

# Book of Abstracts

of the International Colour Association Conference



## AIC 2024 Midterm Meeting

Color Design,  
Communication  
Marketing

São Paulo, Brasil  
16-19<sup>th</sup> September

PUBLISHED BY



ORGANIZED BY



| DESIGN **ESPM**

SUPPORT BY





Mon 16/9		Tue 17/9		Wed 18/9		Thu 19/9		Fri 20/9 - Sun 22/9		
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AIC 2024 Program at a Glance

last update 13.09.2024 (08:00 São Paulo)

**AIC 2024 Midterm Meeting**  
**Color Design, Communication and Marketing**  
16-19 September, 2024. São Paulo, Brazil



## **Book of Abstracts**

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### **Conference Topics:**

Color in Branding and Marketing  
Color and Consumer Behavior  
Color in Design and Visual Communication (all forms of design)  
Color and Consumer Products  
Industrial Color Application (cosmetics, paints, textiles among others)  
Color in Interior Design and Architecture  
Color Semantics and Semiotics  
Color and Psychology  
Color and Physiology  
Color and Physics  
Colorimetry and Color Control and Color Order Systems  
Color Education  
Color in Art, Culture, and History  
Color in Games and Toys

## Welcome to the AIC 2024 Midterm Meeting on Color Design, Communication, and Marketing



Dear researchers, artists, professionals, and enthusiasts of color in its many meanings, welcome to the AIC 2024 Midterm Meeting dedicated to the theme of “Color Design, Communication, and Marketing”. This year, the meeting is held in São Paulo, Brazil, in this beautiful country of a thousand colors, multi-ethnic and multi-cultural.

The conference is organized in a three-day scientific program and a pre-program day dedicated to two workshops: the first on “Watercolor Painting of Brazilian Plants and Landscapes” and the second on “Digital Color” Mixing. There will also be a workshop on “Brazilian Rainforest Natural Pigments” and Keynote Speakers from all around the world, Anat Lechner, Leatrice Eiseman and Petronio Bendito US, Patricia Fecci, Ciça Costa and Polar Design BR, Urangoo Samba GB, Larissa Noury FR, Ingrid Calvo Ivanovic CL.

The program will have the AIC Student Paper Awards, issued every two years at any AIC Midterm Meeting. Its goal is to encourage students to present their work at the AIC Midterm Meeting and support their interaction with the world color community. I wish to thank the Colour Group (GB) because, thanks to their sponsorship, we will also have the Robert W. G. Hunt International Poster Awards this year.

After the sad years of COVID-19, having an AIC conference exclusively in person is also lovely. The purpose of conferences is to exchange one’s research and experiences, talk about them, meet, interact during the breaks, appreciate the posters, and speak without a camera in front of us.

The work of giving the AIC a permanent home is not yet finished. Managing today a global association that carries out the activity of publisher of four diamond open access publications, the Journal of the AIC, the book series Proceedings of the International Colour Association, the Annual Review, and the Newsletter, as well as the management of personal data in compliance with the General Data Protection Regulation, involves a series of legal and administrative obligations. On Thursday, September 19th, there will be an Extraordinary Assembly of AIC Members to propose a few changes to the AIC statute to make it more aligned with Austrian and EU laws and add a new AIC award.

The AIC 2024 Midterm Meeting is a true international conference. I want to thank the Associação ProCor do Brasil that organizes it, the chairs Paula Csillag, Carolina Bustos Raffainer, Vien Cheung, and Ricardo Zagallo Camargo, the Escola Superior de Propaganda e Marketing (ESPM) that hosts the conference, and the sponsors Sherwin-Williams, Abrafati, Lukscolor, RAL, Studio Imagine, Canson, Sinteglas and Sitivesp.

It is thanks to the sponsors and the enormous volunteer work of ProCor and ESMP that it was possible to organize an AIC Midterm Meeting accessible to everyone with an early registration fee very accessible to young people, pensioners, and people who come from disadvantaged countries. For this, I am very grateful to ProCor and Paula Csillag because the science and culture of color must be accessible to everyone. And so it is to all of you, participants, here today that my greeting also goes: thank you for sending your papers and coming here in person.

Enjoy the AIC 2024 Midterm Meeting in São Paulo, Brazil.

The AIC President  
Prof. Maurizio Rossi



## AIC Executive Committee 2024-2025

### EC voting members

President .....	Maurizio Rossi (Italy)
Vice President.....	Maria João Durão (Portugal)
Secretary/Treasurer.....	Pichayada Katemake (Thailand)
Ordinary Member.....	Eva-Lena Bäckström (Sweden)
Ordinary Member.....	Valérie Bonnardel (France)
Ordinary Member.....	Ingrid Calvo Ivanovic (Chile)
Ordinary Member (AIC 2025 Congress Representative).....	Pei-Li Sun (Taiwan)

### EC consultant members

Auditor .....	Tien-Rein Lee (Taiwan)
Auditor .....	Javier Romero (Spain)
Immediate Past President .....	Leslie Harrington (USA)
JAIC Editor .....	Vien Cheung (UK)

## AIC Members

### Regular Members

Grupo Argentino del Color.....	Argentina
Colour Society of Australia .....	Australia
Interdisciplinary Colour Association – Belgium .....	Belgium
Associação Pró-Cor do Brasil.....	Brazil
Colour Group – Bulgaria .....	Bulgaria
Colour Research Society of Canada .....	Canada
Asociación Chilena del Color.....	Chile
Color Association of China .....	China
Hrvatska udruga za boje, HUBO .....	Croatia
Suomen Väriyhdistys Svy Ry .....	Finland
Centre Français de la Couleur.....	France
Deutscher Verband Farbe.....	Germany
The Colour Group (Great Britain) .....	United Kingdom
Hungarian National Colour Committee .....	Hungary
Gruppo del Colore – Associazione Italiana Colore.....	Italy
Color Science Association of Japan .....	Japan
Korean Society of Color Studies .....	Korea
Asociación Mexicana de Investigadores del Color.....	Mexico
Forum Farge .....	Norway
Associação Portuguesa da Cor .....	Portugal

Slovensko združenje za barve .....	Slovenia
Comité Español del Color .....	Spain
Stiftelsen Svenskt Färgcentrum .....	Sweden
pro colore .....	Switzerland
Color Association of Taiwan .....	Taiwan
Color Society of Thailand.....	Thailand
Stichting Kleurenvisie: Het Nederlands Platform Voor Kleur.....	The Netherlands
Inter-Society Color Council .....	United States

## **Associate Members**

Color Marketing Group (USA)

International Association of Color Consultants/Designers (USA)

## **Individual Members**

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Martina Vikova (The Czech Republic)

Jaqueline Carron (France)

Yannis Skarpelos (Greece)

Yulia Griber (Russia)

Andrea Urland (Slovakia)

Kazim Hilmi Or (Turkey)



## Conference Chairs' Preface

Welcome everybody to AIC 2024 Midterm Meeting!

What a wonderful moment to gather so many people that have one point in common: the passion for color! May we say that color chose us, and thus, here we are meeting, as a family of color!

The date of this conference was chosen specifically when Spring is beginning in Brazil, when flowers are blooming and the sun shining! Not a coincidence, this is also the period when we celebrate the Brazilian Day of Color with our national color association, Associação ProCor do Brasil.

The plan for this conference began in 2019, in Buenos Aires AIC EC Meeting. At first, ProCor was invited, but the invitation was declined since ProCor is an association composed of volunteers and we would not have any possibility of hosting it. But, when the invitation was amplified for a partnership with ESPM University, it started to be feasible. And now, here we are!

The conference received 119 abstract submissions from 26 regions. A total of 228 reviews were conducted by members of the Scientific Committee which comprises of over 60 color experts from around the world, who generously offered their valuable time as volunteers to support this critical task. Under the conference theme "Color Design, Communication and Marketing" the oral and poster presentations in the Technical Program are organized into 14 topics: Color in Branding and Marketing, Color and Consumer Behavior, Color in Design and Visual Communication (all forms of Design), Color and Consumer Products, Industrial Color Application (Cosmetics, Paints, Textiles among others), Color in Interior Design and Architecture, Color Semantics and Semiotics, Color and Psychology, Color and Physiology, Color and Physics, Colorimetry and Color Control and Color Order Systems, Color Education, Color in Art, Culture, and History, and Color in Games and Toys. The Technical Program also features a total of eight plenary lectures over three days and the AIC Study Group meetings on Tuesday evening. We hope you also enjoy our selection of workshops: Watercolor Painting of Brazilian Plants and Landscapes, Digital Color Mixing and Amazon Pigments.

We would like to thank ESPM University for the most precious partnership and feasibility of the event and thank each and every person from ESPM, among many, that helped us. We would like to thank our sponsors: Sherwin Williams, ABRAFATI, Lukscolor, RAL, Studio Imagine, Canson, Sinteglas, and SITIVESP. Many thanks to our supporters: ABA, CNPq, Paint Innovation, Pintar, and Visite São Paulo. Many thanks to everyone that helped voluntarily in the committees. All this synergy was very precious!

*May we bring more color to the world!*

Conference Chairs

**Paula, Carolina, Vien and Ricardo**

## AIC 2024 Conference Chairs



**Paula Csillag**

ESPM University  
and ProCor



**Carolina Bustos  
Raffainer**

ESPM University



**Vien Cheung**

University of Leeds



**Ricardo Zagallo  
Camargo**

ESPM University

## AIC 2024 Conference Committees

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Robert Hirschler  
Paula Csillag  
Carol Bustos  
Ricardo Zagallo

### Social Events

Paula Csillag  
Marketing ESPM

### Fundraising

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Paula Csillag  
Patricia Fecci  
Mari Nishimura  
Ricardo Zagallo  
Fabio Humberg  
Flavia Figueiredo (Finance ESPM)

### Finance

Paula Csillag  
Flavia Figueiredo (Finance ESPM)  
Sandra Bena

### Publicity

Jane Mundel  
Paula Csillag  
Angela Negreiros  
Alexandre Lopes  
Vien Cheung  
Design Lab ESPM  
Marketing ESPM

### Publications

Vien Cheung  
Peter Rhodes  
Robert Hirschler  
Paula Csillag  
João Luis Figueiredo  
Ricardo Zagallo

### Honor

Dalton Pastore  
Tatsuo Iwata  
Denilde Holzhacker  
Cristiano do Amaral Britto de Castro  
Rodrigo Cintra  
Elisabeth Dau Corrêa



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Alessandro Rizzi – *University of Milano*

Alexandre Leão – *Universidade Federal de Minas Gerais*

André Beltrão – *ESPM University, Rio de Janeiro*

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Berit Bergstrom – *Swedish Colour Centre Foundation*

Brian Funt – *Simon Fraser University*

Camila Silva – *Universidade Federal do Rio de Janeiro*

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David Briggs – *National Art School, Sydney, Australia*

Donald Dedrick – *University of Guelph*

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Maria João Durão – *School of Architecture, Lisbon University*

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Mikiko Kawasumi – *Meijo University*

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Paloma Carvalho Santos – *Universidade do Estado do Rio de Janeiro*

Paul Green-Armytage – *Curtin University*

Peter Rhodes – *University of Leeds*

Pichayada Katemake – *Chulalongkorn University*

Rafael Huertas – *Universidad de Granada*

Raju Shrestha – *OsloMet, Norway*

Robert Hirschler – *Colour Consultant*

Robert Wei – *Chinese Culture University*

Robin Kingsburgh – *York University*

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Shino Okuda – *Doshisha Women's College of Liberal Arts*

Suchitra Sueeprasan – *Chulalongkorn University*

Supawadee Theerathamakorn – *STOU*

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Venkat Venkataramanan – *McRae Imaging*

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Veronica Conte – *CIAUD, Portugal*

Vien Cheung – *University of Leeds*

Vincent Sun – *Chinese Culture University*

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Yulia Griber – *Smolensk State University*

Zena O'Connor – *Design Research Associates, Australia*

**Technical Program** – last update 13.09.2024 (08:00 São Paulo)

**Tuesday 17 September 2024**

	TEATRO ESPM (ESPM THEATER)	AUDITÓRIO CASTELO BRANCO (CASTELO BRANCO AUDITORIUM)	SALA CIVITA (CIVITA ROOM)
08:00	Registration opens		
08:30	Opening Ceremony		
09:00	<b>Plenary Lecture:</b> Color Strategy in the Age of Artificial Intelligence <i>Anat Lechner (Stern School of Business, NYU)</i>		
10:00			
10:15		Colour in Branding and Marketing	Showing the brochure true colors: the interplay of color emotions and cultural values in the cosmetic market <i>Antônio Costa Alves; Flávio Santino Bizarrias; Edson Crescitelli; Fábio Pereira; Evandro Lopes</i>
10:30			Quantifying emotions evoked by artworks using psychophysical methods: Relationships between emotions and colorimetric structure of abstract paintings <i>Carlo Gaddi; Marcelo Fernandes da Costa</i>
10:45			Cues in color: may profile image imply users' personality traits? <i>Leyan Huang; Rongjin Tian; Yaqing Cai; Yuxuan Bai; Lina Xu; Pan Hui; Luwen Yu</i>
			Characteristics of Japanese skin color and its associated factors in comprehensive health checkup examinees <i>Tomoko Kutsuzawa; Wakana Toya; Yuki Akizuki; Satoshi Iwamoto; Fitoshi Ohyama; Shinji Takashimizu</i>



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11:00			
11:15	<i>Coffee break</i>		
11:45		Identification of quarries in the Cuzco Valley for the extraction of inorganic pigments to produce local artisanal paints <i>Carlos Guillermo Vargas Febres; Juan de Rivera Serra Lluch; Anna Torres Barchino; Edwin Roberto Gudiel Rodríguez</i>	Chromaticity contrast thresholds and sufficient illuminance of multi-channel LED for the simulated low vision eyes <i>Pichayada Katemake</i>
12:00		Uncertainty evaluation of color measurements for color control and color communication <i>Erkki Ikonen; Yasaman Rezazadeh; Anders Nilsson; John Seymour; Juha Peltoniemi</i>	Chromatic analysis in coming of age movies <i>Milena N Dias; Paula Csillag</i>
12:15		Color in personal image: for a decolonization of the seasonal color analysis based on the Brazilian skin color <i>Aliana Barbosa Aires; Josenilde Silva Souza; Josivan Pereira Silva</i>	Palette politics: balancing empathy and self-expression in color design <i>Ellen R Divers</i>
12:30		Translating Albers to CAM16: a case for next-generation color pickers <i>Nader Sadoughi</i>	Color and light in the birth environment <i>Monique Denoni; Natalia Naoumova</i>
12:45			Investigate the preference and the expectation of Chinese male skin colour for Generation Z <i>Jiapei Chen; Mengmeng Wang</i>

	TEATRO ESPM (ESPM THEATER)	AUDITÓRIO CASTELO BRANCO (CASTELO BRANCO AUDITORIUM)	SALA CIVITA (CIVITA ROOM)
13:00	Lunch		
14:00		The colors in the axós of the candomblé terreiro Axé Ilê Obá <i>Aymê Okasaki</i>	Colour Literacy Project beta-testing: report from St. Teresa partner school <i>Colette Harrison; Maggie Maggio; Robert Hirschler</i>
14:15		Color over volume in contemporary 3D Animation <i>Carlos Nogueira</i>	21 <sup>st</sup> century colour education – a student's point of view <i>Josué C Neves; Gisela CP Monteiro; Pedro Viana; Robert Hirschler; Camila A. P. Silva</i>
14:30		Contemporary poetics with natural paints <i>Taís Monteiro; Taís Monteiro; Bianca Stella</i>	21 <sup>st</sup> century color literacy pilot course at University of Texas <i>Luanne L Stovall; Honoria Starbuck; Maggie Maggio</i>
14:45		Gaudi's chromatology: a cross-comparative analysis of colour surface qualities <i>Maria João Durão</i>	Pursuing terminological consistency of colour attributes in the Portuguese language <i>Gisela CP Monteiro; Robert Hirschler; Camila A. P. Silva; Josué C Neves</i>
15:00	<b>Plenary Lecture:</b> S/S 26 Key Colours and Colour of the Year 2026 <i>Urangoo Samba (WGSN)</i>		
16:00	Coffee break		



	TEATRO ESPM (ESPM THEATER)	AUDITÓRIO CASTELO BRANCO (CASTELO BRANCO AUDITORIUM)	SALA CIVITA (CIVITA ROOM)
16:30		Color in Design and Visual Communication (I)	Revitalizing public spaces: a guide for chromatic interventions with augmented and virtual reality technologies <i>Anamaria Amaral Rezende</i>
16:45			Reinforcing colour literacy with colour games <i>Paul Green-Armytage; Maggie Maggio</i>
17:00			Limits and possibilities of using color as information on medicine packaging in the Brazilian market <i>Camila A. P. Silva; Patrícia Peralta</i>
17:15			Teaching color in a transdisciplinary approach between physics and the arts <i>Paloma Oliveira Carvalho Santos; Maria Lima; Kim Ramos; Paula de Chiara; Teo Senna; Leandro Silva; Jorge Chaves; Laura Jeunon; Larissa Cysne; Palloma Dreher; Carolina Pacini</i>
17:30		Color Education (II)	Influence of wall color on performance in university offices <i>Mahshid Baniani</i>
17:30			The seminars “Why did we forget Goethe when we teach optics?” <i>Kim Ramos; Paloma Oliveira Carvalho Santos; Maria da Conceição Barbosa-Lima</i>
17:30	<b>Plenary Lecture:</b> Chromatic Design Cases <i>POLAR Design Studio</i>		Research on the correlation and implementation path of children's sense of belonging in color education <i>Qian Huang</i>
18:15	<b>Study Group Meetings</b>  <b>Color in Education</b> - TEATRO ESPM (ESPM THEATER) <b>Color in Art and Design</b> - AUDITÓRIO CASTELO BRANCO (CASTELO BRANCO AUDITORIUM) <b>Environmental Color Design</b> - SALA CIVITA (CIVITA ROOM) <b>Color in Games and Toys</b> - Álvaro Alvim Bloco B Sala de aula-B217 (DE AULA BUILDING B ROOM B217)		

**Wednesday 18 September 2024**

	<b>TEATRO ESPM (ESPM THEATER)</b>	<b>AUDITÓRIO CASTELO BRANCO (CASTELO BRANCO AUDITORIUM)</b>	<b>SALA CIVITA (CIVITA ROOM)</b>
08:30	<i>Registration opens</i>		
09:00	<b>Plenary Lecture:</b> Color Trends for 2025 <i>Patricia Fecci (Sherwin Williams)</i>		
10:00			
10:15		<b>Color Semantics and Semiotics</b>  Inclusive beauty: a multidisciplinary approach to designing a nail polish collection - Colorama introduces 'nude da sua cor' <i>Ana Paula P Nascimento; Pâmela França; Selma C Miranda; Elir Guatiello Palermo; Robson Jandyroba; Erick Malfei; Isis Provençano Souza; Luana Tomaz; Sandra Damas Da Silveira; Ana B Mattos; Letícia F Pereira; Luiza Bessa Lins; Taísa N Veiga</i>	<b>Color in Interior Design and Architecture (I)</b>  Effectiveness of real appearance images and characteristics of building images that alter impressions <i>Kiwamu Maki; Sari Yamamoto</i>
10:30		<b>Color Semantics and Semiotics</b>  The effect of reading background colour on human cognitive performance based on multi-modal data analysis <i>Lina Xu; Dehan Jia; Zhongyue Zhang; Leyan Huang; Guobin Xia; Luwen Yu</i>	<b>Color in Interior Design and Architecture (I)</b>  The communication of colors in interior design: an analysis of the covers of the world of interiors magazine from the 1990s, 2000s and 2010s <i>Rebecka M.M. Pires</i>
10:45			<b>Color in Interior Design and Architecture (I)</b>  Chromatic metaphors: red as green among Bahrain's Sunni and Shi'a Landscapes <i>Gareth G Doherty; Maria Vallas</i>
11:00	<i>Coffee break</i>		

	TEATRO ESPM (ESPM THEATER)	AUDITÓRIO CASTELO BRANCO (CASTELO BRANCO AUDITORIUM)		SALA CIVITA (CIVITA ROOM)	
11:30		Color in Art, Culture, and History (II)	Anish Kapoor: the use of red and black between materiality and the void <i>Lucas P. O. Tolotti</i>	Color in Interior Design and Architecture (II)	Material and color mood boards for birth space designs <i>Juan Serra; Javier Cortina; Ana Torres</i>
11:45			The colors of the movie Poor Things: yellow is power <i>Pedro Felipe P Souza</i>		Chromatic survey methodology: case study of the Planalto by João Artacho Jurado <i>Bianca M T Fonseca; Maria Fernanda Brandi; Joao Carlos de O Cesar</i>
12:00			Cultural landscape and urban polychromy: analysis of the landscape's chromatic identity <i>Gustavo M Gonçalves; Ana Paula Neto de Faria; Natalia Naoumova</i>		Color in architecture in the 21 <sup>st</sup> century, and the manifestoes and programs of architects in the 20 <sup>th</sup> century <i>Joao Carlos de O Cesar</i>
12:15			“Los Ríos en Colores”: color chart from the south of Chile <i>Elisa Cordero-Jahr; Victor Gerding; Eréndira Martínez; Carlos Rojas; Ingrid Calvo Ivanovic; Catalina García</i>		Immersive space of coloured light <i>Nicole Hartmann</i>
12:30	Lunch				



	TEATRO ESPM (ESPM THEATER)	AUDITÓRIO CASTELO BRANCO (CASTELO BRANCO AUDITORIUM)	SALA CIVITA (CIVITA ROOM)
13:30		Color, design, and poison dart frogs <i>Jada K Schumacher</i>	Dorothy Draper: a Brazilian chromatic palette - case study of the Quitandinha hotel <i>Josivan Pereira Silva; Leonardo P. C. Toni</i>
13:45		(Post)humans and technology: exploring the colour palette in the visual narrative of Metaverse images by international media outlets <i>Lina Schmidt</i>	Color studies in trauma-informed design in spaces <i>Esther Hagenlocher; Rene Berndt; Morning Star Padilla</i>
14:00		Color in cultural landscape: cross- cultural differences in strategies for constructing harmonious color combinations <i>Yulia A. Griber</i>	Urbanisms of color: exploring communicative roles and evolutionary trends <i>Beichen Yu; Gareth G Doherty</i>
14:15		The role of aesthetics and color in sustainable textile practices <i>Marjan Kooroshnia</i>	
14:30	<b>Plenary Lecture:</b> Natural Pigments from the Brazilian Rainforest <i>Cica Costa</i> (Laboratorio Cores da Floresta)		
15:30	Coffee break		
16:00	<b>Plenary Lecture:</b> Ecology of Color in Urban Environment <i>Larissa Noury</i>		
16:45	Poster Session – PCA AREA		
17:30	Workshop 2: Brazilian Rainforest Natural Pigments – ATELIER		
19:00	Optional Gala Dinner at SELVAGEM Restaurant in Environmentally Preserved Rainforest Area		

Thursday 19 September 2024

	TEATRO ESPM (ESPM THEATER)	AUDITÓRIO CASTELO BRANCO (CASTELO BRANCO AUDITORIUM)		SALA CIVITA (CIVITA ROOM)	
08:30	Registration opens				
09:00				AIC General Assembly	
	Coffee available [10:30 – 11:00]				
11:00	<b>Plenary Lecture:</b> The Crossover Colors: Utilizing Nature’s Most Abundant and Versatile Hues in All Areas of Design <i>Leatrice Eiseman (Pantone Color Institute)</i>				
12:00	Lunch				
13:00		Color in Art, Culture, and History (III)	Colors and meaning making - a rhetorical perspective <i>Sharon Avital</i>	Color and Consumer Behaviour	The effect of colors on quiet luxury consumption: the role of uniqueness and xenocentrism <i>Flávio Santino Bizarrias; Evandro Lopes; Suzane Strehlau; Kelly Parnwell; Jussara Cucato</i>
13:15			The color chart of Jalpan de Serra, Querétaro, Mexico <i>Maria A Dorantes Lambarri; Ana Torres-Barchino; Irene de la Torre Fornés</i>		The influence of age on the color perception and judgment: a color meaning study with mouthwash packaging <i>Ana Laura Alves; Luis Carlos Paschoarelli</i>
13:30			Color in between art, technoscience and politics: the Vantablack controversy <i>Yuri Gabriel Campagnaro; Luciana Silveira</i>		Visual elements in organic products communication: The impact of yoghurt packaging material and color on consumer perception <i>Luisa M. Martinez; Ana Bento; Luis Martinez; Filipe Ramos</i>

	TEATRO ESPM (ESPM THEATER)	AUDITÓRIO CASTELO BRANCO (CASTELO BRANCO AUDITORIUM)	SALA CIVITA (CIVITA ROOM)
13:45		Contemporary Landscape Color Design and Its Origin in the Work of Roberto Burle Marx <i>Mira Engler</i>	The use of colors as an element of customization of the surface of myoelectric upper limb prostheses <i>Juliana Harrison Henno; Monica Tavare; Chi Nan Pai</i>
14:00	<b>Plenary Lecture:</b> Colour Design for a Sustainable Future <i>Ingrid Calvo Ivanovic (Design Department, Universidad de Chile)</i>		
15:00	Coffee break		
15:30		A critical analysis of in-car lighting design and its impact on driver alertness under nocturnal conditions <i>Qian Cheng; Guobin Xia; Philip Henry; Luwen Yu; Peter Rhodes</i>	A board game for the education of young hair colorists <i>Simone Liberini; Marco Tarini; Giannantonio Negretti; Roberta Suardi; Alessandro Rizzi</i>
15:45		Evolution of the 'under new direction: performatic catwalk' methodology: exploring the neutrality of gray color in design, art, and fashion <i>Antonio A Rabàdan; Ione Maria Ghislene Bentz</i>	Visual grouping: a study on preponderances of color or shape in match-three games <i>Joyce C Cavallini; Paula Csillag</i>
16:00		The subconscious of color in the case study, Senso Book: a methodological process for fashion event production <i>Antonio A Rabàdan</i>	Color vision deficiency in video games <i>Andrea Siniscalco; Alessandro Rizzi</i>

	TEATRO ESPM (ESPM THEATER)	AUDITÓRIO CASTELO BRANCO (CASTELO BRANCO AUDITORIUM)	SALA CIVITA (CIVITA ROOM)
16:15		The role of colors for digital three-dimensional materials: using colors as a parameterization tool to obtain advanced shaders <i>Henrique Sobral</i>	Board games for early screening of color blindness in Italian primary schools <i>Alessandro Rizzi; Liliana Silva</i>
16:30			Enjoy learning for wonder of colors and color vision diversity <i>Tsukasa Muraya; Momoka Nagatomi; Taiju Inoshita; Shoji Sunaga</i>
16:45	<b>Awards Presentation and Closing Ceremony</b>		



## Posters

P01	Color harmonies and playful interactions a quantitative analysis of the impact of colors on the design and behavior of the game Trine 4 The Nightmare Prince	<i>Fabio Augusto A Rodrigues Pereira</i>
P02	Fresh Appearance and Color in Green Vegetables	<i>Pablo R Ixtaina; Agustín Pucheta; carlos colonna</i>
P03	Colors, ideologies and meanings in the 2022 Brazilian elections	<i>Carla Pereira</i>
P04	Calibracor: a novel and free software for digital image color calibration	<i>Luiz Henrique Romanhol Ferreira; Alexandre Cruz Leão; Maria Cecília Almeida Marques; Rennan Neves de Oliveira; Carlos Antônio de Souza Perini; Renato Antônio Celso Ferreira</i>
P05	The role of colour in the visual narrative of video games	<i>Josefa Queupuan; Ingrid Calvo Ivanovic</i>
P06	Color in the city: an analysis of chromatic interventions in the pavement of urban space	<i>Lauren N G Duarte; Natalia Naoumova</i>
P07	Color, environment, and sustainability: Faculty of Law, Universidade de Lisboa	<i>Ana Paula Pinheiro</i>
P08	ColorApp: technology to educate, inspire and help women make the best color choices for their personal image	<i>Kisley S Gomes</i>
P09	Beyond awareness: stimulating pro-environmental actions through colour-driven web interfaces	<i>Lingxue Tong</i>
P10	Study of the correlation among mineral contents, instrumental and sensory color of brown sugar	<i>Vinicius P. M. Xavier; José Luis Godoy; Claudio Ueno; Lyssa Sakanaka; Marta Verruma-Bernardi</i>
P11	Understanding the use of colors and characters in snack packaging sold in Brazil	<i>Carla Pereira; Carolina Souza</i>
P12	Methodological proposal for signage design project: chromatic, ergonomic and spatial orientation analysis of the regional council of medicine of the State of São Paulo (Cremesp)	<i>Jade B Longo</i>
P13	Warm colors x cold colors – analysis of the preferences of teenagers in a playful business game	<i>Luiz C Barçante; Bernardo Fajardo</i>
P14	Cultural factors impacting car color choice: an analysis in the Brazilian market	<i>Fabio Ferrero</i>
P15	The subjective use of color: in creative practices with alternative materials	<i>Antonio A Rabàdan</i>
P16	Study on reproduction of spatial brightness on a high-luminance large LED display -effects of image color and texture on subjective evaluation	<i>Kazuto Takase; Mayu Nomoto; Hinako Kage; Kazuyoshi Harimoto; Nozomu Yoshizawa</i>
P17	Urban polychromy: an experimental methodology tested in Belo Horizonte, Minas Gerais, Brazil	<i>Bianca M T Fonseca</i>
P18	A study of utilizing mixed reality (MR) to establish environmental color schemes	<i>Yuh-Chang Wei; Monica Kuo; Ya-Ping Kuo</i>

# Color Strategy in the Age of Artificial Intelligence

## Anat Lechner

Professor of Business, Stern School of Business, NYU  
Co-Founder CEO of Huedata, Inc., The Color Intelligence Company



## Biography

Anat Lechner, Ph.D., is a Full Professor of Business Management at the Stern School of Business, New York University, focusing on disruptive leadership, innovation, and strategic change. She is also the co-founder and CEO of Huedata Inc., a Color Intelligence Company. A former Research Fellow at McKinsey & Co. Dr. Lechner has advised global Fortune 100 firms in the Financial Services, Pharmaceuticals, Chemicals, Energy, Food, Tech, Design, Defense, and Retail industries. She has had numerous appearances on the NYT, WSJ, BBC, ABC, FT, Forbes and other premier global media outlets. Anat holds an MBA and a Ph.D. in Business Management from Rutgers University, NJ.

