

A large, stylized letter 'U' graphic. The left vertical bar is a solid purple semi-circle. The right vertical bar is a vertical rectangle with a color gradient from blue at the top to red at the bottom. The text 'DESIGN ACROSS BORDERS UNITED IN CREATIVITY' is overlaid on the right bar in white, bold, sans-serif font, with 'DESIGN' and 'UNITED' each enclosed in a black rectangular box.

**DESIGN**  
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**CUMULUS CONFERENCE PROCEEDINGS SERIES**

**MONTERREY 2024**

**UDEM** | UNIVERSIDAD  
DE MONTERREY



Tecnológico de Monterrey  
Escuela de Arquitectura,  
Arte y Diseño



**DESIGN** | **ACROSS BORDERS**  
**UNITED** | **IN CREATIVITY**

## **Cumulus conference: Design Across Borders - United in Creativity**

Co-hosted by the Universidad de Monterrey (UDEM) and the Tecnológico de Monterrey (Tec)  
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Design Across Borders: United in Creativity.

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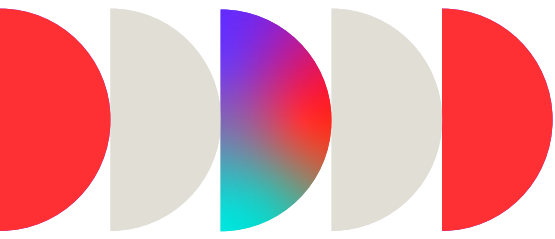
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## Preface

In a world shaped by constant transformation and global interconnectedness, design emerges as a bridge between people, places, and ideas. Cumulus Monterrey 2024: Design Across Borders – United in Creativity invited the international design community to reflect on the profound potential of design to transcend cultural, geographic, and disciplinary boundaries, uniting us in the shared pursuit of innovation, inclusion, and positive change.

This edition of the Cumulus Proceedings gathers contributions that respond to urgent questions: How can design foster empathy and intercultural understanding? In what ways does it become a catalyst for social transformation in a complex, globalized world? Can design truly become a universal language—and what are the challenges in achieving that ideal?

The richness of perspectives represented in these proceedings speaks to the global nature of the Cumulus network. Authors, researchers, educators, and practitioners from across continents have come together to share insights, experiences, and provocations within four thematic tracks:

- Design for Change explores design’s role in social innovation, sustainability, equity, and the circular economy—highlighting projects that place co-creation and inclusion at their core.
- Speculative Futures ventures into emerging territories shaped by technology, artificial intelligence, and immersive experiences, imagining the future of creative practice.
- Education in Art and Design focuses on pedagogical innovation, interdisciplinarity, and the challenges and opportunities of digital transformation in global learning environments.
- Translocality brings critical attention to issues of migration, decolonization, and the Global South, recognizing the importance of diverse voices and perspectives in shaping a more equitable world through design.

Together, these contributions reflect a collective commitment to harnessing creativity as a force that transcends barriers—linguistic, political, cultural—and brings people together around shared values and visions.

We are proud to present this volume as a testament to the power of design to imagine, inspire, and unite. May it serve not only as a record of this important moment in time but also as a spark for continued dialogue, collaboration, and transformation in the global design community.



**Design Across Borders: United in Creativity**  
**Lorenzo Imbesi**  
**Full Professor, Sapienza University of Rome**  
**President, Cumulus Association**

The Cumulus Monterrey 2024 Conference marked a timely and vital moment in the global conversation about the role of design in shaping a better world. Hosted at the prestigious design institutions of Tecnológico de Monterrey and Universidad de Monterrey (UEM), the international gathering has been further enhanced by the unique Monterrey's rich heritage and cultural identity, contributing to a thriving ecosystem of creative exchange for scholars, researchers, and practitioners across various design disciplines.

The central theme of the conference, "Design Across Borders: United in Creativity," provided an inspiring gateway for exploring how design holds the possibility to transcend geographical, cultural, and disciplinary boundaries. In particular, the conference was framed by four imperative trajectories: "Design for Change," investigating how design practices can drive social innovation and sustainable development; "Design Futures," exploring the interplay between technology and creativity, immersive experiences, virtual realities, and the implications of artificial intelligence; "Education in Art and Design," investigating pedagogical approaches in the field; and "Translocality," addressing complex issues of migration, decolonisation, and North-South dynamics. Themes highlight the broad scope of contemporary artistic and design pursuits.

At the heart of the conference was a shared recognition that design can be a dynamic force for empathetic understanding and intercultural dialogue. Through a rich program of keynote lectures, panel discussions, workshops, exhibitions, and informal exchanges, the international community demonstrated determination to work collaboratively across geographical and cultural divides, confirming the foundational premises of the conference: that creativity knows no boundaries, and through design, we can forge connections that transcend the limitations of space, time, and cultural difference. In an era of unprecedented global challenges, from climate change to technological acceleration, from cultural conflicts to social inequities, designing without boundaries means identifying areas of commonality, intersection, and convergence, highlighting them in ways that resonate with and reflect the spirit of our transborder region. As traditional confines between nations, disciplines, and cultural contexts become increasingly permeable, the design community must find itself uniquely equipped to harness this fluidity. Rather than resisting uncertainty, design must embrace it, transforming constraints into opportunities for innovative problem-solving and cross-cultural exchange.

The proceedings collected in this edition offer an extensive variety of perspectives on the ideas and projects discussed at the event. They include case studies, speculative work, educational reflections, and practical strategies, all pointing to the evolving role of design to shape societal interactions, encouraging intercultural dialogue, and building a more harmonious and interconnected world. However, these proceedings capture only a portion of the energy and insight shared during the conference, with the remaining impact continuing to reverberate through ongoing collaborations and dialogues within our global community.

As we move forward, the conversations from Cumulus Monterrey 2024 remind us that creativity thrives not in isolation, but in community. And in a time marked by division and uncertainty, design, when practiced with care and intention, can truly serve as a bridge. One that brings us together to learn, to act, and to imagine a positive change.



