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# Space-Time Experience in the Meta-Environment: A Cybersemiotic Analysis

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University of Plymouth

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**SPACE-TIME EXPERIENCE IN THE META-ENVIRONMENT:  
A CYBERSEMIOTIC ANALYSIS**

CLAUDIA FERREIRA JACQUES DE MORAES CARDOSO



In memory of my parents,  
Rogério Jacques de Moraes and Maria Léa Ferreira de Moraes.  
In celebration of my sons, Roger Moraes Cardoso and Matthew Moraes Cardoso,  
for their courage to pursuit their own paths, which inspired me to pursue my own.

*She believed in angels and, because she believed, they existed. (Lispector, 1986, p. 39)*



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**UNIVERSITY OF  
PLYMOUTH**

**SPACE-TIME EXPERIENCE IN THE META-ENVIRONMENT:  
A CYBERSEMIOTIC ANALYSIS**

by

**CLAUDIA FERREIRA JACQUES DE MORAES CARDOSO**

A thesis submitted to Plymouth University  
in partial fulfillment of the requirements for the degree of

**DOCTOR OF PHILOSOPHY**

School of Art, Design and Architecture

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## AUTHOR'S DECLARATION

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award without prior agreement of the Doctoral College Quality Sub-Committee.

Work submitted for this research degree at the University of Plymouth has not formed part of any other degree either at the University of Plymouth or at another establishment.

A programme of advanced study was undertaken, which included composite sessions in:

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Plymouth, United Kingdom, July 9 to 18, 2010  
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Shanghai, China, August 20 to 30, 2011  
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Meta-Environment. *Technoetic Arts: A Journal of Speculative Research*. Vol. 10: 1 (2012): 93-99, doi: 10.1386/tear.10.1-3.93\_1, 2012.

Brazil's Tropicália movement: Reflections on anthropophagic syncretic reality. In R. Ascott & L. M. Girao (Eds.), *CR12 Presence in the mindfield: Art identity and the technology of the transformation* (pp. 139-143). Aveiro, Portugal: Universidade de Aveiro, 2011.

Cyberperception, Technoetic Aesthetics & Consciousness in 'Mixing Realities': Theory into Practice. In R. Ascott, E. Gangvik and Margarete Jahrman (Eds.). *Making Reality Really Real, Consciousness Reframed II* (pp. 43-45). Trondheim, Norway: TEKS Publishing, 2010.

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*Figure 1: Matt Cardoso interacting with *Mixing Realities*, 2009, New York, NY*

## ABSTRACT

**CANDIDATE:**

Claudia Ferreira Jacques de Moraes Cardoso

**TITLE OF THESIS:**

Space-time Experience in the Meta-environment: A Cybersemiotic Analysis

Written from the perspective of a reflective technoetic art practitioner, this thesis investigates Human-Computer Interactions in interactive hybrid environments and their influences on mediated consciousness. It argues that practices established during the advent of computer graphic interfaces have limited the interactive potential of such environments. It examines interactive processes among user, information, and interface; proposes a closer look at representational paradigms of space and time; suggests potentially illuminating parallels with complex adaptive systems; and explores their theoretical and practical co-implications.

Influenced by Marcel Duchamp's conceptual-interactive art experiments, Brazil's syncretic Tropicalismo movement, and Roy Ascott's technoetic art, this thesis deploys Søren Brier's Cybersemiotic framework to bridge practice and theory. It presents the interactive hybrid installation *Mixing Realities* (2009, 2014) as contemporary example, analyzing its physical and digital components, aesthetic and conceptual goals, and reception by various users.

This thesis suggests that, as products of the mechanical age, space-time representational paradigms emphasizing embodiment rely on linear visualization and episodic memory, thereby restricting digital information's potential and preventing more balanced integration among user, information, and interface--a triadic relationship identified as "meta-environment."

This thesis observes that current theoretical frameworks have dissonant understandings of information, communication, process, perception, and meaning, which impedes integration of user-information-interface in a manner that accords them equal weight and acknowledges their mutual influences. The current understanding is that information is either exclusively human perception or computer interface process.

Søren Brier's cybersemiotics integrates phenomenological perceptions and feedback processes, thereby enabling study of the meta-environment with focus on how individual elements influence one another in dynamic triadic relationships. Visual representations of this analysis suggest that each element at some point works as mediator of interactive processes. The possibility of understanding these interactions as dynamic complex adaptive systems creates the potential of expanding how humans interact, perceive space and time, and mediate consciousness.



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## TERMS AND ABBREVIATIONS

2D Design | Two-dimensional design. An area of study in art focused on the close analysis of form.

ADHD | Attention deficit hyperactive disorder | Brain disorder marked by an ongoing pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development.

Autopoiesis | Meaning self (auto), creation or production (poiesis), refers to a system capable of reproducing and maintaining itself.

Complex Adaptive Systems | Natural and artificial systems characterized by apparently complex behaviors that emerge as a result of often nonlinear spatial-temporal interactions among a large number of component systems at different levels of organization. These systems have recently become known as complex adaptive dynamic systems able to adapt in and evolve with a changing environment.

Consciousness | State or quality of awareness or of being aware of an external object or something within oneself.

Cybernetics, First Order | Concerned with the outside observation of the circular causal feedback processes of systems.

Cybernetics, Second Order | “the study of the control and communication of complex systems, whether they are living organisms, machines or organizations, paying special attention to feedback as the main way of regulation” (Brier, 2011, n. p.).

Cyberperception | The “faculty of technologically augmented cognition and perception” (Shanken, 2007, p. 376).

Cybersemiotics | Transdisciplinary theory of information, cognition, meaning, communication, and consciousness that integrates cybernetics and Peircean semiotic paradigms in a common framework (Brier, 2008).

Cybersemiotic Experience | A technoetic construction of meaning based on Søren Brier’s cybersemiotic star. Reflects how the elements in the meta-environment interact with and mediate each other.

## TERMS AND ABBREVIATIONS

Cybersemiotic Star | A representation of how the communicative social system of the four main areas of embodied minds' knowledge arises. Physical nature is usually explained as originating in energy and matter, but sometimes also information, living systems as emerging from the development of life processes (such as the first cell). Social culture is explained as founded on the development of meaning and power in language and practical habits. Finally, the inner mental world is explained as deriving from the development of our individual life world and consciousness, in spiritual and religious frameworks often ultimately from an objective transcendental spirit or as a soul coming from a personal creator or god (Brier, 2008).

Entropy | a thermodynamic quantity representing the unavailability of a system's thermal energy for conversion into mechanical work, often interpreted as the degree of disorder or randomness in the system.

Double Consciousness | "The state of being that gives access, at one and the same time, to two distinctly different fields of experience: psychic space and cyberspace, the material world and the virtual in an artwork and outside of it" (Shanken, 2007, p. 377).

Dyslexia | a general term for disorders that involve difficulty in learning to read or interpret words, letters, and other symbols, but that do not affect general intelligence.

HCI | Human Computer Interaction, a field of study.

Hermeneutic Phenomenology | Interpretative examination of human experience in the creation of meaning.

Interactive Hybrid Environments | Interactive systems whose elements have contrasting characteristics: atoms/bits, physical/digital, temporal/atemporal, linear/non-linear.

Meta-environment | The interaction among, and characteristics of, users, information and interface, observing their different levels of exchange and complexity.

Moistmedia | "Interactive media comprising of bits, atoms, neurons, and genes in every kind of combination" (Shanken, 2007, p. 363).

Qualia | Individualized phenomenological experience.

Semiotics | The study of sign process (semiosis) and meaning creation.

Semiotic Dance | Charles Pierce's unlimited semiosis applied to the creation of meaning in interactive artworks.

Shaman | "The one who cares for consciousness, for whom the navigation of consciousness for purposes of spiritual and physical wholeness is the subject and object of living" (Ascott, 2007, p. 358).

**Structural Coupling** | The complementarity of different organisms that can emerge when they operate interdependently over a prolonged period.

**Syncretic** | organic and fluid technoetic aesthetics | The classical concern with the surface image of the world gives way to the technoetic aesthetics of creative consciousness and artificial life.

**Technoetic Art** | “Technoetics is a convergent field of practice that seeks to explore consciousness and connectivity through digital, telematic, chemical or spiritual means, embracing both interactive and psychoactive technologies, and the creative use of moistmedia” (Ascott, 2008, p. 204).

**Telematic** | “Term used to designate computer-mediated communications networking between geographically dispersed individuals and institutions ... and between the human mind and artificial systems of intelligence and perception” (Ascott, 1990, in Shanken, 1997).

**UI** | User Interface design aims for an easy, efficient, enjoyable, and user-friendly mode of machine operation which produces a desired result. This generally means that the operator needs to provide minimal input to achieve the desired output and also that the machine minimizes outputs undesired by the human user.

**UX** | User Experience design encompasses all aspects of the end-user’s interaction with the company, its services, and its products.

**UMWELT** | The world as it is experienced by an individual organism.

## CHAPTER I | INTRODUCTION

- 1.1. Context/Overview
- 1.2. Scope and Limitations
- 1.3. Research Questions
- 1.4. Explanation of Methods
- 1.5. Outcomes
- 1.6. Description of Chapters

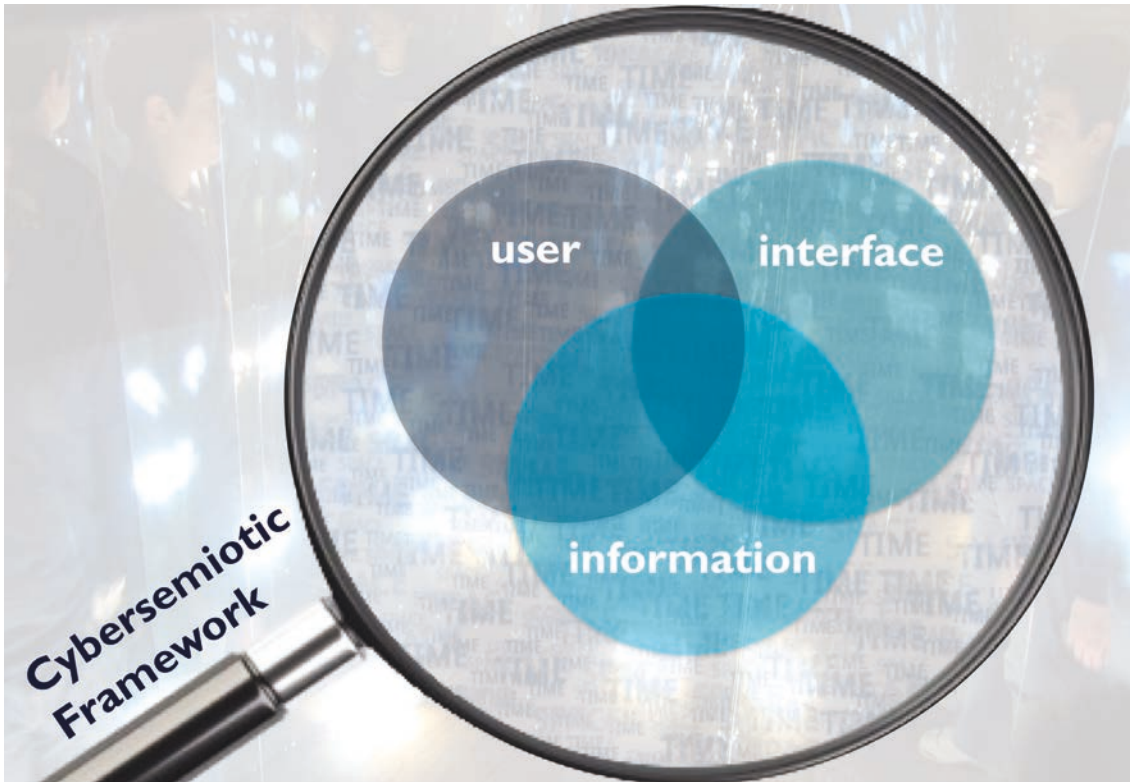


Figure 2. The Meta-environment under the lens of Cybersemiotics.

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### 1.1. Context/Overview

This dissertation lies at the intersection of (1) artistic experimentation in altering human perception and consciousness through creation of digitally-based or -enhanced interactive art and (2) inquiry into the nature and implications of human-computer interactions (HCI).<sup>1</sup> It examines known gaps between these two broad

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<sup>1</sup> “Human-computer interaction (HCI) is an area of research and practice that emerged in the early 1980s, initially as a specialty area in computer science embracing cognitive science and human factors engineering” (Carroll, 2014, <https://www.interaction-design.org/literature/topics/human-computer-interaction>).

areas (involving user, information, and interface) and questions the validity of current ontological and methodological approaches to reducing these gaps. It utilizes a design approach, focusing on space-time aesthetics in an attempt to connect theory and practice through the framework of cybersemiotics. It reflects on the implications and impact on consciousness of such an integrative framework.

My own entry into this convergent, transdisciplinary conversation was my practice as technoetic artist<sup>2</sup> and information designer developing interactive hybrid environments.<sup>3</sup> More specifically, the initially uneven reception and limited success of my installation *Mixing Realities*, a large dynamic and interactive hybrid physical-digital installation begun in 2008, was the impetus for my delving into the theoretical frameworks available to conceptually ground and potentially enhance my artistic practice.

*Mixing Realities* PVC prototype (Figures 3 and 33) was first introduced to the public in December 2008 at the School of Visual Arts, MFA in Computer Arts open studios. The rudimentary prototype with mirrors, camera, monitor and a MAX MSP Jitter patch controlling the interactions was well received although the informal studio setting seemed to have facilitated the interactions. The current wooden structure environment was first introduced at the SVA MFA in Computer Arts studio in May 2009 (Figures 4 and 34) and officially presented to the public a week later at the School of Visual Arts Chelsea gallery (Figure 5) in a show entitled *Mediated Realities*. The artwork, a 7 by 7 feet triangular wooden structure, was designed to promote a private and individualized experience so people could feel free to explore the interactions. The

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2 “Technoetics is a convergent field of practice that seeks to explore consciousness and connectivity through digital, telematic, chemical or spiritual means, embracing both interactive and psychoactive technologies, and the creative use of moistmedia.” (Ascott, 2008, p. 204).

3 The term *Interactive Hybrid Environments* refers to art and design practices that combine physical-digital systems to convey information through a user’s direct intervention (art installations, web interfaces, ubiquitous computing, etc.)





*Figure 3:* People interacting with *Mixing Realities* prototype in the SVA studio, December 2008, NY, NY.

*Figure 4:* People interacting with *Mixing Realities* finalized in the SVA studio, May 2009, NY, NY.

*Figure 5:* People interacting with *Mixing Realities* in the SVA gallery, May 2009, NY, NY.

*Figure 6:* *Mixing Realities* in the WCC Fine Arts gallery, March 2011, Valhalla, NY.

*Figure 7:* *Mixing Realities* with external monitor, ArtsWestchester gallery, May 2014, White Plains, NY.

*Figure 8:* *Mixing Realities* with external monitor, Regeneron public space, September 2014, Elmsford, NY.

artwork sat isolated in the back of one of the gallery's biggest rooms. Not many people ventured walking through the gallery's room to interact with the installation, and the people who did walk to the installation would not necessarily open its doors to check inside and when they did they seemed frozen at the sight of their reflections; not the expected outcome. It seemed that unseen forces were in place, blocking the users from experiencing the artwork. Assuming that people needed an even more private environment than I had envisioned I attributed the open back of the installation to be one of the problems. In 2011, *Mixing Realities* was shown at Westchester Community College, SUNY gallery in a show called *Faculty Selects*. This was the first time the gallery was showing an interactive hybrid installation and it was an opportunity for me to share my work with my students. I addressed the open back issue by blocking the rear of the artwork (Figure 6). Nevertheless, it soon became clear that the initial connection between the user and the interface was not intuitively occurring and a deeper analysis of the interaction was needed.

*Mixing Realities* was developed to focus on time perception as subject matter and content, and as such its design (form<sup>4</sup>) attempted to hypermediate time perception by "seeking to make the digital interface [and physical environment] 'transparent' [to the user]. In this sense, a transparent interface would be one that erases itself, so that the user is no longer aware of confronting a medium, but instead stands in an immediate relationship to the contents of that medium" (Bolter & Grusin, 2000, pp. 23-24). My modest intention was simply, as Roy Ascott states, "to start a dialogue, to set feelings and ideas in motion" (Ascott, 2007, p. 98) concerning time perception and physical embodiment. Nonetheless, observing how so few people actually engaged with the artwork instigated a sense of frustration and puzzlement about how or

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4 Subject matter, content, and form are the components of art, according to Ocvirk, Stinson, Wigg, Bone, Cayton, 2009, pp. 10-16.



what people were actually experiencing. The artwork was designed to combine physical and digital elements in a visually enticing, intuitive, user-friendly environment. Cyberperception<sup>5</sup> was explored through intentional communication loops between input, output, and observer, following the principles of second-order cybernetics. Materials were carefully selected, considering their form and function, in order to mediate the user's experience.

This research attempts to connect theory and practice, to understand the limitations of *Mixing Realities*, and to gain a better vantage point on human-computer interactions by employing a common method of analysis utilized by art historians, designers, architects, poets, and other creative individuals to evaluate practice through theory. It involves defining the subject matter and observing content and context behind the artwork, while focusing on form. Through this approach, it became possible to observe *Mixing Realities* as a whole while also focusing on the individual elements composing the artwork, their characteristics and relationships.

Artists and scholars addressing interactive hybrid environments often borrow concepts from different fields, which do not necessarily share the same methodology or ontology, creating a gap in the understanding of such environments. HCI, cybernetics, information theory, semiotics, design, and new media are some of the fields which attempt to describe these environments, but they don't necessarily agree on the subject matter, content, or context, much less on the same components or their characteristics and relationships. Such pseudo-transdisciplinarity revealed both ontological and methodological problems. As my research proceeded, I became especially aware of the frequent reliance on conceptualizations of the interface (I) as

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<sup>5</sup> Cyberperception is the emergent human faculty of technologically augmented perception (Ascott, 2007).

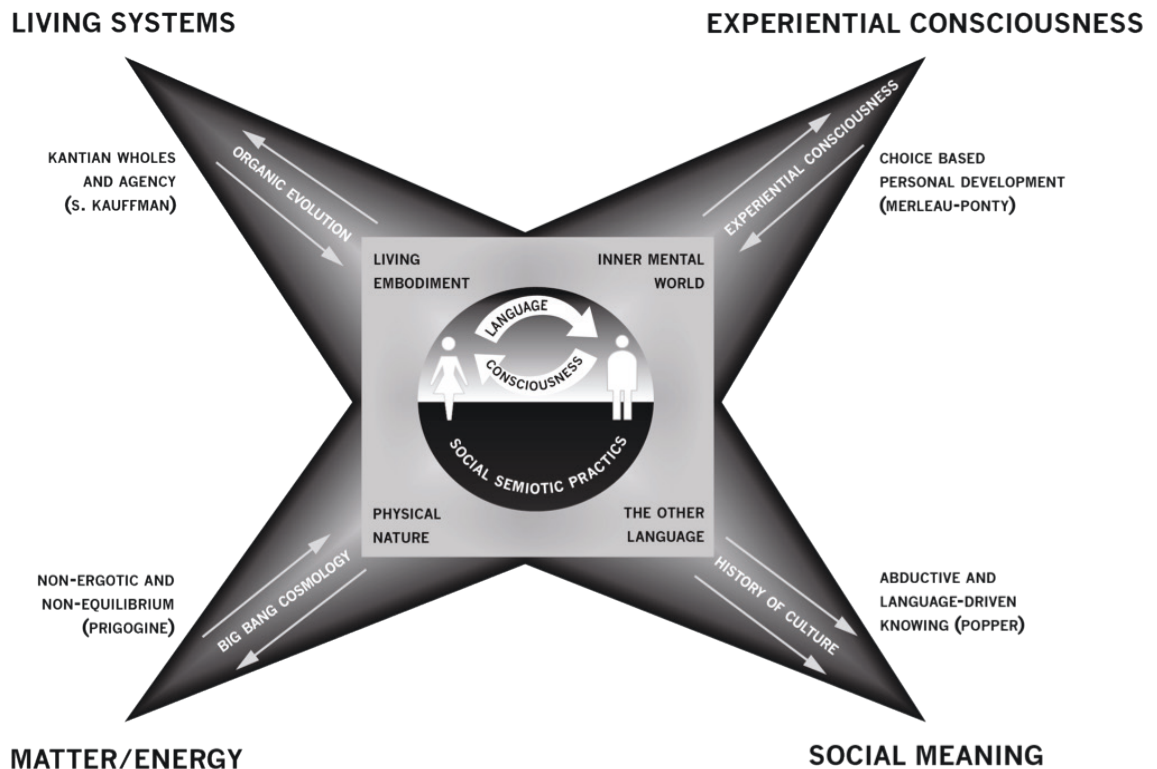


Figure 9. The Cybersemiotic Star (Brier, 2008).

replicating and reinforcing physical perceptions of embodiment and also (2) as the sole mediator of the digital/physical experience.<sup>6</sup>

Ontologically, this thesis highlights the problem of the user-interface disconnect that I perceived in my artistic/design practice as well as the inadequate conceptualizations of human-computer (i.e., user-interface) interaction in the theoretical literature by systematically incorporating the third element—information—

<sup>6</sup> These assertions are based on different sources, but I share two to illustrate my point: An introduction to embodiment and digital technology research: Interdisciplinary themes and perspectives by William Farr, Sara Price, Carey Jewitt (2012) [http://eprints.ncrm.ac.uk/2257/4/NCRM\\_workingpaper\\_0212.pdf](http://eprints.ncrm.ac.uk/2257/4/NCRM_workingpaper_0212.pdf) analyses how concepts of embodiment permeate and mediate HCI. Also in *The Encyclopedia of Human-Computer Interaction*, 2nd ed. online, John M. Carroll proposes the following description of human-computer interactions. <https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/human-computer-interaction-brief-intro>.

"HCI addresses the dynamic co-evolution of the activities people engage in and experience, and the artifacts — such as interactive tools and environments — that mediate those activities [emphasis added]. HCI is about understanding and critically evaluating the interactive technologies people use and experience. But it is also about how those interactions evolve as people appropriate technologies, as their expectations, concepts and skills develop, and as they articulate new needs, new interests, and new visions and agendas for interactive technology.

Reciprocally, HCI is about understanding contemporary human practices and aspirations, including how those activities are embodied, elaborated, but also perhaps limited by current infrastructures and tools. HCI is about understanding practices and activity specifically as requirements and design possibilities envisioning and bringing into being new technology, new tools and environments. It is about exploring design spaces [emphasis added], and realizing new systems and devices through the co-evolution of activity and artifacts, the task-artifact cycle" (Carroll, 2014).

into the analysis and by introducing the concept of the meta-environment (see Figure 2) as the locus for describing and analyzing the triadic relationship among user, information, and interface.

Methodologically, the problem of the user-interface disconnect and inadequate conceptualizations of HCI is addressed through the analytical framework of cybersemiotics,<sup>7</sup> a transdisciplinary theory of information, cognition, meaning, communication, and consciousness that integrates cybernetics and Peircean semiotic paradigms in a common framework (Brier, 2008), which allows for an integrative analysis of the elements in the meta-environment taking into consideration that information can be not only data but “jointly actualized meaning” (Brier, 2008 , p. 20).

Under the Cybersemiotics framework the three elements in the meta-environment—user, information, interface—can be seen as part of a complex adaptive system allowing its elements to be equally balanced and analyzed, by factoring in the user’s essential influence in the system and by considering the manner in which information functions as both human perception and logical process. Broadly speaking, cybersemiotics seeks to close the gap between art and science through combining the four approaches below represented by the Cybersemiotics Star (Figure 9):

1. A physico-chemical scientific paradigm based on third person objective empirical truth and mathematical theory but with no conceptions of experiential life, meaning and first person, embodied consciousness and therefore meaningful linguistic intersubjectivity.

2. A biological and natural historical science approach understood as the combination of genetic evolutionary theory with an ecological and thermodynamic view based on the evolution of experiential living systems as the ground fact, engaged in a search for empirical truth, but with no theory of meaning and first person embodied consciousness and thereby linguistic meaningful intersubjectivity.

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<sup>7</sup> Soren Brier’s cybersemiotic framework is introduced in chapter 4 and discussed in chapter 5.

3. A linguistic-cultural-social structuralist constructivism that sees all knowledge as constructions of meaning produced by the intersubjective web of language, cultural mentality and power, but with no concept of empirical truth, life, evolution, ecology and a very weak concept of subjective embodied first person consciousness, but taking conscious intersubjective communication and knowledge processes as the basic fact to study (the linguistic turn).

4. A phenomenological (Husserl) or actually phaneroscopic (Peirce) first person point of view taking conscious meaningful experiences before any distinction between subject and object as the ground fact, on which all meaningful knowledge is based, considering all result of the sciences including linguistics and embodiment of consciousness as secondary knowledge. This includes an intersubjective base in that Peirce considers all knowledge as intersubjectively produced through signs only emotions are Firstness (Brier, 2011, n.p.).

Cybersemiotics helped me expand the connection among the elements in the meta-environment by offering a common language for classification, description, and exchange among these elements where the following transdisciplinary aspects could be equally considered: (1) physic-chemical aspects such as spatiality and temporality, (2) biological and natural science aspects (atoms or bits), (3) linguistic-cultural-social structuralist aspects related to subjective and/or objective sign interpretation and meaning creation. (4) aspects of consciousness (qualia), the “phaneroscopic first person point of view” in embodied cognition and meaning creation from “one mental space to another” (Brier, 2008, p. 303).

This transdisciplinary, holistic analysis of the meta-environment highlighted the cognitive dissonance between human perceptions and computer-mediated processes while revealing the potential of the meta-environment to function as a complex adaptive system.

This theoretical approach underpinned a further realization that in the implementation of interactive hybrid environments, information is generally translated to the user through a design architecture that assumes embodiment and relies

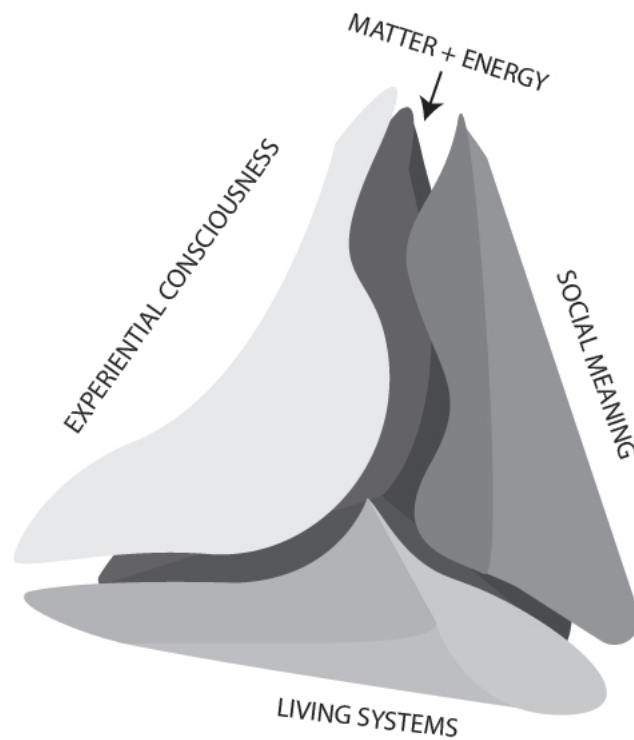


Figure 10. Proposed extruded 3D tetrahedron representation for the Cybersemiotic Experience.

primarily on physical narratives that privilege space over time. It also showed how the elements in the meta-environment comprise a complex adaptive system with different levels of interactions and processes, affecting and mutually influencing each of the individual elements, similar to the manner in which the elements of an artwork influence and affect perceptions of that artwork.

