







AIC2016 INTERIM MEETING - COLOR IN URBAN LIFE: IMAGES, OBJECTS AND SPACES

# AIC2016 INTERIM MEETING COLOR IN URBAN LIFE: IMAGES, OBJECTS AND SPACES

SANTIAGO DE CHILE, OCTOBER 18-22, 2016

## **BOOK OF ABSTRACTS**

(with USB Flash Drive enclosed)

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# INTERNATIONAL COLOUR ASSOCIATION, AIC

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## AIC PRESIDENT'S MESSAGE: NICK HARKNESS

It is a true reflection of the global presence of the AIC that an AIC meeting is being held for the first time in Chile in the dynamic city of Santiago de Chile. This is my third visit to Chile and I have wonderful and colourful memories of the natural and rugged landscape of Patagonia and Torres del Paine plus the strident blues of the Grey Glacier and the turquoise of Lake Pehoe. The urban environment is equally colourful with the amazing trompe l'oeil of Punta Arenas and the World Heritage City of Valparaiso.

What better a location than Chile for hosting an AIC Interim Meeting on Colour in the Urban Life.

On behalf of the AIC Executive Committee and AIC family, I would like to thank Co-chairs Ingrid Calvo Ivanovic, Maria Rosa Domper, Paz Cox Irrarrázaval, Mariana Kaplun and the team at Asociación Chilena del Color who have put together an outstanding programme in which to absorb ourselves for three colourful days.

Highlighting the global significance of the AIC there are more than 100 oral and poster presentations at AIC 2016 from twenty seven countries from Asia, Europe, North and South America, the Middle East and the Sub-Continent. AIC membership now stands at 26 regular members, 20 individual members and three associate members.

I would like to thank and congratulate Asao Komachiya, Hirohisa Yaguchi and their colleagues from the Color Science Association of Japan for hosting a very successful Mid-Term AIC Meeting 2015 in Tokyo in May last year.

Future AIC meetings are scheduled for Jeju Korea AIC Congress 2017, Portugal AIC 2018 and Argentina AIC 2019. Please check the dates and plan your schedules. There are three candidates to host the AIC 2021 Congress.

The AIC Executive Committee has been working on a number of initiatives this year including the establishment of an AIC Student Award to encourage the next generation of colour researchers.

I should also mention and thank others who actively support the AIC and the Executive Committee:

Berit Bergstrom who in addition to working with Maria João Durão in obtaining UNESCO recognition for the ICD is also responsible for reviewing the AIC logo.

Jose Caivano who does an enormous amount of work behind the scenes keeping the AIC Website up to date; most recently overseeing the transfer of our domain name to a new home together with Frank Rochow and Dimitris Mylonas. Jose Caivano has also worked with Vien Cheung Associate Editor of JAIC to include the JAIC onto the main AIC website. JAIC is now live on [www.aic-color.org](http://www.aic-color.org)

Stephen Westland, Vien Cheung and Kevin Laycock do a fantastic job as Editors of JAIC as do the technical review committee in creating a very high quality journal of which the AIC can be proud.

There are four active AIC Colour Study Groups in which you are invite to participate:

*Study Group on Colour Education* chaired by Robert Hirschler

*Study Group on Environmental Colour Design* chaired by Verena M Schindler

*Study Group on Colour Vision and Psychophysics* chaired by Katsunori Okajima

*Study Group on The Language of Color* chaired by Dimitris Mylonas

I look forward to meeting you in Santiago and wish you all a very successful, enjoyable and creative AIC 2016

NICK HARKNESS

**President**

**International Colour Association**

## AIC PAST-PRESIDENT'S MESSAGE: JAVIER ROMERO

This book is the evidence of the great interest produced around the AIC2016 conference main theme, *Color in Urban Life: Images, Objects and Spaces*, within the international community dedicated to the study of color, both academically and professionally. The contributions presented here, cover a wide range of topics related to the conference theme: environmental color, architectural color design, urban color, color perception and vision, color and culture, color in design, color psychology, color science and materials, color health and wellness, color education, aesthetics, among many others. As it can be seen, the list of papers is extensive and each of the topics will provide the reader, through the interesting scientific papers, an idea of the contributions made to the color field around the world.

The conference main theme couldn't have been better chosen, because color impregnates every aspect of our daily lives especially where we live: the city. Color is in the streets, inside buildings, in objects and so on. More than ever, the use of color has to be thoughtful and the color itself is critical for object design and connotation. Color gives life to our visual sensations and incites expected and unexpected emotions. Some expected and some not.

Color not only accounts for the present and future of our actions, but also has been part of the previous experiences of humanity, it helped founding what we call culture. Therefore, is important to emphasize that this conference has devoted special attention to color issues related to design, health, culture, and education on the knowledge and use of color, which ensures a scientific and cultural enrichment for generations to come.

Personally, I believe that the organizing and scientific committees of the *AIC2016 Interim Meeting, Color in Urban Life*, have done a remarkable work selecting the papers and editing this book, which will be corroborated by rewarding discussions during the conference. Congratulations to all of them and to the Chilean Association of Color, they have been constantly working through the years promoting and encouraging studies of Color in Chile with great international projection.

JAVIER ROMERO  
**Past President**  
**International Colour Association**

## ACC PRESIDENT'S MESSAGE: PAZ COX

The International Color Association (AIC) together with the Chilean Color Association (ACC) has developed an ambitious project for 2016: to hold the annual meeting of the AIC in Santiago, capital of Chile. This event –that will be held between the 18 and 22 of October– will gather 26 color associations and individual members from more than 30 countries.

The ACC is a Chilean nonprofit organization associated with the AIC. It was founded in 2008 in order to share, create, promote, coordinate and disseminate initiatives that support topics related to color. These initiatives may be applied –through education, extension and research– in different areas such as sciences, humanities, art and crafts.

The main topic of this event, *Color in Urban Life: Images, Objects, and Spaces* as decided in relation to the characteristics of the hosting city, a big and complex urban place with a population over seven million habitants. Santiago presents the common dynamics of contemporary Latin Americans' megalopolis, and it is marked by a rapid urban growth. It is therefore an excellent scenario to bring together experts from different disciplines and backgrounds, looking to contribute to the Santiago urgent challenges by providing greater physical and emotional well being to its habitants.

The resulting work of this event, based on the lectures of outstanding specialists, technical conferences, and workshops proposed by the Chilean Association of Color and both the University of Chile and Pontifical Catholic University, will be reflected in subsequent publications and transmitted by different broadcast channels.

Being able to receive in Santiago academics, researchers, artists and professionals of different areas, is a big opportunity to share and celebrate; it is a party in the broadest sense of the word, a meeting of chromatic experiences!

PAZ COX

**President**

**Asociación Chilena del Color**

## AIC2016 COMMITTEES

### AIC2016 ORGANIZING COMMITTEE

**Conference Co-Chairs:** Ingrid Calvo Ivanovic, Paz Cox Irrarrázaval, María Rosa Domper, Mariana Kaplun | **Technical Chair:** Osvaldo Zorzano | **Finances:** Carolina Armstrong | **Technical Support:** Andrea Barrios, Lina Cárdenas, Sofía Correa, Francisco Mancilla, Josefa Minassian, Bruno Perelli, Bernardita Sánchez, Magdalena Stephens, Ximena Ulibarri | **Publicity Support:** Constanza Almarza, Óscar Zamora.

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## AIC2016 CONFERENCE THEME: COLOR IN URBAN LIFE: IMAGES, OBJECTS AND SPACES

The aim of AIC2016 Interim Meeting is to share experiences regarding the use of color in images, objects and spaces, from different perspectives and disciplines. All of these to contribute to a better user experience and to improve life quality in our cities.

This meeting will provide an opportunity for the presentation and further discussion of the latest findings in the following topics, from both theoretical and practical points of view:

**Color & Environment:** environmental color design; landscaping; colorful neighborhoods & cities; color in planning, designing, and realizing the built environment; sustainability, urban agriculture; color as affected by geography, geology, and climate

**Architectural Color Design:** interior design; architecture; urban planning & design; innovative projects

**Color Perception & Vision:** color vision, deficiencies, abnormalities, synaesthesia

**Color & Culture:** color & identity; graffiti; color interventions & installations; cultural heritage; conservation; preservation

**Color in Design:** branding; color in wayfinding systems & signage; communication design & digital data visualization; color trends; usability; graphic design; typography; marketing, materiality, texture & surface; transparency and translucency; reflection and glossiness; ergonomics; customer behavior; street furniture; product design; packaging

**Color Psychology:** perception, chromatic harmonies; emotional interactions; perceptual illusions; color combination, palettes & schemes; color & form; phenomenology of color

**Color, Health & Wellness:** well-being, visual comfort, lifestyle, chromotherapy, biodiversity, waste, pollution; the design of hospitals, assisted living facilities, medical offices, laboratories

**Color Education:** didactics, methodology & theory; teaching aids; color naming and categorization; static and electronic media applied to color teaching; color order systems

**Color, Materials & Science:** color constancy, color adaptation, color appearance models, lighting design, LEDs, color rendering indices, metamerism, shadow, night vision, color measurement, photometry, quality control, digital color management, reproduction, image processing, color imaging, computer graphics, virtual reality, color in 3D printing

**Color Aesthetics:** art; arts & crafts; visual culture & studies; photography; performance; museology; scenography; music & sound; virtual & media projects; fashion; textiles; cosmetics; food





# ORAL PAPERS, IN ORDER OF PRESENTATION



## FROM TWO-DIMENSIONAL MONOCHROME TO ENVIRONMENT COLOUR IN ART

Renata POMPAS

*www.color-and-colors.it*

### ABSTRACT

How does art use single colour to act on space?

The space designed relies on aesthetical and symbolic codes, from which art develops ever-renewed languages, using it as a means to engage viewers. This work is a reflection on the choice by some artists to use a colour that is free from any objective reference, a Monochrome, acting at a perceptive, aesthetical, ideological and emotional level at the same time. After adopting colour as an independent meaningful subject at the end of the 20th century, art has not contented itself with painting on the surface, but it has gone beyond the canvas as it has installed Monochrome in the space and finally transformed it in a space viewers can walk through.

This paper will focus, among others, on Kazimir Malevič with his radical *White on White* in 1919; Wassily Kandinsky with “*Spiritual in art*”, a text published in 1911 theorizing the relationship between form and colours and associating the latter with a mystical and moral property; Piet Mondrian, who pursued perfection through the spatial relationship of Steiner’s three primary colours, yellow, red, and blue. Other subsequent major factors were the lessons and the texts by Johannes Itten, the definition of aesthetical, communication and numerical values of each primary colour, and the ideas by Josef Albers on chromatic perception, artists who influenced generations of students.

This work focuses on some significant and clarifying examples of the path of two-dimensional monochrome with its different meanings: expression of silence for Robert Rauschenberg, self-hypnotic for Barnett Newman, contemplative for Ad Reinhardt, emotional for Mark Rothko. This work will present the moment when colour went beyond the canvas breaking through it, in the spatial monochromes by Lucio Fontana. Then will compare the adoption of three-dimensionality in the esoteric monochromes by Yves Klein, in the Neo-Dada works by Piero Manzoni and in the optical works by Paolo Scheggi. This work also shows how Monochrome dissolved in the interference painting by David Simpson; how it took on an evanescent feel in the natural elements by Wolfgang Laib; how it dematerialized in the light by Dan Flavin and in the atmospheric and hallucinatory light by James Turrell; and how it dilated in space, creating a sensorial environment in Anish Kapoor’s work.

## THE USE OF ENVIRONMENTAL COLOR IN HOTELS: A CASE STUDY ON CETA ECOTEL MACAPÁ, BRAZIL

Paula CSILLAG,<sup>1</sup> Tilia Monte de ALMEIDA<sup>2</sup>

<sup>1</sup>Faculty of Design, ESPM University, São Paulo and  
President Associação ProCor do Brasil (Brazilian Color Association)

<sup>2</sup>Architect Carneiro Home, Post-Graduate Student at São Paulo  
Fine Arts University

### ABSTRACT

The aim of this article is to present a study on how the use of colors on the internal and external environments of a Brazilian hotel affected consumer and employee behavior. The results are analyzed in terms of model Sens|Org|Int, which differentiates physiological aspects of color human response from cultural and interpretive aspects (Csillag, 2008). The study was conducted at CETA ECOTEL, an ecological hotel at the city of Macapá on the northeastern coast of Brazil. The methodology was of a case study (Yin, 2004), using a triangulation process, crossing information obtained from three points of view: the researchers' analysis of the environment, a qualitative & quantitative questionnaire with 50 employees of the hotel, and a qualitative & quantitative questionnaire with 640 consumers (visitors of the hotel). Results show consumers' and employees' most and least preferred colors for the environment. These results were triangulated for analysis using Model Sens|Org|Int indicating, among other conclusions, that visitors preferred colors that have a specific physiological response (Org) which is related to the hotel's market niche being it an ecological Brazilian hotel (Int). Employees preferred a different physiological response of colors, considering that their choices are for the work environment (Org). It is observed that their choice is correlated to their motivation for a good work environment (Int).

# URBAN SPACE AND THE QUEST FOR COLOR HARMONY

*Atis KAMPARS*

*RISEBA University of Business, Arts and Technology*

## ABSTRACT

The idea about the necessity of harmonious colour sets seems popular and is at least one of the reasons for the regulations on color application in the urban environment. My contemplations were caused by the cognition that spatial objects like buildings, parks, streets etc. create relatively harmonious colour combinations disregarding the kinds of visual properties they actually possess. There are several external factors, which influence the quality and of information obtained by spatial observation such as the intensity of light, the angle of reflection, the distance of observation, the density of atmosphere, and, at the end, the internal ability of an individual to perceive. Systemic color schemes are the basic codes of thinking yet they cannot be used as an operative tool for visual orientation in the spatial environment because of their two-dimensional character, the fixed condition of colors and use of a neutral, static light. Two observational principles derived from the concept of the optical axis determine the balanced color relations in the external environment and color harmony seems to be the by-effect of spatial observation – an interpretation of the world of visual things rather than the evaluation of the visual properties of objects themselves.