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# Index

## PAPERS

Ngaua Te Pae Hamuti: Rise To The Challenge: Tethering Commonality And Contrast To Create Opportunities For Positive Social And Environmental Change	21	Research on Fashion Clothing Design Strategies for the Young Elderly From an Inclusive Perspective	218
3D Printing Of Energy-Efficiency Windows	22	Beyond Boundaries: Enhancing Human Experience Through Inclusive Design	239
Analyses Of Sustainable Development In City Visual Image Design: A Study Based On Citespace Knowledge Mapping Method	45	The Development and Logic of Digital Fashion From The Perspective of the Design	253
“The European Fusilli Project In The City Of Turin: The Systemic Design Of Circular Agri-Food Proposals Involving Local Actors Of Mirafiori Sud District”	58	Strategic Foresight and Worldbuilding With Companies	282
An Analysis of Inclusive Design Integration And Intersectionality In Design Education Curricula	87	A Design-Led System Towards Circularity	304
A Contrastive Study of Service Design in Public Transportation System in Shanghai and Turin	112	Speculative Design Education: Identifying and Analyzing Critical Moments in the Process of Extrapolating Future Scenarios	326
Collaborative Design Explorations With Augmented Reality	136	Design for Being Home and Connected: Emerging Types of Dwelling at Home Toward Smart Furnitures	352
Biomaterials and Biodesign Transferring Knowledge From Academia to Secondary Schools	159	Adaptive Learning Experience for Art and Design Graduates in a Changing World	376
“The ‘Maraña’ as a Dysphoric Notion for Staying with the Troubles of Revolts”.	179	“Deconstructing the Traditional Boundaries of the Automotive System Through the Recycling of Composite Materials in the Design and Production of the Future Car”	388
	200	Bridging The Gap: Linking Transferable Skills to Potential Futures in Graphic Design	410

Design for Children’s Active School Commuting Environmental Safety Empowered by Artificial Intelligence and Augmented Reality	<b>432</b>	Research on the Emotional Value of Traditional Residences from the Perspective of Daily Life — Take the Example of the Eagle River Diaolou Group	<b>607</b>
“Ensurance” Environmental Insurance: Research And Practice Based on Social Innovation Design	<b>452</b>	“Blockchain Applied to Systemic Design: Ensuring Project Authenticity Through Quantitative Report Verification”	<b>625</b>
Research on Health Detection Product Design Based on Affordance and Traditional Chinese Medicine (Tcm ) Wellness Concepts	<b>467</b>	Untold Stories: The Graphic Design of Maria Keil and Cristina Reis During the Portuguese Dictatorship and the Path Towards Inclusiveness	<b>640</b>
Cross-Cultural Design Innovation Through Technology And Creativity	<b>481</b>	Cultural Dimensions in Design: Research on the Shifts of Interactive Relations	<b>663</b>
Research on the Experience Product Design of Intangible Cultural Heritage “Song Dynasty Kites” Based on the Perspective of User Needs	<b>501</b>	Navigating Challenges in Participatory Design: Exploring Handover Tools when Designing for People with Dementia	<b>688</b>
Research on Environmental Regulation Design of Sustainable Community from the Perspective of Thermodynamic System	<b>522</b>	Time for (S)Heroes to Enhance Circular Fashion and Costume, Art Installations, Devising for Design, State-of-the-Art Technology, Inclusion and Diversity	<b>713</b>
Extended Curriculum Programmes in South Africa: A Focus on Social Justice and Arts-Based Pedagogies	<b>547</b>	Data Sonification and the Power of Audio: Breaking Boundaries of Information Design with Creativity, Accessibility, and Innovation	<b>737</b>
Multidimensional Artistic Processes and Strategies for Conversational Practices Between Women	<b>570</b>	“Places to Learn – Cultural Heritage Enrichment Model (Chem) for Transformation and Innovation Through Art and Design”	<b>763</b>
Packaging and Cultural Accessibility. Designing Product Comprehensibility for All Users	<b>586</b>		

How can Generative AI Transform Smartphone Communication?: Exploring New Design Landscapes for Everyday Experiences	<b>785</b>	Design Futures for Traditional Craft: A Collaborative and International Approach	<b>974</b>
Regenerative Design in Tibetan Regions: Place-Based Learning Through Storymaking	<b>801</b>	A Study on Modular Concept Design for Street Vendor Markets in the Context of Consumption Downgrading	<b>993</b>
Shifting Graphic Design Pedagogy: Co-Creating With Cancer Survivors for Inclusive Clinical Trials	<b>824</b>	Sustainable Choices, Fresh Approaches: Redesigning Meal Kits Using Activity Theory	<b>1013</b>
Research on Brand Experience Design Strategy for Mr Virtual Community Based on Ahp-Qfd Model	<b>841</b>	Research on Daily Spatial Practices in Traditional Chinese Villages: A Case Study of Fujian Tulou Villages	<b>1030</b>
Design and Biomaterials: Integrating New Models for Sustainable Design	<b>863</b>	Extending the Lifecycle of Designed Products for Sustainable Development: Insights From Zisha Teapot	<b>1051</b>
Cultural Regeneration of Domestic Wastes From Participatory Design Perspective	<b>883</b>	“Designed By Women (DPM): Approaches for a Historical, Non-Sexist, and Co-Creative Study on Pioneering Women Designers In Chile”	<b>1079</b>
Design-Driven Innovation (DDI) as a Catalyst for Transformation: A Case Study of the Air-Membrane Version of Huo-Yan Laboratory	<b>914</b>	“Co-Creation and Design of Tools for Cultural Mediations in Art Museum of Ciudad Juárez”	<b>1100</b>
Pemo, Positive Emotion: A Gamified AI Journaling Website Centered on Facilitating Users in Developing More Positive Narrative Identities	<b>936</b>	From Dystopia to Micro-Utopia: Societal Change Through Digital Design Innovation	<b>1121</b>
Puli Project Semillas Del Futuro: Implementing Design-Led Education to Transform Communities	<b>957</b>	Crafting Immigrant Narratives of Belonging: Art and Design for Social Innovation with the Latino, Latina, and Latinx Community of Iowa City	<b>1137</b>