Applying this new understanding to my own practice laid a basis for understanding why so few people had fully experienced *Mixing Realities* and, more broadly, supported re-conceptualization of the relationship among user, information, and interface in the meta-environment and their mediation capabilities. By questioning such dichotomous paradigms as physical/digital, space/time, and human perception/logical-mathematical process, cybersemiotics pointed toward the need for a more holistic and integrated qualia experience, described and visually represented here as the Cybersemiotic Experience.

Grown out of Brier's transdisciplinary approach to meaning creation and consciousness described earlier and represented in his cybersemiotic star; the Cybersemiotic Experience proposes that the cybersemiotic star facets be represented by a three-dimensional tetrahedron (Figure 10) reflecting an adaptive and dynamic self-regulating structure that constantly experiences entropic changes in each of its four facets and thus, is in constant change due to the interdependency among its elements. The Cybersemiotic Experience promotes Ascott's technoetic construction of meaning in interactive hybrid environments as an unique and individualized experience (qualia).

The applied concepts of Duchamp's Creative Act and the semiotic dance promoting the cybersemiotic experience in Ascott's technoetic construction of meaning came to *Mixing Realities* as an external monitor helping users mediate the interaction (Figures 7, 8 and 36) and informed the conceptualization of the interactive hybrid environment *Digital Ayahuasca* which aims to promote a construction of meaning by promoting interaction with our own brain waves.

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## **1.2. Scope and Limitations**

This dissertation focuses on my view as an artist/designer attempting to create interactive hybrid environments that rely on human-computer interactions in order to mediate a holistic and integrated consciousness experience.<sup>8</sup> As such, it limits its scope to the designer's creations, views, and discourse based on the integrative framework of cybersemiotics. Thus, the dissertation's practical case studies and theoretical analysis are used to illustrate the creator's view and aim to provoke an awareness that the

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<sup>8</sup> Asserting the relevance of the artist/designer's view addresses Roy Ascott's observation that "While scientists seek to analyze, dissect and explain consciousness, artists attempt to navigate consciousness and create new structures, images and experiences within it. Consciousness is a field where art and science can co-mingle" (Ascott, 2000, p. 4). More on the subject in chapter 2.

current conceptualizations of HCI are limiting the potential of interactive hybrid environments to promote enhanced consciousness experiences.

This research attempts to produce a new practice and theory by offering a new perspective on HCI in interactive hybrid environments expanding the relationship among user, information and interface which he is proposed to be called meta-environment to reflect its complex adaptive system potential in order to further “a technoetic aesthetics in which consciousness in all its forms, at all levels, and in all things, is both the subject and object of art.” (Ascott, 2000, p. 4).

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### **1.3. Research Questions**

The research questions below are strictly limited to ontological and methodological problems related to interactive hybrid environments which aim to promote enhanced consciousness experiences:

- What are the current domains and limitations of HCI in interactive hybrid environments? How are user, information and interface portrayed therein?
- Is there a need to redefine the elements involved in HCI within interactive hybrid environments under a transdisciplinary framework?
- How can the understanding of the user-information-interface relationship as a complex adaptive system, addressed here as meta-environment, promote a paradigm shift in HCI?
- Can the transdisciplinary framework of cybersemiotics help facilitate a more holistic analysis among user-information-interface (meta-environment)?

- Can the cybersemiotic analysis of the meta-environment facilitate the interaction among its elements to promote a more holistic qualia experience (cybersemiotic experience)?

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#### **I.4. Explanation of Methods**

Led by my practice as a reflective technoetic artist and information designer developing interactive hybrid environments such as *Mixing Realities*, this dissertation applies an interpretative analysis through a design discourse grounded in the framework of cybersemiotics. It specifically:

- introduces the artist/designer's conceptual and practice background to establish the understanding of interactive hybrid environments;
- describes the different elements involved in interactive hybrid environments as user, information and interface;
- surveys how different disciplinary fields define the different elements in interactive hybrid environments;
- observes the dynamic, complex adaptive relationship among user, information and interface and describes this relationship as meta-environment;
- observes and describes the meta-environment elements' space-time aesthetic qualities and properties;
- establishes the need for equal integration of these fields and elements through the transdisciplinary framework of cybersemiotics (Figure 3);
- explores the individual elements' of the meta-environment capabilities



to mediate consciousness and redefines their “structures, images and experiences within it” (Ascott, 2000), using the framework of cybersemiotics;

- proposes new approaches to the elements’ interaction to promote a more holistic and integrated consciousness experiences;
- suggests that what I call the “Cybersemiotic Experience” (Figure 4) is an appropriate name for and likely outcome of these new approaches.

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### **I.5. Outcomes**

Today most areas of social or scientific inquiry rely on some form of human-computer interaction. The research presented here outlines the need for a more holistic understanding of the user-information-interface relationship in HCI. It also establishes the practical implications of this potential in that the Cybersemiotic Experience may promote a technoetic construction of meaning. Following the practice to theory to practice trajectory of the reflective practitioner, this study expands its implications to the conceptualization and planning of a new artistic practice called *Digital Ayahuasca* and observing the needed understanding in the developments of consciousness today and the potential for different practices which rely on interactive hybrid environments to enhance human consciousness.

The significance of the new portrait of HCI that this research paints is heightened by the advent of ubiquitous computing’s expansion to everyday life, turning refrigerators, cars, phones, doors, so forth, into interactive hybrid environments; a

momentous change which in turn affects how humans perceive and interact with information in hybrid interactive environments and how our consciousness is mediated.

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## **I.6. Description of Chapters**

**Chapter 1 | Introduction** presents the key aspects of the dissertation by offering an overall view of its context, scope and limitations, research questions, explanation of methods, outcomes, and a brief description of chapters.

**Chapter 2 | Why Interactive Hybrid Environments?** introduces the contextual background and conceptual foundation by establishing the influences of Marcel Duchamp's retinal-conceptual-interactive art experiments, Brazil's syncretic Tropicalismo art movement, and Roy Ascott's technoetic approach as harbingers of today's interactive hybrid art practices; defines its approach to consciousness; and exposes my personal motivations for pursuing art as new knowledge focusing on interactive hybrid environments and this artist/designer's view to conceptually bridge theory into practice.

**Chapter 3 | Mixing Realities** presents the dissertation's creative practice and methodological background by introducing the designer's view of and practical experience with the interactive hybrid art installation *Mixing Realities* as contemporary example, analyzing its physical and digital components, aesthetic and conceptual goals, and reception by various users. This chapter interrogates the work's interactive potential for expanding consciousness and creating new knowledge as well as the conceptual limitations of current-traditional physical narratives that emphasize embodiment to represent the architecture of digital information environments and the user-interface relationship.

**Chapter 4 | Space-Time Experience in the Meta-Environment** presents a critical review of the current frameworks used to describe and analyze interactive hybrid environments in the promotion of consciousness and suggests the need for a new structured view of the field of study calling for a transdisciplinary context.

A section on the Meta-Environment presents the second statement of the problem by introducing the individual elements in interactive hybrid environments, proposing that this triadic relationship be identified as meta-environment; taking into consideration its different elements, characteristics, and overall interactive relationship.

A section on Space-Time Experience in the Meta-Environment presents the theoretical contexts, subject matter, and issues through the first statement of the problem, which defines parallels between the industrial and digital revolutions as a way to contextualize existing space-time representational paradigms, suggesting that as products of the mechanical age, physical narratives rely on linear visualization and episodic memory, thereby restricting digital information's potential and preventing more balanced integration among user, information, and interface.

**Chapter 5 | Cybersemiotic Analysis** connects practice to theory and back to practice, offering the description and justification of the research methods by establishing that an adequate analysis of the meta-environment requires an integrative theory. It establishes a comparative analysis of the meta-environment's individual elements and mediation properties within the framework of cybersemiotics. It presents the transitions from theoretical findings into practice by creating connections with established practices and integrating with an aesthetic/design approach. It also analyzes Brier's cybersemiotic star, a three-dimensional representation of the four aspects that ground the cybersemiotic framework (natural, biological, phenomenological, semiotic)

united in the center by the integration of human knowledge and consciousness (Brier, 2008, p. 361) to define the Cybersemiotic Experience and the potential of the meta-environment to expand consciousness.

**Chapter 6 | Outcomes** reflects on the implications and applications of the Cybersemiotic Experience on technoetic art and presents *Digital Ayahuasca*, a conceptualized project to promote and call for expansion of art practices to telematic, digital, genetic, vegetal, moist or linguistic interactions.

**Chapter 7 | Conclusion** presents an overview of the dissertation and describes the possibility of understanding interactive hybrid environments as triadic dynamic complex adaptive systems and their potential for expanding how humans interact with hybrid environments, perceive space and time, and mediate consciousness.

## CHAPTER 2 | WHY INTERACTIVE HYBRID ENVIRONMENTS?

### Contextual Background

- 2.1. Introduction
- 2.2. Pictorial Representation
  - 2.2.1. Introduction
  - 2.2.2. Tools & Representation
  - 2.2.3. Overview
- 2.3. Photography: Subject Matter to Form and Content
  - 2.3.1. Introduction
  - 2.3.2. Representation and the Birth of a Medium
  - 2.3.3. Freedom from Representation
  - 2.3.4. Overview
- 2.4. Marcel Duchamp: Conceptualism and Interactive Art
  - 2.4.1. Introduction
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- 2.5. Brazilian Syncretism:  
Participatory and Collective Interaction
  - 2.5.1. Introduction
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  - 2.5.4. Syncretic Context
  - 2.5.5. Art and Nationalism
  - 2.5.6. Roots of a Movement
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  - 2.5.10. Overview
- 2.6. Roy Ascott: Technoetic Art and Consciousness
  - 2.6.1. Introduction
  - 2.6.2. Ascott's Path
  - 2.6.3. Telematic Discourse and Cyberperception
  - 2.6.4. Technoetic Art and Consciousness
  - 2.6.5. Overview
- 2.7. Why Interactive Hybrid Environments?

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### 2.1. Introduction

Consciousness of the way the world is understood changes at different moments in history relative to the available knowledge of that period. A major shift in consciousness can change the premises about how we should seek to understand the world, what is important to look at and how we should present it. (Lovejoy, 2004, p. 13)

This chapter addresses the theoretical and practical influences for this research starting with Lovejoy's understanding of how the available knowledge in our social-cultural-political environments shapes our views of the world, and how new technologies influence and are influenced by this knowledge. It surveys art-historical concepts and technological developments, as well as the people who deeply influenced my understanding of the potential of interactive art (more specifically interactive hybrid environments). Ultimately it contextualizes the technological and conceptual developments to call attention to the shifts in perceptions and consciousness that led to interactive hybrid environments.

This chapter briefly surveys the evolution and mutual influence of art and technology from pictorial to photography to interactive art highlighting how technological advances shape human understanding, with particular emphasis on Marcel Duchamp as conceptual and interactive artist, his inclusion of the spectator as co-creator –creative act– and the semiotic implications of such inclusion. It also examines Brazilian syncretism, surveying events in the mid 1920s highlighted by *The Cannibal Manifesto* (Andrade, 1928), which later influenced Brazilian Neoconcrete artists Lygia Clark and Helio Oiticica. They in turn influenced the Tropicália movement of the 1960s and 1970s, revealing how Brazilians perceive their creative expressions despite the appearing dissonance of concepts and practices, thus focusing a culturally specific lens on interactive hybrid art and its elements. Roy Ascott's syncretic understanding of cyberperception and technoetic aesthetics is then introduced as the anchor point for this research, offering the possibility of integrating technological and scientific advances employed to explore new forms of mediated consciousness through interactive art, and serving as the background to my own understanding of interactive hybrid art environments.

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## 2.2. Pictorial Representation

### 2.2.1. Introduction

Representation<sup>9</sup> is the system that relates seeing to art (Lovejoy, 2004, p. 5, 1997, p. 14<sup>10</sup>) and as such is the core objective of visual art. The use of drawing and painting to visually represent reality—pictorial art—has been present in human experience since the Stone Age. Examples of pictorial art from more than 30,000 years ago are found in caves in France and Spain. “The most striking works of Paleolithic art are the images of animals incised (cut into the stone), painted or carved on the rock surfaces of caves” (Janson & Janson, 1997, p. 33). The desire to visually represent reality has followed humanity through the ages.

### 2.2.2. Tools & Representation

In his famous *Lives of the Most Eminent Painters, Sculptors, and Architects*, Italian painter and writer Giorgio Vasari (1511–1574) left a unique human document: a first-person account by a working artist of his own artistic generation consciously and meticulously employing newly developed tools and technologies in the refinement of observational and rendering skills that would revolutionize art practice and the Renaissance artist’s ability to represent reality at a qualitatively higher level of achievement. The significance of Vasari’s documentation of the evolution of pictorial art at an historical turning point can be seen with particular clarity in his summary discussion of sculpture and painting in the preface to Part Two:

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<sup>9</sup> Representation in this dissertation “refers to a system of iconography which contains both the perceptual and the aesthetic when related to art and has conventions of both tool and medium inscribed in it” (Lovejoy, 2004, p. 3).

<sup>10</sup> Margot Lovejoy offers the same verbatim entry in two different publications: *Digital Currents: Art in the Electronic Age* published in 2004 by Routledge, and *Postmodern Currents: Art and Artists in the Age of Electronic Media* published in 1997 by Prentice Hall.

The works which were produced during this period of stylistic renewal bear witness to this change, as will be seen in this second part, where the figures of Jacopo della Quercia possess more movement, more grace, better design and care, while those of Filippo reflect a more careful investigation of the muscles, better proportion, and finer judgment, and the same could be said for the works of their pupils. But Lorenzo Ghiberti in his work on the doors of San Giovanni added even more of these qualities, displaying invention, order, style, and design, so that it seems as if his figures move and breathe. Although Donatello lived in their period, I could not decide whether or not to place him among the third group of artists, since his works are comparable to excellent ancient ones. In any case, I must say that he can be called an example for other artists in the second period, since he himself possessed all the qualities divided among many others, for he imparted to his figures a sense of movement, giving them such liveliness and animation that they can stand comparison with both modern works and, as I have said, those of the ancients.

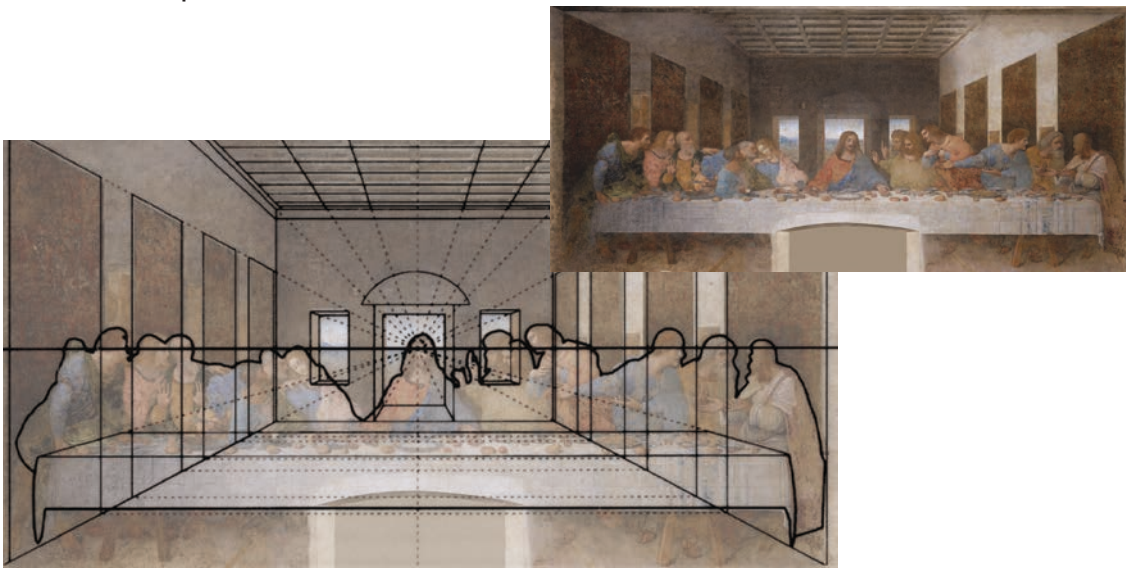
And painting made the same improvement in these days as sculpture did, for here the most excellent Masaccio completely abandoned the style of Giotto and found a new style for his heads, clothes, houses, nudes, colourings, and foreshortenings. And he gave birth to that modern style which has been followed from those times down to our own day by all our artists and which has been enriched and embellished from time to time with greater grace, better invention, and finer decoration. This will be made evident in detail in the lives of the artists, where we shall recognize a new style in the colouring, foreshortening, and natural poses; a more highly expressive depiction of feelings and physical gestures combined with an attempt to make their designs reflect the reality of natural phenomena; and facial expressions which perfectly resemble men as they were known by the artists who painted them. In this way, these artists attempted to produce what they saw in Nature and no more; in this way, their works came to be more highly regarded and better understood; and this gave them the courage to establish rules for perspective and to make their foreshortenings exactly like the proper forms of natural relief, while proceeding to observe shadow, light, shading, and other difficult details, and to compose their scenes with greater similitude; and they tried to make their landscapes more similar to reality, as well as their trees, grass, flowers, skies, clouds, and other natural phenomena. They did this so well that it can be boldly declared that these arts were not only improved but were brought to the flower of their youth, giving promise of bearing fruits to follow and, in a short while, of reaching their age of perfection. (Vasari, 1998, pp. 56–57)

Vasari reveals not only an achieved interest in picturing the natural world, in observing and representing form through light, value, and color; but he also describes the new technological developments underpinning these achievements: the mathematical principles of linear perspective and foreshortening used to create the illusion of



## CHAPTER 2 | WHY INTERACTIVE HYBRID ENVIRONMENTS?

depth and volume. The Renaissance also saw the development of aerial perspective,<sup>11</sup> (Figure 11) first applied systematically by Leonardo da Vinci (Getlein, 2008, p. 113). These advances helped establish the Renaissance humanist belief in humankind's inherent dignity and the pursuit of knowledge for its own sake in contrast to the Medieval understanding, based on Church dogma, that humankind was inherently fallen and worthless except through divine grace and intervention (Getlein, 2008, p. 393). Renaissance humanism also reshaped how artists were seen. In the Middle Ages, visual artists—painters, sculptors, architects—were seen as highly skilled laborers comparable to blacksmiths, goldsmiths, and carpenters (Getlein, 2008; Kleiner, 2010). The shift in the social position of artists came with the new tools: linear perspective, aerial perspective, foreshortening, and enhanced understanding of light; coupled with the revival of the humanistic ideals of classical art. In the Renaissance, art began to be seen “as the creative expression of an individual artist” (Kleiner, 2010, p. 384). This shift elevated artists to a category of unique creators: divinely inspired creatures who could themselves reproduce God's most exalted creations.



**Figure 11.** Leonardo da Vinci, Last Supper, 1495-1498. Oil and tempera on plaster, 13' 9" x 29' 10". Refectory, Santa maria delle Grazie, Milan (Kleiner, 210, p. 460). Original (top right) and showing linear and atmospheric perspectives (bottom left).

<sup>11</sup> Aerial perspective, today commonly known as atmospheric perspective is the optical effect of seeing color getting muted (losing its saturation) as it recedes into space away from our eyes.

### 2.2.3. Overview

For almost 250 years, under the brilliant canopy of Renaissance achievement, artists invested in perfecting the skills of direct observation and representation of the three-dimensional world in a two-dimensional medium, reshaping human perception of space and time, and religious, social, political and cultural consciousness. Representations of God, heaven, hell, sin, love, wars, heroes, muses, and so forth, created during this period, are still enshrined in our collective consciousness today, as are the techniques developed at the time to represent reality. Incoming students in visual art are required to spend countless hours developing their skills of direct observation, relying on rendering value and vanishing points to replicate the natural world in two-dimensional drawings and paintings.

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## 2.3. Photography: Subject Matter to Form and Content

### 2.3.1. Introduction

The fact that artists in the Renaissance fundamentally reshaped human consciousness, even as they employed new tools to represent the world more naturalistically, suggests that there is more to visual representation than a merely technical emulation of perceived reality. Commenting on the social construction of artistic representation, Lovejoy observes that:

The way we see is shaped by our worldview, which governs our understanding of what representation is. Thus, we can say that representation is a form of ideology because it has inscribed within it all the attitudes we have about our response to

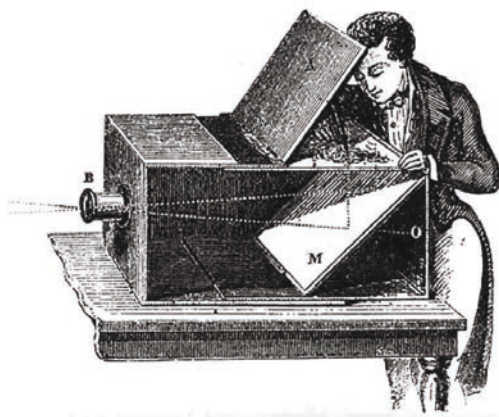
## CHAPTER 2 | WHY INTERACTIVE HYBRID ENVIRONMENTS?

images and their assimilation; and about art-making in general, with all its hierarchies of meaning and intentionality (Lovejoy, 2004, p. 15, 1997, p. 14).

The connection between artistic and technological advancements in relation to shifts in human consciousness, which was found in the Renaissance artists' desire to represent the world in its most realistic form, may also be found in the birth of photography.

### 2.3.2. Representation and the Birth of a Medium

Photography arose in the advent of the Industrial Revolution from a combination of two distinct processes that had co-existed for centuries, one optical and the other chemical. The camera obscura (Figure 12) or dark room is a dark box with a hole that allows light in, casting an image through lenses and mirrors onto the opposite interior wall. This optical tool was documented in the early sixteenth century by Leonardo da Vinci with the purpose of aiding drawing to sketch a subject with precision (Janson & Janson, 1997, p. 453; Getlein, 2008, pp. 210–211).



**Figure 12.** A camera obscura. The image formed by the lens (B) and reflected by the mirror (M) on the ground glass (N) is traced. From A. Ganot, *Traité élémentaire de physique* (Paris: 1855), (Newhall, 1988, p. 10).

In the same way, the chemical process of bleaching colors was [had been] known since the seventeenth century. Impressions on paper and other materials were often made by artists, but there wasn't enough knowledge at the time to understand

that light rather than heat or air was the main factor in this kind of printing (Janson & Janson, 1997, p. 453; Newhall, 1988, pp. 9–10).

In 1827, Joseph Nicéphore Niépce, a French chemist who spent years trying to improve the lithographic process, was able to produce a permanent photographic image using material that hardened on exposure to light. In 1829, Louis Daguerre, a skilled painter, joined forces with Niépce to improve the tools and technique. In 1839, Daguerre discovered how to develop a positive image on a metal plate, how to reduce the process of exposure to light from eight hours to half an hour, and how to make the image permanent by immersing it in salt. The new process was named Daguerreotype and began the age of photography. The results of this process were stunning because of the sharp quality of the details (Janson & Janson 1997; Newhall, 1988). Also in 1839, William Henry Fox Talbot, an artist and inventor, produced a negative that, although poor in quality, if compared with daguerreotypes could make an unlimited number of positive prints. His discovery, called calotype, led to the process of using negative film to record images (Newhall, 1988).

While different photographic processes were being discovered through technical experimentation, the number of people interested in the medium grew exponentially. The human desire to represent the world, which was only accomplished previously by skilled painters, could be satisfied by anyone with a camera. As more and more people discovered the technical aspects of photography and became photographers, their views of the world were being captured on plate or paper. Addressing different subject matter—people, landscapes, cities, objects, scenes in nature—and expressing photographers' many different intentions, the medium of photography completely changed how humans “seek to understand the world”

(Lovejoy, 2004, p. 13), creating new technical knowledge of the possibilities of representation as well as new social constructions of the very act of representation.

### 2.3.3. Freedom from Representation

There is no doubt today that Niépce's innovations in the chemical reproduction of images, Daguerre's use of daguerreotype photographs as artistic medium, and Talbot's positive/negative photographic process were the foundation stones for the medium of photography. This new medium, in turn, profoundly influenced other media such as painting, drawing, printmaking, and architecture, allowing artists to focus on the content; they no longer needed to reproduce subject matter since a camera could do it more realistically. Other media such as film, video and animation were also consequences of these three men's discoveries.

In the beginning, the quality of details of daguerreotype plates left the art world in disbelief; it was difficult not to see the daguerreotype as an art medium, so much so that artists like Paul Delaroche and William Ross predicted that painting was going to become extinct with the advent of photography (Leggat, 2003).

As the daguerreotype became popular, the question of whether photography was a form of art or not began to divide critical and popular opinion. The fact that miniature portrait artists were losing their clients, while some artists found work coloring monochromatic plates and other artists turned to photography to survive, added fuel to the controversy. Poet Charles Baudelaire was one who fervently questioned the new medium and its artistic claims. On the one hand, photography was displacing miniature painting, but on the other, it was aiding portrait painters who started to draw and paint from photographs since this allowed them to reduce the

number and length of sittings, if not eliminate them altogether. Negre, Tissot, Gauguin, Cezanne, Lautrec, Delacroix, and Degas were some of the master artists who used photography to aid their paintings (Leggat, 2003).

The advent of faster, cheaper and easier processes brought an abundance of new photographers interested in different subject matters. Some photographers like James Robertson, Roger Fenton, Matthew Brady, Jacob Riis, and John Thomson were more interested in recording the world in order to change it than in making art. They introduced the concept of documentary photography and photography for social reform. Others, like Richard Beard, were interested primarily in portrait photography. Some, like Christina Broom, were pioneers of photo-journalism, while some others wanted to elevate photography to a high-art form (Leggat, 2003).

In the later years of the nineteenth century, as photography spread worldwide and with diverse objectives, people began to question whether photography wasn't merely a more detailed and accurate mechanical process of recording images. This line of thought, and the fact that painting was still viewed as a much higher art form, made some photographers approach their medium differently, introducing new techniques with the intention of creating an authentic high-art photography. This movement was called Pictorialism, and photographers associated with the movement aimed not so much to represent reality through captured images as to create or compose reality as they saw it. This distinction demonstrates how an impulse to depart from subject-matter representation was present even among photographers, who had the most technologically sophisticated tools for representation. This goal of achieving a higher art form parallels the manner in which the newly discovered tools<sup>12</sup> employed during

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<sup>12</sup> As seen in topic 2.2 Pictorial Representation: Perspective—linear and atmospheric, use of light—value and color; chiaroscuro (broad contrasts in value to create the perception of depth), camera obscura.

## CHAPTER 2 | WHY INTERACTIVE HYBRID ENVIRONMENTS?

the Renaissance to reproduce reality also instigated a change in consciousness, in the ways humans perceived their reality through form, value, and color. New tools and techniques created new artistic possibilities, which in turn altered human perceptions, sometimes in unpredictable, even paradoxical, ways.