## TREES OF BUENOS AIRES CHANGING THE APPEARANCE OF THE CITY

*Maria Luisa MUSSO*

*Programa Color. Facultad de Arquitectura, Diseño y Urbanismo, Secretaría de Investigaciones. Universidad de Buenos Aires*

### **ABSTRACT**

The color of a city is not limited to the inherent color of the facades of their buildings. It must be considered the perceived color in all its complexity and all the elements, which form the urban landscape, as buildings, equipment, and trees. With regard to vegetation, important areas of Buenos Aires show modified the appearance by the trees in different seasons of the year. These sections refer only to the trees that produce changes in the appearance.

# **[COLOUR STUDIES] RE:PLACING COLOURS. EVALUATION OF THE CHROMATIC INTERVENTIONS ON THE BLOCKS OF FLATS IN BUCHAREST, ROMANIA**

*Veronica Maria ZYBACZYNSKI*

*Faculty of Architecture, "Ion Mincu"*

*University of Architecture and Urban Planning, Bucharest*

## **ABSTRACT**

The communist era left Bucharest, and Romania in general, with hundreds, thousands of grey concrete blocks of flats (4 to 11 story high). In the early 2000 the City Council together with the Ministry of Regional Development decided to rehabilitate these blocks of flats by financing the entire project or just parts of it. The intention was to improve the city's image by removing the grey damaged envelope of the blocks of flats and by replacing the monotonous and uniform colour with colours appropriate for the contemporary urban environment. Thus, after 2007 scaffolds were mounted and rehabilitation began. This article aims to evaluate the outcome of the interventions on the envelope of the blocks of flats in terms of colour and also in terms of the impact at the urban space level. The assessment is based on colour mapping of several main streets of Bucharest, streets bordered by rehabilitated blocks of flats by highlighting the chromatic palette used in these cases. The colour mapping method used was based, on the one hand, on the pictures produced in situ and, on the other hand, on the comparison of colours with a reference colour chart. The results of the evaluation of the chromatic interventions for the blocks of flats show that the used colours, the applied chromatic schemes and the association of colours were arbitrary chosen, without taking into consideration the laws of colour harmony. At the urbanscape level the impact of these chromatic rehabilitations was disastrous, creating a cacophonous urban image, a colorful cocktail. Each block of flats was designed separately and was not put into context. The findings of this research highlight the need of creating a colour atlas and a colour plan for the city. The lacks in legislation need to be filled in order to create and maintain a coherent chromatic urbanscape.



# ANALYSIS OF KOREAN UNDERPASSES, SPACES UNDER OVERPASSES, AND PASSAGE BOXES WITH LOW LIGHTING RATIOS AND PROPOSAL FOR ENVIRONMENTAL COLORS. FOCUSED ON THE UNDERPASS AT SEOKGYE STATION

Kim YOOSUN<sup>1</sup>, Shin SANGEUN<sup>2</sup>, Lee SUNGJOO<sup>3</sup>, Lee YOOJIN<sup>3</sup>, Park JINJOO<sup>3</sup>

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<sup>3</sup>Sahmyook Environmental GreenDesign Research Institute

## ABSTRACT

Today, people are highly satisfied with their lives. However, they are exposed to many natural disasters and various crimes. To solve these problems, people try to improve the surrounding environment. In fact, it is possible to create a safe and stable environment through the use of colors.

Color improvement is economical in that a color change does not require the addition or removal of environmental and design factors. Besides, color can provide safety through its visibility and attractiveness; it can also foster psychological stability and a sense of historical identity and aesthetic appeal. Thus, color can play various roles as an effective tool for environmental improvement. These days, among public spaces in Korea, spaces under bridges (used by both vehicles and people) and overpasses, underpasses, and passage boxes have low lighting ratios that are linked to an increase in crimes. Further, the visual aesthetic impression of these spaces is poor. Therefore, people are requesting that nearby public facilities and underpasses become brighter and more attractive. Accordingly, this study promotes the use of safe colors in the design of surrounding environments in order to improve the negative image of underpasses and their safety and stability.

A color plan has been proposed in this study based on an environmental factor analysis of the underpass at Seokgye Station, located in densely populated Seoul. Subway lines 1 and 6 connect there, so the number of people passing through is high. The underpass, however, is old and without color (unlike other underpasses nearby). For the underpass at Seokgye Station, this researcher used yellow-based light gray as the dominant color, orange as the accent color, and blue as a secondary harmonizing color for psychological stability, aesthetic impression, and a local historical identity. It is expected that these colors will help provide a public space characterized by increased safety, psychological stability, historical identity, and convenience.

# SUSTAINABLE DESIGN: COLOUR TECHNOLOGIES FOR STATIC FAÇADES WITH DYNAMIC EFFECT

*Alessandro PREMIER*

*Dept. of Civil Engineering and Architecture, University of Udine, Italy*

## ABSTRACT

As we all know, colour combination and contrasts can confer specific effects to an object. You can highlight some parts of it, you can smooth other parts, you can make it vanish in the context, etc. There are a lot of “colour strategies” used by the designers to obtain certain effects. In the specific field of the architectural façade design the majority of the research seems to be directed towards the study of adaptive systems. As it can be easily guessed dynamic façade technologies are quite complex and relatively expensive, depending - of course - by the complexity of the whole building design. Sometimes the customer doesn't really need a dynamic façade but he wants to pursue a dynamic effect through other means. In these days we see more and more buildings' façades that exploit colour technologies to obtain a chromatic effect of movement or dynamism even than they are built with static elements.

The aim of this paper is to propose a classification of the chromatic strategies used by the designers to achieve dynamic effects in static façades. The dissertation will make use also of significant examples of buildings.

## COLOR UNIVERSES FOR THE REGIONAL HERITAGE

Elisa CORDERO-JAHR

*Instituto de Arquitectura y Urbanismo,  
Facultad de Arquitectura y Artes, U. Austral de Chile*

### ABSTRACT

A color universe is a conceptual arrangement of colors related to its origin, ownership, culture, and space, among others. It differs from a color palette and a color chart because of its metaphorical reference. We used this type of chromatic order in two architectural projects in the Region of Libertador, Chile. The first one is an interpretation center that will shelter the 11,000 year old archaeological and paleontological site in Tagua Tagua lagoon. The second one is another interpretation center related to the work of the famous *chamanto* poncho weavers, high-quality and beautiful woven pieces. Both of them add value to the cultural heritage of the region. A comprehensive color study was conducted in each site, including field visits, interviews, photographs, watercolor paintings, samplings and color surveying. The colors found were arranged into a color universe specially created for each project. The application of these colors to different supports, keeping a consistent project image, was a major challenge. We hereby present the full study, covering from the field visits to develop the color study and the data collection methods which were applied to the creation of color universes and, finally, their application to the project's global image: architecture, museography, graphic design and merchandising.

# COLOURS OF A NEIGHBORHOOD: METHODOLOGICAL QUESTIONS AND CHALLENGES

Saara PYYKKÖ

*Department of Architecture, Aalto University,  
School of Arts, Design and Architecture*

## ABSTRACT

This paper addresses methodological questions that arise from large-scale architectural colour research. The paper will discuss some preliminary findings of my on-going PhD. The PhD project represents a practice-led study concerning the colour planning six residential areas built during the last twenty years in the greater Helsinki metropolitan area in Finland.

The paper will focus on one of these sites, Aurinkolahti, which is situated in the eastern part of Helsinki and was built between 2000–2016. In this pilot study, I tested two research methods, for enabling architects, artists and colour designers to conceptualize their experience of architectural colours, particularly in terms of the design process. The first method referred to as colour walk, is an ethnographic walking method. Colour walk allows the designer to provide words for non-verbal experience of colours in architecture and to create concepts for the artistic colour design process. The second method, visual ethnographic photography is both a method for documentation and an approach for conducting artistic research concerning the atmosphere of architecture focusing on colours. Designer-photographers act with their own perceptions and knowledge documents and photographs the area in order to visualize their thoughts.

## ANALYSIS OF THE URBAN LANDSCAPE TO INTEGRATE ARCHITECTURES WITH A VISUAL IMPACT THAT ARE IN CLOSE PROXIMITY TO HISTORIC MONUMENTS

Juan SERRA-LLUCH<sup>1,2</sup>, Pedro CABEZOS<sup>2</sup>, Susana IÑARRA<sup>2</sup>, Javier CORTINA<sup>2</sup>

<sup>1</sup>Colour Research Group, Institute of Heritage Restoration,  
Polytechnic University of Valencia

<sup>2</sup>Department of Graphic Expression in Architecture,  
Polytechnic University of Valencia

### ABSTRACT

This study is part of a research project whose aim is to put forward innovative architectural solutions to improve the visual integration of architectures with an impact on the urban landscape, evaluated in a virtual reality environment through immersion. Some buildings in Valencia historic city center have been taken as case studies. In this paper we discuss certain architectural resources that have been useful to develop different landscape integration proposals based on three aspects: a *historiographic* study of the image from the past, a study of the *current formal reality* and a study of *other similar contemporary examples*.

# **PAINTINGS ON RESIDENTIAL FAÇADES: COLOURING OUT CHANGE, HOPE AND RENEWAL TO THE PUBLIC SPACE**

*Verónica CONTE*

*CIAUD, Faculty of Architecture, University of Lisbon*

## **ABSTRACT**

Today, when we think about paintings in public space, possibly due to their strong presence in the urban environment, intensity of their colours and watch words, graffiti is the first thing that comes to our minds. My research is focused on actions that also make use of the wall as support for visibility, and as place for public life (Brighenti, 2009), although they emerge from different processes and generate a distinct visual culture. Thus, three actions in focus and analysis - “Greening and Painting” (Tirana, Albania), “Singing and Painting the Epiphany’s Eve” (Meca, Portugal) and “Livecolour Colourinhabiting” (São Cristóvão, Portugal) - building public space by non-disruptive actions to local authorities, involving different authors and inhabitants’ participation. Regardless of their very different origins, they have the transposition of a message of change, hope and renewal to the walls in common. Analyzing and comparing the differences among these three actions, I propose to think about levels of peoples’ participation, image results, benefits and difficulties, and consequently, to draw attention to the potential of each painted message in the construction of public space.

# ANALYSIS OF VISUAL ECOLOGY AND ENVIRONMENTAL STRATEGY BY COLOR IN THE TOWNS AND CITIES. CHROMATIC STUDY OF ARCHITECTURE AND URBAN PLANNING

Larissa NOURY

*Architect-Colorist, President-founder "Color-Space-Culture"*

## ABSTRACT

The color image of the city is rooted in its geographical space, but changes over time: its modifications have always been due to the evolution of architectural and urban planning of the city and are still constantly changing. If all the visual elements of urban space and land territory compose the integral image of the city, the color remains an essential part of the architectural, cultural and social heritage. Today, a city, a town, aspire to offer their inhabitants a high quality of living environment while respecting its geographical properties, landscape and architectural culture of their own. This is why the debate on the sustainable town must include a chromatic environmental strategy. At present, designing color in the towns & cities is part of new planning ideas and urban innovations.

## PERCEIVED COLOUR AND COLOUR PERCEPTION

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### ABSTRACT

The nominal colour of a façade is rarely perceived as the exact same colour, as the hue and nuance will be perceived differently depending on different variables, e.g. observer and surface properties, distance and angle, surrounding colours and light conditions. Whereas the nominal colour of a façade in a built environment can be measured and registered, the perceived colour –and how the façade colour is perceived in the overall gestalt– is rarely documented. The identities of the majority of Norwegian towns and cities are foremost associated with painted façades, with chromatic colours in combination with façades in nuances of neutral colours. However, counter to this long tradition of chromatic and achromatic variation, Norwegian architecture points to a dramatic change in the colour pallet towards a perceived uniform, achromatic pallet and/or use of strong chromatic colours. As a countermeasure to these tendencies, The Municipality of Trondheim co-operated with NTNU in a pilot project to do a colour registration of façades in the historic city center. The driver for the pilot project was to create a colour archive and to identify a more specific colour pallet for the city in general. This study aims to make practical use of established and published research and colour methodology by Karin Fridell Anter and Grete Smedal to form a general colour guideline. The overall aim for the general colour guideline is to be publicly accessible, and to be of practical use for developers, architects, homeowners, etc.



## URBAN CHROMATIC MOODS. RELATIONSHIPS BETWEEN LIGHT – MATERIAL – COLOUR – CULTURE

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<sup>1</sup>Isis Colour

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### ABSTRACT

The Urban Chromatic Moods in Auckland, Brisbane and Paris are strikingly distinctive. Analytical studies of the “Géochromie” and “Biochromie” of each city led to three very different projects. All three are marked by a strong presence of water traversing the cityscape, bringing to life a constant play of the interaction of light, water and material in urban space. Reflections, reverberations and refractions dancing through very different climates and cultures on opposite sides of the planet.

To discover and rediscover a land is to interpret its characteristics and feel “a spirit of place” while analyzing the potential of the natural world and its evolution, shaped by the transformations of time and human intervention. Each site emanates a certain presence, a specific resonance revealing different collective memories and visible layers of urban space development. “Géochromie” is the concept that the interdependent relationships between geography, climate, history, culture and socio-economy take part together in the development of our environment.

“Biochromie” is the concept of living colour revealed by the energy of light and associated to the fundamental elements of our biosphere: air – light – water – plants – minerals. “Biochromie” is the fusion of the chromatic diversity in the creation of the mood of an environment. The interactive energy between light, material and colour varies depending on each context and the vibrations through space.

Our approach to site analysis is based upon an annual cycle observing seasonal variations in the environment related to qualities of the light and evolution of the plant world. This analysis phase includes colour annotations of the existing mineral, vegetable and aquatic sites, presented by line and watercolour sketches, colour chart documents and photographic essays. These observations enrich material references compatible with the existing environment while remaining aligned to the planning scheme.

# COLOUR IDENTITY AS REPRESENTATION: A SEMIOTIC APPROACH

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## ABSTRACT

The study is a preliminary effort to examine the definition of colour identity and its associational meaning in non-verbal communication. Through interpretation of colour identity, it attempts to decode specific colour symbolic meaning of urban environment. As the result, this paper presents an overview of colour identity as representation in semiotic theory and analysis of some samples of environmental colours. The literature review has shown that through a process of characterizing, and representing the 'true conditions' of content, the colour of an object can be recognized as colour identity. The interpretation of meaning needs a referent. In literature, it suggests the referent should be considered a sociocultural dimension.

