



Proceedings of the International Colour Association (AIC) Conference 2021

Milan (Italy), August 30th - September 3rd 2021



Published by
International Colour Association (AIC)



Sponsored by
**Gruppo del Colore
(Associazione Italiana Colore)**



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ISBN: 978-0-6484724-3-8
eISSN: 2617-2429
ISSN: 2617-2410

HOW TO CITE THIS BOOK

AIC (International Colour Association). 2021. Proceedings of the International Colour Association (AIC) Conference 2021. Milan, Italy. AIC.
How to cite an article included in this book:
Author's name. 2021. Title of the article. In: Proceedings of the International Colour Association (AIC) Conference 2021. Milan, Italy. AIC, page numbers of the article.



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AIC PRESIDENT'S MESSAGE

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

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



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

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

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

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

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

Vien Cheung





AIC President, July 2021



International Colour Association
Internationale Vereinigung für die Farbe
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14TH AIC CONGRESS AIC 2021 - MILAN, ITALY



**WELCOME
to the
14th AIC
CONGRESS**



Gruppo del Colore-Associazione Italiana Colore President's Message

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



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



The Congress received about 270 Abstract submissions from 37 countries and the abstracts were reviewed and selected by the International Scientific Committee consisting of 112 experts from around the world. The total number of papers that will be presented in this Congress is circa 250 including 200 oral presentations (regular and short), eight Invited Lectures, and two Award Lectures. In addition, there are four special sessions, namely 'Innovation and research in color for beauty care and hairstyle', 'All the colors of cinema', 'Colour, light & sound: holistic approach for wellbeing' and 'All the recent books on color'. There are also four AIC Study Group Workshops with special programs, such as AIC 2021 Study Group on Environmental Color Design, AIC 2021 Study Group on Arts and Design, AIC 2021 Study Group on Language of Color, and AIC 2021 Study Group on Color Education. As is evident, the program is international and highly multidisciplinary.

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

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

Marcello Picollo

Gruppo del Colore-Associazione Italiana Colore President



The AIC2021 14th Congress - Chairs introduction

The International Color Association (AIC) Congress is a unique multidisciplinary event that brings together scholars and professionals from a wide range of fields. It has been held every four years since its inception in 1969, and in 2021, it is hosted in Italy, for the first time, organized by the Gruppo del Colore - Associazione Italiana Colore.



The Covid19 pandemic imposes multiple constraints all over the world. In Italy, the state's laws and the safety rules of the previously chosen Venue (Ca' Granda, Università degli Studi di Milano) prohibit any socializing, which is one of the fundamental reasons for the participation in presence. Moreover, due to travel-related risks and restrictions, the Gruppo del Colore – Associazione Italiana Colore, in agreement with the AIC, has decided to organize the AIC 14th Congress online in compliance with the program elements required by the AIC rules: Opening Ceremony, Awards, AIC General Assembly, AIC Study Groups Workshops and Closing Ceremony.

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

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



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

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

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

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

Robin Jenkin *"The influence of CFA choice on automotive and other critical imaging systems"*

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

Luca Missoni *"Color in fashion design"*

John McCann (Judd Award) *"Edges in illumination control appearance in natural HDR scenes"*

Austin Nevin *"Conservation science and changing colours - approaches to measuring and managing change"*

Giovanni Pinna *"Lighting and color design in the show"*

Francesca Valan *"Chromatic Sustainability: a new approach to color design"*

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

*The AIC2021 14th Congress Chairs
Alessandro Rizzi and Maurizio Rossi*



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

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Colour proposals consistency in the CMF for car design education

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Abstract

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

Keywords: *CMF design, representation, color proposal, car design, design education*

INTRODUCTION

In car design there is an important, but often underestimated, step able to change the perceiving of a car literally. It's named Colour & Trim and is tasked with devising surfaces, textures, and colours, both interior and exterior, that form a physically subtle but significant proportion of the vehicle's identity. Practically, it means to research, design, and develop all interior and exterior colours and materials for all the visible surfaces finishing. So, the trim lines for the future automobile are chosen from hundreds of fabric, leather, paint and plastic samples and colours. And, sometimes, they are created entirely new from scratch. This job is mainly carried out by CMF designers.

The Colour & Trim car designers work in close collaboration with exterior and even more with interior designers, as well as with marketing and product team, but also with ergonomists and with technical engineers who work on the concept and industrialisation of the new vehicles. The main goal is to collect technical input and non-technical feelings from all of them and give a strong brand and product identity to the new project using colours, materials, and finishing because people's relationship with them emotionally connects them.

Because of all these interactions, CMF designers can act as Colour & Trim car designers should be very good in visual representation and in its techniques and should know how to materialise and communicate ideas. S/He should have a strong cultural, artistic, and technical background, as well as a passion and a good understanding of the trends and lifestyle evolutions.

This work aims to investigate both the learning and the rendering processes of the CMF project by analysing the methods of colour representation in the thesis of students of specialisation courses in Transportation design. For this purpose, the activities developed in the last years within the specialisation master course in Transportation & Automobile Design of Politecnico di Milano have been considered.