The development of photography liberated the fine arts from an exclusively representational mission, from the felt need to portray reality using the tools and techniques pioneered by Renaissance artists. Photography allowed French Impressionists during the second half of the nineteenth century to break away from the tradition of subject matter representation and to focus more freely on the manner in which a painting is executed (form) and the message/feeling it communicates (content) (Leggat, 2003).

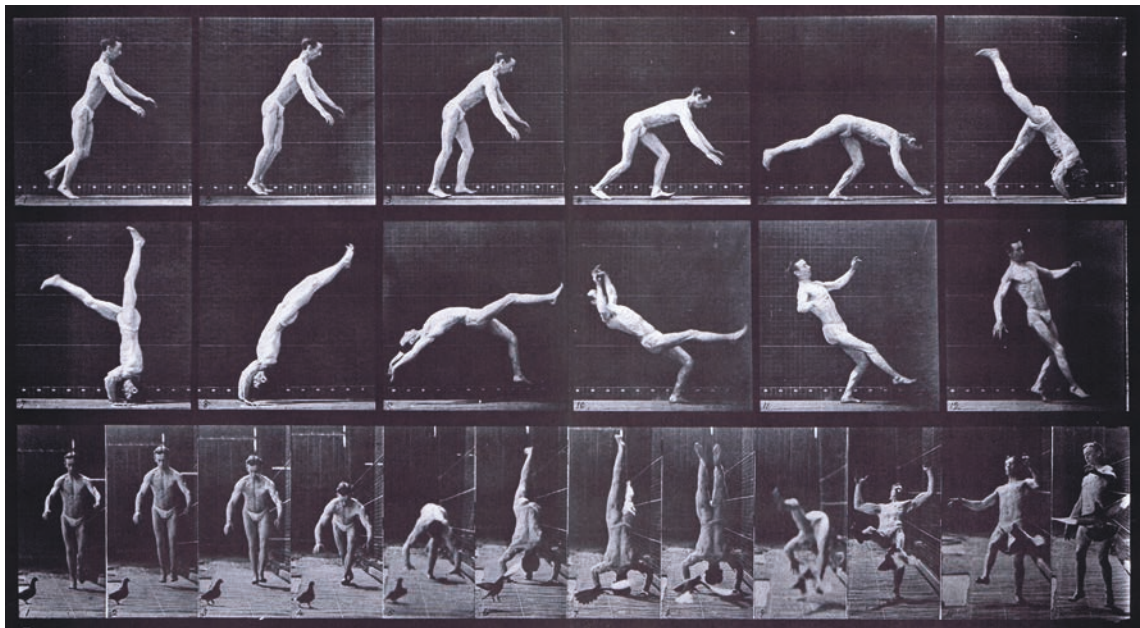
The advent of chronophotography completely changed how humans perceive motion. Beginning in 1872, Eadweard Muybridge used multiple cameras to create stopped action photographs capturing animals and people in motion through successive frames of prints. These allowed viewers to see, for example, still images (in sequence) of a galloping horse with all four hooves simultaneously in the air or a man doing a headspring (Figure 13). This technological advance made possible new visual perceptions and awareness never before experienced. It also introduced the perceived linearity of motion associated with the passage of time, which became more deeply reinforced by the development of film. Lovejoy summarizes the varied applications and implications of these new photographic and cinematographic tools for art, culture, and the very way humans experience and understand reality:

The invention of the camera ... changed the nature of representation in drastic ways. Photographic images depend on the variable gaze of the camera eye. Photographs are inseparable from time passing and from specific placement of visual reality. Cinematography provides the possibility of multiple viewpoints.



The camera moves, rises, falls, distances objects, moves in close to them, coordinating all angles of view in a complex juxtaposition of images moving in time. Film (and video) offer a deepening of perception for they permit analysis of different points of view and they extend comprehension beyond our immediate understanding by revealing, much as did the microscope and the telescope in the Renaissance,<sup>13</sup> entirely new structures of a subject beyond those available to the naked eye alone. (Lovejoy, 1997, p. 3)

The machine age and modernism emerged in the late nineteenth and early twentieth century leading to a series of inventions that changed the way artists saw the world.



*Figure 13.* “Eadward Muybridge, *Head-spring, a Flying Pigeon Interfering*, 1885. Plate 365, *Animal Locomotion* (Philadelphia:1887).Albumen print from original master negative in George Eastman House, Rochester, N.Y.” (Newhall, 1988, p. 122).

### 2.3.4. Overview

“Influences from the mid-century scientific study of optics and the physiological principles of visual perception and color” (Lovejoy, 2004, p. 33), utilized in photography and film, transformed the ways artists created and opened new possibilities for reproducing or not reproducing reality. New scientific discoveries freed artists from

<sup>13</sup> Microscopes and telescopes use the same optical process and were invented in the late sixteen hundred (1590) in the Netherlands. These tools also changed how humans perceived reality yet because of its much indirect influence on interactive art it is not directly addressed in this dissertation. <http://www.history-of-the-microscope.org/hans-lippershey-invented-the-telescope.php>



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exclusively portraying subject matter and allowed them to focus on form and content. This contributed to a new consciousness, which opened doors to modernism (Lovejoy, 2004, p. 4).

The freedom from representation and the full use of machines as artistic media led to the birth of an artistic coterie known to history as Dada. This short-lived international avant-garde was a self-described “non-movement” of artists rebelling against traditional painting-based art movements. Dada emerged circa 1916 amidst the horrors and unprecedented slaughter made possible by the destructive technology introduced during World War I. It reconceptualized art as a conscious departure from the aesthetically pleasing and instead satirized and protested the banality and brutality of contemporary society and its political, social, cultural, and artistic values and choices. Dada reflects Walter Benjamin’s concept of the “loss of ‘aura’, [where] . . . that sense of uniqueness and primal consciousness that attaches to a singular work of art . . . is lost in reproduction” (Lovejoy, 2004, p. 2). Dada also reflects a “state of mind” (Chipp, 1984, p. 389)<sup>14</sup> or new consciousness as the creative arts began a departure from a focus on subject matter to a focus on form and content. Surrealism, Constructivism, Lettrism, Fluxus, Pop and, Op-Art, Conceptual Art, and Minimalism are some of the movements whose genesis can be traced to Dada and its stronger focus on form and content.

Especially relevant to this dissertation is the manner in which the new artistic tools and techniques of the Industrial Age, most particularly photography and film, promoted changes that would deeply influence how humans perceive space and time, even today, creating an understanding of a fixed space connected to linear time from

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<sup>14</sup> Even though my direct source for the quote “Dada is a state of mind” attributes it to Tristan Tzara’s “Lecture on Dada,” it seems that the date referenced, 1924, is erroneous as other sources reference it to 1922 including Motherwell. I also found a discrepancy as to who originated the quote: Tzara or Breton. As this text is not directly related to the primary thrust of my research, there was no attempt to ascertain the original source.

which emerged a new space-time aesthetics. The adoption of a universally synchronized time—Greenwich Mean Time—reinforced by the ways in which memories entwined with photographs and moving images underlay a perception of reality in a specific space and time increasingly independent of memory. Photography and film also presented a wide range of realities that humans simply could not see before: angles, movements, heights, cultures, regions. As Jean Baudrillard<sup>15</sup> affirms, “[t]he traditional photography is an image produced by the world, which thanks to the medium of film, still involves a dimension of representation” (2009, p. 37.) Documenting life on film changed the ways in which humans interact with space and time, but also permitted such interaction without the need for representation in more traditional media such as drawing and painting. Cubism, for example, was an art movement that attempted to represent several facets of space and time at once in a single representation. Surrealism deliberately presented unrealistic representations of aspects of space and time.<sup>16</sup>

Artists such as André Breton, Tristan Tzara, Pablo Picasso, Jean Arp, Man Ray, and Salvador Dali, among many others, deeply influenced and contributed to the unfolding of modernism in the Machine Age, yet within the scope of this study and the evolution of my own artistic practice, Marcel Duchamp’s brilliant achievements hold a place of pre-eminent importance.

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<sup>15</sup> Baudrillard quote is used here to help substantiate the claim that photography exposed representation. Although it is important and interesting to acknowledge that Baudrillard’s intention was to highlight the liminal aspects of photography evolving changes not when it first appeared but in relation to digital photography. The quote below reflects his sentiments: “Particularly in these changing times of ultra-rapid technological process, the absurd idea has emerged of ‘liberating’ the real by means of the image, and of ‘liberating’ the image by means of the digital” (2009, p. 39).

<sup>16</sup> These changes will be analyzed more closely in Chapter 5 to establish how space-time aesthetic perceptions are also mediated and affected by technological tools.

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## 2.4. Marcel Duchamp: Conceptualism and Interactive Art

### 2.4.1. Introduction

Marcel Duchamp's brilliance rests on the fact that he went beyond freeing himself from subject matter to focus on form and content; he not only abstracted from long-established norms of naturalistic representation of subject matter but also used form to subvert content, in the process "rais[ing] fundamental questions about the function of art" (Lovejoy, 1997, p. 49) and the role of the spectator.<sup>17</sup>

Duchamp's experiments in art connect him with the genesis of Dadaism, Cubism, Futurism, and Surrealism, although he didn't directly associate himself with any of these movements. In a 1946 interview with curator James Johnson Sweeney (Chipp, 1984, pp. 392–395), Duchamp affirmed that, even though he was interested in decomposing form as the cubists did, his desire was "to go further—much further—in fact in quite another direction altogether" (Chipp, 1984, p. 392). He did this with his famous readymades.<sup>18</sup> Referring to perhaps his most famous work, he denied "any connection between the *Nude Descending a Staircase* and futurism" (Chipp, 1984, p. 392).

Duchamp's aim was not to represent time through movement as in films or Muybridge's chronophotography but to create "a static representation of movement—a static composition of indications of various positions taken by a form in movement" (Duchamp, 1989, 124), "a kind of graph—the body in internal and external motion"

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<sup>17</sup> Even though the word spectator is used in this chapter in respect of and to reflect Marcel Duchamp's usage of language, one of the main points of this research lies on the need to introduce the word user to describe the one who interacts with an artwork. The simple fact that the word spectator is still used today contradicts Duchamp's aims of incorporating the person experiencing his creative act (interacting with his artwork) since spectator has a passive connotation.

<sup>18</sup> A readymade is "an object elevated in the iconoclastic Dadaist tradition to the realm of art" (Lovejoy, 1997, p. 50).

(Joselit, 1998, p. 54). Duchamp was thoroughly familiar with contemporary avant-garde art movement yet kept an intentional distance from them. This stance allowed him to see artists, their creative processes, chosen media, artworks, and spectators through a new lens. The shift in his approach turned the focus of creative practice from production to conceptualization although the making of art was never wholly absent, as Janson and Janson affirm:

Whatever the Conceptual artist's intention, this making of the work of art, no matter how minimal the process, is as essential as it was for Michelangelo. In the end, all art is the final document of the creative process, because without execution, no idea can ever be fully realized. ... And, in fact, Conceptual art has embraced all of the mediums in one form or another. (Janson & Janson, 1997, p. 568)

#### 2.4.2. Conceptualizing the Creative Act

Even though the term conceptual art only emerged in the 1960's, Duchamp prefigured it in his experiments with readymade and machine-powered works. These reflected his focus on the artist's intention above the art work's actual production and aesthetic values (Smith, 1990, p. 257). Duchamp freely explored form and representation in order to focus on content and meaning/conceptualization. He also questioned the Renaissance notion of the artist as uniquely gifted, god-like creator representing "humankind's inherent dignity" (Getlein, 2008, p. 393), and included the role of the spectator as an essential partner in the creative act.

This dynamic and complex relationship among artist, artwork, and spectator is described by Duchamp in his 1957 lecture "The Creative Act." Exploring the idea of the artist as a "mediumistic being" channeling the artwork (Duchamp, 1989, p. 138) and thus deposing his or her status as divine talent (Getlein, 2008, p. 393), Duchamp adds the spectator to this equation, explaining that "the creative act is not performed by



*Figure 14.* Trébuchet shown (arrow) in Marcel Duchamp's studio, 1916-17. Source *tout-fait*, The Marcel Duchamp Studies Online Journal, vol 1, issue 3, Dec. 2000, Wikipedia. Retrieved March 25, 2018 from: [https://en.wikipedia.org/wiki/File:Marcel\\_Duchamp,\\_1916-17\\_studio\\_photograph.jpg](https://en.wikipedia.org/wiki/File:Marcel_Duchamp,_1916-17_studio_photograph.jpg).

the artist alone; the spectator brings the work in contact with the external world by deciphering and interpreting its inner qualification and thus adds his contribution to the creative act” (Duchamp, 1989, p. 140).

Duchamp's Dadaist state of mind in performing the creative act is clearly seen in his work *Trébuchet* (1917). An everyday wall-mounted wooden coat rack had been left on the floor of his studio, amusing or annoying his visitors. (Figure 14). Noting their interactions, as well as his own, Duchamp turned the object into a ready-made, describing it as follows:

A real coat hanger that I wanted sometime to put on the wall and hang my things on but I never did come to that—so it was on the floor and I would kick it every minute, every time I went out—I got crazy about it and I said the Hell with it, if it wants to stay there and bore me, I'll nail it down ... and then the association with the ready-made came and it was that. (Duchamp, quoted in Joselit, 1998, p. 160)



**Figure 15.** Marcel Duchamp, *Trébuchet* (Trap), 1917 / 1963. Marcel Duchamp: The Art of Chess at Francis M. Naumann Fine Art, New York, 2009. Retrieved March 25, 2018 from <https://www.flickr.com/photos/sixteen-miles/4043019213/>.

Molesworth highlights Duchamp's playful attempts to interact with the spectator by affirming that:

*Trébuchet* presents not a step saved but a step wasted, a distraction. Or, it was a perverse "step saver," for when one trips one "misses" a step, saving it in another regard. *Trébuchet* is a visual pun, but more important, it is a physical set-up for slapstick. (Molesworth, 1998, p. 56)<sup>19</sup>

Duchamp's attempts to conceptualize the creative act by channeling the artwork—which in turn becomes a vehicle of communication and interaction with the spectator, who in turn completes the creative act—is still an avant-garde notion today. The idea of an artwork installed in the halcyon spaces of a gallery or museum, yet vulnerable to being kicked or touched, is still a foreign concept in the art world.

Figure 15 illustrates how far contemporary exhibition practice is from Duchamp's intention concerning *Trébuchet*. The piece was presented in 2009 in a show entitled Marcel Duchamp: The Art of Chess at the Francis M. Naumann Fine Art gallery in New York (Naumann, Bailey, Shahade, 2009). Placed on a platform protected by walls

<sup>19</sup> Molesworth (1998, p. 56) offers the following footnote about *Trébuchet*: "In French the verb *trébucher* means to stumble, trip, or fall. It is also a chess move in which a pawn is used to take an important piece."

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on two sides, the work which was intended as a trap to provoke different reactions from spectators was in fact isolated from spectators, losing its essential quality as mediator for the creative act. The aura given to the mundane object by the artist himself was destroyed by the felt need to invoke the Renaissance glorification of art as a representation of subject matter, rather than a conceptualization of form and content as Duchamp intended.

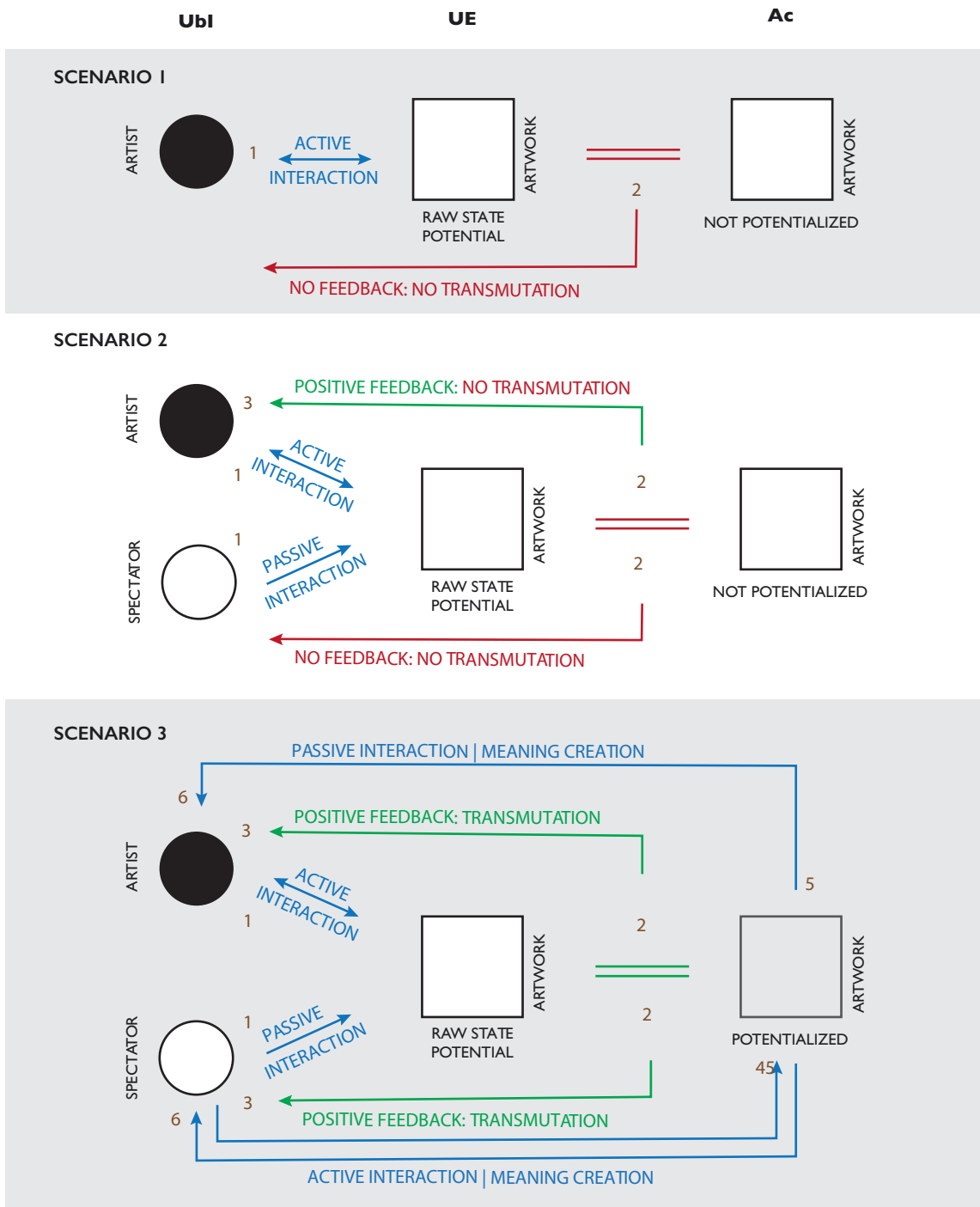
In his “Creative Act” lecture, Duchamp introduced a pseudo-arithmetical equation to explain the relationship between artist, spectator, and artwork. Aiming to stay neutral in judging the value of the work, he calls the artwork the “art coefficient” [Ac] which reflects the difference between the artist’s unexpressed but intended [Ubl] concept and the “unintentionally expressed” [UE] work (product).

$$Ubl - UE = Ac$$

Creative Act Equation

This “art coefficient” is a personal expression of art “à l’état brut,” that is, still in raw state which must be “refined” ... by the spectator ... [who] experiences the phenomenon of transmutation; through the change from inner matter into a work of art, an actual transubstantiation has taken place, and the role of the spectator is to determine the weight of the work on the aesthetic scale. (Duchamp, 1987, 139)

In other words, the artwork is only completed and validated when the spectator experiences it. Unfortunately, in cases such as the show at the Naumann gallery, where the artwork was exhibited on a pedestal set apart from the spectators’ interactions, the Ac is completely changed from when it was shown in Duchamp’s studio. By isolating the artwork and removing physical interaction between the spectators and the artwork, curators and gallery owners failed to see how such artworks are so detached from Duchamp’s Ubl that in these cases the Ac is only the UE. The spectator only experiences the UE as a visual representation of the artwork, without transmutation or



**Figure 16.** Creative Act scenarios analyzed under columns: “unexpressed but intended” [Ubi] concept, the “unintentionally expressed” [UE] and the “art coefficient” [Ac] in the production of meaning.

In Scenario 1 only the artist interacts with the artwork in raw state but without a spectator the work doesn’t transmutate or transubstantiate into Ac (new meaning.)

In Scenario 2 both artist and spectator interact with the artwork in raw state but as the spectator doesn’t engage with the artwork, it stays in raw state. The spectator’s feedback to the artist reveals that the artwork doesn’t promote the Ac.

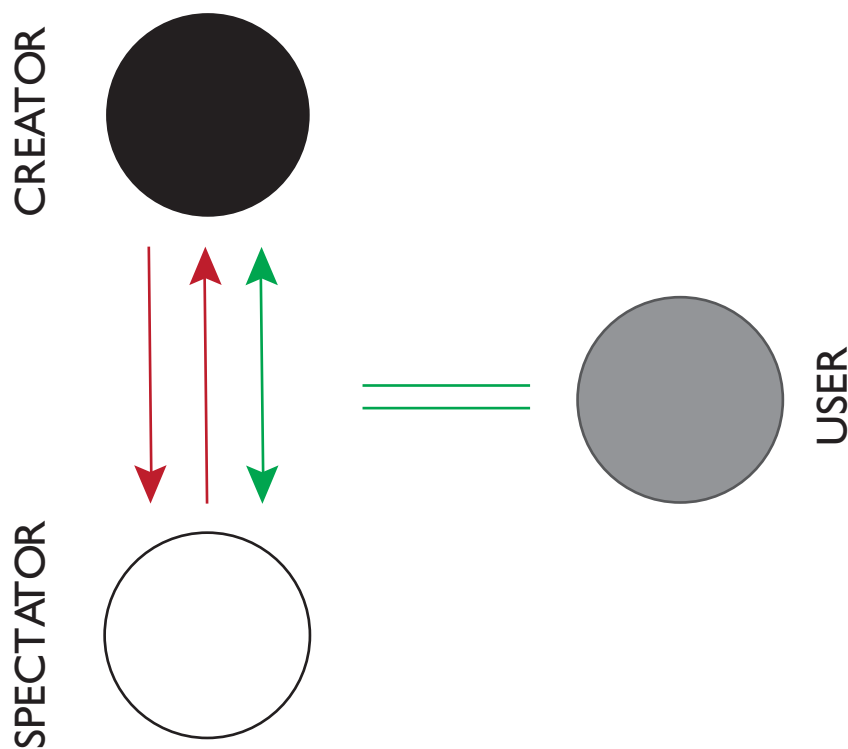
Scenario 3 represents the ideal Ac, where artist and spectator interact through the artwork and transmutate and transubstantiate the work. into Ac, and both experience new meaning.



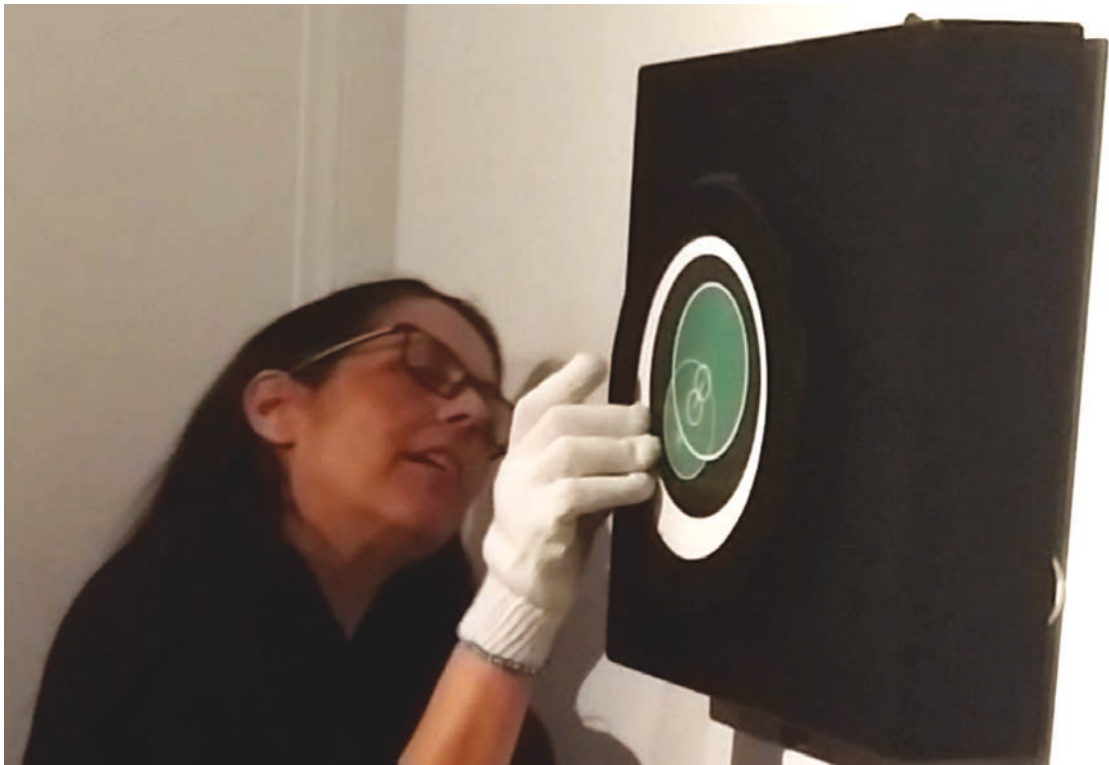
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transubstantiation into Ac since the spectator is limited to refining his own Ac without or with minimum artist's Ubl (Figure 16).

Based on this understanding, two ideas that are the genesis of this research study become salient: (1) In order for an (interactive) artwork to be completed, Duchamp saw the need to add the spectator as the one experiencing the Ac in the creative act; (2) The need to perpetuate the Renaissance's glorification of the artist by attributing the artwork exclusively to the artist (completely contradicting the principles of Duchamp's creative act) actually displaces (or at least minimalizes) the artist's Ubl. The consequences of the latter displacement have had great impact on how we perceive and relate with artworks today, which by extension has also influenced how we understand and address human computer interaction (HCI).



*Figure 17.* Representation of the process in which artist and spectator collaborate as co-creators of meaning: user based on Duchamp's creative act.



**Figure 18.** Claudia Jacques interacting with Marcel Duchamp's *Rotorelief* (optical discs) 1935-1953 119/150 edition, 1965. Offset lithographic drawings on both sides of six (6) 7 7/8" diameter discs (optical) two magnetized disc frames (1" & 2") felt covered wood; frame 14 3/4" x 14 3/4" motorized machine; signed 1965. David Bermant Foundation, Santa Ynez, California, USA. Photograph by Richard Courage, August 2017.

The discussion of these influences and their impact on HCI, specifically on interactive hybrid environments, is presented in chapters 4 and 5. Also important for this research is acknowledgment of Duchamp's syncretic approach to describing the creative act, in which art, metaphysics, logic and science are equally considered and employed to analyze and evaluate aesthetic concerns. This holistic understanding starts here with Duchamp but is next amplified by examination of the manner in which syncretism is manifested in Brazilian art, in Roy Ascott's technoetic art, and in my own creative practice. The latter is described through a design language, which in turn led me to cybersemiotics, an integrative framework that provides the foundation for observing and analyzing interactive hybrid environments and their elements.