## Abstract

Artificial Intelligence (AI) is rapidly becoming mainstream, showcasing its potential to generate greater production efficiencies and, in many instances, superior creative design outputs compared to human efforts. From chair design and DALL-E 2 text-to-image illustrations to Japanese garden architecture and new perfume development, AI is proving to be increasingly powerful and disruptive. This evolution is poised to transform the practice of design as we know it, pushing the boundaries of creativity and innovation across various domains.

This keynote will explore the emerging cross-industry disruption driven by AI, with a focus on creative cognitive technology applications in product, brand, environment, and experience design. By examining these applications, the talk will highlight how AI is revolutionizing traditional design processes, workflows, and outcomes. Within this context, special attention will be given to the necessary transition towards data-driven color decision-making, showcasing how color data analytics and machine learning capabilities can inspire, inform, and validate creative choices of color design, leading to more efficacious design solutions.

As designers increasingly adopt generative AI and leverage data in their practices and decision processes, they need to re-evaluate traditional design principles and up-skill to harness AI's full potential. The talk will provide insights into how designers can navigate these changes, emphasizing the importance of staying abreast of generative AI advancements, capabilities, and tools, and incorporating them to enhance design workflows and results.

The keynote will conclude with a forward-looking perspective on the future of color design in the age of AI, underscoring the transformative potential of creative cognitive technologies and the exciting opportunities they present for the design industry.

## The Crossover Colors: Utilizing Nature's Most Abundant and Versatile Hues in All Areas of Design

**Leatrice Eiseman**

Executive Director, Pantone Color Institute



### Biography

Leatrice Eiseman is a color specialist and consultant who has been called “the international color guru.” In fact, her color expertise is recognized worldwide, especially as a prime consultant to Pantone®. She has helped many companies make the best and most educated choice of color for personal or professional development, product development, logos and identification, brand imaging, web sites, packaging, interior/exterior design, or any other application where color choice is critical to the success of the product, promotion, company image or environment.

Lee heads the Eiseman Center for Color Information and Training and is also executive director of the Pantone® Color Institute. She is the author of ten books on color.

Both the New York Times and Fortune Magazine named Lee as a “Top Decision Maker” for her work in color. She conducts many color/design seminars at trade shows, museums, colleges, and universities, delivers in-house color training and is widely quoted in consumer publications and online, ranging from fashion and interiors/exteriors to various trade magazines.

Her academic background includes a degree in psychology from Antioch as well as advanced studies and counseling specialist certification from UCLA. She has studied both fashion and interior design and has taught in both areas. She is a member of the international forecasting group for the Pantone® View Color Planner and develops a home forecast yearly. She also heads the committee for naming Pantone’s color of the year and seasonally assists in identifying the top fashion colors for Women’s Wear Daily that is shared internationally.

Lee is an allied member of the American Society of Interior Designers, Industrial Design Society of America, as well as the Fashion Group, and has received several awards from the Color Marketing Group where she served as a chairholder. She is a founding member of the Film Institute Museum in Los Angeles and a member of the American Film Institute.

She shares her expertise on color and design for industry and personal image in certified programs presented online and in person.

# Color Trends for 2025

## Patrícia Fecci

Marketing Manager, Sherwin Williams



## Biography

Patrícia Fecci is Marketing Manager for Color & Design Services at Sherwin-Williams Paints, one of the largest paint manufacturers and distributors in the world. Her job includes responsibility for color management for use in various distribution channels, assisting in the development of color systems (tinting), differentiated color palettes, merchandising combinations and materials, color consulting services, and training for architecture and interior design professionals.

Patrícia also tracks and forecasts color trends and design influences for the coatings industry, creating and giving color presentations to architects and designers internationally.

During her 25-year career with the company, Patrícia has completed projects in many countries, now focusing on South America.

Board Member (2023-2025) of the Color Marketing Group (CMG), the premier international association for color design professionals and also Vice-President of Pro-Cor Brasil Association (Color Association in Brasil).

## Abstract

The American multinational Sherwin-Williams, which has been operating in the paint market for more than 150 years, being the largest company manufacturing, distributing and selling paints, celebrates its 80 years of activity in Brazil in 2024 and will present its study of color trends for 2025.

The study is conducted by a group of multidisciplinary professionals, experts from all over the world in color projects for the hospitality, educational, commercial, health segments, etc., analyzing different aspects of the consumer, including social, cultural and economic. And it has been debating the different visions of trends to translate the next colors that will best represent the scenario in the coming years. This color forecast allows you to anticipate tomorrow and shape a world full of more harmonious, intense and versatile colors.

Colors are part of our identity; they move us and have the power to change the essence of everything we touch. Through color, we navigate a new world, having the opportunity to get to know it deeply and insert our personal touch.

Colors can define our mood, awaken feelings, create connections and stimulate new actions and through them we are able to express ourselves.

For this new collection, Sherwin-Williams invites everyone to look within, delve deeply into our roots and revere our heritage to see a future beyond the superficial. This invitation will make us reflect on the connections between colors and what really matters, such as nature, the community, our ancestors and our family.

This collection will make us reflect on how origins can influence and impact the future, bringing references and insights for a new reading of the use of colors. In this presentation, we will bring a lot of inspirational content and possibilities for using colors in internal and external environments, with a focus on decoration, design and lifestyle.

## S/S 26 Key Colours and Colour of the Year

**Urangoo Samba**

Head of Colour WGSN



### Biography

Urangoo's extensive experience in colour strategy, macro trends, market needs and consumer expectations drive her role at WGSN. She leads the WGSN Global Colour team to create world-class insight and analysis over interiors, beauty, fashion and consumer tech industries to ensure success across all market levels. Urangoo has a diverse and unique career background spanning nearly two decades of global experience having worked with major design companies such as adidas. Her expertise covers apparel, trend forecasting, footwear and CMF. A keen traveller and foodie, Urangoo was born in Mongolia, raised in London and has lived in Hong Kong and Germany. She brings a global point of view having worked in different parts of the world throughout her career.

### Abstract

What is colour forecasting and what will be the colours to invest in 2026?

In this lecture, WGSN's Global Head of Colour, Urangoo Samba will dive into the three key points of colour forecasting:

- 1) *WGSN research methodology* – In a complex world, trends are born from the convergence of many disparate factors. WGSN observes, synthesises and forecasts these factors through our STEPIC lens to uncover, understand and predict the future impact of market shifts. This methodology is the foundation of all our trend forecasting including colour forecasting, and it empowers us to anticipate signals of change, answer pivotal questions and highlight possible futures for the short, medium and long term.
- 2) *WGSN data* – WGSN identifies, verifies and tracks colour trends by using a mixture of qualitative and quantitative data and expertise to forecast what is coming in the short-, medium- and long-term future.
- 3) *WGSN STEPIC* – WGSN's proprietary STEPIC methodology is the foundation for all our forecasts including colour forecasting, synthesising changes across Society, Technology, the Environment, Politics, Industry and Creativity. We unpack how it works and why it provides a more holistic and interconnected approach to predicting the future of colour.

*Colour of the Year 2026 and S/S 26 Key Colours* – We will finish by revealing the Colour of the Year for 2026: Transformative Teal, explaining why this hue will be relevant for all industries across the globe, and how companies can apply the S/S 26 Key Colours for product success.



# Natural Pigments from the Brazilian Rainforest

**Ciça Costa**

Founder Laboratório Cores da Floresta



## Biography

Designer, co-founder of Estúdio In Totum where the principles of design are at the service of social transformation and human development, aimed at creating a healthy, fair, prosperous and happy world. She develops, coordinates, and facilitates social projects in communities, working on social design, valuing local culture and practices and exchanging knowledge. Co-creation of the Movimento Revolucion Artesanal, Lab Cor and Cupu do Quintal (AM). Projects | IPP Amazônia (2011 – Tumbira – AM), Alinhavando o Futuro (2012) with women from RDS Rio Negro and Laboratório Cores da Floresta – Tumbira – Rio Negro/AM since 2019, currently in its 6th edition. Graduated in Social Communication from Faculdade Cásper Líbero and in Physical Education from FEFISA. She participated in the Profides (2015), Delicate Activism and Invisible Artists Program (2016-2018) courses at Instituto Fonte and Proteus Initiative.

## Abstract

In the forest, colors are not born because we want to produce them. Color arises from the exchange of knowledge and knowing within the community, from the interaction between human beings and nature, how we relate to it and our human capacity to imagine, create and do.

The yellow color of a mango tree comes from the moment we relate to and interact with the tree. From pruning its leaves and branches, boiling and straining, yellow emerges. From the prepared fabric, ties and immersion in the dye come the drawings in color and shape.

In this whole process, it is not enough just to extract the color and dye it; we need to comprehend the cycles of nature, its rhythms, local wisdom and the relationship between the knowledge exchanged with the people of that place, from which we learn and teach. The local people teach us about nature, we teach them about fabric in shape and color. Nature teaches us about its times, cycles, its life.

From this teaching and learning comes the Laboratório Cores da Floresta – Amazônia (Forest Colors Lab), an invitation to experience the forest by relating to nature and the living beings of that place, both human and more-than-human. Lab Cor invites us to experience discovery and to discover ourselves in this place. To remember that we are part of nature and that we relate to it. Out of this immensity that is the Amazon, which shows us that colors are born where there is life.

And so, colors are born. From respect for nature and the knowing of those who live there. From the connection between artisanal work and the hands that turn leaves into color. From learning by doing, which allows us to make, think and create, setting us in motion to go beyond where we are. The exchange of flavors, wisdom and practices between different cultures. The knowledge that turns into wisdom, into care, into respect for life that transforms the society based on the human, the living intelligence of nature, of the forest, of the waters... of life.

# Ecology of Color in Urban Environment

## Larissa Noury

Professor of Color in Art and Architecture

ITECOM Art&Design Paris, President-founder Couleur-Espace-Culture » France,

Centre Français de la Couleur



## Biography

Painter, designer-colorist, colorist-council architect. Lives and works in Paris, Montmartre for 25 years, Doctor of Art History – Michel de Montaigne University, Bordeaux; Doctor of Architecture – École Polytechnique de Minsk and the Academy of Fine Arts in St. Petersburg.

## Abstract

The harmony of colour is a universal, transcultural phenomenon. Whether it is the creation of images, the invention of drawings for the design industry or the construction of urban spaces, it represents a system of coded messages of the visual world that helps us to apprehend, evaluate and act in different contexts. Through the prism of historical and intercultural approach, our study shows the evolution of colour harmony and invites you to an imaginary journey into the infinite universe of colour harmony in different cities of the world. Throughout space and time, it shows us how the phenomenon of colour and its symbolic language have evolved alongside the civilizations.

Today's urban territories need an aesthetic organization just as they need an organization in terms of transport, energy or telecommunications. This is why now more than ever; the question of respect for the environment must include the question of the harmonization of the visual components of the city because this determines the quality of the living environment and the visual ecology of the urban spaces.

Our study is at the crossroads of artistic, architectural, and urban environmental design studies, based on historical and scientific reasoning. We propose the system of 24 colour harmonies classification which help us to explore the infinite universe of colour relationships in Art, Urban design and Architecture.

The results of these investigations are the part of our educational programs for students that we have developed for different grades of academic studies according to our own practice of many years of teaching in Art & Design School and Universities. In this course, the student discover the qualities of color and its functions in art, design and architecture. The challenge is to develop in each student a personalized and sensitive perception of the visual world by offering him a certain theoretical and practical effectiveness. Our methods of analysis and exploration will bring a new and different look at the question of colour culture including material and digital colour, as well as on the question of the integration of color in architectural space (interior & exterior) at the crossroads of visual arts and applied arts.

## Creating a Sense of Identity through Design

### Polar, Ltda. Design Studio

LAD awarded as best design studio in Brazil



### Biography

Polar, Ltda. is a place to design what is identified around people, brands, and spaces. The studio brings together professionals from different cultural backgrounds and specialties, aiming to *design today new perspectives for tomorrow*. Based in São Paulo, Brazil, the studio *collaborates with global clients who are willing to build projects with a purpose above all else*. Working on projects that operate across virtual, print, spatial, and audiovisual platforms, Polar's production ranges from visual identity, packaging, digital media, typography, animations, to editorial projects and more. In its four years of operation, Polar, Ltda. has collaborated with clients such as Nubank, Netflix, Itaú, Rede Globo, WhatsApp, and YouTube.

# Colour Design for a Sustainable Future

**Ingrid Calvo Ivanovic**

Assistant Professor at Design Department, Universidad de Chile



## Biography

Colour Designer, Researcher and Consultant. PhD in Design Research, Politecnico di Milano. MA in Image Studies, UAH. Member of the Executive Committee of the International Colour Association (AIC). Member of the Editorial Board of the Color Research & Application, WoS Journal. Member of the Steering Committee of the AIC+ISCC Colour Literacy Project. Member of the Study Group on Colour Education (SGCE) and the Study Group on Environmental Colour Design (ECD) of AIC. Member of the Design Committee of the National Agency for Research and Development (ANID), Chile. Chair of the Cumulus Working Group on 21st Century Colour Education. Assistant Professor of the Design Department of Universidad de Chile, and Lecturer at Politecnico di Milano, Italy. For 15 years, Ingrid has been a full-time researcher and epistemologist in the field of colour, developing methodologies for its study, teaching, and application in design, architecture, and art concerning other research areas such as visual and curatorial studies. Ingrid has presented specialized conferences and workshops in different countries in America, Asia, Europe, and Oceania.

## Abstract

During recent years, it has become imperative for design to reflect on the social perspective, as fostering more sustainable user behaviour is a growing field of interest, together with a need for a careful evaluation of ethical concerns. These reflections are also very relevant for colour design, as colour application and production can have a huge impact on water contamination, waste creation and consumers' behaviour, to name a few. Therefore, design discipline and education should motivate a careful evaluation of a sustainable colour applications, stimulating critical thinking and fostering concrete actions related to reuse, recycling, and recovering colours, among others.

This presentation proposes a call for action through eight strategies on colour sustainability to be addressed within design decisions. The strategies are (A) first and above all, "promoting a sustainable colour mindset" through the entire chain of decisions that are taken in a colour design process. Educating designers and consumers on colour sustainability, and collaborating with key ethical stakeholders, are some actions of this strategy. Secondly, (B) "reflecting on colour trends" as the impact of consumer culture and ever-changing colour trends generate more waste and yearly exploitation of the planet's resources. Third, (C) "fostering identity through local colours" can positively shape perceptions of territory and create reconnections with the land and landscapes. Fourth, (D) "exploring sustainable ways of working with colour" as colours and dyes that go beyond traditional pigments are emerging, such as bio colours and nanoscale colours, among others. Fifth, (E) "embracing colour relativity and lifecycles", as colours' fading, and evolution must be accepted and integrated as a normal aspect of a product's lifespan. The sixth strategy is (F) "adopting imperfection: using visible recycled colour", as it can be a clever way to spark discussion and generate excitement about the prismatic potential of the things we throw away, while highlighting the eco credentials of a product. Seventh (G), "upcycling discarded colours", as industrial waste can contain valuable pigments which can be recovered, through experimentation that combines science and art. Finally, the eighth strategy (H) is "performing (more) colour management" to optimize the technological processes of colour production and reproduction.

This study aims to provide guidelines to address these issues in the design process, and therefore, the strategies are presented through suggestions, case studies and examples for their implementation.

# Showing the Brochure True Colors: The Interplay of Color Emotions and Cultural Values in the Cosmetic Market

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## Abstract

Brochures are a pivotal element in communication and marketing strategies, promoting products, launching new brands, engaging consumers, and helping to increase sales. Despite the digital revolution, they have maintained their relevance, transitioning into the virtual environment as an essential digital marketing strategy (as electronic brochures or e-brochures), particularly within the cosmetics industry. The cosmetics market is closely intertwined with consumers' self-perception, leveraging products and brands specifically designed to enhance beauty and aesthetics, using advertising and brochures to reach this goal.

Brochures capitalize on sensorial marketing by providing visual stimuli such as colors, textures, photos, images, and symbols. They primarily engage the visual sense and are instrumental in processing cognitive information. Colors are used in brochures to influence consumer behavior and are related to emotions, varying their meanings according to each diverse cultural group and their values. However, the interplay between diverse cultural values and color usage in communication and advertising remains underexplored.

Drawing from the World Values Survey (WVS), this research examined the impact of cultural values on color choice in cosmetics e-brochures. The authors analyzed data from three years (2021-2023), extracting 24,828 colors from 636 e-brochure front pages of 14 culturally diverse countries. By using multivariate statistical methods, this study found that (H1) there is an association between color choices and cultural values; (H2) for countries with higher survival and traditional values, warmer and more saturated colors were used compared to those with higher self-expression and secular values; (H3) warmer colors are more associated with traditional values, as opposed to colder colors, which are correlated with secular-rational ones.

Our research expands knowledge on color emotions by exploring the relationship between color choices in communication and cultural values, linking marketing strategy with consumer identity. The findings suggest that brochure color selection is based on matching cultural values and consumer preferences.

**Keywords:** color emotion, communication, cultural values, advertising, cross-cultural study.



# Color Interplay with Online Shopping Attribute's Structure and Channel Strategy: An Investigation on Consumer Experience

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## Abstract

The increase of online shopping has surged significantly in recent decades. Although physical storefronts continue to play a crucial role in distribution and customer relationship management, there has been a concerted effort among managers to amalgamate these channels into a cohesive strategy aimed at augmenting the consumer experience. This integrated business model has become a cornerstone in the strategic decision-making processes of marketers, focusing on distribution and consumer engagement in alignment with consumer preferences. Crafting an optimal blend of physical and digital consumer experiences presents a multifaceted challenge that impacts consumer attitudes, behaviors, and decision-making processes. Factors such as website design—including color schemes, brightness, information density, anthropomorphization, and the incorporation of omnichannel strategies into retail operations—have been examined in isolation within scholarly research. This study seeks to address this scholarly gap by examining the interaction between online shopping, website design elements, and channel strategy.

Our methodological approach is twofold. Initially, we investigated the congruence between online shopping websites and the consumer's self-concept, along with its impact on the consumer's extended self, mediated by the need for touch interaction. This overarching inquiry led to a more focused examination, employing a subordinate approach, which scrutinized the effects of specific design elements—such as color (blue, yellow, and red), brightness (higher or lower levels), information density (higher or lower levels), anthropomorphization (presence or absence), and omnichannel strategy (presence or absence)—on consumers' perceived value of online shopping. Utilizing theories from color psychology, design, and marketing strategy as a foundation, we analyzed the responses and evaluations of 148 participants regarding ten distinct online shopping configurations through regression and conjoint analysis methods.

Our findings indicate that the need for tactile interaction significantly mediates the relationship between website design congruence and the extension of the consumer's self-concept through the medium of website design (Hypothesis 1). Furthermore, we discovered that color, accounting for 51.48% of the influence (followed by information density at 18.58%, anthropomorphization at 16.07%, and omnichannel strategy at 13.87%), exerted the most substantial impact on the configuration of online shopping experiences (Hypothesis 2). This study also delves into the valuation of design attributes preferred by consumers in online shopping contexts and evaluates the ten proposed configurations.

The research enhances the theoretical framework of consumer behavior in relation to color by delivering empirical insights into the dynamic relationship between color psychology and the design of online shopping platforms. From a practical standpoint, this study informs managerial strategies by identifying color as a primary catalyst for consumer engagement within online retail environments, and further explores the significance of information, human presence suggestion on online shopping and omnichannel strategies in this context. Subsequently, we delineate potential new avenues for future research and acknowledge the limitations of the current study.

**Keywords:** Colors, online shopping, consumer behavior, website attributes design, retail strategy.

# Shades of Change: The Intersection of Color, Branding, and Social Discourse in Urban Landscapes

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## Abstract

Urban landscapes serve as poignant windows into the evolving fabric of modern cities, reflecting societal shifts and resistance, cultural nuances, and economic trends. As an essential aspect of landscape design, the role of color extends far beyond mere aesthetics; it also serves as a potent tool for communication.

In traditional landscapes, colors were mostly derived from plants or color intrinsic to local materials, including stones, bricks, soil, or locally produced earth pigments. Colors have been sophisticatedly woven into landscape design to depict a calming atmosphere and convey messages on cultural understandings and place identity. However, dramatic changes in color design of urban landscapes have been taking place since the new millennium, marked by the innovative use of highly saturated artificial colors.

To comprehend the shifts in color design within the landscape domain, this research centres on the communicative aspect of colors. By analysing key design features gathered from nearly 700 landscape projects over the past two decades, this paper asserts that the language of color design has been significantly influenced by context, circumstances, and the intentions behind color usage. One notable feature is the integration of color design in landscapes with that of advertising and branding.

Specifically, we propose that the new branding language has surprisingly assimilated the rhetoric of commercial branding with the rhetoric of localised social movements, along with the rhetoric of new media. As suggested by Naomi Klein, traditional marketing based on needs has been replaced in the 20th century by branding which evokes a complex yet immediate set of emotions to create a recognizable and affective “brand identity.” In response, street artists created colorful street art which deepened the sense of place and community. Importantly, it signified an attempt to reclaim the public space from the dominance of said universal brands. We propose that in recent years, the commercial and revolutionary languages have been blended and once again reclaimed by market forces and municipalities, hereby creating a new rhetoric of branding. The effacement of the separation between the moving image and the street as noted by Lev Manovich and others have further contributed to the creation of a highly saturated language and focus on branding.

By conducting a thorough analysis of landscapes and integrating these theories, this paper aims to enhance our understanding of the significant shifts in color design within landscapes. It seeks to explore how this new language of color enhances communication in branding and social movements, particularly within the global online sphere. Additionally, it aims to delve deeper into the explanation regarding the communicative role of colors; how they evoke emotions and potentially bridge previous divides between worldviews.

**Keywords:** *color, urban landscapes, branding, color communication*

# Identification of Quarries in the Cuzco Valley for the Extraction of Inorganic Pigments to Produce Local Artisanal Paints

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## Abstract

This communication is focused on identifying quarries in the Cuzco Valley used to extract inorganic pigments to produce local artisanal paints. The importance of this study is highlighted, which aims to preserve and revive the tradition of Cusco rock art, using local lands and incorporating unskilled labor to promote local development. The approach involves extensive analysis that combines geological methods with traditional knowledge and the experience of local experts. The geology of the Cuzco Valley was mapped and an ethnographic investigation was carried out, which included interviews with local artists, elderly people, and experts in oral tradition, to collect information about the location of the quarries used in pre-Hispanic and colonial times. With these pigments, paintings were produced through a local workshop with students from the professional school of architecture, using motifs from the religious architecture of Cusco as a revaluation of the artisanal production of painting.

This feedback places scientific research in the historical-cultural framework of the region, ensuring the authenticity and relevance of the results obtained. The importance of identifying the original quarries used during a particular historical period is emphasized, as this provides a solid basis for producing artisanal paintings that are close to the techniques and colors used by the ancestral cultures of the area.

**Keywords:** Quarry, inorganic pigment, artisanal painting, Cuzco

# Uncertainty Evaluation of Color Measurements for Color Control and Color Communication

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## Abstract

It is stated in the ASTM standard E2214-20 on the performance of color-measuring instruments that “the exact methods for propagating the uncertainty in a reflectance factor measurement into the color coordinates is still a matter of some dispute.” Our aim here is to describe such an exact method. The novel method is based on the recent experimental observation that the spectral deviations of participants from the true value in all radiometric key comparisons have a specific spectral structure: On the average, the amplitude of each harmonic component of spectral deviations is inversely proportional to the harmonic order, corresponding to a power-law exponent of -1. With such additional information, the uncertainty of spectral measurements can be propagated by Monte Carlo simulation into quantities described as ratios of spectral integrals, like color coordinates  $x$  and  $y$ .

We have measured reflectance spectra of a large number of color reference samples in d:8° geometry with two independent color-measuring instruments. It should be noted that the uncertainty propagation method of previous paragraph needs to be amended here, because the true reflectance values are not known in these measurements. An uncertainty band can be associated with each of the measured spectra, but the problem is the unknown correlation of the reflectance values at the neighboring wavelengths and at more distant wavelengths, which hampers the propagation of uncertainty to the uncertainty of color quantities. To address this problem, we have carried out spectral analysis of the deviations of reflectance values measured with the two independent instruments. The power-law exponent for the harmonic amplitudes that we found from this analysis is -0.6 instead of -1 found in the analysis of radiometric key comparisons. We thus made an additional assumption that the power-law exponent describing the spectral reflectance deviations from the unknown true value is the same for both instruments. Then an iterative process of Monte Carlo simulations was carried out to determine the latter power-law exponent of -0.7, which allowed to complete the uncertainty propagation into color quantities, such as  $x$ ,  $y$ ,  $Y$ ,  $L^*$ ,  $a^*$ ,  $b^*$  and  $\Delta E^*$ .

The described method can be used for assigning a scientifically justified uncertainty to color quantities. It requires the knowledge of the power-law exponent related to spectral deviations from the true value. In this work, the desired power-law exponent was found by determining the spectral characteristics that are needed to explain the differences of reflectance spectra measured with two well-characterized, independent instruments, assumed to be equally reliable.

It can be expected that the new method of uncertainty evaluation of color quantities improves the reliability of color control and color communication. The method also meets the challenge of uncertainty propagation quoted in the first paragraph from the ASTM standard E2214-20. The standard describes a method for estimating the confidence interval for color differences due to repeatability. The method presented here takes into account also the effect of unknown systematic biases hidden in repeatability measurements.

**Keywords:** Color standards, spectral reflectance, spectrally integrated quantities, uncertainty propagation

# Color in Personal Image: For a Decolonization of the Seasonal Color Analysis Based on the Brazilian Skin Color

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## Abstract

The concept of personal color analysis as we know it today finds its roots in the work of the north American Suzanne Caygill in 1980, when she launched the book "Color: The Essence of You" (Kyle, 1989). Caygill popularized the idea of associating individual color palettes with the four seasons, linking each season to a specific color family that would ideally enhance an individual's natural features. Souza (2023) identifies the launch of the book "Color me Beautiful" in 1987 by Carole Jackson in the United States as a milestone in the studies on image consultancy and personal color analysis. Over time, the global north, especially European countries, and the USA, have strengthened research and studies in the field, expanding the season systems for personal color analysis. In Brazil, this process was introduced in the late 1980s, with the emergence of the first professionals in the area, known as personal stylists (Souza, 2023). In 1990, especially in the city of São Paulo, the image consultancy market had grown, and the seasonal color analysis was gradually disseminated in the national territory. However, it should be noted that Brazil is a country that has in its genesis a miscegenation of people, coming from different continents, such as Europe, Africa, and Asia. The mixture of different contexts has given rise not only to peculiar cultural and artistic manifestations as to a diversity of racial biotypes. According to the official classification of race/skin color in Brazil, used by the Demographic Census of the Brazilian Institute of Geography and Statistics (IBGE), it's composed by five categories – White [Branco], Brown [Pardo], Black [Preto], Yellow and Indigenous (Travassos, Laguardia, Marques, P.M. et al, 2011). In this way, applying in Brazil the seasonal systems for personal color analysis, especially developed for the North American and the European skin, can be understood as an unfolding of the European colonization process that has been established in our country for a long time, ranging from clothing, furniture, decoration, etc., which led to an importation of the lifestyle from the global north to the global south. This research aims to reflect on the use of the seasonal color analysis for the Brazilian skin color, considering that a broad study is needed to identify the diversity of Brazilian skin types, as well as their peculiarities, for the construction of accurate methodologies. This study will use bibliographic research on decolonization, personal color analysis methods and image consultancy theories in addition to documentary research in data released by national and international institutions of relevant scope.

**Keywords:** *personal image, seasonal color analysis, Brazilian skin color, image consultancy, personal stylist.*



## Translating Albers to CAM16: A Case for Next-Generation Color Pickers

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From his personal experience with the poor state of modern color-education, the author identified a significant contributor to color illiteracy in modern color pickers. The universally taught art-educational material, *Interaction of Color* (Josef Albers, 1964), is used to form a case-study proposing CAM16 (with static parameters) as an alternative to the commonly used HSB & HSL pickers in most modern graphics software. Albers's *Vanishing and Vibrating Boundaries* are the test cases. For these exercises, Albers asserts that colors must be equally light but from differing hues, a task impossible for HSB & HSL. This confusion in relying solely on either HSB or HSL is discussed, along with their shortcomings in the artistic process. Albers's flexible use of color-appearance terminology is walked through, with his comments on the Munsell Color Ordering system suggesting that the "lightness" or "light-intensity" he is referring to is equivalent to Munsell's "Value". This paper expands on this "translation," forming a syllogism suggesting that Albers's "light-intensity" is equivalent to CAM16's "lightness". Spectrophotometric measurements of Albers's examples of *Vibrating and Vanishing Boundaries* validate the syllogism. The measurements indicate that Albers's references to "lightness" / "light-intensity" are functionally synonymous to CAM16's "lightness". The author demonstrates CAM16's ability to create *Vibrating & Vanishing Boundaries* without manual color picking/human-supervision. Examples of multi-hue "*Vibrating Gradients*" are introduced, a cumbersome task now possible with the aid of a Color Appearance Model. Full CAM16 is identified as better suited for creative use and color communication than HSB, HSL, LAB, LAB derived systems, and partial CAM16 implementation. The state of currently available alternative color pickers is assessed. Until full CAM16 replacements for HSB & HSL are introduced to the public, the author strongly urges educators to assess the unintended confusion HSB & HSL pose in their curriculums.