## RED ON RED. FRAMEWORK FOR THE INTERACTION OF COLOR IN THE BUILT ENVIRONMENT

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### ABSTRACT

This research project is based on a temporary, experimental proposal for the International Garden Festival at Les Jardins de Métis in Grand-Metis, Quebec, Canada. Building upon Josef Albers' seminal primer on color theory, *Interaction of Color*, the garden seeks to establish a new framework to experience color perception and sensation in a larger field.

# YOUR CITY, YOUR CANVAS: COLOUR AS A TOOL OF TRANSFORMATION TO REIMAGINE AND ENRICH URBAN SPACE

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## ABSTRACT

Colour Your City is a participatory global movement dedicated to reimagining urban space with colour. It invites people to look at their city as their canvas. Through the analysis of four projects, this study explored how colour is a tool of urban transformation. The case studies were: Beware of Colour, a large-scale public art intervention in Johannesburg, South Africa; the prolific Urban Forms Gallery of murals in Lodz, Poland; a Place Performance Evaluation of cultural complex the Southbank Centre, and an overview of the Colour Your City augmented reality mural in Well Street, both in London, UK.

The study revealed the use of colour has the power to bring profound and lasting benefits to city life by changing and revitalizing physical aesthetics, as well as socially by engaging the community. Colour can be used in a diverse array of mediums including paint, light, public art, street furniture and new technology such as AR. Impacts include changing the way people interact with the city landscape and each other, unlocking creativity, creating a dialogue, enhancing placemaking, fostering civic pride, encouraging playfulness, helping to spur political change, improving the sociability of space and even rebranding entire cities.

## PULSE OF A STREET: AN URBAN STREETScape EXERCISE IN BANGALORE

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### ABSTRACT

To capture an 'emotional experience' of a physical space is at the heart of this paper. For a city to be a recognizable, the defining and distinctive characteristics that can be readily identified need be highlighted. These are functional as well as non-functional qualities. These include city appearance comprising of built structures, people, geography etc., and people's experience of the city, and what kind of people inhabits the city.

The project aims to visually document and articulate (as form and colour) the iconic streets in Bangalore.

In a group of three the students were asked to select a street within Bangalore and make a visit to the place and capture the essence of the street with respect to all the five senses in collage.

Simultaneously pictures are taken during the visit. Having experienced a street the designer then penned down the experiences in a brainstorming session with teammates came up with keywords/phrases that aptly describe your experience in the street. Out of all the pictures were taken during your visit to the street 10-12 pictures were selected that are visual representations of that streetscape.

Out of each of the 10-12 pictures extracted were, dominant colours. The term 'dominant colours' interpreted as amount of colour, which means a colour present in a situation in large quantities or in small in quantities, however the emotional impact of its presence is undeniable.

Carefully, by process of elimination selected were 8-10 colours describing the place. This would make the final colour palette, supported by keywords/phrases thought of during the brainstorming session.

The design solution was in the form of posters for each street. The format of the poster could be a landscape or portrait or a square format. The decision of format was chosen depending on the mood of the street.

The final artwork is a culmination of multiple sensations, and can be used as a street branding element with the urban landscape.

## URBAN ENVIRONMENTAL COLOR: EXPERIENCE, SENSE AND IDENTITY IN THE CONTEMPORARY CITY

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### ABSTRACT

In the contemporary world, the recent urban transformations represent new material and contextual conditions; therefore, there are new ways to use the urban space that presume a change in its concept and appreciation and as a consequence, of the city as well. The present urban conditions confronted in a game of tensions focus on the nature of the urban experience with the purpose of recovering it in a broad sense, and more specifically, as an essential place for urban life (Mongin 2006). In this context, the role of environmental color is vital since it suggests atmospheres that promote ways of understanding and experiencing the space (Zumthor 2006), being this a primary element in the strengthening of urban life and the idea of the city as a collective space to inhabit.

# COLOR IN URBAN DESIGN: A DIDACTIC APPROACH TO RESTORING COLOR TO THE CITY PLANNING PROCESS

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## ABSTRACT

Colorful Life - Colorless City

City life is bursting with color: people rushing to work, shop window displays, the vibrancy of cafés on the market square. The colors, hues and textures of a city combine in a blur of lights, advertising, cars, treelined boulevards, front yards, parks and gardens. The fabric of buildings that make up streets and squares, the texture of street pavements and the material of roof tiles seen from above are all component parts of a city's color palate. Many cities are indeed famous for their trademark colors: Siena for its earthen tones, Jaipur for its pink facades, Jodhpur's indigo and the limestone buildings of Jerusalem.

Now, imagine a city without color. A city where buildings, streets and trees are of a uniform color. Unthinkable? Not at all, because this is precisely the way many modern cities are imagined in contemporary city planning: through diagrams, line drawings, through mass models of wood, plaster or styrofoam or simply through the one-tone digital mass models that visualize the first ideas.

There is a remarkable dichotomy between the reality of experiencing a city and the urban planning process: a dichotomy between reception and production, and consequently between a world of color perception on the one hand and a design process that only regards atmosphere crafted by color, texture and light as a by-product at the end of the process on the other, if at all.

## ADAPTING TO A CHROMATIC ENVIRONMENT

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### ABSTRACT

An art installation in a room filled with white smoke and illuminated by coloured lights (magenta, yellow and cyan) provided an ideal visual environment to explore chromatic adaptation. Although measurements of the spectral power distribution of the illumination showed that it was not highly saturated, we were able to observe the Helson-Judd effect, especially under the cyan illumination.



## COLOURED FILTER LENSES MAY ENHANCE COLOUR VISION PERCEPTION IN COLOUR VISION DEFICIENT PEOPLE AND DYSLLECTIC PATIENTS

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### ABSTRACT

**Aim:** To show that colour vision deficient people may benefit from colored filters as glasses or contact lenses. **Material and methods:** The author has papers about using colour filters in colour vision deficient people. The papers about fitting colour vision filters and author's personal experience are reviewed. The colour perception is measured clinically with Ishihara pseudoisochromatic charts or Wang and Wand pseudoisochromatic charts. Ishihara charts have only red-green axis, but Wang and Wang charts have red-green and blue-yellow axis in measuring clinical colour vision. In the colour examination each eye's colour perception should be evaluated separately. The examination of the fitting of the colour filters is made also for each eye separately. **Results:** The disparity between the eyes in colour perception is in colour deficient people higher than in colour normal people. So mostly, almost always both eyes need colour filters in different colours. The results are mostly satisfactory for the patients. In 90 % of the cases the colour perception becomes better in (so called) Ishihara Index. It rises about 30-90 % in each individual patient. The perception achieves maximally about 1/3 of the different colours in normal colour vision. But the patients are mostly satisfied because they achieve colour ranges that are much higher than in their previous lives until that day. The pure dyslectic (reading difficulty) patients seem to have a subclinical interocular colour vision deficiency, so they benefit also in high rates from colour filters. **Conclusion:** The colored filters as glasses or contact lenses can be used successfully and efficiently in colour vision deficient people and dyslectic patients.

## COLOUR VISION IN NORMAL AGING, CONGENITAL DEFICIENCY AND RETINAL DISEASE

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### ABSTRACT

Significant advances in understanding the genetics of colour vision make it possible to account for much of the observed variability in both 'normal' trichromatic colour vision and in congenital colour deficiency (J. Neitz & Neitz, 2011; M. Neitz & Neitz, 2000). Recent developments in colour assessment techniques yield reduced within subject variability and hence more accurate assessment of both red / green (RG) and yellow / blue (YB) loss of chromatic sensitivity (J.L. Barbur & Connolly, 2011; J.L. Barbur & Rodriguez-Carmona, 2012) with reliable classification of the subject's class of colour vision (i.e., normal trichromatic colour vision, deutan-, protan- or tritan-like and acquired deficiency). The least and most sensitive young normal trichromats exhibit a ~ 2.2-fold variation in RG and YB chromatic sensitivity. The smallest thresholds correspond to ~ 20 years of age with ~ 10% increase per decade for RG and ~ 16% for YB colour vision. 'Normal' aging therefore only doubles one's threshold over the lifespan, an increase that is hardly noticeable (J.L. Barbur & Rodriguez-Carmona, 2015). Congenital deficiency, on the other hand, yields a continuum of thresholds from just above the normal limits of trichromatic colour vision to complete loss of sensitivity. Subjects that rely on a normal M- and a variant M-pigment for their residual RG colour vision (i.e., the protanomalous) are more affected and in general exhibit greater loss of sensitivity than deuteranomalous observers. Acquired loss of colour vision is more common than congenital above 55 years and its incidence increases gradually with age. It is particularly prevalent in subjects with diseases of the retina such as glaucoma and age-related macular degeneration or systemic diseases that affect vision, such as diabetes.

## SUPERIORITY OF DICHROMATS IN A VISUAL SEARCH TASK CUED BY S-CONE STIMULUS VALUE

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### ABSTRACT

People with colour-vision deficiency typically perform poorly in colour perception tasks. Morgan et al. (1992), however, reported that dichromats exhibited superior performance in penetrating camouflage in a visual search task involving red-green mosaics. In their experiment, the red-green mosaic consisted of colours that served as distracting visual noise for trichromats, but did not affect dichromats. In the present study, we designed an experimental condition in which trichromats and dichromats could perceive the same number of colours. We investigated whether dichromats showed superior performance over trichromats in a visual search task where the stimuli were distinguished only by a difference in S-cone stimulus value. Participants observed 13 disks (1 target and 12 distractors) on a CRT monitor. Two colours were used as distractor colours, which had different S-cone stimulus values relative to the target colour, and were assigned to six disks each. The observer's task was to report which quadrant the target colour was located within. Our results showed that dichromats exhibited superior perceptual performance to trichromats. We propose that this effect may be caused by a difference in categorical colour perception between trichromats and dichromats.

## COLOR SELECTION FOR THE DEVELOPMENT OF A COLOR VISION TEST FOR CHILDREN WITH ASD

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### ABSTRACT

The visual perception in children with ASD (Autism Spectrum disorder) has been of particular interest among many researchers in the past years. These developmental disorders have shown atypical responses to visual stimuli, in particular color perception, suggesting a distinct processing of sensorial information. The Neitz, the Roth 28, The Chromatic Contrast Discrimination Threshold Test (CCDTT), the Farnsworth-Munsell 100-Hue Test, among many others, have been widely used by researchers as tools to study color perception and discrimination among patients with ASD. However, such tests involve the arrangement of color caps with just noticeable differences (JND) in color, or the discrimination of color figures and patterns. Such tasks are complex and can be difficult to isolate for those with atypical sensory processing. Therefore, it is important to develop psychophysical tools that simplify the assessment of color perception in patients with ASD. This study shows the selection of colors for the development of a color vision test especially designed for children with ASD. A total of 28 colors were selected out of 116 by a group of people with color vision problems. Later, the 28 colors were compared to those of the Ishihara test and FM Munsell and based on the confusion lines used for the construction of color vision test, a final selection of 11 colors is proposed.

## ESTIMATING CHROMATIC ADAPTATION IN A MUSEUM ENVIRONMENT USING A TABLET COMPUTER

*Danny GARSIDE<sup>1</sup>, Lindsay MACDONALD<sup>1</sup>, Kees TEUNISSEN<sup>2</sup>,  
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### ABSTRACT

Colour constancy has been explored extensively in the past in lab environments, using a multitude of experimental arrangements and stimuli. Rarely has the phenomenon been investigated in real environments, natural or unnatural, due to the large number of uncontrollable variables and the methodological logistics involved. A potential method for testing chromatic adaptation point, using achromatic setting on a hand-held tablet computer, is proposed and explored.

## TOWARD COLOUR RENDERING OF SELECTED ADVANCED GLAZING TYPES

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Technology (NTNU)*

### ABSTRACT

For most people, the correct perception of colours of objects and room surfaces is an important part of the quality of life. The aim of this study was to increase understanding of glazing materials' effect on perceived colours. The study is based on the visual observation of colour appearance of nine test colour samples in a sequence of experimental situations by participants.

The following research question was studied: How is the perception of colour influenced by glazing types in combination with light of various colour temperatures (CT)?

The experiment was carried out at Daylight laboratory at NTNU, Light & Colour Group. It has been repeated with three different glazing types: electrochromic (EC), electrotopic (ET) and photochromic (PC) glass in combination with three different CTs of exterior light, 2700K, 6500K and 8000K. Since all the 21 subjects received all stimuli, this experiment had within-subject design.

The results from n-way ANOVA show that the effect of colour temperature of light is rather weak. However, a clear colour difference between the outside and the inside appearance of samples was observed for most of glazing types.

## CHILEAN NORTHERN COLORS IN THE SANTIAGO SCENE: A CONTEMPORARY SELECTION BASED ON PRE-COLOMBIAN TEXTILES

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### ABSTRACT

This article shows the development of three contemporary color concepts and their associated palettes based on the combination of colors that evoked the chromatic legacy from the northern pre Columbian Chilean textiles. The concepts were developed using as inspiration contemporary contexts in which the colors could be applied: interior paint, Furniture and Kitchen utensils. For each concept, three color palettes were proposed in paper using 15 colors out of 36 available from a previous research (Calvo, 2015). Each palette and each of the fifteen colors were visually assessed by 15 observers tested for normal color vision. The observers determined concepts, feelings and any geographical or climatic associations in their assessments. Additionally, a visual evaluation of the 15 colored samples, presented in two different surfaces, (watercolor paper and pine wood) was carried out by 10 observers with normal color vision. Results showed a validation of the selected colors as part of the identity of culture and geography of Chile. A strong relationship between color and its associated concept was not affected by variations in the brightness or texture of the materials. This study demonstrated that is possible to use these colors in new industries, contexts and applications, contributing to the preservation of cultural heritage and the aesthetics of current Chilean identity.