Artistic Resistance in the Post-Privacy Era: Reflection, Imagination, and Reconstruction Under Liquid Modernity	<b>1153</b>	Pastry as a Medium: Design for Social Innovation of Catering Service in a Chinese Nursing Home	<b>1354</b>
Empathy Engine: Using Game Design and Real-Time Technology to Cultivate Social Connection	<b>1172</b>	Augmenting the Double Diamond: Critically Integrating Generative AI in the Creative Process	<b>1371</b>
Digital Droplets: Shaping the Appreciation Experience of "Spring Water"	<b>1194</b>	Eco-Data Informed Processes. Nature as a Co-Designer to Face Environmental Change	<b>1386</b>
Care of New Knowledges - Educene	<b>1213</b>	Hauntological Speculation Device: Designing Lost Futures with Design Students to Explore Socio-Technological Scenarios	<b>1413</b>
Co-Designing for Equity: Addressing Anti-Black Racism in the Arts in Canada- A Working Paper	<b>1232</b>	Depictions of Sustainability and Unsustainability: AI-Generated Images as Part of our Semiosphere	<b>1431</b>
Experience prototyping with an Educational Robot Platform: Development and Pedagogical Reflection from an Interaction Design Course	<b>1256</b>	Reassembling Resilience In Breakdown: How Mexico City Recovered Food Security Through Micro-Innovations During the Covid-19 Pandemic	<b>1444</b>
Onlife. Exhibit Design in the Time of the Mangrove Society	<b>1276</b>	Design-Led Circularity for Furniture Manufacturing. An Application on Montessori Kindergarten	<b>1462</b>
Aigc and Vernacular Creativity: A Study of Chinese Rural Children's Aesthetic Education From the Perspective of Capability Approach	<b>1295</b>	Towards A Post-Anthropocentric Creative Framework To Support Designers In Envisioning More-Than-Human Futures	
'Re-Wilding' The Cultural Landscape. Breraplus, an Ethical and No Borders Museum Experiment	<b>1318</b>	Brand Strategy Empowers the Revitalization of Rural Areas and Social Innovation in China	<b>1491</b>
Design-Driven Innovation for Natural Capital: Mapping Criticisms Among Conservationbodies to Implement Accessible Technological Tools for Conservation	<b>1333</b>	A Study Of Multisensory Stress-Relieving Product Design for Female Office Workers	<b>1510</b>

Brand Strategy Empowers the Revitalization of Rural Areas and Social Innovation in China	<b>1528</b>	Application Strategies of Artificial Intelligence Technology in Art And Design Education: A Multi-Case Study from the Perspective of Interdisciplinary Thinking Cultivation Feasibility	<b>1721</b>
Artificial Intelligence as a Catalyst for Individual and Collaborative Creativity in Design Conceptualization	<b>1544</b>	Updating Wayfinding Literature and Teaching Methodology	<b>1738</b>
"Design for Chronicity: The Case of Pharmaceutical Packaging in Medical Treatment for Elderly"	<b>1558</b>	Explore Boundary Space: Design Strategies for Street Renewal in Beijing's Hutong Neighborhoods Based on the Idea of Symbiosis	<b>1758</b>
Enhancing Pro-Social Experiences Through Cross-Cultural Interactions for the Campus of the Future	<b>1577</b>	Identity Construction and Spatial Production: The Evolution of Milan's Chinatown	<b>1771</b>
Across Borders: A Pilot Phd Programme in Design, Art And Technologies. Open Questions for A Post-Disciplinary Education & Research Model	<b>1597</b>	Archeology in Transit	<b>1789</b>
Design in the Multidisciplinary Era: Collaborative Approaches to Cultural and Territorial Reactivation	<b>1616</b>	Exploring the Concept of Multiespecies Design: Perspectives from Mexico	<b>1818</b>
Hospitals or Homes: Where Will We be Cured in the Future? Design Challenges and Visions in the Rapidly Evolving Home Care Sector	<b>1643</b>	Event-Based Education in Design: A Case Study on Fostering Critical Thinking and Social Impact	<b>1846</b>
"Design to Create Value: <i>Made In...</i> Paraguay for Transition"	<b>1658</b>	Empowering Design: A Framework for Stigma-Free Design and Human Augmentation	<b>1874</b>
Design as Resilience: A Model for Global Collaborations	<b>1684</b>	Designing a Participatory Process to Implement Technology-Based Projects in Vulnerable Communities.	<b>1892</b>
Space Exploration: Community of Intercultural Identity Through Memory Sharing	<b>1706</b>	Architecture of Degrowth: A Spectrum	<b>1908</b>
		The Future Evolution of Design-Oriented Practices in the Context of Human and Non-Human Collaboration	<b>1936</b>