Over the years, the educational path of this course has evolved significantly to improve the effectiveness of a curriculum aimed at professionalising students. The expected output profile is a junior professional able to have a broad vision of the many activities that contribute to the design process of a complex object such as the car and have representative skills consistent with this profile.

To achieve these objectives, the Car Design Studio within the master's program has been structured to simulate what happens inside an Automotive Design Centre: there are four teachers, three of them

involved in teaching/reviewing a specific aspect of the car design process (exterior, interior, colour & trim); all of them are coordinated by the fourth teacher who corresponds to the design director.

Colour & Trim design is, therefore, one of the subjects covered within the Car Design Studio and is one of the design aspects that students develop within their final thesis project.

METHODOLOGY

The CMF design includes multiple processes based on very different practical activities, such as market research, colour experiments, tactile checks, and even relationships with suppliers. Mainly for these reasons, the teaching of CMF design is a well-known problem in the product design degree curricula, often managed on a theoretical basis because of the fragmentation of the several different topics to be covered (Zhang, 2020).

To prevent this problem, in the specialising master course in Transportation & Automobile Design, a double path for teaching CMF design has been setup: the first one happens outside from the Car Design Studio, as an introductory course mainly based on a theoretical approach; the second one happens inside the Car Design Studio, and it's only based on design reviews activities, in accordance with the Shön, Oxman and Cunliffe approach to cognitive processes. They redefine the educational tasks on designer training, suggesting a shift from an orientation linked to a product achievement to a cognitive-constructive system. For this reason, design reviews are the founding moment of all the teaching activities of the Car Design Studio; during revisions, the act of "reflection in action" allows to spend time exploring why students acted in a certain way and how to improve their quality both in design and in representation. Indeed, the only way to describe the cognitive processes of design is to identify a set of representational techniques that can model visual and conceptual knowledge as well as its dialectical interaction with the "reflection in action" process. The cognitive characteristics of design thinking and its acquisition can be found in the content of the metacognitive and recursive approach to design education that involves "learning to learn". Moreover, moving from a cognitive to a practical approach, it can be observed that the specificity of the educational project is strongly linked to the relationship between visual and conceptual contents (Shön 1983; Oxman 1999, 2004; Cunliffe 1999). In the CMF design field, in which the choice and combination of chromatic variables play a fundamental role, the representation quality is essential because of the need to express ethereal concepts such as the emotions linked to the user's experience.

From Theory to Practice

Currently, in the didactical path that is independent by the Car Design Studio, students learn the basics of colour theory and its history, the most important typologies of materials used in the making of a car, and some suggestions on eco-friendly materials, as much as on next-generation and experimental materials. At the same time, students are involved in a more practical activity focusing on the making of reports on the most important design exhibitions to highlight the new trends in the sector; that means either the most famous Motor Shows, like Geneva, Tokyo, Paris, but also exhibitions not directly focused on vehicles, like CES (Consumer Electronics Show in Los Angeles), Salone del Mobile. Milano, or Lineapelle (in Milano, New York, and London). This assignment is completed with a survey in materials libraries and, of course, in the web platforms specialised in colour and lifestyle trends. The last part of the preparatory activities is a simulation of a CMF project for a piece of a car (for example, the door panel). The project is described using a moodboard with references to at least three different materials and to a colour palette. The colour definition is always requested in one of the coded colour palettes (mainly RAL, NCS, Pantone) to keep more consistent information. In the end, students are ready to implement the same process in their thesis projects, developed in the Car Design Studio, with reviews by the same teacher.



Figure 1: Moodboard “Cozy Digital” by Marco Quamori Tanzi. On the left the moodboard to describe materials, finishes and sensations; on the right the CMF proposal for the interior of a vehicle.

During the CMF project developed in the Car Design Studio, the emotional parts of the general project are initially expressed through the definition of moodboard based on the project brief, but also on the brand, on the needs of the target user and his/her experience. The colour variables are simplified as a triad of colours (the main colour: 60%; the secondary one: 30%; and the accent: 10%) to allow students to manage a complexity that, by its nature, must also consider the geometry of the project as well as materials, finishes, textures, and patterns. The final materials selection happens gradually with the final definition of the interior shapes, going deeper into the project details via graphical proposals. For each project, two alternative CMF projects are developed, the main one and a secondary one: the main one will be used in the presentation images and models.

RESULTS

In a ten-year-long list of exhibitions made to highlight the final thesis projects developed by the Transportation & Automobile Design course students, the exhibited materials are changed, evolving towards a more complete and professional way to describe a car design work.

