AIC 14th Congress
Milano 2021
August 30th – September 3rd 2021
ONLINE EDITION

BOOK OF ABSTRACTS

14th AIC Congress AIC MILAN 2021

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AIC PRESIDENT'S MESSAGE

Welcome to AIC 2021, the 14th AIC Congress. It is the time again to get together at our annual colour event.

First and foremost, I would like to express my sincere gratitude to Gruppo del Colore – Associazione Italiana Colore, the AIC 2021 Organising Committee. The continued uncertainties of the coronavirus pandemic situation have added substantial challenges to the congress arrangements. In January 2021, just under 8-month countdown to the congress, a tough decision of converting the traditional physical-venue-based congress to entirely online format had to be made. The AIC 2021 Organising Committee responded to the exceptional circumstances positively. To provide maximum participation opportunities, the congress programme is structured to well-suit both the eastern and western time zones. The refreshing 5-minute short-paper presentations stand-in for the conventional poster presentations.

The AIC has been awarding outstanding work in the field of colour science via its Deane B. Judd Award for over 40 years. I am pleased to announce that the Deane B. Judd Award 2021 will be presented to John McCann. Established in 2015 and first given in 2017, the AIC Award for Color in Art, Design and Environment (CADE) recognises excellence in the areas of design, art, architecture and humanities. Many congratulations to Jean-Philippe Lenclos, the recipient of the CADE Award 2021.

During the Congress General Assembly, Regular Members will be voting on the AIC Statutes revisions that introduced by our former Auditors (2016-2017) and Executive Committee (2018-2019). Regular Members will also be electing the new Executive Committee for the term-of-office 2022-2023.

As part of the community and public engagement promoting colour, the AIC established the International Colour Day (ICD), held on 21st March each year, over a decade ago. To-date we have twenty-seven Regular Members, over five continents, participated the ICD celebrations. This achievement marks an important step towards the AIC's planned application for international days observed at UNESCO.

Last but not least, AIC 2021 would not be possible without the support of the AIC and wider colour communities. I would like to thank the authors for submitting and presenting their papers, the Scientific Committee for their help with the review process, the Session Chairs for the smooth running of the programme, the Chairs and Co-Chairs of the AIC Study Groups for hosting a selection of workshops, the Co-operating Societies for their assistance and the Sponsors for their financial contributions.

I hope you enjoy the programme. Have a productive time at AIC 2021!

Vien Cheung
AIC President, July 2021

AIC

AIC MILAN 2021
14th AIC Congress

GRUPPO DEL COLORE
ASSOCIAZIONE ITALIANA COLORE

AIC International Colour Association
Internationale Vereinigung für die Farbe
Association Internationale de la Couleur

AIC, International Colour Association

www.aic-color.org

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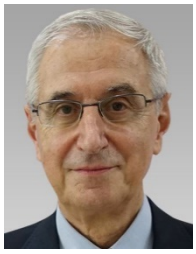

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Brazil Associação Pró-Cor Do Brasil

Bulgaria Colour Group - Bulgaria

Canada Colour Research Society Of Canada

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China Color Association Of China

Croatia Hrvatska Udruga Za Boje

Finland Suomen Väriyhdistys Svy Ry

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Germany Deutscher Verband Farbe

Great Britain The Colour Group (Great Britain)

Hungary Hungarian National Colour Committee

Italy Gruppo Del Colore - Associazione Italiana Colore

Japan Color Science Association Of Japan

Korea Korean Society Of Color Studies

Mexico Asociación Mexicana De Investigadores Del Color

Norway Forum Farge

Portugal Associação Portuguesa Da Cor

Slovenia Slovensko Zdruzenje Za Barve

Spain Comité Español Del Color

Sweden Stiftelsen Svenskt Färgcentrum

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Taiwan Color Association Of Taiwan

Thailand The Color Group Of Thailand

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Color Education (CE)

Chairs: Robert Hirschler, Maggie Maggio

Colour Vision and Psychophysics (CVP)

Chairs: Katsunori Okajima, Manuel Melgosa

Environmental Color Design (ECD)

Chairs: Verena M. Schindler, Yulia A. Griber

The Language of Color (LC)

Chairs: Dimitris Mylonas, Galina Paramei

14TH AIC CONGRESS AIC 2021 – MILAN, ITALY

Gruppo del Colore-Associazione Italiana Colore President's Message

The Congress of the International Color Association (AIC) is a unique multidisciplinary event that brings together scholars and professionals from a wide range of fields. It has been held every four years since its inception in 1969. The 2021 event, which is the 14th AIC Congress, will be organized in Italy, for the first time. The Italian Gruppo del Colore - Associazione Italiana Colore has prepared it for five years since Italy was chosen to host it under the decision of the AIC Executive Committee in the AIC Interim Meeting, which was held in Santiago, Chile, in 2016.

On behalf of the 14th AIC Congress Organizing Committee, we welcome you to the first AIC Congress fully online. The decision to organize it online was made at the beginning this year due to the Covid-19 pandemic, that imposes multiple constraints all over the world with its trail of dead and ailing. Nevertheless, the 14th AIC Online Congress will comply with the provisions of the AIC Regulations for general congresses in which the following events must be present: Opening Ceremony, Award Ceremony, AIC General Assembly, Workshop of Working Groups AIC and Closing Ceremony. In addition, all standards required for publications and the handover of the AIC banner to AIC2022 will be respected.

The Congress received about 270 Abstract submissions from 37 countries and the abstracts were reviewed and selected by the International Scientific Committee consisting of 112 experts from

around the world. The total number of papers that will be presented in this Congress is circa 250 including 200 oral presentations (regular and short), eight Invited Lectures, and two Award Lectures. In addition, there are four special sessions, namely 'Innovation and research in color for beauty care and hairstyle', 'All the colors of cinema', 'Colour, light & sound: holistic approach for wellbeing' and 'All the recent books on color'. There are also four AIC Study Group Workshops with special programs, such as AIC 2021 Study Group on Environmental Color Design, AIC 2021 Study Group on Arts and Design, AIC 2021 Study Group on Language of Color, and AIC 2021 Study Group on Color Education. As is evident, the program is international and highly multidisciplinary.

I wish to thank you all in advance for your patience as we navigate through the complexities of a fully digital conference. I also wish to thank my friends and colleagues, the local organizers, for making this event possible. I also wish to thank the Scientific Committee members who dedicated their time to promoting the conference and reviewing the submissions.

Online Milan, together with the Università degli Studi di Milano and the Congress organizers (Gruppo del Colore – Associazione Italiana Colore), is ready to welcome the participants from all over the world to the 14th AIC Congress, both as presenters and auditors, to explore the scientific and cultural themes of human activity in which color intervenes or assumes a prominent place.

Marcello Picollo

Gruppo del Colore-Associazione Italiana Colore President

The AIC2021 14th Congress - Chairs introduction

The International Color Association (AIC) Congress is a unique multidisciplinary event that brings together scholars and professionals from a wide range of fields. It has been held every four years since its inception in 1969, and in 2021, it is hosted in Italy, for the first time, organized by the Gruppo del Colore - Associazione Italiana Colore. The Covid19 pandemic imposes multiple constraints all over the world. In Italy, the state's laws and the safety rules of the previously chosen Venue (Ca' Granda, Università degli Studi di Milano) prohibit any socializing, which is one of the fundamental reasons for the participation in presence. Moreover, due to travel-related risks and restrictions, the Gruppo del Colore – Associazione Italiana Colore, in agreement with the AIC, has decided to organize the AIC 14th Congress online in compliance with the program elements required by the AIC rules: Opening Ceremony, Awards, AIC General Assembly, AIC Study Groups Workshops and Closing Ceremony.

In AIC2021, which should have been in presence, the Chairs wanted to create an **Ethically Sustainable Congress**, thinking about young people, retired people, and professionals who cannot afford to spend too much to attend a Congress. This was our leading idea since 2016 when we proposed Italy to AIC EC in Santiago. Following this idea, the early registration fee available since 2020 for the 14th AIC Congress is about half that of the previous Congress. The early registration is nearly the same fee of students in the previous Congress. On January 5th 2021, in agreement with the AIC, it was decided that, due to Covid19, the AIC 14th Congress will be online. Therefore, we have decided to halve further the early registration fee, which is less than a quarter of the previous Congress, lower than the fee of students, and the single-day fee of the previous congresses. With a fee equivalent to what used to be the registration of a single day, now participants can follow in the entire five-day Congress. To achieve this goal, the AIC2021 Congress is organized and directly administered by Gruppo del Colore - Associazione Italiana Colore, a non-profit association. Gruppo del Colore - Associazione Italiana Colore could have decided to delegate the organization and administration of the Congress to a company specialized in the organization of events, but this would have more than doubled the current registration fee even for an Online congress and would also have added VAT (+ 22% in Italy). For a 5-day online Congress, this would have resulted in doubling the registration fee. This has been possible thanks to the volunteer work of the members of the Gruppo del Colore - Associazione Italiana Colore in the organizing committee, which here we want to acknowledge and thank.

AIC is a society that gathers together color experts from the broadest set of different approaches of study and practice. The conference aims at keeping all of them under the same (virtual) "roof" to foster discussion and cross-fertilization. Hence, in the AIC2021 Congress, all the topics related to color have been welcome.

They have been divided into areas to organize the time schedule of the attendees that are free to switch between sessions. We have made our best to shrink the more than 250 talks in a timespan that could be attended by everyone regardless of the time zone from which one is connected. This resulted in a trade-off for which the morning sessions (Italian time) will be easier to follow for the eastern participants, while the afternoon sessions are more suitable for the western ones. For this reason, we have put the official moments exactly in the middle of the Italian day. A perfect solution was not possible, so we hope you can consider our effort to be as inclusive as possible and forgive us for any possible inconvenience for which we apologize in advance.

In this 2021 edition, we have promoted special thematic sessions that resulted in four of them. The first that opens the conference is a special session on "Innovation and research in color for beauty and hairstyle" followed on the same day (Monday) by "All the colors of cinema". Two more special sessions follow, one organized by the International Light Association (ILA) on Tuesday and the last one closing the conference on Friday about "All recent books on colour". There will also be a special session for the awards: the AIC "Judd" award founded in 1973, the AIC "Color in Art and Design" (CADE) award, and the Gruppo del Colore – Associazione Italiana Colore "Premio Colore GdC" award.

Precious guests are eight invited speakers, highly esteemed scholars in the field that (in alphabetical order) will give us a series of special talks:

Reiner Eschbach *"Color deficient see this way .. or don't they?"*
Robin Jenkin *"The influence of CFA choice on automotive and other critical imaging systems"*
Pietro Marani *"Leonardo's colour today: from the dark to the light"*
Luca Missoni *"Color in fashion design"*
John McCann (Judd Award) *"Edges in illumination control appearance in natural HDR scenes"*
Austin Nevin *"Conservation science and changing colours - approaches to measuring and managing change"*
Giovanni Pinna *"Lighting and color design in the show"*
Francesca Valan *"Chromatic Sustainability: a new approach to color design"*

We hope you will find in the Congress all the stimuli you are searching for your future research and career, and you will keep joining this growing multidisciplinary, international community.

The AIC2021 14th Congress Chairs
Alessandro Rizzi and Maurizio Rossi

AIC 14TH CONGRESS MILANO 2021 IS ORGANIZED BY GRUPPO DEL COLORE – ASSOCIAZIONE ITALIANA COLORE

www.gruppodelcolore.org

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Eva Valero	University of Granada	ES
Thelma van der Werff	International Light Association	NZ
Meritxell Vilaseca Ricart	Universitat Politècnica de Catalunya	ES
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- Associação ProCor do Brasil
- Comité del Color
- Color Science Association of Japan
- Federchimica Avisa
- ILA – International Light Association
- Inter-Society Color Council
- Politecnico di Milano
- Procolore
- Società Italiana di Fisica – SIF
- Società Italiana di Ottica e Fotonica – SIOF
- Society for Imaging Sciences and Technology
- Suomen Väriyhdistys Svy ry

CALL FOR PAPERS

Authors are invited to submit abstracts only if they really intend to participate in the congress.

All submissions must be in English and describe original work that has not been published or submitted elsewhere. All abstracts will be reviewed by at least two members of the Scientific Peer Review Committee in a double-blind peer-review process. Abstracts sent by email will not be accepted. Abstracts must be uploaded on the on-line management conference system EasyChair available at:

https://easychair.org/conferences/?conf=aic20210

To send contributions you must first register on EasyChair creating an account or, if you are already registered, you can use the one you have. To register for the first time, choose “Create an account” on the first page and follow the instructions. It is important to enter complete data by carefully filling in the format, entering real data and valid e-mails so that the congress organization can contact you.

Abstract submission deadline: March 31st, 2021

To send the abstracts, connect to the EasyChair system by entering the login and password obtained from the previous registration and choose “Make a New Submission”, then:

- fill in the data of the authors and tick “Corresponding Author” so that the email address indicated (at least one) receives communications from the organizers;
- enter the title and abstract in the prefixed fields (maximum 4000 characters including spaces and references);

choose the topic of interest to which the paper will refer:

1. COLOR AND MEASUREMENT / INSTRUMENTATION. Colorimetry, photometry and color atlas: method, theory and instrumentation; quality control and food coloring, dyes, organic and sustainable color.
2. COLOR AND DIGITAL. Reproduction, management, digital color correction, image processing, graphics, photography, film and video production, printmaking and 3D print, artificial vision, virtual reality, multispectral imaging, data visualization.
3. COLOR AND LIGHTING. Metamerism, color rendering, adaptation, color constancy, appearance, illusions, color memory and perception, color in extra-atmospheric environments, lighting design, lighting technologies, visual comfort.
4. COLOR AND PHYSIOLOGY. Mechanisms of vision in their experimental and theoretical aspects, color vision and color appearance, deficiencies, abnormalities, clinical and biological aspects, synesthesia, health, well-being.

5. COLOR AND PSYCHOLOGY. Phenomenology of colors, color harmonies, color & form, perceptive, emotional, aesthetic and diagnostic aspects.
6. COLOR AND PRODUCTION. Food and beverages, agriculture, textiles, plastic materials, ceramics, paints, gemology, color in the food industry.
7. COLOR AND RESTORATION. Archaeometry, painting materials, diagnostics and techniques of conservation, restoration and enhancement of cultural heritage.
8. COLOR AND ENVIRONMENT. Representation and drawing, urban planning, project of color, architecture, interior design, landscapes & horticulture, color and architectural syntax, territorial identities, biodiversity.
9. COLOR AND DESIGN. Furniture, CMF design, fashion, textiles, textures, cosmetics, food design, museography.
10. COLOR AND CULTURE. Arts and crafts, history, philosophy, aesthetics, ethno-anthropology, graffiti, geology, sociology, lexicology, semantics, anthropology of vision, food culture and heritage, color naming.
11. COLOR AND EDUCATION. Pedagogy, didactics of color, aesthetic education, artistic education.
12. COLOR AND COMMUNICATION / MARKETING. Graphics, communication, packaging, lettering, exposure, advertising.

Special Sessions

1. Innovation and research in color for beauty care and hairstyle
2. All colors of cinema
3. All the recent books on colour
4. Colour, light & sound: holistic approach for wellbeing

Presentations can be oral or poster, the authors must indicate their preference (the final decision will be up to the organizing committee); enter at least 3 keywords relating to your abstract; a confirmation e-mail will be sent to the corresponding author that the abstract has been correctly sent to the organizers. By May 5th, 2021, the organizers will communicate if the work has been accepted with any suggestions for drafting the final paper.

The final manuscript must be sent by July 15th 31st, 2021. The deadline for submitting papers on Easychair has been extended again to August 15. After this date, papers will no longer be accepted for the publication of the Congress proceedings. Papers must be submitted only through the Easychair online system, do not send email.

Please note that at least one of the authors of the accepted submissions must register for the congress and send the Transfer_of_Copyright by May 15th 22th 29th 2021, participate in the

congress and present the work in the format decided by the organizing committee (full oral or short presentation). The registration of 1 author is valid for the submission of a maximum of 1 abstract/paper.

Each author and/or co-author wishing to participate in the congress must pay the registration fee.

People who have not previously registered to the congress and paid the registration fee will not be admitted to the congress.

Proceedings

Only the accepted papers that will have been presented (oral or poster) during the Congress will be published in the AIC2021 Proceedings. Papers not uploaded to Easychair within the indicated deadline will not be published in the proceedings. Papers that do not comply with the template required by the AIC will not be published in the AIC proceedings. Please read carefully the instructions on the Final Paper Submission Guidelines page. As requested by the AIC, only the papers of the abstracts that have been accepted after the double-blind peer review closed on May 2021, and the Awards, will be published in the proceedings.

Special issues

Plans are underway to have the best papers, in extended version, selected for possible publication in some reputable journal as a special issue. Detailed information are available on the congress website.

PROGRAM AT A GLANCE

Time-zone UTC+2	Monday 30-Aug-2021	Tuesday 31-Aug-2021		Wednesday 1-Sep-2021		Thursday 2-Sep-2021		Friday 3-Sep-2021
09:00-10:00	***Special Session*** Innovation and Research in Color for Beauty Care and Hairstyle	Colour and Physiology	Color and Design	Color and Education	Color and Psychology	Color and Measurement / Instrument.	Color and Comm./ Marketing	Color and Lighting
10:00-11:00				Color and Restoration				
11:00-12:00						Color and Digital	Color and Culture	Color and Built Environment
12:00:13:00		Invited Speaker		Invited Speaker		Invited Speaker		Invited Speaker
13:00-13:30	Break	Break		Break		Break		Break
13:30-14:30	Opening Ceremony	AIC General Assembly		AIC Working Groups Workshop	AIC Working Groups Workshop	Awards		Closing Ceremony
14:30-15:30								
15:30-16:00	Break	Break				Break		Break
16:00-16:30	Inivted Speaker	Invited Speaker		Break		Color and Digital	Color and Culture	Color and Built Environment
16:30-17:00	***Special session*** All the Colors of Cinema	***Special session*** ILA Color, Light & Sound: holistic approach for wellbeing	Color and Design	Invited Speaker				
17:00-18:00				Color and Lighting	Color and Psychology			
18:00-19:00				Color and Restoration		Color and Measurement / Instrument.		***Special session*** All the Recent Books on Color
19:00-20:00	Color and Culture				Color and Education			
20:00-21:00				Color and Built Environment		Color and Production		

SCIENTIFIC PROGRAM

Note: all time scheduling is refer to UTC+2

Monday August 30th, 2021 (single session ROOM 1)

09:00 – 10:05 **SPECIAL SESSION** **INNOVATION AND RESEARCH IN COLOR FOR BEAUTY CARE AND HAIRSTYLE - 1** **Chairs: *Alessandro Rizzi, Maurizio Rossi***	
Oral:	
Christine Fernandez-Maloigne	History of colors and beauty
Helene De Clermont-Gallerande	A comparative study of lipstick shades preferences by geographical area
Isabel Espinosa Zaragoza	Parallelism as advertising strategy in Maybelline's lipstick colour names
Yuchun Yan, Hyeon-Jeong Suk	Fifty Shades of Beige: An Analysis on the Color System for Liquid Foundation
10:05-10:15 BREAK	
10:15 – 11:05 **SPECIAL SESSION** **INNOVATION AND RESEARCH IN COLOR FOR BEAUTY CARE AND HAIRSTYLE -2** **Chairs: *Christine Fernandez-Maloigne, Helene De Clermont-Gallerande***	
Oral:	
Xiaoxuan Liu, Rui Peng, Ming Ronnier Luo	The impact of skin colours on visual impression
Yan Lu, Kaida Xiao	Quantifying facial colour appearance of Caucasian and Chinese faces
Kumiko Kikuchi, Shoji Tominaga, Jon Hardeberg	Development of measurement system for optical properties of facial skin using 3D camera and projector
Short presentation:	
Katsuaki Sakata, Hitomi Shimakura	Reference point for judging human facial skin tone

11:05-11:15 BREAK	
11:15 – 12:00 **SPECIAL SESSION** **INNOVATION AND RESEARCH IN COLOR FOR BEAUTY CARE AND HAIRSTYLE – 3** **Chairs: *Helene De Clermont-Gallerande, Christine Fernandez-Maloigne***	
Oral:	
Simone Liberini, Alessandro Rizzi	Munsell and Ostwald color spaces: a comparison in the field of hair coloring
Alessandro Rizzi, Roberta Suardi, Simone Liberini	Hair color wheels and charts
Alice Toninelli, Simone Liberini, Roberta Suardi, Giannantonio Negretti	Chromatic appearance of nylon swatches in hair color charts
12:00-12:10 BREAK	
12:10 – 12:55 **SPECIAL SESSION** **INNOVATION AND RESEARCH IN COLOR FOR BEAUTY CARE AND HAIRSTYLE – 4** **Chairs: *Alessandro Rizzi, Marcello Picollo***	
Oral:	
Daniele Fusari	Influence of color discrimination proficiency on wellness professionals' training and craft
Giannantonio Negretti	Hair coloring and customer satisfaction
Lupe Voss, Sherman Wong	More than a tube of Hair Colour - The Emotion
12:55-13:30 BREAK	

13:30-15:30 OPENING CEREMONY

Maurizio Rossi - Congress Chair welcome

Vien Cheung - AIC President

Marcello Picollo - Associazione Italiana Colore President

Alessandro Rizzi - Congress Chair to introduce the Congress Program

Premio Colore GdC 2021 - Vittorio Storaro

15:30 – 16:00 BREAK

16:00-16:40 Invited Speaker

Reiner Eschbach "Color deficient see this way…or don't they?"

Chair: *Alessandro Rizzi*

16:40-16:50 BREAK

16:50-18:05

SPECIAL SESSION
ALL THE COLORS OF CINEMA – 1

Chairs: *Sabrina Negri, Mark Wentworth, Alice Plutino*

Oral:

Ivan Magrin-Chagnolleau	Handling Color in Photography and Film: From Photo Retouching to Color Grading
Pedro Felipe Pinho Souza	Color correction and color grading: how a film colorist works
Manuela Piscitelli	Colour in characters' identity in the animation cinema
Alice Plutino, Beatrice Sarti, Gabriele Simone, Alessandro Rizzi	A film in a frame: movie barcodes for film restoration
Mark Wentworth, Orly Morgenstern, Tania Erandeni Fuentes Villa	The Lilac Scarf – Color as a visual narrative as depicted in the film Far From Heaven (2002)

18:05-18:15 BREAK

18:15-19:45

SPECIAL SESSION
ALL THE COLORS OF CINEMA – 2

Chairs: *Alice Plutino, Mark Wentworth, Sabrina Negri*

Oral:	
Paula Csillag, Amanda Sabião	PIXAR's Colorscripts: Chromatic Analyses of Four Films Using Sens|Org|Int Model
Ângela Santos, Vanessa Otero, Márcia Vilarigues	Colours of pre-cinema projections: the evolution of hand-painted magic lantern glass slides' palette
Sabrina Negri	Fine Arts on Film: The Hand-Painted Work of Stan Brakhage
Giorgio Trumpy, Sreya Chatterjee, Ulrich Ruedel, Barbara Flueckiger	A Material Investigation of Color Film Technology through the Koshofer Collection
Luca Giuliani	Digital color in cinema: an incomplete transition
Beatrice Sarti, Arianna Crespi, Giulia Morabito, Alice Plutino, Alessandro Rizzi	Film Repository for Restoration (FiRe2): identification of photographic and cinematographic films
19:45-19:55 BREAK	
19:55-20:55 **SESSION 1 - COLOR AND CULTURE** **Chairs: *Doreen Balabanoff, Letizia Bollini***	
Oral:	
Martino Pavignano, Ursula Zich	Colour, material and prototyping for Architecture
Enrico Zampieri, Vincenzo Baldoni, Simone Garagnani, Andrea Gaucci, Michele Silani	Digital reproduction of colors and materials used in pottery: a case study from the ancient Picenum
Marcela Sepúlveda	Polychromy from the Atacama Desert (South America). An interdisciplinary approach for an archaeology of color.
Camilla Tartaglia	The hidden history of woad blue: a path through technology and diffusion of "European indigo" in 18th-century technical literature

Tuesday August 31st, 2021 (2 parallel sessions)

ROOM 1 09:00-10:15 SESSION 2 - COLOR AND PHYSIOLOGY Chairs: *John Barbur, Marisa Rodriguez-Carmona*		ROOM 2 09:00-10:25 SESSION 4 - COLOR AND DESIGN Chairs: *Berit Bergstrom, Maurizio Rossi*	
Oral:		**Oral:**	
Larry Wallace	An introduction to Syntonic Phototherapy, and Vision Rehabilitation	Aigerim Shunayeva, Taesu Kim, Bokyung Lee, Hyeon-Jeong Suk	Style assessment of home appliances in various interiors using virtual reality
Kota Akiba, Midori Tanaka, Takahiko Horiuchi	Effect of ipRGC on Colour Perception of Display Device under Various Illuminants	Gyunpyo Lee, Taesu Kim, Hyeon-Jeong Suk	Is Blue still a Representative for Future Vehicles?
Miyoshi Ayama, Minoru Ohkoba, Tomoharu Ishikawa, Shoko Hira, Sakuichi Ohtsuka	Difference Scaling and Color Naming of Red-Green Color Deficiencies	Boram Kim, Hyeon-Jeong Suk	Visualization of chair color data through network analysis
Firdevs Gökmenoğlu, Saadet Akbay	Effects of Colour on the Sense of Immersion in Virtual Interior Environments	Terumi Konno, Koichiro Kakiyama, Yasuhiro Kawabata	Observed changes in garment color selection of university students across normal and test periods
Short presentation:		**Short presentation:**	
Hideki Sakai	Brightness evaluation under the closed-eye condition: Measurement of optical transmittance of eyelid	Masato Sakurai, Ryoma Yamamoto	Relationship Between Taste Impression and Color in Snack Packages
Taesu Kim, Hyeon-Jeong Suk	EEG Responses to In-Car Dynamic Cluster Light	Tomoharu Ishikawa, Takumi Nakajima, Yoshiko Yanagida, Minoru Mitsui, Kazuya	Effect of Sensation Modalities on Texture Evaluation of Beige Fabrics by Japanese and Chinese

			Sasaki, Miyoshi Ayama	
10:15-10:25 BREAK			Yumi Awano, Masayuki Osumi	The visual effect of costume woven with peacock feathers and the symbolism in Japanese culture - Evaluation derived from gonio-photometric spectrum analysis and microscopic observation
			Eunji Han, Yungkyung Park	A study on associative color attributes of Antonyms in Korean language
			10:25-10:35 BREAK	
ROOM 1 **10:25-12:00** **SESSION 3 - COLOR AND PHYSIOLOGY** **Chairs: *Valérie Bonnardel, Cristian Bonanomi***			**ROOM 2** **10:35-12:10** **SESSION 5 - COLOR AND DESIGN** **Chairs: *Saara Pyykkö, Francesca Valan***	
Oral:			**Oral:**	
Francisco Díaz-Barrancas, Halina Cwierz, Pedro José Pardo	A study of physical and perceived linearity in a virtual reality environment		Agata Kwiatkowska-Lubańska	Colour and ornament in the Polish Art Deco style. Karol Homolacs and his colour course at the Cracow Workshops 1913-1926
Kari Bjerke Gjærde, Anne Kristin Kvitle, Phil Green, Peter Nussbaum	How accurate is an on-line test for colour vision deficiency?		Verena M. Schindler, Yulia A. Griber	The evolution of environmental colour design in the French period
Laura Rey-Barroso, Mónica Roldán, Francisco J. Burgos-Fernández, Susanna Gassiot, Anna Ruiz	Evaluation of Confocal Microscopy as a Diagnosis Tool on Red Blood Cell Diseases		Anna Kmita	CMF in commemorative ceramics. Project of a color and texture palette on the example of "Ckliwie na szkliwie"- Nostalgic Glaze.

Llobet, Ignacio Isola, Meritxell Vilaseca				Personal collection of memories on ceramic plates.
Kazim Hilmi Or	A specific use of colour and dyes: „Vital dyes in ophthalmology“		Marcus Farr, Andrea Macruz	Colored Response: Technology, Thermo-chromic Material Systems and Human Awareness
Marisa Rodriguez-Carmona, Benjamin E. W. Evans, John L. Barbur	Assessing colour vision using single and multi test protocols		Francesco Scullica, Elena Elgani, Umberto Monchiero	The relevance of color in post COVID-19 interior design
Flávia Mayer	The Construction Of Color By The Congenitally Blind		Anna Barbara, Reejy Atef Abdelatty Mikhail, Maria Camila Álvarez García	The Odor of Colors: Correspondence from a Cross-Cultural Design Perspective
Short presentation:			**Short presentation:**	
Francisco J. Burgos-Fernández, Tommaso Alterini, Fernando Díaz-Doutón, Meritxell Vilaseca	Colorimetric analysis of eye fundus structures with multispectral retinography		Gyeonghwa Lee, Vien Cheung, Tang Tang	The role of colour designers in the design process
12:00-12:20 BREAK			12:10-12:20 BREAK	

ROOM 1

12:20-13:00 Invited Speaker

Robin Jenkin “The influence of CFA choice on automotive and other critical imaging systems”

Chair: *Gabriele Simone*

13:00-13:30 BREAK

ROOM 1

13:30-15:30 AIC General Assembly

15:30-16:00 BREAK

ROOM 1

16:00-16:40 Invited Speaker

Luca Missoni “Color in fashion design” Chair: *Maurizio Rossi*			
16:40-16:55 BREAK			
ROOM 1 **16:55-17:55** **SPECIAL SESSION ILA - 1** **COLOUR, LIGHT & SOUND: HOLISTIC APPROACH FOR WELLBEING** **Chairs: *Vicky Syriopoulou, Jeannette Hanenburg***		**ROOM 2** **16:55-17:55** **SESSION 6 – COLOR AND DESIGN** **Chairs: *Ralf Weber, Agata Kwiatkowska-Lubańska***	
Oral:		**Oral:**	
Thelma van der Werff, Mary Ashby-Green	Colour as a coaching tool with Colournostics	Michel Albert-Vanel	Combinations of colours as an analogue model in Modern Art
Pascal Vidal	Photonic Medicine, the therapeutic use of light and colours in Medicine	Gisela Costa Pinheiro Monteiro, Robert Hirschler	A mount-it-yourself 3D colour model for designers
Pauline Allen, Heather Benghiat, Phil Stickland	How the sensory systems impact our journey through life	Ingrid Calvo Ivanovic, Marta Elisa Cecchi, Clorinda Sissi Galasso, Ambra Borin, Claudia Mastrantoni, Martina Scagnoli	The Colours of Individual and Collective Memory: Mnemosphere, a Visual Atlas of Memory, Emotions and Atmosphere of Places
Susana Ribeiro	Bodygraphy - Chromatic performance on surrounding space	Luwen Yu, Stephen Westland, Vien Cheung, Guobin Xia	Analysis of research strategies to determine colour preference II: AFC, rank-order and rating
17:55-18:05 BREAK		17:55-18:05 BREAK	

ROOM 1 18:05-19:05 SPECIAL SESSION ILA - 2 COLOUR, LIGHT & SOUND: HOLISTIC APPROACH FOR WELLBEING Chairs: *Vicky Syriopoulou, Jeannette Hanenburg*		ROOM 2 18:05- 19:15 SESSION 7 – COLOR AND DESIGN Chairs: *Dimitris Mylonas, Doreen Balabanoff*	
Oral:		**Oral:**	
Gerald Zrenner	echobell - "Sound-pharmacy to go" Effective treatment with sound, vibration and light	Déborah Epicoco, Christine Mohr, Mari Uusküla, Michael Quiblier, Maliha Bouayed Meziane, Eric Laurent, Domicele Jonauskaite	Making sense of free associations with PURPLE – A new coding scheme testing French speakers in three countries
Angelika Klotz	Post-Pandemic Support with Colour, Light and Frequencies	Inez Michiels	Design Semantics Database
Valérie Bonnardel	Colour, Human experience and cyborgism	Martinia Ira Glogar, Sandra Flinčec Grgac, Antonia Zanchi Sarwari, Jose M. Canal	Interaction of Colour and Cotton Fabric Surface Coated with Ultrafine Cellulose (UFC)
Margo Ruiter	The power of earth colours	Guobin Xia, Philip Henry, Francisco Queiroz, Stephen Westland, Luwen Yu	Colour–cognitive performance interaction in Virtual Reality (VR): A study of gender differences
19:05-19:15 BREAK		19:05-19:15 BREAK	
ROOM 1 **19:15-20:45**		**ROOM 2** **19:15-20:25**	

SPECIAL SESSION ILA - 3 COLOUR, LIGHT & SOUND: HOLISTIC APPROACH FOR WELLBEING Chairs: *Vicky Syriopoulou, Jeannette Hanenburg*	
Oral:	
Claudia Bonollo	The imagined body (2001-2021)
Daniel Asis	Auricular Chromotherapy in the treatment of Psychological Trauma
Arzhan Surazakov	Principles of regenerative therapy with low-intensity laser, colour, ultrasound and magnetic field (coMra)
Abhay Wadhwa	Soul-X: The Experience Center for Mind-Body Harmony
Anadi Martel, Christophe Desteuque	Treating chronic pain and depression with color and sound: recent studies using the Sensora system

SESSION 8 – COLOR AND DESIGN Chairs: *Vien Cheung, Francesca Valan*	
Oral:	
Delia Dumitrescu, Marjan Kooroshnia, Erin Lewis, Kathryn Walters	Colour, texture, and luminance: Textile design methods for printing with electroluminescent inks
Elizaveta Kushnirenko	Color in Fashion Design: orange that changed our perception of Luxury - the use of color at Hermès Paris.
Xuechang Leng	The meaning of blue-green tiles on the roofs of the Qinzheng Hall complex at the Summer Palace
Rebecka Pires	Application of color in domestic interior design: an analysis of the 1960s, 1970s and 1980s
Short presentation:	
Gianluca Guarini, Maurizio Rossi	Procedure to obtain trustful colors in renderings produced by BIM
Ana Paula Pinheiro, Rui Duharte	Color and Sustainability in Fashion Design: DUARTE, Portugal

Wednesday September 1st, 2021 (2 parallel sessions)

ROOM 1 09:00-10:35 SESSION 9 -COLOR AND EDUCATION Chairs: *Robert Hirschler, Jodi Sandford*	
Oral:	
David Briggs	More than Three Dimensions: Communicating the Attributes of Colour Perception in Colour Education
Ching Chih Liao	Analysis and Application of Artwork Color - Awakening Students' Color Aesthetics and Narrative Ability through Artworks at the National Palace Museum in Taipei
Woon Lam Ng	Factors that Influence Color Choice – A Study of Cultural, Symbolical and Synesthetic Behaviors
Gülru Mutlu Tunca, Saadet Akbay, Güler Ufuk Demirbaş	Parametric Design Studio in Interior Architecture Education: A Case of Integration of Colour Design
Paul Green-Armytage, Maggie Maggio	Beyond the Rainbow: A New Sorting Set for Teaching colour
Short presentation:	

ROOM 2 09:00-10:35 SESSION 14 -COLOR AND PSYCHOLOGY Chairs: *Osvaldo Da Pos, Alessandro Bortolotti*	
Oral:	
Mahshid Baniani	What color is your mood? The association between moods and colors
Jinyoung Kim, Jiyeon Lee, Yungkyung Park	Why are common nature colors (soil, sand, trees, sky, stones, etc.) useful? Why does it go well with all colors?
Byeongjin Kim, Taesu Kim, Hyeon-Jeong Suk	Comfortable Brightness for Watching Television in the Dark
Akira Asano, Ayaka Shimura, Chie Muraki Asano	Effect of red color and external interferences in selection tasks
Ray-Chin Wu, Chao-Lung Lee, Ming-Hsiu Mia Chen, Chien-Wei Chang, Yun-Maw Cheng	A study on colour emotions of the mask
Short presentation:	

Lea Jeong , Yungkyung Park	Color Names Education Effect on the Color Range Recognition		Andrew Chalmers	Is "Naturalness" a valid lighting concept
Jihye Choi, Paolo Calafiore	Colorful safety guide		Yoonjeong Jo, Yungkyung Park	Changes in Color Appearance and Preference of Rose Affected by Color Temperature and Illuminance
Junior Vendrami, Marley de Lira, Berenice Gonçalves	Educational resources based on augmented reality applied to Color Theory contents / UFSC		Ichiro Katayama, Kin'nosuke Yamaji	Effect of the shade due to the surface unevenness of objects on whiteness perception
10:35-10:45 BREAK			10:35-10:45 BREAK	
ROOM 1 **10:45-12:00** **SESSION 10 - COLOR AND RESTORATION** **Chairs: *Marco Gaiani, Anna Marotta***			**ROOM 2** **10:45-12:00** **SESSION 15 - COLOR AND PSYCHOLOGY** **Chairs: *Cristian Bonanomi, Yulia A. Griber***	
Oral:			**Oral:**	
Junglim Lee, Yungkyung Park	Colour Prediction Method of Digitalized Korean Court Documentary Painting		Muhammad Farhan Mughal, Ming Ronnier Luo, Michael R. Pointer	Perceived attractiveness across Chinese and Pakistani ethnic groups
Wensi Lin, Mengyue Zhang, Jisheng Wang, Mengqi Li, Jing Chen	The Experimental Restoration of the Colour of Nanjing Brocade from China		Tzuhao Liu, John Hutchings, Ming Ronnier Luo	The Valence and Arousal contribution of colour parameters
Yuton Jiang, Luke Li, Yihua Zheng	Quantitative color examination and restoration of historical architecture: the study of polychrome decoration of a Qing-style timber-frame		Rui Vasques, António José Macedo Coutinho da Cruz Rodrigues,	Visual and sensory perceptions between static and dynamic colors

	structure in Tsinghua University (Beijing, China)
Martina Redi, Sofia Ceccarelli, Alessandra Terrei, Noemi Orazi, Fulvio Mercuri	Diagnostic analysis for colour restoration of a painted Japanese *emakimono*
Marcello Picollo, Costanza Cucci, Andrea Casini, Filippo Cherubini, Lorenzo Stefani	Hyper-Spectral Imaging Technique: Application for Colorimetric Analysis of Paintings
12:00-12:20 BREAK	

Diamantino S. Abreu	
Pia Lopez-Izquierdo	The Emotional Language of Colour
Short presentation:	
Sachiko Noguchi, Rumiko Takata, Kaori Segawa, Ichiro Katayama	Application of color feelings prediction formulas to the estimation of two-color combination feelings of “kimono”
Shi-Min Gong, Wen-Yuan Lee	Color Preference for Color Combinations Applied onto Three-Dimensional Color Configuration
Alessandro Bortolotti, Loreta Cannito, Stefano Anzani, Riccardo Palumbo, Maurizio Rossi	Lighting emotions: a review of the emotional influence of color perceived lightness
12:00-12:20 BREAK	

ROOM 1

12:20-13:00 Invited Speaker

Austin Nevin "Conservation science and changing colours – Approaches to measuring and managing change"

Chair: *Marcello Picollo*

13:00-13:15 BREAK

ROOM 1

13:15-16:15 AIC Study Groups Workshop

13:15 - 14:45 AIC 2021 Study Group on Environmental Color Design

Chairs: *Yulia A. Griber, Verena M. Schindler*

The authors of this session have not been subjected to double-blind peer-review. Therefore as requested by the AIC, they will not be published in the AIC proceedings series.