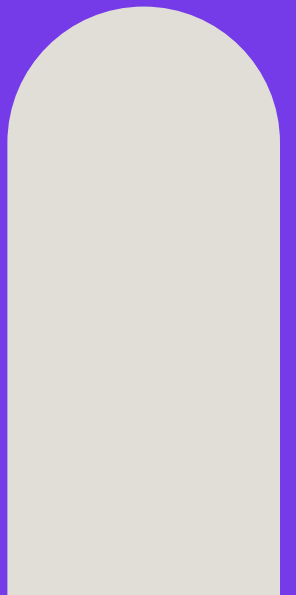
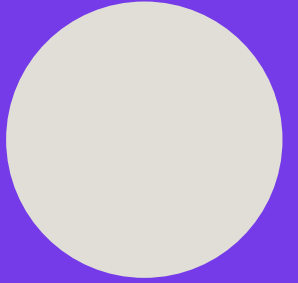
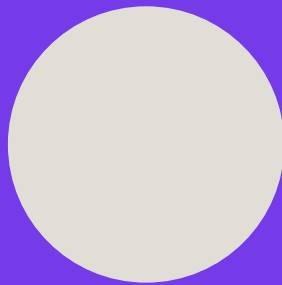
Designing for Durability: How Fashion Brands are Encouraging Longer Garment Life Through Consumer Behaviour Change	<b>1956</b>	Digital Fashion Education: A Collaborative Approach to Preparing Students for Industry 4.0	<b>2104</b>
Prototyping a Migrating Virtual Receptionist Using Physical and Virtual Reality Tools: Implications for Design Competency and Tool Development	<b>1975</b>	Global Collaboration For Sustainability: An Innovative Educational Approach	<b>2106</b>
Designing Hybrid Welfare Spaces and Services: Exploring The Intersection of Physical and Digital Dimensions for Social Inclusion In Urban Contexts and Peripheries	<b>1998</b>	Human Mobility And Design	<b>2108</b>
		<b>WORKSHOPS</b>	<b>2109</b>
"Alles Richtig Ist Nicht Richtiges Für Alle"	<b>2011</b>	Designing for Social Justice and Human Rights: Building Networks for Victims of Violence and Families of the Disappeared	<b>2110</b>
Co-Designing with Humans	<b>2030</b>	CMF Strategy Design Using Generative AI	<b>2111</b>
Economic Generation Project for Indigenous Women in Northern Cauca	<b>2047</b>	New Turn In Design Research And Education - A Panel Discussion	<b>2113</b>
Sustainable Community Renewal with Civic Participation: The Practice of Building Community Gardens in Shanghai	<b>2074</b>	Dear AI, What Do I Want To Say And What Does It Look Like? Tools And Methodologies For Image Making	<b>2114</b>
<b>POSTERS</b>	<b>2096</b>	Physicalising Symptoms: The Role of Materials in Supporting Intimate Data Collection to Improve Awareness and Communication In Healthcare	<b>2116</b>
The Evolution Of Graphic Poster Design: A Meta-Analysis Of Media Technology's Influence On Creative Practice	<b>2098</b>	Codex Artificialia: A New Creative Act to Resist the Hype of Smart Commodification and Decolonising Tomorrow	<b>2123</b>
Enhancing Child Development Through Interactive Illustration Design In Picture Books: An Interdisciplinary Approach	<b>2100</b>	Design As Community Care: Drafting a New Manifesto for Design Education	<b>2125</b>
Talavera Of Puebla, Design As An Element Of Cultural Identity Of Puebla, Mexico	<b>2102</b>	Refugeoly Gam	<b>2126</b>

Co-Creating Collaborative Cultures: How To Teach Collaboration In Design School	<b>2127</b>	Art and Design Activities as Data	<b>2180</b>
Rethinking Design Education: Teaching if We Could be Risky	<b>2129</b>	Cultivating Community Collaborations To Foster Societal Change	<b>2181</b>
Designing With The Desert: Crossborder Pedagogies For Sustainable Bioregions	<b>2133</b>	Gota and Gulshan: Poetic Adornment	<b>2183</b>
Designing Plural Futures	<b>2140</b>	Transformation to a Circular Campus	<b>2185</b>
Green Threads: Sustainable Fashion Jam	<b>2142</b>	Technology and Māori Narratives in Design Education and Research	<b>2187</b>
Beyond Words: Image, Gesture and Empathy	<b>2143</b>	Co-Designing Health Communication for Neurodevelopmental Disorders in South Asia	<b>2189</b>
Application Workshop Cumulus Conference Monterrey 2024	<b>2145</b>	Representing Risk: Radical Collaboration In A Design Classroom	<b>2192</b>
Robotics With Us in our Meaningful Places: Combining Art-Based Methods With AI to Build Empathy Between Human-Robot Interaction	<b>2148</b>	Kinesthetics and Interoception: Future Designs for More Than Five Senses	<b>2195</b>
The Country of Origin Effect: Mapping Design Values and Patterns	<b>2153</b>	Decolonizing Design: Equity in Participation	<b>2196</b>
Systemic Design Interventions: Understanding the Transformation Towards the Circular Plastic Economy Through the Lens of Aquaculture Case	<b>2156</b>	Strategic Foresight for Social Impact: Utilizing Design to Promote Empathy and Intercultural Understanding	<b>2198</b>
Strange Strangers In Strange Lands: A Collaborative Storytelling Game For Community Biodiversity Activism	<b>2173</b>	The Evolution of Collaboration: Tracking Benefits of Alternative Instruction Methods	<b>2201</b>
<b>SLIDE DECKS</b>	<b>2179</b>	We All Need A Home: Co-Creating Sustainable Shelter	<b>2203</b>
		Off Road, Try Out & The Choreography of Making	<b>2206</b>
		The Future of Craft	<b>2209</b>





PAPERS



# SPACE EXPLORATION: COMMUNITY OF INTERCULTURAL IDENTITY THROUGH MEMORY SHARING.

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**ABSTRACT** | How can design guide future scenarios of space exploration through systems-actions-visions that continue to create connections that transcend the limits of space and cultural boundaries? As emerges from current trends, in the coming decades, the human presence in space will expand from low Earth orbit to the lunar surface and the crew will be made up not only of astronauts but of new users with heterogeneous purposes and missions. Today, the International Space Station (ISS) is a place of strong cooperation, where boundaries are not defined and people, thanks to long selection processes and shared training, acquire a strong empathy so that cultural differences are not perceived as a limitation. In the future, this balance may change significantly. In fact, the risk of a larger presence of “space travelers” with their short stay, is that the space habitat becomes just a “crossing” space without an identity, without a shared memory, a non-place.

The paper investigates how design in synergy with humanistic and technological fields can encourage the creation of a new community not only of interest, but with a shared intercultural identity within these new extreme environments.