### 2.4.3. Experiencing the Creative Act

During a short residency at the David Bermant Foundation in Santa Ynez, California,<sup>20</sup> I was able, as the spectator, to experience Duchamp's creative act much more closely to his intentions. This allowed me to directly experience and more deeply understand the discrepancy between the Ac as he intended and what I experienced seeing his artworks in museums and galleries. In the David Bermant Foundation collection, one can find the 119th edition (out of 150) of Duchamp's Rotorelief (Figure 10) among several interactive artworks by different artists that range from kinetic to computer powered.

Movement and rotation cause these drawings to transform from flat, geometric planes of color into convex and concave objects that are suspended in motion. Although the mind knows the "true" status of the work, the eyes question the dimensionality. The color incorporated heightens the optical illusions. (David Bermant Foundation, n.d.)

As the Foundation permits manipulation of the artworks (using gloves), I was able to experience the magical feeling and childlike delight of becoming part of the creative act, discovering the possibilities of interchange with the artwork and the visual effects that my choices would bring (Figure 18).

This is the Creative Act! It is that syncretic moment when the artwork is actualized—UE—by the spectator's actions with Ac revealing the artist's intention—Ubl—as the act and essence of interactive art (Figure 8, Scenario 3). In this exchange, my choices as the spectator/user interacting with Rotorelief expanded the possibilities of the creative act to embrace my actions while also bringing a 1957 work to the "posterity" of 2017 as Duchamp intended.

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20 David Bermant Foundation <http://davidbermantfoundation.com>

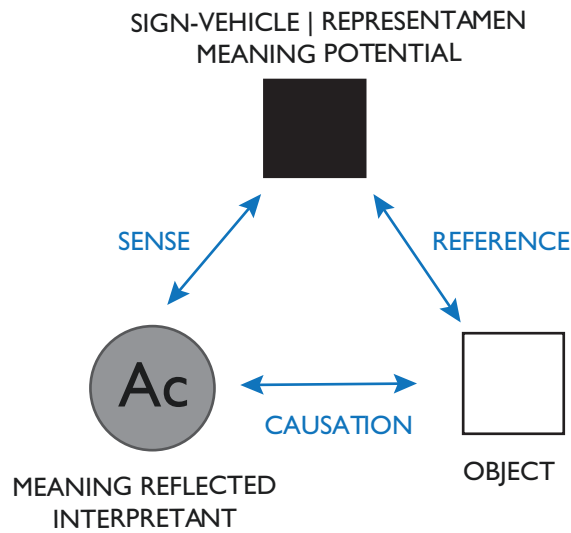


Figure 19. Semiotic Interaction. Duchamp’s Creative Act seen under Pierce’s semiotics.

#### 2.4.4. A Semiotic Interaction

Duchamp’s ludic interactions with the spectator, questioning form and content, and consequently meaning, extended beyond visual arts into language. Throughout his career, Duchamp’s use of signs was a constant and significant element. It was a means of converting his static artwork into dynamic dialogue (interaction). As Sanouillet states, “Duchamp’s subversive fervor has been directed against language. We will see how he intends to re-form (not reform) our most common means of expression” (Sanouillet & Peterson, 1989, p. 5). Sanouillet goes on to say that Duchamp’s intention was to give “to each word and each letter an arbitrary value to the point of total divorce between the expression and the expressive content which we customarily attribute it” (Sanouillet & Peterson, p. 6).

Even though Joselit (1998) attempts to connect Duchamp’s playful usage of language to Saussure’s signified–signifier (concept–word) dyadic understanding of semiology (Chandler, 2007, p. 14; Cobley & Jansz, 2012, p. 21), his analysis actually reinforces Duchamp’s aim of reflecting triadic relationships, and he proposes “to incorporate three interrelated levels of exchange: the linguistic, the economic, and the

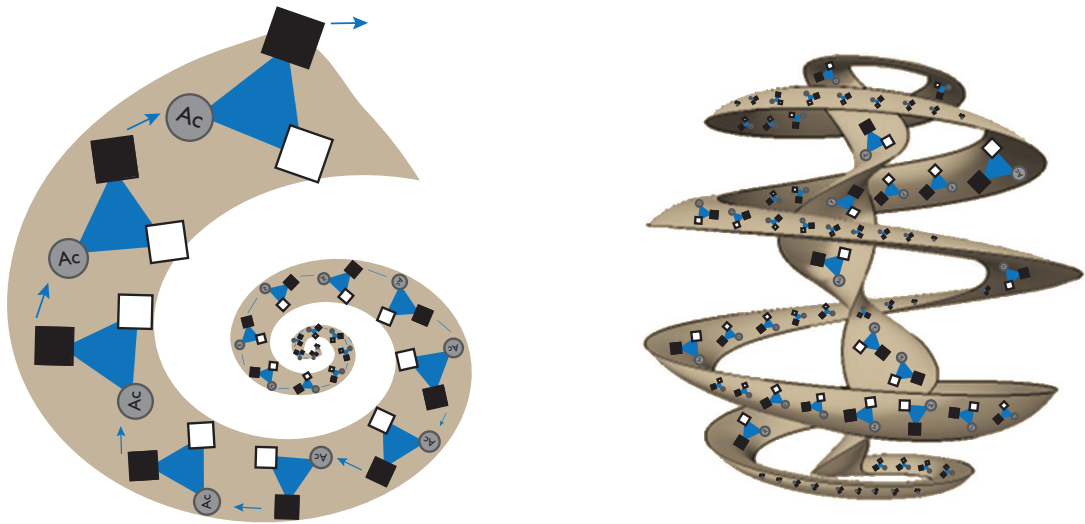
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erotic” (Joselit, 1998, p. 34). Thus, by attributing value to Saussurian dyadic semiology, Joselit inadvertently reflects Charles Peirce’s triadic theory of signs or semiotics.

“Whereas Saussure’s sign (signified/signifier) needs to combine with other signs to take part in the flow of meaning, Peirce’s version of signification has an in-built dynamism” (Cobley & Jansz, 2012, p. 25).

Peirce’s semiotics refers to the study of signs through a triadic relationship among the “[1] Representamen (the sign itself) which has a relation to an [2] Object, which relation entails an [3] Interpretant. [In other words,] the sign or representamen is quite simply, something which stands to somebody for something in some respect or capacity” (Chandler, 2007, p. 14; Cobley & Jansz, 2012, pp. 21–22). Peirce’s semiotic thus explains Duchamp’s readymades (Figure 19).

Duchamp’s readymades questioned the meaning of art, bringing to light the possibility of an object representing and meaning different things, both for the artist and the spectator. Artist and spectator become co-creators exchanging passive and active roles as meaning creators and vehicles of meaning (Figure 17). Take for example the case of the Fountain (1917), a stand-alone porcelain urinal which Duchamp signed “R. Mutt” and titled Fountain. The porcelain receptacle (object) which we call urinal (representamen) is known as a place for men to urinate (interpretant) yet, by signing “R. Mutt” and re-titling the object Fountain, Duchamp introduces a new art object (interpretant). In turn, this new meaning (interpretant) becomes the sign-vehicle (representamen) for the spectator who by reading the title can choose to embrace the object as an art object, thus expanding the creative act and the relationship among artist, artwork and spectator to a dynamic dance among object, meaning creation



**Figure 20.** Semiotic Dance visualization where artist and spectator become co-creators of meaning. The unlimited semiosis interplay reflects a mobius spiral in constant change yet circumscribed by the user.

(representamen) and meaning (Ac – interpretant). This semiotic dance<sup>21</sup> (Figure 20) between representamen and interpretant is what makes the object tangible and knowable, allowing for this relationship to be expanded even further by the understanding that individually changing any of the expected elements in this triadic relationship also affects the outcome of the whole exchange.<sup>22</sup>

The semiotic dance with its changing representamen which consequently promotes evolving interpretant is parallel to Goodman’s understanding of relational worldmaking<sup>23</sup> empowering works of art to promote “growth in knowledge [...] not by formation or fixation or belief but by the advancement of understanding” (1999, p. 22).

Semiotic implications promoting growth in knowledge may also be observed in Duchamp’s use of language. Playing with the meaning of words, he (unintentionally)

21 The term *semiotic dance* was proposed by Jeanette Bopry, editor of *Cybernetics and Human Knowing* journal who was a reader for this dissertation.

22 This understanding will later be crucial on the analysis of the elements in interactive hybrid environments.

23 Even though Goodman’s worldmaking parallels unlimited semiosis, his philosophical approach to world construction equates physicalism with phenomenalism flattening perceptions and processes, consequently limiting how these constructed worlds relate. Goodman’s wordmaking highlights the need for an integrative framework, proposed in this dissertation to be Cybersemiotics.

worked with Peirce's triadic semiotics<sup>24</sup> by questioning the object (the actual brute fact, word–index associated with Secondness) to change its representamen (potential for meaning–symbol creation and associated with Firstness) to change the interpretant (what we associate with– icon, quality given to the object, Thirdness). His playful and witty dance of communicating, relating, and interacting with the spectator through language and his artwork may be seen in his description below of the conditions of a language:

### Conditions of a language:

The search for “prime words” (“divisible” only by themselves and by unity).

Take a Larousse dict. and copy all the so-called “abstract” words, i. e., those which have no concrete reference.

Compose a schematic sign to designate each of these words. (This sign can be composed with the standard stops). These signs must be thought of as the letters of the new alphabet.

A grouping of several signs will determine (utilize colors—in order to differentiate what would correspond in this [literature] to the substantive, verb, adverb declensions, conjugations etc.)

Necessity for ideal continuity. i.e.: each grouping will be connected with the other groupings by a strict meaning (a sort of grammar, no longer requiring pedagogical a sentence construction. But, apart from the differences of languages, and the “figures of speech” peculiar to each language—; weights and measures some abstractions of substantive, of negatives, of relations of subject to verb etc, by means of standard-signs (representing these new relations: conjugations, declensions, plural and singular, adjectivation inexpressible by the concrete alphabetic forms of languages living now and to come).

This alphabet very probably is only suitable for the description of this picture. (Duchamp in Sanouillet & Peterson, 1989, pp. 31–32)

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24 Joselit (1998) attempts to explain Duchamp's usage of language through Saussure's dyadic signified-signifier semiotics. Duchamp's triadic usage of signs in the creative act, along with his writings and readymades through object reinterpretation, coupled with the usage of language in his titles seem to be evidence that if he was not directly knowledgeable of Peirce's understandings of signs–semiotics, he had at least the same triadic understanding of signs. A deeper investigation of this matter is not relevant for this research but it is an attractive future research.

Applications of the text above are found in the title of his artworks, which instigate connotative and denotative changes to the words. *Trébuchet* (1917; Figure 14) and *Fountain* (signed by “R. Mutt,” 1917) are examples of how the titles of his readymades were used with different connotations and denotations. The denotative meaning of the French *trébuchet* is a catapult or siege engine, but it can also have a connotation of trap or ambush as well as referring to a particular chess move (Joselit, 1998, p. 160).

Only the spectator interacting with Duchamp’s coat hooks nailed to a floor can fully activate the meaning of the work. *Fountain* changes the denotation when used to represent a urinal, in this case, changing how the spectator perceives the objects being re-presented by Duchamp. Removing the object from its context and attributing a new name (representamen), Duchamp “altered the object’s identity and value” (Stile & Selz, 1997, p. 804) offering to the spectator a new representation (interpretant). Just like Peirce’s semeiosis, Duchamp’s interplay of object, representation, and meaning is not static.

In discussing the correctness of pictorial representation, Goodman affirms that when an artist “makes or discloses [. . .] unseen aspects of the world, he is sometimes said to have achieved a new degree of realism by discovering or presenting new aspects of reality” (1999, p. 131). In the examples above, Duchamp disclosed new aspects of the world by giving a different meaning to his objects and words. Thus, acknowledging through his creative act the potential to promote unseen aspects of the world. Yet, differently from Goodman, Duchamp centered the discovery of new meaning on the spectator, not on the artist or the artwork. For Duchamp, once the spectator starts to perceive the object with a new meaning, this object becomes an object d’art (representamen) with endless possible representations (interpretants; Chandler, 2007,



p. 31; Copley & Jansz, 2012, p. 25). Zics (n.d.) explains this triadic understanding through the spectator-artist-artwork relationship based on Eco's (1989) open artwork—semiotic openness—which presents the concept of the active spectator and as such a multiple semiotic creation process yielding the possibility of multiple meanings, the possibility of infinite relationships between spectator, artwork, and artist: the semiotic dance.

### 2.4.5. Overview

Duchamp's opened doors to changes that are still affecting art and culture today. He added the spectator as a partner in the creative act while also making it possible for an artwork to be a medium for interaction between the artist and spectator, offering endless possible conceptual interpretations of and interactions with the artwork. In this sense, Duchamp introduced the possibility of the artwork as an interface for information, co-created by the artist and the spectator, which in this study will be discussed as a single unit, the user.

In an unconscious parallel with Peirce's semiotics, Duchamp's "The Creative Act" reveals the triadic exchange between user (artist + spectator), interface (artwork—medium), and information (meaning), but our understanding of the complexity of such interrelationships may be expanded even further through an examination of Brazilian syncretism insofar as it exposes the possibility of a multitude of levels and role shifts in such triadic relationships.



Figure 21. Facsimile of Oswald de Andrade Manifesto Antropófago [Cannibal Manifesto], published May 1928 in Revista de Antropofagia 1:1, Sao Paulo (Bary, 1991, p. 34).



2.5. Brazilian Syncretism: Participatory and Collective Interaction<sup>25</sup>  
 2.5.1. Introduction

The potential of the complex interrelationship among user, interface, and information—the meta-environment; is introduced in the previous section through an analysis of Duchamp’s practice. This relationship is expanded even further if seen through the lens of Peirce’s semiosis. In “The Creative Act,” Duchamp employs both metaphysical and scientific words and expressions (mediumistic being, labyrinth beyond time and space, pure intuition, consecrated by posterity, aesthetic osmosis, transmutation) to describe the levels of complexity in the relationships among the elements in the creative act. This interplay between metaphysical and scientific realms reflects “a syncretic process that maintains the plurality of difference” (Ascott, 2005, n.p.).

25 An earlier version of this analysis appears in Jacques (2011).

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Born and raised in Brazil, a society fundamentally characterized by cultural syncretism, I experienced first-hand the intrinsic blend of different, dichotomous, or even contradictory realities, but also knew “the in-between condition of ‘being both’” (Ascott, 2005, n.p.). The nation’s great diversity flows from its history of intermixing different cultures, religions, races, and ethnic groups within a matrix of colonialism, imperialism, slavery, social inequality, and dictatorship. This syncretic mix of diversity made Brazil in the 1960s a flourishing ground for a language of participatory and collective interaction (Osthoff, 1997).

### 2.5.2. The 1922 Week of Modern Art

Despite Brazil’s rich roots in different ethnicities, cultures, religions, and forms of expression, until the early 1920s the country’s writers, visual artists, and musicians dedicated their studies mainly to European art forms, incorporating an elitist culture at the cost of giving up their own native background and folk culture (Hawksley, 2014; Calirman, 2009).

The 1922 Week of Modern Art in São Paulo marked a turning point in Brazil’s art world. Led by poet Mário de Andrade (1893–1953) and influenced by Futurism, Cubism, and Dadaism, o Grupo dos Cinco (the Group of Five)—as the movement’s leaders called themselves—was composed of Mário de Andrade, Oswald de Andrade (both poets but with no family ties despite their same names), Menotti del Picchia (poet and painter), Tarsila do Amaral and Anita Malfatti (both talented painters). The group challenged the dependency of Brazilian creative artists on European academic styles and values and called attention to the richness of Brazil’s indigenous and African legacies (Hawksley, 2014; Calirman, 2009).

For the people of Brazil, 1922 was a landmark year. It marked a full century of independence from Portugal—and it was also the year that put Brazilian art on the international map. An idea grew up from the artists' studios of São Paulo: to dedicate a week to modern art, to run alongside the government-organized centenary celebrations.

For seven days, artists constructed, deconstructed, performed, sculpted, gave lectures, read poetry and created some of the most avant-garde works ever seen in Brazil. (Hawksley, 2014, n.p.)

The 1922 Week of Modern Art marked the beginning of Brazil's Modernist movement, which opened doors to rich creative expressions depicting the diversity of Brazil's visual and linguistic flavors. The 1928 *Manifesto Antropófago* (The Cannibal Manifesto<sup>26</sup>), (Figure 21) written by Oswald de Andrade revealed and exalted the fertile creative possibilities in the ideas and practice of the Group of Five (Hawksley, 2014; Calirman, 2009). The fruits of the Modernists movement were experienced decades later with the advent of 1950's Neo-concretism in art setting the tone for 1960's Tropicalismo.

### 2.5.3. Cultural Cannibalism

Broadly similar to the *Dada Manifesto*, Oswald de Andrade offered a playfully humorous manifesto defending the argument that the influences of Amerindian, European, and African cultures had all been equally ingested and digested, in the process generating a uniquely Brazilian cultural syncretism.

Only Cannibalism unites us. Socially. Economically. Philosophically.

The unique law of the world. The disguised expression of all individualisms, all collectivism. Of all religions. Of all peace treaties.

Tupi<sup>27</sup> or not tupi that is the question . . .

One participating consciousness, one religious rhythm.

<sup>26</sup> The *Cannibal Manifesto* full text in English can be found in [https://www.academia.edu/1424345/Cannibalist\\_Manifesto](https://www.academia.edu/1424345/Cannibalist_Manifesto)

<sup>27</sup> Tupi people, Tupinambá, were one of the main ethnic groups of Brazilian indigenous people. They allegedly practiced cannibalism as ritual after war in the belief that they would absorb the strength of the enemy.

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Against all the importers of canned conscience. For the palpable existence of life.

And let Levy-Bruhl go study prelogical mentality.

We want the Cariba Revolution. Bigger than the French Revolution. For the unification of all the efficient revolutions for the sake of human beings. Without us, Europe would not even have had its paltry declaration of the rights of men ... (Andrade 1928/2002)

Explicitly influenced by de Andrade's manifesto, anthropologist Richard Parker uses the concept of syncretic cannibalism to define Brazilian culture:

Through a kind of cannibalism that the modernists of the 1920s and 1930s could not help but admire ... the transgression of a food taboo can easily be linked to the transgression of sexual taboos in a symbolic construct focused on devouring the flesh of another human body in order to incorporate it within one's own. As a symbol of incorporation, then, anthropophagy can be invested with layers of meaning ranging from cannibalism itself, to the act of sexual intercourse, to the mixture of races and cultures that is taken as definitive of Brazilian reality. (Parker, 2009, p. 219)

The influences of a specifically Brazilian strain of Modernism, as articulated in the *Cannibal Manifesto*, rippled through the middle decades of the twentieth century and set in motion a movement of mass consciousness that would profoundly affect how Brazilians chose to represent themselves and their culture.

### 2.5.4. Syncretic Context

The understanding that different realities can coexist, informing and being informed by one another in the creation of new and unique realities, reflects and extends Duchamp's creative act to the level of group consciousness. This line of thought, if viewed through the lens of Peirce's semiosis, reveals boundaries between creators and spectators (users) so thin and transparent that new realities (artworks/ mediums/interfaces) are constantly generating new understandings (information/ meaning).

This fluid and spiral dance among user, information, and interface doesn't reflect "a synthesis of form and meaning, but the heterogeneity of the syncretic" (Ascott, 2005, n.p.). Ascott summarizes the understanding of complementary differences that enriched the cultural and social dynamics underlying Brazil's syncretic realities.

In the syncretic context, extreme differences are upheld but aligned such that likeness is found amongst unlike things, the power of each element enriching the power of all others within the array of their differences. (Ascott, 2005, n.p.)

The influences and consequences of the heterogeneity of the syncretic can be seen through the development of Modernism in Brazil and particularly in the forms of creative expressions that flourished in the 1950s, 1960s and 1970s.

The 1922 Week of Modern Art had represented what could be considered an induced modernity, willed into being by the society's most visionary artists, intellectuals, and—as would soon become apparent—architects. The rebirth of the syncretic anthropophagic sentiment expressed by the Neo-Concrete artists in 1950s boosted Brazil's induced modernity, which culminated with the inauguration on April 21, 1960, of the new, planned capital city of Brasília, which reflected the pride and hopefulness first signaled in 1922. But the forces of change—whether artistic, cultural, social, or political—always provoke resistance and opposition by proponents of tradition and order. Brazil's modernizers were soon faced with a politically and culturally repressive counterrevolution, followed by two decades of right-wing military dictatorship.

Under such extreme political and cultural oppression, one would have expected social segregation and cultural stagnation. Instead, 1967 saw a dynamic, syncretic countercultural movement called Tropicália emerge beneath the heel of dictatorship

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Forms of creative expression—literature, visual arts, interactive art, new media, music—played a central role in the emergence of this socio-cultural movement but were also transformed by it, reshaping all genres of Brazilian art and redefining the very consciousness of the nation (Jacques, 2011).

### 2.5.5. Art and Nationalism

The social-political-economic arena in Brazil in the late 1950s enhanced the country's nationalistic spirit. The need to reject external influences and focus on Brazilian roots was strongly felt in the visual arts, music, and cinema. Efforts to be more nationalistic were exemplified in music with Bossa Nova (New Trend), a style marked by its samba-jazzy refined chords, and in film with the Cinema Novo (New Cinema), which portrayed the impoverished life in the arid Northeast region of Brazil.

In these two cases, external influences were countered by the desire to be 100% national, yet no real efforts were made to express authentically Brazilian cultural forms. Despite its samba-like arrangements and use of common Brazilian musical instruments, Bossa Nova was an intellectualized mixture of sounds largely detached from native Brazilian musical genres and traditions such as xaxado, frevo, maculele, baião<sup>28</sup> and even real samba,<sup>29</sup> all of which reflect more accurately the essence of Brazilian sound.

The Cinema Novo slogan “Uma câmera na mão e uma idéia na cabeça” (a camera in hand and an idea in mind) mimicked the Italian neo-realism approach to

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28 Xaxado, baião, frevo, maracatu, bumba meu boi, are among many of Brazil's syncretic-folkloric musical forms and dance rhythms, mostly found in the northeast and north of the country. They each use specific instruments to create distinctive sounds to convey narratives through rhythms, body movements, costumes, and colors.

29 Growing up in the sixties and seventies, and able to experience the many varied sounds of Brazil, I can attest that Bossa Nova, even though somewhat popular with the generation before mine, did not feel appealing or interesting to my age peers. Many of the Bossa Nova musicians are far better known abroad than in Brazil.

movies. Cinema Novo attempted to combine the everyday lives of rural workers with the mythology of Brazil's Northeast and its violent land wars and recurrent famines. Yet even with shooting authentically on-location scenes, Cinema Novo's attempts to detach from international influences never succeeded in rendering a narrative of the real Brazil, creating in its place only a surreal Brazil (Cinema Novo | Brazil: Five Centuries of Change, n.d.).

This same nationalist sentiment led visual artists who were mostly exposed to the European art movements to explore ways to reconcile such influences with Brazil's essence.

[Neo-concrete] artists such as [Helio] Oiticica and [Lygia] Clark self-consciously traced their lineage to prewar European figures such as Piet Mondrian, whose paintings were insistently sovereign entities and anticipatory fragments that imagined the end of art. (Small, 2016, p. 6).

The right balance between these two pulling forces (European and nationalist aesthetic) influenced and set the tone for Neo-concretism, "the first truly 'Brazilian' avant-gard movement" (Small, 2016, p. 6).

#### **2.5.6. Roots of a Movement**

Launched during the prosperous years of the 1950s, the São Paulo Biennial showcased the avant-garde of young Brazilian artists. Among them were Rio de Janeiro artists Lygia Clark (1920–1988) and Lygia Pape (1927–2004), who had become fascinated with the abstract art experiments of the Concrete Art movement.<sup>30</sup> Clark and Pape soon found themselves drawn, however, to the splinter group known as the neo-concrete movement, which called for an art of more sensuous forms, richer colors,

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30 "Among the aims of Concrete Art was the distancing of visual expression from figurative art, which had played such a strong role in the past. Concrete artists would be attuned to contemporary theories of cybernetics, Gestalt psychology, and the optical experiments of international artists such as Victor Vasarely and Bridget Riley" (Sullivan, 2001, n.p.).



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and more intensely poetic feeling. In 1959 the *Neo-Concrete Manifesto*<sup>31</sup> written by poet Ferreira Gullar (1930–2016) was published in the *Jornal do Brasil*,<sup>32</sup> formally marking the beginning of the short-lived movement. Hélio Oiticica (1937–1980) joined the group in 1960 and became one of its leaders (Calirman, 2009).

Oiticica and Clark developed a strong collaboration, jointly interrogating their artwork and the dichotomy of European influences and native Brazilian cultural forms. Oiticica used Andrade's 1928 *Cannibal Manifesto* as a basis on which to undermine this dualistic paradigm. Both Clark and Oiticica saw their work as a vehicle of sensorial exchange with the spectator through interactive installations. Simone Osthoff highlights the importance of their collaboration and their role as pioneering practitioners of interactive art in the decades before the Digital Age:

The rapid development of the Internet since 1994 and the increasing number of artists working with digital communications technology has brought new attention to the role of interactivity in electronic media and in emerging digital culture. Interactivity in art, however, is not simply the result of the presence and accessibility of personal computers; rather, it must be regarded as part of contemporary art's natural development toward immateriality, a phenomenon that is evidenced, for example, in the works of Brazilian artists Lygia Clark and Hélio Oiticica. (Osthoff, 1997, p.279)

Oiticica interrogated the socio-political realm while engaging the spectator through “sensorial explorations involving social, cultural, architectural and environmental spaces” (Osthoff, 1997, p.283). Clark's artworks focused primarily on the subjective and psychological dimensions (Osthoff, 1997). Yet, the essence of their work aimed “to inaugurate conditions of knowledge [ . . . , to] reconfigure one's perception of the world” (Small, 2016, p.8), not necessarily in theory but in the phenomenology

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31 The 1959 manifesto, signed by Amílcar de Castro, Ferreira Gullar, Franz Weissmann, Lygia Clark, Lygia Pape, Reynaldo Jardim and Theon Spanudis, stated that the Neoconcretist stand had been taken “especially vis-à-vis the Concrete Art movement, which has dangerously indulged in excessive rationalism” (Neoconcretism history, n.d.). Opposing the orthodox dogmatism of the constructivist and geometric trends, Neoconcretism defended freedom of experimentation, return to the expressive act and the restoration of subjectivity (Neoconcretism history, n.d.).

32 Major Brazilian newspaper.

of practice, similar to Duchamp's call for the Creative Act in a fluid and generative exchange between user (artist–spectator), artwork and meaning creation (semiotic dance), translated into a syncretic interactive (participatory) art.

### 2.5.7. Syncretic Interactive Art

Clark and Oiticica were fundamental to the development of interactive art and to this research. Their syncretic understanding of the relationship among artist, artwork, and spectator, as well as their commitment to the freedom to use and reuse wide-ranging materials and objects to complete this triadic relationship parallels my understanding of Duchamp's creative act through the lens of semiosis. At the same time, their conceptualizations and artistic practice significantly “contributed to the development of an original vocabulary of interactivity” (Osthoff, 1997, p. 279).