-Zena O'Connor "Identifying and managing the factors that impact variability between specified and perceived color"

-Pablo Manyé "Variability of sociocultural colour associations related to the environment in Northeastern Brazil"

-Monica Kuo "East vs. West: How color is perceived differently in psychological and physical environments of different cultures"

-Kazim Hilmi Or "Colours of face masks used during Covid-19 pandemic and social messaging"

- Stig Evans "London's Largest Painting"

ROOM 2

13:15-16:15 AIC Study Groups Workshop

13:15 - 14:45 AIC 2021 Study Group on Arts and Design

Chair: *Maria João Durão*

The authors of this session have not been subjected to double-blind peer-review. Therefore as requested by the AIC, they will not be published in the AIC proceedings series.

13:15 WELCOME REMARKS

13: 20 Jeannette Hanenburg "Art Classes at Ações Sociais Amigos Solidários

(ASAS)-Florianopolis, Brasil. Room with a view - A case study"

13:45 ARTS & DESIGN VIRTUAL EXHIBITION (Part 1) - Curated by Maria João Durão

14:00 Larissa Noury "COLOUR HARMONY: ART, DESIGN & ARCHITECTURE.

Tactile painting & Haute Couture"

14:15 ARTS & DESIGN VIRTUAL EXHIBITION (Part 2) - Curated by Maria João Durão

14:30 DISCUSSION

ROOM 1	ROOM 2
14:45-16:15 AIC 2021 Study Group on Language of Color **Chairs: *Galina Paramei, Dimitris Mylonas*** The authors of this session have been subjected to double-blind peer-review. Therefore they will be published in the AIC proceedings series. - Emanuela Valeriani & Lourdes García Ureña "The language of color in the Bible (Hebrew, Greek, Latin): A methodology to approach the meaning of color terms" - Maria MichelaDel Viva, Ilaria Mariani, Carmen De Caro, Galina Paramei "Florence blues are clothed in triple basic terms" - Mari Uusküla "From Welsh *gwyrdd* to Italian *azzurro*: Translation of colour language between and within languages" Galina Paramei & Dimitris Mylonas, Discussion & the SGLC by 2021	**14:45-16:15 AIC 2021Study Group on Color Education** **Chairs: *Robert Hirschler, Maggie Maggio*** The authors of this session have not been subjected to double-blind peer-review. Therefore as requested by the AIC, they will not be published in the AIC proceedings series.
16:15-16:30 BREAK	
ROOM 1 **16:30-17:10 Invited Speaker** **Giovanni Pinna "Lighting and color design in the show"** **Chair: *Maurizio Rossi***	
17:10-17:15 BREAK	
ROOM 1 **17:15-18:15** **SESSION 11 - COLOR AND LIGHTING** **Chairs: *Andrea Siniscalco, Gianluca Guarini***	**ROOM 2** **17:15-18:35** **SESSION 16 - COLOR AND PSYCHOLOGY** **Chairs: *Galina Paramei, John McCann***

Oral:		**Oral:**	
Maurizio Rossi	A proposal for the definition of colored light sources in lighting CAD	Anna Marotta, Alessandra Brosio	Color as a therapeutic adjuvant: theories and applications in the hospital setting
Laura Bellia, Francesca Diglio, Francesca Fragliasso	Lighting quality for home-working spaces: a survey	Domicele Jonauskaite, Christine Mohr	Colour-emotion associations: What have we learned so far and what are the unknowns?
Carolina Espinoza-Sanhueza, Claude Mh Demers, Jean-François Lalonde, Charles-Antoine Pelletier, Marc Hébert	Potential of colour in interiors for human light-responsive ambiances in northern locations	Barbara Matusiak, Marzieh Nazari, Kine Angelo	Colour shift due to Chromogenic dynamic glass
Laura Bellia, Urszula Błaszczak, Francesca Fragliasso, Lukasz Gryko	The colours of light in indoor environments: Mixing daylight and electric light spectra to define a proper match	Juan Serra, David De Andrés, Ana Torres	ColorDoku 3d, gamification to improve perceptual color discrimination ability and spatial vision
18:15-18:25 BREAK		Katherine Carpenter, Susan Farnand	Determination of the Representative Color of a Smartphone Image
ROOM 1 **18:25-19:35** **SESSION 12 - COLOR AND RESTORATION** **Chairs: *Austin Nevin, Marcello Picollo***		**Short presentation:**	

Oral:			Nian Xiong, Henry J. Trussell, Renzo Shamey	Psychophysical Study of the Perception of Color Gradient Boundaries
Guido Frison, Maurizio Aceto, Angelo Agostino, Dimitris Mylonas, Alberto Calatroni	Spectrographic analysis of the colourants of cultural items: from a qualitative to a semi-quantitative data treatment through BCTs		18:35-18:45 BREAK	
Jimena Vanina Odetti, Alberto Reyes González	Color, landscape and cultural heritage. The case of the Pitillal river, in Puerto Vallarta, Jalisco, Mexico.		**ROOM 2** **18:45-20:15** **SESSION 17 - COLOR AND EDUCATION** **Chairs: *Maggie Maggio, Verena M. Schindler***	
Olivia Kuzio, Susan Farnand	LED-based versus Filter-based Multispectral Imaging Methods for Museum Studio Photography		**Oral:**	
Eric Kirchner, Carola van Wijk, Henni van Beek, Tammo Koster, Pim Koeckhoven	A new target to test color accuracy in technical photography of fine arts		Berta Martini, Rossella D'Ugo, Monica Tombolato	Teaching and learning color. An insight into STEM/STEAM approach
Short presentation:			Caroline Bouchez, Blandine Chorein, Dominique Corger	Color and Polymers at ITECH
Hortense de La Codre, Charlotte Marembert, Rémy Chapoulie, Laurent Servant, Aurélie Mounier	Hyperspectral mapping (VIS-SWIR) of materials of three 18th C. tapestries of Royal Manufactures in France (Gobelins, Beauvais, Aubusson)		Saara Pyykkö	How to convert the experience–based university course about colour, light and space for the web?

Márcia Hazin, João Pernão	The NCS color notation as a guide to produce colors from traditional pigments in conservation: The case study of two painted ceilings from eighteenth-Century Churches in colonial Brasil
19:35-19:45 BREAK	
ROOM 1 **19:45-21:00** **SESSION 13 - COLOR AND BUILT ENVIRONMENT** **Chairs: *Anna Marotta, Larissa Noury***	
Oral:	
Jean-Luc Capron	Spatio-temporal Factors of Colored Light Sequences in the Built Environment: the case of a choral concert – Part One
Camilla Giani, Cristina Boeri	Children's colour preferences in the school context
Estelle Guerry	Prehension and qualification of chromatic and lighting environment. Study case – Païmio Sanatorium, Alvar Aalto
Justyna Tarajko-Kowalska	Is "yellow house" really "yellow"? Survey on determining the range of perceiving the yellow color on building facades
Franca Zuccoli	Mario Lodi: "Children's colours are festive, flamboyant, vivid colours"
Flora Gaetani, Fausto Brevi, Donatella Balloni	Color proposals consistency in the CMF for car design education
Craig Kirkwood	We don't know Jack about Hue – the Colour Knowledge Survey

	depending on the hue, lightness and chroma.
Ana Sutlović, Martinia Ira Glogar, Ivana Padavić, Koraljka Kovač Dugandžić	Plant Transfer Printing on Cotton and Silk

Thursday September 2nd, 2021 (2 parallel sessions)

ROOM 1 09:00-09:55 SESSION 18 – COLOR AND MEASUREMENT/INSTRUMENTATION Chairs: *Ming Ronnier Luo, Hyeon-Jeong Suk*		ROOM 2 09:00 – 10:35 SESSION 25 – COLOR AND COMMUNICATION/MARKETING Chairs: *Anna Marotta, Larissa Noury*	
Oral:		**Oral:**	
Kanoko Makino, Kaoruko Kitamura, Haruno Tsuda, Yuki Oe, Nozomu Yoshizawa	Colour appearance of a white space with greenish daylight	Zena O'Connor	Data visualization: The power and persuasive capacity of color
Shimpei Fukagawa, Hiroyuki Iyota, Hideki Sakai, Mai Isomi	Development of color and gloss measurement system with wide-range temperature and humidity control unit	Qinyue Chen, hun Yan, Hyeon-ng Suk	Designing Voice-Aware Text in Voice Media with Background Color and Typography
Raymond Chiang, Pei-Li Sun	Identify the characteristics of optically variable inks with deep learning	Boshuo Guo, Stephen Westland, Peihua Lai	Sentiment Analysis Based on Frequency of Colour Names on Social Media
Short presentation:		Daniela F. Pinheiro, Teresa	Color Specificity: the perception of

Shuhei Watanabe, Takahiko Horiuchi	Estimation of authenticity model considering the colour: Leather as a case study		Almeida, Domingos Loureiro	difference through exhausting repetition
09:55–10:05 BREAK			**Short presentation:**	
ROOM 1 **10:05 – 10:55** **SESSION 19 – COLOR AND MEASUREMENT/INSTRUMENTATION** **Chairs: *Takahiko Horiuchi, Dimitris Mylonas***			Anica Hunjet, Sandra Križan, Dijana Vuković	Influence of wine color on wine selection and consumption
Oral:			Lidija Mandić, Maja Strgar Kurečić	The role and signifance of color when choosing cars
Jiaxun Zhang, Haisong Xu, Hao Jiang	Cross-media color reproduction under mixed adaptation condition		Peihua Lai, Boshuo Guo, Stephen Westland	Why do people choose their car colours?
Ye Zhang, Kaiyin Chen, Shulei Ma	Study on colour effect of transparent material under colour-light		10:35-10:45 BREAK	
Qinyuan Li, Jinxing Liang, Yan Lu, Kaida Xiao, Michael Pointer	Quantification of the effect of colour appearance and materials on the visual-tactile properties of fabrics		**ROOM 2** **10:45-11:40** **SESSION 26 -COLOR AND CULTURE** **Chairs: *Osvaldo Da Pos, Simone Garagnani***	
Short presentation:			**Oral:**	

Shahin Aldhahir	Differential Color Perception Theory		Jing Chen, Wensi Lin, Jisheng Wang, Mengqi Li	Digitizing and Recovering the Tacit Knowledge of the Traditional Color of China
10:55-11:05 BREAK			Zoriana Lotut	Reading Medieval Colour. The Case of Blue in the Canterbury Tales
ROOM 1 **11:05-12:10** **SESSION 20 - COLOR AND DIGITAL** **Chairs: *Arjan Gijsenij, Javier Hernández-Andrés***				
Oral:			**Short presentation:**	
Yiming Huang, Haisong Xu, Zhengnan Ye	HDR image quality evaluation for mobile displays			
Li Yumei, Liao Ningfang, Wu Wenmin, Deng Chenyang, Li Yasheng	Research on HDR image tone mapping algorithm based on modified ICAM06		Xiaochan Ge, Xue Mao, Jie Xu	Identifying the colour of Longquan Celadon Porcelain
Sandhiya Jayaprakash Brindha, Monica Vatteroni, Gabriele Simone	HDR imaging using CMOS technology inspired by human eyes for Automotive applications		Lia Luzzatto	Colors in the feminine between the Middle Ages and the Renaissance
Yi-Tun Lin, Graham Finlayson	Recovering Real-World Spectra from RGB Images under Radiance Mondrian-World Assumption		Renata Pompas	Chagall e Malevič: the colors of the imagination and the colors of the absolute
Short presentation:			11:40-12:20 BREAK	

Pengpeng Yao, Jack Hc Wu, John Xin	The use of LED-based illumination for Multispectral Imaging System		
12:10-12:20 - BREAK			

ROOM 1

12:20:13:00 Invited Speaker

Pietro Marani "Leonardo's color today: from the dark to the light"

Chair: Maurizio Rossi

13:00-13:30 BREAK

ROOM 1

13:30-15:30 AWARDS

Leslie Harrington - AIC Vice President will chair this session

Vien Cheung - AIC President will show the CADE Medal

Verena M. Schindler - Citation for Jean-Philippe Lenclos: the AIC Award for Colour in Art, Design and Environment (CADE) 2021 recipient

Jean-Philippe Lenclos - CADE Award Lecture: «Living in colour» -«Vivre en couleur»

Leslie Harrington - AIC Vice President will show the Judd Medal

Alessandro Rizzi - Citation for John McCann: the AIC Deane B. Judd Award 2021 recipient

John McCann - Judd Award Lecture: "Color Vision responds to Natural Scenes: Roles of Glare,

Receptor Quanta Catch, and Neural Spatial Comparisons"

15:30-16:00 BREAK

ROOM 1	ROOM 2
16:00-17:15	16:00-17:15
SESSION 21 - COLOR AND DIGITAL	SESSION 27 - COLOR AND CULTURE

Chairs: *Pedro Pardo, Susan Farnand*		Chairs: *Berit Bergstrom, Leslie Harrington*	
Oral:		**Oral:**	
Cristian Bonanomi, Kedar Sathaye	Imaging colorimeters to evaluate Camera Monitor Systems	Dimitris Mylonas, Alexandros Koliousis, Mari Uusküla	Synonymy in the language of colour
Simone Bianco, Marco Buzzelli, Gianluigi Ciocca, Raimondo Schettini, Mikhail Tchobanou, Simone Zini	Analysis of Biases in Automatic White Balance Datasets	Yannis Skarpelos	Color semantics in popular culture: Greek women's magazines and music albums colors in the postwar era
Chloe Game, Michael Thompson, Graham Finlayson	Chromatic Weibull Tone Mapping for Underwater Image Enhancement	Letizia Bollini, Martina Falta	Brides in black widows in white. Semantic evolution of the social and cultural meaning of the colours
Marco Buzzelli, Simone Bianco, Raimondo Schettini	Angle-Retaining Color Space for Color Data Visualization and Analysis	Mari Uusküla, David Bimler	The green-blue border does not depend on the number of blues in a language: Evidence from cross-linguistic colour-naming data
Short presentation:		Yulia A. Griber, Dimitris Mylonas, Galina Paramei	Age-related differences in richness and diversity of Russian color lexicon
Ana Belén López-Baldomero, Manuel Rubiño, Carolina Ortiz, Carlos Salas	Comparison of color gamuts generated by digital printing devices under different conditions	17:15-17:25 BREAK	
Alfonso De Lucas Tron	The perceptual calibration of		

	color. An exploration			
Hao Cui, Renzo Shamey	Diagnosis of Psoriasis using image segmentation and deep learning			
17:15-17:25 BREAK				
ROOM 1 **17:25-18:45** **SESSION 22 - COLOR AND DIGITAL** **Chairs: *Laura Bellia, Mark Fairchild***			**ROOM 2** **17:25-18:55** **SESSION 28 - COLOR AND CULTURE** **Chairs: *Robert Hirschler, Verena M. Schindler***	
Oral:			**Oral:**	
Yuteng Zhu, Graham Finlayson	Designing a Single Pre-filter for Making a Group of Cameras more Colorimetric		KEYNOTE SPEAKER Clino Trini Castelli	Umbrella Diagram - 1981-2021, four decades of forecasts and CMF design
Jake McVey, Graham Finlayson	Fast and Optimal Contrast Limited Tone Mapping		Anna Marotta, Rossana Netti	Knowledge as a project parameter: comparative colour theories
Arjan Gijsenij, Peter Spiers, Stephen Westland, Pim Koeckhoven	Deriving representative color palettes from mood board images		Anna Marotta	Scientific basics in art from the Theories of Color: Authors, methods, rules, applications
Emilie Robert, Magali Estribeau, Rémi Barbier, Greggory Swiathy, Justin Plantier, Pierre Magnan	Impact of the training data used in LLS optimization for faithful scene-specific color correction of raw images		Cristiana Bartolomei, Cecilia Mazzoli, Caterina Morganti	The building materials of Luis Barragán: light and colour
Short presentation:			Joaquim Santos	Tili Wiru Tjuta Nyakutjaku:* Towards

				an Extensive Cultural Paradigm
Barbara Blaznik, Franci Kovač, Grega Bizjak, Sabina Bračko	Fastness of black dye-based ink-jet printing inks in aqueous solution in the presence and absence of oxygen		18:55-19:05 BREAK	
Brandon Hobley, Graham Finlayson, Michal Mackiewicz, Julie Bremner, Tony Dolphin, Riccardo Arosio	Improving image registration using colour transfer methods in remote sensing applications			
Pedro Pardo, Francisco Díaz Barrancas, Halina Cwierz López	Color Constancy in virtual reality scenes. A first step toward a color appearance model in virtual reality		**ROOM 2** **19:05-20: 15** **SESSION 29 - COLOR AND CULTURE** **Chairs: *Mari Uusküla, Paula Csillag***	
Marisol Fernández-Carvelo, Miguel Angel Martinez-Domingo, Eva M. Valero, Juan Luis Nieves, Javier Romero, Javier Hernández-Andrés	Band selection for different dehazing algorithms in the visible range		**Oral:**	
18:45-18:55 BREAK			Mark Fairchild	System for Visual Assessment of Wine Color
ROOM 1 **18:55-19:40** **SESSION 23 - COLOR AND MEASUREMENT/STRUMENTATION** **Chairs: *Renzo Shamey, Francesca Fragliasso***			Petronio Bendito	Algorithmic Color Methods of Media Arts

Oral:			**Short presentation:**
Esther Perales, Andrea Morales, Alejandro Ferrero, Juan Carlos Fernández-Becáres, Marjetka Milosovic, Joaquin Campos, Khalil Huraibat, Jorge Pérez, Valentín Viqueira	Impact of the color hue on the sparkle perception		Zhaohua Lei, Elza Tantcheva-Burdge, Vien Cheung	Investigation into the Colours of the DunHuang Murals from the Tang Dynasty
Khalil Huraibat, Esther Perales, Eric Kirchner, Ivo Van der Lans, Alejandro Ferrero, Joaquín Campos	Multiangle visual validation of a physically based rendering of goniochromatic colors		Henriette Jarild Koblanck, Monica Moro	Straw/Light – Colour
Rada Deeb, Graham Finlayson	The Locus Filter			
19:40-19:50 BREAK				
ROOM 1 **19:50-20:15** **SESSION 24 - COLOR AND PRODUCTION** **Chairs: *Maria João Durão*, *Filippo Cherubini***				
Oral:				
Vesna Marija Potočić Matković, Ana Sutlovic, Martinia Ira Glogar	Colour fading in the polyurethane coating depending on the substrate and conditions of natural weathering			
Short presentation:				

Ji Eun Lee	Evaluation of Emotional Images According to Differences in Post-processing of Plastic Cosmetics Containers		
Georgina Ortiz Hernández, Citlali Q. Ortiz Hernández, Oscar Francisco Bustamante	Shape, Color and Meanings. Comparison of Two Studies		

Friday September 3rd, 2021 (single session ROOM 1)

09:00-10:25 SESSION 30 – COLOR AND LIGHTING Chairs: *Laura Bellia, Andrew Chalmers*	
Oral:	
Hyeonju Park, Hyeon-Jeong Suk	Design Guidelines for Light Interfaces of Home Appliances
Jingyi Lin, Keyu Shi, Ming Ronnier Luo	Colour Performance Evaluation for LEDSimulator Technology
Stine Louring Nielsen, Emma-Sofie Hestbech, Nanna Hasle Bak, Michael Mullins	Moving in Colour Illuminated Space: An Exploration of Analysis
Ayse Nihan Avci, Saadet Akbay	OLED Lighting and Human Circadian System: A Review
Short presentation:	
Lorrain Caumon, Georges Zissis, Céline Caumon, Élodie Bécheras, Estelle Guerry, Christelle Infantes	Colours, light & well-being: characterisation of chromatic phenomena in collective housing
Andrea Siniscalco	A design approach to lighting and color rendering in indoor sets

Mengyuan Chen, Stephen Westland	User acceptance of innovative blue light therapy to treat seasonal affective disorder
Oscar Santilli	Colored light shapes. Protect and enhance the colors of artworks
10:25-10:35 BREAK	
10:35-12:05 **SESSION 31 - COLOR AND BUILT ENVIRONMENT** **Chairs: *Anna Marotta, Ralf Weber***	
Oral:	
Sari Yamamoto	Practice-based research on color planning for educational facilities
Asako Nakamura, Fabrizio I. Apollonio, Marco Gaiani,	Urban color mapping in Tokyo: the case study of Hillside terrace
Lanqing Gu, Adamantia Batistatou, Yvonne N. Delevoye-Turrell, Jenny Roe, Martin Knöll	Using artificial ground color to promote a restorative sidewalk experience: an experimental study based on manipulated street view images
Changying Xiang, Barbara Szybinska Matusiak	Aesthetic Evaluation of Facade Integrated Coloured Photovoltaics Designs-an International Online Survey
Esra Küçükkılıç Özcan, Fatma Rengin Ünver	A screen experiment on the assesment of façade colour perception factors
Patrizia Falzone	Complexity of the theme of the Painted Façades in the large and medium historical centers in relation to the environmental contexts to which they belong
12:05-12:20 BREAK	
12:20-13:00 Invited Speaker **Francesca Valan “Chromatic Sustainability: a new approach to color design”** **Chair: *Andrea Siniscalco***	
13:00-13:30 BREAK	

13:30-14:30 CLOSING CEREMONY **Marcello Picollo - Associazione Italiana Colore President chair this session** **Valérie Bonnardel presenting the Color Group GB - Robert W G Hunt Poster Awards** **Doreen Balabanoff - AIC 2022 Canada presentation** **Pichayada Katemake – AIC 2023 Thailand presentation** **Paula Csillag - AIC 2024 Brazil presentation** **Tien-Rein Lee - AIC 2025 Taiwan presentation** **Ceremony of the virtual passage of the Banner from AIC2021 to AIC2022 (video)** **Alessandro Rizzi & Maurizio Rossi - AIC2021 Chairs short talk on the numbers of AIC2021** **Vien Cheung - AIC President closing talk**
14:30-15:00 BREAK
15:00-16:15 **SESSION 32 - COLOR AND BUILT ENVIRONMENT** **Chairs: *Fabrizio Ivan Apollonio, Fausto Brevi***

Oral:	
Doreen Balabanoff	Colour and Design of Birth Spaces: A transdisciplinary review of the literature
Zhaohua Lei , Fabrizio I. Apollonio, Marco Gaiani	A multiscale approach to the urban space color analysis starting from the case of study of the Collegio di Milano
Jenny Roe, Martin Knöll	The variability of 'green' and blue' in natural and built environments and the implications for restorative environment research and psychological wellbeing.
Filippo Cherubini, Andrea Casini, Costanza Cucci, Marcello Picollo, Lorenzo Stefani	Application of hyperspectral camera and spectrocolorimeter for spectroscopic and colorimetric measurements on polychrome surfaces in a controlled environment: pros and cons of the presented technologies
Jorge Llopis, Juan Serra, Irene De la Torre	Color, ceramics and architecture in the Spanish Renaissance. Serlian serial ceramics and their role in the construction of a new spatiality

16:15-16:25 BREAK

16:25-17:25 **SESSION 33 - COLOR AND BUILT ENVIRONMENT** **Chairs: *Marco Gaiani, Simone Garagnani***	
Oral:	
Beichen Yu, Simon Bell, Giorgio Ponzo	The emerging trend of saturated colour in the contemporary urban environment: an updated view of colour
Ralf Weber, Kine Angelo, Thomas Kanthak, Maya Weber	A Color Inventory of and a Color Guide to Dresden's Neustadt
Francesca Salvetti, Michela Scaglione	The use of color in the urban landscape through regeneration projects of the degraded open spaces of the city
Margherita Cicala, Luciano Lauda	The color in the street art of Gianluca Raro and Fabio Biodpì: between social impact and urban periphery in Scampia
17:25-17:40 BREAK	
17:40-18:30 **SPECIAL SESSION ALL THE RECENT BOOKS ON COLOR – 1** **Chairs: *Verena M. Schindler, Yulia A. Griber***	
Oral:	
Juan Serra	Color for Architects
Ana Torres	Modifications of the visual comfort in residential centers to improve the quality of life for the elderly
Berit Bergström	COLOUR CHOICES A practitioner's guide to creating colour schemes and design
Maria João Durao	'Colour: Urban Space, Architecture and Design'
Paula Csillag	Color Communication: a scientific approach from visual perception
18:30-18:40 BREAK	

18:40-19:30 SPECIAL SESSION ALL THE RECENT BOOKS ON COLOR – 2 Chairs: *Verena M. Schindler, Yulia A. Griber*	
Oral:	
Yannis Skarpelos	Book: The Uncertain Signs
Jodi Sandford	The Sense of Color: A Cognitive Linguistic Analysis of Color Words
Anadi Martel	Light Therapies - A complete guide to the healing power of light
Verena M. Schindler, Yulia A. Griber	Publications: The International Scientific Conference of the Color Society of Russia

INVITED LECTURES

COLOR DEFICIENT SEE THIS WAY .. OR DON'T THEY?

Reiner Eschbach

Norwegian University for Science and Technology (NTNU)

Color deficient vision has been studied for more than 200 years and we have built models that simulate color deficiency for a color normal observer. But is this really how a color deficient person sees ? Or is there more to the human experience of "vision" than we include in our models ? This talk will take a look at our understanding of color deficiency and show areas that can not easily be explained within current assumptions. As such, this talk tries more to establish a new look into the problem area than it tries to be a summary of the "as is".

THE INFLUENCE OF CFA CHOICE ON AUTOMOTIVE AND OTHER CRITICAL IMAGING SYSTEMS

Robin Jenkin

NVIDIA Corp

There are a wide variety of color filter array (CFA) colors and combinations available to modern imaging sensors intended for automotive applications. The spectral transmission curve of an individual filter dictates the wavelengths of interest, color saturation and the transparency of the filter and hence is one of the largest influences on the overall sensitivity and color fidelity of the sensor. Recently, combinations of pale filters including clear, yellow, magenta and cyan, have been used with more traditional red, green and blue colors, in an attempt to increase sensitivity. Typically, red, green, blue filters will have total transparency in the 400 to 650nm range of below 35% whereas, clear, yellow, magenta, cyan, in excess of 60%. This increase comes at the expense of effectively reduced color signals leading to larger terms in color correction matrices (CCM) that are subsequently applied and possible cross-correlation of noise between output color channels. Additionally, combining highly transparent channels, such as clear, with those that are less transparent, such as red or blue, can impact performance as exposure has to be reduced to avoid saturation in the most sensitive channel. This can further constrain the less transparent channels.
This work examines this tradeoff and its effect on post-CCM signal quality for a number of CFA combinations and typical automotive spectra of interest, such as traffic lights, signs, and lines. Signal and noise are traced through simulated systems to examine pre- and post-CCM signal quality, via color accuracy, signal-to-noise, modulation transfer function and noise equivalent quanta analysis. Further, the computational cost, benefit, and effect on MTF and post-CCM noise of pre-filtering chroma channels prior to applying the CCM is analyzed. Results are discussed within the context of human viewing and computer vision target applications.

COLOR IN FASHION DESIGN

Luca Missoni

Artistic Director of the Missoni Archive

Luca Missoni is the Artistic Director of the Missoni Archive that he's developing into a communication and research tool to valorize the Brand Heritage.

Tai and Rosita Missoni's second-born, he grew up artistically in the workshops of the factory. By the end of the 1970s he began working full time for the family company developing knitwear design, sparking interactions between technical advancements and the creative process: "I love discovering new potentials without compromising production, going beyond the results originally intended for a particular mechanism, to apply the art of our craftsmanship to the very outmost."

Formerly the creative director of the Menswear and Sport Collections, since 2007 he dedicated his efforts to give a structure to the archival material the family had been accumulating over more than 65 years of creative work in the fashion and design industry. He conceived and curated exhibitions as *MISSONOLOGIA* in Florence and in Milan (1994), *Missoni Story* in Gallarate (1995), *OPERA* in Tokyo (1996), *Caleidoscopio Missoni* in Gorizia (2006), *Taller Missoni* in Madrid (2009), *Workshop Missoni* in London (2009), *Ottavio Missoni. Il Genio del Colore* in Slovenia and Croatia (2012), *MISSONI, L'ARTE, IL COLORE* in Gallarate (2015) and in London (2016), *Marc Chagall - Ottavio Missoni, Sogno e Colore in Noto* (2017). He is also a photographer and a star-gazer. For Luca Missoni photography has always been an essential part of his visual research. Passionate of Astronomy, the Moon is the protagonist of his artistic statement recently acknowledged with the publication of his book *Moon Atlas.* He lives in Varese and New York with his wife Judith, an American artist.

CONSERVATION SCIENCE AND CHANGING COLOURS - APPROACHES TO MEASURING AND MANAGING CHANGE

Austin Nevin

Department of Conservation, Courtauld Institute of Art

Colour in paintings and works of art is of fundamental importance in conservation, as is the understanding of the ways that pigments are used by artists to create different optical effects in paint. Part of conservation is technical study which involves understanding paint application, the layering pigments in a binding medium, and the role of the varnish or surface coatings – and work at The Courtauld Institute of Art has played a fundamental role in the understanding of the technology of easel paintings and wall paintings. My talk will highlight new research in the use of imaging and spectroscopic techniques for the visualization and mapping of pigments that will include wall paintings in India, Italy and Sweden. A vast range of pigments and layer structures are found in easel and wall paintings, from the single layers to multiple and complex mixtures found in Cypriot Byzantine wall paintings. Conservation is also faced with challenges related to pigment deterioration – which may often have a strong impact on the appearance of paintings and the colour of pigments. Indeed, many factors can affect paintings and the stability of pigments – from photooxidation as a results of light exposure of red and yellow organic lake pigments, to chemical reactions between pigments and binding media, to the degradation of modern pigments. Recent research can shed new light on the mechanisms behind colour change – and may suggest how we may be able to prolong the life of paintings. Here analytical techniques are of fundamental importance to reveal molecular changes on the microscale. Examples of research on cadmium and copper-based pigments from historical samples of easel and wall paintings and works by Picasso and Leonardo da Vinci will be shown.

LIGHTING AND COLOR DESIGN IN THE SHOW

Giovanni Pinna

Live shows are about emotions and the LD is in charge of translating in visions what the audience hears. Freedom of expression and interpretation is unique in this field allowing us to design and create lighting settings following nothing else but our inspiration, taste and personality. Feelings and sensations and continuously involved and when it comes up to color choices, we often follow some kind of unconscious guide that developes in the creation of luminous scenes that compose each cue of our shows in the most personal suggestive way. There is a lot of technique and tecnical knowledge, necessary and essential to achive our goals, that gives us a huge backup in the creative process ,but the “subjective factor” rules and color ,interacting with balance ,intensity,position and direction make the essence of our job.

LEONARDO'S COLOUR TODAY: FROM THE DARK TO THE LIGHT

Pietro C. Marani

Politecnico of Milan

For a long time Leonardo has been considered a "chiaroscurista" Painter: this definition was formulated by Eugéne Muentz at the end of ninenteenth century (1899) when his paintings were compared, according to the taste of the Romantic era, to those ones by Rembrandt. Furthermorethe diffusion of the images of his paintings through the first photographs of mid-ninetheenth century and the bad reproductions in popular books until a few decades ago did contribute to the idea that he was not familiar with colours and this concept also prevailed in art criticism of the first half of the twenthieth century. Despite being well known that Leonardo dealt extensively with colours, light and coloured reflections in his Treatise on Painting and particularly on Colours Perspective, we have to wait the radical changes in art criticism caused by the important restorations which took place at the end of the last century, first of all the restoration of the Last Supper painted in "a secco" technique (not in fresco technique) in the Refectory of the Church of Santa Maria delle Grazie in Milan. This restoration lasted almost twenty years (1977-1999) and revealed the true colours of the composition remained covered under many layers of repaints for five centuries that produced (together with the effect of alteration and pollution) a very dark look of the painting. The restoration of the Adoration of the Magiat the Uffizi in Florence, in these last years, always considered to be a monochromatic painting, has revealed, in turn, to be an unfinished coloured painting as it is the Sainte Anne in the Louvre, which appears indeed, after recent cleaning, in all its subtlety of colour passages. Even the Leonardo's masterpiece, the Mona Lisaat the Louvre, should appear richly coloured, and not dark and yellowish, if a very light cleaning should be tempted to improve its look.

CHROMATIC SUSTAINABILITY: A NEW APPROACH TO COLOR DESIGN

Francesca Valan

Color design is an activity that, dealing with different sectors in different geographical markets at the same time, allows to have a view on how the language of color evolves in product design around the world.
Color language evolves also in relation to new technologies, and color project must evolve at the same pace: colored LED lights used as new accents, online shopping based on purely digital colors, etc. require new ways of interpreting color design.

The novel concept of Chromatic Sustainability responds to the need to reduce consumption, by extending the visual life of products through the use of new finishing with iconic colors, which have a longer lifecycle on the market.
The color design of a product involves well-defined phases. Firstly, the Historical Analysis of the brand identifies iconic colors and chromatic schemes. Competitor Analysis is the second step and is essential to conquer new markets. Trend analysis is one of the best-known phases in color design and leads to the definition of new Identity Scenarios. The color Tools design is less known, but it is the most strategic phase: it collects and analyses all the color data related to the brand and allows to plan the future color strategy. Only at the end of this process color is applied to the product.
This presentation will go through all these phases and present some examples that will show how this activity not only gives a product the most suitable color, but also defines and reinforces the Brand Identity.

AWARD LECTURES

AIC Award for Colour in Art, Design and Environment (CADE) 2021

Citation - Jean-Philippe Lenclos: Recipient of the AIC Award for Colour in Art, Design and Environment (CADE)

Verena M. Schindler

Art and Architectural Historian, Zollikon, Switzerland
Co-Chair, AIC Study Group on Environmental Colour Design
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In 2021 Jean-Philippe Lenclos who is a colour designer, colour researcher, professor and visual artist has won the AIC Award for Colour in Art, Design and Environment (CADE). Established in 2015 the prize is to recognize those who excel in the areas of design, art, architecture and the humanities. The award is presented every two years at congresses of the International Colour Association (AIC). The selection is a rigorous procedure that includes nominations by AIC members and the analysis of the work of the nominees by a jury.

AIC CADE Award Lecture
Living in Colour

Jean-Philippe Lenclos

Colour Designer, Colour Researcher, Visual Artist,
Professor Emeritus École nationale supérieure des Arts Décoratifs, Paris, France
jeanphilippelenclos@wanadoo.fr ;
https://www.jeanphilippelenclos.com

Ph. Martin Lenclos

This AIC CADE Award Lecture outlines the biographical profile and career of a colour designer, colour researcher, and artist. It describes the interaction of the cross- and multidisciplinary universes in the fields of colour design related to urbanism, architecture, decorative arts, textile, and industrial design products, such as the ground transportation, aeronautics, household appliances, telephony, sports equipment, etc. It also draws attention to the philosophical, sociocultural, ethnographic, historical, semiological, symbolic, and practical foundations of *The Geography of Colour* as an inexhaustible subject of study under permanent development. Practiced individually or collectively, colour is a living material evolving through time and space. Further, it addresses colour education methodology in the various disciplines taught at art schools. The fields of colour design, colour research, and colour education are interrelated and ultimately nourished by creative art practices such as drawing and painting.

AIC Deane B. Judd Award 2021

Citation - John McCann: AIC Deane B. Judd Award 2021 recipient

Alessandro Rizzi

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Color is the intersection of the physics of light, the psychophysics of appearance, and the art and technology of reproduction. John has a unique career; he is one of the few that deeply experimented in all these fields. This makes John one of the most influential persons in the field of color. These pages aim at summarizing his vast and fruitful work in which I had the honor and the opportunity to share a certain part. That made me a privileged observer. Many of the anedoctes reported come from direct experience, the others come from a long series of personal communications with John.

AIC Judd Award Lecture

Color Vision responds to Natural Scenes: Roles of Glare, Receptor Quanta Catch, and Neural Spatial Comparisons

John McCann

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The goal of human color vision research is to understand how we see Color. Our vision has evolved to guide us through the world's Natural Scenes. Appearances made by our color vision are the result of: optics of the eye, molecular quanta catch of receptors, and spatial image processing of neurons. The scene in front of the lens is the first critical variable in modeling vision. The spatial distribution of radiances coming to the eye initiates the first major visual event, namely intraocular glare. Imaging the retinal image redistributes the very large dynamic range of light in complex Natural Scenes. The second event is the receptors' response, namely, Light/Matter reactions in atoms and molecules. Color results from the different spectral sensitivities of rods and cones. The third event is that receptors initiate the network of neural spatial comparisons that lead to Appearances. This network is stimulated by the output of all receptors in the retina simultaneously. This talk is about the effects of scenes, glare, quanta catches, neural image processing, and Appearances. This talk introduces 8 different studies of vision that trace the light from the scene, through measurements of Appearances. It discusses Theoretical Color experiments, and practical Color technologies that respond to complex Natural Scenes.