## STUDY OF THE EFFECT OF CULTURE AND EMOTIONS ON THE CONSTRUCTION OF THE LINK BETWEEN SMELLS AND COLORS

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### ABSTRACT

The purpose of this study was to assess emotions impact on the relationship between odors and colors, not only inter-culturally (France - Lebanon) but intra-culturally as well : Lebanon (Zahle (rural area) - Kaslik (urban area)). In the last few years the study of emotions in sensory science field has gained a large importance (Gmuer et al., 2015). Since, nowadays understanding the motivations that drive consumer choices is one of the major challenges for marketing and consumer studies (Spinelli et al., 2014), especially since the measurement of the acceptability of the product alone is no longer a sufficient benchmark for product development and testing. Several studies have investigated the relationships between sensory characteristics and emotional responses (Cardello et al., 2012). The present study used the EsSence Profile, which is a method developed to measure emotions associated with food (King and Meiselman, 2010), to investigate the emotions effects on 18 odors stimuli (national and international odors stimuli), in Lebanon (201 subjects) and France (100 subjects). In Lebanon, participants from both rural and urban areas were tested (101 subjects from urban area Kaslik and 100 subjects from rural area Zahle). Participants had to link the 18 odors stimuli to emotions and colors. Differences were found between both populations and within the same population between urban and rural citizens, in terms of emotions used to describe the odors stimuli and in terms of colors linked to each odor stimuli. Which leads us to conclude first of all that emotions and colors associated to odors vary not only between two different countries but within the same country as well. Secondly, emotions play an important role in building the link between odors and colors, which can be a real challenge for the marketing departments in the food field especially in a small country like Lebanon.



## AYMARA WEAVERS AND THEIR COLORS THROUGH TIME

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### ABSTRACT

In the Andean cultures textiles had and have a relevant role as a cultural medium. Weaves identify, dress, shelter, embellish and are an important defining element in ritual and celebration occasions. Like all cultural artifacts, they are in continuous transformation and materialize their creators' cultural changes, who, maintaining a continuity in fundamental axes, selectively adopt what allows them to recreate over and over again their works and messages, reinvigorating and updating their contents. Color is an essential component of this language, and at the same time a reflex of the dynamism of these cultural processes.

Aymara people, heirs of the millenary Andean culture, are native people without borders that live preferably in high spaces (above 4.000 MASL) in Peru, Bolivia, Argentina and Chile. This work presents the observed changes in the use of color in traditional weaves of aymara craftswomen from the Chilean Andean high plateau for over a century. Associated to technological changes, in this time lapse, weavers have incorporated new techniques and materials, and at the same time are challenged by different chromatic possibilities which they have interpreted in their weaves, managing to sustain their cultural heritage over the permanent intromission.

# COLORS & THEIR VALUES: ANALYTICAL STUDY OF HISTORICAL PERSIAN MARRIAGE CONTRACTS

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## ABSTRACT

Persian marriage contracts are among rare documents in which passion and practicality, which are contrast components of married life, come together. They form a distinct branch in the Islamic Art of the Book in general and in the Persian traditional arts in particular. This is due to their unique and outstanding characteristics, both in the area of literature and in the domain of visual arts. This paper is the outcome of the study of 73 original Persian marriage contracts from Iranian public and private collections that were studied over a period of some 17 years. In addition to these, 27 additional marriage contracts from the collection of manuscripts of the Harvard University, dedicated to the study of the life of women in the Qajar period, and 5 contracts from the Islamic Arts Museum Malaysia were included. The primary focus was to extract the core colors used in the contracts, and, accordingly, developed a color palette. As colors carry with them certain cultural and religious values, literary sources contain passages on Persian color theories from philosophical and mystical literature, have also been studied.

## **ARCHITECTURAL COLOUR: A DISCOURSE IN THE POPULAR NORWEGIAN PRESS AND SOCIAL MEDIA 2014 TO 2016. THE GREYING OF NORWAY**

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*Faculty of Architecture and Fine Art,*

*Norwegian University of Science and Technology (NTNU)*

### **ABSTRACT**

This paper will examine the visual and verbal rhetoric that project the power relationships in the drift towards achromatic colour schemes in new architectural projects and the repainting of surface colour of existing buildings that fall outside heritage regulation in Norway. This is examined through media debate to expose the power relations of cultural capital in the rhetoric used by the stakeholders in the ranging, from householders, to architects, heritage experts, local authorities, colour designers and developers and as mediated through journalism. It considers the relationships between agents in the exercise of cultural capital. It asks how the drift towards the achromatic is mediated and if this is the influence of the cultural capital of decision makers, an accumulative tipping point that leads to a change or the absence of disciplinary knowledge in the complexities of colour in the professions that are responsible for the colour of public space. Standpoints taken by key participants as articulated in the media are analyzed to examine hierarchical roles and establish a clearer understanding of the mechanisms through which this change takes place. The authors will argue that the achromatic palette is now the standard norm.

## COLOUR AS SIGN OF IDENTITY IN URBAN TEXTILES

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### ABSTRACT

*Textile Design as a Sign of Identity* is the title of one of the projects developed over the past five years in the Textile Design Level 2 teaching course, as part of the Textile Design Degree. One objective is to identify and incorporate significant elements to communicate a regional or cultural identity in a series of textiles for home, hotel and office.

In this paper we will focus particularly on the color registers involving a total of 160 projects. As in other studies, we want to recover a space for reflection on the symbolic aspects of color, typical of the students' personal and national culture, partly lost owing to the commercial importance attributed to international trends and homogeneity that this produces in the color experience.

## SECOND COLOUR LIFE

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### ABSTRACT

It is a well known fact that practical training of a university student is very important not only for the performance of the profession but also for their personal and academic development. In that sense, the academic training of future professionals in Product Design Engineering covers a wide range of educational possibilities, which are based not only on the industrial aspects, but on ways of relationships with the Design Culture. Nonetheless, Colour Culture teaching needs a deeper study model in order to become Colour in an essential factor on the design project.

Therefore, the title and content of this paper respond to the reinforcement of two parts. Firstly, to teach student the creative aspects of colour applied to plastic arts and, secondly, to learn the different kinds of representation, from two-dimensionality to three-dimensionality. Thus, we understand that giving a Second Life to Color could include two conditions: the study of the arts and the opportunity of materializing a design. Using materials in order to achieve new ways of seeing the world through art.

## **COLORTRANSLATION TOOL. HOW GRAPHIC DESIGNERS CARE ABOUT COLOR MANAGEMENT**

*Miguel SANCHES<sup>1,2</sup>, Dulce LOUÇÃO<sup>2</sup>, Fernando MOREIRA DA SILVA<sup>2</sup>*

*<sup>1</sup>Polytechnic Institute of Tomar*

*<sup>2</sup>CIAUD – Research Centre for Architecture, Urban Planning and Design*

### **ABSTRACT**

The research presented here aims to explore the topic of color reproduction, mainly with regard to how graphic designers currently communicate technical data concerning color. We want to see in what way the working methodologies of these professionals contribute to the predictability, consistency and uniformity of color reproduction at a time when printing technologies, media, and available resources are increasingly diverse. From this study it was possible to confirm that color reproduction has experienced very significant developments in the printing industry and, therefore, it is necessary to understand how these changes affect the work of graphic designers with regard to the use of color management tools. To improve color communication, we developed a platform – ColorTranslation Tool – where graphic designers can gather the scattered information, particularly with regard to PDF and Preflight default settings and also download Color Settings for certain production conditions. With this tool, the user can select a number of settings depending on the type of work they are producing and, then get access to a set of files that can be loaded into their software to update the Color Settings. We based these settings on industry recommendations and norms, and the tool was evaluated and validated for a broad range by experts in the fields of graphic design, color management, digital workflows and print production.

## EMPIRICAL APPROACH TO DEFINE A DIGITAL COLOUR SPACE FOR LIGHT EMITTING TEXTILES

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### ABSTRACT

The paper describes an approach to define a colour space for LED light emitting textiles. The combination of lights and textiles is settled in an innovative textile material category called smart textiles. Within the context of material research and culture light emitting textiles are considered as smart surfaces using a so-called transfer-technology, which integrates functionality into fibers and yarns based on its conductive properties. These materials are “giving” body to the thought that new is not only what a material “is” but what it “does” (Küchler 2008) and these surfaces after all will change our perception of materiality as they can change their appearance (Mügler and Tomovic 2014).

This paper describes the empirically developed digital colour space for light emitting textiles, which prepares new technology for future use in textile and product design. The experimental setting is methodologically based on the Natural Colour System (NCS), which permits to assess chromatic values visually. The examinations followed three steps: defining white values as baseline; calculating chromatic values; evaluating and refining all values in an expert panel. The outcomes indicate, that a solely mathematical defined colour space should be revised visually. The findings can be applied in design work with light and textiles.

# COLOUR INFLUENCE ON USER'S MOTIVATION TO PRESS INPUT BUTTON: ANALYSIS USING PAIRED COMPARISON

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## ABSTRACT

The aim of this study is to reconfirm the colour influence on user's motivation to press an input button on touch screen equipment. In order to understand the colour influence clearer, paired comparison method was used in this study. The results indicated that the colour of the most pressed button was bright yellow. The button colours, which also gave a high motivation to press, were yellowish, orangish, greenish and white. The results of this study and previous study were similar on high pressing motivation of yellowish and white colours, however greenish colours are pressed more in this study than reddish colours. Correlations between colorimetric values and the scale values of each button were analyzed. There was a high correlation between lightness and the pressed scale value.



## RELATIONSHIP BETWEEN COLOR AND FORM FEATURES OF WATERSCAPE DRAWING AND DRAWER'S PERSONALITY

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### ABSTRACT

Relationship between image features of the waterscape drawing and drawer's personality was investigated. Eighty university students drew a picture according to an instruction 'please draw freely a scene with water.' They also answered YG Personality Test. Pictures were scanned into digital image, and color feature indices (Ave-L\*, Ave-C\*, and Ave-h) and form feature indices (ASM, CON, COR, and ENT) were obtained. Correlation analysis between color and form feature indices of the water image (water-depicted area of the picture) and factor scores of YG Test showed that participants having higher Ag (Lack of Agreeableness) and R (Rhathymia) scores drew water in dark blue (resulting in lower Ave-L\*, higher Ave-C\*, and minus value of Ave-h indicating blue direction), and the image texture of water they depicted tended to have high local contrast (CON) and randomness (ENT). These results were explained as indicating that participants with such personality did the task eagerly, and were highly motivated to draw the water thoroughly in the color he/she chose first (blue in the most case). Different tendency was also found when data were analyzed separately for male and female participants.

# ADUMBRATIONS OF THINGS AND ADUMBRATIONS OF COLORS: A PHENOMENOLOGICAL ISSUE

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## ABSTRACT

In our daily life, we see an object as being of the same color despite the variations in lighting conditions and the diversity of the shades of color. That is the phenomenon of color constancy. How may this be explained from a phenomenological point of view?

According to Husserl (1983: 237), the manifold shades of a color are adumbrations in virtue of which we see one and the same color. The phenomenon of color constancy emerges out of a process of adumbration.

Husserl's theory of color adumbration is based upon his description of visual perception. He develops his theory of adumbration primarily in order to explain the constancy and identity of the objects of our daily perception. His main thesis is that we see one and the same object through the manifold adumbrations or profiles in which it continuously appears. Through its adumbrations, the visual object presents itself as being itself.

Now, the analogy between the adumbration of colors and the adumbration of perceptual things is not immediately evident. The profiles in which a perceptual thing appears are different from the shades of a color. In this paper, I will present some arguments against Husserl's attempt to extend the adumbration theory from the perception of things to the experience of colors.

## WHAT ARE THE COLOURS OF THE WORDS 'ME' AND 'OTHERS'?

Ivar JUNG

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### ABSTRACT

How do people from different cultures associate colours with certain words? This paper describes a study into how people from two different cultures associate 24 words with colours. The findings can be of interest for professionals and academics working in the remit of visual communication in different cultures. The aim of this research is to investigate if there are distinctive patterns –similarities and differences– in how subjects from two different cultures connect some selected words with colours. From the study it is also possible to see if there are differences in the chosen colours related to the subjects' sex, age, experience of colour and religion. The Nepalese subjects are most Hindu and Buddhists while the Swedish subjects are mostly Christians, although it is not known to what extent the subjects are actually practicing a religion. The reason for conducting this pilot study in Sweden and Nepal is that these two countries obviously differ in term of culture and religious context and that I had access to both. This is a pilot study designed to explore the method. With the experience of this study, a larger study is planned in six more countries with various cultures and religious backgrounds in different parts of the world during 2016 and 2017.

## COLOR: MORE THAN A PHYSICAL ATTRIBUTE

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### ABSTRACT

This study describes the results of a psychophysical experiment of perception and emotional connotations of color in a group of Chilean observers (ages 18-30) all tested for normal color vision. First, 30 participants were asked to name basic colors to determine a list of colors recognized by Chileans. Secondly, 60 observers were asked to give at least 3 connotations for the each of the colors selected previously. This type of interview intended to give observers the freedom to choose their own words for description (Clarke et al., 2008. Ferraro, 2009). Each interview was carried out individually in order to avoid bias. Finally, 60 participants were asked to select, from a range of 8 colored chips, which sample represented the “basic color” and which represented the connotations described for each color. Initial results showed that a total of 9 colors are recognized as basic colors. In addition, the initial analysis showed that each color had a wide number of connotations. Red showed the least number of connotations (32) and purple showed the largest number of connotations (68). This work aimed to establish the basic understanding in color connotation among Chileans and how this findings may improve marketability of new products.

## RELATIONSHIP BETWEEN INDIVIDUAL'S COLOR PREFERENCE AND TENDENCY OF SEEKING PLEASANTNESS AND COMFORTABLENESS

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### ABSTRACT

Following Takahashi and Hanari (2015), relationship between individual's color preference and his/her personality concerning pleasantness and comfortableness, active and passive kinds of our good feelings, was investigated. Seventy-three undergraduates answered the degree of liking of twelve basic colors; red, orange, yellow, yellow-green, green, blue, purple, pink, brown, white, gray, and black. They also answered the questionnaire originally developed for assessing one's personality of seeking pleasantness and comfortableness using five short statements each. Individual's preference score of each color and the degree of seeking pleasantness (P score) and comfortableness (C score) were obtained, and analyzed by the correlation analysis and the multiple regression analysis. The results showed that participants with high P score tended to like pink, red, purple, and brown, and participants with high C score tended to like orange. These results were not explained by the sex difference. Together with the previous results (Takahashi & Hanari, 2015), relationship between pleasantness-want and purple preference was considered to be most reliable, and possible psychological background that links these characteristics was discussed. Different results between the previous and the present studies were also found, possibly reflecting different aspects of the personality assessed; passive sensitivity in the previous study and active want in the present study, of pleasantness and comfortableness.