The research, through a Responsible Advanced Design, is mapping and analyzing which analogic and virtual practices can activate a “memory” in Space habitats capable of developing a system for transferring the experiences of places and emotions from one user to another, beyond the boundary of time and exceeding it, to give continuity to a story and eliminate the meaning that it is just about experiencing the micro-gravity space for oneself.

**KEYWORDS** | ADVANCED DESIGN; FUTURE STUDIES; SPACE HABITAT; INTERCULTURAL IDENTITY; MEMORY



## 1. Introduction

The dream of reaching the moon is centuries old. Our satellite has always aroused human curiosity, making the sky more than just an inanimate blanket of stars, but a space worthy of exploration. The time has come to change things. Not only are there spectacular explorations by space heroes heading into the unknown, like the moon landing that still ignites human imagination, but also consider that in the last 24 years, the International Space Station has hosted approximately 273 astronauts and cosmonauts from 24 different countries<sup>1</sup>. Current trends indicate that in the coming decades, human presence in space will expand from low Earth orbit (about 400 km from the surface) to the lunar surface, with crews composed not only of astronauts but also new users with diverse purposes and missions. If today the International Space Station (ISS) is a place of strong cooperation where boundaries are undefined, and people, through long selection processes and shared training, acquire strong empathy so that cultural differences are not perceived as limitations, the future does not foresee such “harmony” when constructing new vehicles and space stations. In the future, this balance

may change significantly, especially since by 2031 (Bartheles, 2024), the ISS will undergo significant modifications, if not dismantled entirely. F.e. Space X’s Starship program promotes the idea that the developed vehicle could carry up to 100 people for an interplanetary journey<sup>2</sup>, while Falcon 9 carries 7 passengers. The goal is no longer a destination within our planetary system but interacting with the space surrounding Earth in various ways.

Currently, ensuring greater psycho-physical well-being and a better quality of life for travelers within space modules seems to be one of the main objectives. However, a further step is needed: regenerating the emotional relationship and spatial and bodily interconnection among people who will experience the space habitat presumably for shorter periods, with different interests and objectives than actual astronauts. The psychological negative factor addressed in this paper concerns the risk that the space habitat becomes just a “crossing” space without identity or shared memory, a *non-place* for “space travelers” with their short stay.

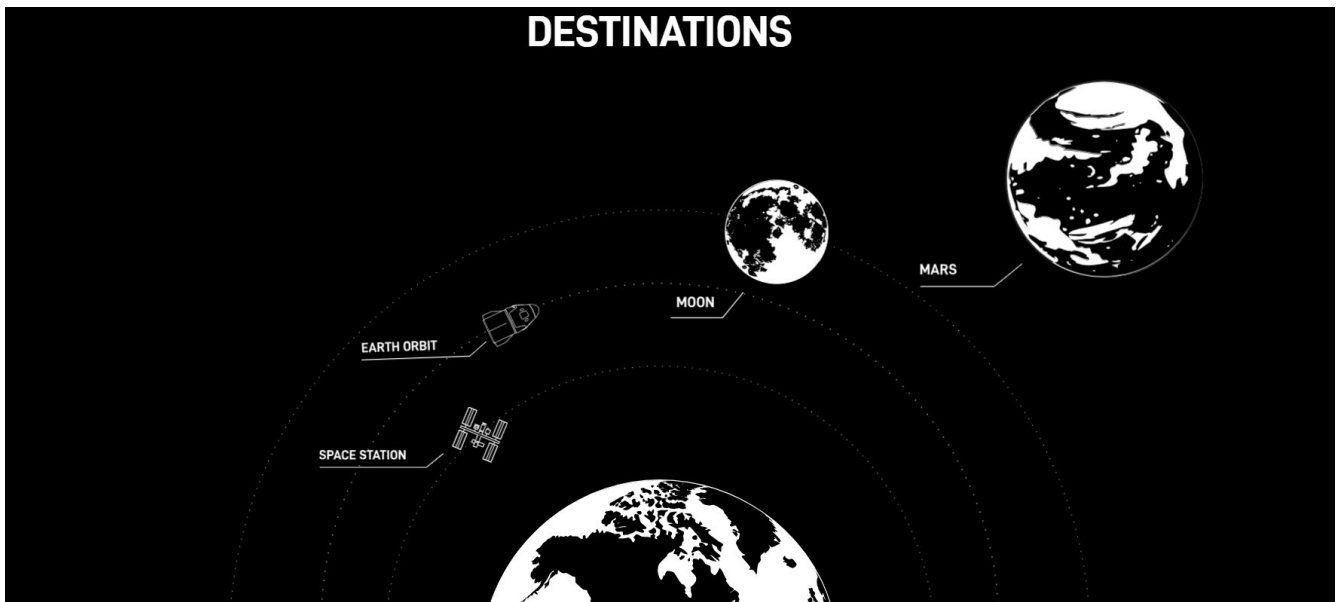


Figure 1. Image taken from the SpaceX website - Human Spaceflight

## 2. Concept of Belonging

Marc Augè defines a place with no personal connection as a Non-Place, devoid of narrative and functional at any point of use. In contemporary experience, Giaccardi and Magatti (2001) address the co-interest in social space as a resolution to loneliness. Places and non-places “interlock and mutually penetrate each other; the possibility of a non-place is never absent from any place,” as Magatti reiterates Marc Augé’s (p.44) statement on the coexistence in social space of places of solitude, non-permanence, and instrumental and contractual interaction. With current developments, space habitats in orbit can be seen as transit and crossing spaces not designed for relationships, where one does not recognize oneself as belonging except for

artefactual details inserted over time by those who experienced these environments. Thus, thanks to the principle of community identity, an apparent non-place can become a place for someone who works and lives there. This distinction of attitude, not substance, must also be designed in new scenarios where innovative design approaches become the drivers of this interpretation.

