapter describing the development of mechanical metamaterial logic. In particular, it discusses the concepts of mechanical Boolean logic gates, the theory of suitable bistable systems and their design, fabrication and applications in mechanical AND/OR and NOT logic gates, as well as the connected AND gates. The next chapter deals with the tunable bistable mechanical metamaterial control system, presenting its function and design with the corresponding analytical model and experimental setups for testing. The results were utilised in the successful development of combinatorial functional mechanisms. The corresponding chapter describes 3D mechanical metamaterials, a multi-plane bistable system, rod-logic mechanical metamaterial, and a mechanical metamaterial safety system. Finally, the work presents a case study comprising the design of a nuclear safety mechanism. The text explains the nuclear safety principles (isolation, incompatibility, inoperability, and independence) and the concept of unique signals. Then it compares the so-called pin-in-maze and counter meshing gears discriminating mechanisms, discusses their recent developments and presents the novel design using mechanical metamaterial.

Events

ICPFE 2022
12th International Conference on Flexible and Printed Electronics

Seogwipo, South Korea
11–14 October 2022

This year's edition of this established international event, taking place in Eastern Asia, is jointly organised by the Korea Flexible & Printed Electronics Association and the Korea Flexible & Printed Electronics Society. On the first day, it offers tutorials in the areas of artificial intelligence, micro-rheology, organic transistors, printing and coating processes, display technology, and bioelectronics. For the next three days, the schedule combines plenary lectures and technical sessions in four parallel tracks. The former includes six presentations: 'Printed wearable electronics for human and robots' by Unyong Jeong, 'Skin-inspired organic electronics' by Zhenan Bao, 'Inkjet printing based technologies for displays' by Yeogeon Yoon, 'Printed electronics for advanced displays' by Kwon-Shik Park, 'The productization of IJP-OLED technology for large size display' by Xin Zhang, and 'Future display technologies with perovskite emitters' by Tae-Woo Lee. The contributions accepted for the latter cover the printed and molecular electronics, biosensors and bioelectronics, printing process and equipment, new technologies and applications, smart packaging, flexible electronics for soft bodies and robots, display technology, flexible electronic materials, 3D/4D printed electronics, energy storage devices and materials, and artificial intelligence for printing. In addition, the programme includes a poster session and an industrial session.

American Printing History Association's 47th Annual Conference

Los Angeles, California, USA
13–15 October 2022

The theme of the 2022 volume of this event is 'Making Artistic Noise: Printing and Social Activism from the 1960s to the Present'. The aim is to explore the printing and printmaking revolution in this period in different areas and from a variety of perspectives, which include printing history, alternative publishing, do-it-yourself printing techniques, graphic design, book arts education, community engagement, labour organising, feminism, Black studies, Chicano and Latino history, as well as sexual and gender minorities' activism. The invited speakers are Lincoln Cushing, sharing the findings from his research on the so-called 'Long 1960s', Marshall Weber surveying current progressive activist printmaking, and Staci Steinberger presenting activist graphics from the Los Angeles County Museum of Art and exploring how their authors employed the available means of production from newspaper broadsheets and screenprints to risographs and social media, with the corresponding exhibition being on view during the conference. The focus of panel discussions is on the legacy of self-help graphics, the role of booksellers in preserving the history of social movements, and engaging students in social activism through the social justice poster project. In addition, conference attendees can visit Rare Books LAX, an antiquarian book, ephemera, fine press, and map fair.

Smithers Events for Printing and Packaging

The events scheduled for the last months of this year are all planned to take place in person, in some cases with an option of virtual participation, and include the 2022 editions of Specialty Papers US in Milwaukee, Wisconsin (4–6 October), Pigment and Colour Science Forum co-located with TiO_2 World Summit in Amsterdam, Netherlands (5–6 October), SmartPack US in Chicago, Illinois (17–18 October), and Sustainability in Packaging Europe in Barcelona, Spain (1–4 November).