## COLOR PREFERENCE STUDY OF SNACK PACKAGE DESIGNS FOR CHILDREN AS A HEALTH COMMUNICATION STRATEGY

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### ABSTRACT

To study the impact of color on the choice of a snack food package, children ages 9 to 13 were asked to select their preferred choice of a snack to eat among packages displayed on a computer in five color choices; green, yellow, red, pink, and blue. The participants were divided into three groups to observe the relationships between the selection of healthy snacks and the impact of color on the packages of the preferred-selections. The result suggests that green is perceived the healthiest color among the five colors, however, green, red, and blue were equally preferred colors on their selections of snacks to eat. When asked a question about the relationship of flavor of their first chosen color, most children's answer was associated with a name of a fruit. Children made their first color choice based on their favorite color to eat; the reason for their second color selection was that the color stood out visually or was bright.

## THE USE OF COLOUR IN HEALTH CARE FACILITIES

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### ABSTRACT

Colour is more than an aesthetic element in interior spaces; it plays an important role related to emotions, feelings and in some cases with biological aspects generated in humans.

It is for this reason, that health care facilities and punctually hospitals should be places where the application of colour is handled in a professional way. It is relevant to take care about psychological, physiological and emotional aspects generated in patients.

Gradually this trend was changed to allow the use of colour, often timidly and incipient. Already in the eighties the Opt Art artist Bridget Riley, was hired to paint murals in the corridors of the Royal Hospital in Liverpool. She proposed a vibrant colour scheme, inspired by Ancient Egyptian Art. She expressed about his work: "The hospital corridors are different, they embrace the whole space: they aim to lift the spirits and to remind one of life outside the hospital."

Riley's work is only one example of how colour can change the appreciation of space according to the user's conditions; today we find more examples to show how important is colour for the patient's recovery.

One of these is The Phoenix Children's Hospital in which the proposal is innovative and daring. Rich, vibrant colours not only flood the public areas, but also the children's rooms. Orange chairs, violet and green walls are combined in some spaces to boost the energy and cheer up children.

The same conception was applied at the Silver Cross Hospital in Lennox, Illinois where the rooms, corridor and other areas are expressed with unusual schemes, but always respecting the patients and visitors wellbeing.

## EVALUATING MUCOSAL TISSUE COLOR USING PERCEPTUAL SCALES

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### ABSTRACT

The color of mucosal tissue plays a crucial role in disease detection and treatment. Whereas the mucosal color has been measured and described, the quantitative evaluation of the mucosal color as the disease developed has not been researched or well-described as of yet. Psychophysical experiments were performed to achieve perceptual scales of mucosal color perception for medical applications. In addition, a mathematical model relating the physical values and the perceptual scales of mucosal color was derived. Finally, the perceptual color values for the physical measures of any mucosal color could be obtained. The results indicate that the perceptual scales exported from the model correspond well with the visual perception of mucosal color change. By using the perceptual scales, mucosal color can be quantitatively evaluated with commensurate changes in disease and then the disease level can be quantified.



## CHROMATIC COMPLEXITY IN THE DEMOGRAPHICALLY DIVERSE BUILT ENVIRONMENTS

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### ABSTRACT

Toronto and its suburbs.

Color plays an important role in the identity of the city, the sense of belonging, the idea of collective history, continuity and sharing of the same social space. In Europe there have been some significant projects about colour and identity of the city or both. In terms of preservation of the old and envisioning of the new- for example the city of Turin, Italy\*.

The historical core of the city and the suburbs have very different dynamics of development, as a result, city core and suburbs most often look aesthetically and by design unrelated to a high degree.

Toronto (established 1834) is a relatively young city, and is not developed from the available material palettes from its natural environment but is modeled after a colonial image of a British red-brick housing style city patterns. Therefore, the architecture of Toronto is simulacra of British architecture built in a very different geography and climate.

Recently, in the context of globalization, Toronto has developed a look of a modern city, which tends to look very similar due to its universally generic modern architecture of steel and glass. This is vividly illustrated in David Cronenberg's, movie "Dead Ringers" (1988).

In my color classes, students have been developing various colour visions and concept for Toronto being a multicultural metropolis and most demographically diverse city on Earth.

## EFFECTS OF ENVIRONMENTAL COLOUR PERCEPTION AMONG THE ELDERLY. A CRITICAL REVIEW

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### ABSTRACT

This study analyses 37 previous colour studies published in AIC Congresses and Meetings from 2002 to 2015. They are selected from various disciplines discussing about colour perception and visual cognition in the Elderly. Focusing on how could the results of these studies affect ageing population in physical environments, as residential architecture or care homes. The study reviews factors such type of setting, method of assessment, type of colors and type of context. How would an interior space change someone's well-being? Could colour schemes influence someone's spatial perception in a particular way?

## COLOR, A GREAT TOPIC TO LEARN MORE. TEACHING EXPERIENCE WITH ACADEMICALLY TALENTED KIDS

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### ABSTRACT

As a professor, facing the challenge of creating a course for PENTA UC, (Teaching Program for kids with academic talent, in Spanish) on color. It was structured around the question “What color do we see when we see?” as a way of inviting personal and provocatively to learn from the world through color, its relation with people’s, animal’s and plant’s lives and uses as an efficient way of communication. The teaching methodology combined two strategies in each session: 1) Presentation of an particular topic each session through ideas, images, and examples; and 2) A workshop of practical exercises developed with colorful materials, individually or in groups, following exposition and discussion of the results. Color in this course lends itself to a sort of pretext for stimulating the students and leading them to discuss a wide array of issues from the world, people, communication and art among many other subjects. In this way, color serves as an inductor of reflection, critical thought and practical knowledge about the world.

## COLOR AND ART TEACHER

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### ABSTRACT

This article is part of a doctoral research that aims to analyze color in Brazilian elementary Art Textbook. Appointments from Art teacher's testimonials are presented here. The observations were made during the analysis of elementary Art Textbooks that are part of 'Plano Nacional do Livro Didático' – PNLD (National Textbook Plan, in English).

# OFF-COLOUR: THE LACK OF INCLUSION OF COLOUR IN THE FORMAL EDUCATION OF ARTS AND DESIGN IN CHILE

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## ABSTRACT

Colour is an uncomfortable resource. It is and has been for centuries. On numerous occasions, the criticism of art, design and architecture have dared to skip the mention of color and have been entangled in a thicket of wrong words, which is not so surprising. Words often seem to be too blundering or too hasty if the purpose is to objectively describe the colour or to subjectively express its effect on the viewer. It's usual to say that colour speaks for itself in art, architecture and design and that any attempt to do so in its behalf, is doomed to failure. In the case of some countries as Chile, the education of design and architecture has historically been focused on the properties and development of form, drawing and perspective. This have left colour immersed into a greater silence, which is significant. This research diagnoses how colour has been uncomfortable to these disciplines and the research also provides the state of the art of the teaching of colour in Chile, in what is related to its history, methodologies, didactic resources and formal inclusion of colour in the curriculums of art, design and architecture schools. This paper additionally seeks to propose some ways to contribute to a better and more meaningful teaching of colour, in the primary, secondary and higher education. This, from a review to particular activities such as workshops, exercises and training activities carried out until 2016. All these activities were based in the individual experience and the direct observation of colour.

## NCS AND THE HERING HERITAGE. COLOUR RESEARCH, MARKETING AND SCIENTIFIC RESPONSIBILITY

*Gunnar TONNQUIST<sup>1</sup>, Karin FRIDELL ANTER<sup>2</sup>, Ulf KLARÉN<sup>2</sup>*

*<sup>1</sup>One of the AIC founders (1967), AIC Judd Award recipient (1997)*

*<sup>2</sup>SYN-TES Nordic Interdisciplinary Network on Colour and Light*

### ABSTRACT

This paper discusses some of the problems involved in maintenance and scientific development of research results when the original researchers are no longer active. With time, there are always problems in communication, and facts and stories tend to become distorted. The organizations, institutions or companies that act as the guardians of once groundbreaking research have a strong responsibility to maintain its accuracy and vigilance, as well as allowing and promoting development and critical analysis.

We discuss these problems regarding the Natural Colour System, NCS, in order to clarify the scientific problems that can arise when research results are owned by a company. Such problems regarding company policy and scientific responsibility might well exist also in other cases, but this is an obvious example that we know well. We also want to make the AIC community aware of the changes from the work honored by the AIC (Judd award 1997) to the present use of the NCS concept.

## SELF-DEVELOPED METHODS FOR WORKING WITH COLOUR DUE TO THE LACK OF TRAINING BY CHILEAN ARTISTS, ARCHITECTS AND DESIGNERS. A CRITICAL APPROACH

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### ABSTRACT

There is a strong concern in the Chilean academic art community regarding the actual condition of colour training in design and art related schools. In spite of the incorporation of some aspects of colour education in the curriculum of art and design careers during the last decade, these changes don't seem to be sufficient and, as a consequence, most students don't reach the basic academic skills for a satisfactory use of colour.

This research seeks to demonstrate the lack of colour training in Chilean universities. Accordingly, this study shows the existence and the need of self-developed methods of working with colour by students and graduates of art and design related majors. For this purpose, an online survey was taken, proposing a brief diagnostic test to evaluate the collective and individual level of colour knowledge. As preliminary results, from the sample of 50 participants, 42 of them (84%) answered to have knowledge on colour theory and application, but from this group, only an alarming 12% answered correctly the diagnostic test, confirming the hypothesis of this research. Furthermore, three participants who failed the diagnostic test were chosen to be interviewed individually, asking them to prepare a colour composition in order to understand and expose their self-developed colour method. Here, all of them indicated that the first step in their method was to imagine a colour palette right after the indications, an intuitive approach. Secondly, some interviewees recalled some of their previous work and others looked for references on Internet to complete the task. Then, some of them were modifying intuitively their initial palette by contrasting colours and deciding if any modification was needed, giving further information regarding their self-developed methods, showing that their process is mainly supported by intuition and experience.

# COLOUR EDUCATION: A BASIC METHODOLOGY AND A FRAMEWORK OF EXPERIMENTS FOR COLOUR AND LIGHTING DESIGN TEACHING

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## ABSTRACT

In this article, a series of basic experiments on the visual perception of light and colour are presented. They are intended to provide practical verification of, and experimentation on, three fundamental aspects that govern the relationship between light, colour and humans: the light's physical traits, visual-optical aspects and cognitive aspects, which influence our perception of objects and the environment.



## COLOREARTE: SCHOOL COMPETITION OF DYEING AND CREATIVITY

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*<sup>2</sup>General Manager, Anilinas Montblanc*

### ABSTRACT

This document aims to raise awareness and give value to the work of COLOREARTE, a school competition that promotes creativity, teamwork, reflection, observation and expression, all capabilities that enrich the color learning in primary and secondary education.

In this paper, the most important aspects of the program will be defined, to continue with its methodology and explanation of the supporting materials.

## RESEARCH ON THE RELATIONSHIP BETWEEN SKY COLOUR AND AQI (AIR QUALITY INDEX)

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### ABSTRACT

“Blue sky” has always play an important role in human civilizations, has necessarily related to environmental aesthetic and wellbeing. With rapid development of industrialization and urbanization, the blue sky appears rarely because of the heavy smog especially in developing countries. This subject based on the interdisciplinary research and the dual advantage of art and science, to explore the relationship between the air quality index and the blue sky index by working on the sky colour and measurement which collected in two years as well as all the data of air quality index in two years.

## MATERIAL PERCEPTION AND SURFACE PROPERTIES

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### ABSTRACT

Color Research has developed prosperously in these years, particularly on “color appearance”, which had made a significant breakthrough. Among them, textures, which are intimately related to color appearance, have got little attention. Features of textures possess enormous influences on surface color perception. Interactions between colors and surface materials have big stake on the accuracy of color display. Recently, the uprising of “material perception” researches has gradually filled up the insufficiency. The present research aims to explore the influences of material properties on the appearance of surfaces. Based on authors’ previous study (Lan, Lee et al. 2015), and adopting the Cesia’s theoretical model (Caivano 1996), which proposed three elements of material properties: Permeability, Absorption, and Diffusivity (P-D-A scale), with the utilization of rotary color mixer devices, in adjustment with properties combined of various ratios of mirror surfaces, matted surfaces, and transparent surfaces, we investigate each element’s influences on the appearance for a variety of building materials collected through professional architects, and inspect influences of various textures on subject’s psychological feelings. The aim is to build a workable Cesia scale for a series of representative building materials, and is to perform a quantitative survey on perception about material surface features in systematic ways, and to deliver results of practical data for subsequent researches on Cesia theory.

## ATLAS OF ARCHITECTURAL CONCRETE: COLORED CEMENT MIXTURES AND THEIR INTERACTION WITH WOODEN MOLDS

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### ABSTRACT

The architectural concrete is a construction material composed of cement, admixtures, sand, stone, chemical additives, etc. The architectural characteristic of this type of concrete is provided by its surface, which presents several aesthetic aspects, such as color and texture that provide different finishes. Color is the consequence of cement and pigments incorporation. Systems or Atlas were elaborated following diverse principles that sketching figures, classify colors according to their different lightness, saturations and hues. For that, a systematization of the color-surface finish concepts and the ingredients involved in their production is proposed. The present work presents diagrammed pictures with information summarized to develop an Atlas. Two groups of mortars were elaborated, each group with red, yellow and black pigments. The color was defined by CIELAB color space and their evolution was compared by CIEDE1976 and CIEDE2000 color difference formulas. The gloss was analyzed too. Results were represented in six pictures to allow quantification and visualization of the different colored mortars. An important color variation was observed from day 7 to day 28. The strong formation of calcium carbonate deposits associated to an increasing gloss was a discouraging result.