**Keywords:** CAM16, HSB, color picker, Josef Albers, color literacy

## The Colors in the Axós of the *Candomblé Terreiro Axé Ilê Obá*

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### Abstract

This work constitutes a concise excerpt from the ongoing doctoral research in Social History under the guidance of Professor Marina de Mello e Souza. The research focuses on the *axós*, the attires of the *candomblé* house, Axé Ilê Obá, with an analysis spanning from its foundation in 1950 to the present day. Axé Ilê Obá holds the distinction of being the first *candomblé* house designated as a historical and cultural heritage of São Paulo by CONDEPHAAT. Currently, it practices the *queto* nation, venerating the *orixás*, deities of the Yoruba people. The objective of this communication is to present a correlation between the colors used in the attires of *candomblé's* deities and their *itans* (myths), which underpin the choices and combinations of hues. In a historical analysis, the presentation aims to demonstrate that one of the elements considered most traditional in the aesthetics of *candomblé* garments, the colors, also undergoes alterations over the years. Colors are intricately connected to the types of fabrics, and despite their numerous sacred foundations within this religious attire, chromatic changes are evident, reflecting the context of each *candomblé* house and events in contemporaneous African continent. For instance, saturated tones for the popular industrially printed wax fabrics, pastel tones for Nigerian-Austrian embroidered fabrics, always accompanied by white in laces, *laíses*, and cotton, symbolizing origin, and creation for the Yoruba people. The analysis also compares the Yoruba chromatic system to the Brazilian one, as Yoruba color analysis categorizes shades into three tones (*dúdu* – black and dark colors, *pupa* – red, and *funfun* – white and light colors) with distinct meanings and applications in everyday and ceremonial textiles. Therefore, it is crucial to perceive how the *itans* in Brazilian *candomblé* are (re)interpreted and how myths from a contemporary Africa continent also broaden such interpretations. The investigation involves an analysis of *queto candomblé* attires through photographs, paintings (especially those commissioned for Axé Ilê Obá by Agnes doSantos), and accounts from the 1950s to the present, with a more substantial visual photographed. It also includes contemporary records in the *candomblé's* house (especially from Axé Ilê Obá's official photographers, Felipe Marcondes, and Eduardo Cancissú) and field studies during public festivities at the Axé Ilê Obá in neighborhood of Jabaquara, São Paulo. Therefore, the colors in these attires serve as communicative elements, narrating the stories of the deities and portraying the adaptations and resistances of traditional terreiro communities.

**Keywords:** *Candomblé. Clothes. Color. Yoruba. Axé Ilê Obá.*

# Color over Volume in Contemporary 3D Animation

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## Abstract

Throughout the last half-century, the imagery generated by 3D software has been characterized by its endeavor to simulate all physical aspects of nature, aiming to present itself indistinguishably from a photographic image (MANOVICH, 2006, p.7).

According to philosopher Willem Flusser, this represents a technical image par excellence, as it is produced by devices (FLUSSER, 2002, p.13) grounded in scientific text, which, in turn, is structured upon empiricism. In recent years, this technique of image production has solidified in the billion-dollar entertainment market as the dominant option for animated feature films.

3D animation distinguishes itself from traditional 2D animation, which dominated the production scene of feature films for nearly a century, by its ability to maintain the spatial coherence of the scene, as well as to simulate with perfection the various tones that produce the volumetrics of characters and objects, as we know from our own experience with the world.

The feature film production space is averse to risks. In 2019, films like the 3D remakes of "The Lion King" and "Toy Story 4" followed the traditional and safe bet on the value of technical and illusionistic novelty, a value supported by the obsolescence of what was previously established and which always favors the technological over the aesthetic (DUBOIS, 2004, p. 34-35). At the same time, contrary to the more traditional productive flow, Sony animation studios released "Spider-Man: Into the Spider-Verse" (2018), a film that developed a visuality opposed to the realistic dictates of 3D software, adopting a literal graphic character through the use of flat colors and simulated halftone screens present in paper prints.

If a movement of this magnitude, abandoning volume in favor of color, is made in a major studio like Sony, it is possible to speculate that the wave that is now taking over this hegemonic productive space began in smaller productions and short films. In 2006, more than a decade earlier, the idiosyncratic Franco-Algerian filmmaker Michel Ocelot produced an important 3D feature film called "Azur and Asmar." Ocelot brings his knowledge of experimental techniques from short films and generates a hybrid and questioning image, an unlikely image from the standpoint of the devices' program (FLUSSER, 2008, p.30), entering the space of art. Similar movements can be observed in various short films, a privileged space for experimentation, such as David O'Reilly's "Please, Say Something" (2009). We are dealing with an expansion of visual possibilities that involve the tensioning of aspects so dear to 3D, such as spatial volumetrics, in favor of using colors in a more direct and pure manner. It is a complex movement that deals with the fatigue of certain visualities, with budgetary questions, and with the hybridization of non-photographic production methods. These are some of the aspects to be developed in the full article.

## Contemporary Poetics with Natural Paints

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### Abstract

This research with natural paints began in the course “Painting I” during the social isolation caused by the COVID-19 health crisis, exploring techniques for extracting dyes and pigments with the students of the Bachelor of Visual Arts course at the School of Music and Fine Arts of Paraná (EMBAP- UNESPAR), in Brazil.

In the view of the above, this study aims to contribute to the development of knowledge on the production of natural paints from vegetable and mineral sources, in the university domain, encouraging the production of dye materials and artistic practice, combined with studies on perception and language in painting, from a contemporary and historical perspective.

In the art scene, the Natural Paints Research Project emerges as a vital link between art and education. The exchanges between artistic expressiveness and the natural color palette permeate both the academic context and artistic practice in general.

Access to recipes allows to produce its own materials, valuing local inputs and dialogues with ancestry and traditional knowledge. Natural paints connect to the roots of art history, chromatic theories and the fundamental principles of color.

Affordability, wide chromatic diversity, quality of materials and environmental sustainability also refer to socio-cultural aspects that deserve greater attention. Even nowadays, art students find themselves almost completely dependent on the use of imported and expensive materials, which often makes it impossible to obtain good quality materials.

The methodology is based on experimentation with mineral pigments and vegetable dyes, such as the natural inorganic pigments found in the earth, and the appropriate techniques for extracting dyes from each element; development of lacquer pigments and tests with binding media, as well as conservation media; besides the documentation and systematization in notes, photographs and recordings.

In the educational field, the classroom is transformed into a laboratory. The students can become the protagonists, engaging in the production of paints. Color diversity, combined with sustainability, brings new ways of understanding, teaching and learning at university.

By equipping students to produce their own paints, the research not only provides theoretical knowledge, but also cultivates creative autonomy. Manifested in the conscious and innovative production of materials, it transcends dependence on foreign inputs, reflecting a paradigm shift in art education.

By collecting inorganic mineral pigments and exploring artisanal techniques, the color palette gains diversity. Each element reveals greater translucency or opacity. The production of lacquer pigments brings greater permanence of color to vegetable dyes by stabilizing them in powder form.

Therefore, the article will demonstrate the development of the project so far, its processes, palettes, and artworks developed by the students and the proposing professor. The practical approach and the space for exchanges opens up room for reflection on the role of the teacher as a mediator of knowledge, and highlights the students' interest in producing their own materials. By immersing themselves in the practices of contemporary artists, the choice of natural paints reveals an intrinsic narrative. We explore the creative processes, the resulting configurations and the conceptual implications that emerge from these choices. The color palette thus becomes a vital expressive channel in contemporary art.

**Keywords:** Visual Arts, Painting, Natural Paints.

# Gaudí's Chromatology: A Cross-comparative Analysis of Colour Surface Qualities

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## Abstract

This paper analyses Antoni Gaudí's (1852-1926) application of colour materials and techniques on the surfaces of his work. Eusebi Güell acquired an estate situated on the southern face of Monte Carmelo, 17-hectares overlooking Barcelona and the Mediterranean sea. Güell intended to build a housing development there in the style of the British garden city, and entrusted Gaudí with that ambitious project. The work began in 1900, but with the discontinuity of the initial housing project and the death of Güell, the City Council opened it to the public as Park Güell in 1926. Gaudí created the most emblematic polychrome architecture of Barcelona in the first decades of the twentieth century, when new ideas pushed science and technology further, aligning with Gaudí's constant need to experiment and innovate in all architectural and design realms. Gaudí covered many of his buildings in elaborate polychrome mosaics, however some cladding processes were only possible due to the technique he created – *trencadís* – and with which he experimented largely in Park Güell. *Trencadís* was inexpensive for decorating and cladding the many curves that characterize the complex geometries of Gaudí's buildings and allowed for a closer imitation of nature in terms of colour variations, reflection, perceived movement and material contrast. Gaudí's aesthetics reflected his various sources of inspiration: belief in the rebirth of Catalan nation, Mediterranean cultural influences of colour cladding, scientific and technical excellence, permanent research for innovation, and hands-on experimental approach. Park Güell represents the convergence of architecture and nature, similar to the experience of an immersion in a dreamlike theatrical setting created by his extraordinary imagination.

**Keywords:** *Gaudí, colour materials, Park Güell, design*

# Revitalizing Public Spaces: A Guide for Chromatic Interventions with Augmented and Virtual Reality Technologies

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## Abstract

This article refers to an investigation that explores color as a form of identity expression in urban public space, serving as the object of study. It seeks to identify, understand, and grasp how the use of Virtual Reality and Augmented Reality technologies can contribute to the development of projects of this nature. The goal is to understand how the use of color in the processes of city modification, especially in public spaces in disqualifed urban areas, can become a form of support for the resignification and reaffirmation of local identity, with the aim of structuring the bases for a creative and collaborative chromatic intervention. This intervention focuses on contexts of socioeconomic deprivation and urban renewal, validating the use of Augmented and Virtual Reality as modeling and verification tools associated with Creative Placemaking.

In addition to discussing the relationship between color and urban space, especially the issue of place identity (Boeri, 2017), the research analyzes the possibility and viability of transforming renewable public spaces. It also discusses the use of technology as a low-cost way of modeling and verifying results. Secondary objectives include providing subsidies and methodological bases for the development of chromatic projects and raising awareness among students, architects, designers, and urban planners about the use of color as an expression of identity.

The methodology involved a creative placemaking action—an experimental urban intervention project focused on inserting the user into the design process (Scherer, 2017). The intervention was proposed for the surrounding area of a public staircase with 70 steps on the outskirts of the city of Diadema, located in the Southeast Zone of Greater São Paulo, Brazil. Augmented Reality (AR) and Virtual Reality (VR) technologies were used as modeling tools and for the virtual visualization of results. The experimental design was structured in phases (Hanington, Martin, 2012; Kumar, 2013; Friis, 2015). The planned activities were divided into five phases, with the first four following the steps organized by Friis (2015) in his collection of Co-creation Cards: Collection, Comprehension, Concept, and Creation. A fifth phase, called Verification, will be included at the end, involving prototyping (Hanington, Martin, 2012) of the proposed chromatic project in AR and VR for delivery and presentation to community representatives and stair users for the evaluation of the proposed project.

As a result of the research, the article will present the Guide for Chromatic Interventions in Public Spaces, using AR and VR (3D, immersive) models. This guide proposes a method for developing chromatic designs for renewable public spaces, outlining the construction process for each stage of development. It is organized into three chapters: 1st Collection, Comprehension, Concept, and 3D Modeling; 2nd Creation; and 3rd Communication, Verification, and Prototypes. In the Creation chapter, 10 creative practical guidelines were proposed that will certainly help students, architects, designers, urban planners, and artists who coordinate, design, or wish to develop this type of project, especially those who do not feel confident, given the lack of color literacy of these professionals.

**Keywords:** *Urban design, chromatic interventions, chromatic guide, color and placemaking, augmented and virtual reality*



# Limits and Possibilities of Using Color as Information on Medicine Packaging in the Brazilian Market

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## Abstract

The consistent use of colors in packaging design reinforces a brand's identity and promotes its recognition, contributing to its distinctiveness on store shelves and consequently favoring commercial competition. When users are in direct contact with these packaging without the mediation of a seller, the contribution of color becomes even more relevant. However, not all industrial sectors have the freedom to use color without legal barriers, such as in the case of medications.

Motivated by this issue, the present study was elaborated. The objective was to bring a discussion about the challenges imposed on designers and other professionals in the pharmaceutical sector. How can the desired distinctiveness and visual attractiveness for such medications be legally protected? Also, how can color contribute in this aspect? What are its possibilities and limitations?

For this purpose, the following methodology was applied. Firstly, a bibliographic survey was carried out regarding the use of colors in medication packaging, as well as the current legislation on intellectual property protection. Then, field research was conducted to retail outlets to analyze, select, and photograph over-the-counter medications, those available in the areas outside the service counters. That is, those for which the mediation of a seller is not necessary. Subsequently, packaging cataloging was carried out, using technical terminology to cover: the hierarchy of information displayed on the packaging; differentiation between technical texts and marketing texts; and description of the colors used, as well as their percentage and location on the packaging.

Through correlation of bibliographic data and field research, the opportunity to investigate medication packaging with three active ingredients was observed. They were: paracetamol; dipyron; and ibuprofen. Packaging of reference, generic, and similar medications were compared. The predominance of green and red colors was observed. These colors both generate familiarity with the active ingredient, but can also lead to consumer confusion as they reduce distinctiveness among competitors. Colors, in isolation, are not subject to industrial property registration in the country, unless arranged or combined in a peculiar and distinctive manner. Only being possible to request protection to this sort of combination by trademark and industrial design registration.

The results contributed to the discussion about the limits of color use and possibilities of use without incurring unfair competition. It is hoped that such research will encourage designers and entrepreneurs to focus on the strategic use of color, as well as the importance of trademark and industrial design registration as a competitive advantage.

**Keywords:** packaging design; medicines; brand identity; legal protection; color impact

# Influence of Wall Color on Performance in University Offices

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## Abstract

This is a continuous research project, and this study is the second part of the project. The first part was presented at AIC2023. Since wall color is one of the largest physical components in an office and it stimulates cognitive responses and affects the behavior as well (Duyan et al, 2016); therefore, the aim of this study is to examine the impact of color on attention and performance of university professors.

To reach the purpose of this study, an experiment consisting of three tasks (questionnaire, performance test, and attention test) was conducted. The participants were 31 Japanese university professors between the ages of 41 and 57. The participant was seated at a desk where a colored panel was hung in front of it and had to perform the tasks. There were 12 colored panels in total and the colors were chosen based on the results of the previous study (Baniani, 2023) and were as follows: red (5R 5-14), light red (5R 9-2), orange (10R 5-16), light orange (10R 9-2), yellow (5Y 8.5-14), light yellow (5Y 9-2), green (2.5G 5-12), light green (2.5G 9-2), blue (10B 5-12), light blue (10B 9-2), purple (5P 4-12), and light purple (5P 9-2). The size of the panels was 840 x 840 mm, and the distance between the participant and the panel was 70 cm. The participants were also required to do the experiment in front of the plain wall which was white. First, the participants were asked to select their most favorite and least favorite color among the colors. They were also asked about their mood. In the questionnaire section, while looking at the colored panel, they had to say whether they like the color or not, if the color makes them feel calm, helps them focus, makes them want to be more active, or if it motivates them to work. Then, they needed to do the Bourdon Attention Test, developed by Benjamin Bourdon (1955), and finally a performance test which consisted of writing the pronunciation or *yomikata* of kanji characters suitable for their level. The experiment was conducted in Japanese, and all the questions were done randomly among the participants.

It was observed that there were no significant differences between male and female participants ( $P < 0.05$ ), therefore all the results of this study are based on the participants as a whole. Orange, light orange, yellow, and light yellow had positive influence on both performance and attentions tasks ( $P < 0.05$ ). Interestingly, in the questionnaire section, nobody associated light orange with a color that gives them motivation to work. The participants didn't perform well in both tasks in front of the white wall which was seen in the previous study (Baniani, 2023) as well ( $P < 0.05$ ). In sum, it was observed that liking or disliking a color doesn't have an influence on performance or attention ( $P < 0.05$ ). Moreover, white may not be the most suitable office color as everyone believes it to be.

**Keywords:** office wall color, performance, Japanese professors, Kanji, Attention

# Effect of Scene Illumination in Images on Perception of Hardness

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## Abstract

People utilize material perception in their daily lives. With the rapid development of information technology and lifestyle changes that make extensive use of online communication due to COVID-19, usage and importance of material perception in images have recently increased. Although previous studies have analysed the mechanism of material perception of real objects, they have shown that it can vary between real objects and their colorimetric colour reproduction images. As the amount of information obtained differs between the evaluation of a real object and observation of a display image, it is necessary to understand the perceptual mechanism of display images, which vary from real objects. In addition, previous studies have confirmed that lighting environment during observation affects human perception.

This study utilized scene illumination as the lighting environment to illuminate an object. It aimed to analyse its effect on the perception of hardness in images by conducting psychophysical experiments using images captured under different scene illumination conditions and constructing models for the evaluation values obtained. We created a material chart consisting of 19 characteristic materials and constructed visual stimulus images by photographing the material chart in a dimmable room under 9 different types of diffuse scene lighting. The 9 types of scene lighting were a combination of 3 colour temperatures (3000 K, 4000 K, and 5000 K) and 3 illuminations (500 lx, 750 lx, and 1000 lx). The images were evaluated using a six-point scale, with 0 and 5 indicating the weakest and strongest impression of hardness, respectively. Ten observers participated in the experiment. Results showed that within the range of colour temperatures used in the experiment, the higher the colour temperature, the stronger the impression of hardness. Therefore, the colour temperature of the scene illumination in the image influenced the perception of hardness.

The results of multiple regression analysis showed that it was difficult to construct a model of perceived hardness using image features calculated from the luminance values of the image and its prediction accuracy was low. As results of the psychophysical experiments suggested that the colour temperature of scene illumination may affect the perception of hardness, the next model was constructed again by adding the colour temperature estimated from the images. Using only 2 variables, contrast features and illumination colour temperature, we constructed a model with an accuracy of  $R > 0.90$ . It was constructed with high accuracy for the visual evaluation of hardness, suggesting that hardness is a material appearance originally perceived by the sense of touch; however, a stable initial judgment can be made only by the sense of sight.

**Keywords:** Colour image, perceptual model, material appearance

# Quantifying Emotions Evoked by Artworks Using Psychophysical Methods: Relationships between Emotions and Colorimetric Structure of Abstract Paintings

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## Abstract

We conducted an experiment in which participants ranked ten abstract paintings based on six emotional descriptors: tense, calm, exciting, boring, enthusiastic and depressive. These descriptors were chosen according to the circumplex model of affect, which proposes that affective states derive from two fundamental neurophysiological systems, and that each emotion can be understood as a linear combination of these two systems. The paintings, representing styles such as post-impressionism, cubism, constructivism, deliberately lacked realistic elements. The sample consisted of 55 Brazilian participants (mean age = 31; SD = 1.1; 29 women), who met specific inclusion criteria regarding age, education, and medical and ophthalmological conditions.

To analyze the ranking data, we combined two psychophysical methods based on the Law of Comparative Judgment, effectively mapping absolute ranking data onto points within a unidimensional continuum. These methodologies have proven successful across diverse fields, highlighting the versatility of interval scales in understanding complex human behaviors. Correlations among the six emotional scales were assessed using Pearson's coefficient, revealing negative correlations for tense-calm, enthusiastic-depressive, and exciting-boring ( $<-0.85$ ,  $p<0.05$ ), and a positive correlation for exciting-enthusiastic ( $0.90$ ,  $p<0.05$ ).

Furthermore, we analyzed the color gamut geometry of each painting in the CIE Lab color space, deriving three colorimetric dimensions: saturation (measured by ellipse area), color proportion (ratio between minor and major axes of the ellipse), and hue (angle between the major ellipse axis and the  $a^*$  axis). A one-way ANOVA was conducted to investigate statistical relationships between the colorimetric structure of the paintings and the emotional scales. Our findings demonstrated a statistically significant difference only between saturation and the depressive scale ( $F=0.68$ ,  $p<0.05$ ).

Almost all the paintings were easily classified under the descriptors tense, calm, depressive and boring, suggesting a consistent interpretation of these emotional descriptors for classifying the selected paintings. When it comes to the descriptors enthusiastic and exciting, the situation appears more complex. Most paintings were positioned very close on the scale, with no statistically significant differences. This may indicate that these descriptors represent more subtle and multifaceted emotional experiences, which can be influenced by a variety of factors including each participant's personal history, cultural and context.

Overall, our results suggest that abstract paintings can be mentally categorized into emotional continua, with these continua displaying a logical interval organization within opposing emotional dimensions. The affective circumplex model seems particularly suited for quantitative studies of emotional perception in complex visual stimuli. The lack of a relationship between colorimetric structure and the emotional intensity of the paintings suggests that color may not significantly influence emotional judgment, while other elements and attributes within visual perception may play a more significant role and require further investigation.

These results have implications for the psychology of art and emotion studies, offering a straightforward protocol for evaluating emotions in abstract artworks. We propose a methodology designed to be easily executable outside traditional laboratory settings, thus accommodating larger and more diverse groups including children and individuals with varying educational levels. This approach is particularly advantageous in scenarios with scant initial data and constrained experimental resources, as often encountered in social experiments and preference studies. Additionally, applying this method to a Brazilian sample provides insights into specific emotional preferences, enhancing our understanding of cultural, visual, and artistic interactions.

**Keywords:** color perception, colorimetric structure, emotional judgment, abstract paintings, psychophysical methods

# Cues in Color: May Profile Image Imply Users' Personality Traits?

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## Abstract

In the digital era, profile pictures significantly shape self-representation, with color serving as a pivotal visual cue conveying subtle user characteristics. To better understand the role of color in conveying deeper personality dimensions, this research investigates the correlation between color choices in profile images and the personality traits expressed on Chinese social media platforms.

This study draws sample user base from Xiaohongshu (RED), a major Chinese social media platform combining visual and textual self-expression with lively discussions centered on Myers-Briggs Type Indicator (MBTI) personalities. The research intends to deepen our insight into the subtle connections between users' profile image preferences in terms of color and content and the wide variety of personalities they exhibit online, by adopting the MBTI framework that intricately categorizes human personality traits.

Methodologically, this research integrates computer vision via OpenCV for color data extraction and leverages transfer learning with Python and the pre-trained VGG16 network to classify image content, thereby enhancing analytical depth. A stratified random sample of 1,200 Xiaohongshu (RED) users' profiles (n=1200), structured according to MBTI categories, ensures a broad representation of personality variation. Employing statistical methodologies including Pearson correlation and Logistic regression, the study illuminates potential relationships between color preferences, content, text length, and MBTI classifications, advancing comprehension of personality manifestation through digital media's visual and textual dimensions.

Preliminary results indicate color-choice correlations with MBTI types: extraverts (E) prefer vibrant hues such as purple and red, introverts (I) lean towards darker tones such as black, intuitives (N) favor warmer hues and less color richness, and sensors (S) opt for cooler hues, realistic styles, and richer colors. 'Feelers' (F) and 'Thinkers' (T) are differentiated by color saturation, while 'Judging' (J) and 'Perceiving' (P) types exhibit distinct aesthetic predilections. Moreover, biographical narrative length correlates with conscientiousness, reinforcing text as a complementary personality indicator. The integration of these visual and textual parameters in predictive modeling presents a robust approach for accurate classification of 'Feeling' and 'Judging' personality dimensions.

Anticipated outcomes are poised to refine our comprehension of digital identity formation by demonstrating how color and textual cues in profile images can collectively inform predictions of personality types. By capitalizing on the combined predictive power of color and text in profile representations, platforms can engineer highly personalized user experiences, devise tailored avatars, and craft strategic marketing initiatives deeply rooted in an understanding of color psychology.

**Keywords:** Color psychology, personality, social media, profile image

# colour in psychology and physiology (I)

## Characteristics of Japanese Skin Color and Its Associated Factors in Comprehensive Health Checkup Examinees

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### Abstract

In clinical settings, medical personnel assess the severity of a patient's condition based on the color of their face. However, this is a subjective measure, making information sharing difficult. Skin color can also be objectively indicated by lightness ( $L^*$ ), redness ( $a^*$ ), and yellowness ( $b^*$ ) in the CIELAB color space. Unfortunately, despite a large number of elderly patients, studies on colorimetry of the elderly are scarce.

We measured the skin color of examinees who underwent a comprehensive health checkup using a spectrophotometer to elucidate the characteristics of skin color in middle-aged and older Japanese individuals, as well as the factors associated with skin color.

A total of 208 examinees ( $62.1 \pm 10.9$ -year-old, men: women 89:119) undergoing a comprehensive health checkup were enrolled. The skin color of the forehead and bilateral inner forearms was measured using a spectrophotometer (CM-700d, Konica Minolta), expressed as  $L^*$ ,  $a^*$ ,  $b^*$  under the standard light source D65, and calculated  $C^*$  and  $h$ . Vital signs (body temperature [BT], blood pressure [BP], and pulse rate [PR]) and percutaneous oxygen saturation ( $SpO_2$ ) were also measured. Age, height, weight, medical history, and laboratory data such as hemoglobin (Hb), hematocrit (Hct), creatinine, and total bilirubin (Bil) levels were obtained from the health check data.

No significant differences were observed in age, BMI, BT, or  $SpO_2$  between men and women. The BP and PR were significantly higher in men than in women. The Hb, Hct, creatinine, and Bil levels were also significantly higher in men than in women. The skin color of women was significantly higher in  $L^*$ , and  $h$  and lower in  $a^*$ ,  $b^*$ , and  $C^*$  than that of men. The forehead exhibited lower  $L^*$  and  $h$  values, and higher  $a^*$  and  $C^*$  values than that of the forearms. No significant difference was observed in  $b^*$  between the forehead and forearm. The examinees were divided into three age groups: under 60 years, 60–69 years, and 70 years and older. In men, no significant differences were observed in skin color between the forehead and bilateral forearms across the three age groups. In contrast, women aged 70 and older had significantly lower  $L^*$  and higher  $a^*$  on the forearms than those aged less than 60 years. Hb levels were correlated with  $L^*$ ,  $a^*$ , and  $h$  in the foreheads of men and women, and with  $L^*$  and  $h$  in both arms of women. Bil was associated with  $b^*$  in the foreheads of both sexes and with  $b^*$  and  $C^*$  in both arms of women.

Men exhibited lower  $L^*$  and stronger  $a^*$  and  $b^*$  values than women. Compared to the findings of previous studies (skin color in Chinese participants) with different age groups and sex ratios,  $L^*$  and  $b^*$  were higher in this study. The skin color of the forehead demonstrated reduced  $L^*$  and increased  $a^*$  values in both sexes, probably because of sunburn. The effect of age on skin color was observed in both forearms of women with low melanin levels. Additionally, Hb and Bil levels may be associated with skin color.

**Keywords:** Skin color, older person, hemoglobin, bilirubin



# Chromaticity Contrast Thresholds and Sufficient Illuminance of Multi-channel LED for the Simulated Low Vision Eyes

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## Abstract

In our previous study, the optimized multi-channel LED, comprising blue, green, red, yellow, and low intensity white, was proposed for better color discrimination enhancement for the elderly and those with low vision. This research aims to study the effect of the optimized multi-channel LED, on the chromaticity contrast threshold viewed by simulated low-vision eyes with blurred and cloudy lenses under a wide range of illuminance. This would be compared to white LED and fluorescent lamps as controls. Chromaticity contrast refers to the difference in colour properties between two areas in terms of their chromaticity coordinates, which is a measure of the quality of colour regardless of its luminance.

In the study, there were two levels of visual acuity of blurred lenses and three levels of cloudy lenses that were in the low vision category. The blurred lenses are transparent, and the perception through the lenses yields good color but a blurry edge, whereas the cloudy lenses are foggy, and the perception through the lenses yields lower chroma. The stimuli of the red text on a green background and vice versa of the Landolt C with twelve levels of chromaticity contrast were presented randomly to the simulated low-vision observers, aged between 20 and 25. The experiment was conducted in a two-room type with a small window between the stimulus and the observer rooms, allowing only the Landolt C to be observed. The illuminance of the stimulus room was varied: 10 Lux, 30 Lux, 100 Lux, 300 Lux and 1,000 Lux, and of the observer room was 300 lux and without light. Viewing the red text and green background by the simulated blurred lenses, when the illuminance in the observer's room increased from the dark to 300 lux, the chromaticity contrast thresholds of all visual acuities were not distinct. The chromaticity contrast threshold was maintained when the illuminance in the stimulus room rose from 300 to 1000 lux. It showed that the illuminance of 300 lux is sufficient. Viewing the same stimulus by the stimulated cloudy lenses from the dark room, the chromaticity contrast threshold was maintained when the illuminance increased from 300 to 1000 lux. Viewing from the brighter room, the illuminance of 1000 lux is insufficient to see the chromaticity contrast. It shows that an illuminance of over 1000 lux is required for the cloudy lenses. A similar pattern shows for the green text on the red background, but the chromaticity contrast threshold is lower. All the results mentioned above compared with the controls, and the discussion with the previous studies by other authors will be explained in the full paper. Sufficient chromaticity contrast could enhance or detect features in images, aid in object recognition in image processing and computer vision field, could improve the visual quality and readability, and could create an easily distinguishable and visually comfortable environment.