What makes the environment livable is our relationship with it. Relationships with others, sensory memories, light, rhythms, physicality; these connections compose a multichannel perception capable of generating poetic images (Mallgrave, 2015, p.112) extracted from the experiences the body has lived. In the transposition of the space habitat becoming home, the

<sup>1</sup> Buon compleanno, ISS! - Infini.to (planetarioditorino.it), website consulted in July 2024

<sup>2</sup> SpaceX – Starship, website consulted in July 2024

place where we spend time beyond just functional activities like shopping but staying to eat, sleep, and interact with space and relationships with others, it is evolving from a “container/machine” towards an idea of an ecosystem that, thanks to the multiplicity of infrastructural networks (Mitchell, 1995), is increasingly interconnected with the objects and people inhabiting it. In new types of living spaces, according to Flusser (2003, p.88), “relationships are ‘attracted’”; the habitat is no longer a place of protection but is “creative as a node of an interpersonal network.” The infrastructures shaping the habitat are elements that compose that open network, opening new design fronts for space and life in relation to others. But also segregation with the intensified use of digital communication tools. People can relate more easily to a product, service, or experience when they can connect to it on a personal level and thus recognize in it languages, forms, and behaviors they have already experienced and can dialog with, whether effectively or not.

Zygmunt Bauman (2011, p.113) connects Richard Sennett’s thought to the definition of empty space by Jerzy Kociatkiewicz and Monika Kostera, highlighting the difficulty of generating relationships, cohesion, and coexistence in spaces without meaning. For the same reason, the lack of meaning, the loss of identity, the lack of stratification of memory, and the disintegration of the collective element of *non-places*, according to Augé, make them alien to man in the process of participation, sharing, and association. If the connections generated between people

and places do not participate in building personal, collective, and identity memory, they become meaningless and without hierarchies, failing to acquire value in human life.

Therefore, design must create a narrative that, in turn, generates memory, leading to the research question of this article: How can design guide future scenarios of space exploration through systems-actions-visions that continue to create connections transcending spatial and cultural boundaries?

### 3. Memory and Space-Time

Maldonado asserts that there is an evident connection between memory and identity in their relationship with dwelling and, consequently, with the objects accumulated within.

**“‘Dwelling means,’ said Walter Benjamin, ‘to leave traces,’ and traces are the imprint of memory. As has been said many times, in the Western world the accumulation of objects, considered as traces, represents one of the most important means of defining one’s space and identity. We have seen so far how literature bears witness in an almost sculptural way to this character of our material civilization.”**

(MALDONADO, 2005)

This relationship lives through what is defined as bodily memory, resulting from the layering of past motor experiences the body has perceived and lived in relation to itself and

others or objects it has come into contact with. Considering the weakening relationship between man and things due to a changed nomadic configuration dictated by the increasingly digital consumption of content is another design area to consider for a general rethinking of our living systems.

The present research reveals that current space habitats are built to respond to survival and work functionalities, not to welcome passengers and placing their belonging needs in the background. It is a sense of multiple belonging: primarily physical, belonging to the station/vehicle crew, which could also be defined as a “common destiny.” The other sense of belonging is to the home on Earth, with which the connection system has technically improved significantly over time, and organizationally, for example, the ISS astronauts’ agenda includes space and time to correspond to this need. The sense of belonging to a space seems linked to the time spent in it. For example, on a long train or plane journey, the seat we occupy gradually becomes ours, and we identify with it. When we stay longer in a hotel room, we start moving furniture. And if years imprisoned, appropriation occurs even under the form of inscriptions on the wall, like the first humans on earth who testified their presence with a hand reproduction on the cave wall. We leave traces of our presence, like hearts carved into the tree where we encountered our first love.

### 3.1 Time in Relation to the Individual and the Community

As seen until now, beyond spatial and temporal factors in future space explorations, it is important to consider the relationship between the individual and (travelling) community, as well as the institution of reference.

The relationship between the individual and the community today is regulated by procedures, training paths, and highly concentrated physical-psychological preparation and the creation of a strong sense of cooperation and cohesion. People, thanks to long selection processes and shared training, acquire strong empathy so that cultural differences are not perceived as limitations. In contrast, the relationship between the community and governance is defined and protected by international agreements between public institutions, preserving a common good: extraterrestrial space and the multicultural nature of missions.

As expressed at the beginning of this contribution, the paradigm shift is defining new systems of governance of outer space, new forms of space occupation and resource use, new dynamics of partnerships between international non-profit entities and companies, focusing less on the social and cultural implications of these important changes (Pasa & Sinni, 2024).

All this brings up further questions: How will the future users relate to each other? How can living space be made qualitative for

multicultural cohabitation? How can living space be designed to be cohesive?

In this complexity, time can be a driver of innovation by using the timely succession of people in the orbit at different moments as a community building resource: If considered as a variable of design (Celaschi et al., 2014), it can work on the design process to keep individual identity connected with being an active part of a community and a promoter of an international and multicultural cooperation system.

#### 4. Action – Research

The Advanced Design Unit research group at the University of Bologna, through a project funded by the European community called *Made in Italy Circolare e Sostenibile* (MICS) - PE11 – PNRR, is carrying out the “Beyond the Space Life. Digital Living Lab for human life in space” project within the research line of Spoke 1. The work team involves various scientific fields in academia, such as design and mathematics, and an important aerospace company, Thales Alenia Space Italia (TASI).

This synergy between research and industry allows the investigation of the phenomenon of space exploration, particularly related to life in micro-gravity space habitats, through two lenses: 1) tangible factors such as the sustainability of tools and design processes, circularity of innovation strategies, use of technologies concerning the environment or people (Van Ellen, 2023; Valori et al., 2020), and 2) intangible values such as inclusion,

well-being/care of the individual, community, and space, cooperation, that belongs to the concept of Responsible Innovation (Stilgoe et al., 2013). Of particular interest for this contribution is the second research thread closely related to the elements, needs, and opportunities described earlier. As already emphasized, the reference context is an extreme environment, not comparable to life on Earth. Microgravity, the absence of natural stimuli, and altered sensory perceptions bring the human body into a new dimension and to live uncoded experiences. If until today astronauts have been able to overcome adaptability difficulties, social isolation, and identity sense thanks to their backgrounds and learned abilities, in the near future, this will not be possible due to the much shorter preparation of space travellers as described previously.