## HOW THE BRIGHTNESS OF RELIEF WALL DEPENDS ON COLOUR, SURFACE GEOMETRY AND ILLUMINATION?

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### ABSTRACT

The paper focuses at brightness of modern relief walls. It starts with the reference to the ancient stone reliefs from Egypt and Persia. Then modern architectural examples of relief walls are shown and characterized.

In the experimental part the paper presents analysis of small relief plates (24 x 24 cms.); each of them having a uniform surface colour and a simple rectangular design with a linear pattern. The plates were made with three degrees of deepness: 1:0.5; 1:1.0; and 1:2.0 and were painted with a matt spray painting in colours: red, blue, green and yellow. The average reflectance of the relief plates was measured with a spectroradiometer in the artificial sky simulating overcast sky and was calculated using Sumpner's formula for calculation of effective reflectance of the relief lowering considered as cavities.

The main conclusion from this study is that the brightness of the relief wall decreases with increase of the total area of lowering in relation to the total area of the relief wall and with the relief deepness. The colour of the relief material or paint has also strong impact as brightness increases with its reflectance. The use of Sumpner's formula in reflectance calculations gives about 5% accuracy for rather dark colours and about 10% for light ones.

## PERCEPTION OF GOLD MATERIALS BY PROJECTING SOLID COLOUR ON BLACK MATERIALS

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### ABSTRACT

Gold gives a unique luxurious impression and therefore golden objects are often desired. As Gold is an expensive metal to start with, it is not feasible to produce objects made of gold at reasonable prices. In this study, we have developed a simple representation method that makes real objects appear to be made of gold using projection mapping technology. In recent years, this technology has been extensively explored, mainly in the field of entertainment. Most of these studies have been focusing on technologies where a target image is superimposed onto an object. Our method, unlike the conventional approach, does not project a target gold image but simply projects a solid colour onto an object, thereby giving the perception that the object is made of gold. We have conducted two psychophysical experiments to confirm our representation method. Our results indicate that objects were easily perceived as golden objects when a solid colour was projected onto black objects rather than white objects. Furthermore, a few samples were perceived as metals, even though they were actually paper or fabric. These results suggest that not only the colour but also a change in material was perceived when superimposing a solid colour onto an object.

## METALLIC REFLECTIONS IN THE CITY

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### ABSTRACT

After a short but fundamental description of the optical properties of metals, semi-metals and alloys based on the example of the Luxor Obelisk, we describe a certain number of visual effects and link their origins to the fundamental optical properties of the complex indices of refractions of metallic materials. Conceived as a beacon in ancient Egypt, the obelisk today is erected in Paris and oriented according to the cardinal points. Formerly topped by an electrum-plated pyramidion, but now covered in gold leaf, this small pyramid situated 23m above ground level reflects the sunlight in such a way that it was, and still is, visible from dozens of kilometers away. By focusing on this concrete example, we demonstrate that the aspect of materials, in this case metals, cannot be reduced to the concept of color, and even less to that of trichromatic color. Our goal is to outline the entire predictive rendering process and, via a concise demonstration, to present the key concepts of physics that must be met to generate a computer image that is identical to a photograph of an actual scene.

## A STUDY ON THE EFFECTIVENESS OF WHITE LEDS WITH HIGH COLOUR RENDERING AS A SUBSTITUTE OF DAYLIGHT

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### ABSTRACT

Daylight has high colour rendering and provides natural appearances of paintings. However, it is difficult to control and its component would damage paintings. Because of these negative characteristics quite a few museums in Japan have suspended their daylighting system use. Recently, white LEDs have started to be introduced in the field of museum exhibits for their low emission of UV rays and heat, which are harmful for artworks. However, the spectral distribution of white LEDs is completely different from conventional museum lightings and the effect on the appearance of artworks is yet to be fully known. The purpose of this study is to examine whether white LEDs could be substitutes for daylight through subject experiments. Results show the possibility that some of the white LEDs, especially with low colour temperature and high CRI Ra, would become substitutes for Daylight.



## COLORS ACROSS INDIAN CULTURES: A DIALOGUE OF COLOR ASSOCIATION WITH VISUAL IDENTITY

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### ABSTRACT

Colors manifest cultural values and have always been associated with emotional context. We can see over 7 million colors. These are formed by mixing three building blocks; red yellow and blue in different proportions, are termed as primary colours. A single color can have diverse meanings in varied cultures. A vast range of colour association and symbologies are present in India due to its multifold cultural background. Context is everything: a group or community of people wearing black might be part of family function or may be mourners. The traditional meanings associated with colors in various cultures of India have a significant associations and their reflection on the society.

The global impression of India beholds its colorful culture, streets, and stories and it always seems like a page out of an ancient folk tale. India represents simple expressions of colors, holding together multitude of outlooks, lifestyles, and traditions. A peculiar colour symbology is an integral part of all cultures and it holds a significant space in different aspects of life, be it religion, politics, festivals or celebrations. In India, it the north, south, west, or east, color and culture go hand in hand. Just like many other cultures across the world, a distinctive taxonomy of color associations is treasured in India.

Samples of 100 professionals (male and female) with diverse cultural background in age group of 25 to 35 were randomly selected. Questionnaire and personal interview tools were used to collect the information. By using descriptive research method a number of conclusions were drawn by analyzing the collected data.

## COLORFUL NARRATIVES

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### ABSTRACT

This article discusses whether film pictures may be considered an object itself and therefore they are influenced by color. To make an aesthetic and creative use of color, several filmmakers have resorted to colors and presented inventive solutions to use them in film. Manipulate the colors of a film also requires an understanding of specific technologies. Analyzing two works of Brazilian authors (*The Boy and the World* from Ale Abreu and *Here is so far from Eliza Capai*), aims to understand how the use of saturation and black-and-white duality versus color can be used to generate sense and meaning to the films.

## COLOURS IN INDIAN CONTEXT: THE TANGIBLE AND INTANGIBLE PERSPECTIVES OF COLOURS PIGMENTS IN INDIAN PAINTING

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### ABSTRACT

Colour is an integral part of our deep-rooted Indian history, which is immensely strong in its cultures and traditions. This research aims to identify the colour pigments that were used for colorations in the Indian paintings and understand their tangible and intangible aspects, which leads to an understanding of how it has shaped colour associations within India.

The making of colour pigments is a process in itself. In the Vedic tradition the transformation of mineral stones and metals into pigment colour is seen as an inherently alchemical journey and is not only considered as a physical activity; but is also an intangible process of spiritual realization and hence it holds great importance. These colour pigments (tangible element) have been used on paintings, frescoes, crafts and hold symbolic meanings. Based on this, the colour pigments are described according to their use in the tradition of colour application for various purposes. It unveils their occurrence as alchemical materials and pigments derived from plants and other natural sources. There have also been certain influences on the procurement of colours from other countries and that has been looked into as one of the influential parameters for their use. The tradition of alchemical materials were used as ayurvedic medicines and later on passed to the tradition of paintings and frescoes. Performing arts (intangible element) are one of the most valued possessions of the Indian culture and according to the *Natyashastra* (Indian treatise on performing arts that dates back to 200 BCE and 200 CE) every *Rasa* (emotional response of the spectator) has a specific colour. This *rasa* is an emotional response in conjunction to the *Bhava* (expression conveyed by the artist). Since antiquity, the paintings of India have these influencing parameters, which are tangible and intangible in nature, which have been researched in this paper.

# AN EXPRESSION OF THREE-COLOR COMBINATION PREFERENCE SETTING IN REASONS FOR PREFERENCES AS INTERMEDIARY VARIABLES

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## ABSTRACT

An experiment was executed in which the subjects asked to judge the preference of the showed color combination samples and to select their reasons from the list prepared. Two analysis were executed using the obtained data: (1) To clarify the accuracy of the prediction using the data of which items recognized the reason can predict the preference, (2) the accuracy of predict formula that shows the condition the subjects recognize the reasons using three attributes of composit colors.

The correration coefficients between the preference values and the prediction values of preferences is very large, 0.97 shows the possibility of the method based on a new concept from analysis. The correlation between the preference average value and the prediction value calculated with the formula intend to express the condition more than six subjects recognize the reason using three attributes of the composit colors of samples became 0.74 on analysis (2). it shows the possibility of the method.

## COLOUR, CITY AND VISUAL NARRATIVE

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### ABSTRACT

During spontaneous courses and using the photographic image as an instrument of representation, the visual perception of a city can reveal itself gradually. Specific interests are then unfolded: the colour's atmosphere and its transitory nature in space, the movements and rhythms created by variations of light. How is this chromatic image formed? What are the meanings and symbologies behind it? How can they contribute to thinking the architecture and the city? Having these questions in mind, this paper aims to discuss a city's image based on four visual narratives, all of them guided by the colour aspect and built on the everyday life of four different places: Tokyo, Singapore, Morocco and Chicago. The main principles that guide this analysis are the theories of environmental perception, the concept of 'geography of colour' and the situationists writings on the 'dérive' and the 'psychogeography'. In a first stage, the free and spontaneous walks through various sites break the everyday visual perception. Photographic images are then taken and in a second stage organized according to their chromatic nuances. This allows us to identify certain recurrences and local singularities that defy the global and homogeneous image of the contemporary metropolis. It is the association between sensorial and spatial qualities, as well as aspects of environmental communication, that guide the creation of these four visual narratives. In the end, each of them is materialized in a small picture book that represents a chromatic synthesis of the analyzed sites.

# POSTERS, IN ORDER OF PRESENTATION



# COMPUTATIONAL COMPARISON OF URBAN SCENES AND REALISTIC PAINTINGS

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## ABSTRACT

In our study we have compared statistical parameters obtained from a set of images corresponding to urban scenes and compared it with images of paintings by Antonio Lopez and Edward Hopper, representing urban scenes. Antonio Lopez is a well-known Spanish painter classified as hyper-realistic style painter. We tried to determine whether the general characteristics of the paintings accurately respond or not to the scenes to reproduce. The statistical parameters studied were the moments of the first order, the color gamut, the patchiness and the signature of the power spectra of the images (FFT) (Oliva). Realistic painting reproduces most of the statistical characteristics of natural scenes, but it can be found small differences, such as the average chromaticity, which can be conditioned by the ambient light in which the paintings were made. It can be also seen some differences between Antonio Lopez and Edward Hopper in terms of lightness, color gamut and patchiness. We found that a realistic painter, such as Hopper, can be closer to real scenes than hyperrealistic painter, such as López, in terms of the computational analysis of the color paintings.



## THE VALUE OF COLOUR DESIGN APPLICATIONS ON URBAN CAMPUSES

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### ABSTRACT

The intention of this research was to assess the social benefits of adding colourful environmental design elements to urban places, by asking the question: Do spatial and/or architectural applications of colour play a role in creating a vibrant urban space? The study concentrated on the influence of certain design elements— colour and coloured light (installations)— on the experiential quality of an urban environment. More specifically, it examined colour's involvement in shaping how citizens use, and ideally enjoy, a public place for social purposes.

This study took an in-depth look at the role of colour played in the experiences of those who visited the Image Arts Building on the campus of Ryerson University, located in the downtown core of Toronto, Ontario, Canada. Primary data was collected from 25 randomly-selected individuals on campus via intercept surveys, inspired by Hutchings and Luo's (2009) five types of design expectations. The findings showed that the majority of the participants enjoyed or regularly enjoy their time in or around the Image Arts Building —with a large percentage of those individuals citing the colour found in and around the space as a major reason.

## EFFECTS OF WATERCOLOR ILLUSION ON PERCEIVED WHITENESS

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### ABSTRACT

Watercolor illusion graphics were presented to observers by using a liquid-crystal color display, and the observers were to compare the perceived whiteness in the white region enclosed by the double contour line using the paired comparison method. Two colors (any two from red, yellow, green, and purplish blue) were combined for the double contour line of watercolor illusion graphics. When the relationship between the evaluation results of the perceived whiteness and colorimetric characteristics of the contour lines of watercolor illusion graphics was analyzed, most observers tended to evaluate the region enclosed by lighter contour lines to be whiter.

## COLOUR, APPEARANCE OF LANDSCAPE

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### ABSTRACT

Colour is a vital element for human vision and affects life every moment. Colour research is a multidisciplinary work that combines physics, chemistry, physiology, psychology, art, etc. In the same way, landscape research consists of geography, biosphere, social culture, environment, architecture, ecology, aesthetics and philosophy, etc. For the research of landscape assessment, colour plays important role in evaluation of landscape aesthetic. Moreover, the theories of colour harmony, colour meaning, colour association, colour emotion are closely linked with landscape visual assessment.

## COLORLIGHT COMPOSITIONS. TEMPORARY ARTWORK FOR WIND POWER PLANTS AT NIGHT

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### ABSTRACT

The design of wind power plants is determined by the requirements for technic and energy. These buildings are placed in landscapes, often like 'windparks'. Their aesthetic is fascinating – but only in daylight. But what's about it at night? What does it mean for our perception, when only small red flashlights are blinking, seeming to soar into the dark sky? And when the rotor blades cut the air with an ominous sound.

Our senses cannot feel these signs and register them with fear. We cannot find the reason for it, because we cannot identify the dimension of that new architecture sculptures with its moving and turning elements in various speeds. This observation has found my interest and I have created a temporary art-project, to react to this observation. I developed Colorlight Compositions, who are based on plenty different parameters. I developed a method to create them with the focus on our perception relating to influences of the weather, temperature and visibility from near and far. I realized this temporary project in several landscapes with 3 and more windmills in Northern Germany 2014/5.

## CREATIVE GAME

*Bernardita LAGRÈZE, Cecilia VALENZUELA*

### ABSTRACT

Children are always discovering and exploring whatever surrounds them, and when they play, they are also learning and expressing themselves. In their play they are experimenting freely.

¿So why not do it forever?

Art is vital in education and especially visual art for designers. Everybody knows that today we need good design in so many fields.

Our Creative Game seeks to increase creativity with a simple method in which we use some of the principles of visual language, color being its major element.