PREMIO COLORE GDC – ASSOCIAZIONE ITALIANA COLORE 2021

Vittorio Storaro

This year the “premio del Colore” award, conceded by the Gruppo del Colore – Associazione Italiana Colore, was given to Vittorio Storaro, who is considered to be one of the most influential cinematographers of all time.

Vittorio Storaro is an Italian cinematographer widely recognized for his work on numerous films now considered classics; he is well known and highly appreciated all over the world. He has won three Academy Awards for Best Cinematography and numerous other national and international awards.

He is originally from Rome where he began studying photography when he was only 11 years old; at 16 he graduated as maestro di fotografia, which roughly translates as Master Photographer. At 18 he was certified as Color Cameraman and became one of the youngest students attending and graduating from the Experimental Center of Cinematography.

In 1966 he had the opportunity to work with Bernardo Bertolucci as assistant cameraman in Before the Revolution, and in 1968 he was director of photography for the first time in Giovinezza, Giovinezza by Franco Rossi. After having worked with Dario Argento in The Bird with the Crystal Feathers, in 1970 he returned to work with Bertolucci in The Spider's Strategy, a film that marked the beginning of a fruitful collaboration between Storaro and the director.

Storaro’s first mainstream studio film was Apocalypse Now directed by Francis Ford Coppola in 1979, which resulted in Storaro earning his first Academy Award. He received his second Academy Award in 1981 for Reds, directed by Warren Beatty, and the third one for The Empire of the Sun, in 1987, directed by Bertolucci.

His research, training, and work experience have led him over time to recognize the fundamental meaning that color has in life. Storaro believes that it is not possible to express oneself in the visual arts, including cinematographic photography, without knowing the physiological, dramaturgical and philosophical meaning of colors, or what Leonardo da Vinci called the “children of light and shadow”. The study of color has been one of the greatest thrills of his life and his life philosophy focuses on the effects colors have on human actions and reactions, and how they influence human perception.

SESSION 1 - COLOR AND CULTURE

Colour, material and prototyping for architecture

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Starting from the critical reading of an architecture by Michael Graves, the paper proposes an analysis of the intertwined relationships between architectural geometries, colours and tangible models obtained by rapid prototyping systems (laser cutter and some specific materials).
The proposal is framed into a wider research project focused on the applicative interconnection between architecture and mathematics through geometry, here intended as a shared and common language. This work is the prosecution of a previous research on models of mathematical surfaces where colour was specifically used as a communication tool to enhance the comprehension of shapes, clarifying that color could guide us to grasp their geometric properties. In this new case, colour acts as a qualifying perceptual element of the architectural shapes.

Digital reproduction of colors and materials used in pottery: a case study from the ancient Picenum

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Digital replicas of pottery, due to their many benefits in terms of sharing opportunities and visualization, recently became popular in museum exhibits, often introducing virtual expositions for pieces belonging to collections all over the world. However, the accuracy of digital duplicates plays a paramount role in the perception of shapes and colors, since the most minute feature could easily lead to identify unexpected clues of an object (e.g. its precise time of production or even its author). This is particularly true of pottery, whose materials, manufacturing techniques and decorations have been subject to dedicated research throughout history. This paper introduces some of the specific outcomes of a research program, oriented to the quick digital acquisition, 3D replication and accurate visualization at the different scales of the Davanzali necropolis in Numana, a settlement of ancient Picenum (Marche Region, Italy).

Polychromy from the Atacama Desert (South America). An interdisciplinary approach for an archaeology of color

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Two archaeological pieces with polychromy from the Atacama Desert of northern Chile in South America are presented for the first time. These pieces show colors (red, yellow, black, blue, green, and white), which demonstrate not only the mastery of their authors but also the knowledge associated to raw materials available in their environment. From an interdisciplinary perspective, we resume the pigments used and discuss the color technologies developed by the desertic populations, between approximately 1,000 and 1,550 AD. Results presented are not only unprecedented for the Atacama Desert, but also for a vast region in the south of the Andean area, as well as showing the existence of a wide chromatic palette rarely observed in the archeology of the South American continent. Together these data are inserted into a broader investigation encompassed as "Archeology of Color" defined to considering color through the study of its materiality.

The hidden history of woad blue: a path through technology and diffusion of “European indigo” in 18th-century technical literature

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Woad, the famous “European indigo” plant, still hides some unknowns in its long history. This study wants to contribute to a better understanding of woad’s diffusion and use in Italy throughout the 18th and first half of the 19th century, by analysing the technical-agricultural literature of this period. The research allowed to collect some information on the “geography” of Italian woad, on its processing techniques and on its relation to “rival” Indian indigo, showing that Italy still had some relevant woad-producing centres at the time, and that woad was still acknowledged to have a significant dyeing function.

SESSION 2 - COLOR AND PHYSIOLOGY

An introduction to Syntonic Phototherapy, and Vision Rehabilitation

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Introduction to Optometric Phototherapy which is based on the application of visible light frequencies(color),to balance the autonomic nervous system as it supports visual function. This includes the how light travels through non visual pathways of the brain and circulatory systems. The presentation will introduce diagnosis ,and conditions treated. Light applied through the eyes has effects on on the physical, chemical, physiological and psychological functions.Applications include non local treatment and focal treatment to affect eye muscles , cranial nerves and tissue regeneration following brain injury.

Effect of ipRGC on Colour Perception of Display Device under Various Illuminants

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In current displays, colour reproduction is performed colorimetrically based on the perception amount of the LMS cones in photopic vision. However, previous studies have suggested that ipRGCs may affect visual perception. If ipRGCs influence colour perception, in addition to what is perceived by the LMS cones, it is necessary to consider the effect of ipRGCs on the colour reproduction of display devices. The aim of this study is to verify the effect of ipRGCs on displays under various illuminants in an experimental environment. In the experiment, colour matching was performed between a colour patch and a reproduced image on a high-luminance display under LED illuminants. The results indicate that ipRGCs may also contribute to the colour vision pathway regardless of the colour temperature of the illuminant. We derive the correction formula of CIE XYZ by correcting XYZ values with the ipRGC absorption rate.

Difference Scaling and Color Naming of Red-Green Color Deficiencies

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In Exp.1, internal color representations of congenital red-green color deficient observers (CDOs) and color normal observers (CNOs) were estimated using differential scaling method for the three types of stimuli, pairs of high-chroma color chips (Exp.1-1), pairs of medium-chroma color chips (Exp.1-2), and pairs of color names on a sheet (Exp.1-3). In Exp.1-1 and 1-2, significant difference was found between the results of CDOs and CNOs. In contrast to that, no significant difference between CDOs and CNOs was found in Exp.1-3. In Exp.2, color naming using free color terms and constrained to 11 basic color terms were conducted. Color representations for CDOs estimated from the constrained naming task are in between the results of color cards and color names. It is suggested that CDOs' internal color representations formed through visual

perception and color names only are different, and they seem to integrate them when they assign color names to surface colors.

Effects of Colour on the Sense of Immersion in Virtual Interior Environments

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This paper investigates the effects of colour on the sense of immersion in virtual interior environments. Since colour in interior environments is vital for the perception of place, the three dimensions of colour, namely hue, saturation, and lightness (HSL), were evaluated as elements for transferring colour to virtual environments (VEs). In this context, this study aims to investigate how the sense of immersion in virtual interior environments differs depending on hue, saturation, and lightness and examines the extent to which colour dimensions influence the sense of immersion in VEs. For this, the HSL colour space was utilised to establish varying degrees of colours. An online survey was conducted to understand the people's sense of immersion in different virtual interior settings. The study's results suggest that perception of colour influences the sense of immersion in virtual environments.

Brightness evaluation under the closed-eye condition: Measurement of optical transmittance of eyelid

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In order to properly describe the light environment during sleep, it is necessary to know the light transmittance of the eyelids and how to feel the brightness when the eyes are closed. For that purpose, we measured the light transmittance of the eyelids from the condition that the feelings of brightness when the eyes were open and when the eyes were closed are the same in photopic vision. The light source used were monochromatic LEDs of red (peak wavelength 630 nm), yellow (593 nm), green (515 nm), blue (460 nm), and a white LED (Tcp = 4188K, Ra 93). The average light transmittances of totally 33 subjects were 52.4% for red, 26.2% for yellow, 21.6% for green, 4.5% for blue, and 42.7% for white.

EEG Responses to In-Car Dynamic Cluster Light

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We investigated the effect of light on drivers' brain activity depending on the chromatic and dynamic characteristics of the in-car light conditions. We installed a total of 25 lights through the combinations of 5 chromatic variations, including Red, Green, Blue, Warm white, and Cool white, and 5 dynamics, including Blink, Dim, FastBlink, FastDim, and On. Twenty-nine college students participated in the experiment. We measured the high beta wavelength (20 ~ 30 Hz) and alpha wavelength (8 ~ 13 Hz) from the electroencephalography (EEG) responses of each participant. We calculated the Tension index, a ratio of high beta wavelength to alpha wavelength, to indicate the driver's alertness. We found out that the light color

influenced the tension index ($p < .05$), and in particular, drivers felt more alert under green and warm-white. Also, the dynamics influenced the tension index ($p < .05$). Subjects showed high alertness on fast-changing lights (FastBlink, FaseDim). The empirical results provide evidence that automobile manufacturers may utilize the light patterns to modulate driver's tension.

SESSION 3 - COLOR AND PHYSIOLOGY

A study of physical and perceived linearity in a virtual reality environment

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Virtual reality has become a great multimedia tool in which it is possible to represent 3D content. It can be used for many applications such as video games, telemedicine, teleworking or airplane simulators. However, visual appearance is an aspect that needs to be further improved if virtual reality wants to take on a much more professional use. Should color be reproduced in the same way in the real world as in the virtual world? We observed that although the chromaticity coordinates were matched, the visual appearance meant that the user did not perceive the colors in the same way. Then, it is necessary to establish a correction in the virtual reality scenario that corrects the user's perception. In this work, we have measured target linearity in a 3D environment. By measuring the different achromatic spectra, we found that the Head Mounted Display linearly behaved if we applied spectral and chromatic characterization techniques.

How accurate is an on-line test for colour vision deficiency?

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This study explores the accuracy and specificity of an on-line version of a standardized colour vision deficiency test – the Hardy-Rand-Rittler test (HRR) performed in an uncontrolled environment.
A group of 25 observers (18 with a colour vision deficiency and 7 with normal colour vision) that had previously been tested in a controlled setting participated, and the results from the on-line test was compared with previous results.
The on-line test successfully predicted the main results of the physical test of all 25 observers. The test also predicted the deutans with an accuracy of 92 %.

Evaluation of Confocal Microscopy as a Diagnosis Tool on Red Blood Cell Diseases

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In hereditary spherocytosis, mutations in red blood cell membrane proteins result in an overly rigid, misshapen cell whose deformability when traveling through the blood vessels is lost, causing severe anemia and splenomegaly, jaundice, and gallstones. In thalassemia, mutations in the globin genes can cause also severe anemia, skeletal and growth deficits and iron overload. Diagnosing these entities can be difficult due to the coexistence of other causes of anemia and blood transfusions, so complex molecular tests are required. In order to avoid these, we explored the possibility of using spectral confocal microscopy as a diagnostic tool for hereditary spherocytosis and thalassemia in pediatric patients. The red blood cell membrane was stained with different color dyes and immunolabels, to identify possible membrane defects expressed as differences in color and shape under a Leica TCS SP8. Staining the membrane and nuclei with lipophilic fluorescent dyes permitted the precise assessment of cell shape.

A specific use of colour and dyes: „Vital dyes in ophthalmology“

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The human eye is a very unique organ like a living camera. with many translucent tissues and cells. During eye examinations and operations it may be necessary to differentiate between these structures which are in microscopic scales. Vital dyes have to be non toxic to the human body and to the external and/or internal tissues of the human eye. The adherence properties at the eye tissues make them usable for the visibility and discrimination of similar looking physiological and pathological eye tissues. Especially the use of state of art 3D heads up surgery operating microscope tecnology make the use of low illumination at operating sites possible. So nanotechnology using liquid crystals and plasmonic colour sources which make use of environmental illumination without the need of extra illumination can be the basics of the innovation for new vital dyes.

Assessing colour vision using single and multi test protocols

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The purpose of this study was to produce reliable predictions of colour assessment outcomes and to examine the extent to which existing single- and multi-test protocols meet current clinical and occupational

requirements. The statistical outcomes of commonly used colour assessment tests have been investigated in this study. All subjects also carried out Colour Assessment and Diagnosis (CAD) and Nagel anomaloscope tests. The sample included 1827 subjects with normal and congenital colour deficiency (age 31.1 ± 12.4, range 10-65 years). The single test protocols pass all normals and almost 50% of subjects with colour vision deficiency. The multi-test protocols, designed to identify protans and to pass only subjects with mild colour loss, pass over 50% of protans and deutans. Many of the subjects who fail exhibit less severe loss of colour vision than others who pass. When high sensitivity for detection of congenital deficiency is achieved, single-test protocols fail many normal trichromats. Multi-test protocols produce large variability and fail to achieve desired aims.

The Construction of Color by The Congenitally Blind

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This study investigates how people with congenital blindness configure cognitive scenarios involving colors. We use Cognitive Linguistics as a theoretical basis to approach human creative capacity to build these mental scenarios and embody experiences. An experiment was carried out with congenitally blind participants on a mediated visit to a museum gallery. From the data collected, it was possible to verify a robust occurrence of metaphorical and synesthetic constructions in the participants' experience of color, confirming the study hypothesis.

Colorimetric analysis of eye fundus structures with multispectral retinography

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The analysis of the eye fundus is critical to prevent retinal and choroidal diseases since most of them cause no symptoms at early stages. Treating them when the very first signs appear is crucial to avoid vision losses. To this end, the color of eye fundus structures of healthy and diseased patients was assessed from images acquired with a novel multispectral fundus camera (400 nm – 1300 nm) with high spectral and spatial resolution. Characteristic color traits were found: in healthy eyes, large CIEDE2000 color differences were reported between arteries and veins due to different blood oxygenation; the contrast of nerve fibers/fovea was enhanced, giving rise to relevant color differences; in eyes with age related macular degeneration, lesions such as drusen could be better distinguished than with traditional color retinography; alterations of the optic disk in patients with glaucoma were also assessed, showing remarkable CIEDE2000 values when compared to healthy patients.

SESSION 4 - COLOR AND DESIGN

Style Assessment of Home Appliances in Various Interiors Using Virtual Reality

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The style assessment is critical in the product design process. We utilized virtual reality(VR) to create an immersive experience for designers to assess product style on a one-to-one scale. To investigate the values of virtual reality to assess product style, we employed four different interior styles and lighting conditions with regard to an air purifier product. We tried to observe how environmental changes affected designers' judgments. We conducted a user study with 18 designers and summarized the findings in five aspects: first, immersive design experience; second, designer's sensitivity to changes; third, changing product's properties inspired by the interior; fourth, the most frequently changed product property; and lastly, designers' thoughts while being in a virtual environment.

Is Blue still a Representative for Future Vehicles?

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Studies in alternative fuel vehicles identified blue as a representational color even though it is used scarcely in vehicle design. They also identified that blue usage in the vehicle's interior is minimal compared with the exterior. The study analyzes the press-released car interior photos of electric vehicles (EV) and internal combustion engine (ICE) vehicles of global automakers in identifying blue dominance by incorporating a k-means clustering algorithm with weighted color filters. The analysis resulted that blue and green are used more in EVs to represent eco-friendliness and electrification. Ford, Kia, and Mercedes Benz have statistically significant evidence with 99.5% confidence in the independent t-test for blue. Audi and Nissan have significant evidence with 99.5% confidence in green. Consequently, the study confirms that blue is the representational color for three prominent global OEMs.

Visualization of Chair Color Data through Network Analysis

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We visualized the color combinations used in design chairs by using a social network analysis method. This paper suggests a new approach in the context of the research of how different color combinations appeal to a particular style. As chairs are meaningful in design history, 1000 chairs were chosen as an analysis material, we employed a total of 14 color categories mainly based on the basic color names. After applying the network analysis with this dataset, we visualize the network: an integrated version of the network based on color categories. According to the analysis results, nearly half of the chairs which consist of a single color and achromatic colors, such as black, gray, and white, were positioned closest to the center of the network.

Through the study, we analyzed color combinations used in design chairs and visualized the relation of different colors.

Observed changes in garment color selection of university students across normal and test periods

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The present study examined whether university students' selection of their garments would be affected by normal or test periods. An observational study was conducted on a sample of Japanese university students to measure the difference in their selection of garment colors during normal school periods (n = 580) and test periods (n = 372), and the relationship between three garment color attributes across the school periods was analyzed. The results revealed that the selection rate of achromatic colors for upper garments was 59% during the normal school periods; however, it increased to 64% during the test periods. Moreover, the proportion of the chromatic colors in the upper garments decreased during the two periods, whereas that of the achromatic colors increased during the test periods, along with the average garment lightness. Data suggest that the students might avoid stimulating or distracting salient colors to concentrate on examinations.

Relationship Between Taste Impression and Color in Snack Packages

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To reveal the relationship between taste impression and color (its combination) in food packages, especially snack packages, a subjective evaluation experiment was carried out presenting the image of snack packages commercially available. Ninety-nine images were selected from snack packages commercially available as the stimuli in this experiment. The participants were asked to evaluate the impression of basic tastes (sweetness, sourness, saltiness, bitterness, and umami) in stimuli presented to each taste on a five-point scale. In the results, the stimuli with high red color occupancy in the image of snack package were highly evaluated the impressions of sweetness and umami. Compared with the results of the previous study, it is suggested that the highest occupancy color of snack packages strongly affects its taste impression visually.

Effect of sensation modalities on texture evaluation of beige fabrics by Japanese and Chinese

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This study aimed to clarify the effect of Japanese and Chinese students' sensation modalities on their evaluation of the textures of beige fabrics. We carried out two experiments—one using both visual and tactile sensations (VTE) and another using only tactile sensations (TE)—to determine participants' evaluations of the textures of 39 types of beige fabrics. Both the TE and VTE results showed significant differences between the Japanese and Chinese groups in the texture evaluation of each fabric material. In particular, the VTE results indicated that the Japanese group could more clearly evaluate the texture of fabric than the Chinese group based on fabric attributes, such as the structure of the fabric and the thickness of its threads. Thus, the results suggest that the difference between the Japanese and Chinese groups' texture evaluation of the fabric was greater when visual information was added to tactile information.

The visual effect of costume woven with peacock feathers and the symbolism in Japanese culture - Evaluation derived from gonio-photometric spectrum analysis and microscopic observation

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There are two types of designs on peacock feather weave costumes. We named the one characterized with the shape of the "eye" as "hilarious *DATE*", the other characterized with the change of optical anisotropy as "austere *DATE*". The "austere *DATE*" style Obi we investigated was designed that brings out the effect of optical anisotropy with an iridescence between high saturation green or dark blue and a copper brown. Among the peacock's allegory, the "eye" on the feather believed to have the versatility to see all in nature and have a mysterious power, and the ecology of fighting with poisonous snakes believed to remove disasters and dispel illnesses. There are cases of "hilarious *DATE*" in Jinbaori or Kabuto that weaved peacock feathers; it could consider a peacock feather weave costume makes enhanced the expectation as a talisman not only for performance that expresses the spirit of *DATE* with eccentricity.

A study on associative color attributes of Antonyms in Korean language

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Confrontation means that opinions, situations or characteristics are in opposition or contradiction. It also implies a situation of mutual opposition. The conflicting characteristics of meaning are deeply and widely spread in life and everyday life as well as human way of thinking. In this study, 50 pairs of vocabulary considered to be cognitive antagonistic in Korean language were experimented to freely select colors associated with 20 participants participating in the digital color matching experiment. As a result, the antonyms showed differences in color association. However, the color characteristics of each vocabulary varied, indicating differences in accuracy in the three attributes of color. Through this study, it can be seen that there is a difference in colors that people associate with the opposite vocabulary. Their characteristics are very complex and diverse, each resulting in the conclusion that it is inconsistent with the linguistic

(national) difference. These results suggest that color associations do not show a consistent form, which should be recognized as a complex element of various characteristics of language and color.

SESSION 5 - COLOR AND DESIGN

Colour and ornament in the Polish Art Deco style.

Karol Homolacs and his colour course at the Cracow Workshops 1913-1926

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The aim of this paper is to analyse the theory and practice of colour of the Polish painter and designer Karol Homolacs. He was the creator of the original programme of education in colour and ornamentation at the courses held at the Technical and Industrial Museum in Krakow from 1913 to 1926. Homolacs was the author of books on colour and based his colour theories on the research of Wilhelm Ostwald. The Polish artist developed his theory of colour harmony, combining it with the principles of ornament construction. The aim of this article is to present the theoretical assumptions of Karol Homolacs and their practical applications in designing batik fabrics, kilims, wooden toys and parchment paper decorated with the batik method. As only natural dyes were used in the dyeing of fabrics in the Cracow workshops, colour combinations were shown on examples of colours obtained from popular dyeing plants. Since the book by Karol Homolacs "Construction of Ornament and Harmony of Colours" (1930) was published in black and white, the result was an attempt to reproduce different types of colour combinations in the examples of ornaments described in the textbook. In the analysis of colour combinations, Polish decorative textiles created by artists and students of the Cracow Workshops, found in the collections of the Ethnographic Museum and the National Museum, as well as in the Museum of the Academy of Fine Arts in Cracow, were used.

The evolution of environmental colour design in the French period

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This paper describes the third (and final) part of an analysis of the results of an on-going research project concerning the French period of environmental colour design. In May 2019, a qualitative oral history approach was used to conduct a series of semi-structured interviews in French with six colour consultants presently living in Paris: Michel Albert-Vanel, Yves Charnay, Victor Chérubin Grillo, Bernard Lassus, André Lemonnier, and Jean-Philippe Lenclos. Applying an inductive approach and implementing a thematic analysis for the interpretation and representation of the interview data revealed answers to the question "*Comment voyez-vous l'évolution de la couleur dans l'environnement?*" or, in English, "How do you see the evolution of colour in the environment?" The answers of the six colour designers carefully analyzed in the French context since the 1950s contribute to a better understanding of key aspects of the evolution of environmental colour design.

CMF in commemorative ceramics. Project of a color and texture palette on the example of “Ckliwie na szkliwie” – Nostalgic Glaze. Personal collection of memories on ceramic plates

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The idea is to document the existing design elements used in the fading tradition of making commemorative plates. The research and design work included the development of colors and technology of decorating unique ceramic plates. The project became an inspiration and an impulse to cultivate memory and build a community based on the Silesian tradition. The service of creating commemorative plates is based on the stories that users tell and, together with a designer, translate into a graphic design. A characteristic imaginary map is created, which is a personal record of the space, images, colors, words that are in the memories of the participants. The entire process consists of developing a personal story (interviews and workshops), designing a color palette and graphic decors of decals, for any personalization by participants, up to the final product of the project – a unique commemorative plate.

Colored Response: Technology, Thermo-chromic Material Systems and Human Awareness

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Design and communication have been significantly affected by color responsive technology for decades. In the 1960s, color television and photography affected our relationship with technology in ways that influenced the ability to communicate around the world. With this came new processes of color sensitization and dye responsive properties that started a dialogue between designers and technology that has expanded exponentially. With the advent of computers, our relationship with technology has become so intrinsic that it is now difficult to communicate without them. Nevertheless, because of technology, isolation and polarization are becoming socially commonplace. The link between technological innovation and social segregation presents an ongoing issue that can be addressed by designers using responsive color. Is there a way color and technology can merge in architectural environments to allow for better communication? What materials and processes are conducive to this? Can this potential be leveraged to allow for better spaces and increased empathy between people?

The relevance of color in post COVID-19 interior design

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The aim of this paper is to investigate the impact of thoughtful use of colors in post COVID-19 interior design and architecture, through the analysis of relevant case studies that challenge the definition of residential, work and hospitality spaces.
Houses used to provide a private retreat from working and social activities, but in 2020 they abruptly took on new functions that once were prerogative of hotels and workspaces. This resulted in an extreme blurring of private and public spaces in the home, that can potentially have detrimental effects on the mental health and well-being of its occupants. Reconsidering essential elements of design practices, such as the chromatic definition and acoustics, could therefore help soothing the popular insecurities of the fruition of public places, well remark the role of private ones and further define new hybrid spaces, as shown by the research "Living, Working and Traveling", curated by E. Elgani and F. Scullica.

The Odor of Colors: Correspondence from a Cross-Cultural Design Perspective

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Would a rose smell as sweet if it were blue? Perhaps not, colors and odors are associated. It is more likely that people would use the word ''yellow'' to describe the odor of a lemon, than the word ''blue'' if they were asked to use color terms for describing their olfactory experiences. The paper is a scientific and cultural exploration of color–odor correspondences, with suggested variables to be explored in design studies. The findings are considered as a protocol for designers to adopt the inclusion of the sense of smell within the design of places through synesthetic behavior assisted by the use of color.

The role of colour designers in the design process

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The purpose of this study is to offer an understanding and knowledge about the role of colour designers in the design process (particularly paint industry), and to discuss the required attributes and skills of colour designers in each stage of the design process. In order to achieve the goals of the research, a qualitative autoethnography was conducted based on five years of experience gained by one of the authors as a colour designer in paint companies. The experience was described in line with five-stages for a colour design

framework based on the idea of general tendencies in the problem-solving process. This research provides a deeper understanding and knowledge about the work of colour designers in the practical design environment, as well as providing a clear colour design framework based on the practical activities of colour designers. The research is expected also to increase awareness of the roles of colour designers in our society. Increased awareness may lead designers to enter the colour design area and engage in colour design research.

SESSION 6 – COLOR AND DESIGN

The combinations of colours as an analogue model

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After many experiments carried out with the students of the ENSAD, it was possible to confirm the fact that the combinations of colours are reduced to only 22 fundamental sets, which can act as an analogue model in multiple fields, such as music, linguistics, health, architecture, and especially painting.
Thus the Impressionists were able to find a perfect place in these 22 categories of the Planetary Colour System.
In this regard, a very powerful classification process has been developed, which makes it possible to compare the different schools, and art periods between them.
The period of Modern Painting, from 1900 to 1950, prolongs this study by a transposition of colours, but also of forms.
Thus formal combinations become similar to coloured combinations, because the same space can represent them, with cardinal oppositions, such as complementary colours, or neighbourhoods such as shades...
It is essentially for "The School of Paris" to which many artists of foreign origin, such as Pablo Picasso, Joan Miró, Salvador Dalí, Wassili Kandinsky, Piet Mondrian, etc., were able to join forces, and bring a new breath.
For half a century, these artists have been able to develop a revolutionary pictorial creation, which we could think developing ad infinitum...But this is not the case, because we can show that these pictorial categories reduce to a sort of three-dimensional mandala, which is a closed universe where no formal innovation is possible, because everything was tried, and everything was said there!
In the basis of this diagram, we can even detect the beginnings of a certain disarray of what will become Contemporary Art, moving towards the random, the absence, the incoherence, the informal, and even the negation of painting.
Is this the end of an art, as Marcel Duchamp has announced? This is what we propose to develop in this talk.

A mount-it-yourself 3D colour model for designers

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A three-dimensional model registered in Brazil named Colorcria® has been developed to help designers visualize colours and their relations. The model consists of a limited number, typically four or five, “cards” (sheets) corresponding to the (nearly) constant-hue pages of the colour order system it is supposed to represent. The system can be freely selected, in our paper we shall illustrate the model based on either the Munsell or the NCS®© system. The structure of Colorcria® allows opposite pages (with complementary or opponent colours) to be easily assembled and disassembled, making it easier to visualise colour relations. On the model initially there are no colour swatches affixed, thus the designer or student can place the selected colour swatches into the required positions. Colorcria® has already favourably been tested, both in paper and in acrylic version, in an academic environment.

The Colours of Individual and Collective Memory: Mnemosphere, a Visual Atlas of Memory, Emotions and Atmosphere of Places

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This paper presents Mnemosphere, an interdisciplinary research project that investigates how the memory of places can be designed and communicated through experiential spaces capable of stimulating emotions. The research reflects on memory enhancement for the design of temporary exhibition spaces within the atmospheric dimension. It is approached with a particular focus on the topics of colour and emotions as one of the leading research axes. Through a visual research methodology, the project proposes the creation of 'emotional landscapes' related to the atmosphere and memory of places: rationed thematic atlases made up of images collected through a massive Open Call. The result is the translation of formal characteristics of the images (figurative, geometric, organic, abstract, among others) towards purely chromatic information by identifying the most recurrent hues of every atlas while paying particular attention to brightness and saturation, as these two colour properties are also fundamental for semantic purposes. The ultimate aim of the research is to define the morphological elements that represent the collective and individual memory in a system that could allow the further codification of parameters and guidelines for design practice.

Analysis of Research Strategies to Determine Colour Preference II: AFC, Rank-Order and Rating

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Exploring an efficient research method to understanding colour preference is important to researchers and designers. This work compares three experimental methods for individual colour preference resaerch (N-alternative-forced-choice, rank-order and rating). Three psychophysical experiments have been carried out with 338 participants. Participants were presented with six colour patches (red, orange, yellow, green, blue and purple) arranged in a random order. This work suggested orange is the strongest preferred colour and green is the weakest preferred in three individual colour preference experimental methods with six hues. The Monte Carlo Analysis method further compares the result performance for three methods, which suggests the rating and rank-order method are more stable than the AFC method when only small number participants take part in the experiment, such as for studies involving small numbers of participants, the rating and rank-order method should be preferred.

SESSION 7 – COLOR AND DESIGN

Making sense of free associations with PURPLE – A new coding scheme testing French speakers in three countries

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The colour category PURPLE is strangely heterogeneous, potentially due to the use of different cognates. We asked French speakers from Algeria, France, and Switzerland (*n* = 274) to produce up to three free associations with *violet* (basic term), *pourpre,* and *lilas* (non-basic terms). We counted 2,075 associations. We developed a coding scheme that i) covers nine major themes, and ii) shows high inter-rater reliability. Overall, the themes *colour terms* and *natural elements and objects* were most prominent showing that participants provided closely related associations. Finally, *violet* triggered more diverse semantic associations than *pourpre* or *lilas*. This was true for all countries. It seems that the basic term PURPLE carries more diverse associations and connotations than the non-basic terms.

Design Semantics Database: Towards an analytical and logical approach for meaningful design

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The present paper discusses the DSD, a design semantics database for the applied and liberal creative professions. This online application (khnum.club) helps to create meaningful psychologically appealing design and to analyse whether the envisaged values, identity or emotions of a design are effectively communicated. The DSD is a scientifically based design tool that offers information on the meaning and the emotional effect of keywords, colours, colour combinations, forms and compositions, textures, tastes, and postures. A logical data structure, wherein colour functions as a classification system, forms the framework in which the keywords and design elements are classified and connected. As such the DSD offers a unique source of design information bringing intuition to the surface and enhancing it.

Interaction of colour and cotton fabric surface coated with ultrafine cellulose (UFC)

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In this research the influence of ultrafine cellulose (UFC) coating of cotton fabric, on the colour characteristics of a digitally printed sample was tested. Three pastes with a difference in the amount of binder and crosslinking agent were applied in the layering process. Coated cotton surfaces were digitally printed in a multicolour pattern. The synergy of the two layers (ultra-fine cellulose and pigment layer) was analysed in terms of colouristic, fastness and chemical-physical properties. Wet rubbing resistance of layered surface before printing and washing resistance of layered surface after printing were tested. The morphology of surface structure of the samples was analysed by using FE-SEM (Field Emission - Scanning Electron Microscope). Coloristic parameters were analysed by numerical evaluation and graphical representation of CIELAB colouristic values as well as in terms of CIE colour differences.

Colour–cognitive performance interaction in Virtual Reality (VR): A study of gender differences

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The immersive qualities of VR technologies offer an enhanced environment for design research. In this study the potential of colour to influence cognitive performance is explored. A series of psychometric experiments were conducted where selected colours were presented to the participants whist in a dark neutral VR room setting. Cognitive performance was evaluated via a series of single choice tests (i.e., tests assessing people's logical and lateral thinking abilities) in a dark environment delivered via a HTC VIVE VR headset. A total of 18 male and 17 female Chinese students between the ages of 20–25 years participated in the experiments. The results indicate that colours delivered via a VR headset can have arousing and impulsive effects on people's cognitive performance. Specifically, female participants made more errors with the yellow backgrounds but fewer errors with the orange backgrounds than male participants. This suggests that gender differences exist in the effects of colour stimuli on people's cognitive performance in VR environments.

SESSION 8 – COLOR AND DESIGN

Colour, texture, and luminance: Textile design methods for printing with electroluminescent inks

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Smart materials for textile printing present an exploratory design space where the traditional textile methodology of working with colours and print design needs to be revisited to exploit their expressive potential. This research explores the design possibilities presented by electroluminescent inks as printable smart materials for textile design with the aim of expanding the colour palette and its expressive range. Three conventional textile print methods – colour mixing, halftone rasterization, and overlapping – have been investigated through experimental research to expand the design potential of electroluminescent inks, and to analyse the challenges that occur in the surface pattern design process when working with this material. The result presents a set of methods which expand the possibilities of designing with this material: a method of defining diverse colour mixtures, a method for mapping colours using the RGB system, and a method for working with halftone textures.

Color in Fashion Design: orange that changed our perception of Luxury - the use of color at Hermès Paris

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Color is an important part aspect of fashion design. Every well-known brand relates to this topic with great prudence and seriousness. The color use accompanies designer starting with choosing the color palette for the logo and till the creation of the final product. For the analysis the author chose one of the world's best-known fashion brands Hermès Paris. The paper is subsequently divided into two sections, starting with the investigation of the importance of a logo and its prominent role in brand recognition. Hermès Paris is a great example that proves the statement. Notwithstanding the absence of the marketing team, the marque is considered to be one of the world's best-identifiable ones. By studying this phenomenon were discovered alternative methods of influence on customer's behavior from the marketing point of view. The second part is devoted to color application in textile production, studying how color can affect consumer choice and buying. This part is based on studies made during the working experience at Ratti, a textile company in Italy. While executing research and development of the textile and print not only the color has been taken into consideration but also such important aspects as material and finishing that encompass the product design itself. The formerly conducted study intends to be a future handbook for designers of various disciplines and marketers due to its high applicability.

The meaning of blue-green tiles on roofs of the Qinzheng Hall complex at the Summer Palace

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Blue-green, also known as Qing in Chinese, is a distinctive colour. On roof tiles, it appears as a dark-grey colour, which has a slight bluish-greenish tinge. All of the roofs of the buildings of the Qinzheng Hall complex at the Summer Palace (Beijing, China)—built by the Emperor Qianlong (1711-1799)—were covered with the same unglazed blue-green ceramic tiles. A core function of this complex was to manifest the hierarchical relationships of the people in the Imperial Court, such as the Emperor, high officials, and imperial guards, etc. While colour was used in other building elements to indicate status, the use of identical blue-green colour, however, did not make this differentiation. By looking into historical materials, this study suggests that the intention for the adoption of blue-green was to express the Confucian virtue of simplicity as a subtle reinforcement of the imperial power.

Application of Color in Domestic Interior Design: an analysis of the 1960s, 1970s and 1980s

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This article aims to analyze how colors were applied in domestic interior design, from the analysis of color temperature, in 1960s, 1970s and 1980s in Sweden, acting as influencers of the psychological environment Therefore, a literature review was carried out, obtaining an understanding of what color is, its dependence of light, effects caused on the user and its symbology. Once understood, they were analyzed as the covers of IKEA Store Catalog, with Sweden as a special reference, according to specific knowledge in the literature. As a result observed: in the 1960s as the predominant color pallets were cold, with a predominance of blue and green; in the 1970s there was also a predominance of cool tones, blues and greens, in addition to neutrals, black and white; and in 1980s there was a greater presence of warm colors, such as red, yellow and orange.

Procedure to obtain trustful colors in renderings produced by BIM

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The BIM methodology offers the various professionals involved in the design phase a database of information relating to the project's various components. Among this information, colour can be reported in two ways: at the level of digital data to be inserted in the database and at the level of representation in the visualization design images, which are the renderings. Although having to follow standard and specific procedures depending on the device used, the correct acquisition of the colour to be used in the project and its insertion as data is an overall linear process. Instead, the discussion on maintaining the consistency of colour between reality and its representation in the renderings is more complicated and open. This article presents a general and as effective as possible study regarding resolving this problem, analyzing the various criticalities, and

proposing possible solutions using the tools currently offered by BIM software with the help of external plug-ins.

Color and Sustainability in Fashion Design: DUARTE, Portugal

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Color is a constant presence in fashion design which has been greatly explored by highlighting tones, brightness, opacities and transparencies. The combination of these factors integrated into a palette makes the research concern marking a plastic and communicational meaning that takes advantage of sustainability, technique and used technologies. Besides the importance of color in fashion, communication is also symbolic, a way of explaining the theme being used to mark ecological messages, call attention to relevant and critical aspects of the world we inhabit. The environmental references combined with the technical and sensitive process of design are always present in the Duarte brand who draws the attention to the preservation of our planet. The brand has a sustainability rate (4 out of 6), being part of the “Sustainable Brand Platform”. Ana Duarte, the founder and head of design of the sustainable Portuguese streetwear brand DUARTE, won the C.L.A.S.S. Icon Award 2021.

SESSION 9 -COLOR AND EDUCATION

More than Three Dimensions: Communicating the Attributes of Colour Perception in Colour Education

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Colour education typically describes colour as having three attributes or dimensions, usually listed as (1) hue, (2) a term for lightness such as "value", "greyscale value", or “tone”, and (3) a term for chromatic intensity, usually either "chroma" or "saturation", and generally meaning chroma as defined by the CIE. The remaining CIE-defined attributes of saturation (*sensu* CIE), brightness and colourfulness are rarely emphasized in colour education, despite being well-suited to the task of describing the colour appearance of illuminated objects. The writer has devised illustrations and explanations to help communicate these and related concepts during many years of teaching colour in art and design courses, and the paper presents selected examples of these that help to communicate the concepts of modes of colour appearance, brightness, colourfulness, saturation, brilliance and blackness.