[Clark and Oiticica] questioned representation in art by examining ideas inherited from modern avant-garde movements—Neoplasticism, Constructivism, Suprematism and Concrete Art—that broke with mimesis and assumptions of realism. In the late 1950s, they reframed modernist notions of universal aesthetics by translating them directly into life and the body. Weaving a web of relationships around the body's internal and external spaces, they relayed a Modern European geometric abstract tradition to Brazilian vernacular culture. This syncretic process fused two very different traditions—a Western aesthetic canon that privileges vision and metaphysical knowledge, and Afro-Indigenous oral traditions in which knowledge and history are encoded in the body and ritual is profoundly concrete. It must be noted that, in a true syncretic spirit, both traditions have always coexisted in Brazilian society at large, but it was not until Oiticica began working that this syncretism was methodically investigated in the visual arts. (Osthoff, 1997, p. 280)

Clark reflected the richness of Brazilian cultural influences and the syncretic anthropophagic relationship among artwork, materials, and audience by “focusing primarily on the subjective and psychological dimensions of sensorial experimentation” (Osthoff, 1997, p. 279). In her attempts to dissolve the body/mind duality, Clark explored, reworked, and re-envisioned materials ranging from wood and flexible metals

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(*Creatures*, 1961) to rubber (*Soft Work*, 1964), fully engaging the spectator as an active participant and co-creator through interaction with the artwork (Clark, n.d.).

Brazilian syncretic fluidity is greatly exemplified in Oiticica's relationship with Rio's Mangueira Samba School.<sup>33</sup> Its people, sounds, colors, textures, and even smells informed his artwork, reflecting the richness of Brazilian cultural influences and the syncretic anthropophagic relationship among artwork, materials and audience. On Mangueira's website the history of the samba school starts like this:

Mangueira maintained the traditions and beliefs of its ancestors, drumbeats and songs, now with a Brazilian flavour; a fusion of traditions of several African nations, native indigenous and Europeans: Afro-Brazilian. Candomblé and umbanda had many adepts in the community and some hovels served as temples. They held religious ceremonies and other celebrations. The terreiros<sup>34</sup> of Tia Fé, Chiquinho Creole, of Minan and Maria Queen, among others, served to the sacred and the profane, grounded by the sound of the atabaques.<sup>35</sup> (Peixe, Sant'Anna, & Alves, 2015, n.p.)<sup>36</sup>

In 1967, Oiticica's art installation *Tropicália* (Figure 22) was exhibited at the Museum of Modern Art in Rio de Janeiro (MAM-RJ). An immersive labyrinth of visual, tactile and sound experiences portrayed Brazil's anthropophagic syncretic realities of natural resources, habitats, objects, living creatures and environments, where "the audience were invited to track through narrow, sandy aisles, stumble into puddled water, or trample upon books representing the hegemony of western culture" (Bendito & Britsch, 2006).

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33 Grêmio Recreativo Escola de Samba (G.R.E.S.) Estação Primeira de Mangueira is the official name for the Mangueira Samba School.

34 The word terreiro describes a piece of land close to a house that has no vegetation. It is also used to reference the physical sites of Afro-Brazilian religious ceremonies.

35 Afro-Brazilian hand drum.

36 Text translated by Claudia Jacques from the original "Mangueira mantinha as tradições e crenças de seus ancestrais, seus batuques e seus cantos, agora abrasileirados, numa fusão de tradições de várias nações africanas, com influências indígenas e também dos brancos: afro-brasileiras. O candomblé e a umbanda tinham muitos adeptos na comunidade e alguns casebres serviam de templos. Neles eram realizadas cerimônias religiosas e outras comemorações. Os terreiros de Tia Fé, Chiquinho Crioulo, de Minan e Maria Rainha, entre outros, serviam ao sagrado e ao profano, ao som dos atabaques" (Peixe, Sant'Anna, & Alves, 2015, n.p.).

Twice I was able to experience *Tropicália*; once as a child in 1967 at the MAM-RJ; and again in 2006 at the Bronx Museum of the Arts in New York. In April 1967 I was only five years old when my sister and I went with our father to see the show *Nova Objetividade Brasileira*<sup>37</sup> (The New Brazilian Objectivity) show, yet the sensations and feelings of *Tropicália* left an imprint in my soul. The surreal and exciting participatory installation was complemented by its setting, the MAM-RJ; a majestic all concrete building with large windows backdropped by the Guanabara bay. *Tropicália* was an architectural set of big<sup>38</sup> connecting rooms, which didn't reflect my father's understanding of an artwork, and to me was an exciting huge maze made with familiar materials ranging from sand, straw, cotton cloth, wood, to a TV, and birds. Such rich and fun environment, which Oiticica called *Penetráveis* (penetrables), was very familiar to me for its sensorial qualities; thus the experience of navigation the environment relied on my sensory familiarity with its form; not the novelty of interacting with such rich environment.

In the 2006 *Tropicália: A Revolution in Brazilian Culture*<sup>39</sup> exhibition at the Bronx Museum of Art, the experience with the artwork was completely different from my childhood memories. I had relocated back to the United States from Brazil in 1996 and had been immersed in the American culture for ten years; time had slowly been fading the Brazilian colors, sounds, textures and smells in my memory. Living in the suburbs of New York City imposes a dissonant contrast between achromatic and oversaturated sensorial experiences. At the time, the prospect of experiencing *Tropicália* again with its rich and yet harmonic Brazilian sensorial characteristics seemed to rely more on my folkloric memory of the experience of the artwork than on the inherited qualities

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37 More on the show at <http://enciclopedia.itaucultural.org.br/evento81894/nova-objetividade-brasileira-1967-rio-de-janeiro-rj>

38 I was five years old, everything seemed big then.

39 More on the show at <https://uptownflavor.wordpress.com/2006/10/27/tropicalia-open-house/>.



**Figure 22.** “Hélio Oiticica, *Tropicália*, 1966–67. Plants, sand, birds, and poems by Roberta Camila Salgado. César and Claudio Oiticica Collection, Rio de Janeiro. © César and Claudio Oiticica, Rio de Janeiro. Courtesy of the Whitney Museum and Carnegie Museum of Art, Pittsburgh. Photo by Bryan Conley.” Retrieved March 25, 2018 from <https://www.wmagazine.com/story/helio-oiticica-whitney-museum-exhibition-instagram>

of the work. I went to the show with the expectation of finding familiarity and was completely thrown off when I didn't. Everything seemed different from my memory; the sizes of the physical constructions were too small; the materials seemed mundane and unimpressive, the colors and sounds seemed exaggerated, the maze was just a path with small room-like constructions. Yet, the novelty of (re)discovering the environment's sensorial qualities pulled me right in to experience the work.

Analyzing these two contrasting experiences of the same artwork under the cybersemiotic framework<sup>40</sup> reveals that my familiarity –or lack of– with the environment mediated my initial interaction with its raw state, transmutating and

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40 Duchamp's creative act promoting the semiotic dance. See section 2.4.4.

transubstantiating the artwork to its Ac. The sensorial richness coupled with the immersive experience greatly influenced my own practice when developing *Mixing Realities*, affecting my choices of physical structure, its materials and participatory characteristics.

Clark and Oiticica's ideas also influenced other artists working in various media. One was Rogério Duprat, a musician and composer whose interest in the avant-garde took him to Europe and led him to experiment and combine sounds, sharing their neoconcretist ideas. Duprat combined socialist ideals and activism with experimentation with different musical instruments, techniques and technologies to engage the spectator. In 1963, Duprat and Damiano Cozzella used an IBM 1620 computer to compose *Klavibm II*, making them the first Brazilian musicians to experiment with digital sound (Gaúna, 2002, p. 51). Painter, poet, sculptor, and filmmaker Antonio Dias also joined Oiticica and Clark in returning to the 1928 *Cannibal Manifesto* for inspiration. The artistic, cultural and political collaborations and mutual influences of these and other creative artists of their generation pressed by Brazil's 1960s political turmoil established the cultural tone and flavor that set the stage for the birth of the Tropicália movement.

### 2.5.8. Brazil's 1960s Political Context

Inauguration of the new capital, Brasília, was the defining moment of Brazil's induced modernity. Under the slogan "50 years in 5 years," President Juscelino Kubitschek<sup>41</sup> presided over relocation of the center of political power from the Atlantic coast to the remote geographical center of the country. Culturally, this move symbolized a desire to change Brazil's Eurocentric paradigm and extend modernization

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41 Juscelino Kubitschek was the president of Brazil from January 31, 1956 to January 31, 1961.



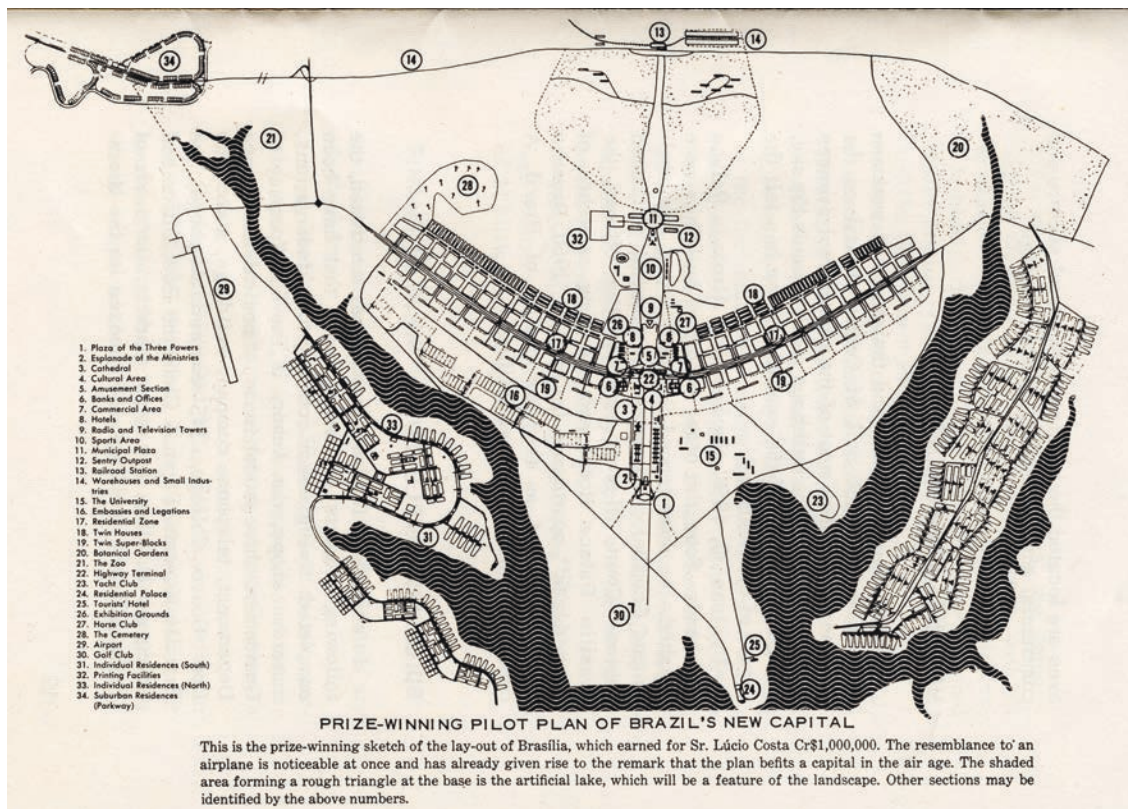


Figure 23. Brasília, Lucio Costa pilot plan for Brazil's the new capital. Retrieved March 25, 2018 from <https://usbeketrica.com/article/brasilia-l-ex-capitale-du-futur>

from the affluent southeast region of Rio de Janeiro<sup>42</sup> and São Paulo. This aspiration was further embodied in the audaciously modern architecture of Brasília's designers, Oscar Niemeyer<sup>43</sup> and Lúcio Costa.<sup>44</sup>

Influenced by Le Corbusier's<sup>45</sup> concept of the ideal house as a machine for living, Niemeyer and Costa envisioned the new capital as a socio-geo-political machine for change, designed in the shape of an airplane (Figure 23) but with allusions to the

42 "Rio de Janeiro became the colonial capital in 1763 and was the capital of independent Brazil from 1822 until 1960, when the national capital was moved to the new city of Brasília" (Guimarães, A. P., Geiger, P. P., & Schneider, R. M. [2017]).

43 Brazilian architect Oscar Niemeyer born in 1907 designed Brasília's main buildings: the Brazilian Congress, Itamaraty Palace and Brasília's Cathedral among many known structures as the United Nations building in New York City. His work combined concrete with curvilinear lines (Niemeyer, n.d.).

44 Urban planner and architect Lúcio Costa designed Brasília's basic format "Plano Piloto" (Pilot Plan) resembling the structure of an airplane seen from above, an essential image of modernity in the mid-twentieth century (Goodwin, 2017).

45 "Le Corbusier (1887–1965) was a Swiss-French architect, painter, and writer, who had a major effect on the development of modern architecture. ... Essentially a functionalist, he broke with the forms and design of historic styles, and sought a new 20th-century style to be based on engineering achievements in bridge building and steamship construction; on modern materials such as ferroconcrete, sheet glass, and synthetics; and on contemporary needs such as town planning and housing projects. His work did much to bring about general acceptance of the now-common international style of low-lying, unadorned buildings that depend for aesthetic effect on simplicity of forms and relation to function" (Le Corbusier, n.d., n.p.).



*Figure 24. Palácio do Congresso Nacional [National Congress building], designed by Oscar Niemeyer, 1960. Retrieved March 25, 2018 from <https://www.theguardian.com/travel/gallery/2014/jun/12/bend-it-like-niemeyer-10-of-the-best-buildings-in-brazil#img-1>*

flowing curves of Rio de Janeiro's mountains, beaches, and bays. This monument to modernist architecture and urban planning was built from nothing in the heart of Brazil's midwestern plains, a vast, flat expanse of arid, sparsely populated land.

Aesthetically (Figure 24), Brasilia can be seen as a modern art initiative on different levels. Using Duchamp's creative act and Peirce's triadic semiosis, which allows the expansion of the creative act elements to user, information, and interface, the roles attributed to these elements were inevitably interchanged. From this perspective, the concept of modernity can be viewed as the information that Brasilia (the new city/ artwork/medium/interface) was trying to convey to (or be conveyed by) the various users (designers, construction workers, potential residents). Yet construction workers who relocated to the Midwest to build the new capital became part of that artwork and, as such, of the interface (Brasilia) and the information (modernity). Amplified by



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print media, music, and film, this fluid interchange helped connect Brazil's modern art and induced modernity with Kubitschek's vision of prosperity for all.

Such rapid change inevitably provoked reaction. The short-lived administrations of Kubitschek's successors, Jânio Quadros and João Goulart, were attacked for their reform agendas and willingness to forge ties with revolutionary Cuba. Brazil's relationship with the International Monetary Fund deteriorated, and the nation soon suffered skyrocketing inflation.

In April 1964, claiming widespread fear of communist takeover, a military coup d'état supported by the upper classes overthrew Goulart. As time passed, repression deepened, and after Institutional Act No. 5 (AI-5<sup>46</sup>) in 1968, an overtly right-wing military dictatorship was established. These political events shifted Brazil's consciousness away from modernity and prosperity towards a paradigm of mass fear, anger, failure, and insecurity.

### 2.5.9. A Movement Born

During the dictatorship, the new medium of television spread nationwide, made available to the masses through monitors in public places. Music provided the most popular programming, and between 1965 and 1970, Record Television Station broadcast giant song festivals every year. Young musicians seized the chance to show their talents, among them Caetano Veloso, Gilberto Gil, Tom Zé, and Os Mutantes. They shared their beliefs in lyrical expression and social change through different genres of Brazilian and

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<sup>46</sup> The December 13, 1968 AI-5 or Ato Institucional Número Cinco, was the fifth institutional act imposed by the military dictatorship with aims to take more control and power over the legislative and judiciary branches of the Brazilian constitution. The AI-5 gave the military government power to take over any state, municipality or city that didn't comply with their interests, arrest and torture Brazilian citizens "against" the regime without the right to a trial, established a much tighter censorship among other initiatives. Many people in politics and arts had to leave the country (Calirman, 2009).

international music: Samba, Bossa Nova, Baião, Chachado, Rock, and alternative sounds. In this period of destabilized cultural identity and felt insecurity, it was through televised song festivals and new forms of musical expression that the masses were most deeply touched.

At the 1967 Record song festival, one song in particular reflected the syncretic cannibalism concept that Oiticica introduced under the influence of de Andrade's 1928 manifesto. Caetano Veloso's "Alegria, Alegria" (Joy, Joy) does not talk about social oppression or grand cultural aspirations. Its lyrics are poetic but not formally structured; they proclaim reality, not utopian, not dystopian, just everyday Brazilian life. The instrumental sounds hint of Samba, Bossa Nova, Baião, and Rock, offering a sense of familiarity, yet unique and exuberantly unlike any specific musical genre. As a contemporary music journalist observed:

"Alegria, Alegria" has the feeling of a new exclamation-manifesto, more important than ever, in the face of the crisis of insecurity .... By refusing to opt between [opposing viewpoints] ... Caetano Veloso ... proposed, in an Oswaldian way, "to digest" that which is new in these mass and youth movements and to incorporate the achievements of modern popular music... without abdicating formal principles ... founded on northeastern musical roots.... "Alegria, Alegria" ... in the larger context of Brazilian popular music... took on the characteristics of an exclamation-challenge.... The composer ... would end up exclaiming at the end, arms opened to the conquered audience, "Por que não, por que não?" [Why not? Why not?"] (Campos, 1967, n.p.)

Campos documents the pivotal importance of the new music emerging so dramatically at the song festivals. He explains how it syncretically absorbed various socio-political and musical influences and lunged toward an authentically Brazilian "national" music by fearlessly devouring musical rhythms, styles, and traditions from sites as far apart as Salvador and Liverpool. The significance of this cultural moment was reinforced by the July 1968 release of the album *Tropicália: ou Panis et Circencis* (Figure 25) attributed



Figure 25. *Tropicália ou Panis et Circensis* album cover, with Caetano Veloso, Gal Costa, Gilberto Gil, Nara Leão, Mutantes e Tom Zé (1968) 1968. Retrieved March 25, 2018 from: <http://www.musicontherun.net/2016/09/discos-para-historia-tropicalia-ou-panis-et-circensis-1968.html>.

to os baianos,<sup>47</sup> a collaboration of Gilberto Gil, Caetano Veloso, Tom Zé, and others.

The album's title made allusion to Oiticica's *Tropicália* installation and captured the imagination of young people from all classes and regions.

Every aspect of media expression, popular or elitist, became involved in the movement, mixing the old and the new, addressing the underprivileged and popular culture in new media arts (TV, film), fashion (clothes, hair, make-up), interior design

<sup>47</sup> Baiano is the person born in the state of Bahia.

(furniture, house objects, decoration), graphic design (magazines, ads, LP covers, posters) as well as music and other performing arts.

The military government became uneasy with how Tropicalism was being embraced by the masses, sometimes instigating street gatherings or marches against the regime. Intending to end all manifestations of discontent—even the most subtle and indirect-- the government unleashed the full range of its oppressive powers with the December 1968 AI-5 decree. Many artists, musicians, and political figures left the country; others were arrested, tortured, and in some cases killed. In 1969 Gil and Veloso were arrested. After a few months in prison they were allowed to go into exile in London, where they stayed until 1972. Despite repression, Tropicália had already crossed the line between upper and lower classes and among different cultural influences, instigating the masses to become part of an interactive relationship with any and all forms of creative expression. The solitary spectator had become part of a co-creative collective in a fluidly participatory body-mind exchange with art concepts and objects. This development undermined old paradigms of representation and dyadic artist-art relationships. There was no turning back.

### 2.5.10. Overview

Conceptually grounded in Oswald de Andrade's 1928 *Cannibal Manifesto*, Clark and Oiticica's sensorial and visual art experiments intentionally engaged spectators as collective co-creators of artworks, further expanding the complexity of Duchamp's creative act as seen through the lens of Pierce's semiosis. The background of Brazilian cultural syncretism offered a fertile ground for this expansion, exposing a fluid participatory exchange among user (artist + spectator as co-creators), interface

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(artwork/medium), and information (meaning/sensorial perceptions), where body, objects and sensations play shifting roles as creator, medium and information.

This conceptual approach to art was a fundamental departure from the Renaissance ideal of reproducing reality through visual representation, and by engaging the whole body in the art interchange, these artists expanded the aesthetic experience of reality to embrace all the senses. Crossing the lines among different classes, media, cultural influences, and aesthetic values and fueled by an impulse to instigate social and cultural changes, Brazil's rich anthropophagic syncretic reality also proved to be fertile ground for the development, mutual exchange, and collective, participatory interactions of the creative artists who associated with the Tropicália movement. This cultural breakthrough in a period of imposed stasis and isolation exemplifies this observation by Roy Ascott:

Of the myriad universes of discourse that constitute whole cultures and countries, only those open to change and adaptation are likely to survive the step change in evolution exerted by scientific development and technological innovation. If countries and communities are to avoid homogenization in this process, it will need to be a syncretic process that maintains the plurality of difference. (Ascott, 2005, n.p.).

It is in the plurality of difference—first highlighted in the Brazilian creative arts context by the 1922 Week of Modern Art, followed by the 1928 *Cannibal Manifesto*, expressed with heart and soul in Clark and Oiticica's interactive experiments, ingested and digested by the Brazilian masses drawn to Tropicália—that this research finds its core conceptualization and inspiration to understand interactive hybrid art. As Osthoff argues:

Probing a language of the body and signifying processes through concrete operations that explored touch, sound, smell and movement, Clark and Oiticica worked with life's energy and simple matter, merging perceptual and conceptual knowledge in ever-changing forms (Osthoff, 1997, p. 280).



In order to explore the perceptual and conceptual interactions in a matter where both (perceptions and processes) are syncretic integrated (and not merged) it is necessary to observe them through the transdisciplinary lens of cybersemiotics. Under a cybersemiotic analysis, the individual elements involved in such exchange can be observed as potential meaning creator and/or vehicle. It is under this understanding that Clark and Oiticica, along with the Tropicália movement, reveal the complex conceptualization underlying Duchamp's creative act, highlighting the potentiality of the semiotic dance in the production of meaning and establish the need for a triadic paradigm among user (artist + spectator), interface (artwork/medium) and information (meaning). In such a paradigm, artist and spectator syncretically become co-creators and co-participants, experiencing reality through both body (interface/object/stimulus) and mind (information/meanings/sensation) as part of a collective whole.

In the early 1960s, roughly at the same time period as Clark and Oiticica's were exploring their interactive works, similar concepts were first being explored and brilliantly integrated with the revolution in telecommunications media by Roy Ascott (Shanken, 2007; Lovejoy, 1997; Osthoff, 1997; Popper, 1975).

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## **2.6. Roy Ascott: Technoetic Art and Consciousness**

### **2.6.1. Introduction**

The preceding sections introduced this researcher's view of the evolution from pictorial representation to changes in the degrees of subject matter representation with the focus shifting toward form and content, leading to innovative conceptualizations, interactive artworks, and sensorial experimentations. I also

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interrogated the closed artist-artwork relationship where the spectator is removed from analysis and interpretation of this supposedly dyadic unit. In addition, I argued for a broader analytical framework that takes full account of the triadic and syncretic relationship among the human user (artist/spectator), the interface (artwork/medium), and the resultant information (meaning/aesthetic experience). The conceptual and practical achievements of Roy Ascott as artist, theorist, and educator will next be seen as a milestone in this evolutionary development, in particular his role in moving interactive, participatory, syncretic art into the Digital Age.

Despite their apparent distance from visually representative art forms, the advent of new telecommunication tools quickly brought new possibilities for rendering aesthetic meaning and intentionality in artmaking.<sup>48</sup> Lovejoy (1997) revisits Walter Benjamin's essentially dystopian view of the influence of technologies on aesthetic practices and a resulting loss of meaning and intentionality. But Lovejoy counterbalances Benjamin's ideas with Marshall McLuhan more utopian views of the aesthetic potential of new telecommunications media, concluding that

the computer shattered the existing paradigm of visual representation by converting visual information about reality into digital information about its structure, modeling the visual rather than copying it and allowing for interactivity as a new aspect of representation (Lovejoy, 1997, p. 213).

Lovejoy suggests that in modeling visual representation and converting visual into digital information, interactivity emerges as a vitally creative aspect of representation, "defining a new arena of consciousness and feeling" (Lovejoy, 1997, p. 214). It is in the realm of the digital and telecommunications that Ascott brilliantly refocused representation

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<sup>48</sup> These two terms refer back Lovejoy's quote shared under the subsection 2.3.1. Introduction: "The way we see is shaped by our worldview, which governs our understanding of what representation is. Thus, we can say that representation is a form of ideology because it has inscribed within it all the attitudes we have about our response to images and their assimilation; and about art-making in general, with all its hierarchies of meaning and intentionality" (2004, p. 15; 1997, p. 14).

toward a more balanced relationship among subject matter, form and content, while also expanding the aims of representation to embrace interactive systems.

Popper (1975) attributes to Ascott (and also Clark, Moholy-Nagy and Agam<sup>49</sup>) a pioneering “appeal to total [spectator] participation, [completely abolishing the] strict antimony between action and contemplation” (Popper, p. 10–11). Ascott’s visionary role is further acknowledged by Osthoff (1997, p. 283), who points out that, unlike “Clark and Oiticica [who] didn’t explore the possibilities of technology for art making” (Osthoff, p. 285), Ascott undertook artistic endeavors with telecommunications and became “one of the earliest pioneers of ‘telematics’” (Lovejoy, 1997, p. 215). Ascott shared with Clark and Oiticica a focus on perception, which allowed artist and spectator to syncretically become co-creators, experiencing reality through both the body and the mind as part of a participatory and collective whole. Ascott went beyond them by embracing digital communications and collective digital networks. He theorized human-computer interaction while avoiding a reductive approach to either human perceptions or digital processes.

Attempting to clarify how Ascott balances and integrates an understanding of such seemingly opposite realms—human perception and digital processes, Frank Popper (1975, p. 11) observes that “Roy Ascott aimed to achieve a wider ‘cybernetic’ awareness through acting on the psychology of the spectator, who was invited to regroup the elements of the technological universe and exploit certain of its meanings.” Invested in expanding meaning and representation beyond the confines of a single medium or static experience in order to embrace dynamic levels of perceptions and processes, Ascott forged a unique career path.

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<sup>49</sup> Yaacov Agam is an Israeli born (1928) sculptor and Optical-Kinetic artist, who “encouraged spectator participation at a time when such strategies were rare.” (Guggenheim, n.d.).



### 2.6.2. Ascott's Path

To understand Ascott's great influence on interactive art and on this research study, it is important to highlight his career path and its many different facets: artist, educator, researcher, theorist and a cultural messenger shaman.<sup>50</sup>

Early in his artistic career, Ascott was exposed through his mentors, Victor Pasmore and Richard Hamilton, to a "wide range of aesthetic and non-aesthetic sources" (Shanken, 2007, p. 7), which helped him question and breach the boundaries between art, science and technology, as well as between theory and practice.