Playing is always fun and this game will challenge you not only to reach a goal, but to search in new ways for different solutions, improve your imagination, broaden your mind and enjoy the wonder of the process itself.

## THE APPEARANCE OF PAINTINGS UNDER WHITE LEDS WITH HIGH COLOUR RENDERING. DIFFERENCES AMONG OCCUPATIONS, AGE GROUPS AND PAINTINGS

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### ABSTRACT

Recently white LEDs have been introduced in many museums and galleries. The spectral distribution of general white LEDs is within a visible region and does not emit UV, which will damage paintings. However, their effects on the appearance of paintings are yet to be fully known. In this paper we will report the effects of new White LEDs, whose long-wavelength red region is strengthened, on the appearance of oil and pastel paintings. Differences in the evaluation among occupations, such as curators, lighting designers and students, and age groups from 20s to 70s were also examined in this experiment. Results show that halogen lamps could be replaced with the high colour rendering white LEDs and there are some differences in evaluation among occupations and age groups.

## SPECTRAL AND POLARIZED ENVIRONMENT IMAGING

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### ABSTRACT

Realistic 3D image synthesis of urban materials, such as glass, metal, stone, concrete, wood, and so on, are at the core of numerous fields of research and development, notably for the correct predictive rendering of architectural spaces and building simulations. The main focus of this paper is to investigate the use of spectral data and light polarization states for the purposes of photorealistic predictive image calculations of both natural and artificial environments. More than merely rendering photorealistic 3D scenes, predictive rendering makes it possible to accurately compute the radiative (heat) and illumination properties of a future building, or of any digitally created object. After a short overview of analytical skylight models, we outline a polarization calculation process based on scientific data and models, and then present the device we developed to measure spectral and polarized environments, the SPLIS (Spectral Polarized Light Image Sensor). A complementary device, developed concurrently, is also presented. Though the SpectroSun takes fewer samples of the skydome, it takes more samples from the visible spectrum and can therefore be used for the calibration of the SPLIS. Attending the AIC conference in Chile will allow us to use these devices to take measurements in both urban atmospheres (polluted) and atmospheres at different altitudes (very pure conditions).

## STUDY ON JAPANESE SKIN COLOR CHART OF INJURED OR SICK PERSONS ACCORDING TO AGE AND GENDER

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### ABSTRACT

This paper indicated artificial procedure of the injured or sick skin color, which was the most prominent symptom in shock with the distal ischemia portion of healthy subjects. By using collected spectral reflectance of skin color, the Three Skin States' Color Charts (healthy, ischemia-shocked, and reperfusion-congested skin states) for four kinds of Japanese groups (young male, young female, elderly male and elderly female) were proposed.



## THE CHROMATIC EXPRESSION IN THE CITY: URBAN PLACES IN CÓRDOBA, 1980-2015

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### ABSTRACT

The clear trend towards the global city as a virtual city of flows makes us focus our attention on the Urban Place and its insertion in the present urban condition. The urban exteriors display new expressive and communicative functions of color that facilitate the promotion of pleasant experiences and contribute to the construction of urban places. Light, color and sound are sensory effects with the relevance of new ways of expressions established by present technologies (Bahamon 2010).

The concept of place has changed together with the evolution of societies and the research contributions of many disciplines. Nevertheless, its close relation with the concept of existential space proves that the perceptual expression of the city and its places matches the different ideas of city throughout time. This is true in the city of Córdoba, Argentina, where the leading roles of different components of the urban scene prevail according to the idea of each historical time. Consequently, every place or net of places in the city is the result of their previous history. Besides, the accompanying chromatic expression is an active element of the city.

## AN EVALUATION ABOUT THE COLOR-FRAGRANCE ASSOCIATIONS DIFFERENTLY APPEARED DEPENDING ON TRANSPARENT, OPAQUE AND GLOSSY CONDITIONS

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### ABSTRACT

This study aimed to investigate the responses to the color-fragrance synesthesia differently appeared depending on the factors of gloss, transparency or opaqueness as well as colors being considered at designing fragrance products. For verifying this anticipation, this study produced total 99 pieces of 33-color chips with materials having of gloss, transparent and opaque surface features on the basis of IRI Hue & Tone 120 Color System. After then, the sample chips were directly presented to subjects and ordered to select the fragrance kinds being associated from the samples, and evaluated the intensity of associated fragrance. As the results of the evaluation, it was tended that the kinds of fragrance being associated depending on a material's surface feature and its color were clearly appeared. In the experiment about the fragrance-association intensity depending on a material's surface feature, the fragrance-association intensity scores were higher at using the opaque chips than at using the gloss chips. This result implied that an opaque chip featuring no-glossy and solid surface more strongly associated a fragrance than other glossy-surfaced chips. The results of color-fragrance synesthesia response experiment will apply the color notes in several stages or the fragrance intensity minutely changing to fragrance-emitting products through their surface features.

## THE COMPARATIVE ANALYSIS OF BUILDING COLOR ON TRADITIONAL COMMERCIAL STREET BETWEEN KOREA AND CHINA USING NCS NUANCE ANALYSIS

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### ABSTRACT

This study is a part of the color analysis on the traditional commercial street in Korea and China. This study is aimed at comparing NCS (Natural Color System) Tone analysis of Architecture color for traditional commercial street in Seoul (Korea) and Beijing (China) which have traditional regional cultures, and its research method is as below: 1) In this study, we measured the street of Architecture color, the current study used NCS color Scan 2.0 and NCS Index original-1950 color atlas to measure physiological signals. To avoid the inaccuracies in this study, I must wipe out the Architectural surface by lens paper before color measuring and measure the Architectural surface for many times. Compared with other method, such as photographical analysis method analysis, this method that raise precision and reduce the error is kept below 0.1. 2) To compare and analyze architecture color, the color is classified into three parts: dominant color, assort color, accent color. Also, the NCS(Natural Color System) Tone, which used dominant color values of architecture color on the streets of target area with continuous horizontal spaces, is extracted, analyzed, and compared. As a result of doing comparative analysis of the tonal status of the structures of target areas, it was found that the color of the buildings on traditional commercial streets in Korea created a bright atmosphere on the whole while Chinese counterpart created a dark atmosphere in comparison with Korean traditional commercial streets. In addition, it was found that all of the buildings in target areas were applied by diverse tones, especially in case of Korean traditional commercial streets comparing to Chinese ones, somewhat giving an extraneous feeling, and adding to visual confusion.

# CHROMATIC ANALYSIS AS A REVALUATION PROPOSAL OF THE URBAN IMAGE OF PUERTO VALLARTA: BUILT COLOR, IMAGINED COLOR

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Andrés Enrique REYES GONZÁLEZ  
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## ABSTRACT

The article presents a review of the literature and background information on the issue to propose through a methodology an analysis of the chromatic elements from the city of Puerto Vallarta, Jalisco, Mexico, due the identification of color relationships with feelings and thoughts around the city, together with key drivers that indicate the relationship between the latter and the inhabitant, establishing a network of significance between color, architecture, context and urban imaginaries.

The proposal or theoretical contribution of the work based on the literature review and the analysis of examples around the world, argues that the presence of color, both in architecture and in each one of the elements that constitute the public space, are fundamental for the effective construction of the meaning of an urban image.

One of the conclusions of the analysis, is that the perception and experience of the architectural landscape, give the user or inhabitant a number of meanings and information that help to create a chromatic mind map, and this constitutes together with the passage of time, configurators elements of an identity.

## THE RELATION BETWEEN COLORIMETRIC QUANTITIES OF TWO-COLOR COMBINATIONS AND THE IMAGE SCALE OF 'WARM-COOL' AND 'SOFT-HARD'

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### ABSTRACT

The purpose of this study is to find the relation between colorimetric quantities of two-color combinations and the axes of warm-cool and soft-hard on the color image scale. The colorimetric quantities were calculated from CIELAB values of three constituents of a combination. These values are the mean of lightness  $L^*$ , the mean of chroma  $C^*$ , and the mean of hue angle  $h$ , as well as the differences in lightness  $\Delta L^*$ , the differences in chroma  $\Delta C^*$ , and the differences in hue  $\Delta H^*$ . A multiple regression analysis was performed to find the relation of these quantities with the image scales. The warm-cool image has the strongest relation with the difference in hue.

When  $\Delta H^*$  becomes larger, the image of color combinations becomes warmer, while  $\Delta H^*$  becomes smaller the image becomes cooler. On the other hand, the soft-hard image has the strongest relation with the mean of lightness. When  $L^*$  becomes higher, the image becomes softer, while  $L^*$  becomes lower the image becomes more hard.

## RESEARCH ON THE DIFFERENCE OF AMBIENCE BY APPLYING DIFFERENT BACKGROUND COLORS AT STAGE

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### ABSTRACT

With the development of technology and appearance of new media, new aspects started showing in the stage background of theaters. The traditional stage representation techniques through 'picture drawing' with color field are gradually replaced with the direction of lighting or complex technology. Recognizing differences of general ambience in accordance with the color application to the stage background of theaters, this study examined the ambience drawn by each application method.

In the results of the research, when realizing color for the stage background of theaters, depending on the application methods such as lighting or color field, there was specific ambience differently felt by audience. On the other hand, the ambiances noticeably shown in the lighting method were like fantastic, lively, or tense mood, so that it would be suitable for more dynamic performance or scenes. As the ambiances noticeably shown in the color field method were like peaceful, warm, or delicate mood, this type of color application method would be suitable for static mood. In order to more suitably and effectively deliver visual language to audience by differently using the color application method in accordance with the character and ambience of performance, more researches on communications between performance and audience should be continuously conducted.

# LEGIBILITY DIFFERENCE OF THE LIGHTNESS CONTRAST BASED ON COLORS OF THE FONT AND BACKGROUND IN THE USER INTERFACE

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## ABSTRACT

Due to rapid supply of mobile devices, researches on legibility of text by font types used in the Web have been conducted actively because the interest is shifting from print media to the web interface environment and the rate to acquire and use information from the tablet PC in the web interface is increasing. This study examined how the legibility assessment of the three basic types of font had changed depending on the lightness contrast based on colors of the font and background in the user interface. The independent variable of the experiment was set to the type of the font, the lightness contrast of background and texts, and the type of the display screen. The lightness contrast based on colors of the font and background, and the types of font and display have been identified as factors that affect the legibility assessment. Also, it was confirmed that the standard of minimum lightness contrast users felt was different according to each font. Thus, this study can propose the proper colors of font and background in order to effectively apply various fonts to consider users when configuring a user interface on the Web. Also, it may be provided as the basis for the interface configuration.

## COMPARISON OF SENSIBILITY IN LIGHT SOURCE COLOR, AND OBJECT COLOR OF RED AND GREEN

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### ABSTRACT

This study is intending to do comparative analysis of a human's emotional reaction consequent on brightness of Red, Green color light, and object color in Mock-up space.

To this end, this study conducted an experiment on 20 subjects in their 20s~30s, and analyzed the emotional evaluation results when illuminance was 10 lx and 100 lx in the space created by Red, Green color light and object color.

As a result of this research, the experimental space, in which the Green color light was used, was highly evaluated for its [Stable] image while the experimental space, in which Green object color was used, was highly evaluated for its [Energetic] image. In addition, as for the experimental space, in which Red and Green object color were used, its [Unusual] image was highly evaluated, through which, this study was able to learn that there existed the difference in sensibility according to color light and object color. Such a difference in sensibility can be interpreted as the actual influence of color light and an object color on feelings.



## **ANALYSIS OF THE INFLUENCE OF COLOR TEMPERATURE ON HRV (HEART RATE VARIABILITY) IN TIME OF LUMINAIRE CEILING PROJECTION**

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### **ABSTRACT**

This study is targeting large area lighting, i.e. a luminous ceiling. This study classified variables into 3000K and 6000K in color temperature with the average lamination of 100lx. Hereupon, this study confirmed HRV influence before/after stimulation.

The study results are as follows: The cardiovascular system variables based on large area lighting (luminous ceiling) were all included in standard range, and in the significance probability before/after stimulation, there appeared no significant difference with more than 0.05 in both variables. It was found that 3000K showed a stable response in SDNN, VLF and HF while 6000K showed a negative response in LF. Accordingly, mental stress got higher in 6000K, but regulation of body temperature, vasomotion, and adaptability to external environment, and HRV showed a positive response.

# A STUDY ON LIGHTING AND TECHNICAL DEVELOPMENTS IN THE DOMESTIC AND INTERNATIONAL LIGHTING COMPANY

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## ABSTRACT

Each country is introducing an eco-friendly policy according as an environmental problem is coming to the fore worldwide. Due to the depletion of fossil fuel, the necessity of reduction in energy is ever emphasized, and among others, the lighting area is consuming 25% of the world electricity. Accordingly, this study did the comprehensive analysis of the status of light emitting diode (hereinafter, referred to as 'LED') and organic light emitting diode (hereinafter, referred to as 'OLED') and technical development by manufacturer, and the analysis results showed that most of the companies are in possession of the ability to control the color temperature of lighting, and brightness. In addition, they were analyzed to achieve the development of lighting control function through the equipment of security, ventilation and fire, etc., an alarm, and a sensor.

## **ANATOMY OF REGULATIONS RELATED TO ENVIRONMENTAL COLOR DESIGN IN RUSSIA**

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### **ABSTRACT**

The history of regulations related to environmental color design in Russia was explored using a literature review, case studies and observations. The purpose was to determine laws addressing environmental color design, basic principles and the most important planning instruments of urban color design in Russia. The content and functions of color certificates, color catalogues and albums of model projects, regulating Russian urban coloristic, were analyzed. The structural components of the system of regulations related to environmental color design in Russia were found, and its internal working processes (the anatomy) were revealed and discussed.