Analysis and Application of Artwork Color – Awakening Students' Color Aesthetics and Narrative Ability through Artworks at the National Palace Museum in Taipei

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As many observe, aesthetic experience and awareness of color aesthetics is rather limited among new university design students, and their frequent use of mobile phones and social media erodes their narrative ability. Therefore, units for a required Color Theory course were designed based on cultivating the color aesthetic experience and narrative (storytelling) ability of these students. Peers evaluated naming a theme and theme story narration, self-portrait drawing, color naming and color matching, as well as completed a self-evaluation of their own learning. Research results show that this instructional design helps to improve students' color association and color matching abilities and enhances their aesthetic experience, with significant highly positive correlations. However, the correlation between narrative ability, color matching and color association abilities, and aesthetic experience is relatively weak. The former suggests a future direction in the teaching of Color Theory, while the latter illustrates a need to further bolster narrative ability.

Factors that Influence Color Choice – A Study of Cultural, Symbolical and Synesthetic Behaviors

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This paper is a study of color choice based on cultural, symbolic, or emotional context. This contextual background especially emotional context further connects to basic and strong synesthetic behaviors. In general, there was minimum statistical proof of any universal human response that has a closed relation to cultural or emotional context. The only exception is the basic synesthetic behavior that connects to people’s daily and common experiences. The findings suggest that there are diverse decisions made based on every

contextual background. The research findings serve as a guideline for a pedagogical design that needs to include the teaching of color application related to the cultural, symbolic, or emotional context. The training of color application has to be bound by the pre-defined contextual background. Some basic synesthetic responses may be taught. Extensive discussion of the synesthetic connection between color and other sensing responses should be avoided.

Parametric Design Studio in Interior Architecture Education: A Case of Integration of Colour Design

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This paper aims to disclose the alternative ways in which the interior architecture students integrate their colour design decisions as one of the main determinants of the project from the beginning of the design process. This revised approach is proposed in the third-year interior design studio course mainly specialises in the parametric design approaches in interior spaces. This paper outlines how colour design is integrated into stages thoroughly in the parametric interior design studio. The main motivation is to maintain a procedure that will make colour design decisions evolve through the whole design process as an integral part of it. This study suggests that producing colour charts from the initial stages of the design process, making colour design decisions for interior environments in 3D visualisations at all stages are critical for improving the student projects and helps them to envision and effectively reflect their atmosphere creations.

Beyond the rainbow: a new sorting set for teaching colour

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In this paper we describe a new set of colours that can be used by children in primary school to explore colour relationships in both two and three dimensions. The set introduces many colours that are “beyond the rainbow” by intentionally expanding the familiar circle of vivid colours to include colours that are light, dark and muted, as well as vivid. These colours are featured on tiles that are easy to pick up and move around for sorting in two dimensions. The same colours are repeated on specially shaped cards that can be assembled to form simple three-dimensional models.

Color Names Education Effect on the Color Range Recognition

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The use of incorrect color names in educational fields where accurate color information is required can lead to the incorrect recognition of colors. This study examines the changes in recognition of color range after color name education to identify the effects of the education on understanding color. First, systematic color names and require specialized knowledge were selected, and color samples of the range corresponding to

the color names were presented. Then, the pre-and post-color name education results were analyzed after the color name selection was made for the color sample. It was revealed that yellowish-red was distributed a little more widely in the Y direction, and reddish-yellow was distributed a little more widely in the R direction. These results indicate that the recognition of color range has changed in a way that conforms to the contents of color name education. Therefore, it was confirmed that color name education serves as the basis of color information.

Colorful safety guide

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NOROO Milan Design Studio wants to focus attention on how color can be an efficient tool for childhood assuming different levels and scales of intervention. NMDS has created four color projects to reorganize the flows and guide the entrance spaces of the institutes in Milan, to ensure the safety of children, families, and all users. The approach of NMDS projects is concentrated on finding a key element in each place of intervention and imagining the application of color through forms that determine an effective visual impact to satisfy needs, such as in this case of interpersonal distancing for the problem caused by the covid-19 pandemic. Site specific Color Design that takes on the role of safety guide contribute to by carrying out an educational game.

Educational resources based on augmented reality applied to Color Theory contents

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This article reports research developed in the Color Theory class, from the Design course at Federal University of Santa Catarina, Brazil. This course used a Virtual Learning Environment for 10 years, but in 2021 sought to expand the interactive and participatory possibilities by creating a resource based on Augmented Reality, for the selection of chromatic scales. This resource, programmed in the class's Instagram profile, was adopted for the systematization of the Chromatic Principles and Harmonies. Design academics were asked to identify and classify design pieces from the resource. The results showed that the “color select” filter was significantly accessed by the group and proved to be useful as a tool to support the identification of chromatic scales in examples from the Design area. The strategy proved to be productive, especially when used in conjunction with teaching activities and processes previously forwarded by the Moodle Virtual Environment.

SESSION 10 - COLOR AND RESTORATION

Colour Prediction Method of Digitalized Korean Court Documentary Painting

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Minhwa artists work to revitalize *chaesaek-hwa*, painting in brilliant colours, that reflect Korean people's traditions and aesthetics and one of the important tasks is retrieving the original colours. The purpose of this study was to predict the colours that are used in a digitalized court documentary painting, *The Royal Procession to the Ancestral Tomb in Suwon*, from 1795 Joseon Dynasty for accurate depiction and heritage colour preservation. The experiment was done with the colours extracted from the digital file of the painting and *CIELAB*. 17 colours were chosen to make the target colours. RGB values extracted from the colours were then converted to L*a*b* and L*, C* and h_{ab} were calculated. L*C* tone graph was made for each colour and discoloration tendency was examined with one of the four shapes of colour clusters. Newly calculated L*, C* and h_{ab} were then converted back to RGBs and the colours that are predicted to be close to the original were then created and displayed.

The Experimental Restoration of the Colour of Nanjing Brocade from China

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The precious colour knowledge of Nanjing Brocade has no systematic documentation and it's difficult to recover the fading fabrics. This paper introduces a comprehensive research on literature, artifacts and expert experiences that demonstrates the colour range of Nanjing brocade from both conceptual and visual perspectives. We firstly collected colour terms by text mining to find the commonly used colours of Nanjing brocade. Then, we detected natural dyes in textile fragments by high performance liquid chromatography (HPLC), and conducted dyeing experiments in ancient way to create colour samples of Nanjing brocade. Finally, a perceptual evaluation by experts helped match the samples to terms. Therefore, we can develop a colour specification in line with Chinese aesthetics. With internationally accepted LCh value, the specification will facilitate colour identification and application for researchers, producers, and designers.

Quantitative color examination and restoration of historical architecture: the study of polychrome decoration of a Qing-style timber-frame structure in Tsinghua University (Beijing, China)

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This study incorporates quantitative color examination and measurement into the study of visual performance of tradition Chinese architecture. It provides an objective and scientific way for generating color-restoration drawings and makes it possible to compare the similarities and differences of color schemes between different cases on a common and standard ground.

Diagnostic analysis for colour restoration of a painted Japanese *emakimono*

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In the restoration of painted artworks, the colour characterisation is a fundamental analysis to address the choice of suitable materials for the recovery and the consolidation of the painting layers. In this paper, we present a diagnostic study on a unique Japanese painted paper handscroll (*emakimono*), dated back between the late Edo (1603-1867) and the early Meiji (1868-1912) periods, preserved at the Museum of the Civilisation- Prehistoric Ethnographic Museum "Luigi Pigorini" in Rome (Italy). The artwork required an urgent restoration and consolidation of the entire structure. In order to identify the most appropriate materials for the intervention, non-destructive FORS and XRF measurements were carried out on the artefact. The results allowed the identification of the colour palette used for tests on the chromaticity and the efficacy of the proper consolidants to employ in the final restoration.

Hyper-Spectral Imaging Technique: Application for Colorimetric Analysis of Paintings

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Collaboration with curators and conservators is of utmost importance when working with Hyper-Spectral Imaging (HSI) technique as the instrumentation and experimental protocols have to match their requested

requirements. Other recommendations that need to be followed when acquiring data with an illumination/observation geometry configuration are those issued by the Commission Internationale de l'Eclairage (CIE) for calibrated RGB images and colorimetric values. The difficulties related to obtaining accurate, reliable, and reproducible data suitable for matching the colorimetric calculations as required by CIE result in the still rare application of HSI technique in the art field for colorimetric analysis of paintings before and after restoration. This paper describes the HSI scanner developed at IFAC-CNR for non-invasive diagnostics and accurate color acquisitions on paintings and will discuss HSI measurements focused on color evaluation of the paint surface of a 15th century panel painting before and after the challenging restoration operations.

SESSION 11 - COLOR AND LIGHTING

A proposal for the definition of colored light sources in lighting CAD

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In the last ten years, the introduction of LED lighting sources has brought elements of innovation to interior lighting design. Besides the new tunable white LED source, light is no longer exclusively white; indeed, colored lighting has wholly entered the design practice thanks to the positive effects on people's health and mood. Unfortunately, these elements of innovation cannot be computed correctly in commercial Lighting CADs. These are based on the assumption that light is only white or defined in terms of RGB triplets in the relative color space of the computer graphics, which does not have a physically correct relationship with the actual spectral power distribution (SPD) of light sources. In this paper, the attention is focused on describing the light sources for practical lighting design that also consider the SPD. The focus is on information available to lighting designers who cannot have a laboratory to measure light sources and luminaires. This information is nowadays available in online datasheets from luminaires and light sources manufacturers. Following this idea, a set of functions is proposed to be easily implemented in Lighting CAD software to improve light sources' color management.

Lighting quality for home-working spaces: a survey

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The paper presents a survey to investigate the typical characteristics of the luminous environment of workstations organized in private houses and to test people's average awareness about their choices regarding lighting conditions settings. The research has been carried out on a survey sample made up of home workers and students who were forced to work at home because of the pandemic constraints. Daylight and electric light characteristics in home working spaces are inquired: their description, control systems and overall evaluation are shown. Results are presented and discussed.

Potential of colour in interiors for human light-responsive ambiances in northern locations

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This research examines the potential effects of colour in interior architectural surfaces under different types of daylight colour temperature to respond to human's photobiological needs in a northern context.
Colour corresponds to a fundamental element in architecture since it provides multiple characteristics to an ambiance that could enhance people's psychological well-being. Likewise, colour and light interaction create a novel stimulus perceived by the visual system that could influence in human biological functions such as

the synchronization of the circadian clock. Northern regions and their significant photoperiod over a year could potentially disrupt the shift phase of this biological cycle. Further conditions such as cold temperature force people spend large part of their time in indoors therefore indoor spaces should fulfill people's lighting needs. This experiment therefore analyzes the interaction of light and colour in terms of visual comfort and circadian effectiveness as a potential strategy to ameliorate the lighting conditions and quality in northern architecture. A reduced scale model which can emulate a generic room was used as a test chamber. Principal tonalities (red, green, blue and yellow) were tested in interior surfaces such as floor, ceiling, walls as well they were applied in the complete space. The light source corresponds to a mirror-box artificial sky equipped with LED lamps in dimmable intensity and correlated colour temperature, simulating a northern overcast sky. The interplay of light and colour parameters were analyzed using high dynamic range images and post-processing calculation to evaluate visual comfort in photopic units and circadian effectiveness in melanopic units. The relation between melanopic and photopic results (better known as M/P Ratio) were also calculated to properly understand the potential of an ambiance to produce effective circadian light and to accomplish the minimum thresholds to perform visual tasks. An important influence of hue and lightness colour properties were evidenced in the results.
Colour application and its interaction with light can permit the amelioration of interior ambiances and environmental satisfaction, as well to generate responsive lighting ambiances according to people's photobiological needs in northern regions.

The colors of light in indoor environments: Mixing daylight and electric light spectra to define a proper match

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The paper presents a simplified method to evaluate the spectral distribution of the light reaching an observer's eye in indoor environments, when daylight and electric light are integrated. The method considers both the direct component of light and that reflected by the environment, starting from the actual spectral power distribution of the sources and the spectral reflectance of the indoor surfaces. The spectral irradiances at the eye level for a simple office located in two European cities (Naples and Bialystok) were analyzed considering different mixing conditions of electric light and daylight. Then Correlated Color Temperature (CCT), distance of the chromatic point from the Planckian locus (Duv), Circadian Stimulus (CS) and Equivalent Melanopic Lux (EML) values were obtained, in order to evaluate the quality of light incident at the eye level.

SESSION 12 - COLOR AND RESTORATION

Spectrographic analysis of colourants of cultural items: from a qualitative to a semi-quantitative data treatment through BCTs

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We propose to use current spectrographic techniques for detecting colourants in cultural items in a semi-quantitative way, by systematically utilising the notions of colour term, basic colour term (BCT), and by sampling the coloured areas of each BCT. Given for example two manuscripts (MSS), criteria for sampling the areas of the illuminations of a given BCT, and the detected colourants of those areas, it is possible to estimate a degree of colourant difference. Further, a unique identifier of the item colourants is proposed. For achieving this aim we discuss some steps of the analytical procedure, and borrow from ecology three homologous concepts for detecting colourants, i.e.: for a given BCT, the colourant richness, the colourant abundance distribution, and the evenness of this distribution. Further, we explore a procedure, the input of which is a generic picture, and the output is a map of the same object giving the BCTs distribution.

Color, landscape and cultural heritage. The case of the Pitillal River, in Puerto Vallarta, Jalisco, México

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A study on the Pitillal River in Puerto Vallarta is presented, from the chromatic study of its biodiversity, architecture and urban development. The objective is make an analysis of the construction of a joint memory between color and the river as cultural heritage. The relationships built with the river, biodiversity and the colors that are characterized in their context are identified. With a qualitative research methodology, we start from the visual and ethnographic study of the river, its colors and its context; heritage is pointed out as a tool to revalue identities. As work areas, two polygons were established. The first, in its eastern position in the high mountain area, where there is a relationship with the community of origin. The second polygon is in the western part, where the river meets the sea, the most visible area when it is in front of the framework of the tourist structure, generating relationships and occupations of the territory with new tourist scenography´s.

LED-based versus Filter-based Multispectral Imaging Methods for Museum Studio Photography

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Two practical methods for implementing multispectral imaging within the framework of museum studio photography were investigated. Imaging was carried out using a consumer RGB digital camera paired with either 1) colored glass filters and a broadband source or 2) optimized multiband LED illumination, yielding five or six spectral image bands, respectively. Color targets were used to develop and verify profiles for transforming between the multiband camera signals and final color managed images. The filter-based and LED-based profiles were assessed quantitatively for color accuracy using color difference statistics, and several paintings were imaged and rendered using the profiles as visual demonstration of the differences. While both were superior to conventional RGB imaging, the LED-based method outperformed the filter-based method for accurate reproduction of independent data. This supplements practicality and cost considerations that are informing the development of accessible multispectral imaging strategies for highly color accurate museum studio photography.

A new target to test color accuracy in technical photography of fine arts

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We created a new color target for camera profiling, consisting of 63 color patches. It was created in order to reduce problems that relate to the main bottlenecks when using the common color target for professional photography, the ColorChecker SG chart. Here, we investigate specifically the influence of glossiness and impastos.
Our results prove that spectrophotometer measurement data at 45/0 geometry is affected if the paint has impasto instead of being smooth (CIEDE2000 = 3). However, the effect from having a high-gloss or a matte varnish has a much stronger influence on measured reflectance data (CIEDE2000 = 18). For high-gloss varnishes, also the reproducibility of reflectance measurements becomes worse in the case of impasto paints (CIEDE2000 = 2.0±2), even if the paint sample is not rotated between measurements. Impasto paints make gloss measurements effectively useless, especially in the case of varnishes with high gloss.

Hyperspectral mapping (VIS-SWIR) of materials of three 18th C. tapestries of Royal Manufactures in France (Gobelins, Beauvais, Aubusson)

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At the end of the 17th century, and following a reorganisation by Colbert, the Aubusson, Gobelins and Beauvais French Manufactures obtained the title of Royal Tapestry Manufacture. This title gave rise to the establishment of numerous rules concerning the quality of the materials used in the works produced. A control of the said quality exercised by inspectors of the Crown and renowned board painters sent to work in the Manufactures, leading to the birth of the “Grand Teint” Tapestries 1. This study therefore proposes to compare the materials used in the three Manufactures through three tapestries dating from the mid-18th century, each coming from one of the Royal Manufactures. The power of hyperspectral imaging (in the visible and near infrared ranges) and the treatment’s robustness of the data are exploiting and discussed to map the materials (textiles & dyes).

To enable the study of these high quality tapestries, a colour chart of more than 600 references based on recipes from 18th century treatises2–4 was created, thanks to a collaboration with the Myrobolan dyeing workshop (Brussels). The reference spectra (mainly reflectance or fluorescence) of these samples were then recorded with several non-invasive analysis methods (HSI-VIS-NIR, FORS, LEDµSF...) creating a database that will finally be compared to the spectra recorded on the tapestries studied, thus allowing the identification of the materials used at the time 5–7.

In order to allow the identification of the materials used, different classification techniques based on the database have been tested and optimized to obtain material maps (Spectral Angle Mapper, Extraction of endmembers….). On the tapestries studied, the analyses revealed, for example, differences in the use of textiles between the Manufactures. For example, the Gobelins used more silk than wool comparing to Aubusson. Also, dyes were not fixed on same fibre type. Indigo is dyed mostly on silk in the Gobelin tapestry whereas it is fixed on wool at Aubusson. Thanks to the mapping classification, many differences have been noticed.

Finally, the characterization and the mapping of the materials allowed a discussion on the technical and aesthetic choices of the Manufactures and also to place them in a French and European context. The price, the provenance, the ease of supply or the commissioner could explain some material choices.

The NCS color notation as a guide to produce colors from traditional pigments in conservation: The case study of two painted ceilings from eighteenth-Century Churches in colonial Brasil

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Roman Catholicism, introduced in Brazil since the 16th century by religious missionaries who accompanied the Portuguese explorers and colonizers, contributed decisively to the art expressed in the churches built in this former colony of Portugal, with religious orders and congregations assuming an important role in this process. This paper represents part of a PhD research that aims to use the NCS (Natural Color System) to analyze the painted ceilings of the churches of Pernambuco, Brazil, from the eighteenth century, namely those legally protected at the federal level. The motivation for this investigation is based on the promising field of color studies, which, together with new technologies, has allowed for a greater understanding of the works of the past. A standardized and worldwide known color system, free from any relation to paint brand references, will add a new scope to color analysis on this field, allowing also the possibility of comparison between paintings and the registration of future changes in surface colors due to the passage of time, or other aging factors. Moreover, there is a considerable number of works of art (paintings on wood ceilings), with no attributed authorship, which is a historical gap that this study of colors could help to solve. The intention is to contribute to the research procedures in the fields of conservation, restoration, the study of colors, and the investigation of authorship. On this case study, this procedure was applied to two eighteen century painted ceilings on churches in Pernambuco. For the comparative study between these two monuments, the classification of the colors was carried out with NCS color reader and sample comparison, allowing the definition of hue, chromaticness and blackness.. These color dimensions were later used to formulate and test the mixture of pigments in order to use colors in the process of restoration. This research is expected to build a procedure that will add scientific knowledge and methodological improvements to the work of professionals in this field.

SESSION 13 - COLOR AND BUILT ENVIRONMENT

Spatio-temporal Factors of Colored Light Sequences in the Built Environment: the case of a choral concert – Part One

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When designing a light show using sequences of colored lights, it is essential to consider spatial and temporal dimensions, as well as their interactions. These two dimensions must be approached in their multiple aspects, taken individually and in their interactions. In this paper, the color lighting design of a choral concert in an enclosed space, defined by a backstage wall and a space dedicated to spectators between four large pillars will be analyzed. The analysis is carried out on the basis of 1,890 photos captured every half a second during a 15-minute performance. We will present in detail the characteristics of the context of the performance, in order to identify the spatial and temporal strategies of the performers, the audience and the designers of the color lighting. This light show responds to the rhythm of songs and declamations of poems to make of the event a visual as well as an acoustic experience.

Children's colour preferences in the school context

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The aim of the paper is to present an ongoing study on the evaluation of children's colour preferences in the school context. In particular, two experiments have been planned and partially conducted in order to evaluate both the differences that may be found between colour preferences expressed in generic terms and contextualized in a school environment, and the differences that may be found between digital simulations displayed on the computer and experimented using the CAVE technology. The paper presents the methods of the two experiments and the results of the first experimentation conducted on children between the ages of 6 and 10 using an online questionnaire that showed children both digital colour samples and digital colour simulations of the same colours applied to a classroom environment.

Prehension and qualification of chromatic and lighting environment.

Study case – Païmio Sanatorium, Alvar Aalto

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The case study presented in this paper aims to define the chromatic and luminous character of the Sanatorium Païmio, designed by the architect Alvar Aalto, in order to identify the architect's designs. For it, I based my exploratory work on the development of a chromatic and luminous "identity card" which lists the different colors and lighting modes used. The study is divided into three phases: a color observation, a light observation and the observation of interactive movements. This study highlights the work carried out by the architect on the behavior of chromatic atmospheres under different light and their influence on human

reactions, ensuring the most favorable viewing and rest conditions for patients who were staying in his sanatorium. thanks to the combination of the fields of physics, aesthetics, physiology and psychology.

Is “yellow house” really “yellow”? Survey on determining the range of perceiving the yellow color on building facades depending on the hue, lightness and chroma

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The article's primary goal is to present the author's online color survey results. The study was aimed at checking which colors chosen from NCS Color System's four yellowish hue groups: G80Y, G90Y, Y, and Y10R are perceived as "yellow." The 28 nuances differed in hue, lightness, and chroma, were presented separately on color swatches and building facades. At first, the respondents assessed the yellowness of selected colors and then indicated the most appropriate ones for the color term "yellow." The analysis of the 444 results confirmed the high importance of saturation and lightness (whiteness/blackness level) in color appearance and naming. The research proved that a given color is likely described as "yellow" only when its parameters of lightness and saturation are similar to the prototype of the yellow color category, characterized by high saturation and high intrinsic lightness. The clarity of the hue was also the significant factor.

Plant transfer printing on cotton and silk

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The application of plant transfer printing on cotton and silk was investigated. The influence of pH and choice and concentration of mordants on the visual effect and on the colourfastness to washing and light was examined. The obtained colorations were evaluated spectrophotometrically (dE_{76}) obtained by comparing the samples before and after washing and illumination. Plant transfer was carried out with the leaves of the Rosa Canina. Sodium carbonate, acetic acid and oxalic acid were chosen as pH regulators, and potassium aluminium sulphate dodecahydrate, copper(II) sulphate pentahydrate and iron(II) sulphate heptahydrate was used as mordants (metal salts). From the aspect of aesthetics and design, it is necessary to optimize the process parameters in order to achieve optimal fastness of colouration, in that way the usable properties are also ensured. The paper also presents the creative aspect of the research and shows the process of creating an interior object of original aesthetics.

SESSION 14 -COLOR AND PSYCHOLOGY

What color is your mood? The association between moods and colors

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The purpose of this study was to identify how people associate their mood with color. Like other studies, angry was associated with red. However, although in other studies happy is associated with yellow and sad with blue, in this study female participants associated happy with light pink and sad with dull purple. In addition, the clear influence of culture on color was observed. For example, light pink was associated with Sakura (cherry blossoms), saturated pink with Ume flowers, and light orange with Kyoto. In sum, it was observed that the associations between colors and current moods in parts resembled other color-emotion association studies.

Why are common nature colors (soil, sand, trees, sky, stones, etc.) useful? Why does it go well with all colors?

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Nature colors are being used consistently in all industrial fields, and are considered as trend colors every year. Then, why are nature colors so useful in all industries? In this study, we defined an unclear color that is not classified as a single color because it is not on the color wheel as a nature color, and tried to investigate the characteristics of the nature color that people generally perceive. The range of samples was specified through preliminary experiments, and 60 samples out of 228 samples were classified as nature colors through main experiment. It was found that nature colors are affected more by chroma rather than lightness, and it was found that green and blue were not recognized as nature colors when low saturation.

Comfortable Brightness for Watching Television in the Dark

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This study investigated the visually comfortable brightness range of viewing television content in a dark environment. We prepared 8-second-long six types of videos for the experiment, and their luminance level was adjusted along with the 15 luminance levels, ranging from 20 nit to 500 nit. Thirty-one participants joined the experiment, and each watched the videos in a dark room. Then, the participants made subjective judgments of the visual comforts of the displayed videos using 5-point Likert scales ranging between -2 (too dark) and +2 (too bright). The television luminance around 129.82 nit was found to be acceptable in a dark environment. In particular, the participants preferred higher luminance when viewing the dark videos, and lower luminance videos when viewing dynamic videos. The results provide empirical evidence that display manufacturers may offer users a more comfortable television viewing experience in a dark environment.

Effect of red color and external interferences in selection tasks

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It has been said that the red color has high visual attractiveness, i. e., attracts much visual attention. It is investigated by experiments in this paper whether the visual attractiveness of red color can be reduced by external interferences of suggesting to the respondents the avoidance of the red color. It was conducted in remote experiments, and the respondents are all Japanese language speakers. As the first step, an image of two black “buttons,” guided as “Select one of the buttons to get a piece of sweets,” was presented to all the respondents, and they selected a button. As the second step, red and blue “buttons” were presented, and the respondents were requested to select one similar to the first step under some interferences. It was found that the red was significantly avoided in the case that it was commented, “A piece of 'spicy snacks' is given when you press one of the buttons.”

A study on colour emotions of the mask

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Face masks have become the must-have daily accessories to slow the spread of COVID-19. People tend to choose different masks based on their feelings or preferences. The aim of this study was to evaluate colour emotions for plain colour masks. There were two stages of experiments conducted. Firstly, a Likert scales was used to investigate bipolar adjective pairs of colour emotions in order to obtain appropriate pairs. Secondly, a semantic differential technique was applied to analyze the selected bipolar adjective pairs of colour emotions. The result showed that the emotions aroused by plain colour masks are “clean,” “like,” “modern,” and “new.” A neutral colour was conceived as “cool.” These two bipolar adjective pairs, "modern-classical” and “new-old,” are similar. Also, lightness can affect intensity of colour emotions.

Is Naturalness a Valid Lighting Concept?

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The purpose of this paper is to answer the question in the title by outlining several experimental investigations of the lighting quality of various light sources, predominantly LEDs. All the cases represented here included colour naturalness as at least one of the dimensions studied, and one has to conclude that naturalness is something of great interest to lighting engineers and scientists. A question remains, however, regarding an acceptable definition of naturalness in lighting. The paper also includes a brief overview of some of the major metrics used to represent light source colour quality.

Changes in Color Appearance and Preference of Rose Affected by Color Temperature and Illuminance

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The purpose of this study is to analyze the color appearance and preference evaluation that changes according to the color temperature and illuminance of light sources for rose color and to identify the interaction between color temperature and illuminance accordingly. Five colors of Roses were photographed at chromatic temperatures of 2700K, 3,500K, 5000K, and illuminance levels of 300lx, 600lx, 1000lx, and 1500lx, with a total of 60 stimuli used in the experiment. Results show that, first, the color temperature of the light source influenced the color appearance and preference evaluation of the rose. Second, illuminance influenced the color appearance and preference evaluation of roses. Finally, color temperature and illuminance interacted to affect the color appearance and preference of roses but did not affect roses of all colors. In conclusion, although the color temperature values for color appearance were different for each color of the rose, roses of all colors had the highest preference for illuminance at 1500lx.

Effect of the shade due to the surface unevenness of objects on whiteness perception

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This study measured the subjective equivalent luminance of the whiteness of plaster samples with regularly arranged unevenness on their surfaces illuminated with constant illuminance to determine the effects of shading caused by the surface unevenness of white objects on whiteness perception. As a result, the subjective equivalent luminance was about 5% to 20% higher than the average luminance of the sample, and white objects with uneven surfaces were perceived to be brighter and whiter than their average luminance. This is thought to be because a low-luminance area of the object surface is perceived not as a low-reflectance area but as a shaded area caused by the unevenness of a uniform high-reflectance surface. In addition, it became clear that the subjective equivalent luminance is strongly influenced by the highlighted parts caused by the surface unevenness of objects.

SESSION 15 - COLOR AND PSYCHOLOGY

Perceived attractiveness across Chinese and Pakistani ethnic groups

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In perceptual science, many factors contribute to a face being considered attractive. Previous studies have shown that attractive faces are perceived as belonging to people who are cooperative, sociable, likeable, healthy, etc. Also, facial feature geometry has been shown to have a significant role in the overall perception of the face. In this work, a psychophysical experiment was conducted that used Chinese and Pakistani facial images and observers. A new model is proposed to correlate the data relating to the attractiveness of the Chinese and Pakistani faces and to compare the data with previous models of symmetry, golden ratio, neoclassical canons and their combination. Also, the differences were evaluated between the results from Chinese and Pakistani observers. It was found that the new model performed better than existing models and the ethnic group difference was quite reasonable.

The Valence and Arousal contribution of colour parameters

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Previous studies found that music emotion can be expressed well by valence and arousal. In addition, music can be expressed by static and dynamic colours. The goal of this study is to evaluate people's emotions resulting from audio using a number of emotion terms including 'Valence' and 'Arousal'.
From the results of our earlier experiments about colour and music emotion, 'Joy' and 'Intensity' were extracted from 25 perceptions that can be used to describe music emotions.
In this experiment, the same music pieces were used, and subjects were asked to judge them using 13 scales, including 'Valence' and 'Arousal'. According to the factor analysis in this experiment, the scales of 'Valence' and 'Arousal' were both located in the factor of Joy. This indicates that in this experiment, the 2 scales cannot be used to explain the colour parameters well since the two sets of data were too close.

Visual and sensory perceptions between static and dynamic colors

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Through the investigation of natural pigments, the main object of the PhD in Design by the author Rui Vasques, several questions arise and refer to the reflection on diferent aspects about color.

This PhD investigation has as main objective, the study of the pigments and colors existing in the different types of soil of the mountains of Socorro and Archeira (Torres Vedras), for the discovery of the potential of the use of these pigments by Live With Earth Association, located in Cadriceira. The method is based on the experimentation and prototyping of different applications of these pigments, such as natural paints, plasters and dyes, for the development and creation of eco-products able to add value to the universes of eco-arts, eco-design, eco-construction, education and social entrepreneurship.
One of the chapters of the thesis-project is about color in its different study optics, focusing on design and color psychology, with a transdisciplinar and complex thinking approach . As a factor that permanently influences human physiology and behavior, the psyche, is a vast field of information, frequencies, images, sensations, etc... It is intended to study through the human psyche, the phenomena that happen in it, related to the different ways of perceiving colors, as well as the categories of colors introduced in this study: static and dynamic.
This article represents a deep reflection about human perception, the five senses, the meanings, the characteristics and potentials existing in colors, creating a parallelism and a duality between two categories of colors: the "**static colors**" that we mostly observe in human metrics and applications, and the "**dynamic colors**", mutant, which we mainly observe in nature. This article intends to deconstruct these categories of color, while also framing, in general, the connection of the themes addressed with the concepts of "organic" and "inorganic".
Considering light, time and erosion, as the main influencing factors, this study aims to answer the main questions:
-Which are the different human sensory perceptions, between dynamic colors and static colors?
-Which are the meanings present in dynamic colors, in static colors, and between them?
-Which are the main differences and similarities between dynamic colors and static colors?
-How do static and dynamic colors communicate?
This study is carried out through bibliographic research, among other references, and through a questionnaire addressed to professionals from different areas who work with color, and also an interview with the artist Micaela Jarast, whose painting work is based on the philosophy and use of ecological inks made with natural and semi-natural pigments.
Of the few certainties we have today, it is that everything is uncertain and is constantly changing, on a path of evolution. However, within this certainty, humanity continues to erect structures, mechanisms, ways of thinking, actions, behaviors and beliefs that go in the opposite direction, of eternal permanence, of resistance to the natural mutations of life, of preservation and resilience.

The Emotional Language of Color in Architecture

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As a result of the restrictions triggered by Covid 19, the “psychological health” of the population has been deeply affected. I believe that architecture and color can play a major role in improving the psychological well-being of individuals, acting as catalyzer between the physical and emotional worlds.
When we use color in the 3D physical spaces, due to the nature of its perception, thoughts and emotions are trigged, creating behavioral benefits. We will explain that color perception can sometimes be enriched by the beliefs of the cultural background and the natural environments, Varela et al. (201a). And it is in the Chinese Philosophy in which we encounter the color beliefs connected to the communicative and emotional contents.
In this paper, we present the emotional language of color, made up of five concepts involving color and its situation in space. We will display some of the proposals made for a penitentiary in Seville, Spain.

Application of color feelings prediction formulas to the estimation of two-color combination feelings of “kimono”

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This study aimed to examine the applicability of color feelings prediction formulas to the estimation of color combination feelings of “kimono” by performing an evaluation experiment of color combination feelings using illustration images of a woman wearing “kimono” and analyzing the correlation between the evaluation and estimation values of color feelings prediction formulas. As a result of the experiment, the following conclusions were obtained: (1) “Pleasantness” and “beauty” are closely similar feelings. (2) “Floridness” and “contrast” are closely similar feelings. (3) Color feelings prediction formulas are effective in estimating the color combination feelings of “kimono.” However, there is room for improvement in the estimation accuracy of “pleasantness” and “contrast.”

Color Preference for Color Combinations Applied onto Three-Dimensional Color Configuration

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This study aimed to understand the color preference on 3D color configuration. Thirty-two observers were invited to take part in a psychophysical experiment. Each observer was asked to assess 141 experimental samples on the “like-dislike” scale. According to the results, color preference is mainly affected by the sum in lightness, and needs to be divided into three phenomena: (1)when achromatic color configured with achromatic color, the lightness sum between two colors is greater, it is more liked, (2) when color combination is chromatic color configured with achromatic color, the color preference is lower when the sum in lightness between the two colors is closer to 110, but when the sum in lightness is greater than 110, the higher the sum in lightness, the more it is liked , and (3) two colors with higher lightness sum tend to be more preferred while chromatic color configured with chromatic color.

Lighting emotions: a review of the emotional influence of color perceived lightness

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As human beings, we are continuously exposed to stimuli that modulate our psychological functioning and behavior, presumably through the influence exerted on our emotions (Valdez and Mehrabian, 1994). In literature, among others, the feature of color, mainly related to the three attributes of hue, chroma, and

lightness, represents one of the most explored topics (Wilms and Oberfeld, 2018). By the way, the multidisciplinary lens through which it has been investigated and the partial lack of methodological rigor (Elliot, 2015) make it difficult, thus far, to unify the research evidence while being able to disambiguate the single contribution of each color's attribute. The current review aims to provide an overview of the most recent literature, focusing on evidence that highlights the role of the perceived lightness of color, in its functional as well as aesthetic properties, in influencing emotions and behavior. Practical implications and future directions in this research area are outlined.

SESSION 16 - COLOR AND PSYCHOLOGY

Color as a therapeutic adjuvant: theories and applications in the hospital setting

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If in the past the hospital was conceived as a mere container of professional skills, whose success was linked to the preparation and skills of individual professionals, today hospitals define their goals on basis of user demand.
The quality that is sought is no longer just the health one, but also takes into consideration all the sensory perceptions that an individual, in an evident state of illness or not, can perceive.
Medical staff and patients are influenced by the environment in which they spend most of their time; each structure, as a whole, conveys important non-verbal messages that can be perceived and interpreted in a positive or negative sense and consequently have repercussions on the outcomes of their work and of the treatments themselves.
The present contribution therefore aims to compare some outcomes resulting from the application of theories, consolidated and modern, and of consciously conducted experiments, with shareable results.

Colour-emotion associations: What have we learned so far and what are the unknowns?

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Colours carry certain affective meaning to most people. We feel blue, see red, are green with envy. Obviously, with our linguistic, cultural, and perceptual environments being rich in affective colour meanings, colour-emotion associations can also be detected in controlled laboratory settings. Affective meaning of colours has been empirically researched for over 120 years (early studies: Allen & Guilford, 1936; Dorcus, 1926; Major, 1895; Wexner, 1954) and there are over 100 empirical studies linking colours and emotions. However, only recently different laboratories started systematic investigations to understand the mechanisms guiding these associations. Here, we focus on associations between colours and emotions, and empirical studies conducted in our psychology lab in the last five years.
In most studies, we asked participants to associate colours, presented as either basic colour terms or focal colours representing these terms, with 20 emotion concepts, varying by valence, arousal, and power. By consistently using the same methodology in different samples of participants, we reached five conclusions. First, colours and emotions are associated systematically (not randomly), with a possible exception of purple. Second, colour-emotion associations are universal, at least when testing associations with colour terms across 30 nations (Jonauskaite, Abu-Akel, et al., 2020) Third, these associations are further modulated by perceptual and linguistic experiences. More specifically, participants living geographically closer or speaking more linguistically related languages associate colour terms with emotions in a more similar manner (Jonauskaite, Abdel-Khalek, et al., 2019; Jonauskaite, Abu-Akel, et al., 2020). Fourth, colour-emotion associations have a strong conceptual component, suggesting that these associations are abstract rather than driven by direct visual or affective experience. In other words, semantic representations are sufficient for colour-emotion associations to be reported, at least in adulthood. We based the latter conclusion on two observations in French speaking Swiss participants: i) emotion associations with colour terms and colour

patches were very similar (Jonauskaite, Parraga, et al., 2020), and ii) colour-emotion associations reported by colour-blind individuals were similar to those reported by non-colour-blind individuals (Jonauskaite et al., 2021). Going beyond conceptual associations, participants seem to match similar colours to felt emotions (Jonauskaite, Althaus, et al., 2019).
With this knowledge at hand, we highlight some open questions. First, systematic colour-emotion associations do not automatically imply that colours "evoke" emotions. In fact, there is little empirical research supporting this claim, despite the popularity of this idea in the popular media (e.g., chromotherapy). Second, the origins of colour-emotion associations and their universality are still obscure. Potentially, colour-emotion associations are shared across countries because of shared environmental experiences or rather globalisation. Third, developmental and age-related changes in affective colour connotations are poorly understood. Finally, the link between colour-emotion associations and colour preferences is understudied, and both types of affective connotations are often lumped together. Hopefully, future studies in our and other labs will shed light on these and other questions in affective colour psychology.