The objectives and lines of intervention of this second track are multiple: on the one hand understanding who the new users will be and designing for the awareness and ethics of people undertaking these explorations, redesigning the experience from including ergonomic and sensorial perspectives (Burattini et al., 2014; Dominoni & Quaquaro, 2023; Inglese et al., 2024) on the other hand focusing on the design that allows to share memory and experience of travellers through time creating a new kind of “space community”.

In this line of intervention, TASI’s involvement is ensuring good experimentation of the project, guaranteeing related humanistic

and technological skills on a basic research level and to put theoretical visions into action by collaborating with further industry companies. The complexity of this research area, influenced by human, spatial, temporal variables, and unpredictable factors, requests combining knowledge and know-how from different fields through an interdisciplinary approach (Kopeck et al. 2024).

To avoid interdisciplinarity remaining a theory and to bring to light shared design strategies, the working group takes design discipline as the engine of innovation. Design is not just seen as an innovation bearer of a product, service, or experience, but of a process; a design that assumes the role of mediator among multiple actors and disciplines and becomes an anticipator of possible futures (Iniguez et al. 2014; Succini et al. in press).

#### **4.1 Methodology: From Human-Centered Design to Responsible Advanced Design**

Today, the most widespread design approaches in the field of Space Design are guided by methodological tools typical of engineering disciplines or oriented towards design-driven methodologies. The most widespread is Human-Centered Design (HCD) (Long et al., 2022), which allows consideration of human factors, ergonomic criteria, and user experience throughout the design development. In recent years, other approaches have developed that, starting from HCD application in this field, have elaborated actions and tools that take

into greater consideration the movements and changes in gestures characterizing this context, an example is Use and Gesture Design (Dominoni, 2021).

The complexity of this project led to studying these approaches and analyzing others related to solving wicked problems (Rittel & Webber, 1973) to find in Responsible Advanced Design (RAD) (Formia et al., 2023; Succini & Ciravegna, 2022) a synthesis of characteristics and tools capable of addressing not only the project from the perspective of space, human factors, and experience interaction but also considering time, the creation of extraplanetary interpersonal relationships, and the social and cultural impacts of this new paradigm shift in the entire design system. An approach where imagination is not only a factor of creativity but of desirable future design.

Advanced Design has been dealing since 2009 with the “relationship between the evolution of the time factor and innovation driven by design (Celi, 2010)” (Celaschi, Celi & Formia, 2014 p.22). Within this approach, time is not intended as a continuum but opens up to imagination and various possible, probable, or potential solutions (Celaschi, Formia & Franzato, 2018).

The relationship between future, anticipation and design (Celi 2015; Poli 2019) aims to “anticipate change” (Celi & Morrison, 2019) by transitioning from a user-centred approach to forms of collaborative design (co-design) in which each actor involved contributes

knowledge and experience by activating forms of cross-fertilisation along the value chain (Celaschi et al.; Iniguez et al., 2014).

Responsible Innovation (Stilgoe et al., 2013; Salamanca et al., 2019) introduces or reaffirms a design responsibility where everyone is an active part, a concept of innovation more focused to inclusion, care for the future, impacts not only tangible but also intangible, and the value of the community within a design process.

Therefore, the interaction between these two approaches has led the Advanced Design Unit since 2020 to develop a design model starting from this method to then experiment it in various contexts. The model consists of macro-actions that decline the concept of responsibility in four areas of design: Responsible Design, Responsible Thinking, Responsible Production, and Responsible Community, each characterized by design strategies and tools typical of design, enhanced by RI-oriented principles (Succini, 2023). Depending on the research area in which one operates, the approach can adapt, considering in the analysis, design, and experimentation process only some of these areas (macro-actions).

Specifically for the ongoing project concerning the creation of a bridge between research and experiments related to memory, space, and time in extraterrestrial contexts, strategies and tools related to Responsible Design and Responsible Production have been activated.

Below are schematically reported the RAD actions and tools considered and the purpose of their use:

### **Responsible Design**

- Actions: Activation, Observation
- Tools: Observatory; Collaborative spaces and tools
- Objective: Mapping and observation in other contexts of memory activation systems; peer-to-peer reading and clustering of research through collaborative tools and shared definition of reading keys to identify new design strategies for activate a community space.

### **Responsible Production**

- Actions: Experimenting; Co-producing
- Tools: Design Workshop; Checklists
- Objective: Co-produce through collaborative and multi-actor workshops, a case studies analysis system centered on project's key factors (bodily, sensorial, time, intercultural relationship, spatial inclusion, community, etc.), and possible futuristic scenarios where the concept of memory becomes the glue of these new forms of exploration and life in extreme contexts.

During the research, the two macro-actions have intertwined, and the results of one activity are defining the drivers for applying subsequent tools. Thanks to an iterative process between source research, case study

research, and field collaborative actions, the first conjectures theorized through literature are being validated.

## 4.2 Memory as an Inclusive and Multilevel Design Framework

Thanks to the approach described above, the research is mapping and analyzing which analogue and virtual practices can activate a “memory” in space habitats capable of developing a system for transferring experiences of places and emotions from one user to another, beyond the boundary of time, giving continuity to a story and eliminating the notion that experiencing microgravity is only for oneself.

The analysis begun with the study of the ISS, bringing to light current practices related to the concept of memory, such as the Space Mission Patches. Those stickers are attached

in different parts within the ISS and can be read as a visual sign/reminder of those who have experienced the station in previous missions (fig. 2). This analysis was extended through research in other areas outside the domain, with the aim of identifying other products or experiences of memory activation and transfer.