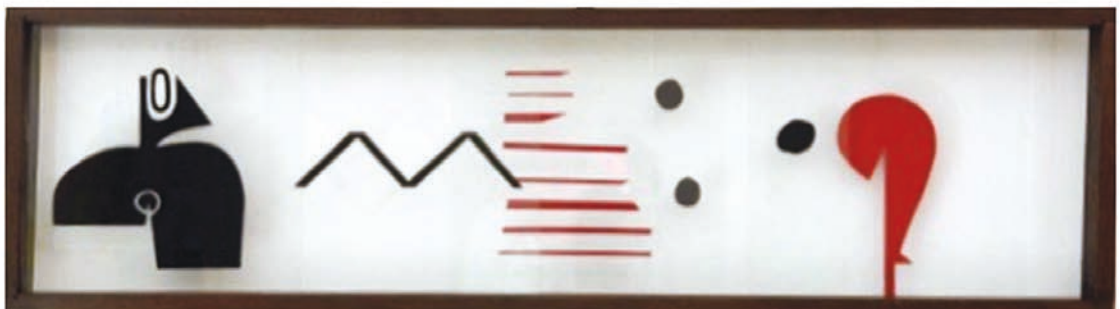
Edward Shanken's introduction to Ascott's 2007 essay collection presents the complexity of Ascott's understanding of the influences of technologies and scientific paradigms and their implications for artistic practices. His work as researcher and art practitioner, interacting with his own artwork as well as with the spectator, formed a solid ground for his role as an educator, nourishing his own growth and the growth of a new generation of artists. He embraces biological and technological tools, research and theory in order to inform himself even though, as an educator, he views his role not as transmitting information but rather as engaging the learner/spectator in a dialogue where engagement/learning/interaction is a consequence of this exchange.

In an article for the occasion of Ascott's 2011 Retrospective show at the Tate Museum, Elena Crippa summarized the different facets of his career path as follow:

The retrospective exhibition presents a variety of objects relating to Roy Ascott's work as an artist and teacher, including artworks as well as copies of

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<sup>50</sup> This claim is shared by Victoria Vesna and Edward Shanken (Roy Ascott Golden NICA 2014—Studio for Transdisciplinary Arts Research) for the occasion of the 2014 Golden NICA award granted to Roy Ascott by the Prix Ars Electronica (Prix Ars Electronica). It can be better understood through the following definition: "The Messenger Shaman brings information back from the non-ordinary world to the world commonly called the real world. His or her messages may deal with immediate events or predict those to come at some point in the future. Such messages guide or direct the individual. In past years, the messages dealt with the hunt, good crops or if a tribe should move to a new area" (Four Types of Shaman, (2014). Pioneerthinking.com. Retrieved March 25, 2018, from <https://pioneerthinking.com/four-types-of-shaman/>)



*Figure 26.* Ascott, R. (1966). *Change Painting*, three views. Cellulose paint on movable glass panels.; 30 x 90 x 10 cm. In *Cybernetics and Human Knowing journal*, 23(4), 2016.

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texts, diagrams, games devised for his students and photographs and videos documenting his work as a tutor. Such eclectic material is testament to the fact that Ascott's practice as an artist, his thinking on the creative process and his work as a teacher are highly intertwined and influenced each other over more than four decades of work (Crippa, 2011).

Ascott's quest to expand his unique understandings of the possibilities and implications of interactive art while also embracing the new digital technologies, then still in their embryotic stage, highlighted the need for a language to unify the segregated worlds of art and science and consequently the need for new terms to describe such experiences. Words such as telematics,<sup>51</sup> cyberperception, technoetic art, and moistmedia reveal the aggregation of new contrasting meanings. At the same time, Ascott's theoretical insights and explorations, reflected in his artwork and teaching, became the motivation to introduce his aesthetic views to other artists, exposing them to this unknown world and the new language to describe and document it. A true messenger shaman, Ascott connects the known and unknown, real and virtual, physical and digital, emotional and spiritual, biological and technological with diverse cultures, people, and forms of interaction.

### 2.6.3. Telematic Discourse and Cyberperception

Attempting to engage in an active communication with the spectator, Ascott's artwork and conceptualization often directly reveal his thought and artmaking processes. This inherently self-disclosing practice (reflecting Pasmore's influence) reveals Ascott's ingrained understanding of second order cybernetic communication

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51 Shanken offers the following quote to explain the term: "Telematic Art has drawn on a central tendency of 20th century experimental art to make the viewer an increasingly active agent in aesthetic exchanges. Ascott has been the field's primary theorist, first applying the term 'telematic' to art in 1983. Telematics, as Ascott has defined it, is ... a term used to designate computer-mediated communications networking between geographically dispersed individuals and institutions ... and between the human mind and artificial systems of intelligence and perception" (Shanken, 1997). This is the original note for the quote: Roy Ascott (1990), "Is There Love in the Telematic Embrace?" *Art Journal*, 49(3), 241. Ascott credits Simon Nora and Alain Minc with coining the word *télématique* in *L'informatisation de la société*, Paris: La Documentation Française, 1978, p. 2. (Published in English as *The Computerization of Society*. Cambridge, MA: The MIT Press, 1980).

processes and its relevance in his work as feedback to engage and contextualize the spectator's interpretation (Ascott, 2007; Shanken, 2007). Shanken explains the core insight of cybernetics in this manner:

Cybernetics introduced a method for thinking about the relationships amongst the various interrelated elements of a system, concentrating on the regulation of these elements in order to control the outcome of the system. Primary to the management of the system was the ability for each element to offer the system feedback about its own status. In this way, the elements could communicate with each other and provide information which would enable the regulation of the system as a whole (Shanken, 1997, n.p.).

Shanken (2007) questioned "Ascott's claim that passionate attraction in telematic systems expands perception and creates a unified global consciousness," in part because it was "partially based on theories that are not generally accepted" (Shanken, p. 76). This critique was advanced, however, at a time when computer-mediated communications through social networks were in their early stage of development. As digital social networks and media have grown and expanded exponentially, Ascott's assertions have come to appear as acutely prescient accounts of today's reality. From enhanced family ties to sharpened political awareness, telematics has changed our perceptions of reality.

Ascott applied cybernetics to art, introducing the idea that the primary motivation of the artist and the art-object is to connect with the audience, creating a communication between the artwork, the artist and the audience (Ascott, 2007). This idea expanded Duchamp's vision of art and interactivity and also established a perspective on the artwork that emphasized relativity and change (Shanken, 2007). It refocused representation from static to dynamic, where form gives life to meaning through the artist's and spectator's individualized perceptions and consciousness (qualia).

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As the art editor for the *Cybernetics and Human Knowing* journal, I had the honor of featuring Ascott's early artworks in 2016 (Volume 24, Issue 4). Extending as far back as the late 1950s, these works document the development of Ascott's creative practice and demonstrate how advanced his thinking and creative processes were, even by today's standards. *Change Painting* (1959) (Figure 26) is a good example of how Ascott applied cybernetics to his practice, actively including the spectator in the artmaking and meaning-making process, refocusing representation by balancing subject matter, form and content. Commenting on the piece, Ascott described his intentions this way:

Interchangeable elements, each with an individual identity, may, by the physical participation of the spectator, be brought into a series of relationship, each one adding up to a whole which is more directly related to the manipulator of the parts, than if it were static at a distance. The act of changing becomes vital part of the total aesthetic experience of the participant (Ascott, 1960 quoted in Shanken, 2007, p. 29).

In *Change Painting*, subject matter is intrinsically connected with meaning (content), which relies simultaneously on the artist's initial form and the spectator's manipulation of such form. This complex interchange among artist, artwork and spectator expanded representation from the purely visual to include tactile, postural, and aural perceptions, which Ascott addresses as behavioral. These understandings of a holistic exchange among creator, creation and spectator-user found deeper relevance with the advent of digital technologies, which rely on human-computer interactions and networks of exchanges and where meaning (content) and form syncretically entwine with the user/spectator.

Ascott calls the human experience of this syncretic exchange *cyberperception*, defined as "the emergent human faculty of technologically augmented perception" (Ascott, 2007, p. 376). The understanding of this enhanced perception allows the

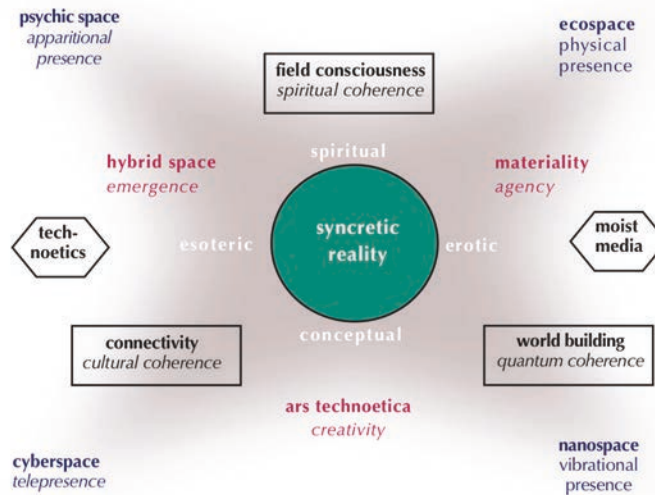


Figure 27. Syncretic Reality (2008) slide reproduction shared at Plymouth Art Centre show The Syncretic Sense, Roy Ascott.

artist to “empower the viewer through direct physical interaction to collaborate in the production of meaning and the creation of authentic artistic experience” (Ascott, p. 357).

#### 2.6.4. Technoetic Art and Consciousness

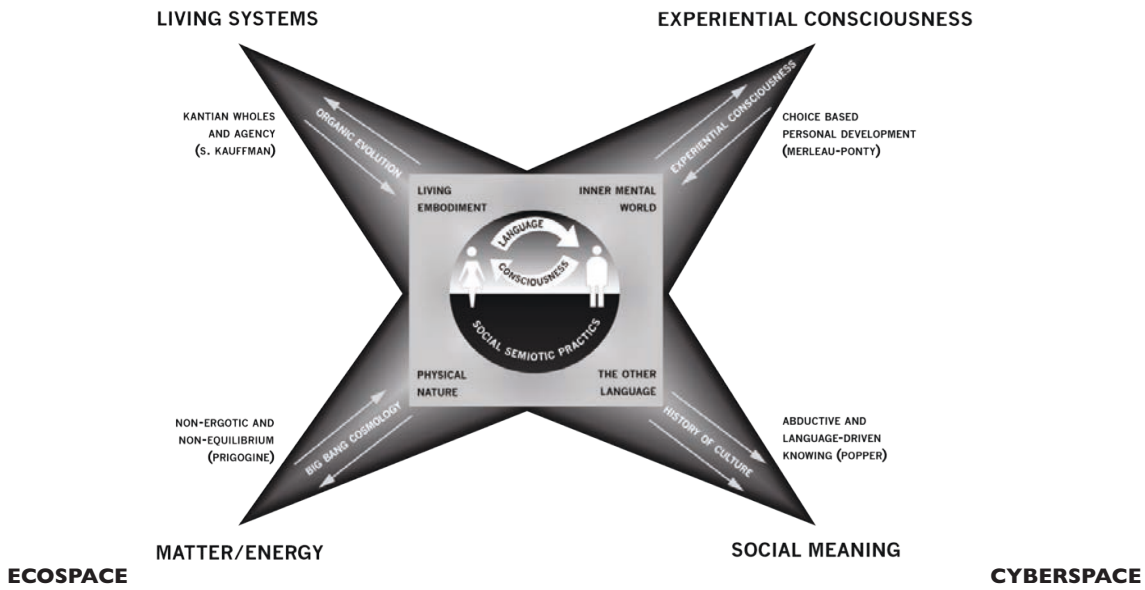
Technoetics is a convergent field of practice that seeks to explore consciousness and connectivity through digital, telematic, chemical or spiritual means, embracing both interactive and psychoactive technologies, and the creative use of moistmedia (Ascott, 2008, p. 204.).

Ascott theorizes art “as part of an integrated process in which thought and action [are] interconnected components of an inter-responsive system, fundamental to which is consciousness” (Shanken, 2001, n.p.). This statement reveals the essence of his motivation as promoting qualia—an individualized phenomenological experience.

The assertion of a need for a holistic and integrated consciousness experience associated with qualia draws on Ascott’s double consciousness concept. Ascott observes that “while scientists seek to analyze, dissect and explain consciousness, artists attempt to navigate consciousness and create new structures, images and

**NANOSPACE**

**PSYCHIC SPACE**



**Figure 28.** Brier’s Cybersemiotic Star tetrahedron model correlating to Ascott’s Syncretic Reality tetrahedron model.

experiences within it. Consciousness is a field where art and science can co-mingle” (Ascott, 2000, p. 4).

Ascott uses a four-sided model (Figure 27) to represent the different aspects of interactive art and its influences on the construction of human consciousness as a complex adaptive system. This syncretic reality, as Ascott calls it, is composed of physical, vibrational, tele- and apparitional presences. These four presences are merely starting points as the final goal is a syncretic understanding of the self. The intended outcome of this complex multi-level dialogue is what Ascott calls a technoetic aesthetic.

It is in Ascott’s representation of syncretic reality that I see a parallel to Søren Brier’s Cybersemiotic Star<sup>52</sup> since both representations portrait the understanding that consciousness is a complex and integrated experience composed by different aspects of life (reality). The difference between these two representations lie on

<sup>52</sup> Søren Brier’s Cybersemiotic Star is introduced in chapter 1, section 1.4. Explanation of Methods.

the ontology of words related to the phenomena that they aim to communicate. In Ascott's case the phenomenon is art, most precisely interactive art, where the different aspects of perceiving and understanding reality are experienced as one. In Brier's case the phenomena are mostly biological and cognitive sciences. Yet, Ascott and Brier representations are tetrahedrons correlate (Figure 28) since they both observe physical (ecospace/matter-energy), biological (nanospace/living systems), cognitive (cyberspace/social meaning) and spiritual (psychic space/experiential consciousness) aspects of reality aimed to highlight the need for a holistic and integrated consciousness experience—qualia.

#### 2.6.5. Overview

In his career path, Roy Ascott has embraced many different roles, and it is this multifaceted creativity and productivity that have particularly inspired my own practice and theorizing. Ascott is simultaneously an artist, theorist, researcher, educator, and cultural messenger shaman. As an artist, he stands in a line of interactive practitioners extending back at least a century to the brilliant modernist experiments of Marcel Duchamp. The making of the artwork and its conceptualization are for Ascott, as for Duchamp, fully and simultaneously integrated and intertwined. Ascott writes that:

Art, for me, is largely a matter of freely developing ideas and creating forms and structures that embody them. Whatever ideas I may pursue—and in art, the entire universe is open to investigation and reconstruction—behaviour is an important reference in my considerations of space, time, and form. I make structures in which the relationships of parts are not fixed and may be changed by the intervention of the spectator. As formal relationships are altered, so the ideas they stand for are extended (Ascott, 2007, p. 97).



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Ascott does not so much depart from representing reality as interrogate the representational paradigm, in the process demonstrating how and why “the entire universe is open to investigation and reconstruction” (Ascott, 2007, p. 97).

As theorist, Ascott describes, interprets, and models an art that is radically open-ended, an invitation to the spectator to exchange and join in the creation and completion of the aesthetic experience. Such art is

a form of behaviour (rather than a simple array of images or objects) ... [and] takes on the quality of a transaction. Art aspires to the condition of exchange. There is consequently no final outcome, no ultimate climax, no absolute resolution or irreversible conclusion in art now, as in life. (Ascott, 2007, p. 173)

Ascott’s thinking expands the boundaries of art to include the spectator as co-participant and co-creator and to consider each spectator’s uniquely individual perceptions and consciousness (qualia) as a fundamental constituent element in the art experience. As a great synthesizer of ideas and practice, Ascott views his role as educator as rooted in his art practice and his theorization of the interchange between artist and spectator:

To project my ideas, I set limits within which [the spectator] may behave. In response to behavioural clues in a construction (to push, pull, slide back, open, peg in, for example), the participant becomes responsible for the extension of the artwork’s meaning. He becomes a decision maker in the symbolic world that confronts him. (Ascott, 2007, p. 97)

It is in this sense that Ascott (2007, p. 97) asserts “All art is, in some sense, didactic; every artist is, in some way, setting out to instruct. For, by instruction, we mean to give direction ... Through the culture it informs, art becomes a force for change in society.” Beyond that, Ascott has taught others through his many essays and books, the journals he has founded and edited, and by his inspirational teaching and mentoring of undergraduate and graduate art students at institutions on three continents ranging

from London's Ealing Art College to his present roles as President and Director of Studies of the Planetary Collegium at the University of Plymouth, UK, and De Tao Master of Technoetic Arts at the DeTao Masters Academy in Shanghai, China.

Ascott's role as cross-cultural educator and technoetic artist places him at the intersection of art, science, and technology, of multiple scientific and humanistic disciplines, and of many cultural and value systems. He is committed to an understanding of the primacy of human consciousness and its transformations in the Digital Age. The *telematic embrace* of instantaneous digital communications through geographically dispersed networks facilitates an experience of shared consciousness on a planetary scale. Beyond that, Ascott is exploring the potential of what he calls double consciousness. Ascott explains this as

the state of being that gives access, at one and the same time, to two distinctly different fields of experience. In classical anthropological terms, this is to describe the shamanic 'trance' in which the shaman is both in the everyday world and at the same time navigating the outermost limits of other worlds, psychic spaces to which only those prepared by physical ritual and mental discipline, aided often by 'plant technology,' are granted access. In post-biological terms, this is mirrored by our ability, aided by computer technology, to move effortlessly through the infinities of cyberspace, while at the same time accommodating ourselves within the structures of the material world. (Ascott, 2007, pp. 358–359)

This state of double consciousness gives access to both the hard surfaces of the visible world that might be mechanically reproduced, articulated in language, or rationally analyzed and also to a realm that can only be experienced and suggested through allusion, indirection, shared participation, and metaphor. Creative artists, philosophers, and shamans alike try to explore this realm.

It is in Ascott's teachings as artist, educator and theorist calling for the condition of exchange with the user that led this research and my practice to observe

interactive hybrid environments and to the awareness that the relationship among user, information and interface needs to be seen as a complex system adaptive system.

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### **2.7. Why Interactive Hybrid Environments?**

Initially, my own path as an artist did not greatly diverge from the Renaissance aims of reproducing reality. As an art student, I too was exposed to countless hours attempting to develop the skills of drawing and painting through direct observation. I say *attempting* as the exercises require patience and concentration, not natural traits found in people with ADHD. Like the Renaissance artists first discovering tools and techniques for rendering the three-dimensional world on two-dimensional surfaces through conscious observation, foreshortening, one- and two-point perspectives, and value gradation, I also had to rely on tools to mediate and compensate for my poor observation skills. Grids, camera obscura, and drawing over light boxes were some of the tools I tried although they never seemed adequate to address the challenges of a naturalistic rendering. Frustrated with my limited success at most realistic drawings, I incorporated the use of collage and photography into my practice.

Freed from the burden of realistic depiction, I became more aware of the spectator's potential contributions to the artwork. The desire to ensure open communication with the spectator led me to pay closer attention to feedback processes and to incorporate digital tools. The latter, combined with physical structures in hybrid interactive environments promoted open exchange between artist and spectator and augmented or transformed everyday perceptions into Cyberperception. I began to envision narratives whose meanings could only be defined by the spectator as

the outcome of such interactions. This awareness of the potential of my art practice to expand consciousness in turn gave me a new understanding of reality itself.

Despite our sense of apartness, of living alone within our own subjective worlds of experience, a human desire to exchange and to communicate our inner realities seems always to emerge, linking our own creative ventures with those of other humans extending back to the French cave drawings. This desire to communicate was carried forward through the developments of realistic representation in the Renaissance, and centuries later through the advent of photography. This new technology helped establish a mass perceptual understanding of reality but also freed artists, philosophers, and scientists alike to investigate the aesthetic understanding of reality beyond visual representation. Duchamp's conception of the creative act included the spectator in the creative process while establishing the potential of highly conceptualized visual representation as means to understand reality – semiotic interaction. As such, Duchamp acknowledged first-hand the complex and dynamic interactive relationship among artist, artwork and spectator as co-creators of reality. Brazilian syncretism expanded this departure from representation by adding the element of participatory and collective interaction. Through Brazil's Neo-concrete and Tropicália movements, especially the sensorial experiments of Clark and Oiticica, the interaction among artist, artwork and spectator could be seen as an anthropophagic and syncretic process, where the other is only truly perceived when ingested and digested by both artist and spectator. Each of these co-participants brings their own reality to the artwork, consequently generating a new creation.

A further development of syncretic, anthropophagic aesthetic practice and process may be seen in Ascott's understanding of the shift from artistic visual

## CHAPTER 2 | WHY INTERACTIVE HYBRID ENVIRONMENTS?

representation to behavioral experimentation (Ascott, 2007, p. 110.) This is expressed through an interactive, participatory art experienced as a “perpetual state of transition” (Ascott, 2007, p. 111). It is a liminal zone that relies on second-order feedback exchange processes among artist, medium, and spectator and that opens doors to telematic art, where isolated interactions or systems can interact with other systems promoting broader systems of connectivity. These in turn allow for the inclusion of digital technologies as tools and means of exchange, augmenting human perception to cyberperception. A technoetic art is the result, one that you see, touch, feel, or sense and are part of, that enhances and expands perceptions allowing for this perception to be swallowed, digested and returned as a unique experience or qualia.

The creation of interactive hybrid environments is concerned with systems where artist, spectator, and medium generate and exchange perceptions and processes. It focuses on expanding the creative act to the spectator-user. The user’s understanding of the world—semiotics—is what changes perception of the artwork. This semiotic dance is what connects the syncretic, technoetic art of Roy Ascott with the cybersemiotic philosophy of Soren Brier. The aim of syncretic art is to promote new perceptions, with the capability of a holistic experience integrating diverse processes and perceptions.

The next chapter introduces the circumstances influencing my creative process, the design approach employed to connect theory and practice, and the different methods and tools that eventually led me to create interactive hybrid environments, in particular *Mixing Realities*, the artwork used as case study in this dissertation and highlights the issues that motivated this research. The next chapter also provides a brief overview of how the phenomenological hermeneutic methodology is employed and

establishes the complexity of the interactions and need for an integrative framework of analysis—Brier's cybersemiotics.

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**3.1. Introduction**

The previous chapter addressed the theoretical influences for this research. It surveyed art historical concepts and technological developments, as well as the people who deeply influenced this researcher's understanding of the potential of interactive art—more specifically interactive hybrid environments. It contextualized the technological developments in order to call attention to their potential—as tools—to mediate shifts in reality and include the spectator's perception in the creative act—interaction—consequently creating new ways to navigate consciousness through new structures, images and experiences (Ascott, 2000).

This chapter establishes this dissertation as practice-led research as substantiated by Thomas Kuhn's (1970) understanding of Michael Polanyi's concept of tacit knowledge, Nelson Goodman's (1984) approach to aesthetics and knowledge, Roy Ascott's *The Construction of Change* (2007, pp. 97-107), and this artist-designer's own view based on reflective practice.

Chapter 3 introduces the circumstances influencing my creative process and practice, the methodological approach based on formal design analysis employed herein to connect practice and theory, different attempts to mediate experiences, my eventual turn to creating interactive hybrid environments, and an overview of "*Mixing Realities*," the interactive hybrid artwork used as case study in this dissertation.

The goals of this chapter are to highlight the issues that motivated this research, establish this dissertation's phenomenological-hermeneutic approach, introduce the methodology used, establish the complexity of the interaction, and identify the need for an integrative framework—cybersemiotics—to address the ontological and methodological issues observed in HCI.

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## **3.2. Art: Practice to Theory**

### **3.2.1. Introduction**

While developing my final thesis project for a Master in Fine Arts in Computer Art at the School of Visual Arts in New York, USA, I developed an interactive physical/digital installation called "*Mixing Realities*." The installation was grounded on Ascott's concept of cyberperception and aimed to explore perceptions of space and time



## CHAPTER 3 | MIXING REALITIES

mediated by technological processes. It was then, based on my reflective practice as a technoetic artist aiming to promote new experiences within consciousness, that I became aware of the dichotomy between perceptions and processes in such physical-digital (hybrid) environments. Puzzlement and curiosity about such sharply contrasting approaches to and understandings of interactive hybrid environments led me to explore semiotics (Pierce) and cybernetics (Wiener, Shannon). While trying to address some of the issues I perceived, in relation to design, content and context, I realized that the same issues could be found in the web interfaces that I develop, and I began to understand the wide gap between theory and practice, perceptions and processes, involved in Human-Computer Interactions (HCI) and the need for an integrative methodology and revised ontology to facilitate the analysis of such environments.

HCI is considered a multidisciplinary field, combining “theories and practices from a number of fields including computer science, cognitive and behavioural psychology, anthropology, sociology, ergonomics, industrial design, and more” (Wania, Atwood & McCain, 2007, n.p.), yet such fields are commonly dissociated from one another in their methodology and terminology. If one chooses to look at HCI through the lens of computer science to analyze cognitive learning, for example, the language and methods available for such analysis reduce, limit or even ignore the phenomenological, cultural and biological aspects of human perception.

The need for “a genuinely non-reductionist interdisciplinary view of knowledge that allows different kinds of knowledge to interact in a non-ideological way” (Brier, 2008, p. 20) becomes acute when technoetic artists, working with interactive hybrid environments, are attempting to “create new structures, images and experiences within consciousness” (Ascott, 2000, p.4) to relate practice to theory .

The following subsections describe the path that promoted and substantiated my passage from practice to theory and ultimately taking a step toward the creation of new knowledge. They explain why an artist would pursue such a shift, describe the methodological approach employed in this practice-led research, and examine an example of an HCI experience, showing how my personal limitations brought me to investigate interactive hybrid environments.

### 3.2.2. Why Practice-Led Research?

“Why would an artist pursue a Ph.D.?” This question has haunted me since I enrolled in the Planetary Collegium.<sup>53</sup> As much as I try to ignore it, relatives, friends and colleagues keep bringing it up over and over again. They are either artists who see the pursuit of rigorous academic research as betraying the class or scientists who seem skeptical about the possibility of artistic practices yielding new knowledge.

The artists see a betrayal of the class because they understand academic research methods as rigid, narrow-minded, and limiting to aesthetic production, and they believe that, as artists, we have somehow earned the artistic freedom to create wherever we please while keeping a balance between our creative processes and perceptions. The scientists imply that artists don’t have the foundation to develop a rigorous methodology and, as such, the outcome may not be sufficiently reliable, properly grounded, or developed enough to account for new knowledge contributions.

Unfortunately, I have to agree with both sides. Artists are free to express any content they may want without the formal restraints of scientific methods. Parallel to

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<sup>53</sup> Led by pioneer media artist Roy Ascott, “The Planetary Collegium is an international research platform that promotes the integration of art, science, technology, and consciousness research, under the rubric of technoetic arts” based at Plymouth University, in Plymouth, UK ([https://en.wikipedia.org/wiki/Planetary\\_Collegium](https://en.wikipedia.org/wiki/Planetary_Collegium)).

that, the biggest task in developing a rigorous academic research project is to detach from self-expression and analysis, which are intimately ingrained in artistic creative practices. So, what would propel this dyslexic, hearing-impaired Brazilian artist<sup>54</sup> with attention deficit hyperactive disorder to pursue this huge (and seemingly unnecessary) path just to express her aesthetic views of space-time and consciousness in interactive hybrid environments?

In order to answer this question, it is necessary to point out that my creative approach to art is a reflection of my culturally syncretic Brazilian heritage<sup>55</sup> combined with my fascination for Roy Ascott's concept of technoetic aesthetics.<sup>56</sup> Independent of any specific medium, my work aims to reconcile different understandings of the world, especially such binaries as mundane/sublime, virtual/real, digital/physical, and space-time. I also seek to encourage connectivity and consciousness by transcending normal assumptions, physical constraints and social barriers.