**Keywords:** chromaticity contrast threshold, chromaticity contrast, mixed channel LED, low vision

## Chromatic Analysis in Coming of Age Movies

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### Abstract

The purpose of this article is to focus on scenes and their colors in films from the subgenre of the drama genre, commonly Hollywoodian, but not necessarily: the Coming of Age genre. The approach to colors and visual language in the scenes of a movie has the importance of exploring possible messages that can be transmitted to the viewer. This research contains both bibliographical and empirical research, in which scenes from five selected Coming of Age films were analyzed using an analysis script. The intention is to explore the possible variable emotions and significance of the colors and visual language of these scenes, such as movement, vibration, saturation, contrast [...] and how altogether they may cause an impact over who is watching. Bearing in mind that we often understand and absorb less than half of the content and visual language of a feature film, this research explores this language through colors, describing its connections and applications with and in the characters and settings of these works, in order to bring to the target audience – those interested in this genre of films or not – a more complete experience in the world of cinema.

The basis of the research was developed following the studies of certain authors, such as Barros (2007), Heller (2000), Farina, Perez and Bastos (2006), Mahnke (1996), Brown (2016), Schmidt (2002), Frey Büchel (2018), Demo (1994), and others. Their texts are a variable content over the origin and meaning of colors, the social origins of the coming of age genre and the visual language in cinematography. With their studies, it is possible to understand the social context under which this subgenre became so emotionally touching, and how the colors and visual language in the scene of a movie open so many windows of possible meanings that we never thought they could have.

**Keywords:** *Coming of Age, color, cinema*

# Palette Politics: Balancing Empathy and Self-expression in Color Design

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## Abstract

The disciplines of Art and Design are often lumped together into one entity: Art/Design. Similarly, Physics, Chemistry and Biology fall under the heading of “Science”, yet most educated people understand the differences between these disciplines. Even those who are in the “Art/Design” field, however, may not readily articulate how these two disciplines are different. Although they both may deal with color and the other elements of design and often overlap in the same project, they are distinct worlds, with different goals and often different audiences. As a result, a designer may on occasion approach a project as an artist when it should more properly be approached as a designer. Understanding how art and design are alike and how they are different may help practitioners “get it right” and better manage the effects of color on human comfort.

One context where understanding the difference matters greatly is in the design of therapeutic spaces (i.e., healthcare), where designers must be acutely aware of their audience’s emotional state (e.g., anxious, grieving). Yet how can designers and artists do their work without a complete understanding of the emotional impacts associated with all regions of color space? The reality is that neither designers nor artists have been afforded the opportunity to learn the psychology of color space in its entirety, because until now the focus has been exclusively on associations with the vivid hues. This “hue myopia” which likely has its roots in Isaac Newton’s discovery of the spectrum, has shaped the lens through which we view color in modern times, and has affected the work of both practitioners and researchers. As a consequence, all the remaining colors in color space – pale, muted and dark colors – have essentially remained unexamined. Without an understanding of their impact on human response, how can designers and artists manage their effect in their projects that serve people?

Fortunately, in the last decade researchers have begun to examine the other two dimensions of color, value and chroma, and there is now a body of work that clarifies how people understand the character and meaning of what we can describe as pale, dark, vivid and muted colors. This knowledge completes our understanding of the psychology of the full color space which designers and artists can now apply in their work. Valdez & Mehrabian (1994) mapped the correlations between hue, value and chroma to a psychological theory known as Pleasure Arousal Dominance (PAD) Theory. This model of human response offers designers a path toward understanding how their use of color may affect people’s emotional responses. A Color Compass has also been developed to aid this transition from seeing color exclusively according to Hue to also seeing it through the lens of Value and Chroma, and it is hoped that compass will aid both artists and designers in incorporating empathy into their respective processes.

**Keywords:** color design, color psychology, color education, empathy

## Color and Light in the Birth Environment

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### Abstract

This research investigates the influence of light and color on a human well-being in delivery environments, aiming to analyze the feelings of comfort of both laboring women and healthcare professionals. It also examines how the use of colors and light can contribute to the humanization of natural childbirth, facilitating the progression of labor. For a better understanding and organization of the research, a bibliographic review of theoretical, conceptual and historical fundamentals of the considered theme was performed.

The research was conducted with the base on the two case studies: the UFPEL School Hospital (HE) and São Francisco de Paula University Hospital (HU), located in Pelotas-RS, Brazil. The former exclusively serves the Unified Health System (SUS), while the latter serves both SUS and private patients.

The study is developed in the area of Environmental-Behavior Relations, and adopts a qualitative methodological approach, based on archive documents and field surveys. The latter consists of exploratory visits and semi-structured interviews (both individual and group) as data collection methods. The international chromatic system (NCS) was used to identify colors in the physical environment (hospital rooms). In order to understand the experiences and perceptions of the interviewees regarding the investigated spaces, various techniques, such that content, thematic and phenomenological analyses, were applied to examine the collected data.

The results of analysis indicate that color and light are essential elements in the birthing environment, exercising a visible and direct influence on visual comfort. In particular, color and lighting play an important role in supporting childbirth processes, creating the feelings of comfort and empathy desired by laboring women instead of unpleasant and monotone coloring. It is noteworthy that the absence of positive aspects caused by inappropriate coloring evokes a deep negative emotional response.

Interviewees emphasized the need for greater humanization of environments with aesthetically pleasant colors in the room, pleasant images, positive distractions, adjustable lighting, windows, natural light control, and more lighting options for increased visual comfort. The lack of art also contributes to an unattractive aesthetic and non-inviting hospital environment.

The research highlights the necessity of studying color and light together to develop integrated guidelines for the design of childbirth environments that can promote better processes, experiences and feelings.

**Keywords:** *Environmental Perception; Color and Light; Birthing Environment.*

# Investigate the Preference and the Expectation of Chinese Male Skin Colour for Generation Z

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## Abstract

A trend of “neutral sex look” for Chinese celebrities dramatically influences the appearance preference of Generation Z in China. Also, the rising of male makeup influencers has led to the widespread acceptance of male beauty products in the market. Researches were carried out to investigate the skin colour preference of females, which assisted cosmetic product development. However, limited research is focused on men. Our previous studies of skin colour preference found that the feminine/masculine beauty concept for Chinese males has changed, and a less masculine appearance is preferred. In this research, we further studied the skin colour preference of Chinese males and investigated the appearance they wanted or expected to be built.

Surveys and psychophysical experiments were carried out in this research. There are 223 subjects, aged 19-24, including 135 females and 88 males, participated in this research voluntarily. Firstly, each subject needs to complete a questionnaire about the ideal appearance of Chinese males. Then, he/she participated in a psychophysical experiment that investigated the relationship between skin colour and the ideal Chinese male appearance characters. Twenty-six skin colours were selected based on the skin colour gamut of the Liverpool and Leeds skin colour database. These skin colours were rendered on the face of a Chinese male as the stimulus. Six adjectives that can be used to describe characters with Chinese male appearances were studied. There are two sets of questionnaires designed for female and male subjects, respectively.

The survey results showed that both gender groups preferred less masculine appearance, which inferred that they were more civilized. The female group is more focused on the details of the appearance than the male group. The psychophysical results revealed that the preferred skin colour of females and males were different. The female group is more sensitive to the yellowness of the skin than the male group and considers skin colour with high yellowness to be less preferred. Both groups showed that redness is closely related to masculinity. The results reveal the beauty concept of Generation Z in terms of skin colour. The agreement and disagreement between the males and females of Generation Z regarding expected Chinese male appearance are delineated.

**Keywords:** skin colour preference, Chinese male appearance, generation Z, masculineness

## Colour Literacy Project Beta-testing: Report from St. Teresa Partner School

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### Abstract

St. Teresa RC Normal School in Irlam, UK is the first partner school to complete the first two series of teacher trainings in the beta-testing phase of the Joint ISCC/AIC Colour Literacy Project (CLP). This initial phase of the project is designed to test a new, foundational, interdisciplinary curriculum for updating teachers on core concepts related to colour education in the 21<sup>st</sup> century.

Following the start-up of the project in 2020, St Teresa's was nominated as a partner school by Colette Harrison who volunteered to act as the CLP coordinator for the school. With the full support of the Head Teacher, Sandra Burgess, the school initiated a pre-survey of colour knowledge at each grade level, coordinated the schedule for the combined teacher and staff trainings, and arranged for CLP materials and resources to be sent to the school.

This paper reviews the preliminary results of the school's past three years of engagement with the CLP.

The teachers completed the first set of trainings, the Eye Opener Series, during staff development sessions in the spring of 2021. The first set of trainings included three, two-hour sessions focused on the core concepts of describing colour. The second set of trainings, the STEAM (Science, Technology, Engineering, Arts, and Math) Series, spanned the fall of 2021 and the winter of 2022 and focused on the core concepts of perceiving colour. The format for each session with the teachers included short presentations by the Colour Literacy team accompanied by hands-on activities. The two series together totalled 14 hours of professional development focused on expanding colour education as an interdisciplinary subject.

Following the final STEAM session in February 2022, the teachers at St. Teresa's voted to celebrate

International Colour Day (ICD) school wide in each of the classrooms. The success of this special day led to the decision to celebrate ICD in both 2023 and 2024. During the regular school year, the teachers extended what they learned and made it their own by developing new activities at age-appropriate levels. They have continued to engage the students across all the levels and in many subject areas in experiments and discussions about colour. Details of the training sessions, along with documentation of the ICD activities and the results of the beta-test post survey will be included in the paper.

The effectiveness of the CLP approach at St Teresa's School can be seen not only in the growth of knowledge about core colour concepts but also in the student's expanded vocabulary and use of descriptive language as well as in the teacher's and student's willingness to experiment, play and explore as part of the learning process.

**Keywords:** *colour education, colour literacy project, colour exercises*



## 21st Century Colour Education: A Student's Point of View

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### Abstract

This paper reviews the results of the “Colour with Purpose” workshop, based on the approach proposed by the Colour Literacy Project (CLP), from the perspective of the students who assisted in organizing the project. The workshop took place in Brazil at the Fluminense Federal University (UFF) and is part of an “Extension Project” at the same university called “Colour for Designers”. The idea of developing this project came about after realising that there was no specific subject on colour at the university. The first year of the extension project was in 2023, starting a long-term study with the future aim of building a course on the subject. Throughout 2023, the extension project team (professor and two students) studied the book “Colours in the Visual World” by Harald Arnkil; and held fortnightly online classes with Robert Hirschler, members of the CLP team. The result was the development of the workshop, bringing learning closer to the reality and professional needs of product designers. The event was divided into theoretical and practical parts. The first dealt initially with colour fundamentals as developed by the CLP, and concepts such as colour characteristics, White’s Illusion and Koffka’s Ring, the latter two being the target of exercises applying theory to practice.

Through this workshop it was possible to observe the students’ performance in terms of the theory and the exercises applied. The class’s reception of the theoretical content was unanimously positive. The application of the practical exercises was generally positive, but it was possible to observe difficulties in carrying out certain aspects of the exercises, revealing the need to extend the duration of the workshop to that of a short course, allowing the students more time to learn and develop the knowledge acquired.

The effectiveness of the CLP approach at UFF can be seen in the awakening of the interest of the workshop students in the study of colour, leading them to obtain knowledge that was previously inaccessible, as well as the expansion of topics that previously had only superficial understanding. The main result of such an exercise is the training of design professionals equipped with knowledge of concepts and topics that will make a difference in their professional areas.

**Keywords:** colour education, colour literacy project, design

## 21st Century Color Literacy Pilot Course at University of Texas

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### Abstract

This paper is an overview of AET 339 Color Literacy, a pilot course taught in the 2024 Spring semester at the University of Texas at Austin (UT) in collaboration with the Colour Literacy Project. AET 339 Color Literacy is the first course offered at the post-secondary level that is directly aligned with the goals of the Colour Literacy Project to recognize color as a meta-discipline and to strengthen the bridge between the arts and sciences, while connecting color education with the needs of our global culture. The upper level in-person course was offered through the Department of Art and Entertainment Technologies (AET) in the School of Design and Entertainment Technologies, a division of the College of Fine Arts.

AET 339 Color Literacy was developed and team-taught by UT Lecturer Luanne Stovall, a member of the Colour Literacy Project Steering Team and Dr. Honoria Starbuck, Professor and AET Foundations Lead. The course introduced color literacy as a 21st century meta-discipline with foundational skills that expand students' knowledge of color science, color's expressive role in visual storytelling, and color's integral role in our lives. Working within UT's Learning Management System, the three hour per week course was designed with six modules: Introduction, Color Perception, Color Interaction, Color Psychology, Color Design, and Resources: Find Out More About Color.

Assignments included a weekly Color Diary; an in-class Color Perception lab using a Miro Board as a digital tool to explore the role of light, matter, and human color perception with prompts for text and images; individual research investigating color perception in animals; color interaction labs to sort colors according to light, dark, vivid, muted characteristics and to determine how the context of surrounding colors impacts color interaction; and Cracking the Color Codes, a research project with ten colors, ten teams, ten topics, and a video presentation. Other components included guest speakers offering key tools and methodologies. Petronio Bendito provided students with RGB/CMY color wheel tools that involved mapping and naming systems. Ellen Divers presented the Color Compass and Divers Method to identify light, dark, vivid, muted color characteristics and create strategic proportional palettes. Field trips involved visiting UT's Payne Theater Lighting Lab with Professor Matt Smith and touring the Blanton Museum to investigate exhibition design including wall colors and lighting choices. Homework assignments featured readings, discussions, and video reviews. The final project was designed to implement twelve Chromatic Strategies for impactful visual storytelling.

Student engagement methods incorporated open-ended questions for daily activities that were woven into conversational exams. Assessment tools included pre-course and post-course surveys, graded discussions, a midterm evaluation, and conversational exams. Post course assessments focus on reviewing feedback to determine what to keep, what to emphasize, what to eliminate, and what to add from both student and teacher perspectives. The long-term goal is to create dynamic modules that can serve as curriculum templates for students at the University of Texas and post-secondary learning environments around the world.

**Keywords:** *color literacy, color education, color interaction, color design, color communication*

# Pursuing Terminological Consistency of Colour Attributes in the Portuguese Language

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## Abstract

The present study is part of an academic project aimed at reviewing and analysing the literature on colour in Brazil in order to understand and unify the various nomenclatures and definitions found in the Portuguese language for the field.

Given the premise that there is no consistency in the terminologies for teaching colour in the books used in Brazilian design education, a methodology consisting of three detailed steps was defined. Firstly, a national and international bibliographic review on colour theories and science was conducted to select the main concepts and attributes. Next, a survey of syllabi from design courses in Brazil that addressed colour was carried out, gathering the syllabi available on the internet. Finally, a comparative table was drawn up based on the colour literature used in the country, covering conceptualization and the most used colour attributes, primarily those related to hue, value, and chroma.

From the results obtained, it was possible to identify different words in the Portuguese language to define the same attribute, possibly either due to interpretation issues or literal translation. Three words in Portuguese were identified to define the term 'hue': 'matiz', 'croma', and 'tom/tonalidade'. For the term 'Value', five terms were identified: 'brilho' (brightness); 'luminosidade' (luminosity); 'obscuridade' (obscurity); 'valor de luminosidade' (brightness value); and 'claridade' (clarity). Meanwhile, for 'chroma' three were identified: 'grau de cromaticidade' (degree of chromaticity); 'intensidade' (intensity); and 'saturação' (saturation). This variety of terms alone presents the potential for significant confusion in communication between professional fields and, above all, in the teaching and learning process. It is observed that the term 'croma' is related to both 'hue' and 'chroma'. Regarding 'value', there are translations that focus on opposite extremes, addressing both brightness and obscurity. A similar situation occurs with the translation of 'chroma', since something saturated in colour is often referred to as having an intense hue.

Based on the works of Lusophone researchers in this area we aim to draw a parallel with the study conducted by the Colour Literacy Project, establishing definitions in the Portuguese language for the main terms related to colour attributes. The main contribution of this study is to collaborate to a more consistent and effective dialogue among those who use colour in their professional activities, whether designers, artists, graphic producers, advertisers, or communicators. We argue that as students and professionals encounter a more consistent literature on colour, the subject will be seen with the seriousness it deserves while avoiding possible communication breakdowns among peers.

**Keywords:** colour, colour attributes, glossary, Portuguese language, education.

## Reinforcing Colour Literacy with Colour Games

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### Abstract

Games are a good way to expand awareness, to introduce new possibilities, and to keep new information alive.

Education about colour must begin by developing awareness of the range of colours that can be seen. When we look around, we can see that vivid colours are far outnumbered by other colours that are paler, darker, or more muted. Awareness of colours, in all their variety, must then be linked to language. We need terms for describing what we see. Awareness also leads to recognition that there are various ways in which colours can be related so that they can be arranged in order. It becomes evident that such an order must have at least three dimensions.

To make learning about colour fun, we developed a basic sorting set of coloured tiles that can be used for teaching about colour and for playing a wide variety of games. In the set there are nine 'hue families': red, orange, yellow, lime, green, turquoise, blue, violet and magenta. In each hue family we have four 'characters' which we call pale, dark, muted, and vivid. There is also a nine-step grey scale running from white to black. We use the terms 'hue family' and 'character' to locate colours in a three-dimensional space. The terms for character and hue family are used in a simple naming system. For example, a colour can be described as 'vivid red', 'muted green' etc.

For the Colour Literacy Project we are beta testing a series of workshop exercises that include the sorting set tiles. While the tiles are useful for sorting exercises, they also lend themselves to use in games along the lines of *Dominoes* and *Scrabble*. Experience has shown that, without this kind of reinforcement, students typically revert to the limited ideas they held before. Playing games, where tiles must be placed next to other tiles from the same hue family, or that have the same character, helps to reinforce these concepts in an enjoyable way. The concepts are further reinforced when the colours are named as a game proceeds. An earlier game, where players have the 36 chromatic colours of the sorting set printed in random order on a sheet of card, was designed to reveal the difficulty of using words to describe what we see. This game can be played before concepts of hue family and character have been introduced and then played again to see if communication is improved with the use of the naming system.

We are also working on sets of playing cards with which it will be possible to play several more games, such as versions of *Rummy* and *Happy Families*, as well as games played with a conventional deck of cards. We are including additional colours, with four more hue families: amber, leaf, cyan, and purple, and, for some games, additional characters – colours that are very pale and very dark.

Feedback from some who have played these games has been encouraging. One reported that she found herself noticing subtle differences between colours that she would once have dismissed as being 'the same'. We hope it will be possible to play some of these games in São Paulo and will bring sets of tiles and playing cards to the conference.

**Keywords:** colour games, colour education, Colour Literacy Project, colour naming, colour order

## Teaching Color in a Transdisciplinary Approach between Physics and the Arts

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In 2023, a partnership was formed between the Institutes of Arts and Physics of the Rio de Janeiro State University, with the aim of fostering interdisciplinary debates on the topic of Colour Education in order to develop original didactics for teaching color in the most diverse areas and levels. The group's debates provided problematizations and updated perspectives regarding colour studies and historical experiments. From the outset, both Newton's and Goethe's spectrum were considered; the study of industrial color systems was integrated with optics; and the cultural approach and artistic and poetic expression of color, integrating specialists from different areas: Physics, Arts and Philosophy.

An important feature in our research is this methodological assumption: a multidisciplinary and collective approach, integrating researchers from different areas interested in the debate about ways of teaching color. In the interaction between these different researchers, it was found that, on the one hand, if in high school Physics classes, more precisely in the study of Light (Optics), teachers do not honor and deepen the teaching of the subject "Color"; on the other hand, for art teaching professionals, understanding ordering systems can help creative professionals to have a systematic understand of the dynamic relationships between colours and reproducibility, for that it is also important to know the objective data as pint codes and notations that present their components and formulas in relative and quantifiable proportions.

Therefore, one objective of the research was to develop a way to stimulate interest in color research and the recognition of the relevance of the topic, both for professionals in the areas of Physics and Arts teaching, and to recognize that in the future, young people might be professionals who will need prior knowledge about "Color" to carry out their professional activities. After 4 months of work, the group decided to develop a didactic proposal for mixing colors in unusual materials and processes to observe the influence of the substrate's characteristics (roughness, base color) on the subjective experience of color through playful experiences.

In order for this proposal to be democratically applicable to all economic strata of society and to engage all types of audiences, we were careful to investigate economically accessible, everyday materials that could still convey the main concepts and promote precise experiences with tones. We have arrived at a proposal for a "slime coloring workshop with synthetic food colorings", due to their stability and availability. We chose the three shades closest to the concept of primaries related to the printing industry standard, CYMK to generate all the mixtures: tartrazine yellow E 102, brilliant blue E133, and magenta INS 127- three standard food colorants. The workshops are being held since december 2023 in a high school class at Colégio Gálatas in Vila Valqueire, Rio de Janeiro.

We aim that our proposal manage to raise young people's awareness of the topic of colour and that alternative materials can indeed be effective for the approach to color systematization. We believe that the study of colors should not be based solely on the acceptance of stable norms, but rather on an experimental practice that leads to a philosophical approach: coherent teaching and a constant and curious search. We have put certainties on hold and, by investigating other ways to teach color, we put it into perspective by expanding its academic, scientific and artistic possibilities.

**Keywords:** *colour mixing, colour workshop, colour education.*

## The Seminars “Why Do We Forget Goethe When We Teach Optics in Physics Classes?”

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### Abstract

This communication aims to share the results of four seminars whose central purpose was to present, explain and execute a didactic intervention based on the work of the German Johann Wolfgang von Goethe dedicated to the study of chromatic phenomena. Those seminars arose from the initiative to disseminate parts of a Master's research about Goethe's "Doctrine of Colors" and its popularization in Brazil (RAMOS, 2022). The seminars were presented both to graduate and undergraduate physics. In the first moment, there was a presentation of Goethe's works on colors - its historical, philosophical and scientific context and main conceptions and the exposition of Goethe's particular method. Then there was conducted a more detailed discussion on the origin of color phenomena in his point of view and within his polemic against the Newtonian color theory.

After this introductory moment, some triangular glasses and acrylic prisms were handed out to the participants, which were guided through an experimental sequence proposed by Goethe himself in one of his first works on colors – “Beiträge zur Optik, part I” (GOETHE, 2011). This small book is accompanied by cards with which Goethe hoped to provide his readers ways to experience the phenomenon he describes, in addition to “having placed an instrument in the hands of teachers for a pleasant speech with their students” (GOETHE, 2011, p.73). The participants were able to experience for themselves the awakening of colors in the most diverse situations and conditions. At the same time, they were faced with Goethe's experimental novelty and introduced to his polemic and scientific discourse that was designed to confront Newton and his theory of light and colors. We highlight the moment when participants discover the existence of a complementary spectrum and, in particular, a new complementary color, magenta.

Not just Goethe's novelties were the subject of debate, so were his conceptual errors, which, in fact, are not minor to his thought but, rather, fundamental to his scientific, artistic and philosophical conceptions. At the end of the seminars, the participants returned to the former question: why do we keep “forgetting” Goethe in physics classes because he made a conceptual mistake and never recognized it, and, like others in his time, didn't welcome the intimate relationship developed between physics and mathematics? There's more at stake.

We continue to point out that the forgetfulness of Goethe's contributions to the teaching of optics in Brazil cannot be justified simply by the existence of such errors, nor by the positions that Goethe and a certain portion of German scientists had. In the foreground, the reactions to his highly controversial speech, which takes in its entirety one of the three parts of the “Doctrine of Colors”, were relentless and resulted in true contempt from the scientific community of his contemporary and subsequent decades. Secondly, physics teaching has not only forgotten Goethe, it has forgotten the experimental study of color, the history of color studies, and the development of color theory. It is common to leave the contributions of “big” names to this topic in the background to the detriment of those that “impacted” more on the development of physics (for example, the works on colors by Young, Maxwell, von Helmholtz, Schrödinger on optics did not gain as much prominence compared to other research in other areas of physics). Contrary to these trends, we believe that sharing those experiences at this meeting may strengthen the certainty that the teaching-learning of color in physics classes can provide aesthetic, experimental and scientific development to individuals and instigate critical thinking. After all, the history of light and colors is full of controversies. The one between Goethe and Newton is certainly one of the richest.

**Keywords:** Johan Wolfgang von Goethe; Color on Physics; Color Education; Optics teaching

# Research on the Correlation and Implementation Path of Children's Sense of Belonging in Color Education

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## Abstract

This study focuses on children's color education and aims to deeply analyze how color education effectively cultivates children's sense of belonging, especially focusing on the four core elements of belonging: relevance, participation, identification, and consistency. We adopt a research method that takes "cultural belonging, community belonging, and school belonging" as a progressive level. By implementing color education, children can gradually establish a deep emotional connection with culture, community, and school while acquiring color knowledge.

In our research, we pay special attention to the inheritance and promotion of traditional Chinese color culture. Through carefully designed textbook content, we integrate traditional color knowledge into modern teaching, allowing children to appreciate the charm of traditional culture while feeling the unique beauty of color. At the same time, we organize children to carry out community color awareness activities, perceive the beauty of community colors through personal experience, enhance their sense of belonging to the community, and enhance their participation and consistency.

In addition, we actively guide children to participate in campus design activities, encourage them to use their color knowledge to add color to their campus, experience the joy of creation, deepen their sense of identification and belonging to the school, and further strengthen their connection with the school.

This study aims to explore how to design color education programs tailored to the learning styles and interests of children, in order to effectively enhance their sense of belonging. We focus on how color, as a visual element, can become an important link for children to establish close connections with the world around them through active participation at different levels such as the country, community, and campus.

Through this study, we hope to delve deeper into the intrinsic connection between children's color education and a sense of belonging, especially how color education affects the four core elements of a sense of belonging. This will provide more specific and in-depth theoretical support and practical guidance for children's color education practice, thereby promoting their comprehensive development.

**Keywords:** Children's color education, sense of belonging, implementation path



## The Canarymeter: The Power of Colours in the Serinus Canaria Kingdom

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### Abstract

Flowers provide one of the most spectacular variations in terms of colour semiotics, with a great range of tones from white to black. In addition to this variety, the contrast with the green pigments derived from chlorophyll is added. In the animal kingdom, birds also allow a multicoloured variation of their colours, especially the household canary.

Around the year 1600 a flock of small songbirds, *Serinus Canaria*, was brought from the Canary Islands to the European mainland. When reproducing in the domestic environment, some chicks began to have different feather colours from their parents, called mutations. By 1709 there were already 28 mutations recorded.

According to the Ornithological Federation of Brazil, the colour of a household canary is made up of three basic components: Variety, Type, and Category. The Variety comprehends six background colours: Recessive White, Dominant White, Yellow, Ivory Yellow, Red, and Ivory Red. The Type comprehends four colours: Black Melanin, Brown Melanin, Pheomelanin, and Lipochromic (Non-melanic). The Category is represented by Intense, Snowy, Male Mosaic and Female Mosaic. In addition, canaries can exhibit oxidations, which lighten, darken or pulverize melanin in feathers: Cobalt, Eumo, Jasper, Mahogany, Onyx, Opaline, Pastel and Topaz. Canaries can also have red eye colour, beaks and feet, as well as yellow beaks. In principle, all these characteristics can be combined, which does not allow us to estimate the rising of new mutations. The set that makes up the colour of a canary is called Nomenclature, and each canary has its own nomenclature.

Lipochrome is a carotenoid of plant origin that, after being metabolized, is deposited in the feathers. In the plumage of canaries there are only two types of lipochrome, yellow or red. Lipochrome can be deposited throughout the plumage of canaries, extending to the ends of the wings and tail, or being deposited only in certain regions of the plumage.

Eumelanin can be black, brown, or pheomelanin and is deposited in parts of the plumage, forming the design and wrapping, and in the eyes, feet, and beaks. Pheomelanin is deposited mainly on the edges of feathers.

A particular colour canary is identified by its nomenclature, such as Agate Red Male Mosaic.

This article shows in a clear and simple way the process of formation of more than 800 colours of canary currently and officially approved for evaluation and competition according to the international norms foreseen in the World Ornithological Confederation, and present a system for identifying the colours of domestic canaries, called Canarymeter. The Canarymeter is a figure that presents all the nomenclatures of the colours classified by the Ornithological Federation of Brazil. In it, the creator identifies all the possible variables of the colours that a given nomenclature contains.

The Canarymeter, regardless of how many types, varieties and categories that may exist, can be updated constantly, replacing a huge list of colours and making life easier for breeders who don't need to memorize a huge list of canary colours.

**Keywords:** *Serinus Canaria*, Household Canary, Canarymeter, System of Colours.

# Inclusive Beauty: A Multidisciplinary Approach to Designing a Nail Polish Collection – Colorama Introduces ‘nude da sua cor’

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## Abstract

In a country where it is possible to find 55 out of the 66 skin tones mapped in the world, there is a need to develop products that cater to all tones appropriately. This study focuses on the development of Colorama's "Nude da Sua Cor" nail polish collection, aiming to provide a comprehensive range of nude shades that align with future trends and address the growing demands for diversity and representation in the beauty industry. To ensure the utmost precision and relevance of this collection, a multidisciplinary approach was adopted, involving experts in design, marketing, product development, diversity and inclusion, personal coloring, color science, and consumer science.