Colour shift due to Chromogenic dynamic glass

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Visual and thermal comfort are crucial for users' well-being and work efficiency. The solar radiation through windows may become a source of thermal and visual discomfort. A Chromogenic Dynamic Glass is being tested in the Test-cell at NTNU, Norway, as a promising glass that automatically adjusts the light transmittance according to the weather conditions. As the glass has a colour tinge, technical measurements and the visual evaluations of colour were done in following scenarios: No glass, clear Reference glass and the Smart glass (Chromogenic). The results show a clear difference in perception of colours between the Reference and the Smart glass. The Smart glass behavers differently in sunny conditions (shift toward green, washed-up colours, especially red and purple) and overcast conditions (shift toward yellow, more colourful). The Smart glass makes colour compositions (besides the monochromatic yellow) less harmonious, slightly cooler, faded and sombre, and less sharp, especially in overcast condition.

ColorDoku 3d, gamification to improve perceptual color discrimination ability and spatial vision

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The description of color as a visual phenomenon with three perceptual variables, hue, value and saturation, resulted in different 3D color models since the beginning of the XIXth century. The ability to discriminate colors and organize them in the right order is a worth training for architects and artists, as it improves their sensitivity and expands their color abilities. Moreover, to have a robust spatial imagination is an essential skill for an architect, and so it is the understanding and manipulation of 3d objects. To merge the knowledge about regular polyhedra and color understanding, we have developed a digital app called ColorDoku 3d, in which the user can drag and drop the colors provided into the right faces of a solid to complete a 3d puzzle.

This app is aligned with innovative pedagogical practices like gamification, that has demonstrated to be a good way to engage students in tough learning.

Determination of the Representative Color of a Smartphone Image

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An online experiment was performed to assess what observers determine to be the representative color of an image. This experiment was part of a larger study assessing color science in the context of agriculture. It was an attempt to understand which characteristics people use to categorize a crop, particularly tomatoes, as ripe and how those characteristics are rendered by smartphone imaging. Observers were shown an image for one second, followed by a gray screen. They were then presented with an array of nine colors to choose from as the most representative of the image they had just seen. There was a split in observers' choices of representative color in terms of choosing the mean versus choosing a more saturated color. A trend was visible in the location of the color chosen, where the centermost color was chosen most often. No trend was found in time taken per image.

Psychophysical Study of the Perception of Color Gradient Boundaries

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Color gradients constitute an important component in the color quality control evaluation of multicolored patterns that contain color transitions. A psychophysical study was designed and employed to test a set of lightness change, hue change, and chroma change color gradients. The influence of several parameters on the visual detection of the gradient boundaries and perceived smoothness levels were tested. These parameters included the orientation and slope of the color transitions and variations in the gradient-based on lightness, hue, or chroma.
The design of the psychophysical experiment contained two parts. In the first part, the perceived boundaries of color gradient stimuli were determined. In the second part of the study, the perceived smoothness of the stimuli was examined. We propose that different gradient slopes cause differences in ranked smoothness. We further hypothesize that the orientation of the color gradients also influence the perceived smoothness. Four binary transition regions were simulated: brown-green, brown-tan, green-olive, and light sage-olive. Three different linear-gradient slopes were applied to each transition, and the stimuli were presented in four orientations: horizontal, vertical, right diagonal, and left diagonal.
Results indicate that the gradient slopes influence both the perceived boundaries and perceived smoothness levels. Observers were found to be more sensitive to luminance variations than chromatic variations. Furthermore, observer responses indicate higher sensitivity to color variations in the horizontal direction.

SESSION 17 - COLOR AND EDUCATION

Teaching and learning color. An insight into STEM/STEAM approach

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The paper aims to help define the STEM/STEAM approach to Color Education. Nowadays more and more schools embrace this approach as it seems to respond to a need for renewal of teaching while adapting it to the present time. However, this approach is not univocally defined, so that under this label fall experiences of color education of various kinds and different educational effectiveness. Therefore, this work intends to clarify the meaning of this approach. The article is divided into three parts that show the methodological path undertaken. In the first part, some invariant properties of situations classified as STEM/STEAM were identified; in the second part, the invariants were described in terms of didactic variables inferred from the literature and some STEM/STEAM teaching activities; in the third part, some procedural principles to guide teachers' work were formulated and discussed in the context of teaching and learning about color.

Color and Polymers at ITECH

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ITECH Lyon was founded with the aim of combining 4 professional fields into a single course of study focusing on "polymer materials and coatings": chemistry, plastics engineering, leather and textiles.
These specialties have in common polymers chemistry and color. ITECH has a laboratory dedicated to colorimetry, for academic and professional training.
In the Colorimetry Lab, training is organized in different sessions, based on the following topics: practice of color and use of dyes/pigments for visual color-matching, measurement of colors with spectro-colorimeters and use of colorimetric quality-control software, interpretation of color differences, formulation-correction of colors by using computer-aided color-matching and dye/pigment databases, as well as initiation to effect colors and effect pigments with metalized colors and pearly colors.
Colorimetry is part of many constantly-evolving industries, which is why training is essential for novices and experts alike. Many devices that can be used during the training are adapted to participants and so is the content. Novices are taught the color vocabulary, the color definition, to achieve color-matching, etc. Experts will better understand and anticipate color variation, they will learn how to control and adjust tints by using a spectrocolorimeter, how to create a database on a specific spectrocolorimeter, how to optimize the use of devices, etc. Many ways to help professionals and students to expand their knowledge.

How to convert an experience–based university course about colour, light and space for the web?

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COVID-19 forced university studies to the web. This paper describes the case study of an experience-based MA-level course at Aalto University about colour-light-space. The purpose is to evaluate and research the used pedagogical methods in the web-based educational environment. The research methods are: practice-based case study, documentation of the course and students work, a questionnaire for the students, and personal notes. Three pedagogical principles summarize the results: 1) new practices and rules of the web-based educational environment, 2) pedagogical methods for connecting people during the course and 3) methods for building the experience of colour, light and space for the web. All lectures, assignments and virtual excursions were adapted to the web.

Mario Lodi: “Children’s colours are festive, flamboyant, vivid colours”

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Mario Lodi was a teacher and key figure in the history of Italian education. His school journals and joint compositions with pupils are still studied by trainee teachers today: they illustrate Lodi’s classroom practices, the value he attributed to children’s voices, and his commitment to mindful but flexible educational design, documentation, and self-evaluation. The centenary of Lodi’s birth on 17 February 2022 invites us to rediscover lesser-known aspects of his work, such as his interest in children’s multiple languages, including expressive languages and colour. In 1989, Lodi founded *Casa delle Arti e del Gioco*; in 1992, at the Galleria Gottardo in Lugano, he staged *L’Arte del Bambino*, which later became an itinerant exhibition showcasing children’s artistic productions, from their earliest scribbles through their first abstract works. In this paper, I explore Lodi’s colour education and its relevance to contemporary didactics, based on his autobiographical writings and practical work with children.

Colour proposals consistency in the CMF for car design education

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The aim of this work is to investigate the learning processes of the CMF project, through the analysis of the methods of colour representation in thesis of students of courses in Transportation Design. In car design, the eventual richness in students’ representational abilities is crucial for them to best express their ideas. In the CMF design field, in which the choice and combination of chromatic variables play a fundamental role, the representation richness is even more important because of the need to express ethereal concepts such as emotions. A first result described in this work identifies a recurring difficulty by students in the graphic restitution of the chromatic concepts, stated in the moodboard of their own projects, with style and quality consistent with the other parts of the project. At last, the areas on which the teachers will have to take action to reduce these difficulties are highlighted.

We don’t know Jack about Hue: The Colour Knowledge Survey

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What does the average person know about colour? The Colour Knowledge Survey concludes that few people can confidently identify basic principles as to the nature and behaviour of colour. The survey collected spans a period of some 12 months, across a broad range of participants, from professional designers through to those who profess little or no understanding of the subject. The conclusion is that colour literacy is generally poor even among those whose profession or education requires a high level of competence.

SESSION 18 – COLOR AND MEASUREMENT/INSTRUMENTATION

Colour appearance of a white space with greenish daylight

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White is a special colour used in modern architecture. According to a previous study (Kitamura et al. (2020)), the white in actual architecture appeared with various tints and tones. For example, the white walls inside are sometimes coloured green subtly by daylight reflected on the surrounding greenery. The purpose of this study is to clarify to what extent the appearance of green in space can be varied with daylight coloured by the surrounding green, and to investigate its mechanism. In this paper we conducted a subjective experiment using a mock-up model and the result showed that the area where observers perceived strongly coloured was in the boundaries between the high and low luminance. The mechanism of the perception was discussed from the viewpoints of Mach band effect, Bezold-Brücke phenomenon, and chromatic adaptation.

Development of color and gloss measurement system with wide-range temperature and humidity control unit

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We have developed equipment for measuring the color and glossiness of objects in a wide range of temperature and humidity conditions. This equipment can control temperatures up to 100 °C and 5%-100% humidity ranges and measure the color and glossiness of objects using a well-calibrated digital camera. We verified the measurement accuracy and found that the color difference is quite small and that we can obtain accurate glossiness data in the of dark color range. We demonstrated the results of the measurement of silica gel (whose color changes with humidity) and black beans (Japanese traditional food, whose glossiness changed with temperature). We obtained important experimental data on the relationship among temperature/humidity, weight of the materials, and color/glossiness.

Identify the characteristics of optically variable inks with deep learning

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The optically variable ink (OVI) displays different colors according to different viewing angles. It is often used as an essential item for anti-counterfeiting of security documents. Forensic authentication of OVI is very important. In this study, 5 pairs of color samples were made by painting either authentic or fraud inks using an ink squeegee. A multi-angle spectrophotometer, a flatbed scanner, a camera with multi-angle lighting and a microscopic magnifier are used for recognizing authentic OVI. The results show that the OVI images

obtained by the flatbed scanner have a 99.96% successful recognition rate through a Convolutional Neural Network.

Estimation of authenticity model considering the colour: Leather as a case study

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Material appearance and perception have important aspects of product design. In this study, we focus on the authenticity perceived from leather. In various products, not only genuine leather but also artificial leather is used due to animal rights and environmental issues. The artificial leather is manufactured to resemble genuine leather, but it may give consumers a different perception. In previous studies, we investigated using black leather samples. The model was proposed based on a layered model that imitations the perception mechanism. However, it is clear that colour affects perception. Therefore, the purpose of this study is to derive the perception model considering colour. Using various colour samples, we conducted measurement and subjective experiments. As a result, the model considering the surface colour showed a high correlation with subjective scores. The model can contribute to understanding the human perception of leather and efficient appearance design of artificial leather.

SESSION 19 – COLOR AND MEASUREMENT/INSTRUMENTATION

Cross-media color reproduction under mixed adaptation condition

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Mixed adaptation occurs when an observer is evaluating the cross-media color reproduction using a successive binocular observation. This study focuses on the influence of the luminance disparity between the two media on the mixed adaptation status. A color matching experiment was conducted to obtain the corresponding colors between the fabric samples illuminated by a light booth and the softcopy images displayed on a monitor with a much lower luminance level. Compared with the prediction of the existing mixed adaptation models intended for the condition with the two media being roughly equal in luminance, the reproduced colors on the monitor requires higher lightness or colorfulness to compensate for the luminance difference in the present experiment, indicating that the luminance-dependent color appearance phenomena may play an important role in the mixed adaptation. In addition, the texture effect is discussed as well, which turns out to have an insignificant impact on color reproduction.

Study on colour effect of transparent material under colour-light

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Transparent materials are often used in different light environment because of vibrant visual effects. However it lacks in-depth research on the relationship between transparent materials and colour light, especially in design. This paper thus from a colour design perspective demonstrates a systematic research on the visual effects through transparent materials, colour and light and further proposes a theoretical model based on the experimentation. The study explores the colour effects under the conditions of additive & subtractive colour mixing. The experiment includes two phases that constitutes a colour-light system through transparent materials with various colour gamut, and illumination density. By changing colour of the light, the transparent materials appear a regularity of overlapping visual effects. The finding shows four variables of visual effects: colour mixtures, colour, transparency, and materiality, which provide alternatives for designers and artists who involved in the construction of colour-light urban contexts.

Quantification of the effect of colour appearance and materials on the visual-tactile properties of fabrics

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This paper presents the results of experiments to evaluate the human perception of the visual-tactile properties: *flexible-stiff*, *smooth-rough* and *soft-firm* of fabrics as seen on a mobile-phone display. The aim

of this study was to test whether different colours and different fabrics have significant effects on these properties, and to evaluate the differences between the effects of these parameters. Eighty images, representing four fabrics and 20 colours, were used to judge the human responses to tactile properties. The results showed that observers can be significantly affected by colour when assessing smoothness, roughness, softness and firmness on woollen wool fabric, while most colours have no significant effect on the human perception of flexibility and stiffness. Fabric materials which have different textures have more significant effects than colour for smoothness, roughness, softness and firmness, but there is little difference between the effects of colour and fabric material when assessing flexibility and stiffness.

Differential color perception theory

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Trichromatic color theory does not explain all aspects of our color vision, it has built a very complicated models for the phenomena of color mixing and color definition; by the time it becomes very necessary to have a different approach to the theory of color depending on the newly developed relation between science and art. It is been found that our vision system following different mechanisms for our color perceiving than the conventional color theories. Accordingly; it is approved that our vision system is much simpler than what has been stated by the complicated conventional color theories. Through our work we found that our color vision system following additive and subtractive processing at the same time depending on the different wavelengths absorbed by our M and L-cones in our fovea of our retina. The M-cone detects the whole visible spectrum from 400n to 700n with respective gain and polarity; wave lengths from 400n to 500n introduce negative response with different gain (perceiving magenta), while wave lengths from 500n to 700n give positive response (perceiving green with variable gain). L- cone detects the whole visible spectrum from 400n to 700n as well, with respective gain and polarity; wave lengths from 400n to 520n introduce a negative response with variable gain (perceiving cyan) , while wave lengths from 520n to 700n has a positive response with different gain (perceiving Red). It is approved that wave lengths of a negative response follow a subtractive process of mixing as pigments (art). According to the new color theory our mind needs only the M and L-cones response signals to perceive the whole visible color spectrum. S-cones surrounding our fovea with rods are mainly in charge of our night vision.

SESSION 20 - COLOR AND DIGITAL

HDR image quality evaluation for mobile displays

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A series of psychophysical experiments were carried out on three OLED-based mobile displays from different manufacturers to evaluate the perceived image quality in high dynamic range (HDR) mode by a panel of 15 observers. Eight perceptual attributes, i.e., naturalness, colorfulness, brightness, contrast, sharpness, gradation, preference, and overall image quality, were investigated via rank order method. The experimental results demonstrate that a wide color gamut helps the perception of colorfulness, while higher peak luminance would not mean better performance on brightness and contrast. The analysis of variance (ANOVA) indicates that there are no significant differences among the overall image quality of the three mobile devices.

Research on HDR images tone mapping algorithm based on modified iCAM06

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To solve the problem that the LDR display device is difficult to meet the HDR display, the HDR image tone mapping algorithm is studied. A new modified algorithm based on iCAM06, iCAM06-n for short, is proposed. The iCAM06-n algorithm combines iCAM06 and multi-scale decomposition algorithm, compensates the images chroma via using the compensation method. 4 kinds of algorithms are analyzed. Then 6 typical HDR images were compressed, and the psychophysical experiments were organized to evaluate the images reproduction effects subjectively. The experimental results show that the objective and subjective evaluation tend to be the same, and iCAM06-n has the better performance, which improves the shortcomings of other algorithms. The chroma compensation method effectively improves the problem of saturation reduction and hue shift in the HDR image compression processed by iCAM06. The introduction of multi-scale decomposition algorithm ensures the details and sharpness of images in the tone mapping.

Recovering Real-World Spectra from RGB Images under Radiance Mondrian-World Assumption

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In Spectral Reconstruction (SR), we recover hyperspectral information from RGB data. Recent works benchmark SR algorithms based on hyperspectral images of real-world scenes, where two dominant approaches are regression and Deep Neural Network (DNN). While the former seeks point-based RGB-to-spectrum mapping, the latter incorporates sophisticated architectures mainly to extract and utilize the image contextual information in the SR process. In this paper, we examine the relative performance of the two approaches when applied to some “unseen” and “unexpected” spectral image data. We define a subset of

images complying with a real-world worst-case imaging condition namely the Radiance Mondrian-World assumption, where the image content is limited to overlapping rectangular regions, and the spectral signals are uniformly sampled from the convex closure of the real-world spectra at hand. Interestingly, for all the models considered – including many different regressions and the leading DNN – performance degrades to broadly the same level (indicating there may be little advantage for using the DNN approach in this worst-case scenario).

The use of LED-based illumination for Multispectral Imaging System

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This work investigates the use of full-spectral Light Emitting Diode (LED) as the illumination source in a multispectral imaging system for fabrics. The objective is to completely and accurately collect both spectral and spatial information of the object for subsequent applications such as colour reproduction and image retrieval. In recent years, the advancement of hight intensity LEDs brings advantages such as low energy consumption (i.e., less heat), fast response time and low cost to multispectral imaging systems. In the experiment, two main issues are studied with comparisons to the traditional illumination methods, they are colour measurement accuracy and spatial uniformity, as these are the most important properties for the application in fabrics. The experiment results suggest that using LED as the illumination source in a multispectral imaging system is promising, especially for applications in textile and fashion industries.

SESSION 21 - COLOR AND DIGITAL

Imaging colorimeters to evaluate Camera Monitor Systems

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Over the last few years, we have experienced a gradual increase in autonomous and driver assistance technology. Generally, we refer to systems as ADAS (Advanced driver-assistance systems). A particular aspect of ADAS is Camera Monitor Systems (CMS), a system composed of a camera, a software that performs image processing operations, and a monitor for the driver. These systems help increase the overall safety aspect of the vehicle and increase the visibility of the drivers' surroundings; therefore, the original equipment manufacturers (OEMs) must adhere to country specific regulations, necessary to test the robustness of the system. In this paper we will discuss the various test procedures for CMSs, with particular attention to the optical performance evaluation of the system. This includes lighting system, test patterns and an imaging colorimeter accompanied by a software which performs measurements according to the regulations mentioned in ISO16505:2019 (2019).

Analysis of Biases in Automatic White Balance Datasets

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Learning-based methods for Automatic White Balance (AWB) are trained on properly-annotated datasets, where each image is associated to a ground truth illuminant. The intrinsic characteristics of such datasets, therefore, play a fundamental role in the generalization capability of the resulting AWB model. In this paper we analyze the biases of commonly-used datasets for Automatic White Balance: ColorChecker, Cube+, Gray Ball, INTEL-TAU, and NUS from National University of Singapore. We describe each dataset in terms of employed cameras, distribution of the illuminants, shooting parameters, and image content. The resulting analysis highlights the individual shortcomings of each dataset, as well as the type of image that is under-represented by all analyzed datasets, such as artificial-light and low-light scenarios.

Chromatic Weibull Tone Mapping for Underwater Image Enhancement

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Image enhancement is often used to alleviate the low contrast, blurring and colour reduction effects, common in underwater imagery. Tone Mapping, a particularly simple yet elegant enhancement technique improves image quality by modifying image histograms to a more desirable tonal distribution. In previous work, we presented our novel chromaticity-preserving algorithm, Weibull Tone Mapping (WTM), that can simplify custom tonal manipulations, to increase conspicuousness of image features. In this paper, we present a natural non-chromaticity preserving counterpart, in which the WTM tone map is applied to all colour channels (R,G,B). We demonstrate, as before, that user's prefer WTM to unenhanced images. However, contrary to prior work, our non-chromaticity preserving WTM is less preferred to custom tonal manipulations. Thus, how we map the colour aspect of images (given a brightness only tonal adjustment) has a significant impact on users' subjective preference judgements.

Angle-Retaining Color Space for Color Data Visualization and Analysis

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The Angle-Retaining Chromaticity diagram (ARC) is used to map tristimulus values in a two-dimensional representation, so that angular distances in the original three-dimensional space are preserved as Euclidean distances in ARC. This property makes the ARC diagram particularly useful for computational color constancy, where the illuminant intensity is purposely discarded and illuminant chromaticities are compared in terms of angular distances, through either the recovery error or the reproduction error. We expand the ARC diagram by designing a full-fledged color space that adopts a cylindrical-coordinate color model. The resulting ARC space incorporates a third dimension encoding the intensity information of the initial color, while maintaining the angle-retaining properties of the ARC diagram for the first two dimensions. We formalize the equations that describe the mutual conversion between RGB and ARC space. We illustrate the emerging geometric properties of the ARC space, and its relationship with angular distances. We present a number of potential applications of the ARC space related to color constancy, texture analysis, and image enhancement.

Comparison of color gamuts generated by digital printing devices under different conditions

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In the color industry, it is vital to know the color gamut of a given device. The aim of this work was to compare the color gamuts generated by printing devices, showing the effects that different papers, light sources, printing technologies, and file formats have on the color obtained. For this purpose, a new software for comparing the color gamuts was developed. An automated color measurement system was also used for the printed color samples. For the comparison of the color gamuts, the software simultaneously represents them in the 3D CIELAB space and calculates their volume using two algorithms: Convex Hull and Alpha Shapes. This

work allows for the optimization of color gamuts generated by printing devices by choosing the appropriate factors and settings, helping to achieve high quality color images.

Perceptual calibration of color. An exploration

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We denominate the *perceptual calibration of color* as certain abilities that, precisely technicians and artists, exhibit in the use of color. We understand this property as the sensoperceptual mechanism in which, in the sensory impression of an object, the brain compares or *calibrates* this impression with the idea of color that the brain itself has forged through experience. Without the idea, the impression cannot be calibrated. In spite of the importance of calibration, there are many unknowns concerning its origin, evolution, and characteristics. The objective herein, therefore, was to put together an approximation of this phenomenon employing, for the effect, phenomenological analysis. This derives from the thesis that changes in the illumination of the surrounding environment contribute to a process of perceptual adaptability that stimulates in the individual an idea of color that, in practice, can be occupied in educative processes and for the evaluation of qualified personnel.

Diagnosis of Psoriasis using image segmentation and deep learning

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Introduction: Some chronic inflammatory skin diseases (e.g. Psoriasis) can lead to symptoms such as pain, stinging, and itchiness, while other skin issues including cancer (Melanoma) are responsible for a significant number of deaths each year. According to Mayo Clinic (a nonprofit American academic medical center), there are more than 3 million Psoriasis and more than 200 thousand cases of Melanoma per year in the USA. Early detection is crucial since timely treatment could dramatically mitigate the impact of these diseases. However, diagnosis often requires professional dermatologists, making self-detection challenging for patients in the early stages of the disease.
Objective: Given the background, the objectives of this study are two-fold: 1) design an image classifier to facilitate the early detection of these diseases based on clinical images; 2) employ a suitable image segmentation method to extract the relevant color information. This should accelerate early identification of these diseases by patients as well as dermatologists.
Data Source: 2000 images of three types of skin diseases i.e. melanoma, nevus, and dermatofibroma (fibrous nodule)- were downloaded from an open-source platform, "ISIC archive" to build the image classifier. Moreover, one hundred eighty nine (189) psoriasis images were scraped from the internet for segmentation of this specific condition.
Method: This work consists of three components: 1) image processing, 2) image classification, and 3) image segmentation. The images were processed for noise reduction and data augmentation. Processes such as morphological operation, canny edge detection and spatial filtering were applied to reduce the noise. Data augmentation techniques were then employed to improve the data available for training the image classifier. Following the image processing step, two thousand images (Melanoma) were trained by the pre-trained models (VGG16 and ResNet50) as well as the YOLO model. Finally, 40 images comprising 20 psoriasis and 20 melanoma were segmented using the K-means algorithm and their color information (RGB values) was extracted from the segmented regions of the images for each disease.

Results: Metrics such as Precision, Recall, and F1 score were used to evaluate image classifiers' performance. The ResNet 50 outperformed the other two models with a Precision of 0.89, Recall of 0.95, and F1 score of 0.92. After removing noises the segmentation technique was found to be satisfactory for the high-resolution melanoma images. However, even after removing the noise K-means does not adequately separate the psoriasis area when the images contain intense or shaded pixel areas due to the presence of hair.
Conclusion: Deep learning-based approaches can be used to detect certain skin diseases using dermatological images. The diseased skin images can be further segmented to extract their color information to facilitate accurate communication of colorimetric features among physicians and specialists, and improve public's understanding of their characteristics.

SESSION 22 - COLOR AND DIGITAL

Designing a Single Pre-filter for Making a Group of Cameras more Colorimetric

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A recent study (Finlayson and Zhu, 2020a) proposed a method for designing a color filter that when placed in front of a given camera makes the camera more colorimetric. However, in the previous work, a specific filter needs to be designed and manufactured for each individual camera. In this paper, we extend the prefiltering idea by solving for a single optimal filter that works best for a collection of digital cameras. The starting point for this study is the observation that many digital cameras have very similar sensitivity functions, and that this is especially true for cameras made by the same manufacturer. We show that a single prefilter can be found that improves the colorimetric ability for a collection of cameras, i.e. to record color information more truthfully to the stimulus responses by the human eye.

Fast and Optimal Contrast Limited Tone Mapping

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Image enhancement is often formulated as a tone mapping operation, where input pixel intensities in an image are mapped – by a strictly increasing one-to-one function – to output intensities. One of the most widely deployed tone mapping algorithms is Contrast Limited Histogram Equalization (CLHE). In CLHE the input image is tone mapped such that the histogram of the output image is most-uniform, subject to the constraints that the slopes of the tone curve are neither too steep nor too shallow. In CLHE the tone map is the integral of a derived histogram that by construction is both close to the histogram of the input image but also where the integral (the tone map) meets the slope constraints.

However, recent work showed that the CLHE derived histogram is not optimal. By recasting CLHE in a quadratic programming framework, one can find a derived histogram that meets the slope constraints and is even closer to the input histogram. Of course, quadratic programming is a search-based algorithm, and to find the optimal derived histogram it needs hundreds of iterations to fully converge. In this paper we show, empirically, that convergence is achieved much more quickly (always <5 iterations) if the goal is to achieve a tone mapped image that is visually indistinguishable from the tone mapped image generated after full convergence. Experiments validate our method.

Deriving representative color palettes from mood board images

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Designing a mood board is a creative first step one can take to help in exploring ideas before getting the project off the ground. The colors of a mood board represent important information about the envisioned

designs. In this article, we will focus on *digital* mood boards and we will describe methods to extract a representative color palette from a digital mood board (image). We propose the iterative dE-means algorithm, which includes a fixed initialization to overcome the non-deterministic nature of traditional k-means, and a merging step to ensure all colors in the calculated palette are at least a dE-threshold apart. Results show that the proposed algorithm outperforms existing methods when comparing the calculated color palettes to human-extracted color themes.

Impact of the training data in LLS optimization for faithful scene-specific color correction of raw images

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This paper compares two different methods for computation of a Color Correction Matrix (CCM) through Linear Least Square Optimization (LLSO). The first method uses a Macbeth ColorChecker® comprising 24 patches whereas the second uses the ISO/CIE 11664-3 standard for X, Y and Z computation. The last is done through un-resolved reflectance data such as available from calibrated multispectral images. Results highlight that the general method can be restricted to the use of 12 patches with no drastic impact on the overall color correction confirming the results in Akkaynak et al. (2014) and Alsam and Finlayson (2008). Moreover, it has been shown that the ISO/CIE 11664-3 standard based method can be preferred to the general method to enable scene specific CCM optimization using a single calibrated multispectral image. This method is therefore particularly interesting for scientific applications which include visible multispectral systems in addition to the context DIS.

Fastness of black dye-based ink-jet printing inks in aqueous solution in the presence and absence of oxygen

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Photodegradation of the ink-jet prints is a complex process in which many external and internal factors are involved. Internal factors such as the presence of optical brighteners in the paper, ink as a complex mixture of colorants and various accompanying substances are often overlooked.
The aim of our research work was the determination of fastness of water-based black ink-jet inks in aqueous solutions as black prints are considered to be more long-lasting. However, to achieve a perfect black colour and a suitable fastness of the print, a water-based printing ink often contains a complex mixture of colourants. We investigated the stability of the ink under the influence of UVC light in the presence of oxygen as well as in an inert environment.

According to the results, black inks consist of several colourants that differ in colour as well as in polarity. The results of the spectrophotometric analysis have shown that the presence of oxygen has an extremely negative effect on the stability of black inks.

Improving image registration using colour transfer methods in remote sensing applications

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Image registration is described as aligning several images into a common image coordinate system. For remote sensing, registration is often a key pre-processing step as aerial imagery can be captured by multiple sensors at different spatial and spectral resolutions.
A common approach for registering images from different cameras involves using bilinear interpolation to upsample a lower resolution image and computing robust features to find corresponding points in pairs of images. These correspondences provide the basis to compute geometrical linear transforms that align both images together. However, the main drawback to these methods are that colour information in images is ignored and the multimodal nature of this process can cause sub-par linear transforms to be computed. In this work, we show that multimodal aspect can be circumvented entirely using the Linear Monge-Kantorovitch colour transform and that the subsequent registration is improved.

Color Constancy in virtual reality scenes. A first step toward a color appearance model in virtual reality

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Due to the increase in the use of virtual reality systems, the requirement for quality in it has also increased. The most important factor may be the quality of the visual appearance of the scenes shown in it. One of the aspects that affects the visual appearance, among other things, is the color constancy or the ability of an object to be perceived with the same color under different types of illuminant. This means that even if the illuminant varies, the user can perceive the same color. In this paper we will prospectively discuss whether chromatic adaptation and color constancy should be considered different for a virtual reality device comparing with a 2D image shown in a display and comparing with real life. It could be a great first step toward establishing a color appearance model that can be applicable to devices in virtual scenarios.

Band selection for different dehazing algorithms in the visible

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In adverse weather conditions, images degrade (poor contrast, low visibility and color distortions), depending on distance, atmospheric particle density and wavelength. Five single-image dehazing algorithms have been analyzed on a database of hazy spectral images in the visible range, finding the three optimal wavelengths according to a new combined image quality metric. The optimal triplet of bands depends on the algorithm used and, in some cases, the different bands are quite close to each other. According to our proposed combined metric, the best method is the artificial fusion of multiple exposure images proposed by Galdran (2018), although this is not always supported by the visual appearance of the rendered images.

SESSION 23 - COLOR AND MEASUREMENT/STRUMENTATION

Impact of the color hue on the sparkle perception

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The objective of this work is the design and development of a psychophysical experiment to evaluate the impact of the color hue on the sparkle perception. A visual experiment was designed based on the triplet method. Samples are subsequently shown to the observers, one sample in the middle and two at each side, and the observer is forced to choose between the more similar sample (left or right) to the sample in the middle. Nine samples with three different hues and three different sparkle levels were selected. 19 observers participated in the experiment. The results were processed with a multidimensional scaling algorithm, with which mainly one significant dimension is obtained. The linear correlation coefficient between the obtained visual data (perceived sparkle) and the sparkle grade index (Sg) provided by the BYK-mac instrument is 0.855. According to this study, the hue of the absorption pigments in the samples would not impact on the sparkle perception.

Multiangle visual validation of a physically based rendering of goniochromatic colors

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In this work, we evaluate the capability of a physically based rendering framework to reproduce the color flop phenomena of effect coatings through psychophysical tests. For this task, a digitally simulated lighting environment (the Byko-spectra effect light booth) is built to set up the visual tests, in which physical objects inside the physical light booth are visually compared to the rendered images of virtual objects inside the virtual light booth. Two separate visual tests were conducted by judging the color variation on flat and curved metallic painted panels. Fifteen metallic samples were selected in order to cover different hues and color flop values. Both tests show good intra- and interobserver reproducibility. We found that observers are more tolerant when judging curved samples; the acceptability of visualizing the sample colors over various angles was highest at 97% when using curved panels, versus 80% when flat panels were evaluated.

The Locus Filter

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We study the design of a particular filter for digital photography, that we call the Locus Filter. It is built in a way that guarantees that the light in the scene after applying the filter stays on the Planckian locus. In this paper we provide a physical basis for designing such a filter based on the Wien approximation of Planck's law. While locus filtered Planckian lights are on the locus, the amount they shift depends both on the locus filter and the colour temperature of the light. In experiments we show that real lights shift more or less as if they were Planckian in terms of the changes in their correlated colour temperatures.

SESSION 24 - COLOR AND PRODUCTION

Colour fading in the polyurethane coating depending on the substrate and conditions of natural weathering

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Coated textiles are mostly used in clothing, medicine and transport. Advantages of polyurethane coatings are greater resistance to abrasion and splitting, increased strength and durability. The properties of such materials can be significantly affected by pigment dispersion. Polyurethane-coated knitted fabrics were of interest because they exhibit positive mechanical and thermal properties, and yet they are little studied. Polyurethane coating was prepared in pastes in yellow, blue and dark blue hue, which is used to obtain polyurethane coatings. The results are presented as differences in CIEL*a*b* colour parameters and total colour difference. After exposure to the natural weathering, it is noticed that in the summer season the materials in dark blue hues resist best, while in winter conditions the smallest difference in colour is obtained for yellow materials. In addition, a good correlation of knitted substrate mass, thickness and yarn count with colour fading occurred.

Evaluation of Emotional Images According to Differences in Post-processing of plastic Cosmetics Containers

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Among the elements constituting the package designs, the completeness of color, material, and surface treatment finish (hereinafter referred to as CMF) is an important factor that determines the quality of the product and plays a major role in forming a brand image identity. this study was intended to examine emotional images according to colors and surface treatment finishes (post-processing) among cosmetics package design elements. Emotional image evaluation was carried out with a Likert scale using the extracted emotional adjectives for sample rendering, and those emotional images that appeared at high values by color and by post-processing were analyzed through the average values of individual evaluation results. As a result of the study, it was identified that emotional images appeared differently by color and by post-processing through emotion evaluation. The results of this study as such suggest that the emotional images of cosmetic containers may change according to changes in the color and post-processing.

Shape, Color and Meanings. Comparison of Two Studies

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In this paper, we compare two studies, one conducted in 2008 and the other in 2019. Our main objective was to analyze if time has influenced the assigned meanings to shapes and colors in a student population with similar characteristics.
Our most relevant findings were: In the first study (2008), we found a higher number of meanings for the colors, meanwhile in the second, we found a higher number of answers associated with the different shape-color associations. Some meanings appeared for the same shape-color associations in both studies. The green and the blue square had the higher number of answers, meanwhile the pink and the gray circle and triangle generated new meanings.

SESSION 25 – COLOR AND COMMUNICATION/MARKETING

Data visualization: The power and persuasive capacity of color

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Data visualizations are common across academic, business, educational, and political sectors. They are generally purpose-driven and designed, and while the overall goal it to convey information, this intention is underpinned by the aims and agenda of the author.
Design elements and especially color and contrast play integral roles in data visualization and are used to highlight information. In this context, the mechanics of visual perception in tandem with cognitive processing and critical analysis can influence how an audience perceives, understands, and responds to the information contained within data visualizations.
This paper examines the power and persuasive capacity of color in data visualization and explores the ways it may impact how information can be skewed, depending on an author's aims and agenda. Color and contrast have the capacity to highlight information or misrepresent and mislead, and flow-on effects relate to the ways in which the audience evaluates, responds to, and acts upon information presented in data visualizations.

Designing Voice-Aware Text in Voice Media with Background Color and Typography

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Speech-to-Text plays a significant role in voice media. While preserving semantic information, STT also results in a large loss of nonverbal information in the voice. The goal of voice-aware text design is to bridge the gap between expressive voice and its converted text. An online survey was carried out to compare the effect of different text design elements —font, background color, and typography — on emotion expressivity, content delivery, and appropriateness of converted text. Background color and typography enhanced all three scales; however, the font did not, and even had negative effects on content delivery and appropriateness. We also found that the combination of background color and typography was regarded as the most appropriate text design in both voice messaging and social media.

Sentiment Analysis Based on Frequency of Colour Names on Social Media

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This study aims at finding out the sentiment associated with eight colour terms in the context of an overall negative marketplace sentiment during 2020/2021 and how the sentiment varies over time. We focus on the valence aspect of sentiment. We collected two datasets, separated by six months, each containing 18000 mentions of each of the eight colour terms in English from Twitter users around the world. We calculated the

weighted average sentiment score of each instance when a colour is mentioned. We find that purple, pink and green have a positive average sentiment score in both observation points (July 2020 and January 2021). Brown, red and orange are negative in both observation points. We also find that the relative sentiment value associated with the colour terms did not significantly vary over the six months. This finding indicates that there is a strong coherence in the sentiment associated with the mentions of colour within six months. Our work contributes to colour perception in marketing communication.

Color Specificity: the perception of difference through exhausting repetition

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This article seeks to address the perception of color and its relativity from the approach to creative and artistic processes based on a repetitive and systematic structure through the implementation of a group of formal rules. Paul Cézanne and Claude Monet through their artistic processes show us how their involvement with colors can be a reflex of a long period experience of repetition and observation of a specific formal context. That, we associate to Patricia Stokes and her notions of *ill-structured problems* and *well-structured problems*. Color and its volatility leads us to say that its relativity is associated to *ill-structured problems*, which will allow its author to perceive, based on repetition and creation of several analogous units, the ambivalent instability that identify a chromatic universe. Therefore, we come close to the artists Anoka Faruqee and Ângelo de Sousa to approach repetitive processes, that can lead its author to a creative singular path, where each unit that appears in the space of doing potentiates a confrontation between repetition, difference and singularity.

Influence of wine color on wine selection and consumption

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The paper titled The influence of wine color on wine selection and consumption is first addressed by a theory that seeks to familiarize the reader with the wine itself as a product. They will look at wine throughout history, learn about the way wine is made, the types of wine and how it is paired with food. The process of making a decision to buy wine will also be thoroughly considered. This is followed by an introduction to the color of the wine itself, which is the most recognizable feature of wine. Looking at the color of the wine, many factors can be discovered about the wine, such as the grape variety, its youth or age, origin, mode of vinification. The subject of this thesis is to determine consumer's perceptions of wine, their preferences, and their buying and consumption behavior.