I perceive myself as a storyteller who uses different types of narratives to engage with the viewer-participant-user's<sup>57</sup> perceptions. The stories I aim to tell are not my own, but the users'. My aim is for my work to offer opportunities, prompts and cues for such exchanges between the user and his or her perceptual understanding of the presented reality. Determining the best medium to facilitate this exchange is my greatest challenge and excitement: challenge because it makes me venture through concepts and skills that may be foreign to me, yet necessary to master in order to

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54 The discussion on artistic practice (based or led) PhD's is very alive and strong today. In the book *Artists with PhDs: On the New Doctoral Degree in Studio Art*, James Elkins discusses many of the issues around the topic, including why not pursue a PhD degree (Elkins, 2014).

55 See chapter 2, section 2.5.4. for a description of Brazilian cultural syncretism.

56 See chapter 2, section 2.6.4. for a description of Ascott's technoetic aesthetics.

57 The terms used to define a person experiencing an artwork are somewhat limited. *Viewer* conveys a static experience. *Participant* conveys an active ongoing engagement, which sometimes is not the case. *User* seems to be a more appropriate term as it conveys a dynamic engagement with the artwork. From now on I will refer to the people who experience an artwork as user. Please see chapter 4 for a more detailed analysis of the term.

facilitate the narrative; excitement because this exploration pushes me to focus on the processes needed and to pursue research and collaboration to expand my concepts and skills. Consequently, my artwork may take varied forms such as mixed-media composites, photography, video performance, interactive hybrid environments, and so forth aiming for a dynamic semiotic dance exchange.

In *A Basic History of Art*, Janson & Janson (1997, p. 15) reflect on the meaning of art affirming that “Art enables us to communicate our understanding in ways that cannot be expressed otherwise. ... In art, as in language, we are above all inventors of symbols that convey complex thoughts in new ways.” It is with the intention of creating a vehicle of exchange and communication between the user with his or her own perceptions and opening the possibility for new forms of understanding reality that I decided to expand my practice through a rigorous academic research project to explore the aesthetic aspects and dynamic relationships in my artwork, most specifically in interactive hybrid environments that intentionally aim to mediate consciousness.

The advent of practice-led research has shined much light on the potential of artistic practices to promote new knowledge. Linda Candy (University of Technology, Sydney), who supervises practice-based and practice-led research, defines the latter as follows:

Practice-led Research is concerned with the nature of practice and leads to new knowledge that has operational significance for that practice. In a doctoral thesis, the results of practice led research may be fully described in text form without the inclusion of a creative work. The primary focus of the research is to advance knowledge about practice, or to advance knowledge within practice. Such research includes practice as an integral part of its method and often falls within the general area of action research (Candy, 2006, n.p.).

Candy’s definition of practice-led research supports the aim of this research where the results of my practice are used as methodological tools and described in this

dissertation without fully implemented works of art. Thus, answering the question posed in the beginning of this section, I decided to pursue a practice-led Ph.D. in integrative arts, focusing on HCI in interactive hybrid environments, with the aim to improve “the quality of intimacy between artist [myself], system and [user]” (Ascott, 1999, p. 70)<sup>58</sup> by better understanding the processes and perceptions involved in promoting mediated consciousness to facilitate and expand this exchange.

As this is not the first academic research inquiring into and aiming to expand the potential of artistic practices leading to new knowledge, it is relevant to describe the rationale behind artistic practice-led research and this dissertation.

### 3.2.3. Art and Change

Chapter 2 introduced the technological and conceptual developments in art that influenced this research, focusing on how these developments helped shift human perceptions and consciousness leading to today’s HCI and interactive hybrid environments. In *The Structure of Scientific Revolutions*, Thomas Kuhn (1970) demonstrated how social reality shapes and propels new scientific knowledge influencing not only how we think and experience the world but also how these concepts are shared and become accepted knowledge.

Scientists can agree that a Newton, Lavoisier, Maxwell or Einstein has produced an apparently permanent solution to a group of outstanding problems and still disagree, sometimes without being aware of it, about the particular abstract characteristics that make those solutions permanent. They can, that is, agree in their identification of a paradigm without agreeing on, or even attempting to produce, a full interpretation or rationalization of it. Lack of a standard interpretation or of an agreed reduction of rules will not prevent a paradigm from guiding research. ... Indeed, the existence of a paradigm need not even imply that any set of rules exists (Kuhn, 1970, p. 44).

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58 I modified Roy Ascott’s statement. The original sentence reads: “The quality of intimacy in the relationship between artist, system and viewer is of the greatest importance if a technological based practice is to engage or transform our field of consciousness” (Ascott, 1999, p. 70).

Even though Kuhn is addressing scientific knowledge, at the end of his text he references Michael Polanyi's concept of tacit knowledge, implying that new paradigms can be developed from personal experience without relying on scientific rules and opening the possibility for the *two cultures*<sup>59</sup> to coexist, interact and exchange with one another in the creation of new knowledge.

Polanyi's tacit knowledge correlates to qualia since it acknowledges that individual perceptions and understandings derive from our unique experiences in life, which in turn can only be shared through exchanged actions and experience. This unique and individualized experience, highlighted is what interactive hybrid environments aim for in order for the Art Coefficient to manifest. Thus, reinforcing the connection between art and science in the production of new knowledge. Expanding from tacit knowledge, Nelson Goodman questions "cognition and its role in science, art and perception" (Goodman, 1984, p. 1) affirming that, in order to create new knowledge, science as well as art rely on exploring the unknown through insight and discovery.

Practice, perception, and the several arts are equally ways of gaining insight and understanding. The naive notion that science seeks truth, while art seeks beauty, is wrong on many counts. Science seeks relevant, significant, illuminating principles, often setting aside trivial or overcomplicated truths in favor of powerful unifying approximations. And art, like science, provides a grasp of new affinities and contrasts, cuts across worn categories to yield new organizations, new visions of the world we live in (Goodman, 1984, p. 5).

Goodman's rationale is substantiated in chapter 2, section 2.2.2. which addresses how a humanistic consciousness took shape during the Renaissance with the advent

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<sup>59</sup> The *two cultures* refers to a 1959 presentation by C. P. Snow to Cambridge University's Senate House addressing the lack of common language and shared knowledge between the then elite humanities and the rising scientific community of scholars. His presentation, which later becomes the foundation for a book, started a dialogue between these two main areas of study. C. P. Snow critique referred to how little scholars in the humanities withstanding an elitist vision, knew about the new scientific endeavors, or wanted to know about them. Interesting to point out how this has changed and how today the scientific community is perceived as being superior than the humanities. The need to integrate both communities, especially in areas that invoke new technologies has been crucial to new developments.

## CHAPTER 3 | MIXING REALITIES

of artistic tools such as one and two points perspectives, atmospheric perspective, and use of value gradation to represent reality. This change was not brought about by strict scientific experimentation but rather through hermeneutic phenomenological processes, where artists subjectively exploring more effective ways of representing reality developed new techniques and tools that are still used today.

It is important to highlight that aiming to coincide art and science in knowledge production, Goodman (1978) also explores the construction of meaning based on symbolic representations (words, numbers, images, sound,) which he addresses as worldmaking. In his quest, Goodman promoted a necessary epistemological inquiry and proposed an interesting approach correlating a general theory of signs with a phenomenological interpretation to explain the fluidity of meaning creation, expanded to everyday experiences. Sani Murrani borrows Goodman's concept affirming that "worlds melt into other versions of worldmaking, and thus emerging worlds have relational existence than self-existence" (2018, p. 297) to call attention for the need to observe "active perceptions and cognition and their effects on alternative experiences of the world" (2018, p. 297) when analyzing spacial-social and technological art installations which parallels interactive hybrid environments. Also relevant is Murrani's inspiration on Dan Graham's *Opposing Mirrors and Video Monitors on Time Delay* installation (2018, p. 302) which at first glance *Mixing Realities* shares several similarities including specific time delays to explore space-time continuum (Graham, pp. 29-31).

Goodman, Murrani, and Graham explorations of worldmaking and meaning creation is centered and defined by the user's embodied physicality which can lead to a reductionist approach to meaning creation when addressing user, information and interface relationship (meta-environment) in interactive hybrid environments, leading

this research to follow Roy Ascott's footsteps on the pursue of a more inclusive framework to conceptualize interactive hybrid environments.<sup>60</sup>

Published during the advent of digital technologies and tools, Roy Ascott's *Construction of Change* (1964) shifted attention from representation to communication and interaction, establishing the foundation for new knowledge based on the triadic relationship between the artist, artwork and spectator. As Edward Shanken observes:

Around 1960, Ascott began exploring cybernetics in the context of interactive art and art education. In 1964, he published "The Construction of Change," a text on the relationship between art, systems theory, cybernetics, and behavior. In it, he wrote: "To discuss what one is doing rather than the artwork which results, to attempt to unravel the loops of creative activity, is, in many ways, a behavioral problem. ... It leads to a consideration of our total relationship to a work of art, in which physical moves may lead to conceptual moves, in which Behaviour relates to Idea"<sup>[61]</sup> Ascott's emphasis on behavior included not only the production of objects, texts, and pedagogy, but led to a theorization of art as part of an integrated process in which thought and action were interconnected components of an inter-responsive system, fundamental to which is consciousness. The artist applied such concepts in the systematic Groundcourse he designed and directed at the Ealing School of Art (1961–1964) where he introduced processes and methods such as inverted logic, chance operations, and behavioral psychology into the curriculum. Moreover, the courses he instituted both at Ealing, and later at Ipswich, had at their core a cybernetic approach to collaborative work, whereby discrete groups of six students functioned together as an integrated, self-regulating system (Shanken, 1997, n.p.).

### 3.2.4. Overview

Ascott's vision of the transformative potential of digital art in the 21st century, his exploration and questioning of established paradigms and his engagement of science to inform and ground artistic practices serves as a model and inspiration for this researcher to question dominant paradigms informing hybrid interactive installations

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60 Murrani also attempts to depart from the user's embodied physicality when addressing participatory and interactive technologies by reconciling Goodman's worldmaking with Ascott's cybernetics which she addresses as a "third way philosophy" (2018, p. 298). Murrani's quest to reconcile perceptions and processes is latent with research art practitioners and ignited this research to pursue the integrative framework of cybersemiotics.

61 Shanken's original note: Roy Ascott, "The Construction of Change," *Cambridge Opinion* (Modern Art in Britain) (Cambridge, 1964, p. 1). Ascott's theory of art as process and behavior anticipates by five years the more widely known formulation by Joseph Kosuth in "Art After Philosophy," *Studio International*, Vol. 178, Nos. 915–917 (October–December, 1969).



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while also encouraging connectivity and consciousness by transcending established aesthetic assumptions and scientific constraints. Thus promoting a unique and individualized experience in interactive hybrid environments where the Art Coefficient can manifest through a semiotic dance.

As Kuhn points out: “Within the new paradigm, old terms, concepts, and experiments fall into relationships one with the other” (Kuhn, 1970, p. 148). Much of what is addressed in this dissertation is not new but reflects on established paradigms in order to promote new relationships, which by questioning and reorganizing the established rules may offer new knowledge. As Ascott (2007, pp. 101–102) suggests: “Science can inform a discipline for art, then, not to produce a scientific work but to substantiate our empirical findings and intuitions with clear analysis and reason.”

In this dissertation, “the work of art occupies a pivotal point between two sets of behavior, the artist’s and the spectator’s” (Ascott, 2007, p. 99). The artist and the spectator thus become co-creators of meaning,<sup>62</sup> oscillating through passive and dynamic roles,<sup>63</sup> and their interactive exchange as a semiotic dance is mediated by digital technologies. With this new understanding comes a need to see the artwork in a manner that includes not only such perceptions but also its processes and development, as well as the interactions of artist and spectator. In this case, it is necessary for the artist to become aware of the domains that give rise to the artwork and, as such, create the possibility of new knowledge (Ascott, 2007).

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62 As seen in chapter 2, section 2.2.2.

63 Chapter 4 addresses this concept more broadly.

Learning to observe and map one's own creative process relies deeply on a hermeneutic phenomenological viewpoint as well as a critical understanding of the different semantic and theoretical contexts involved in the production of interactive hybrid environments. The next section introduces some of the experiences that led to this research project.

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### 3.3. The Design Approach

#### 3.3.1. Introduction

One of the outcomes of this practice-led research is the awareness that, in order to more effectively close the gap between theory and practice in the creation of interactive hybrid environments, it's necessary to observe and analyze the elements involved and their interactions as emergent levels in a complex adaptive system,<sup>64</sup> identified here as the cybersemiotic experience.<sup>65</sup> As this understanding is completely integrated into my practice, this dissertation's methodological approach is grounded in formal aesthetic analysis as well as in hermeneutic phenomenological context analysis of my own creative process.<sup>66</sup> Historical and theoretical accounts, along with my own experience, are analyzed through four aspects—subject matter, form, content, context—in order to effectively develop a formal analysis of such environments while

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64 “The concept of emergent ‘levels’ (e.g., levels that arise from interactions of objects at lower levels) is fundamental to scientific theory. ... [which refers to] levels of description that can be used to characterize a system with lots of interacting parts. ... [It is] central to understanding ... how complex phenomena can arise from simple components and simple interactions” (Wilensky & Resnick, 1999, n.p.).

65 The cybersemiotic experience accounts for the conscious experience—qualia—promoted by interactive hybrid environments when the elements, relationships, mediations and context of such interactions are seen through the lens of cybersemiotics and complex adaptive systems (Jacques, 2016).

66 In this dissertation, hermeneutic phenomenological research methodology is incorporated from the perspective of Narayan Prasad Kafle (2011) and Susann Laverty (2003).

## CHAPTER 3 | MIXING REALITIES

also establishing the influences of, implications for, and applications to the creative process.

My understanding of formal analysis is an outgrowth of my study of design, more specifically the discipline of fundamentals of 2D design, which I have been researching and teaching to first year college students for the past seventeen years. Over the years, I decided to adopt the approach and nomenclature of Ocvirk, Stinson, Wigg, Bone, and Cayton (2009) to define the components of art: subject matter, content, and form. As a fourth component, I also incorporated context as delineated by art historians and scholars in order to enable my students—and this developing dissertation—to “interpret art in terms of the culture of its time” (D’Alleva, 2005, p. 46).

Thus this methodology defines the focus of the analysis, identifies its elements, establishes the ensuing perceptions, and surveys its context as follows:

- Subject Matter: defining the focus of the analysis and interaction;
- Form: identifying the elements and formal characteristics involved in the analysis and interaction;
- Content: establishing the perceptions and understandings generating and generated by the analysis and interaction;
- Context: surveying historical and theoretical influences on the subject matter, form, and content.

This design approach establishes the potential of emergent levels both objective (subject-matter and form – processes) and subjective (content and context – perceptions.) It allows for meaning creation by connecting what (subject matter) is being analyzed, how its characteristics (form) are defined, why these characteristics



**Figure 29.** Amazon Echo Family. Left to right: (Front) Echo Plus, Echo 2nd Generation, Echo 1st Generation, Echo Spot, Echo Dot, (Back) Echo Show, Echo Tap, Alexa Voice Remote. Retrieved March 25, 2018 from: <https://images.idgesg.net/images/article/2017/09/echo-family-100737285-orig.jpg>.

create meaning (content–qualia) while observing its setting (context–cultural/social/linguistic background.)

### 3.3.2. Creative Process

The challenge of making the impossible possible, of staring at an empty page, new file, blank canvas, or raw materials before launching a new project, remains so daunting an experience that it carries its own diagnostic label: blank canvas syndrome.<sup>67</sup> Ideas fly by, trying to fill the empty space of the medium, but somehow none seem to stick to it. The more ideas the more overwhelming the process can be. In order to help my students, and myself, face this challenge, I constantly remind them that the creative

<sup>67</sup> Even though the expression *blank canvas syndrome* is widely employed to express the struggles of initiating a new creative project I could not trace its origin to an author or scholarly literature.

process is unique and acknowledges no real mistakes, just the learning that ensues from trial and error. Artists create and designers plan; this combination offers the best of both worlds.

As an artist, designer, educator, and researcher with hearing impairment and cognitive disabilities—dyslexia and attention deficit hyperactivity disorder—I learned to rely on creative expression to communicate with the world. Having disabilities means that the most established and acceptable means of—whether human or machine—and relating with the world may not necessarily be the most effective ones for the disabled person. It also means that most often the disabled person develops coping mechanisms—tools, processes, and perceptions—to close the communication gap and more effectively interact with the world.<sup>68</sup> Tools mediate human interactions with the world, and the choice of tools and forms of mediation decisively impact the communication processes and consequently how these processes affect form—production of reality—and promote new knowledge.

### 3.3.3. Coming to Terms with Limitations

“Alexa, play WNYC!”<sup>69</sup> Alexa<sup>70</sup> is the latest addition to my collection of digital household appliances. “She”<sup>71</sup> is the Voice Service used in the Amazon Echo family (Figure 297) of gadgets intended to mediate our every interaction with the world. Alexa is a multimedia servant waiting for our voice commands to deliver facts, switch

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68 Occupational Therapy is the applied field that focuses on developing coping tools and activities to help people with different kinds of disabilities lead a productive life (The American Occupational Therapy Association, n.d.). Parallel, in HCI, UX & UI make use of Accessibility Guidelines to ensure people with different disabilities can access digital information.

69 WNYC is the name of a local National Public Radio (NPR) station in New York City. <http://www.wnyc.org/>

70 Amazon Echo Show is the proper name of this gadget. Detailed information about Amazon Echo and the different skills the Voice Service Alexa can potentially learn are documented on Amazon’s website. It offers videos and detailed information on the Echo family ( <https://www.amazon.com/Amazon-Echo-Bluetooth-Speaker-with-WiFi-Alexa/dp/B00X4VHP5E>).

71 Here is an example of how the language of embodiment applied to the digital world is, at a minimum, misleading. It should be the proper pronoun used to address and describe the cloud voice server named Alexa, but the entire discourse surrounding the voice server intentionally leads the user to embody the experience as relating to a woman.

the lights, open the front door, snoop on the children, find the keys, remind us of our overdue tasks, or whatever new skills the system can learn from us and that we have the patience to implement.

The concept of using voice commands instead of a graphic interface to perform mundane tasks seemed excitingly appealing, especially since my husband suffered a vision impairment in 2016 and navigating through simple tasks such as inserting a key in a door lock has become daunting. But using Alexa in practice is far from a conceptually optimal experience. A native of Brooklyn, New York, and a scholar of American literature, he has no problem communicating with Alexa. He knows the correct words to use, has the proper American English accent and intonation, and can think linearly, just like she does. I, on the other hand, have a very hard time interacting with her. The fact that I speak with a heavy Brazilian accent seems to bother her immensely as she more often than not dismisses my commands or performs a completely different “action”<sup>72</sup> from what I requested.

Being dyslexic,<sup>73</sup> having ADHD,<sup>74</sup> and suffering from hearing loss add a level of complexity to my interactions with Alexa that seldom falls short of being extremely frustrating. The truth is that the problem is with me. As a designer of interactive hybrid environments, I can attest that I am, more often than not, far from the optimal user whom interface and user-experience designers design for; Amazon Voice Service doesn't seem to change this reality.

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72 Here is another example where the language of embodiment applied to the digital world seems misleading. How can an inanimate box which processes bits of energy deliver an action? The word content seems more appropriate to me since it refers to digital information, but the context of the sentence gets lost.

73 “People with dyslexia have been found to have problems with identifying the separate speech sounds within a word and/or learning how letters represent those sounds, a key factor in their reading difficulties” (<https://dyslexiaida.org/dyslexia-basics/>).

74 ADHD or attention deficit hyperactivity disorder “is a brain disorder marked by an ongoing pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development” (<https://www.nimh.nih.gov/health/topics/attention-deficit-hyperactivity-disorder-adhd/index.shtml>).





*Figure 30. Escola do Sítio, c. 1985.*

The combination of my disabilities has a great impact on my short-term memory, affecting how I retrieve words and compose sentences; spoken commands are not the most appropriate or effective form of interaction for someone like me. Parallel to that, I experience severe high frequency hearing loss, making female voices hard to hear. The scenario of a person who is hearing-impaired and dyslexic and has a short attention span dealing with Amazon Echo fits perfectly as the premise of a comic TV skit but not as an optimal example of human computer interaction. In my case, one would assume that my limitations would be a huge impediment to dealing with hybrid environments involving HCI, and I would be a great Luddite,<sup>75</sup> which is surprisingly not the case.

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<sup>75</sup> Even though the early 1800s Luddites were not against technologies, but unethical practices by manufactures, today the term is used to describe someone against technologies, especially digital technologies involving human-computer interactions (<http://www.smithsonianmag.com/history/what-the-luddites-really-fought-against-264412/>).

People with disabilities have to learn to navigate the “normal” world since the most established and acceptable ways of interacting with the world may not necessarily be the most effective ones for the disabled person. This also means that the disabled person is constantly looking for innovative ways to interact with the world in an attempt to close the gap between their strengths and limitations and the normal ways of interacting.

Very early in life, I became aware of this dichotomy, and it fueled my passion for observing and understanding interactions in general. This passion had different outlets: I relied on and experimented with various tools to assist my everyday interactions. Creatively, I delved into visual arts as a more effective way of interacting with the world, and later I began creating interactive hybrid environments. The creative path leading to this dissertation is described in the following sections.

### 3.3.4. The Right Tool for the Right User

The two activities, creative and pedagogic, interact, each feeding back to the other. ... All art is, in some way, didactic; every artist is, in some way, setting out to instruct (Ascott, 2007, p. 98).

I started my career as a Montessori<sup>76</sup> certified elementary school teacher focusing on alternative educational methods integrated with art. I worked one-on-one with kindergarten and first grade children who had mild learning disabilities which affected their literacy development. I followed Piaget’s theories of early cognitive development,<sup>77</sup> his student Emilia Ferrero’s constructivist approach to written-language acquisition,<sup>78</sup>

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76 “The Montessori Method is an approach to learning which emphasizes active learning, independence, cooperation, and learning in harmony with each child’s unique pace of development” (Montessori Method, 2014).

77 Constructivist psychologist Jean Piaget (1896–1980) developed a comprehensive theory of cognitive-development, which was fueled by his observations of children’s mistakes when dealing with cognitive tests. (Sternberg, 1998).

78 The research of Argentinian psychologist and educator, Emilia Ferreiro (b. 1937) focused on written-language acquisition, taking into consideration that not only does each child have an active role in the construction of their knowledge, but also highlighting the need to observe how children make mistakes. Her view is that “We should not wait for the child to be ready through traditional readiness exercises since they don’t go beyond the motor perceptual level of training when, in fact, it is the cognitive level that is involved in the process” (Ferreiro, 1986, p. 101; translated by Jacques).



and Paulo Freire's call for rethinking the relationship between teacher, student, and society.<sup>79</sup>

I was fortunate enough to work at the Escola do Sítio,<sup>80</sup> (Figure 30) a school in Barão Geraldo, Campinas, Brazil, that adopts an open curriculum, offer links between the different areas of knowledge and the children's daily lives, and focus on concepts and critical thinking, rather than the recitation and simple reproduction of content knowledge. These pedagogical ideas and approaches were (are) supported by scholarly literature, textbooks, and communication technologies, among many others resources. Translated into practice, this approach meant that I would interact with each student a few times in and out of the classroom setting to initially observe the child's interests, strengths, and limitations while developing a relationship of trust. Next I would meet with the student's parents, siblings, and supporting professionals (class teacher, school psychologist, therapist, speech therapist, or any other specialized professional necessary) to gain a holistic understanding of the child, his or her life experiences, and issues that could possibly affect learning and development. Relying on the child's interests and strengths, I would identify an appealing tool to introduce the child to the concept of mark making and communication and eventually to letters, words, and sentences in reading and writing. Thus, each student who required my assistance would learn to read and write through a different method and using a different tool. This extra intervention would last from one to six months and was 100% successful in helping the students attain the level of literacy expected for their developmental age.

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79 Faced with the inequalities in Brazil, Brazilian educator Paulo Freire (1921–1987) wrote *Pedagogy of the Oppressed* addressing education and learning through social-political lenses (Freire, 1987).

80 Escola do Sítio (<http://escoladositio.com.br/>).

One example was a student who was fascinated by machines and loved disassembling them. His parents were academics, worried and frustrated about their seven year old son not being able to read or write yet. He was also showing signs of anxiety and frustration in school through aggressive behaviors towards his peers and the class teacher. The parents were also frustrated with the boy because he was constantly damaging their typewriters.<sup>81</sup> Supported by the school's philosophy, it became clear to me that using one of the broken typewriters was the way to connect with the child. Following his lead, we explored the typewriter in different ways such as the order and arrangement of the letters, how the machine worked, and so forth, until he focused on its mechanism of pressing on the paper to create a mark. Initially we developed our own communication system through invented words, but after a few meetings he realized he could use the typewriter to communicate using actual words to describe people, things, and actions. Next, he and I would take turns pretending to be the typewriter, reproducing the words while the other would be the writer. We first used ink on our fingers (pretending that was the typewriter's ribbon) to "type" the letters on a piece of paper. One would hold the other person's inked finger and draw the letters. Soon enough the child realized that the ink was too messy and suggested pencil and paper. Once the child became aware of his newly gained knowledge and skills, my job was done, and I transitioned him back to the classroom.

Typewriters, sand, frogs, mud, bugs, and so forth, eventually became tools used to promote the children's discovery of written communicating using letters, words, and sentences. The challenge was to find the right tool for each child, which means that even though it was the tool that was apparently mediating the interactive process, the child was ultimately the empowering mediator; that is, the one who defined the

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<sup>81</sup> Yes, a typewriter. The year was 1985.

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appropriate tool, how it would be used, and when it was no longer needed, in the process surpassing his or her own limitations and promoting the potential for new experiences.

### 3.3.5. A Specific Tool

A few years later I found myself involved in a process similar to the one described above where my own disabilities were limiting my exchange with the world and I had to use a tool to mediate that exchange, although the final outcome was different.

I moved from Campinas to New York City in the spring of 1988, and later that year, I was hired by a major bank to translate all its legal international documents from English to Portuguese. This was a major freelance project estimated to last for two or more years. Doing the translations was easy for me, even when I became pregnant, had a child, and later became pregnant with a second child. What wasn't easy was having to deliver the work typed instead of handwritten, which was initially the case. Being dyslexic, having ADHD and a compulsive need for aesthetic perfection made the process of typing a document a painful struggle for me. I was constantly misspelling words and could not bear the visual result of covering the mistake with correction fluid and typing it over. Added to the many challenges of being a new mother, the task of typing became a major source of stress and frustration.

At the time, personal computers were an expensive and superfluous novelty, but seeing my frustration and despair, my supervisor suggested that I buy one as an alternative to the typewriter and my typing struggles. Skeptical but afraid that I might lose the job, in late 1989 I purchased an Apple Macintosh personal computer and a

dot matrix printer to type and print the translated documents. The fact that I could then misspell the words and save the documents to edit them at another time without worrying about damaging or smudging the paper completely removed the stress of typing the translations. Soon I discovered that I could perfectly reproduce the original format of the legal documents, which not only yielded more income but also shifted my career path from education to design.

The need to produce the translations motivated me to learn an entirely new way of communicating, using a computer as a tool. In this case, it may appear that the translations were mediating the process by setting the tone of what I needed to use to cope with my limitations, but in reality, using the computer as a tool is what set the tone of the experience. The tool—computer—ended up promoting the potential for new experiences, even after the job of translating documents ended.