The project was structured into four phases, each employing specific methodologies for product development. The first phase focused on contextualizing and conducting market analyses, which entailed a comprehensive examination of global color trends, followed by a thorough evaluation of the competitive market landscape and the brand's existing portfolio. Furthermore, an assessment of colors utilized in previous collections was conducted, taking into consideration both consumer preference and performance metrics derived from sales data analysis. Based on the insights gained from this evaluation, the criteria were established for the selection of shades to be included in the collection. The primary objective was to encompass the three fundamental undertones (warm, cool, and neutral) and the three primary contrasts (light, medium, and dark), thereby resulting in a set of nine nail polishes for the collection.

As the second phase, to ensure the representativeness and suitability of the chosen shades, we utilized a Pantone tool with a spectrum of nude shades to verify the accuracy and harmony of the selected shades and techniques such as nail color analysis on volunteers across various skin tones. The Colorama Lab team also employed a spectrophotometer for LAB color space readings, ensuring that the choices aligned with the established criteria. From a pool of 138 tones, a process of experimentation and combination was undertaken to narrow it down to 25 shades, aiming to achieve the broadest spectrum possible. The laboratory team then focused on developing these selected tones, which were subsequently tested on a group of volunteers. Finally, after careful evaluation, nine definitive tones were established for the collection.

In the third phase, it was recognized the significance of not only the shade itself but also the associated name. To address this, a collaborative decision-making and naming workshop was conducted in partnership with AfroSOU, L'Oréal's racial affinity network. This workshop generated a diverse range of naming possibilities specifically tailored to the collection. By embracing the wealth of perspectives and insights from this diverse group, we ensured that the final phase involves an innovative launch campaign. This campaign aims to seamlessly connect Colorama's authority in color with the evolving needs of consumers. In conclusion, the result is the 'Nude da Sua Cor' collection, consisting of 9 unique shades carefully chosen to perfectly adapt to different skin tones, further enhancing the brand's commitment to inclusivity and self-expression.

**Key words:** Diversity and inclusion, Color, Consumer Products, Nail polish, Nudes.

# The Effect of Reading Background Colour on Human Cognitive Performance Based on Multi-modal Data Analysis: A Study of Gender Differences

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## Abstract

In the current global context, characterized by a significant increase in available information, individuals are exposed to a substantial influx of data in their daily lives. This trend has led to a growing necessity for individuals to enhance their cognitive abilities to effectively process and manage the abundance of information they encounter. Supporting this, previous research has indicated that proficient cognitive abilities can assist individuals in understanding and processing information, thereby contributing to their physical and mental well-being.

Additionally, colour, as a key element of the human cognitive system, has demonstrated a notable impact on information processing. However, the effects of reading background colour on cognitive performance remain underexplored. Therefore, the primary objective of this study was twofold: firstly, to investigate whether different reading background colours affect human cognitive task performance, and secondly, to examine the specific mechanisms underlying this effect.

To address these objectives, eight low-saturation colours were selected in the CIE LAB space. Forty-two participants (21 males and 21 females) were recruited and placed in a dimly lit experimental room equipped with a standard colour imaging monitor. Task response times, accuracy rates, fNIRS data, and eye-tracking data were collected to assess participants' cognitive performance across different reading background colours.

The results revealed significant gender differences in human cognitive performance across different reading background colours. Specifically, the cognitive data indicated that overall response times were faster for female participants than for male participants ( $p = 0.011$ ), especially on the grey background ( $p = 0.031$ ). The physiological data of the fNIRS showed that male participants exhibited higher activation in the DLPFC-L/R brain regions associated with working memory and executive function ( $p=0.015$ ), the FPA-L/R brain regions related to higher cognitive functions and decision-making ( $p < 0.001$ ), and the FEF-L brain region linked to visual attention ( $p = 0.003$ ), for instance, male participants showed greater DLPFC-L ( $p = 0.024$ ), FPA-L ( $p = 0.004$ ) and FPA-R ( $p = 0.011$ ) activation on an orange background, and increased FEF-L ( $p = 0.011$ ) and FPA-R ( $p = 0.049$ ) activation on a blue background. Furthermore, the eye-tracking data suggested that female participants had longer average fixation durations ( $p < 0.001$ ), especially on a red background ( $p = 0.015$ ), while male participants had a higher number of fixations ( $p = 0.012$ ), particularly on a blue background ( $p = 0.03$ ).

**Keywords:** reading background colour, cognitive performance, multi-modal data analysis, gender differences

# Anish Kapoor: The Use of Red and Black between Materiality and the Void

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## Abstract

Anish Kapoor, a contemporary Indo-British artist, has an extensive body of work that explores various themes such as the sacred, the void, and the body through a dialogue with sculpture and an array of materials including pigment, wax, and PVC. Creating artworks that range from small pieces to large scale, Kapoor expresses dense conceptual poetics through color in relation to space.

In recent decades, the artist has increasingly focused on works that emphasize corporeal intensity through visceral elements, a trend that has become more prominent since the mid-2010s, encompassing both paintings and three-dimensional pieces. Concurrently, another central theme in Kapoor's oeuvre, the void, has been explored in recent years through series such as "Non-object (Black)", which utilize Vantablack technology, an industrial material absorbing over 99% of reflected light.

These two bodies of work, which address both visceral materiality and the black void, occupy the same poetic and chronological space in Kapoor's *oeuvre*. This article aims to establish a relationship between the visceral and the void through Kapoor's utilization of red and black in such artworks. Additionally, the concepts of abjection as proposed by Julia Kristeva, in dialogue with interpretations by Hal Foster, will inform the discussion alongside other critical perspectives from scholars such as Homi K. Bhabha, Daniel Arasse, Maurice Merleau-Ponty, and Georges Didi-Huberman.

These works and their engagement with color, void, and materiality will be analyzed based on the author's visit to the "Anish Kapoor" exhibition, held at the Gallerie dell'Accademia and Palazzo Manfrin in Venice in 2022.

This exhibition marked the public debut of the "Non-object (Black)" series, deepening the discourse on the void within Kapoor's work in direct interaction with the audience. Simultaneously, a significant selection of his artworks exploring the visceral and material aspects were also presented, offering not only a closer examination of these pieces as a poetic unity but also fostering an appreciation and aesthetic connection that reconciles these two thematic strands – the void and the materiality – through the mediating influence of color and its capacity to delineate space both within and outside the artwork.

A conclusion that can be delineated in this article is that the relationship between the void and the materiality is not mutually exclusive, and, as the use of color will demonstrate – more than the physical scale or the space that the artwork is installed – what truly brings the perceptual relationship between the void and the materiality together is the phenomenological space, which creates the *in-between* or a third space. Such space is, as the article intends to elucidate, only brought forward by color.

**Keywords:** Anish Kapoor, void, materiality, contemporary art, phenomenology

## The Colors of the Movie “Poor Things”: Yellow is Power

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### Abstract

Poor Things is a film that follows Bella Baxter (Emma Stone), a young pregnant woman who committed suicide and was brought back to life by scientist Dr. Godwin Baxter (Willian Defoe). To save her, however, it was necessary to exchange the adult brain for that of the fetus, making Bella a unique woman, a child in an adult's body.

The film's cinematography is quite peculiar and this is the first film with sections recorded with Kodak's new negative, Ektachrome with color reversal, a negative that allows for high saturation but maintains skin tones and grays at interesting levels for verisimilitude. To further highlight the moments in which this film negative was used, the photography direction chose to divide the aesthetic concept into three distinct moments, using three different types of negatives. The first part of the film, all in black and white, uses the Eastman Double-X Black and White negative, the development of the film uses Kodak Ektachrome with color reversal, as already mentioned, and the final sequences of the film rely on the most sober and less saturated Kodak Vision3 500T. The purpose of this text is to unravel the reasons behind the choices of these negatives for these three moments of the film, to understand the symbolic choices of colors along with the development of the film.

The art direction of the work is carefully concerned with establishing the main chromatic concepts of the film, and an analysis of the colors of this work necessarily moves between the colors of the main character's costumes. Therefore, in order to carry out an accurate color analysis of the film, we will also look at the costumes and art direction choices. The three main colors used by the protagonist (excluding the black and white sequence) are yellow, a light blue, and a light pink, an obvious reference to the three primary colors for pigments, magenta, cyan and yellow. Yellow in particular carries several symbols and is the most present color in the entire film, being associated with the most striking moments of the work. Our intention here is to observe and analyze the use of this specific color in more depth, comparing it with the use of others and understanding how colors help tell the story of the film.

Yellow appears in the film at important moments in the protagonist's discovery of the pleasures and annoyances of life. Wearing yellow and being around yellow scenes are signs that the film will show the character's evolution towards maturity. Observing the different moments in which this happens in the film will be the main point in the development of this article, but we will deal with other colors for comparative purposes with yellow, thus covering the entire work.

**Keywords:** *film, color grading, look, cinema*

# Cultural Landscape and Urban Polychromy: Analysis of the Landscape's Chromatic Identity

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## Abstract

The *Chromatic Identity* of landscapes concerns the way natural and applied colors are present in the landscape and their relationship with the involved cultural group. The current scenario of globalization, with its tendency towards the homogenization of lifestyles and cultural values, has introduced new challenges to safeguarding the chromatic identity of landscapes shaped by traditional social groups. The loss of chromatic identity is a reality in Brazilian historical centers and traditional settlements. Characterizing this chromatic identity with suitable methodologies can potentially support coherent planning strategies for the local urban polychromy, contributing to safeguarding landscape typicalities.

Our study aims to a) review conceptions involved in understanding chromatic identity such as notions of environmental aesthetics and cultural landscape and b) organize and apply a method to assess the chromatic identity of landscapes. The method is applied to a fishing village located on the shores of Dos Patos Lagoon, in the city of Pelotas, Southern Brazil.

The developed method organizes the understanding of Chromatic Identity into three dimensions: Content, Structure, and Dynamics. Firstly, *Chromatic Content* concerns the analysis of the physical characteristics of colors: a) the colors of different elements of the landscape, natural and anthropic; b) the examination of scale and observation distances, and c) the chromatic attributes of colors (hue, luminosity, and intensity) for each type of element. Secondly, *Chromatic Structure* describes the types of positioning and distribution of colors in the landscape elements and is observed on a general and local scale. Lastly, *Chromatic Dynamics* comprise the assessment of changes in chromatic content and structure over space and time.

The results of the method application indicate that the symbolic universe of artisanal know-how observed in the local landscape is closely linked to the techniques and instrumentation of artisanal fishing. The chromatic identity of the studied area presents a pictorial ambience with certain patterns of color use characterized by the contrast between elements of natural and urban landscapes. The use of intense colors on boats – necessary to ensure their easy visibility on the lagoon and sea – seems to define the aesthetic conception of the residents. The painting of building façades and the decorations based on colorful elements and flowering courtyards follow this trend. Additionally, the installation of clotheslines along street spaces incorporates clothing as a visually colorful element from the public urban environment.

The proposed method and application contribute as a counteract to the scenario of cultural standardization presented in Brazilian human settlements through the consideration of the historical and cultural role of color. Our study also invites professionals and researchers to reflect on the introduction of analytical approaches focused on local specificities of settlements rather than mainstream perspectives.

**Keywords:** *Chromatic Identity, Cultural Landscape, Urban Polychromy, Fishing Village*

## “Los Ríos en Colores”: Color Chart from the South of Chile

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### Abstract

The “Los Ríos” Region, in southern Chile, has an exceptional landscape from the Pacific Ocean to the Andes Mountains, with 63 rivers, 11 lakes, different types of vegetation, soils and skies that change color with the seasons, the weather and of course during the day.

This extraordinary geography and landscape give the region a characteristic chromatic atmosphere, the result of the interaction of all its colors and lights. However, it is not possible to study this phenomenon completely from a single discipline. For this reason, an interdisciplinary team of scientists and designers has been created, with the aim of investigating the color of the region, to create a color chart with its own identity.

We have made trips throughout the region for a year, to collect and measure colors with a colorimeter and by visual comparison, with the NCS chart and the Munsell chart. We have measured the colors of the waters (ocean, rivers, and lakes), the skies and the plant and mineral material existing in these landscapes. We have documented each color in a database, with all its relevant information. We have also made watercolor sketches, as a subjective and artistic interpretation of reality.

From the more than 200 colors obtained, we have created 40 color palettes based on relationships of harmonies and contrasts. The results of the project have been exhibited in an art gallery, on social networks and on a website, and 3 workshops have been held for children and adults, with the aim of introducing both the final color chart, the color palettes, and the entire process of collecting and cataloging samples.

This color chart is a first exploratory step to create a methodology capable of collecting the colors of a territory in an interdisciplinary way. Finally, we hope that this color chart and its palettes are a contribution to all those creative disciplines that work with the identity of a territory, since color is an unavoidable means of expression of creative work.

**Keywords:** *color, color chart, landscape, interdisciplinary.*



# Color, Design, and Poison Dart Frogs

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## Abstract

The paper presents findings from interviews with ground-breaking color professionals to reveal ways color is foundational in the creative process—from project conception to ideation to implementation and evaluation. As an anchor for discussion, the interview questions scaffold around the multifaceted color strategies of aposematic poison dart frogs.

The participating trailblazing color professionals embody a diverse group of international leaders in the field of color such as an Emmy award-winning production designer, a Harvard color conservationist, two Sikkens color prize winners, a preeminent color neuroscientist, an expert in design for colorblindness, a color data analyst using AI, a distinguished color forecaster, a premier indigo grower/artist, cutting-edge product designers, a kintsugi artist, the planetary scientist who created the camera that took the first color photographs in space, and others. Moreover, an interview with an expert on ectotherms outlines the many color strategies critical to the survival of poison dart frogs.

Discussion includes how and when color is used in stages of work and why color is important to the process and result. Color methodologies explored include similarities and differences of color use by interviewed professionals and poison dart frogs. These methodologies include employing color to allure, protect, deceive, and evolve.

The paper elucidates ways in which color can be used with intention to creatively solve problems. The findings illustrate color's role in the creative process across many industries and demonstrate color's impact on cross-disciplinary decision making on a global level.

**Keywords:** *color in design, color and consumer product, color and process, color in industry*

## (Post)humans and Technology: Exploring Colour Stories of Metaverse Images by International Media Outlets

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### Abstract

In a time characterized by rapid technological advancements and an increasing interconnectivity, the visualizations presented by media outlets hold significant societal and academic value as they offer a window to the public into the emerging technology of the Metaverse, generally defined as an interconnected, immersive world that bridges the physical to the virtual. This study conducts a visual content analysis of images and their colour palettes sourced from twelve international news websites and online magazines. The research focuses on the images' themes and respective colour palettes, including contrasts, saturation, and tonal balance. The main aim of this research is to explore the visual themes and colour stories that international media outlets use to depict the relationship between humans and technology in the context of the Metaverse. Specifically, it seeks to identify and analyse visual changes from the period following the launch of Meta to one and a half years later, to understand how media visualisations of the Metaverse evolve over time. The study examines themes relevant to human-technology interaction and the role of colours in shaping public perception and communication. Insights from scholars such as Haraway and Hayles are utilized to frame the analysis within a posthuman context, where the interplay between humans and technology is a central subject.

The findings illustrate the intensification of the human-technology relationship through three distinct aspects. The depiction of VR headsets highlights the blurring lines between humans and machines, illustrating the integration of technology into daily life. Images showcasing AR headsets emphasize the transformative effects of merging physical and virtual realities, reflecting the ongoing evolution in human-technology interaction. The portrayal of cyborgs, robots, holograms, and advanced artificial intelligence underscores the evolving boundaries between human and non-human entities, with specific colour choices reinforcing the posthuman narrative. The colour stories extracted from the media images play a crucial role in conveying the emotional tone, aesthetic appeal and conceptual aspects, influencing how humans interact and may continue to interact with emerging technologies. The analysis reveals that while certain themes and colour palettes persist, the concept of the Metaverse remains complex and dynamic. Both media images and their colour stories contribute to shaping the public understanding and cognition of the Metaverse, affecting how humans perceive and interact with emerging technologies. This study contributes to a deeper comprehension of the evolving relationship between humans and technology and may inform future technological innovations and cultural perceptions.

**Keywords:** Metaverse, posthumanism, colour stories, colour analysis

# Color in Cultural Landscape: Cross-cultural Differences in Strategies for Constructing Harmonious Color Combinations

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## Abstract

In cultural landscapes, we most often deal not with separate colors, but with color combinations. When choosing a color, we usually try to "fit" it into an already existing color context, making the new color combination harmonious. Yet are the "laws" of color harmony fundamental to our shared cognitive architecture, or are they cultural products that vary from country to country? To answer these questions, we conducted an experiment which involved 2,247 participants, aged between 16 and 84 and coming from 52 countries. To create experimental stimuli, we used 10 color combinations composed by the Russian avant-garde artist Mikhail Matyushin and his disciples for the *Reference Book of Color* (1932) based on the shades typical of the architectural design practice – yellow ochre, light umber, light ochre, and burnt umber. We removed from each of the selected color triads the "intermediary" linking color, and asked participants to adjust the color of this band according to their liking.

Our analysis of 11,235 color choices enabled assessment of cross-cultural differences in: the projections of color choices into the CIELCh color circle; the frequency and predominance of colors with specific attributes (hue angle ( $h^\circ$ ), chroma (C), and lightness ( $L^*$ ); and the "geometric" properties of the color triads plotted in the CIELAB color space.

Our experiment showed that when choosing shades from an almost infinite number of possible options, participants from different countries tried to coordinate these choices with the shades already present. Moreover, the chroma (C) of the chosen colors correlated with their lightness (L) and hue angle ( $h^\circ$ ). The higher the C-value, the lower the lightness. Reddish colors, oranges, and purples had greater chroma than green colors. Blue-green colors had the lowest chroma. Another universal strategy was the intuitive choice of a color at approximately the same distance in the color space from the two already given. Thus, in the three-dimensional CIELAB space, the resulting triangles turned out to be isosceles or even equilateral. Along with universal patterns, we recorded noticeable cross-cultural differences in strategies for constructing harmonious color combinations. We demonstrate visually that color triads in different cultures have a different "geometry" in CIELAB color space and on the CIELCh color circle. The most culturally specific are the ratios of angles and side lengths formed by given and selected shades in the CIELAB color space, as well as the areas and types of triangles determined by the color choices. A comparative analysis of color choices according to these parameters confirms the cultural conditioning of the mechanisms of perception, processing, and multimodal integration of color information.

**Keywords:** color combination; color triads; color harmony; online experiment; CIELAB

## The Role of Aesthetics and Color in Sustainable Textile Practices

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### Abstract

This paper explores the role of color in enhancing sustainability and longevity within textile and fashion design, grounded in the Sustainable Consumption and Production framework. It underscores the importance of extending product lifespans and deepening user attachment through the strategic use of color, which goes beyond aesthetic enhancements to foster emotional connectivity and promote sustainable consumer behaviors.

The study employs a qualitative analysis of four case studies from the Swedish School of Textiles, each demonstrating how the integration of color not only boosts product appeal but also supports environmental sustainability by influencing user behavior and attachment. Maelis Ray embraces a dynamic and adaptable approach to designing transformable textile products that promote longevity and sustainability. Ray's minimalist approach, using a limited color palette, enhances the longevity of the textile's aesthetic appeal. This makes the textiles adaptable to changing spaces and styles, reducing the likelihood of aesthetic fatigue. Mia Lehtonen Madsen's collection demonstrates how integrating personalized color palettes and traditional garment structures can enhance the emotional and functional value of wearable textiles. By creating versatile and engaging designs, Madsen's pieces foster deep user attachment and promote sustainability through prolonged use. Luna Gil's 'Seen-UnSeen' collection demonstrates how integrating interactive storytelling and thoughtful color choices can transform textiles into powerful mediums for raising awareness and fostering emotional connections. By engaging users through visual narratives and interactive elements, these textiles promote prolonged interaction and deeper attachment. Emilie Palle Holm's 'Orioli' collection shows the profound impact that thoughtful design and color integration can have on textile products. By creating interactive and visually dynamic textiles, Holm enhances their aesthetic, emotional, and functional value, promoting prolonged engagement and deeper user attachment. These cases reveal diverse methodologies for incorporating color within design processes to achieve greater product longevity and reduce environmental impact.

The discussion emphasizes that while current industrial practices often prioritize speed and cost-efficiency, leading to reduced product life cycles, a deliberate application of color can effectively counteract these trends by enhancing both the functional and aesthetic durability of textiles. This approach positions color not merely as a decorative element but as a strategic tool that plays a crucial role in fostering sustainable production and consumption patterns.

This study advocates for ongoing research into the effects of color on user attachment and product lifespan, calling for a wider integration of sustainable color strategies within design curricula and industry practices globally. Through this, it contributes to a deeper understanding of how color can be leveraged to encourage more sustainable practices in the textile and fashion industry.

**Keywords:** Color communication, textile and fashion design, longevity, sustainability

# Effectiveness of Real Appearance Images and Characteristics of Building Images that Alter Impressions

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## Abstract

The appearance of building surface colors changes depending on the surface characteristics and lighting conditions. Impression-evaluation experiments should be conducted using images representing the appearance of buildings in various lighting environments to reveal the impact of these visual changes on impressions. However, reproduction of the same luminance distribution as that in actual scenes is impossible because of limitations in monitor brightness and latitude.

The real appearance image (RAI)-based method proposed by Y. Nakamura has the capability to reproduce a realistic appearance by altering the image brightness while retaining contrast features in the distribution. Two experiments were conducted to assess the effectiveness of this method.

Experiment 1: Changes in impression based on two significant alterations during RAI creation

The impressions of twenty building photographs displayed on the monitor were evaluated by 19 participants by using sixteen 7-point bipolar scales. The assessed images included photos acquired in auto mode and RAIs created by varying the maximum brightness and compression coefficient, resulting in 70 images.

Experiment 2: Comparison of RAIs and on-site building impressions

Fifteen participants first evaluated the on-site building impressions. Subsequently, twenty participants evaluated the building RAIs composed of multiple photographs with varying shutter speeds. The evaluation scales are the same as in Experiment 1.

The main results of the two experiments are as follows:

Experiment 1: Three factors were interpreted as the main contributors to changes in impressions.

- (1) Changes in the reflective characteristics of the wall surface associated with the overflow from the latitude of the monitor.
- (2) Changes in overall wall surface brightness.
- (3) Changes in the partial darkness of wall surfaces not exposed to direct sunlight.

Experiment 2: The differences in evaluations were significant, reaching approximately 2.0 in certain instances. Obtaining equivalent impression evaluations for on-site evaluations is challenging, even when using RAIs.

Significant features of the images with substantial evaluation differences are as follows:

- (1) Images depicting reflections on metallic wall surfaces or overall wall reflections appeared to receive higher on-site evaluations than those on RAIs for most impressions.
  - (2) As regards images with subtle reflections on calm wall surfaces or with reflections of the sky, evaluations of vividness and brightness were higher as compared to on-site evaluations.
- Additionally, scales representing impressions derived from overall perception, such as preferences, tranquility, and beauty, show a smaller disparity between on-site evaluations and RAIs as compared to the inherent characteristics of the building surface. This suggests that the evaluation process focuses on the building itself rather than its appearance.

**Keywords:** *real appearance image, impression, lighting environment*

## The Communication of Colors in Interior Design: An analysis of the covers of The World of Interiors Magazine from the 1990s, 2000s and 2010s

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### **Abstract**

This article demonstrates the use of cores in domestic interior space through the analysis of the covers of The World of Interiors magazine, in London, United Kingdom. The analysis was carried out based on the composition of the space and the use of cores from magazines from the 1990s, 2000s and 2010s. In this way, it was possible to understand behavior within the domestic space, core palettes for decades and the way communication These trends happen from these covers. To this end, a literature review and explanation of nuclei and their characteristics were carried out, thus enabling an understanding of how nuclei behave in them. Finally, it was possible to understand the colors, the spatial compositions based on them and the behavior of domestic interior spaces.

**Keywords:** *Interior Design, Spatial Composition Trends in Interiors, Color Trends.*

# Chromatic Metaphors: Red as Green among Bahrain's Sunni and Shi'a Landscapes

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## Abstract

Based on remote fieldwork in urban/peri-urban areas across the Kingdom of Bahrain, the paper investigates the presence and perception of red and green among Shi'a and Sunni Muslim religious spaces. Proposing the concept of "chromatic metaphor," the paper argues that Sunni spaces seek to use red as a metaphor for green, an essential colour of Islam. In Bahrain, green is often associated more specifically to the majority Shi'a community and, by extension, to forms of resistance to the Sunni-led state. The paper examines this chromatic phenomenon, by collecting photographic material of Islamic spaces across Bahrain (from street-level and interior views to satellite imagery) and utilizing methods of colour analysis and classification to observe this situated association between red and green.

In Bahrain, the definition of landscape is commonly perceived as the contrast between a constructed green against an arid indigenous environment. As a small and self-contained city state encompassing a diversity of urban to regional environments, of hues of green and perceptions of landscape, Bahrain becomes an intriguing place for investigating broader social, cultural, environmental, and political positionalities of colour. Green, perceived here as a synecdoche for *landscape*, is positively reinforced in the built environment in the form of urban greenery to address the country's aridity but also broader political and social intricacies. As a dense condition of histories shaped over the millennia, Bahrain has culturally been associated to green, long viewed as a green oasis amidst the beige landscapes of the Arabian or Persian Gulf. This reputation is influenced by the geography of Bahrain as the land of 'the Two Seas' (*al-Bahrain* in Arabic), referring to the Gulf that surrounds the archipelago and the major presence of underground springs that resist the persistent aridity of the land.

This paper will offer an intricate perspective on colour, investigating its capacity to convey broader social, cultural, environmental, and political positionalities and aspirations. By identifying the presence and perceptions of the highly politicized colours of red and green in Shi'a and Sunni spaces, this research calls for a greater awareness of colour in the theory of Landscape Architecture and political ecology, recognizing its broader social, political, and environmental implications and opportunities of colour for landscape and the built environment.

**Keywords:** Bahrain, chromatic metaphor, green, Islam, red



## Material and Color Mood Boards for Birth Space Designs

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### Abstract

In the last sixty years in Spain, obstetric care has changed from a model of home care to hospital care, making the birth process much more technical, but with a significant loss of warmth and intimacy. For this reason, there is interest in reversing part of the model, betting on improving the birth experience, prioritizing the mother, the child, and the professionals who participate in the process, from the perspective of gender, accessibility, and safety of care.

In the field of architecture and interior design, there is evidence of the importance of the physical environment in childbirth, which is a unique and unrepeatable experience in the life of every woman, couple and family. Scientific literature highlights some physical features and sensory requirements that contribute to positive experiences and satisfaction (Bellini et al., 2023; Murray-Davis et al., 2023), with particular attention to color and light in birth space design (lit. rev. in Balabanoff, 2023; Aroua & Hussein, 2019). Members of the “Global Birth Environment Design Network” (GBEDN) have developed interesting exploratory proposals for embodied birth environments, together with other tools for the evaluation and proposition of new birth spaces (Balabanoff, 2017).

The objective of this communication is to show and discuss some material and color palettes to be implemented in birth spaces, particularly in labor-delivery-recovery-postpartum units (LDRP) considering the recommendations extracted from the literature and the existing colors of a selection of LDRPs taken as case studies. These color palettes aim to be adequate to communicate subjective connotations influencing childbirth experience and recurrent in literature, such as the physical security, privacy, calmness, confidence, cosiness, etc. (Kazemi et al., 2023; Nicoletta et al., 2022). These new material and color palettes will be developed in the form of mood boards, to express some of the intended connotations and will be evaluated by a group of experts including midwives, women with a childbirth experience, architects and designers. This preliminary study is part of the project “Strategies and models for the improvement of security, functionality and user experience in birth centres” (GVA. INNEST/2023/93) within the Programme of Strategic Projects in Cooperation, financed by the European Union in the framework of the European Regional Development Fund (FEDER) and the Valencian Community.

**Keywords:** color, architecture, childbirth, interior design, hospital

## Chromatic Survey Methodology: Case Study of the Planalto by João Artacho Jurado

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### Abstract

The article discusses a methodology for a chromatic survey of claddings applied to mainly ceramic tiles in buildings. It focuses on the case study of the Planalto which is a Brazilian mid-twentieth-century architectural landmark signed by João Artacho Jurado. Planalto building stands out for the colorful emblematic and innovative tiles in its facades that are a few examples of objects of criticism to Artacho's ahead-of-time aesthetics. It also aims to identify the colors originally used in the Planalto's facades. Such a challenge exists because it was not common at the time to do chromatic registration of the claddings used. Without original color information, the local architects face challenges with the maintenance, preservation, and restoration of the building. Firstly, bibliographical research and several field inspections were made using Nix Color Sensor Mini 2 equipment for the chromatic survey. Such equipment digitally encodes surfaces and relates them to chromatic notation systems. Lastly, the data collected was transferred to a spreadsheet, to allow adequate analysis of the current state of the façade's colors and compare it to the ones perceived in the location. The chromatic survey was able to determine the color scheme Artacho proposed in its current state, as well as some older chromatic information that could be dated from when construction was finished. Plus, the survey is relevant for discussing optimal methods of chromatic perceptions in a building covered mainly by ceramic tiles. Due to the great variation in hue and saturation caused by the material's nature, technological differences in production, and the chromatic variations of nonidentical batches at different times, the number of measurements taken was proven insufficient. Thus, it is paramount to increase sampling to achieve more trustworthy results that might be able to better guide restorations of the building's facades. Final considerations also highlight surprising chromatic and design discoveries during the research process, such as the existence of original painted concrete elements, removed before the building was listed, and the partitive synthesis effect found in some colors of the main facades.