The role and signifance of color when choosing cars

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The research was conducted in two steps; an online survey to determine how people choose color for car and whether they are willing to allocate more financial resources to get the desired color. The second part of the research was carried out at certain traffic locations of the city of Zagreb where it was examined which colors of cars were most presented. The results obtained in the online survey as well as collected data were compared with the research carried out by BASF, analyzing the color distribution on the European car market The results coincide with the study conducted by BASF, black, white and gay are the dominant colors.

Why do people choose their car colours?

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Successful colour forecasting enables companies to provide suitable products to the right customers. Generation Y are significant customers in vehicle markets. Understanding relevant factors on young customers are essential for companies and can help them fine-tune their products' colour for specific demographic groups. However, consumer preference for colour could depend on various factors, including trends, age, gender, income, price level and more. In the automotive industry, automotive exterior colour is a critical decision. The choice may be more considered because the consumer will likely be living with that colour for many years daily. Despite this, few studies have investigated the factors that drive customer selection of automotive colours. Thirty-three participants from generation Y were invited to take an online survey designed to get their ideas on various factors that can influence how they choose car colours. Personal preference and ease of maintenance are two main aspects of their automotive colour selection. This study looks into the effects of relevant factors on the colour of cars. It can encourage more research in the field of colour forecasting in the automotive industry.

SESSION 26 -COLOR AND CULTURE

A Study on the Color of Miao's Badai Culture in Fenghuang County of China

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This paper takes the color of Badai culture, the indigenous religion of the Miao in Fenghuang County of China, as the object of study and analyzes its symbolic meanings in the context of religion. Through fieldwork and NCD color system, this study analyzes the meaning and function of colors in sacrifices, ritual artifacts, and religious clothing.

Reading Medieval Colour. The Case of Blue in the *Canterbury Tales*

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Contemporary readers struggle with the terms of colour in medieval literary texts due to the difference in our colour systems. The current dominant colour model is hue-based. The approach of this model is to perceive colour as part of the electromagnetic radiation, which is measurable in wavelength. Therefore, elementary colour terms in contemporary language predominantly correspond with prismatic colours. As a result, interpreting medieval colour terms with a contemporary hue-dominated perspective creates numerous misunderstandings. In the Middle Ages, the fundamental guidelines for colour perception were luminescence, surface reflectivity, and colour intensity. In medieval literary texts, colour terms frequently described the materiality of the colour, the tactile qualities of the colour, and the general appearance (e.g. glittering or matt). In the *Canterbury Tales* by Geoffrey Chaucer, as discussed in this paper, there are four terms used to describe the colour blue, of which only one can be identified as a hue term. Accordingly, this paper will analyse the terms that portrayed blue in the Canterbury Tales from the perspective of medieval colour measures and explain how they are different from the colour blue, as we know it today.

Identifying the colour of Longquan Celadon Porcelain

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Although research has been done showing that Longquan celadon porcelain is inevitable for China's ceramic culture in the history, lacking systematic research on how to identify the colour in a qualitative way. As an initial stage of a colour research project on Longquan celadon porcelain, this particular paper demonstrate the process of generating, classifying and analyzing the colour data, which is from 111 pieces of antique porcelain samples in South Song Dynasty. As a result, the colour samples show a constant and similar range of volume in LAB and RGB colour mode, which add to previous research in the filed of porcelain colour identity. Further research in this area is needed for a more complete methodology and techniques in colour measurement, data interpretation, and documentation.

The colors of feminine beauty between the middle Ages and the Renaissance

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A research on the evolution of beauty standards in the feminine between the Italian Middle Ages and the Italian Renaissance, with particular attention to the colors that expressed them and that represented this historical period so full of social and cultural changes. It's been taken into consideration, with the cosmetic matters and dyehouses, the influence that culture and religion had on the way of appearing of women and men belonging to dominant classes, social and symbolic values and expressive codes. That is how the clothing's colors, the ones of makeup and hair were expression of moral, social and hygienic virtues, on how religion and philosophy have influenced their usage and have conditioned the aesthetic choices. It's not left out a mention of the wars and of the trade routes which have widespread pigments and trends and it's underlined how aesthetic, not in a very different way from today, was considered an integral part of medicine and of the physical well-being.
The work underlines how, contrary to what people may think, the meeting between different civilizations and the "rising" bourgeois have been springs and have forged also through the person's colors the moral, the beauty and the poetry values.

Chagall e Malevič: colors of the imagination and colors of the absolute

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I have had the opportunity, at different times, to visit the art works of Marc Chagall and Kazimir Malevič, in important European exhibitions and museums,[1] and have recently read the autobiographical memoirs of both, beside seeing the beautiful feature film by Alexander Mitta.[2]
Neither Chagall nor Malevič were Russian-speaking, and their upbringing was a mixture of Eastern Jewish background of one, and Polish cultural background of the other, with the popular peasant tradition of late 19th century villages, although the former due to social proximity and the latter to emotional proximity. Both had a religious upbringing which is reflected in the biblical references in many of their works and, as we shall see, both had as purpose of their art and teaching the renewal of painting and opposition to academicism, which they would express by placing color at the centre of their interests. They participated in the outbreak of the Russian Revolution, sharing in its ideals, and initially playing important cultural roles in art and teaching.
I will present the years around the second decade of the 20th century, when Marc Chagall and Kazimir Malevič were teaching in Vitebsk at the *Popular School of Art* founded by Chagall and comparing their theories on art and teaching,[3] from which emerge two opposing conceptions of art and color, for each a central feature of their own artistic expression, in the name of spirituality and Revolution, which led to a dramatic falling out between them.

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1 *Musée national Marc Chagall*, Nice (France). *Marc Chagall*, Fondation Maeght, Saint-Paul de Vence (France). *Kazimir Malevič una retrospettiva*, GAMeC- Galleria d'Arte Moderna e Contemporanea, Bergamo (Italia).

2 Marc Chagall, *La mia vita*. SE, Milano, 1998. Kazimir Malevič, *Scritti*. Mimesis Edizioni, Milano (Italia), 2013.

3 Martinovich su Lampe, *Chagall, Lissitzky, Malevich: The Russian Avant-garde in Vitebsk, 1918-1922*. In: https://networks.h-net.org/node/166842/reviews/3811016/martinovich-lampe-chagall-lissitzky-malevich-russian-avant-garde

SESSION 27 -COLOR AND CULTURE

Synonymy in the Language of Colour

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We explore synonyms in colour naming within and across three languages, British English, Estonian and Greek, using data collected from a crowdsourcing experiment. We identified 30 common lexical colour categories in British English, 41 in Estonian and 29 in Greek, where no one category was fully contained within others. The synonymy analysis within languages revealed that the highest degree of overlapness was found for a pair of dark reddish loanwords in English (maroon and burgundy) and in Greek (*bissini* and *bornto*) that were absent in Estonian. The synonymy of two purplish categories in Estonian (*lilla* and *tumelilla*) and Greek (*mov* and *lila*) was also prominent but in English purple and lilac were more separated. The investigation of synonymy across languages revealed similar graph properties for all pairs of languages (British English – Estonian; Estonian – Greek; Greek – British English). Our results suggest that the degree of synonymy in the language of colour is influenced by cross-cultural transfer of loan words.

Color semantics in popular culture: Greek women's magazines and music albums colors in the postwar era

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Researching the relation between color and popular culture, I am looking at the structure of the colors used for long periods in certain fields of visual popular culture. My previous research focused on the covers of Greek music albums for the period 1960-2016. The computational analysis of the chromatic values of each period led to a structure of three chromatic layers:

• The first consists of five colors which remain almost stable throughout the whole period. They could be considered as a background upon which the differences found at the next levels become meaningful.

• The second layer consists of six colors, which remain stable for a long period, to change drastically. Such colors seem to follow the pace of value change in Greek society, they can be related to qualitative changes in their sociopolitical and cultural context.

• The third layer consists of seven colors, which come to the fore for a short period of time and then disappear. It looks like such colors are following trends and fashions, related to the sensibility of short periods, or the eminence of some scene.

Such a model may be then tested on other corpora of visual popular culture, to check its consistency. It may also be used to map the diffusion of cultural influence between the center and periphery in a complex and interlinked world.

Though such a finding may sound interesting, it should be contrasted to the colors used in other fields of popular culture if we are to achieve some degree of certainty. In the proposed paper I will attempt such a comparison between the colors of Greek music album covers and those of the women's magazines published in the same period. Several women's magazines were published during the post-war period, and they present on their covers the slow rise of a national star system, achieving a readership of some hundred thousand.

They used full color on their covers and most of them 'died' in early 1990s, leaving the floor open to the Greek editions of international women's magazines.
Thus, the analysis of chromatic values of two distinct fields of popular visual culture may provide an insight to the social semiotics of color in their relation to the dominant and subcultural values in Greek society.

Brides in black widows in white. Semantic evolution of the social and cultural meaning of colours

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The paper follows the evolution of cultural significance of the symbolism and meaning of black and white thanks to the iconographic evolution of the European visual history. In particular, it focuses on the wedding and funeral dresses, as key social and existential transitions, focusing on the historical moment in which the meaning of the two colours was semantically inverted, and critically considering, the phenomenon and its exceptions.

The green-blue border does not depend on the number of blues in a language: Evidence from cross-linguistic colour-naming data

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The borders between different colour categories have been addressed in different disciplines and from different angles – in linguistics, translation studies, psychology, anthropology and beyond (Lindsey & Brown, 2009). Scholars are eager to find out the number of basic colour terms in any given language and the borders between the basic colour categories. The discussion centers on the border of green and blue colours as this is often unclear between or within languages (Ardener, 1971; Sutrop, 2011), while many languages have developed a separate smaller category – turquoise – to denote the area between the blues and the greens. Moreover, where English uses a single basic colour term 'blue' to label a range of colours, Russian and some other languages make a distinction to split the range between two basic blue terms (Martinovic et al., 2020). We hypothesised that the division of the 'blue' category would affect boundaries with the adjacent 'green' category, where a single basic term covers the lightness range vs when there are two categories for blue – light blue and dark/middle blue. The colour-naming data was collected as part of a larger cross-linguistic study (Bimler & Uusküla, 2017). The stimuli were 65 Color-aid Corporation uniform papers glued on 5x5 cm plywood tiles (Davies et al., 1992) randomly shown to the participants one by one. For the analysis, we made a comparison between two pairs of closely related Indo-European languages spoken in Europe: Italian and Castilian Spanish from the Romance group and Lithuanian and Latvian from the Baltic group. The prerequisite for the choice was the difference in the number of basic colour terms as Italian possesses 12-13 basic colour terms with a partition in the blue category (blu, azzurro/celeste) whereas Castilian Spanish has 11 basic colour terms. Moreover, Lithuanian also possesses two blues (mėlyna, žydra) whereas Latvian has 11 basic colour terms.
We plotted the application of a given term to the tiles as a distribution on an empirical color plane with hue and lightness dimensions. This allowed us to estimate the boundary between each pair of terms, where they were used with equal frequency.

The results reveal that despite the narrower scope of 'light blue' and 'medium/dark blue' terms (Bimler and Uusküla, 2017), the boundaries of the blue and green categories maintained the same in these language pairs. Therefore, the number of blue categories does not affect the borderline with the green category and it is plausible that partitioning between green and blue happens before blue splits into two categories. We also consider the 'blue'/'purple' boundaries, though these are complicated by finer subdivisions of the 'purple' category in many languages as many languages have multiple words to denote purple.
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Age-related differences in richness and diversity of Russian color lexicon

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In the present study, we investigated age-related differences in richness and diversity of color lexicon in Russian native speakers. Color names were elicited in 2018–2020 in an ongoing web-based psycholinguistic experiment (https://colournaming.com). An unconstrained color-naming method was employed. A final dataset contained responses of 1,967 native Russian speakers (1,280 females, 677 males, 10 non-binary), from various locations of the Russian Federation, aged 16–98 years. Participants were stratified into seven age groups (years): 16–19 (M=17.59 ± 1.19), 20–29 (M=24.86 ± 3.11), 30–39 (M=35.04 ± 2.89), 40–49 (M=45.18 ± 2.86), 50–59 (M=55.63 ± 2.90), 60–69 (M=65.05 ± 2.87) and ≥70 (M=78.20 ± 4.97). To estimate heterogeneity of color lexicon in each age group, we applied the Margalef and Simpson indices broadly used for measuring ecological diversity. The indices enabled gauging richness of color lexicon, i.e., the number of word types in the dataset, and color-term evenness, i.e., the relative abundance of different color terms. Our analysis of synchronic variability provides evidence that color vocabulary develops actively throughout the entire adult life and remains relatively stable in both richness and diversity up to the old age. Respondents of the three younger groups, under 40 years, revealed the greatest color lexicon diversity. In comparison, in the 40–59-year-old the diversity index was lower, and decreased dramatically in respondents of 60 years and older. The apprehended dynamics reflects intergenerational differences as such, but even more so dramatic changes of sociocultural reality in the post-Soviet era (after 1991).

SESSION 28 -COLOR AND CULTURE

Umbrella Diagram: 1981-2021, four decades of forecasts and CMF design

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The *Umbrella Diagram*, developed by Clino Trini Castelli since 1978, is a fundamental tool to configure CMF design languages and forecast historical color and material trends survey. The tool, based on decades, is represented by arches instead of an evolution of a timeline. This cyclical progress proved to be premonitory of the strong changes observed between the color languages of the decades. The umbrella shape of the diagram stems from the coexistence of large arches (historical trends) with smaller arches (fashion trends), frequently in conflict. Castelli first turned to the past of the 70s, 60s and 50s, testing his format backwards based on what was already observed. He then applied the same principles and parameters, looking rather at the 1980s and, till today, to the other four upcoming decades. The *Umbrella Diagram* was conceived as a proprietary tool of Castelli Design and reserved for his international customers and educational activities.

Knowledge as a project parameter: comparative colour theories

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The "Colour Theory" does not exist! We still see publications that talk about the "Colour Theory" as if there were only one or even mention the elementary convention between additive and subtractive synthesis, forgetting that there are dozens of them in the specialist literature.
Similarly, the images flooding the web - a scope where the problem of validating the scientific sources and data on which the various contributions are based has not yet been resolved - often report erroneous attributions of theories and models.
In countertendency and in order to obviate such unjustified errors and lacks, the contribution will systematically propose again results of investigations already published in *Policroma* (Marotta, 1999) with 48 chromatic theories (and as many Authors, models and related rules and parameters), collected and compared in an interdisciplinary and international dimension, through a synopsis configured as a real "icon" of the Chromatic Culture, which met the interest and approval also of Rudolph Arnheim (in 1999). With these methodological premises, in the imminent second edition of the volume (by Anna Marotta and Rossana Netti), a broader reflection on the possible definitions of the specific concept of "colour theory", also in the "comparative" chromatic version, will be deepened in a rigorous manner, with more precise verifications and applications. Therefore, not a banal and uncritical tool merely for application, with rigid and sterile automatisms from which to mechanically derive rules and standard solutions, but complex and integrated disciplinary approaches, criteria, parameters, rules, to arrive at procedures and mental maps.

Scientific basics in art from the Theories of Colour: Authors, methods, rules, applications

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In the "chromatic way of thinking", between Art and Science, between the Nineteenth and Twentieth centuries, colour played an essential role: between Romanticism and Modernism, between Impressionism, Post-Impressionism, Neo-Impressionism (and other derivated movements). This complex phenomenon (with its experiences and manifestations) is connected programmatically to the equally complex phenomenon of the Theories of Colour, which has to insert in the debate about contemporary artistic theories. In a broad cultural and scientific territory, starting from the qualified literature and from the publications of the time, the analysis methodology addresses the relationships between institutions, and the exchanges between individual theorists and protagonists, paying attention to the artists that have punctually and consciously applied and experimented those theories, up to the examples in executive techniques, practised in relation with their training. It is consistent with my thirty-year investigations on 48 chromatic beliefs, collected and systematically compared (Marotta 1999). The critical rereading of the treatises and works through their interrelated cultures and experiences confirms a system of knowledge stratified and verified in practise, in an international and interdisciplinary dimension, all to be explored.

The building materials of Luis Barragán: light and colour

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The aim of this contribution is to investigate the potential offered by a design approach in which light moulds matter and colours reveal the beauty of forms and spaces. In this context, Luis Barragán is certainly the one who, more than anyone else, has masterfully experimented with the use of colour to transform spaces. His architecture employs a language in which the daring use of colour is correlated with an ever-increasing degree of awareness, starting from the earliest conception and realisation. Light and colour do not only play an ornamental role but actually represent his building materials. The paper seeks to show how colour is able to strongly characterise architecture, through the analysis of some of his projects: the Casa Barragán in Calle Ramirez, (1947-48), the Capilla de las Capuchinas in Tlalpan (1952-1955), the Torres de Satélite (1958), the Los Clubes complex (1964-1969), and the Casa Gilardi (1975).

Tili Wiru Tjuta Nyakutjaku:* Towards an Extensive Cultural Paradigm

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“Looking at lots of beautiful lights”* may take us to experience infinity because they are thousands, because they are light and colour and infinite stars twinkle above us. We are especially focused on the perceptual world we live in, the world of experiences and affection. Although, humankind also has a deep desire for the

invisible. Finite and infinity seem to meet and construct the realm of experiences, of knowledge and beliefs. However, it seems infinity is difficult to become acquainted with and difficult to represent. Infinity challenges philosophy and art, and especially painting. Also, mathematical experience implies that there are infinite types of infinity which automatically makes a comprehensive pictorial experience impossible in a finite length of time. However, Bruce Munro and Tiepolo as well as Australian aboriginal art may takes us to a *cosmos* where colour and infinity meet. Dream time stories embody the material, the immaterial as well as finitude and infinity.

SESSION 29 -COLOR AND CULTURE

System for Visual Assessment of Wine Color

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This paper presents a color chart explicitly designed for the color assessment of wines as a part of a more comprehensive hedonistic or analytical tasting systems. The chart is based on visual, colorimetric, and *in situ* evaluations of existent wine color and the techniques for its assessment in wine tasting. The system is specified in Munsell coordinates and corresponding sRGB values. Its derivation and use is described and a photographic-based system for measurement-based implementation of the system is also introduced.

Algorithmic Color Methods of Media Arts

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The paper describes a framework for systematically exploring the RGB color model for generating color palettes based on six algorithmic methods. The framework was implemented as a foundation to produce algorithmic color palettes for visual expressions while exploring the intersection of mathematical principles of geometry, color, and code. We examine how algorithmic color palettes relate to culture, history, and other artistic practices. An application of the methodology is presented.

Investigation into the colours of the DunHuang murals from the Tang Dynasty

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In 1961 the site of the MoGao cave temples was recognized as one of the State Priority Protected Sites by the State Council of the People's Republic of China and was put under the protection of the national laws including the Law on the Protection of Cultural Relics. In 1987 UNESCO added the MoGao Caves to its protected World Heritage Sites as one of intrinsic unmatched historic value to humanity. The present paper assesses the appearance of colours in the representational system of the murals from the Tang period (618-907 AD) with a view to gaining a deeper understanding of the DunHuang murals as emblematic of Chinese civilization. Thus the use of colour will be discussed in the context of the traditional 'five colour system'.

STRAW/LIGHT – COLOUR

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This project is about the colour of straw, one of the most ancient materials used by humankind. Using as inspiration some of Latour's and Krippendorff's design theories, we find a possible application of the colour in community events.

SESSION 30 - COLOR AND LIGHTING

Design Guidelines for Light Interfaces of Home Appliances

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Home appliances can cause light pollution disturbing people's night life or sleep in the house. Indoor light pollution has not been in attention, even though outdoor light pollution has been regulated through numerous restrictions. In this paper, we carried out a video-based survey to explore the light interfaces surrounding people in their homes at night and collected their opinions to develop design guidelines for designing light interfaces. We recruited 22 participants and collected 117 videos. Each participant recorded 1-minute videos for light interfaces in their living spaces at night. While recording the video, they spoke their opinion about the light interface. Throughout the collected videos, we conducted a thematic analysis and derived design guidelines for light interfaces. We hope that the home appliance manufacturers and industrial designers consider these five design guidelines, thereby serving users to enjoy their night life without any lighting disturbance and understand information from light interfaces.

Colour Performance Evaluation for LEDSimulator Technology

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A computer system to achieve appearance reproduction for supply chain was introduced in the last AIC conference [1]. It is named LEDSimulator. The present paper introduced the hardware of the system, colour management workflow and the development of the key component on display characterisation, and stray light colour correction. Finally, a series tests were conducted to show the system performance in terms of precision and accuracy.

Moving in Colour Illuminated Space: An Exploration of Analyses

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This paper presents statistical results of an experiment investigating how the body moves in four different colour spectra of light across a blindfolded and non-blindfolded condition. In a light lab, 26 participants were immersed in white, blue, amber and red illumination, and asked to move around while blindfolded and non-blindfolded. Video-data of their movements were retrieved and coded by two independent researchers into eight binary movement categories of: fast/slow, up/down, hard/soft, coherent/incoherent. Intercoder reliability analysis shows satisfactory (41%), slight to fair (47%) and no (12%) agreements between the encodings. The coding chosen for further statistical analysis shows that participants moved in significantly different manners within the four lighting scenarios. No significant differences between the two conditions

of blindfolding and non-blindfolding were found. These findings are in line with an earlier analysis of this study and generally appear to support the hypothesis that visual spectra of light are perceived beyond vision.

OLED Lighting and Human Circadian System: A Review

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Light is a form of energy that affects the human sleep cycle, working hours, alertness, productivity, and well-being. As one of the most essential environmental factors, lighting requires extensive research to understand the human-environment interaction. Earlier studies reveal that various artificial lighting technologies are utilised to investigate the human circadian system; experiments employing solid state lighting (SSL) sources are still being conducted to determine how the human circadian system is affected. Due to the advantages of OLED lighting, there is a need to enhance the use of this form of artificial lighting in an indoor environment. This paper focuses on a literature review on artificial lighting sources, particularly OLED lighting, which has been used from the past to the present. This paper also discusses how OLED lighting can be utilised to alter the human circadian system in an indoor environment.

Colours, light & well-being : Characterisation of chromatic phenomena in collective housing

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The objective of the study presented is to demonstrate the value of a chromatic and luminous analysis of a place in the pre-design phase. This analysis protocol is part of a designer's ethic which is to anticipate and respond to the conscious and unconscious needs of users, thus participating in the construction of a quality approach. Using the case study of the "Bonamour" project (Capbreton, France), we question the value and interest of promoting a protocol that favours a benevolent and differentiated design approach. This will allow us to evaluate the relevance of the devices applied. Ultimately, the data collected and the recommendations applied to the project will enable property developers to gradually turn towards a more inclusive and sensitive design of lighting and colour applied in the residential sector.

A design approach to lighting and color rendering in indoor sets

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Indoor lighting and color design practice for television set and movie industries evolved in the decades because the real-time observer is the camera instead of the human being. Nevertheless, even modern cameras do not have the dynamic, adaptation, and cognitive correction of the human visual system. Although technology evolutions of cameras allow regulatory actions to control the parameters related to color, there are still open issues in this sector. Solid-State lighting has greatly enriched the color creativity for directors of

photography, and numerous ways of standardizing color coordinates have been proposed to have a common vocabulary. However, this has also led to the emergence of new technical and organizational issues. Different cameras capture colors illuminated by LED sources, slightly different from each other. The purpose of this paper is not to cover all the scientific aspects for the lighting of indoor sets but to collect the right amount of information relating to the operations design on light and its chromaticity under a design method approach.

User acceptance of innovative blue light therapy to treat seasonal affective disorder

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Lack of exposure to light in the morning, and subsequent inactivation of non-imaging light-sensitive cells in the retina, is linked to a type of depression known as seasonal affective disorder (SAD). Many studies have confirmed the positive effect of early morning light therapy on patients with SAD. Studies have shown that blue-green light in particular (but light generally) can inhibit or promote the secretion of hormones such as melatonin and serotonin. This study investigates a new light therapy method where the light is used either as the person goes to sleep or just before they wake up, implemented with a light-emitting mask which is worn during sleep. This first part of the study evaluates user experience and user acceptance of using such a mask. A group of participants who have previously used traditional light therapy completed a survey about how likely they would be to use a light-emitting sleep mask; 80% of these participants expressed considerable interest. The benefits of such a treatment were identified in terms of reducing patients' awareness of the treatment and minimising the impact of the treatment on patients' families.

Colored light shapes. Protect and enhance the colors of artworks

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In the lighting of works of art a part of the composite light that invests the same artworks is absorbed and a part is reflected. The colors of the absorbed light are the complementary colors of the reflected light. For many objects of the enlightened world the absorbed light plays a physiological function (plants, photoluminescent materials, photovoltaic panels, etc.). But the works of art are generally inert. Absorbed light causes chemical and mechanical damage. For this reason, the rules impose limits. In order to avoid or limit absorptions, it was decided, therefore, to offer the artwork only the light that it will be able to reflect and not the light that it would be forced to absorb. Technically, it was a question of projecting an imprint onto the artwork with the shape and colors of the artwork itself. The experimentation verified the results: improvement of the effectiveness of illuminances with enhancement of luminances, plus other positive effects due to the serendipity of the technique adopted with improvements in vision and enrichment of the possible imaginary.

SESSION 31 - COLOR AND BUILT ENVIRONMENT

Practice-based research on color planning for educational facilities

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In this paper, two color plans for educational facilities are introduced and discussed. The first color plan was realized as part of a renovation of student dormitories and other facilities on campus at the University of Tsukuba. Accent colors were used in accordance with building shape and the same base colors were used for adjacent buildings. The second color plan was part of a reconstruction of facilities at the Tsuchiura Third Senior High School. Colors rarely used outdoors as accent colors were applied, enhancing the uniqueness. Each interior accent color was selected based on the image color of each special room. The resulting color schemes have been well-received by students.

Urban color mapping in Tokyo: the case study of Hillside terrace

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To establish a method to clarify the color image of the city, this study explores the colors of Tokyo from two approaches. The first survey is conducted by extracting colors from aerial photographs, to investigate how the landscape in Tokyo has greyish color impression and which kind of grey it consists of. In the other examination, the changes for over thirty years in the colors and materials of the building facades are visualized in the study site, which is a group of buildings in Hillside Terrace in an area of Tokyo designed by world-renowned Japanese architects. Both macroscopic perspective and chronological microscopic viewpoints are effective to grasp the color image of the city. The visualized urban color images enable to express the mood of the city.

Using artificial ground color to promote a restorative sidewalk experience: an experimental study based on manipulated street view images

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Color is frequently used in urban outdoor spaces, but little research has studied its psychological effects. This study explores the influence of sidewalk floor color on the restorative walking experience in a busy, inner city street lacking natural greenery. We used an achromatic street view image with no vegetation or trees as control. Red, green, and blue were used as “artificial” intervention colors in the sidewalk ground plane to generate 3 visual stimuli. Participants (n=66) rated the perceived restorativeness of the scene and their subjective mood on viewing each image via an online survey. The results indicate “artificial” green ground color, e.g. provided by paint or colored material, promoted a more restorative walking experience enhancing

hedonic tone and arousal and increased relaxation more than red ground color. All three color-interventions improved perceived restorativeness and arousal. This study advances the understanding of the psychological impact of color in urban design.

Aesthetic Evaluation of Facade Integrated Coloured Photovoltaics Designs-an International Online Survey

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Façade Integrated Photovoltaics (FIPV) is a promising way to utilize solar energy and to reduce greenhouse gas emissions in the built environment. However, to the authors knowledge, the colour design of façade integrated photovoltaics has not been studied scientifically yet. The authors developed a theoretical pixelization design method for generation of colour designs for façades with integrated photovoltaics, in which local urban NCS colour palette and colour harmony strategies are used. The city of Trondheim in Norway acts as a backdrop for the study, and two main façade prototypes (multi-story and high-rise building) are derived from the Trondheim's urban context. To test the method, an online international survey has been carried out.

This anonymous online survey consisted of three main parts. In the first part, participants' general attitudes towards FIPV, and the basic information like gender, ages, professional background (architects/urban designers or layperson) are collected. In the second part, participants were asked to evaluate the aesthetics of two façade prototypes (multi-story and high-rise building) having a pixelization FIPV design, on a 5-step semantic differential scale. Besides, pixelization façade design photos were mixed with non-pixelization façade designs, participants were asked to choose the most preferred ones according to their perception. In the third part, pixelization design proposals for real buildings in urban context are presented and evaluated with the same 5- levels semantic differential scale. This time, participants were asked to evaluate the level of integration in the urban context of several pixelated FIPV design proposals for real buildings in Trondheim.

In total, 309 participants living in various countries took part in this survey. The IBM SPSS and the Microsoft Excel programs were used to analyse the survey data. Nearly half of participants were 'experts' with education (master or above level) or working experience in architecture, urban design, or fine arts fields, while the remaining participants were 'laypersons' i.e. without related backgrounds. The survey results show a general preference for the aesthetic qualities of presented pixelated FIPV designs. Pixelated FIPV designs are more preferred than non-pixelated FIPV designs by participants when they have the same or similar NCS hues. Also, the presented pixelated FIPV designs are perceived well integrated into urban contexts by the majority of participants. In addition, laypersons tend to rate the presented pixelated FIPV proposals higher (higher scores) in both, aesthetic quality evaluation and contextual coherence evaluation. The results of this study support the hypothesis: the pixelization method can provide coloured FIPV designs with aesthetically pleasing façades that are harmoniously integrated into the urban context.

A screen experiment on the assessment of façade colour perception factors

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When the colours selected during the façade colour design process are applied to buildings, they are perceived differently from their inherent colours due to colour perception factors. Therefore, during the application stage, different façade colour impressions may occur than expected during the design phase. In the study, an experimental model was proposed for the digital environment to predict the façade colour perception factors by assessing them for certain conditions and a "screen experiment" was carried out as the application of the model. The screen experiment was designed to compare the inherent colour with the perceived colour by using fifty-six images consisting of various combinations of four different façade colours and three façade colour perception parameters. Thus, the screen colour experiment model, which was designed for the virtual/digital environment for the "colour perception" factors that play a very important role in the façade colour design, was made available, and a contribution to the literature was made by revealing the guiding data on the subject.

Complexity of the theme of the Painted Façades in the large and medium historical centers in relation to the environmental contexts to which they belong

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The paper aims to address the theme of Painted Façades, more generally the 'color of the historic building', in relation to the environmental contexts to which they belong. It is a fundamental theme in urban planning and architectural design for its pervasiveness at the level of building, urban and urban-environmental episodes of monumental interest and of entire historical centers.
The discussion is conducted with reference to the fundamental points of the color problem: the image of the historic city is unitary, an expression of the history that has identified it over time, therefore formed by the coexistence of the two categories - monuments and basic buildings - always welded together. The methods of approach and attention must also be similar: for the reciprocity of the effects that are determined at the context level when dissonant and ungrammatical interventions are carried out, even in the smallest and most modest building, but belonging to a relevant historical context. Case studies including the *Piazza dei Signori* in Vicenza with the *Basilica Palladiana*, conclude the paper, demonstrating the assumptions and results of the analysis made.

SESSION 32 - COLOR AND BUILT ENVIRONMENT

Colour and Design of Birth Spaces: A transdisciplinary review

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Colour and light are significant aspects of architectural spatial design that require more critical attention, research, and discussion within birth environment design discourse and planning. Knowledge of how colour, light and darkness impact birth is important for stimulating designers' creative contributions towards better birth spaces. Four themes aid in considering colour and light in birth environment design: 1) amelioration of fear; 2) support for physiological birth processes; 3) ambiance of privacy and intimate sensuality; and 4) grounding for a spiritual experience of birth. The paper presents evidence that colour – understood as material and as light – can be valuable in creating future birth spaces that support women's needs and desires for meaningful, sensitive, and satisfying birth experience.

A multiscale approach to the urban space color analysis starting from the case of study of the Collegio di Milano

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In pursuit of a more objective approach to efficiently support the urban color design, the aim of this study is to introduce a multiscale approach to the urban space color analysis. The paper starts with an introduction of a robust method, based on color corrected images. Specific features, problems and solution are then illustrated. The Collegio di Milano complex, designed by the famous architect Marco Zanuso, was selected as a case study to prove the methodology's effectiveness.

The variability of 'green' and blue' in natural and built environments and the implications for restorative environment research and psychological wellbeing

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A restorative environment is any setting that promotes psychological restoration from depression, anxiety, stress and mental fatigue. There's a now significant body of research showing that nature settings promote psychological restoration, but a large body of the research has been carried out in controlled laboratory settings, using images of 'green' (e.g. trees in full foliage) or 'blue' (e.g. coastal settings) all set in temperate climates in the developed world. No attention has been paid in the research to the variability of 'green' and 'blue', for example, how 'green' foliage changes colour across seasons, or how the colour of surface water changes in relation to scattering of light, wind, flow, ground surface materials. No concepts are available in

landscape architecture and urban planning that help to understand the role of colour in restorative environments as part of larger, interconnected systems of green spaces and water surfaces (i.e. green and blue infrastructure).
This paper will first, set out what a restorative environment is; second, it will summarize evidence showing benefits of 'blue' and 'green' settings to health and wellbeing and the mechanism believed to generate these effects; third, it will identify emerging literature exploring varying hues of vegetation (orange, red) and their effects on health and wellbeing, and finally, it will generate hypotheses for further discussion. Do the positive health effects of contact with 'blue' and 'green' nature hold up, say for autumn foliage (i.e. yellow or orange pigments), for water that is muddier and of a darker hue or for urban greenery that is altered by smog (air pollution) and during extreme heat waves? How can different variants of green and blue be conceptualized as part of urban green and blue infrastructure? This is important research to carry out in light of the dynamic growth of urban agglomerations worldwide, where blue and green infrastructures are an important source for health and wellbeing.

Application of hyperspectral camera and spectrocolorimeter for spectroscopic and colorimetric measurements on polychrome surfaces in a controlled environment: pros and cons of the presented technologies

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The aim of this work is to compare the data obtained with two technologies, namely a hyperspectral camera and a spectrocolorimeter, to study the color and colorimetric parameters of polychrome surfaces.
These measurements are generally carried out with dedicated instruments, such as colorimeters and spectrophotometers, which require contact with the surface and cover areas of the order of tens of mm2. These two characteristics, contact and a very small analysis area, can severely limit the study of polychrome surfaces, as the measured areas are not necessarily representative of the entire surface. Furthermore, it is not always possible to touch the analyzed objects.
A possible alternative is the use of compact hyperspectral cameras, such as Specim IQ, for the in situ study of the spectral and colorimetric characteristics of these surfaces.
To better address this research, still in the preliminary phase, a measurement set with lighting geometry fixed at 45° with respect to the image plane was defined in the laboratory to uniformly illuminate the investigated surface and avoid having components reflected specularly on the camera lens. With this fixed shot geometry, a series of Labsphere color standards (eight different color samples) will be analyzed using four different color backgrounds.
In this way, it will be possible to define the optimal operating characteristics of the hyperspectral camera for laboratory measurements aimed at studying the color of polychrome surfaces.

Color, ceramics and architecture in the Spanish Renaissance. Serlian serial ceramics and their role in the construction of a new spatiality

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In Spain, an important tile industry developed during the 16th century which, based on a fusion of traditional techniques together with motifs and new techniques coming from Italy, spread over the Iberian Peninsula and through the Spanish colonies in America. Polychrome ceramics played an important role in the introduction and dissemination of Renaissance designs in architecture. Architectural color, by means of large full-colored ceramic wall panels, created on the basis of modular geometric designs after Sebastiano Serlio's treatises, became a fundamental compositional variable in the introduction of the new Renaissance aesthetics in the territories of the Spanish Empire. The combination of Renaissance ceramic pieces, designed with a limited number of ornamental motifs expressed with a reduced color palette, created interesting compositions that refer directly to this artistic period. This historical study highlights the direct link between tilework and the Renaissance architecture it covers, accompanying its stylistic reading and enhancing its representativeness.

SESSION 33 - COLOR AND BUILT ENVIRONMENT

The Emerging Trend of Saturated Colour in the Contemporary Urban Environment: An Updated View of Colour

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This paper presents preliminary findings of my PhD research on the uprising use of saturated colours in urban and landscape design between 2000 and 2008. Based on statistics, this paper identified and illustrated the influence of branding on the use of saturated colour in urban spaces. By analysing the role and impact of colour in the urban environment, this paper argues an up-to-date understanding of colour is essential for both colour design and colour study in contemporary urban settings.

A Color Inventory of and a Color Guide to Dresden's Neustadt

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This paper describes the pedagogic structure and the results of a weeklong exercise at the TU Dresden, during which a color inventory of six city blocks of the Neustadt District was compiled and used as a basis for the future use of color on facades in this neighborhood. In 2020, we tested a completely redesigned project structure for the third week of the three-week intensive course which might serve as a model for future student projects and could indeed become an instrument for many city planning departments' approaches to deal with color in urban design.

The use of colour in the urban landscape through regeneration projects of the degraded open spaces of the city

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The recovery of the open urban spaces of the city is an increasingly topical issue that requires new reflections on the methods of reuse also through colour.
In urban areas, the resulting spaces of the connecting infrastructures, such as bridges, viaducts, overpasses, are increasingly the object of recovery, thus offering the city new places with different functions and formal solutions: the use of colour characterizes these spaces, giving personality and recognizability within the city areas.
These spaces, which were not considered central elements characterizing the urban landscape, are included in the new designs as an integral part of the project, as places of use that characterize and identify the

environment. New visions and designs aimed at overturning the nature of marginal and repulsive spaces in inclusive areas, aimed at socio-cultural regeneration.
This article aims to analyze in an analytical and systematic key, both the large redevelopment projects on an urban scale and the interventions, even temporary and spontaneous, self-produced, as cultural manifestations that stimulate people to regain possession of places without identity. Places of connection and passage, without a specific identity which, through recovery projects, acquire a new role within urban dynamics, creating spaces for revitalization with new functions that integrate into the context.
The methodology used for the analysis of the identified case studies will be by comparison between projects characterized by a constitutive and intentional process of regeneration of empty spaces: from urban muralism to street art, to the use of colour for the redevelopment not only of buildings but also of marginal spaces and urban environments.
Main themes identified for the cataloguing of projects aimed at the comparative survey:

- The design of urban spaces dedicated to the recovery of the waste areas of the infrastructures: colour in the project, colour in the drawing;
- Projects for bridges areas with outdoor spaces integrated into the context;
- Projects for the recovery of degraded areas carried out through the use of colour;
- Temporary, spontaneous self-produced projects.