FTA's Fall Conference 2022

Covington, Kentucky, USA
11–13 October 2022

Like each year, the Flexographic Technical Association designed the programme of this event to share the best practices in the flexographic industry and introduce essential innovations, including the exhibition of solutions available in the market. The 2022 edition highlights the novel print calibration technique using tone curves to match an ICC profile, the need for new human capital strategies, and more.

NAPIM 2022
Fall Technical Conference

Oak Brook, Illinois, USA
18–20 October 2022

In 2022, this event held by the National Association of Printing Ink Manufacturers focuses, among others, on new growth opportunities, patents and trade secrets, new energy-curable digital ink raw materials, and new legislation and compliance standards.

PRINTING United Expo 2022

Las Vegas, Nevada, USA
19–21 October 2022

For this year's edition of this large event with hundreds of exhibitors, the PRINTING United Alliance announced a new feature – the Keynote Theater with a panel discussion of how to grow profitably in the present conditions and six speakers sharing their expertise in finding new opportunities in the commercial print sector, software-driven manufacturing of printed products, transforming the postal service, using sustainability as a competitive advantage, building workforce and a loyal customer base.

GRID 2022
11th International Symposium on Graphic Engineering and Design

Novi Sad, Serbia
3–5 November 2022

In 2022, this established bi-annual professional and scientific symposium, which covers a wide range of topics from content creation and design for a variety of applications to production, quality control and environmental considerations, keeps a hybrid format.

33rd International Publishers Congress

Jakarta, Indonesia
10–12 November 2022

The current volume of this event for the publishing industry is entitled 'Reading Matters – Embracing The Future' and held in a newly appointed UNESCO City of Literature. Its programme includes panel discussions on whether social media promote or suppress freedom of expression, what are the impacts of artificial intelligence on book piracy, what challenges arise when addressing climate change, and other essential topics.

IS&T Events

Advances in Printing Technology

https://www.imaging.org
11–12 & 25–26 October 2022

This year, instead of the Printing for Fabrication conference, the Society for Imaging Science and Technology organises this series of topical meetings in a virtual format. Students can attend for free and all participants can access the recordings until 28 February 2023. The first session is dedicated to innovative technology for digital printing, in particular, for inkjet, as highlighted in the keynote 'Inkjet technology innovation: optimization versus diversification' by Adam Strevens. Other topics include multi-material printing, electrohydrodynamic printing, the use of big data for inkjet printing optimisation, and the benefits of nozzle sensing. The two sessions at the end of October deal with the sustainability of essential printing, from photographs to advanced printed electronics, and life cycle assessment, featuring the keynotes 'Eliminate the idea of waste' by Eric Kawabata and 'Ecological challenges of décor printing' by Robert David.

CIC30 – 30th Color and Imaging Conference

Scottsdale, Arizona, USA
13–17 November 2022

For its anniversary edition, this event returns to an in-person format. The offer of the short courses and workshops includes three new options focused on quality and comfort assessment for immersive technologies, physics of organic light-emitting diodes and quantum dots, as well as their application in display systems, and colour calibration and colour rendition challenges for virtual production stages. The announced keynote speakers are Roland Fleming, presenting recent advances in the understanding of material appearance and surface perception, Erik Reinhard, arguing that colour science can and should contribute to sustainability, and Vien Cheung, discussing the state-of-the-art of facial recognition and the concerns associated with applications of this technology. The topics of technical lectures cover the contrast matching between different luminance levels, the perceptibility of colour differences between thin lines, the perception of the appearance of metal-like package printing, and many more.

IGAS 2022
International Graphic Arts Show

Tokyo, Japan
24–28 November 2022

Held after four years, this international exhibition of printing technology and solutions for pre-press, pre-media, printing, binding, paper processing, labels, packaging, and cross-media publishing again offers special features, which include live TV streaming, panel discussion sessions, innovative business zone with the small start area and the industrial printing area, and JPEX, the Japan Printing Exhibition showcasing prize-winning pieces of work from calendars, catalogues and bookbinding to packages, stickers and labels.