**Keywords:** *chromatic survey, claddings, ceramic tiles, Planalto Building, Artacho Jurado*

## Color in Architecture in the 21st Century, and the Manifestos and Programs of Architects in the 20th Century

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### Abstract

This text aims, based on some manifestoes and programs of architects, written in the 20th century and, based on premises of the current century, such as the advancement of material technologies, project development software that allows an almost photographic visualization of the work and even Artificial Intelligence, establish parameters that could constitute a new way of approaching and thinking about color in architecture.

One of the most important manifestoes, in defense of a modern, rational and functionalist architecture, in which color is seen as a mere ornament, was written by Hannes Meyer in 1928, then director of the Bauhaus. The position defended by him, represents how it is still being approached today in many architecture courses, responsible for training professionals who end up repeating patterns, understandable at that historical moment, but which today deserve to be reviewed. The Bauhaus, initially, had a strong influence from artists and architects who argued that colors should have a prominent position not only in the design of architectural projects, but in the training of students. Gropius, Taut and Poelzig signed a manifesto in favor of color in architecture in 1919, which Gropius would retract years later, adopting a more radical stance, where color no longer has space. On the other hand, other important architects will position themselves against this new trend defended by the Bauhaus, closer to the initial concepts, such as Otto Haesler, Frank Lloyd Wright, among others.

Mastering the use of color in architecture does not necessarily mean applying a variety of saturated hues, or as Meyer wrote that he hated chromatic variations, but controlling its contrasts, variations depending on the light, the three-dimensionality of the project and the relationships with the surroundings. Achromatics, if they do not carry the weight of the symbolic factors of hues, can reinforce contrasts and consequently alter the perception of volume. It is possible to specify the color without, as some claim, losing the potential for internationalization of an aesthetic in architecture, since shades can be loaded with cultural, symbolic and consequently regional aspects.

Color no longer has the function of falsifying coverings and construction materials, as the modernists condemned, since not all materials have a unique color that characterizes them. Concrete can be pigmented, paints, as Meyer recommended, do have the function of coating and protection, but not only that, as the project can also be characterized through colors.

The 21st century brought technologies for developing projects and materials that considerably reduce the limitations that existed until then. It is necessary to deepen research, disseminate studies and works, develop teaching methodologies that encourage experience and overturn dogmas, valuing color as an element that makes up architecture and the city, including perceptive, technological aspects, sustainability, the environment and why not, the aesthetic. We need to give color a chance if we really want to build a better world.

**Keywords:** *color and architecture, manifestoes and programs, givecolorachance*

# Immersive Space of Coloured Light

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## Abstract

The role of colour and light has been widely established in the comfort and mental health of people and especially of patients in medical institutions. The research project “Skylight” aims to reduce stress and states of arousal in the context of psychiatric environments with the use of multicoloured light. The systematic research approach and the evaluation of empirical data resulted in the design of an evidence-based prototype. A testing phase was carried out in a Swiss psychiatric hospital, where positive effects on well-being, using colour as a feature, can be demonstrated.

Through the course of the research implementation, the project combined the lighting concept with a personal and adjustable spatial solution. The installation integrates a modular curtain system that can be installed around various sizes of beds within the psychiatric hospital, enclosing the occupant and framing the lighting effect. Key elements include the movable floor lamp “Skylight” consisting of a large disk that has a direct and indirect light configuration; the direct light illuminates the disk, and the indirect light shines onto the walls and ceiling. Using the newest LED technology, different light settings were created, from warm to cold daylight and a variation of multicoloured scenes, enabling the patients to adjust the atmosphere of the space according to their needs. The preconfigured dual-coloured light settings create colour gradients in the space, as seen during sunrise or sunset. Natural light situations are used as a reference to program the light settings, and patients can use an app to choose atmospheric moods like “early morning”, “mild evening”, or “warm moonlight”.

An essential feature of the final design was its flexibility and the potential to change the configuration of the prototype by the patients until the effect of the self-perceived stress reduction was registered. Beyond the potential of painted spaces in such contexts, which allows only a limited amount of colour variation, the use of light as a material to colour a space shows great potential. The colour of a space can be easily adjusted to individual needs and times of the day as seen in nature. The evaluation of the prototype shows that the most preferred light settings are the preconfigured atmospheric scenes, with which the entire space is transformed into an immersive world of colour.

This interior design research project not only shows the importance of an evidence-based design approach to create human-centric spaces but also how much colour can influence the state of mind and overall well-being. The evaluation of the prototype through patient and user questionnaires demonstrates quantitative measurements and a large potential for the future implementations of coloured light as a therapeutic instrument and source of well-being.

**Keywords:** Coloured Light, immersive space, therapeutic instrument, individualization, evidence-based design

## Dorothy Draper: A Brazilian Chromatic Palette – Case Study of the Quitandinha Hotel

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### Abstract

This research is dedicated to the production of Dorothy Tuckerman Draper, considered the precursor of the interior decoration profession in the United States, at the beginning of the 20th century. Her office, established in New York City in 1925, continues to operate till today, being one of the oldest offices in the world. A fan of extravagant environments and the use of color, she was recognized for creating a style called “modern baroque”. She has published two books, “Decorating is Fun!” (1939) and “Entertaining is Fun! (1941) and both mentioned the issue of color application to interiors.

Dorothy Draper was invited by Joaquim Rolla, an influential Brazilian businessman, to design the interiors of the Quitandinha hotel in Petrópolis, in the mountainous region of Rio de Janeiro, in Brazil. The first contacts took place at the beginning of 1942 and the project was developed in her office in New York, but carried out by Brazilian artisans, having been opened in 1944. The hotel, which is still in operation today, was a landmark in decoration for the society at the time and preserves a relevant sample of the history of interior design. This work analyzes the chromatic scheme chosen by the American decorator, based on national and foreign literature, a technical visit to the site and a chromatic survey of the environments.

According to some authors, the forms of Brazilian Baroque architecture and the colorful flora served as a reference for the project. The literature suggests that Draper, in some way, had his work influenced by the experiences she had during his time in Brazil. Later, Draper started to sign a line of openly Brazilian-inspired products, such as cheerfully printed chintz fabrics and accessories. Considering the possibility of still having access to Draper's legacy, this research visits her production in an attempt to identify chromatic references from a palette that may provide evidence of a Brazilian chromatic identity.

**Keywords:** Dorothy Draper, Color, Quitandinha Hotel, Modern Baroque, Brasil

# Color Studies in Trauma-Informed Design in Spaces University Settings for Indigenous Peoples

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## Abstract

This research project builds upon a series of experimental color workshops addressing mental health, which has become a focus area for every institution educating young people. The three authors, two Caucasian immigrants and one member of the Navajo/Chicana Peoples investigate the impact of color in trauma-informed design strategies on mental health in the context of campus life. Building upon their professional and lived experiences, they examine if and how the framework of biophilic design could reduce instances that trigger trauma in the built environment and the role color plays within.

This transdisciplinary collaboration and design approach invites dialogue for sustaining human-centric design at various scales and across space and time. Respectfully encountering indigenous cultures in the visual landscape is tremendously important and can significantly impact how we navigate shared space and life. Indigenous culture's understanding of color and its meaning shows how everyday life is closely connected and focused on a human-scaled living environment. The circle, with a four-pattern communicated through color, symbolizes indigenous culture – the four directions, seasons, and stages of life. These elements of nature must connect to live harmoniously. Colors differ by community, and their connections to the elements differ in some cycles; however, they're about the balance of life. Passing on this from generation to generation is essential.

The biophilic design framework involves multilayered material and color research and inclusive design; therefore, it is a versatile design approach accessible to everyone. Through case studies, students will discuss the cultural impact of designing with color and the role of indigenous people in protecting their cultural achievements and heritage – nature, spaces, architecture, interior architecture, fabric, patterns, symbols, meaning, and color language. Many of these concepts are timeless and have never been equaled. That is why they are still relevant and still exist today. Where can we see their influence – where and how can we make traces visible? Guiding Research Questions:

- **What is the current impact of our indigenous cultural heritage?** Is the indigenous people's approach to color relevant today?
- **What are influential elements associated with color in the meaning of** human-centric design? How can we investigate a color-based framework?
- How will students be able to develop trauma-informed design strategies grounded in biophilia when creating a color and materials palette that addresses emotional well-being and mental health?
- What are the benefits and challenges of understanding color in trauma-informed design?
- What might lead to new understanding, ethics, and aesthetics advancing the practice?
- What methodologies should be embraced to innovate and stimulate color in applying principles within the framework of biophilic design?
- What challenges emerge when blurring and borrowing from multiple points of view?

Whether a biophilic design approach focusing on color is more legible than other design principles must be scientifically examined. However, the fact that it has become enormously relevant in contemporary design discussion, despite its nearly being forgotten, is essential to include it in Color Education. Our heritage is immortal and anchored in us. With an – for now – unconventional approach to color design and its relationships to life and with an understanding of a systematic approach to sensitizing, raising awareness, and balancing out the deficits we experience, color may be accessible – across borders.

**Keywords:** color in trauma-informed design, color in indigenous culture, color in human-centric design

## Urbanisms of Color: Exploring Communicative Roles and Evolutionary Trends

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### Abstract

From the social semiotics of color, society has widely used color for communication and expression across various domains such as art, fashion, and architecture. Theo van Leeuwen's seminal work further argues that color can be considered a semiotic mode in its own right for communication, akin to writing, speech, and painting. However, within landscape design, the communicative function of color has received comparatively less attention than other functions, such as decoration, orientation, and spatial effects. This study critically reviews the communicative role of color in landscape architecture, examining color as a rich repository of semiotic resources. From this perspective, color design in landscapes has been shaped by diverse communication demands and evolves with societal changes.

Over the past decades, urban landscapes have undergone a notable evolution in color expression, marked by the emergence of saturated hues and innovative applications. These vibrant palettes signify a departure from traditional norms, reflecting a global trend towards more diverse and expressive urban environments. By viewing color as semiotic resources, this paper introduces the concept of 'urbanisms of color', illuminating the profound social dimensions inherent in color choices within urban contexts. Urbanism encompasses the processes and outcomes of how urban inhabitants interact with various factors and relations in urban settings, whether physical or social. Urbanisms of color highlight the interrelationship between color and urban issues, suggesting that color is an integral part of the city and changes alongside it.

Through an analysis of landscape projects from recent decades, this study explores how shifts in urbanism have not only enhanced the communicative potential of color but also influenced its expressive functions in landscape design. Influential changes in urbanism, such as globalization and the prevalence of social media, have empowered colors in communicating and engaging communication in urban spaces. The emergence of saturated colors in urban and landscape design is not merely an arbitrary choice or a designer preference but rather a response to diverse social motivations, particularly in communication, arising in contemporary urban environments.

Ultimately, this research contributes to a deeper understanding of the intricate relationship between color, urbanism, and landscape design, emphasizing the transformative power of color as a communicative tool in shaping contemporary urban environments.

**Keywords:** color, communication, social semiotics, urbanisms of color



# The Role of Color in Adaptive Building Facades

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## Abstract

In the contemporary architecture, responsive and adaptive building skins have emerged as pivotal elements for advancing sustainability, energy efficiency, and aesthetic appeal in the built environment. This aspect was incorporated into the ongoing research project examining the ceramic adaptive envelope and its impact on indoor environmental quality at Sassari University (Italy). In the initial stages of this research, I identified a wealth of informative literature and data pertaining to the materials, building systems, design objectives, and response system of the adaptive facade. Nevertheless, it became evident that further analysis was required with respect to the color of the facade components and their requirements, in order to gain a more comprehensive understanding of the state-of-the-art regarding the color of adaptive facade.

The objective of this research is to examine the role of color in the project of contemporary adaptive facades as a strategic element influencing the quality of architectural and urban design. The literature review evidenced that the color choice of these surfaces is exclusively linked to the design intent. However, we know that the color of architectural surfaces significantly influences both the urban environment and the experiences of those who occupy the space, especially both in regard to urban heat islands (UHIs) and the perceived quality of the urban environment. One need only consider the role of color plans in historic centers to see this.

Identifying potential data and information for this research proved challenging, as there was a paucity of information about the color features and their performance for the adaptive facades.

In order to achieve our objective, we conducted a review of existing literature and analyzed case studies (of adaptive envelopes constructed in the 21st century) in order to ascertain whether there is a relationship between the color choice of the facades and the adaptivity characteristics. The objective was to collate essential data regarding the use of colored components in the design of adaptive facade systems. This was done in order to assist designers and technicians in the creation of high-quality, environmentally-conscious systems and in the process of making informed design decisions.

If the appropriate color choice for the facade components is made in accordance with the adaptivity requirements of the facade, it is possible to enhance the energy performance and environmental quality of the entire building envelope. In this initial research phase, it became evident that the optimal color choices are contingent upon a multitude of factors, including cultural local traditions, the local climate, the orientation of the building, and the specific adaptive facade technology employed.

This paper will present the findings of the initial study on the state of the art, which revealed that the color of adaptive facades is a multifaceted design consideration. While it is primarily linked to architectural design choices, it is not directly associated with environmental quality or citizen wellbeing. In recent years, there has been a notable increase in interest in green buildings and sustainability across the globe. However, in this research emerged that the study of color design for the purpose of enhancing energy efficiency and environmental quality remains a relatively underdeveloped area of investigation.

**Keywords:** *adaptive skins, color design, colored surfaces, environmental quality, color culture*

## Colors and Meaning Making: A Rhetorical Perspective

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### Abstract

This paper is a part of a book in process which focuses on colors and rhetoric and hopes to provide a more nuanced and rich way to understand the communicative role of colors in their context. By using rhetorical theories that focus on the elaborate ways in which a variety of texts (including visuals) shape meaning and impact, and by analyzing a paradigmatic case study, this paper hopes to explicate the connections between colors, culture, ideology, and emotions.

The case study chosen is an in-depth analysis of two different color palettes within the same geographical area: a monochromatic palette used in Beni-Brak, an ultraorthodox city, and a vibrant color palette used in a multicultural, multi-religious neighborhood in Jaffa. It analyses the landscapes including the outfits of those living there and integrates interviews with residents and local artists.

While some discussed the ways in which murals create a sense of place and identity, but most of these works did not delve into the color themselves. It seems obvious that the two palettes invite different forms of engagement in relation to place and identity but in what way?

A useful lens through which to explore this question is that of the visual argument and the ideograph. For the visual to be considered a form of argument rather than merely an image which evokes a spontaneous emotion, it must have a specific structure and should be linked to socially or culturally agreed upon conventions that audience members can recognize and fill in the blanks when needed (Birdsell & Groarke, 1997; Smith, 2007). Since colors are more immediate and intuitive than written arguments or even images, theory of a visual color argument would integrate rhetorical with psycho-physiological approaches. This paper also makes use of the rhetoric of cultural and religious tenets associated with said places.

The paper suggests that the palettes have emerged from two different world views that have recently come to a head in Israel. The ultraorthodox ideology is dualistic and contrasts the alleviated God with the mortal man, the sacred vs profane, sin - virtue, masculine - feminine, Jew - "foreigner." The black and white outfits, gray architecture and segregation between genders and communities are a part of the same binary ideology. Moreover, interviews so far revealed that kids in that neighborhood experienced more difficulties than secular kids in identifying various hues and tones.

The saturated murals and colorful walls in Jaffa are direct extension of the multiethnic and spectacularly gay environment there. Thus, the colors in Jaffa still convey an ideology (albeit different) and expresses an argument regarding the character of the neighborhood. Notwithstanding, the colorful has also play a role in localized branding efforts which complicates simplistic comparisons between tradition and postmodernity. Yet, insulation and creativity as well as dualism versus multiplicity are indeed represented by said palettes. Moreover, their use is often conscious and is a part of a culture war and meaning making efforts.

In other words, colors can become a form of a visual argument and understanding them as such could shed light on the ways in which colors communicate and shape bodies, minds, worldviews, and places.

# The Color Chart of Jalpan de Serra, Querétaro, Mexico

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## Abstract

Jalpan de Serra is a municipality located in the north of the state of Querétaro, in central Mexico. Currently it is the municipal seat and the most important economic center of the Sierra Gorda region, a protected natural area that is part of the Biosphere Reserves.

This town was included in the “Pueblos Mágicos” program in 2010 by the Ministry of Tourism of the Government of Mexico because it integrates the historical, cultural, and architectural heritage with the richness of the natural environment that surrounds it and characterizes it among unique landscapes.

An example of the above is the mission of Santiago de Jalpan, which stands out for the polychrome of its stuccoed façade in the mestizo Baroque style, inscribed on the UNESCO World Heritage List in 2003, as well as the Jalpan Dam that has been identified as a Ramsar site (The Ramsar Convention) within the Sierra Gorda Biosphere Reserve since 2004. This wetland of international importance is a vital refuge for birds migrating from the United States and Canada to Central and South America and for endemic species.

This communication tries to identify the original color, present in the municipality of Jalpan de Serra and its surroundings, through a qualitative analysis that was carried out within the framework of the research stay on the study of the polychromy of the façade in the mission of Santiago de Jalpan during two months of study.

The motivation for this study begins as part of the interest in the evident relationship between cities and color as a connection and influence between the social and the cultural that identifies the identity of a people. During the aforementioned period and through a visual chromatic analysis of the environment, it was observed how color manifests itself in architectures influenced by their own natural and material environment, as well as in everything that their society adds in everyday life to transmit certain cultural values.

During this work, a reading and a detailed study of historical-social sources was carried out, as well as fieldwork through a study of graphic representation and photographic reportage. Among other tasks in this project, surveys were carried out with residents to obtain information on the type of customs, ways of life and what kind of influence the use of color has for this population.

The observation, collection and analysis of data that has been carried out in this study has been possible to reach a set of conclusions about the importance of color in the built environment and the use of color as an intrinsic part in the city as a particular integration that represents this population. Finally, the possibility of creating a color chart that would identify and enhance this particular municipality as an essential and integrating part of its intangible heritage was studied.

**Keywords:** color, heritage, culture, Jalpan de Serra, Querétaro

## Color in between Art, Technoscience and Politics: The Vantablack Controversy

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### Abstract

This article studies a controversy in contemporary art, involving the development of Vantablack nanotechnology, a coating that has the effect of being non reflective to light, looking like a completely opaque black color, created by British company Surrey NanoSystems. British artist Anish Kapoor became interested in using it for artistic purposes and bought exclusive rights for artistic use, triggering a response from the art world, which criticized his monopoly. British artist Stuart Semple became the leading voice of discontent. He developed an alternative material, a paint called Black 3.0, which has a similar effect, although accessible, made with an acrylic and non-toxic base. He tried to make this special color accessible to everyone, except Anish Kapoor.

This dispute raises important questions about color. How is it possible for someone to own a color? If a color can be appropriated by someone, then, what is color anyway? Can we identify the materialities of color such as economical constraints, industrialization and access? Is it possible to create a new color? And what is Vantablack? Is it a material, a color or a paint?

To study these issues, we use theories of STS studies, like actor-network approach, material culture contributions and the study of technical media by Friedrich Kittler. We do a mapping, as suggested by Tomaso Venturini, identifying the main actors and the main controversies, writing an analytic description.

In this process we identified how in color studies there are many naturalizations and hidden conflicts, controversies about its concept, its materialities, its meanings. These disputes around the “blackest black” also show us that it is impossible to understand color as a complex phenomenon in disciplinary approaches. The history of the material must be looked through a multidisciplinary lens. To speak of Vantablack is to speak of contemporary art, journalistic media, social networks, nanotechnology, industry, activism, democracy, and so on.

The controversies that we identified influence the trajectory of the material, which assumes different ontologies. At the same time, it is influenced by the interventions and disputes of the other actors. These main actors (Surrey NanoSystems, Anish Kapoor and Stuart Semple) also change a lot because of their interactions to each other and the material.

Therefore, we conclude that the study of the controversies around Vantablack brings fundamental insights of how we can understand color in contemporary world, in a multidisciplinary way, combining the inseparable dimensions of poetics, technoscience and politics, which are in fact co-produced.

**Keywords:** Vantablack, color, technoscience, controversy, Anish Kapoor

# Contemporary Landscape Color Design and Its Origin in the Work of Roberto Burle Marx

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## Abstract

Color in landscape design is an aesthetic and affective matter that carries a potent social, commercial, and political agency. Over the past three centuries, landscape designers have experimented with color and lighting effects toward many ends – conceal undesirables, accentuate desirable elements, display social status, enhance the perception of space, produce moods, surprise, joy, and humor, create place identity, forge attachment to places, and critique stereotypes about color.

The use of landscape color followed shifting color design positions that were largely conditioned by four interrelated variables: (1) the most endemic to landscape design, opposing ideas of nature and art, (2) positions on color by related professions, such as art, architecture, and human and natural sciences (3) media technology in which color is conceived, represented, and conveyed, and (4) cultural stereotypes and consumerism. More recently, affective experience, politics of identity, branding, and digital culture and technology have had their upper hand in shaping landscape color. Contemporary cities and gardens teem with vast, brightly colored and glowing light surfaces that compete on social media. Color is central to the instagrammable and telegraphable appeal of space and performance on social media, where it serves to display identities, sell products, and/or amplify social-political statements in the hybrid real-virtual world we occupy.

In this paper I show that today's landscape color affinities owe much to the work of the Brazilian painter and landscape architect of Roberto Burle Marx. His artistic and instinctual passion for color and his ideas and techniques have continued to guide prominent postmodern and contemporary successors. I focus on the conceptual, technological, and cultural ingredients that shaped Burle Marx's landscape color designs. I then trace defining postmodern and contemporary landscape color design elements to his work. Burle Marx's landscape color moves and techniques – production of "color events" and light performances, dramatization of color through vast surface, volume, or mass, and his quest for a national and regional landscape identity – remain vital especially in today's intertwined experience in both the physical space and its virtual internet counterpart.

**Keywords:** *landscape and garden color design, political-cultural Identity, chromatic and lighting performances*

# A Critical Analysis of In-car Lighting Design and Its Impact on Driver Alertness under Nocturnal Conditions

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## Abstract

Driving at night presents greater challenges and risks than daytime driving, largely due to reduced visibility and the need for heightened attention and reaction capabilities (Abdulla et al., 2023). A comprehensive understanding of drivers' eye movements and how attention is distributed during nocturnal driving episodes is vital. Such insights could significantly inform the development and refinement of in-vehicle lighting technologies, enhancing safety in conditions mirroring night driving. Despite its importance, the understanding of drivers' precise gaze fixations and attention allocation under nocturnal conditions remains scant.

The ambient lighting within a vehicle's interior plays a pivotal role in influencing a driver's mood and attentiveness, factors critical to safe driving. Consequently, the investigation of in-car lighting colour schemes is of paramount importance. This study explores the prevalent colour choices in car interior lighting, utilizing a corpus of images acquired from the internet. We systematically compare our observations against the backdrop of established colour psychology, aiming to scrutinize the rationale and impact behind the selection of specific lighting colours within vehicles. Through the use of the Fatkun image downloader, we amassed a collection of 274 images, from which irrelevant material was diligently removed to ensure the focus and integrity of our analysis.

Employing MATLAB for data processing, we applied the K-means clustering algorithm to categorically identify and quantify the 10 most dominant colours featured in our dataset. This approach, aligned with human colour perception principles, allowed for the aggregation of colour data into coherent groups, facilitating the identification of predominant colour trends. Initial analysis revealed a preference for blue and purple hues in car interiors, a finding that necessitates a deeper exploration into the implications of such colour choices on driver well-being and vehicular safety.

Our research contributes to the broader discourse on automotive interior design, particularly in the context of night driving safety. By illuminating current trends in vehicle lighting colour selection and their potential psychological impacts, this study lays the groundwork for further inquiries into how strategic colour utilization within vehicles can enhance driving safety and overall passenger experience. This research will also provide a basis for coloured lighting selection for our experimental studies.

**Keywords:** car interior lighting, road safety, driver attention, human-centric lighting design

# Evolution of the 'Under New Direction: Performatic Catwalk' Methodology: Exploring the Neutrality of Gray Color in Design, Art, and Fashion

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## Abstract

In this paper, we explore the evolution of the “Under New Direction: Performative Runway” methodology, originally introduced in my doctoral thesis, which investigates the confluence between design, art, and fashion. Our innovative focus lies in examining the impact of color, with particular attention to the neutrality provided by the color gray.

Johannes Itten's theories on color harmony and contrast, along with Joseph Albers's analysis of chromatic interaction, serve as the foundation for our study regarding the influence of color (or its absence) on perception and emotion within the context of design and fashion.

We adopt a perspective that aligns with Massimo Canevacci's “maximum design”, which questions the boundaries between technology, art, and culture, proposing that the simplicity found in the color gray can result in an unexpected expressive complexity. Complementarily, Edgar Morin's complexity theory provides a theoretical context to understand the choice of this shade as an expression of interconnections and ambiguities in the design field.

Our method develops through the digital manipulation of original images from the experiment developed in the doctoral thesis with kimonos, previously addressed in the thesis, changing their color palettes for this study. Thus, we proposing an experiment to be conducted in loco that complements our analysis, capturing the audience's reactions to the variations and their perceptions. With this, we seek to reveal how color influences the reception of the pieces, challenging conventional patterns in fashion and design.

We conclude that this study not only advances the understanding of the role of color (or its absence) in artistic creation and fashion design but also paves the way for future research on the exploration of other hues and approaches, using the methodology developed here. This work aims to expand the boundaries of design, art, and fashion, reconsidering the use and meaning of colors in their practices.

**Keywords:** *Fashion Design, Color Theory, Chromatic Neutrality, Johannes Itten, Design Methodology.*



## The Subconscious of Color in the Case Study, Senso Book: A Methodological Process for Fashion Event Production

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### Abstract

The article to be presented in poster format explores the synergy between the fashion event production methodology outlined by Antônio Carlos Rabàdan Cimadevila in “Senso” and Johannes Itten’s color theory. Integrating these approaches enables a deep understanding of how color can be used as a unifying and communicative element in the fashion design projects of ESPM students, presented to the market through the @senso.livro project on Instagram. Cimadevila highlights the importance of a rigorous methodology in organizing fashion events, emphasizing the role of design and aesthetics in creating memorable experiences.

Additionally, Johannes Itten teaches us that “color has a powerful subconscious effect on the viewer” and that “color is a force that directly influences the soul.” These words resonate deeply with the mission of the Senso project, which aims not only to showcase fashion creations but also to communicate the essence and narrative behind each piece, using color as a narrative link that connects various projects into a cohesive experience.

The poster will illustrate how ESPM students applied these principles in practice, using color to differentiate and highlight the individual themes of their projects while maintaining a visual unity that reflects the collectivity and collaboration of the semester.

We will examine specific cases where color was strategically used to signal different phases of the creative process, emphasizing how these chromatic choices contributed to the understanding and appreciation of the works.

Through this study, the poster will argue that color is not just an aesthetic component but an essential tool for communication and expression in fashion design, capable of transcending visual barriers and connecting various projects into a unified visual narrative. This focus not only aligns with the philosophy of the color congress but also highlights the innovation and creativity of ESPM students, projecting them into the contemporary fashion market.

*Keywords: Fashion Design, Color Subconscious, Johannes Itten, Design Methodology.*

# The Role of Colors for Digital Three-dimensional Materials: Using Colors as a Parameterization Tool to Obtain Advanced Shaders

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## Abstract

Creating materials and shaders in 3D software is complex and requires technical knowledge and artistic skills. These materials are generally simulations of how specific physical properties can be perceived - for example, how a digital 3D model might be perceived as being made of metal, glass, etc. This article investigates using colors as an interface for parametrizing materials and shaders in modeling and rendering 3D software. Such parameters have various implications for complex properties like reflection, refraction, texture, shading, and resource optimization for interactive applications.

The data for this study come from the use of different color parametrization paradigms in complex projects between 2020 and 2023. We highlight the Turku 1827 project and MetAmazonia, both of which were carried out in collaboration with the Finnish studio ZOAN Oy.

Turku 1827 was an interactive digital 3D reconstruction of Finland's first capital at the request of the Museum of History and the Future. Based on research by Panu Savolainen, a professor at the School of History, Culture, and Art Studies at the University of Turku, we were able to recreate with great precision the houses, squares, bridges, castle, temple, and theater, among many other urban landscapes of the city, with the setting of 1827 – the year of the great fire that devastated the old capital.

The MetAmazonia project was a high-fidelity prototype of an interactive three-dimensional environment made at the request of the Amagroup, which has various actions for the preservation of the Amazon forest and the economic development of local communities around the municipality of Manicoré – AM. The proposal was to faithfully reproduce the village of Jatuarana so that software users could experience a virtual presence in the location, learning about the environment and the main local productions (Brazil nuts and açaí) and interacting with other users.

As the main result of using colors as an interface for parametrizing materials and shaders in modeling and rendering 3D software, we obtained high-quality interactive experiences that took advantage of the cutting-edge resources of platforms like Unreal Engine 5. We validated and discarded various production processes, which aroused the interest of other museums and European institutions. Processes and images are detailed throughout this article, which is a material of relevant consultation for designers, artists, and other digital developers.