This article aims to understand the role of colour in the regenerative processes of the city: from design to construction of the work.

The color in the street art of Gianluca Rro and Fabio Biodpi: Between social impact and urban periphery in Scampia

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The widespread phenomenon of contemporary urban art increasingly dominates the pre-existing architectural surfaces, delivering to the degraded peripheral areas a social value and recovery which is correlated with an activation of socio-economic dynamics. Within the broad considerations on street art, this essay analyses two specific aspects of this phenomenon: on the one hand the analysis of the color of the works of art produced as a determining factor for the visual perception and the emotional approach that the decorated space manages to offer; on the other hand the social factor that becomes paramount value for urban regeneration. Specifically, the two analyses of visual communication and social communication are developed around the two artists: Fabio Biodpi and Gianluca Raro.

SPECIAL SESSION

INNOVATION AND RESEARCH IN COLOR FOR BEAUTY CARE AND HAIRSTYLE

History of colours and beauty

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History, sociology, psychology, styling, decoration, many fields are interested in the symbolism of colors and as proof, the incredible number of books devoted to it! Why such an interest in what seems rather superficial? Because after reflection, the language of colors, what they are capable of inspiring us, of making us feel, the behavior they can induce is far from negligible and perhaps even much more important that what we usually think. Thus, since the dawn of time, men and women have sought to enhance their beauty through the use of makeup and it is likely that prehistoric men already practiced body painting. So, want to put yourself on your best for an interview, a date? There is no doubt that choosing your colors well can be wise! So we will retrace the history of makeup over the centuries and take a look at the language of colors for beauty!

A comparative study of lipstick shades preferences by geographical areas

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International cosmetics companies manufacture make-up products that are then sold in all countries where the brand is distributed. Lipstick ranges today each include about 30 shades and each brand offers several ranges with different effects of the make-up result. A couple of years ago, Chanel lipsticks provide 142 shades divided into several ranges: 34 classic lipsticks, 48 shiny lipsticks, 39 intense lipsticks and 21 matt lipsticks. It seemed to us worth looking too, at the 20 best-selling lipsticks by specific geographical area. So, the areas studied are not of comparable size because they are those where detailed sales figures are available. These areas are France, Italy, the UK, the USA, Asia and South America. The best sales per area are analyzed to establish shade preferences in each of these areas. A comparison then made it possible to establish the geographical areas whose lipstick color choices are closest.

Parallelism as advertising strategy in Maybelline's lipstick color names

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This study analyses the word formation processes and formal features of lipstick color names by the cosmetic brand Maybelline. For this purpose, a seventy-six-color name sample was manually collected from their webpage. The analysis reveals the predominance of two main parallelistic mechanisms used in color nomenclature: structure and concept repetition. The former is intended to impress the audience and capture customer attention (e.g., hyphenated expressions like *ruby-for-me*; or determiner plus secondary color terms, such as *more berry*); the latter aims to seduce the consumer by exploiting theme consistency based on color longevity or romance and compulsion (e.g., *taupe seduction*), sometimes combined with alliteration (e.g., *constant cocoa*) and assonance (e.g., *extreme aubergine*). The results and conclusions point to the paramount importance of color terminology and verbal identity (Allen and Simmons 2003), as it contributes to a coherent and homogeneous color range organization that is highly identificatory, memorable and attention-grabbing.

Fifty Shades of Beige: An Analysis on Color System for Liquid Foundation

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With the increasing awareness of skin diversity, cosmetic companies have created foundations with more than 40 shade options. Color researchers endeavored to evaluate the color quality of foundation from product R&D. At the same time, cosmetics companies have conducted their own trials to systematically communicate these tiny shade differences to consumers. In this study, we investigated the relationship between the practical color labels and the colorimetric values of 175 foundations from three global product lines measured in CIEL*a*b* color space. Based on the analysis, the color of liquid foundation, were shades in a wide lightness range, in low chroma, and concentrated hue. Lightness difference was clearly controlled through L*; undertone classification was influenced by L* and was specified with the combination of a* and b* or h (hue angle), which slightly differed from brand to brand.

The impact of skin colours on visual impression

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This study investigates the impact of skin colour affecting visual impressions in terms of attractive, healthy, youthful, feminine, cooperative. The images were rendered on colour calibrated mobile displays for 4 female models, representing the typical types of skin colours. Each image was assessed by 30 Chinese observers using the 5 impressions. The results were used to reveal the relationship between different impressions for each skin type.

Quantifying facial colour appearance of Caucasian and Chinese faces

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This research is aimed to better understand human perception of skin colour and quantify the overall colour appearance of human faces. In this study, a colour matching experiment was conducted and the overall facial colour appearance of 80 facial images, including 40 Caucasian faces and 40 Chinese faces, were obtained. The main finding of this study is that the overall facial colour appearance is different from the average colour in facial area at a very significant level ($p<0.001$). Overall, the facial colour appearance perceived by people are less reddish, less yellowish, and much lighter. Moreover, the overall facial colour can be quantified accurately by linear regressions of average pixel colour calculated in the facial area ($R2>0.912$). The results will be used in further study to test colour appearance models for facial skin, and to support studies predicting facial attractiveness based on the accurate facial colour appearance.

Development of a measurement system for the optical properties of facial skin using a three-dimensional camera and projector

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We have developed a system that measures the optical properties of facial skin together with the three-dimensional shape of the face. In measuring the three-dimensional shape of the face, our system uses a light-field camera to simultaneously provide a focused image and a depth image. The light source has a projector that produces a high-frequency binary illumination pattern to separate the subsurface scattering and surface reflection from the facial skin. Using a dichromatic reflection model, the surface reflection image of the skin can be separated further into a specular reflection component and a diffuse reflection component. The method presented here provides new possibilities in the field of cosmetology and skin pharmacology.

The Reference point for determining human facial skin tone

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Perceptual judgment of facial skin tone is considered more sensitive than general perceptual judgment of color, and a slight change in facial tone can indicate whether one is ill or intoxicated. A reference point for discerning facial skin tone was demonstrated in the results obtained from the response probability for each elementary color indicated among 27 participants. Their responses were compared with five hypotheses regarding the viewer's skin color, skin color memory, the average skin color of the group to which the viewer

belongs, and the skin color of the related educational material. Analyses results indicate the reference point is closest to the average facial skin tone of the belonging group; this fact suggests that people unconsciously memorize the facial skin tone of a person they see regularly and use the centroid as their reference for skin tone judgment.

Munsell and Ostwald Color Spaces: A Comparison in the Field of Hair Coloring

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Color science has had a very long history, dotted over the millennia with many contributions from the most diverse fields of human knowledge. At the beginning of the 20th century, Albert Henry Munsell, an artist formally trained in academia, and Friedrich Wilhelm Ostwald, Nobel prize for chemistry in 1909 and amateur painter, each envisioned and developed a color system with a related color atlas. Both authors recognized the importance of the visual relationship between colors, which they conceived as sensations stemming from, but not merely confined to, pigments and light. We hereby describe the salient features of these color spaces, their strengths and weaknesses, the authors' analogy of intents and divergence in execution. We then comment on how to employ them on a practical basis within an industrial setting, the cosmetic of human hair.

Hair Color Wheels and Charts

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Cosmetic coloring of human hair is based on the so-called series of naturals, a set of ten reference swatches from deep black to light blonde. These are normally visualized radially on a color wheel, where nuance variations are placed within the circle. In this way, opponent colors are underlined. These color wheels are supposed to be a sort of standard way to 'explore' the available color of each color chart. However, they differ considerably from brand to brand. No standard is globally set by the industry. A selection of wheels is reported and described to discuss their differences.

Chromatic Appearance of Nylon Swatches in Hair Color Charts

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Hair color charts are to hair coloring what color atlases are to color painting: a standardized palette of tones and nuances for colorists to choose from. In fact, slight variations exist among them, supposedly for marketing goals. However, a few other inconsistencies are readily apparent by visual inspection in the series of naturals, i.e., the one extending from deep black to light blonde. By means of a visual comparison through

the Munsell Book of Color, we assess the chromatic appearance of a selection of hair color charts comprised of several colored nylon swatches, mainly focusing on the series of naturals. Results show the level of consistency of nuances throughout the scale, and among different brand scales. They also provide a clear indication on the actual tonal scaling of the samples, with particular regard to its perceptual linearity.

Influence of color discrimination proficiency on wellness professionals' training and craft

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Color plays a crucial role in the field of wellness. Identifying color vision deficiency (CVD) – the most typical vision and undiagnosed color vision defect – is fundamental to supporting and addressing vocational students in their professional development. This work aimed to determine the prevalence of CVD among students of the *Centro Poliestetico of Milan*. A cross-sectional and descriptive study about students' color vision deficiency was carried out using the Farnsworth-Munsell 100-Hue test. One hundred and fifty-five students were included (138 females and 17 males). The mean score of the Farnsworth Munsell 100 Hue Test Score was higher in males (64.4 ± 46.3) than in females (45.7 ± 30.5). In addition, a positive association between males and low discrimination levels ($p = 0.042$) emerged. Advice and support on color vision proficiency are necessary for wellness professionals to increase their awareness, reduce anxiety during the working activity, and improve customer satisfaction.

Hair Coloring and Customer Satisfaction

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Hair color is a fundamental identity-defining feature, especially in the female universe. The relationship with the world of hair coloring is equally paramount to customers and professional hairdressers. Among all treatments, hair coloring promotes the highest customer loyalty, and at the same time, it excels in its ability to attract new customers. However, despite the substantial monetary profit and business volume of the coloring service, there is an extremely high percentage of customer dissatisfaction. We tried to investigate where the short circuits between expectation and result occur. Some causes emerged mainly attributable to a generalized lack of appropriate training provided to students during their advancement in the Vocational Training Centers, especially regarding color theory. On top of this is the non-academic approach based on habits, the custom amongst cosmetic companies to determine tone heights in a totally subjective way, and the use of non-standard color charts.

More Than a Tube of Color - The Emotion

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The relationship a colorist builds with their chosen products is deeply emotional and is heavily dependent on trust and confidence in their performance. With this confidence a colorist's focus can remain on their ability

to ensure consumers' happiness through proper product choice, which directly affects the livelihood of a colorist. When a person sits in the colorist's chair, there can be trepidation, anxiousness, eagerness, or excitement. As with all relationships, understanding these emotions builds trust between consumer and colorist. How people feel about their hair color is intimate and unique to each individual. Color creates a connection to how people see themselves, and thus a reflection of how one is perceived. We will look at the perception and psychology behind different colors of hair, such as blonde, red, brunette, and grey. These intended consumer benefits – confidence, happiness, comfort - are often derived from this sacred service.

SPECIAL SESSION

ALL THE COLORS OF CINEMA

Handling Color in Photography and Film: From Photo Retouching to Color Grading

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In this paper, I explore how color is used in photography and film. In particular, I focus my contribution on the treatment of color after the images have been recorded. I'm speaking from the point of view of a scholar dedicated to photography and film philosophy and aesthetics, but also from the point of view of a long-term practitioner as both a photo retoucher and a color grader. What I want to point in this article is how the digital era has made possible and easy the retouching of color in post-processing. I also want to show what are the commonalities between the two, and what are the differences. In particular, in photography, we deal with still images. In the case of color grading, even though the process of working on a still frame is similar, there is in addition the question of the moving image throughout the clip, and how the choice we make on one still frame is also correct for the rest of the clip or not, and how to choose the still frame on which to work as a starting point. There is finally the question of how to match two consecutive clips together. And finally, how to decide what look we want to apply on the whole film, or on some sequences of the film. The outline of the paper is as follows: the first part deals with photo retouching. A simplified workflow is proposed. A second part then deals with color grading, and a simplified workflow for color grading is also proposed. A third part compares the two approaches, points the commonalities as well as the differences, and also shows how the two approaches can feed each other. And finally a conclusion wraps-up the paper.

Color correction and color grading: how a film colorist works

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Amongst many professionals involved in making a film, this paper intends to analyze the colorist's work as an artistic work. This professional performs his work during post-production. They are supposed to digitally manipulate the pixels of the images. It is possible to say that these professionals, within the cinema production chain, are the latest responsible for the chromatic aspects of an audiovisual work before it is released. The work process can be divided into two parts: color correction and color grading. This text aims to show the importance of these two processes to guarantee a satisfactory performance for the colors in a film. In this sense, the uses of color will be analyzed in the film Joker (2019).

Color in characters' identity in the animation cinema

Manuela Piscitelli

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This paper analyses the use of colour in Disney's animation films from three different and closely connected points of view: the first is the link between colour and the identity and psychological features of the characters; the second relates to the chromatic contrasts between the protagonist and his antagonist in the story; the third concerns the figure-background relationships, through the study of the colours of the

environment in which the characters move. The first theme is developed by grouping characters with similar psychological characteristics taken from different films. The second and third themes are treated with reference to certain films considered emblematic.

A Film in a Frame: Movie Barcodes for Film Restoration

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Today, color reproduction techniques are among the most studied and fascinating topic in cinema studies and film restoration. In this study, we propose the use of a tool called movie barcode in order to represent the chromatic variation of a whole film in a single image. The movie barcode is a graph where all the colors used in each film frame are extracted and represented in succession, allowing to synthesize in a single image the chromatic variations throughout the film.
The study and analysis of the movie barcodes allowed us to extract movies chromatic mood board and make comparisons among different videos. The potential of this method has been initially tested on animated films with simple color compositions and next on digitized analog films. This application let us to evaluate the effectiveness of movie barcodes to represent and study films of cultural and historical interest before and after the process of restoration.

The Lilac Scarf – Color as a visual narrative as depicted in the film Far From Heaven (2002)

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This paper aims to analyze the development and construction of a parallel storytelling line by the use of color in the movie Far From Heaven, directed by Todd Haynes. We will focus on the lilac scarf worn by the main character, Cathy Whitaker (Julianne Moore), throughout the film.
Far From Heaven is a popular film from 2002 that embraces race issues, homosexuality, marriage, and society's stereotypes in Connecticut during the 1950's; it was nominated to a series of awards, including Best Cinematography at the 75th Academy Awards and won several others, such as Best Film at that year's New York Film Critics Circle Awards.

PIXAR's Colorscripts: Chromatic Analyses of Four Films Using Sens|Org|Int Model

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The objective of this study is to make chromatic analyses of the colorscripts of four Pixar films using Sens|Org|Int model. These analyses are intended to understand the use of color and their communicative intentions, as well as discuss communicative relationships between emotion and plot through the use of colors, identifying which aspects of chromatic perception are objective (physiological) and which aspects of chromatic perception are subjective or interpretive. The empirical research was conducted creating first an instrument of analyses for the colorscripts, based on the theoretical review. Results of the analyses indicate not only that Pixar uses color very coherently and effectively in terms of physiological visual perception, but also show which color uses and contrasts are mostly used and with which communication intentions. Also, the analyses convey a broad scope of color associations in films that could be useful for future chromatic projects.

Colours of pre-cinema projections: the evolution of hand-painted magic lantern glass slides' palette

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With the magic lantern, the projection of moving animated images was combined with sounds and revolutionised the means of communication for collective audiences.
The colours used to paint by hand 18th- and 19th-century European magic lantern glass slides from Portuguese collections are being studied to unveil a possible relation between the materials applied and the place of production and makers. Ultraviolet-Visible, X-Ray Fluorescence and Raman spectroscopic techniques were explored to allow a first insight into the evolution of the magic lantern colour palette over time. By developing a timeline, it was possible to find differences between manufacturers, countries and periods, mostly in the early 19th-century and revealed to be a promising tool to attribute slides with more precision. Light-sensitive colourants were identified, such as red and yellow organic lake pigments, which is extremely important to develop and implement conservation strategies towards their preservation.

Fine Arts on Film: The Hand-Painted Work of Stan Brakhage

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This paper will approach the topic of colour in cinema by examining the case of the hand-painted films made by experimental filmmaker Stan Brakhage. Specifically, I will present the example of some hand-coloured pre-print elements belonging to the National Cinema Museum in Turin and preserved at the Haghefilm lab in Amsterdam in 2011. I will argue that these films challenge traditional understandings of cinema by belonging simultaneously to the realm of film and to that of the fine arts and will show the consequences of this liminal position both at a practical and a theoretical level. In particular, I will explore the challenges related to the preservation of some of these films, and will relate them to broader issues of originality, medium specificity, and philological recreation of experimental cinema practices.

A Material Investigation of Color Film Technology through the Koshofer Collection

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The Koshofer collection is an invaluable resource about the history of color film technology from the late nineteenth century until the 1980s, including film frames from early applied hand coloring, tinting and stencil coloring, to mimetic color processes such as Kinemacolor, Gasparcolor, and many other rare and popular color film stocks. Multispectral imaging in the visible range has been carried out to characterize the optical properties of the color processes, and an extensive microscopic examination allowed to reveal minute material features. These investigations highlight distinctive elements for the identification of some of the most significant historical color processes on film, and at the same time, offer crucial information for classical restoration techniques and for rigorous digitization strategies.

Digital Colour in Cinema: An Incomplete Transition

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This paper will approach the ever-changing relationship between technical and technological inventions and film language innovations in the history of colour cinema. It will be outlined continuity and discontinuity elements in the transition from photo-chemical to digital cinema. The technological relationship between analog and digital cinema will be addressed under the paradigm of time/space-based color control for photochemical processes and digital software. All together, these analyses bring to some final considerations on the real nature expressed so far by digital cinema, and in particular on the relationship between cinema and other, seemingly more convincing, digital outcomes such as Virtual Reality, Augmented Reality and 3D technology.

Film Repository for Restoration (FiRe2): identification of photographic and cinematographic films

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The identification and restoration of photographic and cinematographic films are often needed as they can undergo severe deterioration, aging, and color fading. Moreover, films also have to keep up with quick technological changes. In this context, knowing the material that composes the film is fundamental to restore the chromatic characteristics to their origins and to perform a correct retrieval faithful to the analog support. Nevertheless, the lack of technical information and the absence of open-source archives of the production companies underlines the actual and concrete need for a database of physical, chemical, and sensitometric data of films and photos. These are the motivations that lead to the creation of FiRe^2, a unique database of cinematographic and photographic materials that can support the work of conservators, restorers, and researchers. With this project, we also aim at promoting cooperation between institutions and professionals.

SPECIAL SESSION

ILA - COLOUR, LIGHT & SOUND: HOLISTIC APPROACH FOR WELLBEING

Colour as a coaching tool with Colournostics

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Colournostics is a unique self-empowerment tool that combines Neuro-Linguistic Programming (NLP) and colour psychology to enable you to articulate your concerns, identify the barriers that prevent you from overcoming them, visualise how you would feel if your problems were solved, and empower you with a plan to get you to that point.
The method, based on NLP and the psychology of colour, removes the blockages from your subconscious mind. The development of this method, by Thelma van der Werff and Mary Ashby-Green, took 5 years and was tested with thousands of people, after which it was designed in the colourful 'process board'. Colournostics has been developed in such a way that your clients (and/or you) can leave behind long-lasting patterns, get clear insight and answers so that a positive change can take place. The Colournostics method can be applied in different ways and you can follow the different modules that suit your way of working and integrate them seamlessly in coaching sessions.

Photonic Medicine, the therapeutic use of light and colours in Medicine

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Photonic Medicine, a medical diagnostic and therapeutic method founded by Professor Pierre Magnin **(†)**, uses photonic application, first to the pinna (reflex microsystem discoved by Dr Paul Nogier) and then to the corresponding somatic areas, always under strict neuro-vegetative control, through the VAS perception. Results in some relevant cases will first be shown, prior to a brief overview of this method.

How the Sensory Systems Impact our Journey Through Life

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Human function is predicated on sensory systems performance. Sensory difficulties are often *'hidden disabilities'* difficult for those *'without them',* to understand those *'with them'.*
Efficient, integrated, systems are needed for optimum function. Disintegrated, inefficient, over-loaded systems are unable to accurately process sensory information affecting performance. Frequently present, in those with learning difficulties, they cause behaviours leading to labels. The 'underlying reasons' are often poorly recognised, misunderstood, ignored, or attributed to 'behavioural problems'.
Assessments establish baseline function using formal tests or critical observations. Therapies, such as **Lightwave Stimulation (LWS)** - coloured pulsed light to help address light sensitivity and light processing

deficiencies, **Auditory Integration Training (AIT)** - to help improve auditory processing and reduce over and under sensitivity to sound, **Neuro-developmental Programme (NDP)** - a sensory integration programme to inhibit Primitive Reflexes enabling Postural Reflexes emergence for development to progress. These therapies help improve social, emotional, behavioural and academic performance.

Bodygraphy - Chromatic performance on surrounding space

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This article presents a reflection that aims to analyze "*Bodygraphy"*, an artistic project that proposes to think about color, body and space in contemporary art. As a researcher, artist and author of this investigation project, I will present a performance reported by the series of photographs developed in the city of Porto. It was necessary to create a colorful costume to use and shelter the body in the chosen places, thus creating body experiences and photographs where new landscapes are inserted as my body/color. Reflections about the dialogues between color, body and space are presented to visualize a process of creation in which the body/color is thought of as an element that delimits a territory. An organic body/color that interferes and claims a geographic place and becomes a part of it. Understanding the role of color in the relationship with the body and space, therefore, became an important starting point for a reflection on this *Bodygraphical* trilogy.

echobell - "Sound-pharmacy to go" Effective treatment with sound, vibration and light

Gerald Zrenner
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1.How are light and sound related?
Background and basic knowledge.

2.Where can I
a. as a therapist and doctor on the one hand and
b. as a simple user on the other hand
use this knowledge effectively in everyday life?

Brief description of the possible uses in therapeutic practice and in everyday life.
3.echobell - One easy to use device for personal and therapeutical use.

Post-Pandemic Support with Colour, Light and Frequencies

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Colourpuncture, as conceived and introduced by Peter Mandel in the 1970s, has been used to support clients with health challenges, illnesses, and diseases for more than 40 years. During the recent pandemic Peter was able to find new ways to help those who needed it most. In this paper we will look at potential challenges with which we were faced during the pandemic as well as suggested new therapy approaches to support healing on all levels - physically, mentally, spiritually as well as bring the body-mind complex back into equilibrium.

Colour, human experience and cyborgism

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In the Varela, Thompson and Rosh's embodied and enactive cognition framework, a middle way is proposed between the objectivism assuming a pre-existing world and subjectivism which consists in an outside projection of a living organism's organisation. In an enactive view, cognition emerges from a dynamic structural coupling between the organisms and their environment in which both determine each other.
With new technology, humans can be equipped with previously unseen sensory capacities (named as cyborgism), which offers an opportunity to reflect on the nature of the structural couplings arising from interactions between the cyborg and their environment.
Our paper will present a case of achromatopsia since birth who senses wavelengths through an antenna shaped detector (eyeborg) that transforms wavelength into sound waves.
Brain modifications consecutive to the continuous exposure to a new stimuli pairing (wavelengths–sounds) together with the cyborg behavioural performance such as colour-discrimination will be considered.

The power of earth colours

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As light therapists, we are used to working with colours of light, the spectral colours. Working with reflected light asks for a different approach. These colours originate by the reflection of light on pigments. These are the colours of the earth.
In 2016 I described a new coloursystem for healing and empowerment, which comprises light into four different colour dimensions. The colours of the earth are one dimension. They are a true healing medium and foundation for creating a life that matters, literally. These colours help to ground ourselves, heal on a very deep level and transform old pain into wisdom. In this article I focus on the earth colours, because I found out that these are the colours my students and clients crave the most, just because the healing power of these colours is overlooked.

The imagined Body (2001-2021)

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THE IMAGINED BODY, the experimentation that Claudia Bonollo has been carrying out since 2001 is a multidisciplinary research that has as its object the human body. An emotional research based on colour. An initially unconscious re-enactment of the cathartic power of art in its broadest sense which also includes music and dramaturgy. The ancient Greek tragedies, as Aristotle explains in his Poetics, help, through the strong events represented, the viewer to detach himself from the passions and daily problems. The same power is attributed to music. In this wake, psychoanalysis, from Freud and Jung onwards, attributes to artistic catharsis the power to free the individual from the emotions that oppress him and to recover vital energies. In ancient Asian, Mesopotamian and Egyptian civilizations, colours were attributed healing power. And even the Greeks, inserting themselves in this millenary tradition, used colors to cure diseases. It is no coincidence that Bonollo's experimentation is called, at first, "BEAUTY, IS ITSELF A CURE. The diseased cell, now transformed into a healthy coloured cell, infuses new vital energy to the observer.
A research that soon extends to the whole human body, to the study of emotions and happiness. The transfigured cells are transformed into a multidisciplinary project with multiple applications, which borders other disciplines that would seem totally foreign to it: medicine, biology, neurobiology, psychology, psychoanalysis and theology. "IL CORPO IMMAGINATO" (THE IMAGINED BODY) is now a multimedia project that offers a different point of view on the human body, illness and healing.
From this research, installations are born in which art and architecture are combined, real and virtual elements, spaces in which the senses are stimulated by a perception of well-being. Transfigured cells become a map of consciousness, biological landscapes are cartographies of being in which the body is represented as a sacred object, sensitive spaces are virtual surroundings, projections where various levels of well-being are experienced, chromatic narratives are short films or experimental techniques of visualization with colours.

Auricular chromotherapy for the treatment of psychological trauma

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Auricular chromotherapy has shown promising results in the treatment of psychological trauma . With its relatively easy and quick technical application, this procedure, could be an indispensable tool for therapists. However, its mechanism of action is not yet understood completely.
Objective: To treat patients suffering from trauma, and PTSD, with auricular chromotherapy.
Materials and Methods: The protocol was applied in 160 patients (135 who experienced traumas; 15 patients with specific phobias and 10 patients with panic disorder). They are 134 women, 26 men, ages 20–60.
Results: The treatment showed 93% of positive response.
Conclusion: This procedure shows the possibility of drawing a path from the external ear to traumatic memories, anxiety disorders and phobias.

Principles of regenerative therapy with low-intensity laser, colour, ultrasound and magnetic field (coMra)

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For decades the main focus of global public health has been on the quantity of years lived, even though the quality of living those years is declining. The burden of disability as a result of chronic diseases is rapidly growing worldwide, due to the simple fact that methods of fighting against various causes of death are not suited to the purposes of building up health. We propose that therapeutic technologies that enhance the quality of health should follow the same fundamental principles that underpin the organisation of life at all levels: regeneration, self-sufficiency, evolution, interconnectedness and intelligence. The regenerative technology of coMra therapy implements these fundamental principles of life by combining low-intensity laser, colour, ultrasound and magnetic field into a united coherent vortex that comprehensively supports self-regeneration of the body.

Soul-X: The Experience Center for Mind-Body Harmony

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With so many distractions and unrelenting work, we often forget who we are. This paper will provide insight into SOUL-X, an experience center dedicated to improving public health. It provides an experience that allows users to transcend the ordinary and realize the interconnectedness with the oneness of life. SOUL-X is an immersive light, color & sound installation which provides a sensory experience, that de-stresses and realigns the body, mind, and soul. It is a collaboration of artistry, healing wisdom, science, and universal health, and well-being to create a unique first-time experience.

Treating chronic pain and depression with color and sound: recent studies using the Sensora system

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We present the results of two recent studies performed in France using the Sensora, a multisensorial stimulation system generating an integrative, immersive therapeutic experience. The Sensora is representative of the novel therapeutic modalities brought about by modern light, color and sound technological innovations. The objective of the first study was to demonstrate the effectiveness of the Sensora system for 10 patients with a diagnosis of chronic pain. The second study examined the impact of the Sensora on 9 patients suffering from anxiety and/or depressive symptoms. Both studies led to the conclusion that the Sensora can be considered as an effective system in its capacity as a supplementary therapeutic modality for the treatment of patients presenting with chronic pain as well as depressive or anxiety symptoms.

SPECIAL SESSION

ALL THE RECENT BOOKS ON COLOR

Color for Architects

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As far back as the earliest Greek temples, color has been an integral part of architecture but also one of its least understood elements. Color theory is rarely taught in architecture schools, leaving architects to puzzle out the hows and whys of which colors to select and how they interact, complement, or clash. Color for Architects is profusely illustrated and provides a clear, concise primer on color for designers of every kind. This latest volume in our Architecture Briefs series combines the theoretical and practical, providing the basics on which to build a fuller mastery of this essential component of design. A wealth of built examples, exercises, and activities allows students to apply their learning of color to real-world situations.

Modifications of the visual comfort in residential centers to improve the quality of life for the elderly

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This publication presents the results obtained from the research project entitled: Modifications of the visual comfort in residential centers for the improvement of the quality of life of the elderly, funded by the State Research Programme launched in 2016-2019 and which focuses on two major challenges. On the one hand, to carry out a colour analysis of the residential homes for the elderly in the Valencian Community, specifically the public-owned ones, by checking and studying the current state of the lighting factors and the colour applied in them.

On the other hand, a research involving a set of suitable mechanisms for the visualization of chromatic parameters in order to examine the expected results of the design before carrying out the works. The treatment of colour is proposed as a key element to help create states of visual comfort and well-being, and consequently to improve the environment of the spaces where the diverse activities of this group take place, as well as improving the quality of life and emotional stability.

Therefore, due to this social phenomenom of recent years, there is a need to act architecturally on the environments in order to promote the well-being and to facilitate, from design, the personal improvement of residents, both in the present and in the future. Colour in architecture is still one of the most difficult elements when choosing a specific colour range, choosing a colour and applying it to the rooms that make up the habitat, as well as when establishing an environment that generates harmony and makes people feel good.

The guide is intended as a tool to guide professionals who, in one way or another, wish to make chromatic modifications in the interior spaces of residential homes and to propose new improvement proposals focused on the environments where our elders live, in order to generate a welfare state in accordance with their environment.

COLOUR CHOICES A practitioner's guide to creating colour schemes and design

Berit Bergström

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This book is a revised edition of a previous book (1996, 2007 Swedish, 2008 English edition) of the same title. The book is under production. More details will be presented in the paper presentation. Few things affect us as much as colour. It plays a vital part in our surroundings, whether at work, in public places or in our homes. Choosing the right colour is a necessary mean of achieving desired effects in colour schemes and design. There are of course no given rules concerning what is right or wrong and what is beautiful or ugly, but some guidance can still be offered about colour schemes. There is knowledge to be gained from our colour research.

It does not set out to answer all these questions but instead to shed light on all the research findings which can be useful and helpful to practitioners in colour schemes and design or those who are otherwise concerned with questions of colour design. These research findings may be worth knowing about and will hopefully provide both support and inspiration for colour selection in colour design, of both products and the colouring of our surroundings.

Other studies presented in this publication indicate methods for analysing the meanings and connotations of different colours, different colour combinations, colour surveys, colour changes caused by distance and the perception of colour with different light sources, but also studies challenging a number of myths about colour, and so on. Systems exist for analysing, checking and communicating about colour. This book is a visual approach to colour.

Structure of the content.

You could say that the book is divided into focus areas, one part with colour knowledge, another with useful methods and approaches in practical colour design and the third part; a lot of inspiration! Part of colour knowledge: General colour theory, our need of colour, colour as a source of information, contextual meanings, our perception of colour. Presentation of different colour collections and colour systems and their uses. The increasing use of colour in every imaginable context has created a need for several different colour systems and atlases.

Methods and approaches in practice: Colour as a phenomenon and the possibilities of structuring our perceptions of individual colours and combinations of colour. This part will include different examples of methodology, and practical research results from researchers. What colours signify and the influence of the room colour are other examples of valuable knowledge to apply in practice. It’s aimed at different target groups as architects, interior designers and also product and graphic designers.

Inspirational and practical use of colour in colour design with inspiring examples: Changeability of colour impressions are different factors to consider in the colour design process such as viewing distance, size & form, surrounding colours, viewing angle, texture, reflections. This third part will also be illustrated with photos and colour schemes from around the world with description of methods from colour scientists and architects. Colour scales with inspiration from our nature, historical colours and from the typical Scandinavian colour palette will be shown.

The examples given in this publication are intended to shed light on methods and examples applicable in all environments and cultures.

Colour: Urban Space, Architecture, and Design

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Colour: Urban Space, Architecture, and Design is a bilingual publication on colour-in two separate volumes-with an international scientific committee of researchers, which aims to disseminate the research undertaken in the multidisciplinary area of colour. This book celebrates the existing collaboration between APCOR - Portuguese Colour Association and the Lisbon School of Architecture – Ulisboa's colour research structures: Colour Lab and Colour and Light Research Group.

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Color Communication: a scientific approach from visual perception

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This presentation refers to the book called, Color Communication: a scientific approach from visual perception, written by Prof. Dr. Paula Csillag, from ESPM College, São Paulo, Brazil. This book was first published in 2015, and now was republished as an e-book, in January 2021. The Publisher is SENAI SP Editora, and the language is in Portuguese. The general objective of this book is to deepen the understanding of chromatic communication elements that tend to be generalizable to human beings with normal vision. To this end, scientific bases were sought in the areas of neurology and psychology of visual perception to create a model of visual perception. This model, created by the author, was presented at the international congress of the International Visual Literacy Association in the United States, in 2007, and her article was awarded as the best paper in the Book of Selected Readings of this congress. This model, here applied to color, guides principles that support the application of colors in visual communication, based on more conscious choices, framing what may be considered as color syntax. The themes developed here find application in the fields of design, advertising, architecture, cinema, photography, fashion, packaging and any other that deal with imagery. With this, the author aims to help professionals who work with visual communication to have objective answers and criteria in their chromatic choices. There is a free app linked to the book, that shows some interactive experiments, in which the user may use sliders to visualize different color contrasts and understand the proper color syntax. The app may be downloaded for free, for androids https://apkpure.com/br/comunica%C3%A7%C3%A3o-com-cores/air.coresAndroid And for iPhone https://apps.apple.com/br/app/comunica%C3%A7%C3%A3o-com-cores/id1049887543. The link to find the book is https://www.amazon.com.br/Comunica%C3%A7%C3%A3o-com-Cores-Abordagem-Cient%C3%ADfica-ebook/dp/B08SW4JFBC/ref=tmm_kin_swatch_0?_encoding=UTF8&qid=1617150094&sr=8-1#detailBullets_feature_div. The book has 157 pages, ASIN : B08SW4JFBC, ISBN: 978-85-8393-112-6.

Book: The Uncertain Signs

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This book is positioned at the intersection between sociology, semiotics and computational analysis of color. Taking as a starting point the idea proposed by Roland Barthes that color is among the dreadful uncertain signs, and the position held by Jean-Marie Floch that color is semi-symbolic, the book is an attempt to provide a methodology and a sound theoretical background, supporting experimentation. The main question it attempts to answer, is the relationship one can find between the colors used in popular culture and the prevailing cultural and societal values. To answer this, it turns to the album covers of Greek recordings since 1960. Dealing with a field so diverse, the author turns to the concept of Art Worlds, as proposed by Howard Becker, and to social network analysis, to provide a novel and innovative view to the scenes of Greek music during the last 60 years. In order to understand the complex semantic mechanisms in operation between scenes or between periods, he turns to the concept of semiosphere, as proposed by Jury Lotman. The book provides a complex narration about the cultural, political and socioeconomic situation in the country during each decade, along with a presentation of the main scenes as recognized in the social network analysis. Then, it moves to the computational analysis of color on the album covers. The examination of the chromatic values of each period led to a structure of three chromatic layers:

• The first consists of five colors which remain almost stable throughout the whole period. They could be considered as a background upon which the differences found at the next levels become meaningful.

• The second layer consists of six colors, which remain stable for a long period, to change drastically. Such colors seem to follow the pace of value change in Greek society, they can be related to qualitative changes in their sociopolitical and cultural context.

• The third layer consists of seven colors, which come to the fore for a short period of time and then disappear. It looks like such colors are following trends and fashions, related to the sensibility of short periods, or the eminence of some scene.

Such a model may be then tested on other corpora of visual popular culture, to check its consistency. It may also be used to map the diffusion of cultural influence between the centre and periphery in a complex and interlinked world.

The Sense of Color: An introduction to the book

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The aim here is to introduce the book “The Sense of Color: A Cognitive Linguistic analysis of color words” that brings together my research in color semantics conducted within the cognitive linguistic paradigm concentrating on the linguistic representation of conceptual structure. It unravels this approach to the analysis of the color frame as it emerges in English. Stress is put on the aspects of embodiment, cognitive operations, and conceptualization of COLOR and SEEING terms. It presents a model specifying the primary conceptual metaphors and metonymies, with the complex that works together to structure our usage of color/seeing terms in natural language. The model includes COLOR as a source domain yielding SEEING IS COLOR, COLOR as a target domain yielding COLOR IS A LOCATION, COLOR IS AN OBJECT, etc., and color metonymy: COLOR ATTRIBUTE IS ACCESS FOR COLOR ENTITY. It further elaborates on color in grammatical functions and specific linguistic constructions the book illustrates in each section.

Light Therapies - A complete guide to the healing power of light

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Anadi Martel. 2018. Light Therapies: A complete guide to the healing power of light. Rochester, VT: Healing Arts Press. ISBN: 9781620557297 (English), 384 p.

Description:

A comprehensive guide to the therapeutic benefits of light and color and how they affect our physical and psychological well-being.

- Shares scientific research on how different wavelengths of light influence our cells, brain function, sleep patterns, and emotional stability;
- Examines several forms of light therapy, including chromotherapy, heliotherapy, actinotherapy, and thermotherapy;
- Explains how to use light and color therapy, maximize the benefits of sunlight, and avoid the health risks of new light sources such as compact fluorescents and LEDs.