# AN ANALYSIS OF JAPANESE TEA CEREMONY SILK TEXTILES USING MULTI-ANGLE SPECTRAL IMAGING

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## ABSTRACT

Damask is a fabric that shows a pattern from irregularity of brightness and is characterized by changing the facial expression in response to the lighting environment. In this paper, we verify that the same colored warp weft silk satin damask represents the best features of damask from measuring  $L^*$  distribution, then consider the aesthetic evaluation that has been accepted as conforming to the Japanese culture, especially relevancy of traditional tea ceremony. On this experiment, we selected two types of similar patterned silk satin damask, which is called FUKUSA used in the Japanese tea ceremony as a sample; the same colored warp weft and the different colored warp weft. A measuring system was applied using the gonio-photometric spectral imaging. The illuminate direction was 15, 45 and 75 degrees from a normal direction, and the detected direction was normal against the sample. Distribution on CIELAB Color Space is calculated from this spectral information and applied analysis of several fabric characteristics, and the correlation between human sense of texture and the range of distribution was researched. According to measurements, the  $L^*$  value of the background area shows more large distribution in comparison to the figure area. In other words, flip-flop phenomenon of the contrast would be prompted by the  $L^*$  value distribution of background area. Further, when the brightness sensation of the figure area is increased as compared to the background area, metallic luster sensation was recognized in addition to the glossy of silk. Since the color of warp weft is dyed yellow, the metallic gloss also accompanied golden sense, and the tactile texture sense emerged on the brightness flip-flop. When the color of monochromatic fabric is recognized as a 'value', the sensitivity for brightness is increased, and threshold of brightness also increases. At that phase, the surface of extremely thin silk fabric would be observed as three-dimensional irregularities, in response to tactile modality. From the above point of view, same colored warp weft silk satin damask indicates a reasonable representation of the characteristics of silk damask on physical, and on perceptual phase.

## IMPACT OF TILES PANELS ON LISBON CHROMATIC ENVIRONMENT

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### ABSTRACT

This paper aims to explore the impact that tiles panels have on the city chromatism. Due to the Islamic occupation of the Iberian Peninsula, Portugal inherited the tiles techniques from the Arabs and they became an important part of the Portuguese culture, becoming the favorite covering material for exterior and interior walls of palaces, churches and popular buildings. By the mid-20th century, a trend has developed to cover large city spaces with artistic tile panels, created on purpose, which included various specific colours and textures. For their dimensions, colours, textures and significance, these panels became a landmark of the city and contribute to the transformation of the city dominant colours. In this paper, will be analyzed several of these tiles panels which are situated near the Tagus River, in a zone that encompasses the avenues *Infante Santo* and *Cintura do Porto de Lisboa*.

# AN ANALYSIS OF THE DIFFERENCE IN ACHROMATIC COLOR NAMES BETWEEN KOREA AND OVERSEAS: FOCUSED ON THE AUTOMOBILES, NAIL AND EYESHADOWS

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## ABSTRACT

In the past, color name is simply used as a tool for communication, but its means further has widened as color density of cultural and image transfer. The meaning of the color names further increases as a color image transmission, we recognized that color names' effect also increased to consumers. Recently unusual and unique color names appear a lot of color names that were an important media that not only establish the identity of each brands also associates the image of the products. My purpose is to identify the characteristics of the achromatic color names for the products. I analyzed the achromatic color names were chosen to Automobiles, Nails, eyeshadows, and then collect achromatic names based on product images on the official website of the brands. Findings of the study are as follows; the most frequent element in the automobile industry is the elements and mineral elements, in the nail industry is nature, in the eyeshadow industry is adjective. However, the most frequent words in the automobiles is ice, nail industry is snow, eyeshadow is night. Finally, it was observed that achromatic color names that colors in three different fields- automobiles, nails, eyeshadows. It is considered that identifies the characteristics of the achromatic color names for the product and provides clear data.

## THE PLANNING OF COLOR SPECIALIZATION AREA IN THE NEW ADMINISTRATIVE CITY OF KOREA

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### ABSTRACT

This study drew the color application plan for the place which has been designated as a color specialization area within the new administrative city of Korea. Also, this study designated some areas of the new administrative city of Korea, in which diverse colors use, such as primary color use, etc. is strictly forbidden, as a color specialization area. In addition, this study applied the diverse colors arrangement pattern to a building facade using techniques of achromatic color harmony, contrast harmony, value contrast, and color contrast while using an achromatic color, mid-value/mid-chroma thematic color together.

## A STUDY ON A SENIOR CITIZEN'S DISCRIMINATION CAPACITY FOR COLOR PERCEPTION CONSEQUENT ON BRIGHTNESS

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### ABSTRACT

The purpose of this study was to examine the color perception discrimination from the eyes of the elderly by brightness using four basic colors such as red, yellow, green and blue. The results are as follows.

The visibility in accordance with the difference of black chromaticity and black pure chromaticity is high regardless of the brightness. If the difference is more than 10 %, it would be instantly readable. On the other hands, the visibility in accordance with the difference of pure chromaticity is high. If the amount of red and blue differs more than 10 % regardless of brightness, it would be instantly readable. However, the readability of yellow and green is declining when the brightness is decreased. In the case that 100 lx is given, when the amount of pure color differs more than 10 %, it can be instantly readable. The visibility in accordance with the change of color mixing ratio is low. The readability is decreased with decreasing brightness. In the case that 1,000 lx is given, when the amount differs more than 10 %, it can be instantly readable. However, in the case that 100 lx is given, it can be instantly readable only when the amount of red differs more than 20 % or the amount of yellow, green and blue differs more than 30 %.



## THE ANALYSIS OF PERCEPTUAL UNIFORMITY OF COLOR IMAGES EVALUATED FROM CIE COLOR SPACES: USING NATURAL SCENERY IMAGES AS TESTED SAMPLES

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### ABSTRACT

In recent years, most researches focused on developing mathematical methods to calculate principle color component value and color difference of tested images. However, CIE recommended color spaces can be applied to predict which spectral power distributions perceived as the same color, but among them are not perceptually uniform to each other. A preliminary study was conducted to evaluate the precision of calculation of principle component color between CIE color spaces via using complex natural scenery color images as test samples. A group of 51 natural scenery color images were selected. An image analysis tool, ColorSpace Convertor, was developed to analyze  $\Delta E$  from the principle component colors of tested color images, derived from CIE color spaces CIEL\*a\*b\* and CIEL\*u\*v\* respectively. The experimental results indicated that there existed a mid-high correlation,  $r = 0.81$ , but with overall variations, CV (%) = 23, of the principle color component values between CIEL\*a\*b\* and CIEL\*u\*v\* color spaces. The largest color difference about 38 in terms of CIEL\*a\*b\* unit occurred between evaluated results has been found. It is to suggest that further experiments need to be conducted to test on other color spaces.

## LIGHTNESS AND BRIGHTNESS MATCH UNDER COLORED ILLUMINANTS WITH SPATIAL ILLUMINANT GRADIENTS

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### ABSTRACT

This paper reports an investigation of perceived colors under colored illuminants with spatial illuminant gradients. In performed experiments, two types of illuminant distribution were used; in one the illuminant strength changes suddenly at the center of an image and in the other the strength changes linearly throughout the right and left side of the image. Subjects were asked to match the test patch area to identify the same luminance as the reference one (called the brightness match) or to match the area to be cut from the same piece of paper as the reference one (called the lightness match) under white illuminant or reddish illuminant. The results showed that the response of the subjects in the brightness match is affected by the luminance of the test patch area; however, the lightness match the response is slightly more stable than the brightness match. This tendency occurred in both illuminant distribution patterns. When using a reddish illuminant, response of the subjects was lower than that for the white illuminant.

## WHO IS AFRAID OF RED AND BLUE? APPROACHES TO COLOUR IN ARCHITECTURE AND DESIGN

*Mette L' ORANGE*

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### ABSTRACT

'Who is afraid of red and blue' includes several studies collocated with my on-going artistic research "Colour between art and architecture" at the Bergen Academy of Art and Design in Norway. The research is investigating the currentness of colour in Architecture and design, seen against the historic frame. I aim to inspire and encourage professionals, students, and laypeople to revitalize their colour tools. The focus is on the transdisciplinarity of colour, asking how especially architects can benefit from collaboration with artists, as well as looking into art practice and colour theory. This implies a deeper understanding of colour interaction, materiality and dimensions. As an architect and artist myself I'm curious of the complexity, dynamics and mutual benefit of "the crossover effect". How can colour balance between functionality and meaning, articulation of space/volume and artistic expression? As interlocutors I choose professionals from the past and present who have developed palettes, philosophies or methods in their use of colour. For the studies within the context of "Who is afraid of red and blue", the colour philosophy of the Swiss architect and artist Le Corbusier (1887-1965) has provided the guidelines. The project Kongsvinger Colour Plan is one of these studies becoming alive.

## COLORARCH: A COLOUR-COMBINATION APP RUNNING LE CORBUSIER'S SALUBRA COLOUR KEYBOARDS

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### ABSTRACT

We have developed a mobile App that allows end-users to choose from the 312 four-colour combinations put forward by Le Corbusier in the colour keyboards commissioned by Salubra in 1931 for its painted wall paper collection. These combinations are shown in a standard colour notation such as Natural Colour System (NCS). The application allows you to browse the colour space NCS, which is shaped like a double inverted cone and to observe the spatial position of each of the 32 Salubra colours, addressing three perceptual variables: *hue*, *blackness* and *chromaticity*. Users can select any of the colour combinations with 1, 2, 3 or 4 targets, evaluate its position in the NCS solid and determine if combination criteria exist based on the similarity of *hue*, *blackness* or *chromaticity*, or on the contrast among any of these perceptual variables. One can also assessed if the colours belong to the same *hue* range or are complementary, if they share the same value of blackness or have contrast, if they are bold or dull colours (low *chromaticity*), etc. The application also indicates the recurrence of each pair of two colours from the total of 1248 matched pairs in the Salubra keyboards. Any recurrence reflects Le Corbusier's interest in said colour combination, whether it was a usual pairing throughout the Salubra charts or whether on the contrary, it was uncommon. In short, our application identifies the colour combinations put forward by Le Corbusier in 1931 for the Salubra colour keyboards, and shows the colour combination criteria in a visual colour space that customers may browse in order to select their preferred palette. This App was a result of earlier research by the authors about the 'colour combination criteria in Le Corbusier's Purist architecture based on Salubra *claviers* from 1931', and published in *Colour Research and Application* (© 2015 Wiley Periodicals, Inc. *Col Res Appl*, 41, 85–100, 2016).

## SENSORY COMPENSATION MEDIA FOR COLOR DETECTION IN THE ENVIRONMENT

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### ABSTRACT

The human visual system consists of a series of complex tasks specific organs for capturing and decoding of color that allows us, among other sensory stimuli interact with the environment around us. However, when we are deprived of the visual stimulus, we are limited in much of our daily tasks. For several authors (Cattaneo & Vecchi, 2011; Kosslyn (1973, 1980, 1994, 2006), Pylyshyn, (1973, 1981, 2003)), lack or deficiency in the functioning of the visual apparatus, does not mean that the subject does not you can respond to a visual stimulus, however, these authors acknowledge the existence of sensory Compensations, i.e., the body derives visual stimuli to other sensory devices. Cattaneo et al. make a review of the most appropriate sensory offs between the other senses (touch, hearing, taste and smell), reviewing previous experiences made with people with total or partial visual impairment, concluding that both stimuli haptic and auditory offset sensorially of best visual stimuli. On the other hand, Kosslyn and Pylyshyn state that, although a person can be prevented from seeing through sensory compensation added to the record of previous experiences, the subject is able to generate pictorial or descriptive imagery.

This research is the result of an initial search to establish possible sensory compensation through the design of technological devices to which I call media compensation. That name is meant as specialized extension that allows ridding the body for performing other tasks (McLuhan (1962, 1964); Hall, (1959)). Both, Hall and McLuhan recognized as technological support a natural extension as both sensory bodies for the subject's interaction with their environment. In this case, preliminary tests hereby focus on the recognition of three basic levels: Color, Form and Distance.

Using techniques and algorithms of Computer Vision, experiences of recognition are performed both video and images in order to recognize certain color ranges, factors that could alter this measurement, the selection of the location of the body where sensory compensation will be made and finally the choice of suitable electronic components to carry out such compensation.

This paper reports the first experiences focused exclusively on color recognition and behaviour of the hardware devices in order to reach the most accurate measurement possible.

## OCCUPATIONAL COLOUR VISION NEEDS WITH EMPHASIS ON AVIATION

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### ABSTRACT

The novel experiments and tests developed for this study yield new data that describe how combinations of luminance contrast and Red / Green (RG) and Yellow / Blue (YB) colour signals affect task completion times (TCT) and the overall accuracy the operator can achieve.

With appropriate design and choice of colours, it is possible for deutan applicants with thresholds  $< 4$  standard normal CAD units to perform as well as normal trichromats when suprathreshold colours with RG and YB components are employed in visual displays. As many as 22% of deuteranomalous subjects can be included in this category. In spite of their congenital colour deficiency, such applicants can operate safely in the Air Traffic Control (ATC) environment as well as in many other occupations that involve the use of large-field, visual displays.

## DOES SHAPE AFFECT COLOR HARMONY AND COLOR EMOTION

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### ABSTRACT

It has long been questioned that does the shape affect color harmony and color emotion? To answer this question, a psychophysical experiment was carried out to clarify the influence of shapes and color combinations upon emotions.

The two-color combinations were applied onto a color configuration made by a cuboid shape configured with side circle, frame, loose voronoi diagram, and dense voronoi diagram. In terms of color combinations, 11 basic colors were used as main color and four-color design techniques to produce second color. Totally, 184 color-shape combinations were used as experimental samples. Each experimental sample was assessed on 21 scales by using 7-step categorical judgment. Ninety-eight observers took part in the experiment. The Balanced Incomplete Block Design (BIBD) method was used for observers randomly assessing the experimental samples.

The shape effect on the color emotions and color harmony was found to be a little. The results also showed the sum of lightness and sum of chroma determined most of color emotions.

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The aim of AIC2016 Interim Meeting is to share experiences regarding the use of color in images, objects and spaces, from different perspectives and disciplines. All of these to contribute to a better experience and to improve life quality in our cities. The fields of inquiry include environment, architecture, design, art, education, media, culture as well as psychology, colour science, perception, materials and wellness.

The International Colour Association (AIC) is a learned society whose aims are to encourage research in all aspects of color, to disseminate the knowledge gained from this research, and to promote its application to the solution of problems in the field of science, art, design and industry on an international basis.

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