**Keywords:** *parameterization of materials, colors, interactive interfaces, 3D software, design.*

# The Effect of Colors on Quiet Luxury Consumption: The Role of Uniqueness and Xenocentrism

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## Abstract

Quiet luxury, characterized by its understated elegance, represents a sophisticated tier of consumer goods, particularly noticeable in the apparel sector, which appeals to the middle-class demographic. This trend, marked by a preference for non-ostentatious luxury, has seen a significant emergence of brands targeting this niche. Clothing choices, in this context, serve as vehicles for individual expression and the conveyance of personal values integral to the individual's identity construction. Notably, the predilection for monochromatic color schemes over vibrant hues has been interpreted as aligning with the ethos of brand exclusivity, sophistication, and distinctiveness, a pattern observable across various product categories including automobiles, electronics, and garments. Despite the practical observation of these trends, scholarly exploration remains nascent, with limited research particularly focusing on the fashion industry.

Employing theories of color psychology and social identity, this study examines the impact of color schemes on the perception of quiet luxury, alongside the mechanisms that facilitate and amplify this effect. Through a series of three experimental studies involving 401 Brazilian consumers of quiet luxury products, and utilizing multivariate statistical analyses, we delve into the dynamics of color perception. The initial study explores how black-and-white *versus* colorful presentations influence perceptions of luxury. Subsequently, the second study builds on this by probing the role of perceived uniqueness as a mediating factor in the relationship between color schemes and luxury perception. The third study further extends the analysis by investigating the moderating effect of xenocentrism on the color-uniqueness relationship through moderated mediation analysis. Findings reveal that monochromatic (black and white) color schemes significantly elevate perceptions of luxury compared to their colorful counterparts, a phenomenon partially mediated by the induced sense of product or brand uniqueness among consumers. Additionally, evidence suggests that xenocentrism amplifies this effect, albeit predominantly among consumers with lower-middle levels of xenocentric attitudes, as identified by the Johnson-Neyman technique.

These results enrich the color theory literature by elucidating the influence of color schemes on luxury perception within the clothing industry. Furthermore, the study enhances our understanding of luxury marketing by integrating color psychology with psychological factors influencing consumer behavior towards high-end products. In conclusion, this research offers practical insights for brands in the luxury segment, outlines avenues for future academic inquiry, and acknowledges its limitations, thereby contributing to the broader discourse on luxury perception and consumer psychology.

**Keywords:** *Quiet luxury, colors, consumer behavior, uniqueness, xenocentrism.*

# The Influence of Age on the Color Perception and Judgment: A Color Meaning Study with Mouthwash Packaging

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## Abstract

Color is a visual feature used in packaging design to capture attention and communicate the qualities of the product and brand messages. Therefore, color impacts the users' perception and engagement with a product. In this context, it is known that the aging process modifies the human perceptual and cognitive dimensions. However, there is a lack of scientific literature pointing out the age influence on the color perception and semantic judgment of packages.

This study aimed to evaluate the age influence on the perception and meaning of three models of mouthwash packaging in different colors. The study has an experimental and transversal approach. One hundred and twenty participants from female (n = 60) and male (n = 60) genders distributed into two age groups (18-29 and 30-55 years old) evaluated three mouthwash packaging in green, red, and blue colors. Thus, the participants got in touch with nine stimuli conditions during the experiment. In a laboratory room with a predominance of white walls, lighting color of 6000K, and luminance of 290 cd/m<sup>2</sup>, we conducted a color-meaning experiment using a semantic differential (SD) questionnaire with twelve pairs of design attributes from functional, aesthetic, and symbolic dimensions. Each pair was evaluated through a Likert scale with seven anchors. To avoid cognitive biases, we randomized the order and polarity of the attributes, creating nine questionnaires. The application sequence of the questionnaires was randomized.

The results indicated significant differences ( $p < 0.05$ ) between the age groups in both genders. Among the twelve attributes assessed, the pairwise comparisons showed that ten design attributes presented statistical differences, four of which appeared in more than six stimuli conditions. These four design attributes are one from the aesthetic (beautiful/ugly) dimension and three symbolic (hygienic/unhygienic, modern/traditional, and unusual/common) dimension. Based on the current findings, we suggest that age is a relevant variable in color perception and semantic judgment related to the colors of mouthwash packaging. In this sense, designers and other human-centered practitioners should consider age as a relevant interaction variable for users' comprehension and engagement with the product, going beyond biomechanics and vision issues. The present study may contribute to further research in the Design and Ergonomics fields.

**Keywords:** age, color meaning, semantic ratings, visual perception, package design

# Visual Elements in Organic Products Communication: The Impact of Yoghurt Packaging Material and Color on Consumer Perception

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## Abstract

In recent years, health issues have increased with especial focus on consumption and food habits, which created an opportunity for the expansion of the organic food market and the creation of new organic product lines by retailers. Therefore, organic product consumption has been increasing, especially due to the promotion of healthy lifestyles. However, it is difficult for these brands to differentiate their products since they lack information about which package elements should be used, besides the organic claims and labels. The purpose of this study is to contribute to this literature gap, by analyzing the impact of packaging materials and colors on consumers' environmentally friendly perceptions, product attractiveness and purchase intention.

We conducted a quantitative experimental study ( $n = 372$ ), with the aim of analyzing organic packaging elements, namely, color and material. Accordingly, a yogurt packaging was created for the purpose of this study, using Adobe Photoshop for image manipulation. The color was compared in three different levels: green, blue and white/black, with the latter being used as a control condition. Also, two different packaging material – recycled plastic and recycled glass – were used as variants. The packaging essentially contains one of the colors under study, along with an image of a cow and brief information stating, "Organic Yogurt", as well as "100% Grass-Fed Cows". For the scope of this research, only changes in hue were made. Results indicate that material impacts attractiveness and environmentally friendly perceptions, color impacts attractiveness, while purchase intention is not affected by any of these elements.

This research contributes to the current literature on color packaging and consumer behavior. Therefore, it is expected that our findings will assist marketers clarifying communication patterns, and helping them to adopt more suitable and sustainable materials in their production processes. These modifications should not be carried out by law imposition only but mostly because consumers are more aware of the environmental issues and are changing their habits and consumption patterns accordingly.

## Acknowledgments

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**Keywords:** consumer behavior, organic food, color, material, packaging, sustainability

# The Use of Colors as an Element of Customization of the Surface of Myoelectric Upper Limb Prostheses

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## Abstract

This article aims to investigate the use of color as an element of customization of the surface of myoelectric upper limb prostheses in order to increase the acceptance rate of this kind of device by the user.

The traumatic loss of a limb causes physical and psychological damages to the individual. The use of a functional prosthesis with customizable aesthetics allows the treatment of these traumas, being able not only to recover the lost manual ability, but also to enable the treatment of psychological trauma and to increase the user's self-esteem. So, we assumed that defining the surface of the prosthesis through the choice of colors will allow greater identification between the user and the upper limb prostheses. Considering that 3D printing is nowadays an accessible technology and, taking that the surfaces that cover the prostheses are capable of being materialized by additive technology, it is admitted that the variability and the selection of colors ensure different customization possibilities by the user. The additive 3D manufacturing process supported by Fused Deposition Modeling (FDM) and Stereolithography (SLA) guarantees respectively the definition of the color of the plastic filaments and resins that will make up the prosthesis covering material. Depending on the coating models which will be printed in 3D, the user will have greater or lesser autonomy in defining the characteristics of the prosthetic surface.

Firstly, in general, the concept of customization will be discussed in the context of assistive technologies for the upper limb, which can also be applied to the lower limb. Secondly, it will be examined how colors can be used to define the visual configuration of upper limb prosthetic surfaces. Thirdly, a case study of customizable 3D printed upper limb prostheses will be presented, which explore different strategies for the user's choice of colors, pointing out this device as an object of belonging and uniqueness.

**Keywords:** *upper limb prosthesis, customization, colors, 3D printing, reception strategies*

## A Board Game for the Education of Young Hair Colorists

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### Abstract

Color education is a fundamental pillar on which all traditional art disciplines are based, and likewise all those crafts that use color in everyday practice, such as hair coloring. Although color is a key item in the hair dressing market, especially for women, the level of basic education on the theoretical foundations of this vast and complex subject is extremely simplified and anchored in rules—or worse, precepts—nowadays outdated and supplanted by the evolution of color science. In order to try to bridge the gap between the training of young hair color professionals and what is requested of them in actual, daily practice, we propose a board game on the educational basics of hair coloring.

The game is based on a dedicated color space consisting of a beginner-friendly reinterpretation of the more traditional hue-saturation-lightness color space. Actually, with due analogies and modifications in place, hair coloring products marketed by all major brands worldwide are already loosely based on this well-coded color attribute triad. This fact, however, goes largely unnoticed—or underappreciated at best—by hair colorists. And in any case, the lack of standardization of hair coloring products and naming is both widespread and concerning. The game is intended to introduce—firmly yet gently—the general concept of color space, well known to colorimetry, and to convey the idea that a more mindful color practice should precisely be based on considering color as a space within which to move.

The game is not, therefore, an exhaustive compendium of all available products, nor does it aim to describe how to use them in practice; an operation, this, that would require an insurmountable amount of information unsuitable for the context for which the game was designed, i.e., ideally a school, or a training center. Instead, its purpose is primarily educational, specifically aimed at recognizing the hair color of hypothetical clients in the form of hair color cards; characterizing them in terms of the profession-specific color attributes; and finally, framing them in terms of the overall concept of color space.

The recreational aspect, while not the strict focus of the game, is intended to offer professors or professional mentors a teaching method complementary to a classic frontal lesson, which is on average based on ill-informed premises in any case, and to encourage reasoning, the sharing of the learning process, and the formation of critical thought through the exchange of opinions and a closer analysis of the theoretical framework on which a conscious exercise of the profession should be based.

**Keywords:** education, board game, hair color



# Visual Grouping: A Study on Preponderances of Color or Shape in Match-three Games

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## Abstract

A type of entertainment that stands out for its popularity are the Match-three electronic games (Coutinho, 2014), in which the player needs to form groups of at least three similar objects to score points. Thus, the study of how players perceive visual groupings becomes an important tool for future developments.

This research investigated color and shape relationships in Match-three games, looking for preponderances in the visual grouping of color or shape in the psycho and neurological response. For this, a bibliographic and empirical research were carried out.

Two match-three games were created and applied to a sample of 64 subjects. One of the games had black and white shapes (circle, triangle, square and lozenge), and the other one had only colored circles (red, green, blue and yellow).

The participants in this study were between 18 and 30 years old, attending higher education at ESPM College in São Paulo, Brazil. Female and male individuals tested were equally divided into two groups. The selected subjects claimed not to have color blindness or any other compromising chromatic pathology.

Results of the visual language and psychologic bibliographic research indicated that color and form belong to the similarity aspect of visual groupings, without showing any preponderances between them. The studied authors affirm that the greater the resemblance of the observed objects, the greater the perception of grouping.

The neuroscience literature showed that the visual grouping of color and shape are perceived in different ways depending on the context in which they are inserted. Some experiments present that color and form are perceived without prominence, others show that for lower exhibition rates, color is perceived before orientation.

Results of the empirical research showed that, for the Match-three category game created for this experiment, visual groupings of color are perceived more quickly and more easily than visual groupings of form.

The developed tests accounted for a total of 644 color groupings and 435 form groupings made by the participants. The cascade movements were not counted by the program, so all the matching counted were made manually.

These results were composed of 47 people (90%) who made more color groups than form, 3 females and 1 male (8%) who made more combinations by shape than by color, and 1 female (2%) who made equal combinations in games of color and shape.

It was noted almost no difference between the number of combinations made by male and female players in both games. In the color game the male respondents made 333 combinations, while the female respondents made 311. In the black and white game, the male respondents made 221 combinations and the female 214. Thus, it may be concluded that the preponderance in combinations of the colorful game was perceived in both sexes.

Results of the qualitative questionnaire reported that the participants had greater comfort when playing the color test. Some of them claimed that the colorful game is more intuitive and needs less effort to group. On the other hand, in the form game, participants reported that everything seemed mixed.

With these results, it may be concluded that color is predominantly seen as a facilitating factor of better and faster assimilation of groupings in the match-three game created for this experiment.

**Keywords:** Design, Color, Form, Visual Grouping, Match-three Games

# Color Vision Deficiency in Video Games

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## Abstract

The video game industry can be identified within the tertiary and quaternary sectors of the entertainment industry. A report by the Entertainment Software Association (ESA) indicates that aided by the lockdown resulting from the COVID-19 pandemic, the total revenue of the video game sector in the United States alone reached \$61.4 billion in 2021, demonstrating that it is no longer merely a niche market. According to an independent report, in 2023, on the Steam digital distribution service alone, 14.445 titles were released, an increase of 1.922 compared to 2022.

A significant number of people enjoy video games thanks to their variety and presence across various platforms. This usage is independent of age, gender, culture, social status, or the presence of disabilities.

Numerous studies have demonstrated that video games, when used within limits that do not lead to addiction, exert multiple effects on individuals with and without disabilities.

In some cases, playing video games can be difficult, if not impossible. A prevalent example is *Color Vision Deficiency (CVD)*, which involves the reduced capacity or impossibility of perceiving specific colors. This genetic anomaly manifests as incomplete color perception in the visual field and consequent reduced chromatic distinction capacity.

There are three main types of CVD: *protanopia* (inability to perceive green), *deutanopia* (inability to perceive red), and, much rarer, *tritanopia* (inability to perceive blue). If the anomaly is milder and involves limited color vision rather than complete color blindness, it is called protanomaly, deuteranomaly, or tritanomaly. In addition to these six conditions, there is a much rarer one called *achromatopsia*, which entirely prevents color perception ("*grayscale vision*").

In the development of video games, ranging from indie productions to major software houses, the development of interfaces and gameplay dynamics heavily relies on color. This practice is understandable because color, besides being a powerful expressive tool to guide the game narrative, is also a quick means to direct players to an efficient use of the graphical interface. For example, designing the interface to distinguish factions using different colors in a team-based game is undoubtedly effective and easy to implement.

However, CVD is a genuine disability, and its incidence is not negligible; about 8% of men and 0.5% of women suffer from it. In the case of highly successful titles such as *Minecraft*, published in 2009 by Mojang Studios, the player base consists of approximately 140 million unique connections per month (with peaks of 11.9 million players connected simultaneously); assuming an equal distribution between genders, this equates to nearly 6.000.000 players with Color Vision Deficiency every month.

Despite this, the fast-paced market rhythms, the economic volume invested, and the need to meet deadlines often lead developers to overlook, or at least underestimate, this aspect of accessibility to video game products.

There is no official list of computer or console products developed that implement specific settings for people with color vision deficiency. However, numerous developers have tackled the issue with results ranging from *excellent* to *detrimental*.

In this article, we aim to address the perceptual issues affecting players with complete or limited color perception capacity and provide some guidelines and possible solutions for the development of more inclusive video games for people with this type of disability.

**Keywords:** Color, Color Vision Deficiency, Design for disability, Videogames

# Board Games for Early Screening of Color Blindness in Italian Primary Schools

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## Abstract

The term “Color Blindness” refers to a condition where a class of cones in the retina functions abnormally, causing the individual to confuse and perceive certain colors in a limited way. Approximately 8% of European men and 1% of European women suffer from color blindness, while in Italy, the number of color blind individuals is estimated to be around 2.2-2.5 million. Color blindness is a condition linked to genetic transmission and is therefore present from birth, but often in Italy, it is diagnosed only after adolescence.

This study aims to explore the possibility of diagnosing this condition in childhood in a playful manner, using board games, to provide teachers and any potential tutors or educators with tools and techniques for classroom assessment. The paper presents a research project funded by the Italian Ministry of Education, named Game4CED.

The project aims to develop a series of board games as educational tools for early detection of color blindness, to raise awareness about color blindness among people, and to enhance the accessibility of board games for color blind individuals. Additionally, the project seeks to provide new tools for teachers and educators to promote a more inclusive school practice for all children.

Firstly, Game4CED will focus on identifying methods and parameters to develop a tool for assessing the accessibility of board games. Through an initial review of the state of the art, the most commonly used parameters for evaluating the accessibility of board games will be selected and implemented, while also assessing alternative metrics. Next, teachers will be engaged in three distinct phases of the project: in the design, development, and testing of inclusive learning activities for individuals with color blindness; in the co-design, development, and testing of the board game based on their experience and feedback; in the design, development, and testing of assessment and/or evaluation tools. Finally, a protocol of actions will be drafted to assist teachers, parents, and educators in utilizing various games as tools for detecting color blindness, understanding the condition, and addressing issues related to the child's color vision.

**Keywords:** *color blindness, board games, education*

# Enjoy Learning for Wonder of Colors and Color Vision Diversity

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## Abstract

In Japan, the concept of color vision diversity, which refers to an understanding of the inherent variation in human color vision, was proposed in 2017 but the prejudice toward the color deficient people has not been solved yet. Only a few programs are developed to understand the concept but even the basic idea is owing to experience the way of color sensing of people with color deficiency which means to promote the understanding unilaterally, only from normal color vision (majority) to color vision deficiency (minority).

The purpose of this current study was to develop educational programs to encourage the understanding of the concept of color vision diversity together with both (majority/ minority) through their experience with fun by the collaboration of the color science and design for inclusion. Our key concept was to make a situation in which all participants must do some activities in a color world different from the usual one so that we employed colored goggles as a tool to change their color world easily but effectively based on a scientific basis.

As a method, we had a three-step process to design two educational programs. Firstly, we experimented to find the color filters for goggles so that the color of color papers or pigments was seen as different from the original color and that the color filters allowed us to see as many colors as possible. Secondly, we created two prototypes of the programs mentioned in the next result section and did a quick trial and modification of them repeatedly. Finally, we implemented the programs for the participants from kids to adults and got feedback from them. As a result, we developed two programs those were named “The Color Detective” and “What color is this pigment!?”. “The Color Detective” was a detecting game for 5 or 6 teammates wearing different colored goggles to find the “correct” color name of a given card with discussion. “What color is this pigment!?” was a painting workshop. We asked participants to wear different colored goggles and try to draw on a large canvas with their teammates, and to appreciate it with the colored goggles that others were wearing after painting. We asked the participants of those workshops through questionnaires from the kids to the adults and interviewed the experts on color vision diversity, art teachers, and people with color vision deficiency.

It was found that those programs were enjoyable to both people with trichromats and color deficient based on the answers from the participants. Moreover, the kids gave us their comments that they could understand that color vision had a variation and that each color vision had its color world. The expert answered those two programs were effective in learning the systems of color vision, especially that colors are not determined by the objects, but by the eyes, the brain function, and the spectral distribution of light. For future studies, we will examine how can we adjust our programs to the real educational settings in schools and cooperate with schoolteachers.

**Keywords:** color vision diversity, color vision deficiency, Inclusion, color education, art

# Color Harmonies and Playful Interactions: A Quantitative Analysis of the Impact of Colors on the Design and Behavior of the Game Trine 4: The Nightmare Prince

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## Abstract

The proposed article addresses the influence of colors on the participant's behavior during interaction with the electronic game. The study will focus on Finnish developer Frozenbyte's video game Trine 4, set in a world of fantasy and magic with a diverse color palette.

The main objective of this work is to investigate how the color palette of the game Trine 4 impacts participants' emotions and evaluate whether there are differences in feelings between participants who play video games and those who do not, considering the colors applied to the environments, characters and objects.

The methodology adopted will consist of a quantitative approach, involving young people and adults over 18 years of age who are consumers of electronic games or not. For the visual analysis of Trine 4's chromatic design, participants will be presented with seven static scenes taken from the game, each scene with a different background, characters, colors and lighting, but containing in its highest concentration of pixels the colors red, orange, yellow, green, blue, indigo and violet which are predominant in electronic game scenarios. The seven scenes will be analyzed individually in the Color Summarizer image analysis software to determine the predominant color of the scene within RGB standards.

As a theoretical lens, we will adopt the work Psychology of Colors (Heller, 2014).

The data collection instrument will be a questionnaire with a Likert scale with five items for level of agreement and disagreement, developed on the QuestionPro platform containing the seven scenes from the electronic game and seven questions related to emotions. The questions were prepared based on the concepts of colors and their relationship with emotions according to Heller (2014): Passion-red, Joy-Orange, Optimism-Yellow, Tranquility-Green, Peace-Blue, Mystery-Indigo, Magic-Violet, in order to measure the player's feelings in relation to the chromatic palette from viewing the seven scenes.

To interpret the data we will use the JAMOVI online version software.

We hope that the results of this study provide an understanding of how colors influence emotions in video games, especially in a commercial game with a playful atmosphere.

This study aims to contribute to the emerging field of research on color in video games, fill gaps in understanding the interactions between color, design and emotions in video games, providing significant contributions to academic research and practical guidance for the game development industry.

**Keywords:** *Electronic Games, Colors in Game Design, Design in video games, chromatic choices,*

## Fresh Appearance and Color in Green Vegetables

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### Abstract

After harvesting, vegetables undergo an accelerated senescence (vegetable stress). Cutting the plant results in the disruption of the supply of water, hormones and other nutrients, which together with the lack of light, interrupts the development of photosynthesis. In the case of green vegetables, this decline generates a modification in the absorption spectrum of chlorophyll pigments. That is why, a change in the plant green color is observed. In the early stages of senescence, discoloration is accompanied by shine loss and changes in texture, typical of the dehydration. Although there would be no nutritional or taste change at this stage, the decrease in the vegetable marketing possibilities is noticeable.

There are different tools to delay the effects of this ageing (post-harvest treatments): refrigerating and hydrating the product, chemical methods to preserve the visual appearance and experimental procedures based on light. The latter uses LED light pulses as a means of keeping active the chlorophyll pigments.

In order to analyze the color changes caused by post-harvest stress, the reflection spectra of four green vegetables were studied. The experiment was performed using four green vegetables that are usually consumed without cooking: lettuce (*Lactuca sativa*), arugula (*Eruca vesicaria*), cucumber (*cucumis sativus*) and spinach (*Spinacia oleracea*). For the plant in a "fresh" state (acquired at the beginning of its marketing chain) and after variable periods of senescence, spectrum measurements were performed.

In the tests, a light source simulating an illuminant A, with a continuous spectrum increasing towards the red zone, was used. The light reflected by the plant, in a wavelengths range slightly higher than the visible (300 – 900 nm range) was captured with an Avantes spectrometer, which also allowed obtaining the color parameters of the sample for this light source. A Diffuse Reflectance Standards were used as reference in order to obtain the vegetable absolute reflexion.

Lettuce was the experimented sample with the most noticeable and rapid changes. A loss of spectral absorption in the 600 – 700 nm zone was observed, together with an increase above 700 nm. From the point of view of an observer, the changes in the spectrum generate a yellowing or redness, which can be quantified with a movement of the color point on the CIE color diagram. The modifications were similar, but of lesser magnitude in arugula and spinach, while cucumber was more complex to evaluate due to the appearance on its surface of areas with different degrees of senescence. In any case, the overall phenomenon was the same: the changes were minimal for wavelengths less than 600 nm. Changes in absorption as a product of vegetable stress, were found above 600 nm.

In practical terms, the results of the study suggest that light sources with a high red content (e.g., illuminant A used in the experiment) visually enhance yellowing. On the other hand, the use of LEDs, especially those commercially known as "cold", because they have a decreasing spectrum above 550 nm, would somehow minimize color change. In addition, and taking into account studies on post-harvest conservation, these same types of spectra could help keep some of the chlorophyll pigments active, prolonging the fresh appearance of the plant.

**Keywords:** *Lighting, LEDs, vegetable, display*

# Colors, Ideologies and Meanings in the 2022 Brazilian Elections

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## Abstract

Colors take on meaning, influencing our responses. In the political field, they represent parties and ideologies, becoming central pieces in communication strategies. People's use of colors also signals political positions and is linked to the idea of belonging to a group. This representation of political identities through colorful symbols has been observed in the context of a polarized world, divided by opposing ideologies. In Brazil, the separation between left and right has been marked by a chromatic opposition, in which the color red is adopted by the progressive camp, while the official national colors (green, yellow, blue, and white) are employed by the right and the extreme right.

This paper presents a comparative study that analyzed graphic artifacts from the campaign of the two main candidates in the 2022 Brazilian presidential elections – Lula da Silva and Jair Bolsonaro – with the aim of understanding the symbolic use of colors in this conjuncture.

A qualitative investigation of an applied nature was carried out in two stages: (1) bibliographic research and (2) visual analysis. The bibliographic study synthesized data on the meaning of colors and their use in the political field, especially in the electoral campaign for president of Brazil. To determine the *corpus* predominant colors, visual observation supported by the Image Color Summarizer (ICS) tool was used, which identifies the most representative shades of the image. The qualitative analysis considered the iconic, plastic and linguistic signs observed in the graphic pieces as indications of the meanings, verifying the articulation of the colors with the other signs in the construction of a discourse inserted in the Brazilian social and political context in 2022.

The results show an exclusive use of national colors in Jair Bolsonaro's campaign, divided into two sets of artifacts: (1) green background, with a predominance of green and yellow; and (2) white background, with a predominance of white and blue. In the pieces analyzed, green and yellow refer to the concepts of 'military', 'patriot' and 'good citizen', contributing to legitimize the image of the candidate as an 'official representative of Brazilians'. White and blue, in turn, reinforce the imagery of the 'messiah', contributing to the intended public perception of a religious and 'uncorrupted' man.

In the graphic pieces of Lula da Silva's campaign, on the other hand, blue and red predominate, combined with white, green and yellow. In this material, red and white identify the left and reinforce the image of the 'proletarian', 'strong' and also 'peacemaker' man. While blue, yellow and green signal the different forces of the political spectrum gathered around Lula's candidacy, and at the same time refer to the idea of the Brazilian nation.

It is concluded that: in Bolsonaro's campaign, the exclusive use of national colors reinforces the direction of communication to conservative and religious groups, excluding sectors of society with divergent thinking; while in Lula's campaign the greater variety of colors signals a broad coalition of forces, suggesting 'composition', coexistence with diversity, 'inclusion' and unity of Brazilian society.

**Keywords:** *color meaning, visual communication, Brazil, political communication*



# Calibracor: A Novel and Free Software for Digital Image Color Calibration

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## Abstract

The widespread integration of high-resolution cameras in smartphones and computational processing has revolutionized image capture, albeit introducing challenges, particularly in the realm of color distortions. These distortions significantly impact various fields, affecting the accurate representation of colors in critical applications such as fine arts reproduction, restoration process of historical objects, documentation processes and many other purposes. Furthermore, the color calibration process is often intricate, requiring user expertise.

In this context, the present study introduces a user-friendly software developed at the Scientific Image Documentation Laboratory (iLAB) - School of Fine Arts - UFMG, named Calibracor, which is aimed at automating the color calibration process in digital images. The web application utilizes the grayscale samples from a color reference target, such as the X-Rite Color-Checker, which are crucial for the calibration process. The software is available online for free at the address "<https://ilab.eba.ufmg.br/calibracor>". Therefore, the primary objective of this project is to reduce reliance on expensive commercial alternatives.

Calibracor uses artificial intelligence, employing U-Net neural networks to automatically identify the position and orientation of a color chart in a given image, enabling fully automated calibration. The assembly of a dataset consisting of 700 annotated images has supplied sample data for training a machine learning model. Once the color chart has been identified, the software applies standard calibration techniques, encompassing white balance and contrast curve correction, including image exposure.

To verify the program's outcomes, assessment metrics, such as the Delta E standard, gauge the algorithm's effectiveness in improving the chromatic quality of images. Furthermore, the use of smartphone cameras, such as those found in the Xiaomi Poco X3 Pro during the testing phase ensures real-world applicability. The incorporation of 5 exposure values (-2, -1, 0, +1, +2) and 12 white balance variations (2000K, 3000K, 4000K, 5000K, 6000K, 7000K, 8000K, and the presets Auto, Incandescent Light, Sun, Fluorescent Light and Cloudy Day), in the image-capturing process adds complexity, reflecting diverse real-world conditions encountered by the Calibracor algorithm.

In summary, the algorithm, Calibracor, has shown significant improvement in the chromatic quality of test subjects. For instance, in a scenario characterized by 0 (zero) exposure value and AUTO white balance preset, it has reduced the color Delta E from 27.9 to 5.2 in comparison between the image and the ColorChecker color data. Emphasizing accessibility, automation and reliability, this research addresses challenges posed by color distortions in digital images and contributes to the color calibration field.

**Keywords:** colorimetry, color control, neural network, image processing, free software.

# The Role of Colour in the Visual Narrative of Video Games

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## Abstract

In recent years, studies have focused on exploring the use of colour in audiovisual language, which has mainly been approached from the context of cinematography. However, research related to colour as a communicative element in the visual narrative of video games is not yet consolidated, and there is a shortage of bibliographies related to this subject. For this reason, this research investigated the identification of strategies for applying colour as a communicative and interactive element in the visual narrative of video games. The starting point was recognizing the role of colour in audiovisual language from various authors related to film studies, and the identification of main visual narrative strategies related to colour in cinematography. Then, using these strategies, an analysis was carried out on ten case studies of video games corresponding to different genres, in which colour is a fundamental element in the art direction. In each video game, the setting elements, characters, and mechanics were analysed. The analysis considered seven modes of application of colour in the audiovisual narrative: its temporal use, identifying use, symbolic use, associative use, transitive use, emotive use, and aesthetic use. The main results of the research indicated a general coherence between the ways of using colour as a communicative element in both media, cinema and video games, through the identification of different applied techniques. However, the interactive nature of the video game differentiates it from cinema and implies additional complexities and possibilities for colour as a communicative resource, which can play a relevant role in the interaction with the player and the development of the narrative and plot. Colour in the video game can facilitate the player's navigation of scenarios, creating an intuitive experience and drawing the player's attention to relevant elements of the story (characters, useful objects, elements of the scenario). Furthermore, colour can be key to differentiating temporal, emotional, environmental, and conceptual elements of the video game. This study is a contribution to the colour decision-making of designers and art directors in the video game creation process while highlighting the role of colour and its communicative possibilities in current and future audiovisual media.