Beginning with sun worship in prehistory and sunshine therapies in ancient Egypt, Greece, and India, light has long been associated with the sublime, the divine, and healing. Yet only recently have we begun to understand how different parts of the light spectrum, from infrared to ultraviolet, can affect our physical and psychological well-being.

Covering the historic, scientific, and spiritual aspects of light and its role in energy medicine, Anadi Martel explores the vibrational nature of light and the interaction between light, biology, and consciousness. He demonstrates light's incredible effects on the physical, energetic, and cognitive dimensions of life and examines several forms of light therapy, including chromotherapy (color therapy). He details how to use light therapy daily, get optimal benefits from sunlight, and avoid the health risks of new artificial lighting such as compact fluorescents and LEDs. Combining his own 30 years of research with practical insight from the many phototherapy pioneers he's encountered, the author examines scientific studies on how specific wavelengths of light influence our cells and DNA, brain function, sleep patterns, and emotional stability; speed the healing of wounds; and are effective in the treatment of disease, including arthritis, stroke, Alzheimer's, Parkinson's, and brain and nerve injuries. Exploring the spiritual aspects of light, the author explains why auras and halos have been used to represent sages and saints of all traditions, revealing the intimate link between light and consciousness.

Investigating the many laser, monochrome, audiovisual, and infrared machines designed to heal disease and treat emotional disorders, Martel also reveals promising medical applications for light that are currently in development, inviting the reader not only to appreciate the complexities of light but to maximize its therapeutic dimensions.

Publications: The International Scientific Conference of the Color Society of Russia

Verena M. Schindler [1,3,*], Yulia A. Griber [2,3]

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This review includes four publications stemming from the International Scientific Conference of the Color Society of Russia, RUcolor2020, held online 1–5 December 2020. Two publications contain Russian and English contributions: *The International Scientific Conference of the Color Society of Russia: Book of Abstracts* (Smolensk: Smolensk State University Press, 2020), and *The International Scientific Conference of the Color Society of Russia: Selected Papers* (Smolensk: Smolensk State University Press, 2021). Two additional publications, *The Scientific Notes of the Color Society of Russia* (Vol. 2, 2020, a special issue on color design for the elderly) and *Sociological Studies* (1;3, 2020, a special issue for young scientists and students), further include nineteen papers written in Russian or translated from English. In total 182 authors from twenty-seven countries and seventeen regions of the Russian Federation presented their research findings at RUcolor2020 and published their papers in these books.

AIC STUDY GROUPS WORKSHOP

AIC 2021 Study Group on Environmental Color Design: Workshop on Variability of color in natural, built, and sociocultural environments

Chairs: Yulia A. Griber, Verena M. Schindler

The Study Group on Environmental Colour Design (ECD) plays a key role in disseminating the various approaches of professionals (scientists, designers, architects, art historians, artists, psychologists and others) from different geographical and cultural regions. Focused around a specific interest in colour as a means of environmental design in interior and exterior space, the scope of research and study is broad and encompasses colour in the built and socio-cultural environments, as well as the investigation of the effects of colour upon human behaviour, cognition and emotion. The study group was consolidated in 1982 at the AIC Interim Meeting on Colour Dynamics held 8–10 June in Budapest. At present the study group includes around 230 members from more than 40 countries. The ECD mailing list has more than 750 subscribers.

The study group's activities and events have opened up exchanges between experts working in diverse countries around the world. The aims of the ECD study group are:

- to promote communication among its members and other interested people;
- to provide continuous exchange of knowledge and experience;
- to stimulate research and teaching, meetings and exhibitions;
- to disseminate theoretical knowledge and practical experience through congresses, seminars, workshops, publications and exhibitions.

Identifying and managing the factors that impact variability between specified and perceived color

Zena O'Connor

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Variability of color in the built environment can occur in response to trends and urban policies, as well as its appearance, the latter of which may be due to the impact of time, ageing and deterioration of colored surfaces. Another form of variability arises in respect to the difference between specified building façade color and the subsequent perceived color once specified color is applied in situ. As a result, specifying façade color in the built environment can be a problematic process for the following reasons. Firstly, it is known that façade color can influence judgements about building size and congruity. In addition, client aims as well as aesthetics and preference are also relevant when specifying building façade color. However, there are a number of additional factors that influence the variability between specified color and the resulting perceived color in situ. Research indicates that these differences between specified color and perceived color can vary in hue nuance and/or tonal value by up to 20%.

This paper explores the factors that impact specified color when applied in situ and which cause perceived color to vary from specified color. Aside from the complexity of both color and human perception and evaluation of color, these factors include: Color undertones in paint; the impact of contextual simultaneous

contrast; light reflectance issues as well as the impact of reflected color; the impact of textured surfaces on façade color appearance; the impact of ambient lighting and the role of aspect (that is, the direction a building façade faces).
Knowledge of the factors that underpin variations between specified color and subsequent perceived color can inform and influence the façade color scheme development process. This is particularly important for projects of a commercial, industrial, and large residential nature where client aims are often paramount and variability in color can impact issues beyond aesthetics. This paper also discusses strategies that can be employed to manage and potentially mitigate factors that may cause variability between specified color and perceived color. These strategies are discussed with reference to projects in Sydney that illustrate the issues arising from variability between specified building façade color and perceived building façade color.

Variability of sociocultural colour associations related to the environment in Northeastern Brazil

Pablo Manyé

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Eleven years ago, I came from Spain to teach at the University of Fortaleza (Unifor) in the city of Fortaleza in Northeastern Brazil. Here I implemented a colour teaching program. One, in particular, was adapted to children age 4 to 6 years from communities at social risk. In one of the sessions, I asked them what they associated with the colour blue. The majority response was "with death." When I asked why, they told me that the people who died went to the blue sky; therefore, all the dead members of their families were there. Another reason is that when a little girl or boy die the child's body is placed in a coffin that is often painted in a saturated cerulean blue. When I asked the colour of the sea, the answer was unanimous: "Green."
Since then, I have not stopped teaching in different areas related to colour, nor have I stopped learning with students. Some are professionals coming from areas such as engineering, architecture, or marketing, as well undergraduate and graduate students at different universities, and especially children of various ages.
Nowadays I am a professor at the State University of Ceara, located in the state capital. The state is known as the "land of light." That motto (arising from José do Patrocínio) refers to the fact that Ceará was the first state to abolish slavery in Brazil. The direct reference between light and freedom evokes Plato in this relation between light and truth.
This part of Brazil is also among the areas with the highest solar radiation (Atlas Solarimétrico Brasileiro. TIBA, C. et al, 2000). The colours are therefore intense and full of nuances, and also, very rich in references due to being a state of encounters between Africans, Indigenous and European people, among other ethnic groups, creating singular associations of colours with feelings, ideas, or fears. These can be especially surprising for someone who comes from European countries or others, as in my case, born in Uruguay.
I would like to present to our group my experience and, if possible, to have an engaging discussion about the sociocultural variability of colour associations related to the environment, different perceptions of colour in this part of South America, and also articulate some associations that have caught my attention in these last ten years of teaching colour in Brazil.

East vs. West: How color is perceived differently in psychological and physical environments of different cultures

Monica Kuo

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As a professor that incorporates practical planning and design as well as academic theory and application but does not have any professional training in “color”, when discussions of “color” appear in the physical environment, nature, wilderness, densely populated cities, and even when it appears in literature, painting, poetry, philosophy, and psychology, etc., it would particularly arouse my interest. Looking back at past international studies on colors in the field of chromatology, they mostly focused on the optics, physics, chemistry, and even the technical verification and equipment accuracy of color, which has indeed made important contributions to the empirical research in its precision science.
However, in the greater contact aspect between people and the environment, such as the impact of the colors between natural and man-made facilities in the environmental landscape, as well as the greatly varied holistic effects created by the interaction of color and natural weather landscapes, background climate, and natural landform due to seasonal or timing differences, it comprises the aesthetic experience and another multi-dimensional effect between people and the environment that contains the sense of beauty and empathy along with association and comfort.
Color is not just an event, nor is it just a single field. It has become another symbolic brand or intangible asset of a certain region. Through the classical Chinese poetry and classical Japanese literature created by the ancients, the color changes in the environmental situations can be deeply explored and become a kind of intuitive color essence, and then further develop the touch of the four-dimensional spatial emotion base on the time sequence, just like the “Keelung Zhengbin Fishing Harbor”, “Taroko National Park Shanyue Suspension Bridge”, “Yangmingshan National Park Datun Bridge”, and “Taipei Civic Boulevard Overpass” color scheme program the author hosted and participated in. Although it is only a thin layer of color alteration, it imperceptibly transformed the life and cultural perceptions and emotions of the citizens into a more diversified and multi-layered element. In addition, natural changes such as the changes in the seasonal weather landscape, the life cycle of flowers and plants, etc., have also touched the different temperaments of mankind, and reached another level of spiritual cleansing and transferal.
As a designer and an interdisciplinary researcher, I look forward to sharing these experiences with everyone, and continuously refine color/aesthetics/literature/art/philosophy… and other multi-dimensional value positioning through alternative exchanges.

Colours of face masks used during Covid-19 pandemic and social messaging

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Shortly after the outbreak of Covid-19 pandemic in early 2020, it has been shown that it has been a droplet infection of virus. So it became mandatory all over the world to wear a sanitary face mask over long periods of a day, especially where social contacts could be. So social distancing (about 1,5 to 2 meters), wearing masks and hand hygiene became mandatory. Until that time there has been no appropriate masks for small droplets including viruses. There were only medical masks (especially for surgeons and medical stuff) on the market. They had three different layers to block bacteria, but they were open on all four sides. They were mostly used during surgeries and for the protection from bacterial infections. Their efficacy in virus infections are limited, because they are not designed for that. On the other hand, there were some professional and

relatively expensive masks (FFP2 / KN95 or FFP3 masks) used for construction workers or other similar professions where very small particles get into the air, which may damage the lungs of the workers. They were much more effective against droplets, but their production has been relatively low, so it has been very difficult to find them to buy. At the beginning of the Covid-19 pandemic there were little amount of relatively effective masks on the market. At that time people started to sew their own masks from available textile materials. A lot of mono- or multicoloured handcrafted masks were created at that time. It has been socially very important, because humans look first at the face of the social partner. The mimicry plays an important role in human social interaction (more than spoken words), but they couldn´t be seen when wearing masks. But the colours and figures on the mask could reflect some part of the intended social message. After some time the production of medical and FFP2 and similar masks increased and they become obligatory in most countries. At first they were all blue as for medical masks (colour of health) and white for FFP2 (colour of cleanliness). Later on medical masks were produced also in other colours (pink, violet, etc.), and FFP2 masks in all colours including black. They could be worn as accessory to clothing and send powerful messages. At the time of pandemic the colour of the masks became a tool of social messaging, which couldn´t be given through facial expressions.

London's largest painting

Stig Evans

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The presentation will describe how Artist Stig Evans and Architects KPF collaborated on a large-scale central London building development.
Central to the project was the consideration of the relationship between the building and its immediate environment. The building, One Crown Place, sits on the fringe of the city of London and the presentation will outline how the building was developed to meet the specific needs of its location. The presentation will outline the initial concepts to final structure and discuss the importance of embracing colour in its final scheme. It will consider the incorporation of distinctive colours to the building and how it was implemented to the facades, both the exterior facing terracotta and the interior facing glass facades. The presentation will go on to focus specifically on the coloured glass facades of the building, and how the commission offered an opportunity to investigate ways in which colour can be used to modify and change architectonic space. It will consider how visual and spatial shifts, produced by changes in environmental conditions, can create interesting and mutable architectural spatial variations on a building's façade.
The presentation will explore the visual impact, in structure and also in colour, enabling the artist to develop themes and interest from his studio-based work as a painter and his work as a fine art picture restorer into an architectural context. Processes from both disciplines will be described and the reasoning behind their application and relevance in this framework will be expanded.
The presentation will describe how each façade was treated as an individual, large-scale canvas and how colours and panels were selected. The article will also reflect on how historic 'cloud studies' by British painter John Constable were used during the research phase as a conceptual and aesthetic foundation to explore the effects of weather patterns and seasons and also to give it an historical context relating to the history of the site.
The presentation will go on to discuss how the final colour swatches were translated into the much larger glass panels and the technique used to apply the colour to the outside of the glass to create London's largest painting.

AIC STUDY GROUPS WORKSHOP

AIC 2021 Study Group on Language of Color

Chairs: Galina Paramei, Dimitris Mylonas

The purpose of the AIC Study Group on the Language of Colour (SGLC) is to share information and discuss studies on psycholinguistics, semantics and semiotics of colour names and their relation to cognitive (neuro)science of colour perception. Key topics are colour cognition, colour naming, categorisation, colour memory, colour semantics and semiotics, and cross-cultural differences. Currently the SGLC has 188 registered members from 45 countries. Social networking platforms of the SGLC in Twitter (@aic_lc) and Facebook (@languageofcolour) have currently 545 and 891 followers respectively. On our website (link) we share latest news on the development of research on the language of colour and the related resources.

The Language of Color in the Bible (Hebrew, Greek and Latin): a Methodology to Approach to the Meaning of the Color Terms

Emanuela Valeriani, Lourdes García Ureña [2]

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We live immersed in a world full of color. We are increasingly aware of its presence, its composition supported by the progress of new technologies. Furthermore, its symbolism is clearly expressed through a lexical repertoire enriched day to day. So, while in Spanish we have a hundred color terms to name the various tonalities and shades that the green color has, we can observe an opposite phenomenon in ancient languages as Hebrew, Greek and Latin: color terms encompass a wide chromatic spectrum, which is why they usually have a polysemic quality. For this reason, the modern reader or researcher cannot indiscriminately translate the texts, but must pay attention to the nuances that they offer. In this regard, it's necessary to develop and to apply a specific methodology.

This methodology has to take into account that the concept of color that we have at present, derived from Newton's studies, varies from the one we find in antiquity and specifically in the biblical text. The first step, then, is to study the concept of color in the biblical corpus. Analyzing the pericopes of the LXX and the Vulgate where χρῶμα/χρόα and color appear (the Hebrew version lacks a term denoting color) one can conclude that color is what 'covers' an object or a person, an aspect of the surface, and in particular the indicator of an internal state, as in one's complexion. Hence, in the biblical corpus, color is not something abstract, but concrete; in fact, analyzing the color terms in the three versions of the Bible, we can see that they are intrinsically linked to an entity.

Thus, we take a step further: the study of color terms requires the analysis of the entity in which they are embodied. In this sense, it is useful for the methodology of the language of color in the Bible, the contribution of Cuenca and Hilferthy who, in their Introduction to Cognitive Linguistics, state that color adjectives such as 'red' are polysemic terms, as they describe various entities that belong to different cognitive domains. This is precisely what is found in the biblical corpus. Moreover, cognitive linguistics provides a set of epistemological principles and tools that facilitate and explain the change of hue in the same color term and its different grammaticalization.

Based on these assumptions, we have developed a methodology that allows us to study all the uses of color terms, to define them while avoiding any kind of tautology and to propose various translations in order to

facilitate the work of the translator and researcher. Thus, we propose: a) a status quaestionis on the meaning of the color terms proposed by the main dictionaries; b) a comparative study of how the terms have been translated in the different versions of the Bible; c) a study of the characteristics of the book where the color term appears; d) an analysis of the context and of the entity that describes the color term; f) finally, we turn to other scientific disciplines that complete the study of the entity.

Florence blues are clothed in triple basic terms

Maria Michela Del Viva [1], Ilaria Mariani [1], Carmen De Caro [1], Galina Paramei [1]

[1] University of Florence

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Recent psycholinguistic studies provide evidence that Italian has more than one basic colour term (BCT) for 'blue'. Across all studies, there is consensus that blu denotes 'dark blue', whereas 'light-and-medium blue' is termed azzurro in Verona (Paggetti et al., 2016) but celeste in Alghero (Paramei et al., 2018). For Florence speakers, the BLUE area apparently is "clothed in triple blues", with azzurro denoting 'medium blue' and celeste 'light blue' (Bimler & Uusküla, 2014).

In the present study, we undertook further scrutiny of Italian (basic) 'blue' terms. Participants (N=31; aged 22.9 ± 2.1 years) were university students born in Tuscany, i.e. exposed to the dialect that was the foundation of Standard Italian (De Mauro, 1983). From The Munsell Book of Color (glossy edition), we employed eight charts embracing chips (N=237) in the BLUE area, with Hue 7.5BG, 10BG, 2.5B, 5B, 7.5B, 10B, 2.5PB, 5PB. (No further charts were included since a pilot study had shown that at one end, beyond 7.5 BG, 'green' responses and at the other end, beyond 5PB, 'purple' responses were elicited.). The Value of the Munsell chips varied between 2–9 and Chroma varied (even number notation) from 2–10, or 12 in 10B, 2.5PB, 5PB. Under the controlled lighting and presentation order conditions, participants named each chip of eight Munsell charts using an unconstrained colour-naming method which allowed, along with monolexemic terms, suffixed, compounded and modified colour descriptors (e.g. blu notte, indaco, azzurro scuro, turchese, acqua profonda, celestino). Following the naming procedure, each participant indicated the "best exemplar" (focal colour) of blu, azzurro and celeste.

Linguistic analysis revealed that relative frequencies of the three monolexemic 'blue' terms were comparable: blu: 33.1%; azzurro: 25.3%; celeste: 24.8% respectively, as were frequencies of the derived forms of each of these terms: 38.0%, 30.2%, and 31.8% respectively.

In psycholinguistic analysis, we estimated referential meanings of blu, azzurro and celeste. For purposes of further analysis, Munsell coordinates of the colour chips were re-notated in CIELAB space (http://www.cis.rit.edu/research/mcsl2/online/munsell.php). For each 'blue' category, we estimated L*a*b*-coordinates of the mean of focal colours and dispersion around the mean. In addition, we estimated L*a*b*-coordinates of the mean and dispersion around the mean of "modal" categories, i.e. of colour descriptors containing at least the word stem blu* (e.g. bluastro), azzur* (e.g. grigio azzurro) and celest* (e.g. celeste chiaro). The denotative estimates of each 'blue' term was visualised in the CILELAB space an ellipsoid reflecting the centre of gravity and the extent of the term denotative meaning, as well as the naming consensus.

We found that means of both focal colours and of "modal" categories of the three 'blue' terms are distinct and separated along all three axes, L*, a* and b*, predominantly along the lightness dimension L*. Our results provide additional evidence that Tuscan speakers require all three 'blue' terms for naming the BLUE area, which is refined categorically along the lightness dimension. Furthermore, celeste 'light blue' appears to be a third BCT for 'blue', along with azzurro and blu, considered BCTs in Standard Italian. We discuss possible historical linguistic origins of cognitive salience of celeste in the Tuscan dialect by scrutinising occurrences of

celeste in Medieval texts – works of Dante, records of Florence notaries, and reports of production in the Florence dyeing trade.

AIC STUDY GROUPS WORKSHOP

AIC 2021 Study Group on Arts and Design

Chair: Maria João Durão

We are in an age of the hybrid, the crossover, a time when the combined force of new media, postmodern thought, and history has made it possible for artists to assemble various art techniques. Boarders are not always clear-cut in the contemporary Arts and Design practices, such as in the domain of painting, where stretching definitions can be the actual substance of the work-the same applies to sculpture and other traditional art domains. This Study Group encourages all colour contemporary art and design expressions, as well as any other historic era.

Disciplines under the umbrella of ARTS AND DESIGN Study Group range painting; sculpture; drawing; illustration; illuminated manuscripts, printing; photography, cinema, audiovisuals, and virtual reality; jewelry design, fashion design, textile design; communication and graphic design; product and industrial design; furniture design, automotive and aeronautic design, among other related fields of colour expression.

Objectives of this study group include

1. creation of a network where artists and designers can communicate and disseminate their work;
2. incentive to research in theory and practice of related disciplines;
3. encouragement to participate in AIC conferences.

The AIC Study Group on Arts and Design Workshop - AIC2021 Congress aims to explore the theme of INTERDISCIPLINARITY OF COLOUR APPLIED TO ARTS AND DESIGN. The Workshop consists of two invited lectures by Jeannette Hanenburg and Larissa Noury, and an ARTS & DESIGN VIRTUAL EXHIBITION curated by the Chair of the SG on Arts and Design. These are followed by a discussion about the interdisciplinary nature of colour in the domains of Arts and Design.

Art Classes at Ações Sociais Amigos Solidários (ASAS)-Florianopolis, Brasil. Room with a view - A case study

Jeanette Hanenburg

Consultant in colourdesign and education; www.colourprofessionals.eu

DREAMS AND VIEW TO THE FUTURE

Art Classes at ASAS*

Through art, it is possible to express the unspeakable, to imagine, to create, to do, to reflect, to overflow, to transform. This transformative impulse is a valuable possibility for each one to rescue our humanity. This perspective is search for ASAS* daily. In the art workshops are proposed activities of drawing, painting, engraving, collage, sculpture, performance and others. Also making dolls, toys and assorted crafts. The technique is demonstrated as a facilitating tool of artistic making and never as a rule, not even as the main objective. The focus is on individual expression, reflection, the experience of doing, the possibility of turning something internal into symbolic. In the process, and the result. Good results empower! And fundamentally

in providing a pleasant moment to the participants. In this process, the transformation has been occurring subtle. Situations are emerging, being faced and transformed.
Fabiola Aguiar Machado, Art teacher at ASAS.

Art is a way of expressing oneself and one's emotions, and gives the opportunity to show once view of the world. The aim of these art classes is to have the underprivileged children of ASAS* experience the possibility to express their feelings and expose emotional distress through colour and art. In this talk, you will see and hear one of the proceedings of this work.
In 2016, I travelled to ASAS in Brazil, to give workshops in teaching the children the principles of mixing colours. They learned that they could use colours to express emotions and how to make this into a work of art. In 2019, I went back to Brazil and worked with the new art teacher Fabiola Aguiar Machado. The exercise we developed is based on the art period of renaissance paintings, 'Room with a view', and stands for an outlook on dreams, future, nature and freedom. The children of ASAS were asked to make a room with a view, imagining their own future and dreams. Also, writing down their dreams under their drawings. After completion, a magazine was made with their work. Not all paintings are published because of the depressed state of mind of some children. For them, an immediate psychological treatment was arranged.
We worked every day with several age groups. There were children which immediately started drawing, maybe not always on how they saw their future, but they liked the exercise. Many children however, had trouble starting, not knowing what their future or dreams are. Some of them fumbled up their paper in anger, and wanted to start over. Some got angry and walked away, returning after a reinsuring talk with the art teacher Fabiola.
Art is a way of expressing yourself and your emotions, and giving the opportunity to show once view of the world. In the art classes at ASAS*, with this exercise, once more, the worrying situation of these children became clear, just by reading the comments they wrote under their drawings. Expressing your feelings through art, to reveal the state of mind in a psychological manner, the importance of ART in education is showed once more.

* ASAS - Associacao Acoes Socials Amigos – Florianopolis, Brasil
In Brazil, many children and teenagers grow up in a world full of violence, danger and poverty. Moreover, they only have to go to school for half of the day. ASAS accommodates underprivileged children, between the ages of 7 and 15 years old, outside school hours. The goal: to ensure that they finish their school and to develop themselves in social, emotional, cultural and sportive terms. ASAS also improves family relationships. This enhances social cohesion, involvement and safety in the living environment.
https://asas.org.br/ *https://power2fly.nl/*

COLOUR HARMONY: ART, DESIGN & ARCHITECTURE.

Tactile painting & Haute Couture

Larissa Noury

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The connection between art, fashion and architectural style is obvious from the end of XIXth century.
Art has often been a major source of inspiration for dress designers of XXth century: we can mention some creations by Paul Poiret, Sonia Delaunay, Elsa Schiaparelli, Coco Chanel, Yves Saint Laurent, Jean-Charles de Castelbajac and Givenchy. In their profession, art is a part of fashion. The designers paraphrase the masters of painting. My inspiration comes from my own painting, from within. Jean Marie Pujol, couturier who

worked with Dior and Yves Saint Laurent at the time, designed several dresses to be painted using my technique to perpetuate the union of art and fashion. With this personal style, we created a series of hand painted dresses “Tableaux Vivants / Living Paintings” presented during my exhibitions and international events.

A constant transformation, beauty of nature, the interaction of forms and images... It is towards this universe of harmony that I invite you. Everything lies in the pondering of both visual and tactile beauties, which conceal thus a created space. Color is a hope for happiness.

I created a universe where the tactile colours build both a universal and personal imaginary space. They overlap and interact in order to evoke the feeling of wavering and well-being.

My style is tactile painting; I invite people to touch it, to discover the world that is greater than our visual world. This tactile colour is between Science and Art. Science of psychology of perception (as visual as tactile) and Art of New impressionism.

We could call a style a New Impressionism, because with overlapping layers I create an image that is constructed in our imaginary world by playing off the color materials and pigments. The difference is just that the Impressionists and the pointillists created the image with points, strikes or dots - I create it by overlapping layers as an architect.

The color compositions are stronger when they create the diptychs, the triptychs, 4 or even 16 panel elements because they can tell a story: there is always the beginning, the subject itself and it is never the end, it is rather the beginning of another story. So this story continues in the infinity of the Universe…

As Tristan Tzara wrote: "The difference of materials an eye is capable of transposing into tactile sensation gives a new depth to the painting, where weight with a mathematical precision joins the symbol of volume and density ". It could seem surrealist, but I find here a confirmation of my hypothesis according to which color is not only a visual image but also an image formed by the intertwining of five senses. The tactile sensation is the most important sensation behind visual, because we possess receivers sensitive to infrared rays and can thus perceive and distinguish the various qualities of the coloured material as we if touched it. Colours are the expression of the depth returned to the surface of things.

This innovative point of view on colour is emphasized on another way in the colourful melodies of Universe compositions. The tactile paintings filled with vivid colours, among which the rhythm and the textures could remind us of nature, sky, elements, just like those of Monet, Turner or Zao Wou-Ki, they make us discover by painting a whole new logic of beauty, building of tactile lights and immaterial colours. For me, it is not a question of painting but of inventing architecture of strata with original and unique colour associations, and especially of creating a perspective of a specific depth full of surprising symbols, changing during the day and depending of natural or artificial lighting.

Existing two-dimensional digital technologies of image reproduction (videos or photos) cannot allow us to feel the energy of tactile colours, we will need three or even forth dimensional digital image. We can only propose you a virtual version of a series of our paintings in order to try to understand this new dimension of colour.

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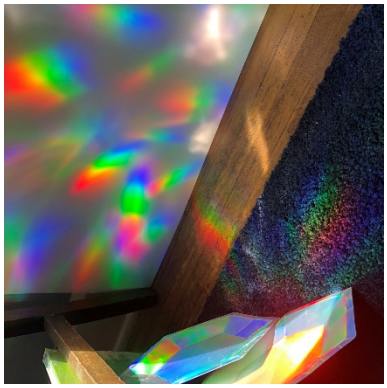
AIC STUDY GROUPS WORKSHOP

AIC 2021 Study Group on Color Education



Chairs: Robert Hirschler, Maggie Maggio

This study group is an international network of teachers within the field of color and other professionals with a specific interest in color education.
Aims: Exchange of knowledge and experiences among its members; stimulation of teaching and research; to inform about coming congresses, seminars, workshops and exhibitions which might be of interest; to share news from congresses, seminars, workshops, publications and exhibitions. The SGCE generally holds its meetings coinciding with the annual AIC conferences, and regularly sends out a Newsletter to its members with news and information.

Research Culture And Science Books

Gruppo del Colore - Associazione Italiana Colore is a scientific and cultural non-profit organization whose aims are to promote science and culture in the technical, scientific, and professional sectors with a multidisciplinary approach. Its aims are to promote science and culture of Color and Light, to spread scientific, technological, cultural and applicative knowledge about the cited disciplines, and to support matters of common interest between members in national and international contexts.

In 2020 the Association decided to add another instrument of cultural dissemination, in the form of a **diamond open access** peer-reviewed book series, freely available for everyone.

The focus and scope of the series is multidisciplinary as RCASB publishes scientific books on specific fields. The aim of the book series is to encourage scientists, scholars, researchers and professionals to publish their experimental results and theoretical work in a comprehensive way, thus providing a forum for the exchange and sharing of scientific knowledge.

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You are invited to propose a Volume!

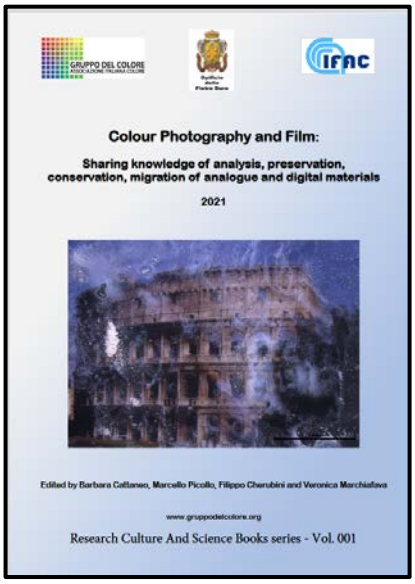
Research Culture And Science Books

VOLUME 1

COLOUR PHOTOGRAPHY AND FILM:

SHARING KNOWLEDGE OF ANALYSIS, PRESERVATION, CONSERVATION, MIGRATION OF ANAOGUE AND DIGITAL MATERIALS

(edited by Barbara Cattaneo, Marcello Picollo, Filippo Cherubini and Veronica Marchiafava)



This volume is the first of the Research Culture And Science Books series. Thus, it was considered appropriate to begin with a very current topic, which is of vital importance for the study and conservation of contemporary artistic artefacts, such as color photographic and cinematographic materials, in both format analogue and digital. This volume consists of a collection of essays derived from presentations given at the International Conference on "Color Photography and Cinema: Sharing Knowledge of Analysis, Conservation, Conservation, Migration of 'analogue and digital materials" organized in March 2021 by the Gruppo del Colore - Italian Color Association in collaboration with the "Nello Carrara" Institute of Applied Physics of the National Research Council (IFAC-CNR) and the Opificio delle Pietre Dure (OPD).

This conference was a unique event as the first international convening in which these topics were treated together. As such, it was an opportunity for discussion at an international level on various topics related to furthering the knowledge of color photographic and cinematographic objects from a historical, material and conservation point of view. It is our hope that this volume will contribute to disseminating to a wide audience the various issues relating to the material and conservation knowledge of these materials and that it contributes to deepening sensitivity towards treating these materials in museum and archive collections.

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UPCOMING BOOK RELEASE

HISTORY OF THE ITALIAN COLOR GROUP – ASSPCIAZIONE ITALIANA COLORE:

SCIENCE, CULTURE AND ART

(edited by Anna Marotta[1], Arch. PhD, Full professor in Representation)

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Abstract

This book aims at making simpler and more comparable some of the objective of the Italian Color Group – Associazione Italiana Colore: bear witness to its memory, make the present more effective and interactive and, accept and prepare for the challenges of the future. These actions have been possible starting from a rigorous work of collection and systematization of the Italian Color Group activities, began in 2012 and carried out over the years by some members of the Association.

In this context, a great importance is still fulfilled by Claudio Oleari, who supported since the beginning the Association's aims to: (1) promote the study of color in all of its aspects (including color vision), (2) offer to a wide public of researchers and professionals the opportunity to share and communicate their problems concerning different aspects (e.g., scientific, industrial, aesthetic, didactic) and (3) assist the dissemination of knowledge about color.

The aim of this book can be resumed as:

"From the past, the reasons to be in the present, toward the future: internationality, innovation, interdisciplinarity and transdisciplinarity ”
(A.M.)

GRUPPO DEL COLORE
ASSOCIAZIONE ITALIANA COLORE

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THE BEGINNING: THE ITALIAN COLOR GROUP CONSTITUTION

The first Chapters of the book report the first actions of the founders involved in the Italian Color Group constitutionHere, the origin and the mission of the Group will be recalled, together with the objectives, the foundation, the institutions, the Rules and Statements and the history of the presidency council. In these Sections will be recollected also the first meetings, the thematic focus, the dialog with other Groups and Associations, the events and the side actions.

CURRENT HISTORY

Today, the objectives, methods, strategies and contexts of the Italian Color Group – Associazione Italiana Colore are recalled and verified through confirmations and innovations.

Starting from the guidelines of the methodology in scientific research for the various disciplines and subjects, a preliminary critical reflection could identify a first level of approach, programmatically interdisciplinary and systematic to reach application and experimentation areas between theories and practices. In the Italian context, we could start from the CUN (Consiglio Universitario Nazionale) declaration, in the various scientific branches, to move subsequently to all the fields of application, their enunciations and characteristics, depending on different moments and contingent opportunities. Thanks to this vision the Color Group takes part to the international debate on the most recent scientific and cultural research.

In the current history of the Color Group, a fundamental role is given by the relationship with AIC, the International Color Association, which provides internationality, innovation, interdisciplinarity, interculture, towards trans-disciplinarity. According to the most advanced perspectives, the concept of multidisciplinarity (i.e., defined as the combination of different thematic approaches to the same object or field of study) and the subsequent concept of interdisciplinarity (i.e., according to which each specialistic approach gets tools and methods characteristic of other domains independently), are in part overcame. Following this idea, without denying the individual specialized skills, we can move from a conception of knowledge, which is monodisciplinary (or multidisciplinary, or multidisciplinary), to a transversal dimension of knowledge, which is integrated with trans-disciplinarity. The trans-disciplinarity knowledge has been redefined recently also by many theoretical and methodological considerations, which have been generated by different schools of thought (Alvargonzalez, 2011; Kötter-Balsiger, 1999), and have been investigated in other domains, e.g., areas linked to the study of built heritage, or totally unrelated to it (Stokols, 2011; Id., 2006).

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The research in a trans-disciplinarity context poses obvious problems of coordination and communication (Lattuca, 2001), which can be overcome through a careful cross-examination of the studies and a focused organization of the methods and phases of investigation.

In the analysis of the current history of the Italian Color Group, specific importance is given to the scientific initiatives of the group: the Cultura e Scienza del Colore - Color Culture and Science (CCSJ) journal, the Research Culture And Science (RCAS) book series, edited by the association and the Master in Color Design and Technology by Poli.DESIGN in collaboration with the University of Milan. Furthermore, the territorial networks of the Italian Color Group are presented, considering the supporting institutions, the collaborations and the group's dissemination.

Figure 1 Actual members of the presidency council: Cristian Bonanomi, Filippo Cherubini, Davide Gadia, Veronica Marchifava, Anna Marotta, Marcello Picollo, Alice Plutino, Alessandro Rizzi, Maurizio Rossi, Gabriele Simone, Andrea Siniscalco and Francesca Valan.

THE FUTURE: NEW CONTEXTS, OBJECTIVE AND CHALLENGES

The strategies of the Italian Color Group for the future aims at proposing new guidelines at the service of the young researchers and, at planning new disciplinary investigations, like reflections on the methodology of scientific research in various domains and in all the theoretical and applicative fields.

Among all the emerging questions, one is always confirmed:

How can we understand and contribute to the worthy mission of promoting and increasing, in a more systematic way, the cultural exchanges and the international and multicultural scientific projects on color?

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The presented book aims also at wonder on the future of the association through the following questions, which could be posed to any member of the group:

1. To which SDS (Scientific Disciplinary Sector), professional field or area of expertise do you belong to?

2. In this context, what do you think - according to the regulations, thus in the applications in theory and practice - about the characters, exchange relations and contiguity with the theme of color?

3. Can you define your scientific-professional profile with relevance to your studies and interests on color?

4. Apart from studies and experiences in your specializations, have you had the opportunity to interface with other scientific sectors, thus living a multidisciplinary or interdisciplinary experiences?

5. Define the theoretical aspects, with the related fields of application, that you derive from your experience, in the positive and negative aspects. Explain how they could be implemented and improved.

6. With respect to your experience, how could the diffusion of the color culture be implemented, for a more conscious and effective use?

7. Would you consider it useful (or indispensable) to have greater control in the professional training of figures not always capable to progress in a chromatic project? If so, what kind of inspection could be referred to?

8. Today, do you think the commitment of the media at all levels is sufficient for the diffusion (and for the correct education) of the chromatic culture? And conversely, do you think we can plan of using color towards more ethical functions and objectives?

9. Can we also speak of sustainable color, not only in the sense of environmental protection and eco-design, but also in a visual, perceptive, psychological, cultural (and other) sense, towards a Sustainable Vision?

10. In color, can visual perception and communication therefore be confirmed as a theoretical foundation that recognizes all the potentialities of seeing, as a physiological-perceptive process of an instinctual nature, but also as a cognitive, cultured, creative and critical action? And can the analysis of visual characters be considered as a "measurable" parameter in the project?

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UPCOMING BOOK RELEASE

COLOR DESIGN AND TECHNOLOGY:

A MULTIDISCIPLINARY APPROACH TO COLOR

(edited by Alice Plutino, Gabriele Simone and Alessandro Rizzi)

Since 2014, Associazione Italiana Colore - Gruppo del Colore, the Italian Color Association with Poli.DESIGN (Politecnico di Milano) and Università degli Studi di Milano, have cooperated to held (in English) the initial four editions of the Master in Color Design and Technology.

As far as we know, nowadays, this Master is the only international, multidisciplinary, theoretical and practical course aiming at training color specialists and technicians, providing them skills for acquisition, measurement, and management of color in many application areas. Main strength of the Master is its strong correlation between theoretical lectures and practical lessons, which allow a rapid learning and the development of professional skills.

So far, the Master has been attended by many students from all over the world like e.g., Australia, Austria, Brazil, Colombia, Finland, India, Italy, Japan, Lebanon, Spain, Portugal, Russia and many others. The multicultural environment in which the students are involved enriches them and allowed the development of a positive discussion about color culture, naming and uses across different nations.

The main purpose of this book is to present the major part of teachers and subjects of the Master, as well as to foster the discussion about the many different possible ways of teaching and educating on the complex topic of color. This book is divided in three Parts, each one of them focused on specific issues about color theories, management, applications and design. In this book, as in the Master, color will not be described as simple attribute of an object, but as technical means of expression, at the base of perception and interaction with reality.