This observation mode, inserted within the Responsible Design macro-action is allowing us to find drivers for change (Celaschi, 2016) and is highlighting design strategies and characteristics to develop systems within habitats where the memory element generates a bridge beyond time boundaries. Shared memory can be seen as an activator of relationships, interpersonal bonds, and recreates empathy among people and communities.

The interaction and iteration between design-driven observation systems (which

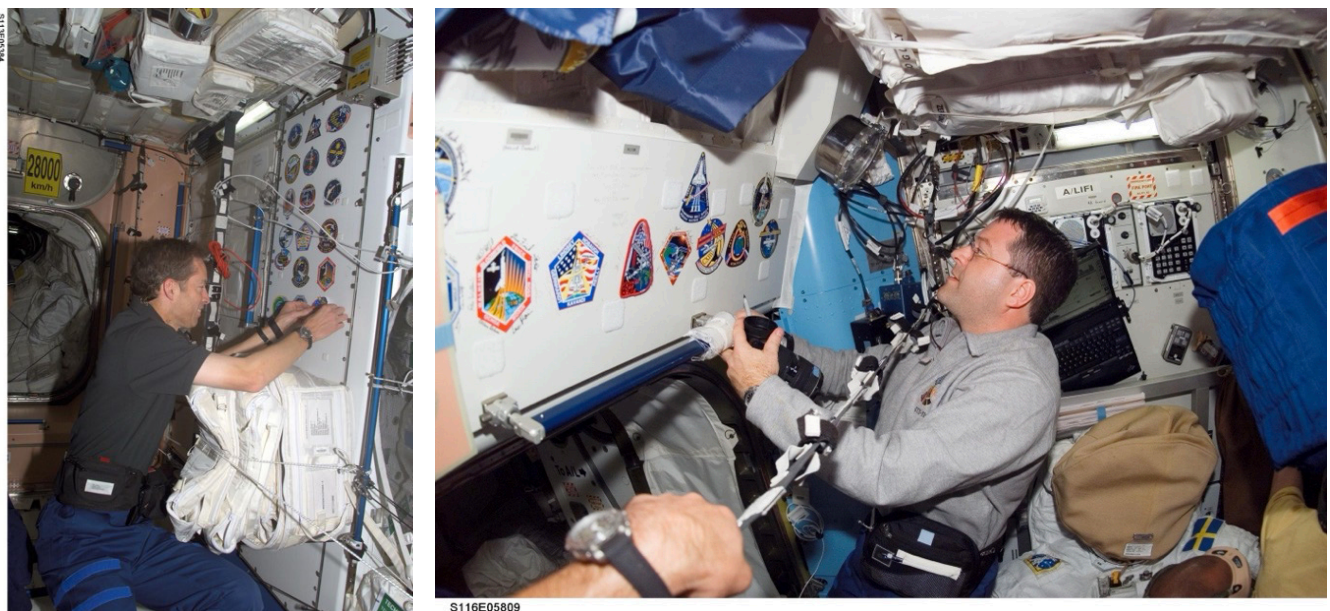


Figure 2. Images of mission patches on space habitat panels in the ISS – Source: Nasa Image and Video Library

use collaborative open-source tools for data collection) and peer-to-peer workshops among researchers, young designers, and company operators have led to a first reading of the memory concept concerning the future users' needs in space explorations. The corridors and intervention lines can be summarized in four categories:

- **Body Memory:** Linked to gestures and postures that lead to reliving a memory or transferring sensations already experienced through coded movements or related to proprioception (Koch et al., 2014);
- **Symbolic Memory:** Connected to artifacts and visual elements that establish a stronger relationship with the surrounding environment;
- **Ritual Memory:** Linked to ways of acting. It becomes a sense-producing element that, through a series of actions, connects the individual with the community, the past to the present and future (Durkheim in Segalen, 2002), and can generate new rituals;
- **Sensorial Memory:** Closely connected to our senses, whether a single sense or their combination, leading the person experiencing it to relive the intangibility of a memory or experience (Bruno, 2022).

These categories are also connected to two possible ways to keep this memory alive through analog artifacts, digital artifacts, or their combination. Main task of the work team will be to define the best balance between these four categories. It can be taken into

consideration that some routine activities executed on a daily basis in the extreme environmental context become part of one's body memories, but most likely transform eventually into ritual memories. Further it is to be considered that digital memories have often short effect and need to be recalled "artificially" while analogue memory keepers guard better a symbolic memory of events and people. On top of this, the placing of by travelers added memory elements that can transport a *space community* feeling over time, is not necessarily related only to one specific area in the habitat, but populates in different ways specific spots, from crew quarter to newly created co-habitative areas. Most likely the design intervention, based on co-designing principles, needs to create tools that over time allow the individual creativity of travelers to express their "*I have been here*", that bridges to the next testimonial of human presence in space, just like the colored hand in the prehistoric cave. In the very end, the first foot print of Neil Armstrong on the moon does not tell anything else to the next traveler who will land on the moon, providing with a first sense of "settling".

## 5. Conclusion and Future Development

Applying the RAD approach in an extreme and high-risk environment has highlighted how its adaptability is not only related to the cultural, social, or territorial factors of a context but also to the flexibility of integrating the use of tools and methods typical of other methodologies.

In our case study, to redefine the future space habitats experience systemically, analyzing the phenomenon with the proposed approach (RAD) was useful, but for the next step, which will see the development of individual components, HCD will remain important reference. Indeed, it is assumed that these two approaches will interact throughout the design process because it will always be necessary to bring the micro to the macro and verify if the actions taken respond to the initial objectives.

As already emerged from the paper, the research is in an intermediate phase of its development, and the following actions will include: 1) integrating this factor within the activities, needs, and functions of space habitats to identify areas where it is necessary to integrate it, 2) creating a taxonomy based on the spaces identified of interaction between the categories (body, symbolic, ritual, sensorial) and the values it should enhance or recreate (sharing, interculturality, inclusion, etc.). This can become a design tool for products/services/systems memory that enhance a community Space identity 3) creating study prototypes of these elements to validate them with the design community.

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