**Keywords:** *colour design, applied colour, visual narrative, video game design, language of colour*

# Color in the City: An Analysis of Chromatic Interventions in the Pavement of Urban Space

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## Abstract

In the last two decades, colors have become part of the global urban environment in a more expressive way (Yu, Bell and Ponzo, 2021), contributing to the city's identity and users' quality of life. Being an important element for the urban image, color helps the legibility of spaces and influences people's well-being.

Currently, many color interventions on urban scale use art in street pavement as an instrument for requalifying city spaces. These are designs and colors applied to sidewalks and/or roadbeds that color the landscape, attract users and strengthen local identity, transforming the city and qualifying previously neglected or abandoned urban space.

Many of these chromatic projects, in addition to impacting the city's aesthetics, act by modifying the road design of a region in order to prioritize pedestrians and/or create areas for permanence. Narrowing the carriageway, extending the curb and creating refuge islands are examples of road transformations promoted by the use of color in the pavement. Other projects are found coloring and humanizing playgrounds and sports courts with the aim of attracting users and promoting the use of these spaces.

In this context, this work analyzes chromatic interventions carried out on public pavement, in order to develop a typological categorization for the possibilities of using color in the city's paving. The study methodology carried out an investigation developed in two stages: bibliographical survey and analysis. In the first stage, websites and guides about urban interventions with color were consulted, such as: Asphalt Art Guide: How to Reclaim City Roadways and Public Infrastructure with art (2019), *Piazze Aperte: Un programma per lo spazio pubblico di Milano* (2023), *Urbanismo Ciudadano en América Latina: Superlibro de acciones cívicas para la transformación de las ciudades* (2022), and *Designing Streets for Kids* (2020). In addition to these sources, other websites were investigated, such as Pinterest, with a greater variety of chromatic interventions in the city.

The selection of the analyzed projects was based on three criteria: (i) the projects must necessarily include the use of colors in the paving of public spaces; (ii) the "amount" of color applied in the intervention must be significant, in other words, only projects with expressive use of colors were selected; and (iii) selected projects must have sufficient information for analysis. Thus, 115 urban projects were selected and investigated.

As a result of this analysis, a classification defined based on two aspects was developed: (i) role played by color in the intervention; and (ii) infrastructure involved. The analysis allowed us to identify, regarding the function of color in paving, two possibilities: aesthetic function and space redesign function; both involve two types of art: urban and mural art. While the aesthetic function uses color as an instrument of visual qualification and attraction of the urban environment, the redesign of space can have two focuses: road redesign or urban redesign. The first describes projects with traffic calming objectives and actions, while the second seeks to transform urban spaces based on new uses. As for the typology determined by the infrastructure involved in the project, the two possibilities identified are: art on the road and art in the pedestrian space, a classification derived from the Asphalt Art guide (2019). In road art, projects are developed in areas accessible to motorized vehicles. Art in pedestrian space describes interventions carried out in areas inaccessible to motorized vehicles, such as sidewalks.

Although the chromatic interventions in the city's paving occur based on different objectives, the study showed that, in common, is the quest for more welcoming, attractive, safe cities and focused on the well-being of users.

**Keywords:** chromatic interventions, pavement, color in urban space, color functions.

## Color, Environment, and Sustainability: Faculty of Law, University of Lisbon

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### Abstract

Since its genesis with the architect Porfírio Pardal Monteiro and the visual interventions of Almada Negreiros, two references in Portuguese architecture and visual arts, the Faculty of Law of the University of Lisbon has always had a series of interventions that highlight its cultural value in architectural, artistic and sustainable terms, where color plays an important role.

The building was later expanded in two phases that predominantly favor the visual arts represented by the glazed tiles of Andreas Stöcklein and interventions by students and professors of the Lisbon School of Fine Arts, and the color of the green patios.

From tile panels and paintings to garden areas, the aim is to explore the importance of the relationship between color, environment, and sustainability through artistic, architectural, and environmental contextualization concerns that address this issue in contemporary times.

We, therefore, analyzed the chromatic and environmental aspects of art and architecture, and how sustainability was an essential factor in their development.

The integration of these factors into the building has as reference not only the time and quality of the interventions but also to the spirit of time, and the author's position as the holder of knowledge and sensitivity.

These are stages in which color is present, being a determinant that allows us to identify the interactive process between subjects, matter, and light. It is a way of transmitting sensations through a phenomenology of the spirit that humanizes the space, making it pleasant and facilitating study and reflection.

Green roofs are areas of physical and visual enjoyment, not only for library users and staff but also for the professors' offices on the higher floors. They present themselves as rational paintings with temporal chromatic variations, meeting energy targets.

The value of the building is explored now through the color of the green and flowery areas of its roofs and patios.

**Keywords:** *Color, Environment, Sustainability, Green Roofs, Glazed tiles*

# ColorApp: Technology to Educate, Inspire and Help Women Make the Best Color Choices for their Personal Image

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## Abstract

Brazil is a country that pulses with colors. The tropical sun makes the colors shine even brighter throughout the year in the diverse Brazilian fauna and flora, which allows us to have a multiplied perception of the tones that inspire us in every corner. Furthermore, the happy and festive Brazilian spirit makes great use of color to express itself, through fashion, personal image and even in grand annual events, such as our colorful Carnival parade.

All that energy also reflects on technology. Brazil is the third largest country on the planet in using social networks, with 130 million active accounts, with 86.5% of the population over 10 years old using a cell phone.

ColorApp app emerged to serve a female audience who understand that color expresses their personality and who needed simple and functional tools to guide their color choices in terms of their image. The app features 12 elaborate palettes that group tones that follow similar color dimensions: luminosity and saturation, as well as loads of blue and yellow in each tone. These palettes are consulted and used by women of different tastes and skin tones to make their daily choices, whether in their personal closet or to guide them in new purchases.

We developed algorithms that help guide another very common problem among them: matching tones. Through exclusive intelligence, we created two tools that provide thousands of combination suggestions, "Harmony", which suggests a tone diagram with greater variation in chroma; and "Neutral", to combine with achromatic tones and others with soft tones. The diagrams proposed by the tool have an intelligence that suggests tones that repeat the dimensions of the captured color, in order to provide practical solutions that the user can understand and decide on the best harmony for what they want.

Tens of thousands of women in Brazil and around the world have already purchased the packages, making ColorApp very popular in the country. Our technology is currently suggested only for reading colors in clothing materials, accessories, and objects. Not recommended for makeup.

Through the app's social media, we always hear and understand users' difficulties with colors. It was from there that we created a "Looks & Colors" area, a catalog of 80 shades of different hues, which shows the differences in nuances and their nomenclature, carefully created based on the most common names used in Brazil and around the world. Each tone shows possible combinations, and also fashion photos with the corresponding color, which illustrate the use of the tone in daily use.

The app's audience expands to clothing store owners, color lovers in general and creative professionals. Today, after 4 years, ColorApp is the biggest app for color in image consulting in Brazil, with more than 1.5M downloads and users who spend at least 2.5 minutes every day on it studying, inspiring themselves and finding color solutions for clothing and other use.

**Keywords:** *technology, colors, personal image*

# Beyond Awareness: Stimulating Pro-Environmental Actions through Colour-Driven Web Interfaces

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## Abstract

The ongoing global environmental crisis persists, marked by a significant disparity between the recognition of the necessity for pro-environmental conduct and its practical implementation. This research aims to investigate the multifaceted motivations underpinning pro-environmental actions, ranging from altruistic environmental concern to more self-oriented motivations such as material acquisition or social comparison. The core proposition of this study is that these motivations can be effectively channelled and influenced through the application of principles derived from colour psychology within web interfaces, thereby facilitating a deeper emotional connection and active engagement in environmental conservation endeavours.

To explore this hypothesis, a meticulously designed experimental web application was developed, incorporating carefully selected colour schemes intended to elicit specific emotional responses conducive to pro-environmental conduct. This application, designed for seamless integration into public platforms like university websites, serves as a controlled environment for examining the intricate interplay between colour-induced emotional states and levels of involvement in environmental activism. Participants underwent comprehensive assessments of their emotional reactions to the colour stimuli, utilizing sophisticated neuroimaging techniques, while their visual attention on the web page was systematically tracked through advanced eye-tracking technology.

Anticipated outcomes of this research endeavour suggest that strategic manipulation of colour palettes within web environments can wield a significant impact on users' emotional engagement and cognitive focus, thereby augmenting their understanding of and commitment to environmental issues. Through meticulous identification of effective colour schemes, this study aims to contribute to a nuanced understanding of pro-environmental awareness and activism, offering novel insights into ways to inspire and mobilize societal action for environmental preservation. By delving into the unexplored terrain of colour psychology within web design, this research not only illuminates the latent potential of this approach but also underscores the imperative of bridging the gap between environmental awareness and proactive engagement. Ultimately, it presents a compelling case for the integration of technological innovation and psychological insights in advancing the cause of environmental activism, thereby paving the way for a more sustainable future.

**Keywords:** *Colour Design, Environmental Awareness, Web Communication, Emotional Engagement, Pro-environmental Behaviour*

## Study of the Correlation Among Mineral Contents, Instrumental and Sensory Color of Brown Sugar

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### Abstract

Color is one of the main attributes that define the acceptance or rejection of a product, being mainly used as a parameter of evaluation. Nevertheless, the use of techniques that minimize the variations of a subjective visual evaluation are necessary. It is verified that color assessments by instrumental methods are useful when they present a good correlation with the sensory measurements. This study aimed to correlate the mineral composition of different brown sugars with the instrumental and sensory visual color analyses. Eight samples of brown sugar were evaluated and identified from A to H.

The mineral composition concentration was measured using inductively coupled plasma-optical emission spectrometry. For the instrumental color analysis, samples were standardized regarding granulometry, and for the determinations, the colorimeter Minolta Chroma Meter - model CM-25d, CR10 was used, for the measurements of parameters  $L^*$  = luminosity from 0 (black) to 100 (white);  $a^*$  = shades from red to green;  $b^*$  = shades from yellow to blue;  $C^*$  = saturation and intensity of color and hue = shade and purity. The sensory visual test adopted was the difference ranking test performed with 60 untrained evaluators. Data results were treated applying a multivariate statistics analysis ( $p \leq 0.05$ ).

Results on the concentration of minerals indicated that they are in accordance to the Brazilian Food Composition Table. The eight samples presented differences on the minerals Ca, Mg, P, K, S, Na, Fe, Mn, Zn and for Cu, sample F showed a prominent content of  $5.65 \text{ mg/kg}^{-1}$ , differently from the other samples which presented lower values. It was not possible to verify a correlation between the visual analysis of color and the mineral content. The results for  $L^*$  varied from 57.00 for sample A (lighter) to 27.0 sample H (darker), with statistical difference between samples, except for samples B and C. There was a statistical difference among the samples for the parameters  $a^*$ ,  $b^*$ ,  $C^*$  and hue. The values of parameter  $a^*$  varied between 9.9 for sample F and the smallest value, 5.9, for sample A. For the parameter  $b^*$ , the results varied from 24.4 for sample B to 10.9 for sample H. Regarding parameter  $C^*$ , the results varied from 25.7 (sample B) to 13.5 (sample H) and for hue, sample A presented a value of 75.3 whereas sample H, 54.5. The correlations between minerals and instrumental measurements showed the highest values for  $L^*$  with Mg ( $R\text{-Sq} = 41.2\%$ ) and parameter  $a^*$  with Fe ( $R\text{-Sq} = 56.5\%$ ). Regarding the discrimination of the sensory color, samples B and C were similar for the evaluators. The matrix of correlation between sensory color and the variables of instrumental color indicated that there was a low correlation with  $a^*$  ( $R\text{-Sq} = 28.6\%$ ); moderate with  $C^*$  ( $R\text{-Sq} = 72.9\%$ ) and  $b^*$  ( $R\text{-Sq} = 79.6\%$ ), and a strong correlation with the variables  $L^*$  ( $R\text{-Sq} = 94.8\%$ ) and hue (84.0%).

In conclusion, despite of not being able to establish a correlation between color and mineral composition, a high correlation between instrumental color and sensory analysis was observed, therefore, variable  $L^*$  and the sensory analysis of color were efficient parameters to differentiate the studied brown sugars.

**Keywords:** *luminosity, shade, ranking test.*



# Understanding the Use of Colors and Characters in Snack Packaging Sold in Brazil

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## Abstract

In Brazil, there has been an increase in the supply of snacks with characteristics considered healthier (e.g. less sodium or fats), but the visual cues used to communicate the healthiness of these foods on the packaging are not fully known. Studies show that visual appeals to children predominate in unhealthy products and authors suggest that the use of colors and characters in packaging can positively influence children's perception of healthier products.

In this context, this research aims to understand the use of colors and characters in snack packaging, identifying their characteristics and recurrences. This paper presents a comparative analysis between snacks with 'healthy' appeal and regular snacks sold in Brazil.

An exploratory mixed-approach study was carried out in four stages: (1) literature review, (2) selection of the *corpus* of analysis, (3) registration and cataloguing of packaging, (4) analysis and interpretation of data. A total of 140 snack packages (70 'healthy' and 70 common) were catalogued. The packages were analyzed with the Image Color Summarizer (ICS) tool, which provided descriptive statistics of the colors and identified the most representative shades of the two sets. The investigation specifically considered the main panel of the packages. A classification of the characters was carried out, considering the audiences to which they are addressed, as well as the typologies and styles of the representation.

The results show a predominance of chromatic colors and a considerably higher average saturation value in common products than in products with 'healthy' appeal, which have an approximate distribution between achromatic and chromatic tones. Common snack packages mostly use chromatic colors and do not use white as the background of the main panel; while those for 'healthy' snacks use very light colors or white as dominant in almost half of the packages, and use chromatic colors less frequently. Black as a background color is more frequent in 'healthy' snacks than in regular ones. Characters were observed in more than half of common snacks packages and in only a quarter of the healthy ones. In both categories, the most frequent typology of characters was *human* (comic/caricatural), followed by *anthropomorphic* (animal). Characters aimed specifically at children were considerably less present on the packaging of 'healthy' snacks than on regular ones.

It is concluded that the restricted use of characters and chromatic or intense colors (associated with the idea of 'fun') indicates that most snack packages with healthy characteristics are not attractive to children, since, according to the literature review, colors attract children's attention and characters favor the choice of products by this audience, being more attractive to them than nutritional information. It is considered that the data obtained in this study contribute to support future projects and studies concerned with positively influencing the perception of healthier products by children.

**Keywords:** Food packaging, visual language, colors, characters, design and health

# poster Chromatic, Ergonomic and Spatial Orientation Analysis of the Signage Design Project from the Regional Council of Medicine of the State of São Paulo (Cremesp): A Methodological Proposal

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## Abstract

The research proposes an experimental analysis of chromatic, ergonomic, psychological and anthropological aspects contextualized in the signage design project, to find solutions to the current problems identified from the place of study: the Regional Council of Medicine of the State of São Paulo (Cremesp). The goal is to provide graphic-visual solutions in the spatial orientation of the environments to develop a new methodology with a formulated structure to address and fill the gaps in the project's needs with a focus on signalling.

Cremesp is a federal autarchy in São Paulo, Brazil, with about 135,000 active physicians. In general, the interest in using the location stemmed from difficulties accessing the sections and wings, as well as a lack of visual information configuration, leading to confusion. The aim consists of studying the journey taken by visiting physicians in demand for services, in addition to those taken by Council employees during office hours. The fact that this subject is not well-addressed in Brazil made the theme intriguing, allowing the research to deepen the analysis from different perspectives. It was essential to gauge the interviewees' knowledge about the topic to craft questions that elicit engaging responses.

Despite numerous studies on the topic, the literature review also encompasses well-executed research. However, the articles examined in the study did not provide comprehensive guidance for developing arguments in the discussed areas. The data collection methods were chosen based on quantitative characteristics, precisely through semi-structured interviews, analysis of materials, documentary analysis (written and photographic records), and primarily through selection bias (structured, unstructured, and participant). Furthermore, it highlights the significance of studying colour and its impact on perception and human behaviour within the environment. In this instance, ergonomic lighting segments were exploited to enhance navigation, identification, and functionality, going beyond emergency signage. This created a pleasant and intuitive experience by utilizing confirmation bias, considering cognitive (colour preference tests), and cultural aspects. The methodology process stands out from existing methods due to its thorough analysis and the efficiency of three different approaches. The developed methodology, whose chosen approach is project-based, contains seven steps: schematization, investigation, goals, conception, implementation, performance verification, and documentation. It is essential to mention that, as it is an autonomous government organisation, bureaucratic issues were found, therefore, the last three stages of the methodology were not viable, referring to the final phase that involves the institution's permission for the application of the material and financial factors, encouraging designers to keep up the steps.

As a result, since there is non-compliance with some principles of space planning, but compliance with structural norms, the research made it possible to discover information processing, decision making and decision execution, to find the solution to the problem: a clear and concise signalling project – following the visual identity already established – that demonstrated to be applicable, with a sustainable physical solution that required low costs (compared to the complexity of the processes and materials), through the application of adhesive recyclable PVC on existing surfaces and a digital proposal for a direction app with limited access to the Council's premises. Additionally, suggestions for enhancements based on ergonomic analysis were recommended to complement the institution's existing measures for work safety. Finally, the research can help enhance the functionality of user journey solutions and demonstrate that the methodology could be tested by future researchers and enthusiasts.

**Keywords:** Methodology, Signage, Design, Chromatic, Analysis

# Warm Colors x Cold Colors: Analysis of the Preferences of Teenagers in a Playful Business Game

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## Abstract

There are some basic rules to be considered concerning a Playful Business Game with teenagers. Some of them are being authentic and honest, creating a business environment that allows the production and sale of colorful items of their interest, keeping a simple message, making useful information available, interacting, asking questions and giving feedback.

In this article we present the analysis of the choice of colors of plastic pins used as raw material for making toys by high school students in a Playful Business Game. This Game has been applied since 1995 to more than 7000 participants, from the most varied age groups, level of training and type of activity in the labor market.

There is no unanimity regarding the choices of color made by children, teenagers or adults. This happens due to the fact that different cultural, social, economic and educational factors interfere in these choices. We present the result of these choices, classifying them into warm, cool and neutral colors. A total of 297 students from 12 classes of 5 private schools located in the city of Rio de Janeiro participated in the survey between 2019 and 2023. In the years 2020 and 2021, activities were interrupted due to the Covid pandemic. In total, 10941 pins were negotiated in the classes.

The Game is playful and uses plastic pins (Magic Pins) with 4 shapes (1 hole, 3 holes, 4 holes and half-wheel) and 5 colors (Blue, Green, Red, White, Yellow) as inputs for the manufacture of toys. Students act as Suppliers, Manufacturers and Retailers, following previously presented guidelines. There is always a rehearsal for them to understand the dynamics of the Game. In addition to working in the market, students evaluate the companies through previously defined questions, based on the Brazilian Business Excellence Model (MEG) of the National Quality Foundation (FNQ). The Game has 4 meetings with 2 hours each.

We emphasize that, historically, the participants of this Game have total freedom to act considering the negotiations of purchase-sale-production-evaluation and decide the shape and color of the pins they are going to work with. The best-rated company in the market wins the game. The market, formed by the students, is sovereign. There was never a case where the class disagreed with the final outcome of the Game.

**Keywords:** Warm color, cold color, choice, teenagers, Magic Pins

# Cultural Factors Impacting Car Color Choice: An Analysis in the Brazilian Market

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## Abstract

The perception of an object is an intricate process that involves several factors, including previous experiences, prior knowledge and sensory systems. These elements interact in complex ways to shape the interpretation and understanding of the environment and object itself. If the characteristics of an object, such as shape, weight and especially in this study, color, go unnoticed, it will have an effect on the perception and understanding of its existence or value judgment.

In the ability to evaluate and attribute meaning to these characteristics, color occupies a special place. Although often considered secondary to other properties such as form and function, color has a profound impact on the perception and valuation of objects.

Culturally, human beings intrinsically link color to symbolic and emotional meanings. These cultural associations influence color choices in products, packaging and environments.

From an economic point of view, color plays a crucial role in marketing and brand identity. Companies choose colors strategically to attract consumers, create brand recognition and convey specific messages.

In contemporary design, color is a powerful tool for creating visual impact and communicating intent. It can evoke emotions, establish atmospheres and even influence user behavior. The choice of colors in products, furniture, clothing and architectural spaces reflects the trends and sensibilities of the time.

Therefore, although color may be considered secondary in relation to other characteristics, its presence and conscious use are fundamental for the complete understanding of objects, products and environments in the contemporary cultural, economic and design context, notably automobiles.

The investigation will seek contexts to expose the amount of variety of colors lost over time, with the reference of the Brazilian automobile market of the 1950s, 1960s and 1970s. There is a recurring perception that the streets are full of vehicles in neutral tones, with a notable dominance of grays, blacks and whites. This trend, which has intensified since the late 1990s, has impacted the automotive landscape, leaving behind the times when vibrant cars in shades of yellow, green and red were common. The production cost and the change in the purchasing profile, with car rental companies as the automakers' main customers, are some of the reasons that explain the disappearance of colored cars. Thus, Brazil on wheels became less and less colorful, with white, black, silver and gray dominating most cities. Red still remains as an outlier, but flashy colors, such as blue, green and yellow, are now residual.

At the end of the analyses, the reduction in color variability in the Brazilian automobile market will be presented. This exposure will take place through the comparison between data and market values from associations of vehicle manufacturers and paint manufacturers, as well as information collected through research into journalistic material and personal examinations.

**Keywords:** *design, car colors, Brazilian market, perception, automobile industry*

# The Subjective Use of Color: In Creative Practices with Alternative Materials

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## Abstract

The poster for the color congress proposes an exploration of the process of developing clothing from alternative materials, centered on the Clown theme. This theme was chosen to encourage students to access and express the pure and naive aspects of their identities in their creations.

The project challenged participants to engage in a deep process of self-discovery, drawing inspiration from the expressive freedom and playfulness associated with the figure of the clown to infuse originality and meaning into their fashion creations.

The research particularly focuses on the subjective and expressive use of color in the students' creations, grounded in Johannes Itten's theories on color as an extension of the artist's individual and emotional expression. Itten articulates this deeply rooted connection between color and personal expression in the following quote: "Color is life, for a world without colors appears dead. Colors are primal, identical to life, identical to nature."

This quote highlights the central idea that the choices and use of colors in the students' fashion creations transcended aesthetic functionality, reflecting significant aspects of their personal experiences and identities.

In addition to investigating the creative process, this study also emphasizes the presentation of the clothing in a fashion show and the creation of a fashion editorial, aiming not just to display the final pieces but to communicate the essence of the students' creative journey. They demonstrate how colors were employed not just as a design aspect but as a vital medium for narration and personal expression.

Thus, this poster not only addresses the intersection between color theory and sustainable fashion but also celebrates individual creative expression, encouraging deeper reflection on the vital role of color in expressing identity and fashion.

**Keywords:** *alternative material, design, color theory, subjective use of color, Johannes Itten.*

# poster Study on Reproduction of Spatial Brightness on a High-Luminance Large LED Display: Effects of Image Color and Texture on Subjective Evaluation

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## Abstract

Recently, simulation tools have become more familiar as the use of BIM has taken root in architectural design. Furthermore, as display performance improves, it is becoming possible to display luminance chromaticity equivalent to that of real space, as displays with high-resolution and wide-color range become more widely available. Visual experiences equivalent to real space utilizing displays are expected to reduce discrepancies before and after construction, leading to more efficient design. The purpose of this study is to clarify the reproducibility of visual effects such as brightness for large displays. In this paper, we examine the effects of differences in image creation methods and reproducibility of color and reflectance characteristics on the spatial brightness evaluation for the large display when images of an interior room with a luminance-chromaticity distribution equivalent to that of real space is displayed on the display.

In the experiment, measured images (based on measured luminance-chromaticity distributions) and simulated images (based on luminance-chromaticity distributions calculated by a light environment simulation tool) were displayed on the large display for different real spaces, and 18 subjects evaluated the spatial brightness relative to the displayed images with different spatial styles and material characteristics. The large display used in the experiment was 4864 x 2736 mm in size, with a depth of 8 bits SDR (Standard Dynamic Range) and a maximum output luminance of 1200 cd/m<sup>2</sup> at the center of the display. The target spaces were spaces with distinctive textures, with wood and carpet tiles used as interior materials. The measured images were tone-mapped so that each pixel had luminance and chromaticity equivalent to the luminance-chromaticity distribution measured in the target space. Areas exceeding 1200 cd/m<sup>2</sup> in the actual space were set so that the measured image corresponding to that area was white (maximum tonal value).

Simulated images were tone-mapped in the same way as the measured images, using luminance-chromaticity distributions created by Radiance as a light environment simulation tool, using reflectance and illumination data of walls and fixtures, etc., measured in real space. For each of the simulated images in spaces A-C, three patterns were prepared: (1) achromatic rendering with diffuse reflection components, (2) chromatic rendering with diffuse reflection components, and (3) chromatic rendering with gloss or texture applied. The measured and simulated images were accurate to within 10% of the sum of squared difference for L\*a\*b\* or L\* for the luminance-chromaticity distribution of the displayed image and real space.

Even for achromatic images in which only the luminance distribution was reproduced and chromatic images in which chromaticity was also reproduced, the spatial brightness evaluation were statistically consistent with those for the real measured images. In a previous study, it was confirmed that the respective brightness ratings for measured images and real space were equivalent when luminance was lower than the maximum luminance (1200 cd/m<sup>2</sup>) that could be displayed. It is suggested that if luminance is reproduced by accurate illumination calculation, it is possible to obtain brightness perception from simulated images that is equivalent to that of real space.

**Keywords:** spatial brightness, high-luminance large LED display, tone mapping, luminance-chromaticity distribution

# Urban Polychromy: An Experimental Methodology Tested in Belo Horizonte, Minas Gerais, Brazil

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## Abstract

Urban polychromy is influenced by geographic, cultural, historical, social, and economic factors. Cities develop distinct color schemes over time due to different productive and historical developments. Unintentionally, in most Brazilian cities, this palette occurs without formal color planning mechanisms. This article introduces a scientific-artistic experimental methodology designed to identify the colors of some urban samples and analyze their relations with socioeconomic aspects in the city of Belo Horizonte, capital of Minas Gerais, Brazil. The study examines these relationships through top views and compositional elements perceived from the pedestrian's perspective. The primary objective is to promote the academic field of urban chromatic analysis in Brazil and assist in the construction of other contemporary urban readings.

As resources, satellite images were associated with urban parameters and demographic data such as income and race of the population by census tract. Eight samples were selected to create predominance graphics, using the Natural Color System (NCS). Manual collages were also assembled to capture the human scale and urban dynamics not visible in satellite images alone. Belo Horizonte presented its own typical chromatic scheme. The graphics showed a predominance of blue, red, green, yellow, and gray hues, respectively, as well as dark and low saturation colors. This polychromy reflects a combination of natural and geographic elements such as vegetation and land, and artificial elements like paving and roofing. The results were analyzed both qualitatively and quantitatively and highlighted existing relations between the colors found in the urban environment and factors such as available materials, income and race of the population, urban environmental quality, and vegetation presence. Thus, it can be concluded that colors play indirect roles in other existing issues in Brazilian cities. However, it's important to note that the reliability of the graphics results may be affected by the conditions under which the satellite images were extracted. Therefore, the findings were supplemented with visual investigation and collages. For improved precision, future research should establish the most standardized possible conditions for image extraction and color determination. It is also recommended to test the methodology in cities with differing characteristics to compare results and further validate the findings.

**Keywords:** urban polychromy, experimental methodology, satellite image, socioeconomic aspects.



## A Study of Utilizing Mixed Reality (MR) to Establish Environmental Color Schemes

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### Abstract

The purpose of research is to further refine the systematic environmental color planning within the context of local revitalization mechanisms. Current study intends to deepen this planning process by exploring the temporal and spatial complexities of environmental colors, aiming to integrate local natural geographical elements (such as local materials, climate conditions, etc.) and architectural colors, along with cultural and social geographical aspects (local cultural traditions, customs, etc.), to enhance the systematic color scheme development process.

Building upon previous research outcomes, this study will continue to employ the color geography survey methodology proposed by J.P. Lenclos to investigate environmental colors. This involves gathering regional color information to establish a comprehensive environmental color database, further conducting principal component color analysis of landscape spatial contexts, and analyzing the relationship between sample color imagery and main color attributes.

A scientific and systematic environmental color planning process will be conducted with using mixed reality (MR) technology to provide an innovative testing experience. Volunteer participants will be invited to engage in color harmonization experiments using psychophysical experimental methods to test the color harmony of various color combinations. The visual effects and comfort levels of different color schemes will be observed and evaluated, based on feedback and evaluation results, to analyze the optimal color scheme for further improvements of the systematic environmental color planning process.

Through scientifically-driven environmental color planning, the goal is to enhance the quality of the local environment, create new visual landmarks, and generate harmonious color effects. It is expected to obtain appreciation and praise from the public, effectively increasing the visibility and innovative potential of local tourism industries.

**Keywords:** *environmental color planning, color schemes, mixed reality (MR), color psychophysical experiment method, color harmony*



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The background of the entire page is a teal color with a detailed, close-up pattern of parrot feathers. The feathers are layered and have a fine, ribbed texture, creating a sense of depth and movement. The lighting is soft, highlighting the natural curves and ridges of the feathers.

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