Currently, the most comprehensive exhibition was made in the summer of 2019. The subsequent ones have been greatly influenced by the covid-19 pandemic scenario and by the related constraints. For these reasons, the 2019 one will be described as the actual state of the art reference to analyse the strength and weakness points in showing the CMF part of the projects. In the 2019 exhibition, each project has been shown using a layout characterised by:

- a 2 x 1.4 m. board containing a graphical description of the global project
- an aesthetic model of the exterior shape in 1:4 scale created with a CNC machine and painted (Brevi and Gaetani 2020)
- a 1:10 scale FDM 3D printed model of the interior, unpainted
- a 1:18 scale FDM 3D printed model expressing a secondary feature of the project, unpainted
- two panels with the two alternative CMF proposals

About the exterior part of the vehicles, the proposed colours were represented by a few ad hoc produced samples (3 or 4 depending on the project) intending to highlight the behaviour of light on concave, convex surfaces and on small and large radii of curvature. The prominent colours combination

proposal has been used to paint the 1:4 scale model. The materials chosen for the interiors are represented by some samples in the CMF panel and in the renderings of the mainboard. The model of the vehicle's interior, built in 1:10 scale, does not show any material characterisation, describing only the layout and the main shapes.



Figure 2: CMF project panel for Audi Crisalis by F. Batavia, J.P. Bruni, E. Trabattoni, P.E. Tranchellini. In the upper part the main colour (blue), the secondary one (grey) and the accent (yellow).

Of course, the final stages of the last two years editions (which ended in July 2020 and 2021, respectively) were inevitably influenced by the covid-19 pandemic. The projects of the 2020 edition were highlighted exclusively online (a webinar, on the master's website, on a YouTube channel): this meant that the digital image became the absolute protagonist compared to the physical component of the models and samples. The development of virtual models and, from them, the creation of 3D digital render images capable of expressing the material component at its best was therefore fundamental (see Figure 2).

In the 2019-20 edition, the students completed the course online after the outbreak of the pandemic scenario, while in the 2020-21 edition, students had to attend the most significant part of the course from home but during the final stages. This matter allowed a hybrid approach to the traditional final exhibition, being back to a physical one in a lighter mode than usual but in which the projects were exhibited again. The presentation models were created in Additive Manufacturing (FDM and SLA) on a 1:10 scale, starting from the digital NURBS models done by the students, and painted. Of course, the exhibition was smaller in size than in the past, but large enough to keep the presentation models, a table with a graphical description of the project, and a secondary 1:20 scale model, unpainted, to tell the alternative function that was in every project (the projects brief requested it).



Figure 3: BMW Hyla by S. Armento, F. Errera, J. Gussoni, A. Lanzalotta, P. Vitale. An image created with a digital rendering from a 3D digital model to describe three CMF proposals.

Because of the still alive difficulties in getting in touch with textile suppliers for experiencing a real tactile experience, the CMF project was still illustrated using prints and video. So, once again, the function of the digital model and, even more, the quality of its rendering was fundamental, especially for the rendering of the materials proposed for the projects.

DISCUSSION

In the last two years, the need to show the CMF part of the projects only using images created by students themselves highlighted the difficulties in keeping consistent the process from selecting colours, materials and finishes to their final representation in printed images and/or in a video. That was partially hidden in the previous years by the physical presence of samples and painted models that were able to go over misleading results in images.

In the 2021 exhibition, the complete lack of samples describing colours, materials and finishes for the interior of the vehicles highlighted the differences in being effective in representing the CMF for the exteriors in relation to the interiors. Indeed, the presentation model (it doesn't matter if in the 1:4 or 1:10 scale) can capture the eyes and give the perception that the colours and finishes of the exteriors are those, and only those, visible on the model itself. That's not entirely true because the result is always a compromise between the student's original CMF project and the colour chips available in the supplier colour collection. And this is one of the reasons why there is a lack of consistency in the colour representation: students work on rendering using as reference their original choices and not the colours chosen as the closest possible choices from the supplier palette. It's mainly a matter of timing because students must start realising rendering images already before the models are painted. Still, it's not possible to imagine delaying further the start of images production.

CONCLUSION

Of course, it's possible to work for better consistency of colour management between physical objects and their digital representation (Gaiani et al. 2011). Still, it could probably be better to teach students that different representation systems could tell other things, highlighting different information about the CMF project.



Figure 4: GoPro Chios by E. Campinotti, R. Gallo, R. Nagaraj, S. Toninato). On the left the physical model in 1:10 scale, on the right a rendered image: both representations are from a 3D digital model done by students.

Besides that, we believe there are two main areas to improve the general quality of the process currently used in the course. The first significant improvement in communicating the CMF project could be to close the gap in perception of CMF for interior and exteriors. To reach this goal could be helpful to have both a panel with CMF samples for interior and exterior, as it was in the 2019 exhibition, and a meaningful part of the interior model as a presentation model with its relative CMF choices applied. This is much more challenging than the presentation model for the exterior because it's not a

matter of paints and finishes only. It is also involved materials to cover the hard model. Still, it could probably be a significant jump in the perceived quality of the CMF representation.

A second improvement probably could be reached with a closer relationship with external suppliers, but this is mainly a management topic rather than a technical issue.

ACKNOWLEDGEMENTS

The paper is the result of common research and findings undertaken by the authors. Nevertheless, Introduction, Methodology (partially) and Conclusions were edited by Fausto Brevi; Results and Discussion were edited by Flora Gaetani; From Theory to Practice was edited by Donatella Balloni.

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Proceedings of the
International Colour Association (AIC)
Conference 2021
Milan (Italy), August 30th - September 3rd 2021