### **3.3.6. Becoming the Tool**

A few years later, combining my background in education and graphic design, I was hired as the instructional designer for desktop publishing and computer graphics courses by the headquarter of People Computação, a franchised chain of fifty technical schools in computer training. My primary responsibilities as National Coordinator for Graphic Design were to research new technologies and applications in desktop publishing and computer graphics (now mostly called graphic design), learn the applications well enough to create a teaching curriculum, and to write teaching manuals. I would then implement the courses by teaching some sections where I could assess the goals, structure, and materials, revising as needed. Once the course was tested and assessed, I would develop the teaching materials and train the instructors to teach the classes.

	<b>Need</b>	<b>Limitation</b>	<b>Apparent Mediator</b>	<b>Ultimate Mediator</b>
	What needs to be addressed?	What is the limiting factor?	What initially promotes the interaction?	What keeps the interaction going?
<b>Escola do Sítio</b>	Learn to Read & write	Child	Tool	Child
Element	Information	User	Interface	User
<b>Citibank</b>	Overcome CJ's stress	Tool (Typewriter)	Translations	Tool (Computer)
Element	User	Interface	Information	Interface
<b>People Computação</b>	Develop tools to teach GD	Course Content	Tool	Course Content
Element	Interface	Information	User	Information

*Table 1.* Table showing how mediation capabilities change according to different contexts under cybersemiotic analysis.

In this example, even though it appears that I, as the courses' author, was the one mediating the process by creating new tools (curriculum, goals, manuals, supplemental materials, etc.) to introduce the courses, it was actually the courses themselves that were setting the tone of the experience. The courses—information—ended up promoting the potential for new experiences, even after I no longer was creating or improving them. The course materials mediated the experience between me and students.

### 3.3.7. Intentionally Mediating Experiences

A few years later, I undertook an MFA in computer arts, culminating in a thesis project that was an interactive hybrid (physical-digital) installation described in detail in the final three sections of this chapter. My goal for the installation was to entice the user to interact with an environment that would promote a different sense of

self. In creating the installation, I drew on nearly two decades of experience designing web interfaces that focus on the user experience and also teaching college level 2D Design.<sup>82</sup> Teaching 2D has heightened my understanding of the interdependency of the components of art<sup>83</sup> in promoting visual communication. Teaching design and working as a designer has shifted my aesthetic emphasis from self-expression to an emphasis on form and how form intentionally reflects and shapes content (meaning), subject matter and context.

In the course of Ph.D. research, the emphasis on design and the rules of form further narrowed to a focus on promoting experiences mediated through the use of digital tools. The question of how the interactions of users and tools can influence and be influenced by a third element—information—revealed a gap in the established ways of conceptualizing human interactions with computers (and with digital tools in general).

The methods implemented in this research parallel the methods I followed in earlier professional interactions, relying on creative approaches with the understanding that, just as a holistic perception of the components of art in an artwork allows users to experience the artwork more fully, the rules of form can influence and are influenced by subject matter, content and context; and therefore, all the components of art need to be observed and analyzed in order for a meaningfully mediated experience to occur.

In observing and analyzing who the user is (subject matter: user, students, myself, computer graphics courses), defining and evaluating how the tools are utilized

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<sup>82</sup> 2D Design is a foundation course that focus on form and is offered to freshmen college students pursuing fields that rely on visual expression such as fine arts, photography, graphic design, media arts, film, and fashion. A more detailed description of the course is found in Appendix 4.

<sup>83</sup> Subject matter, content, form.

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(form: typewriter, computer, teaching materials, web interfaces), understanding why one reacts a certain way and not another to the user and tools (content, meaning, information), and researching the context (the circumstances around the user, interface and information), this research equally depended on feedback processes that fed or were fed by perceptions pointing toward the appropriate tool to mediate the process (see Table I).

This creative approach to knowledge mediated by a tool where theory and practice, concepts and skills, perceptions and processes, are syncretically<sup>84</sup> combined to promote a new and unique experience—consciousness—is the starting point and goal of this research.

### 3.3.8. Overview

This section presented this researcher's path from practice to theory. It introduced the concept and reasons for a practice-led research project and the understanding of artistic practice as a venue of change and creation of new knowledge through the views of Kuhn, Polanyi, Goodman and Ascott. It also introduced the hermeneutic phenomenological approach coupled with a formal aesthetic analysis through a design foundation to reveal the methodological background focusing on case studies to expand the observation process.

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84 See chapter 2, section 2.5.

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### 3.4. Mixing Realities

#### 3.4.1. Introduction

In the development of this research project, the interactive hybrid installation *Mixing Realities* served as the basis for analysis and reflection upon practice. *Mixing Realities* was designed to create awareness of our own individual physical reality as well as the different realities of other people passing by the installation through a process of interactively combining the actual and the virtual, real and imaginary—a process denoted by Roy Ascott as cyberperception. Interactivity is the key element in *Mixing Realities* since it is the experiential nexus of artist, artwork, and spectator/user. It is only through the user's interactive experience that the artwork can be aesthetically validated and fully realized. Physically, *Mixing Realities* may be described as an enclosed equilateral triangular wooden structure using three mirrors (one of them a Plexiglas one-way media mirror), pinhole camera, projector, and computer with Max MSP Jitter<sup>85</sup>

Through *Mixing Realities*, I sought to engage the user as a vital participant in the artistic process, based on my awareness of past artists whose attempts to integrate their work with the user were often neither initially realized nor fully understood but which definitely opened doors to the next phase of interactive artwork practice and conceptualization.

It was only after the development of new media, net media and digital media, which incorporated cybernetics and communications theory, that interactivity began to be fully embraced and developed in something approaching the manner that its early proponents envisioned. Once this technological and theoretical breakthrough had

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<sup>85</sup> Max/MSP/Jitter is a visual programming language—used to build complex interactive interfaces—that allows for the integration of interactive sounds, graphics, and custom effects. The documents created in Max/MSP/Jitter are called patches ([https://en.wikipedia.org/wiki/Max\\_\(software\)](https://en.wikipedia.org/wiki/Max_(software))).



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occurred, the relationship between art, artwork, and user began to exhibit a powerful new meaning. Narrative monologue in art began to give way to dialogue as user engagement triggered the feedback processes of the artwork.

Following Duchamp's conceptualization of the creative act and Ascott's notion of cyberperception, artists began more frequently to produce artwork deliberately intended to generate a dialogue with the user. But not every attempt at interactive dialogue succeeded as intended; users were not always ready to listen or respond, and early interactive practitioners often found themselves still engaged in monologue and not fully able to develop the conversations that Duchamp and Ascott envisioned.

Art historian and new media theorist Katja Kwastek highlights the manner in which realization and comprehension of interactive intentions require a different conceptual or theoretical stance:

If the gestalt of the interactive artwork only emerges each time it is realized anew by a recipient, then an aesthetic analysis of interactive art must look beyond the formal structure and interpretability of the interaction proposition produced by the artist, for the aesthetic experience lies in the action or realizing the work (2013, p. 48).

Canadian artist David Rokeby states the matter more simply and from the artist's, rather than theorist's, perspective: "I am an interactive artist, I construct experiences" (1997, p. 27). Such an assertion reflects a practical understanding of the aesthetic changes envisioned by Duchamp and Ascott.

Kwastek's analysis of interactive art and Rokeby's artistic credo reflect Duchamp's Coefficient of Art and reinforce the semiotic dance in which artist, user and artwork alternately and successively take either active or passive roles in the production of meaning. Parallel theories of communication, especially cybernetics, also

play a crucial role in analyzing and documenting the process of interaction between artist, artwork and user. To document and analyze the realization of the work and close the gap in the communication process, Ascott called upon artists to pay attention to the cybernetic feedback responses they got from their artwork and the user.

The concepts of the semiotic dance and cybernetic feedback processes that were central to the theoretical aspects of my research project allowed me to continually reconceptualize the practice embodied in successive iterations of *Mixing Realities* physically installed at various venues between 2008 and 2014 and now being further analyzed and theorized in an effort to promote a fluid aesthetic experience or dialogue among artist, artwork and user.

The conversation that *Mixing Realities* has continuously sought to create refers to an awareness of the concept of time, space and the subjective experience of different realities around us. We live with the illusion of controlling time, and when we are in our own world or reality, we forget that other times, spaces and realities co-exist with ours. From its earlier inception to the present moment, I have hoped that *Mixing Realities* will promote a dialogue with users and engage them in their own perceptions of time and space along with other users who experience the installation.

### 3.4.2. Concept

As a little girl, I used to go to a great-aunt's house that had a full-length triple mirror, which my sister and I used to dance in front of endlessly. The experience was magical. My sister, Andrea, is only one year younger, and we were five and four years old. The hinged triple mirror allowed us both to be enclosed in that wondrous and

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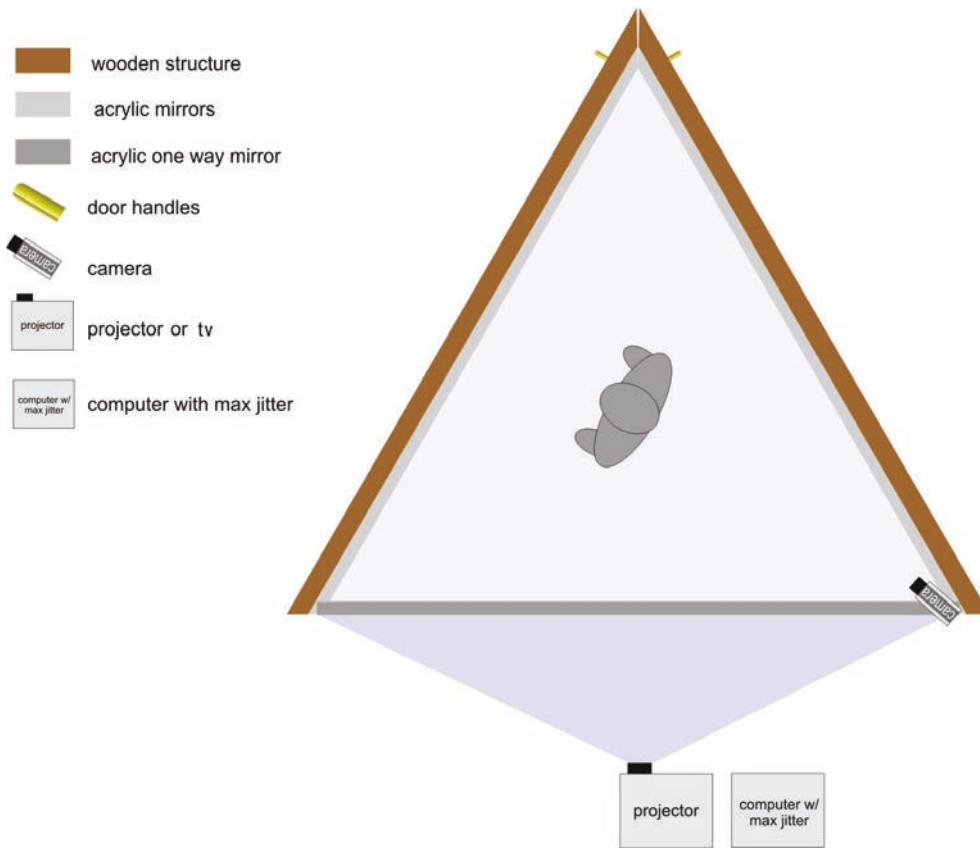


Figure 31

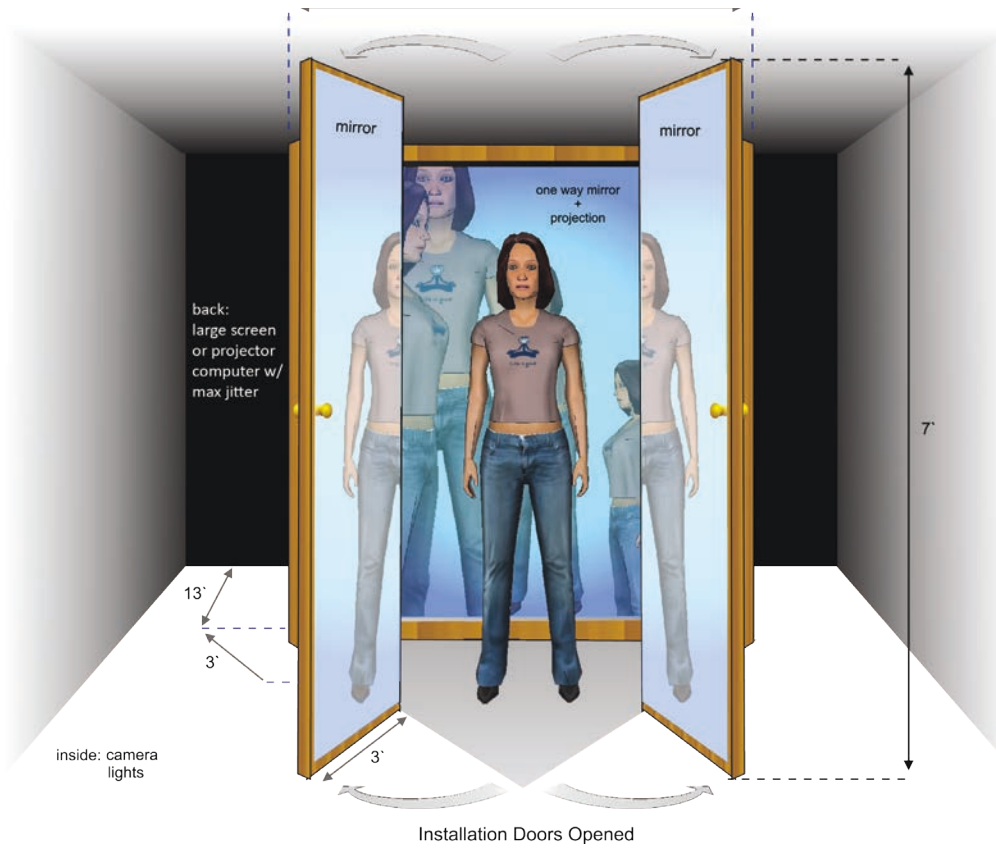


Figure 32. Sketch of the installation.

liminal space, experiencing infinite reflections of ourselves. We would communicate with each other through movement, dancing together without music, for hours. We would interact with one another and with our own slightly delayed reflections in an improvised jazz-like dance, without words or music or any real knowledge of dance, jazz or communication.

I believe that these were the very first times that I was aware of experienced qualia, those unique, subjective moments of consciousness that constitute our everyday sensory experience of a real world bounded by space and time. This awareness stayed with me and has developed throughout my lifetime, and in *Mixing Realities* I deliberately pursued the same sort of naïve, primary, non-propositional consciousness that I had experienced as a child.

*Mixing Realities* started with my remembered fascination with that experience, which later in life, I could also expand to everyday moments of consciousness such as the overwhelming feeling of driving under a bridge just as a car passes over or riding on a train full of people as it passes another train full of people. It is in this subjective, yet conscious, understanding that many realities coexist in just that sliver of space and time. Even a century ago, things were not experienced that way. People would pass by each other, but not in anonymous masses hurtling through space as we do. They would talk to each other, exchanging realities. The development of the means of transportation and communications media altered our modern concept and perception of reality. Now we barely acknowledge that the other person exists.

The goal of *Mixing Realities* is to reproduce the feeling of realities being mixed but to also allow the user to intervene and define the manner in which this exchange is happening. In Duchamp's creative act, the artist, artwork and spectator become fully

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and syncretically engaged only after the artist sets the interface and interaction in motion. I wanted to interact with people through my work in a way that the work itself would do the interaction.

The choices of materials, influenced by the neo-concrete artists, in particular Oiticica's *Tropicália*, were meant to engage the user in a conversation with the artwork through their movements and the movements of people who had experienced the installation before them.



*Figure 33. Mixing Realities* prototype in the SVA studio, December 2008, New York, NY.







*Figure 36.* Matt Cardoso testing the reflections and delays inside *Mixing Realities* installation in the SVA studio, April 2009, New York, NY.

### 3.4.3. Project Description

*Mixing Realities* is an interactive hybrid environment with a semi-enclosed equilateral triangular mirrored wooden panel structure, a CPU running a Max MSP Jitter patch connected to a video camera inside the structure and a projector or monitor placed behind a two-way mirror. The patch interprets the user's movements and controls the opacity, speed and time delay of the projected image.

The three wooden panel mirrors, positioned in a triangle, create an infinite reflection of the audience as seen in figures 31 and 32. While the user engages in seeing himself or herself in front of the mirrors and adjusts to that reality, the video camera captures what is happening in the installation and stores the video in the buffer. Max MSP Jitter patch filters the video's white balance differences controlling how the

buffered video is released back. The videos are released by the patch and projected back onto the installation through the see-through acrylic mirror in four stages. The first is a direct reflection of what is happening inside the installation in the now (now), the second is an echo of the now with a 1-second delay (echo), the third release is a 3-minute delay (past). The released stage depends on the user's movement inside the installation. Past and present are then mixed on the mirror installation, potentially creating a fourth and final stage combining all the images in a psychedelic effect.

The users engaging and adjusting (movements) to their reflections on the mirror trigger the Max MSP Jitter patch filters, which controls how the different time-delayed stages fade into and merge with each other, defining the speed and opacity of the projected images, and how the captured videos are merged with one another. For example, if the user stays still in the center of the installation, the video captured is not released back into the installation, and the user just sees the infinite reflection of the self in the mirrors. If the user slightly moves, the patch releases the buffered 1-second delayed video with a certain opacity mixing the video projection with the mirror reflections. Bigger and faster movements trigger the 3-minute delayed video. Even bigger and faster movements increase the color saturation of the projected image creating the experience of painting psychedelic organic forms. The opacity of the released videos and how they merge into one another is triggered by the patch also based on the user's movements. The more one moves, the more opaque the video is released back.

This interactivity allows the user to mix his or her reality with himself or herself and with others through his or her body perception, thus exchanging between and mixing realities.



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The acrylic media mirrors combined with acrylic see-through mirror shows the best (and safest) reflection results for the installation. To develop the programming part of the project, a PVC prototype holding three 36”x 20” mirror panels was initially created (one panel is a see-through acrylic mirror (Figure 33). Later the wooden environment was created (Figures 4, 5, 6, 7, 8, 34, 37).

A camera inside the structure connected to a computer running a Max MSP Jitter patch (Figures 35) senses the user’s movements, which affects time, speed, and opacity of the images projected back into the structure, either through a projector or on a TV screen. The triangular mirrors create a kaleidoscopic effect, allowing users to see themselves infinitely reflected in the mirror. Any user’s movement triggers Max Jitter to show the video just captured by the camera inside the installation (Figure 34). Small, tentative movements project back into the installation whatever the camera captures with a one-second delay, creating subtle visual echoes of the user’s movements; more ample movements project with a three-minute delay, showing what was happening inside the installation three minutes earlier. Very expansive movements create psychedelic effects that vary according to the colors of the user’s clothes, the time of day, and the user’s movements. Users can then see and interact with their reflected selves in the present and/or in the past, with a stranger, or with shapes and colors—all at the same time and in different amounts as the projection is also reflected by the mirrors and captured by the camera.<sup>86</sup>

Interactive communication is a key element in “*Mixing Realities*,” which follows established second-order cybernetic feedback processes “by emphasizing autonomy,

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<sup>86</sup> The promo video about the artwork *Mixing Realities* can be accessed at <http://claudiajacques.com/work/installation/mixing-realities>.

self-organization, cognition, and the role of the observer in modeling a system”

(Heylighen & Joslyn, 2001, p. 3).

The user of *Mixing Realities* triggers a change in the system as the camera captures the user’s movements and the Max Jitter patch interprets the video’s white balance differences, which in turn trigger a change in the environment affecting how the captured video is projected back into the installation, which then triggers a change in the user’s behavior and interactions with the system.

This approach allows me, the artist, to mix my own perception of reality—in this case through the mirrored physical structure and the Max Jitter patch—with the user’s, which in turn is combined with the reality being projected back into the installation, generating a third reality co-existent with the others.

#### **3.4.4. Project Outcomes**

Early in December 2008, the triangular PVC prototype (Figures 3 and 33) of *Mixing Realities* was first shared with users and very well received. The prototype was set up in New York City at a two-day School of Visual Arts Computer Arts open studios event. The event felt more like an informal show-and-tell happening than a formal gallery exhibition, and it proved to be a perfect opportunity to identify the limits and problems of my first attempt to realize the project.

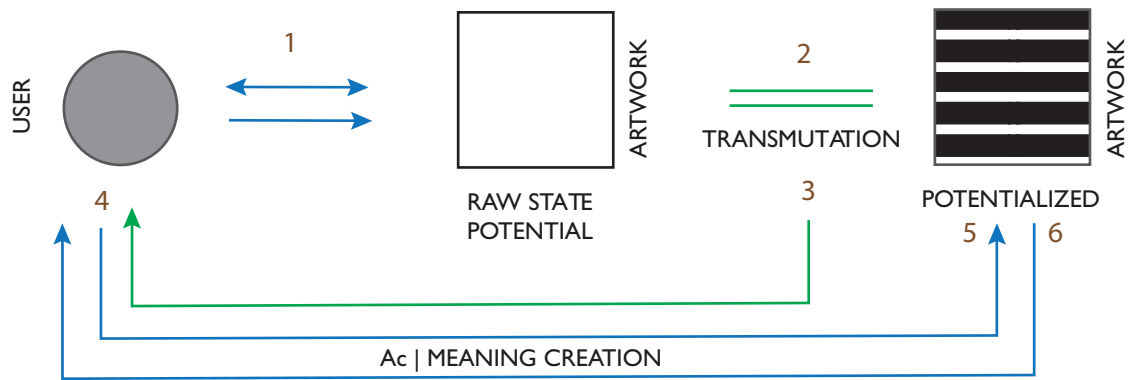
People gathered around the installation, waiting to get into the tight space inside the structure. Some stood close enough to observe the interactions inside, even peeking from above and directly engaging with the artwork and the person

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experiencing it inside. In the prototype, the image captured by the camera and displayed on the monitor screen behind a two-way mirror spilled onto the other two mirrors, and because of the angle of the panels, the image was even reflected outside the structure. This meant that people outside the installation were inadvertently, but quite directly, interacting with the user and artwork, which interfered with my goal at the time of promoting an intimate semiotic dance between the artwork, user, and myself, the artist, rather than an open performance. To address the problem of image spillover, I placed black bedsheets outside the prototype to stop the reflections.

Also, the prototype was consciously designed to fit only one person at a time in order to create an intimate user experience. I soon discovered an unforeseen problem of exclusion when I realized that one of my colleagues in the MFA program, who was wheelchair-bound, could not experience the prototype installation since the area was simply too small for him to access.

On the digital front, I observed that the Max MSP Jitter effects were initially too slow and the time delays too long for most users. The initial programming was mostly based on my own interactions with the artwork. But I have ADHD, and this meant that I was in nearly constant motion and triggering the visual effects much too easily. Most people are naturally less animated than I am, and in the prototype, this meant that they would have to move rather strenuously to trigger the effects. I had to rethink and reduce how Max Jitter was processing the differences between light and dark generated by a typical user's movements. It was surprising to realize that I was so much more active than most people and that there was a need to amplify the differences between light and darks to pick up the more ordinary range of movements. On the



**Figure 37.** The ideal creative act model with production of meaning – semiotic dance in the meta-environment promoting the cybersemiotic experience.

other hand, I had to learn to consciously slow and limit my own movements inside the installation in order to trigger optimal visual effects.

At the time, the sorts of issues presented by this first viewing of the *Mixing Realities* prototype seemed more like annoying minor aesthetic adjustments (similar to final paintbrush retouches on a painted canvas) than like a significant conceptual misunderstanding of meaning creation. In the course of my subsequent research and further practice and reflection, however, I began to look back through the cybersemiotic framework. I also learned to keep in mind the semiotic dance in the production of meaning. With the goal of attaining a cybersemiotic experience in the meta-environment, it became clear that in the absence of conceptual and/or speculative tools to analyze the artwork, I was making subjective decisions based solely on my own experiences observing and interacting with the artwork and its users and also that I was the primary beneficiary of such interactions in terms of meaning creation.

Here it is important to note how Duchamp’s creative act – creator, artwork, and user interactions – influence the *art coefficient* [Ac]<sup>87</sup> potentially promoting

<sup>87</sup> See chapter 2, section 2.4.2 which elaborates on Duchamp’s Creative Act.

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the semiotic dance. In my prototype, the “unintentionally expressed” [UE] artwork expressed the Creative Act when my “unexpressed but intended” [Ubl] concept was refined by the user. The artwork in its “raw state” potentialized the relationship between creator and spectator, who assumed passive and active roles in transmutating the artwork from “inner matter into work of art” (Duchamp, 1987, p. 139). In this transmutation, the artwork (object) became a sign-vehicle (representamen) promoting or reflecting meaning (Ac – interpretant). Here the meta-environment came to life as a dynamic complex system where user (both creator and spectator), information (meaning), and interface (artwork with its physical and digital elements) interacted in semiotic dance promoting a cybersemiotic experience (Figure 37).

In attempting to create an interactive artwork, I became increasingly aware of my own perceptions, which in turn triggered an understanding of the need to observe the relationship between other users and the artwork more closely. This is when Duchamp and Ascott’s thinking became a significant constituent element informing the artwork and its further evolution. By watching others interact with my artwork, I learned about my own self and how I abstractly conceptualized users and their interactions based on my own subjective traits and limitations.

My initially somewhat fuzzy awareness of issues such as image spillover, wheelchair accessibility, appropriate time delays, and optimal screen size, as well as the need for a more organic material, soon led me to transform the prototype from a 36”x 20” PVC structure with glass mirrors to a 6’ x 7’ wooden structure paneled with plexiglass mirrors. The programming was also adjusted to produce a time delay dependent on the user’s individual speed of movement, each triggering a new possibility of interaction.

Once I addressed the issues described above, the first full iteration of the artwork was created and briefly shown early in May 2009 at the SVA Computer Art studio (Figures 4 and 34). The three 6' x 7' wooden structure enclosed and hid the digital world inside, thus enabling the user to have an intimate personal experience. The monitor screen became a 6' x 7' rear projection on a two-way mirror. As most of my colleagues who experienced this full iteration were already familiar with the installation and its intended interactions, the upgrades and improvements were very welcomed.

*Mixing Realities* was first shown to the general public at the School of Visual Arts Chelsea Gallery in a selected student show called *Mediated Realities* on exhibition from May 26 to June 6, 2009. Due to its size and the need for a back area to rear project the images captured inside the installation, the artwork was placed in a large room in the back of the gallery. (Figure 5). The installation, itself a room-like 6' x 7' triangular wooden structure, sat alone in one side of the back room of the gallery. In order to isolate and protect the rear projection area and equipment, chains were placed extending from the back of the artwork to the walls.

I was surprised to observe that only about half the people who passed by the installation opened the doors to peek inside. My expectation was that most of them would have enough curiosity to be motivated to explore the physical environment and, according to their own perceptions and inclinations, engage with the artwork on different levels. However, once those users who actually took the initiative to look inside saw their infinite reflections in the mirror, they apparently became self-conscious and quickly left the environment. Others just stood inside for a few moments, staring at themselves in the mirror without attempting to move about and interact with the

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artwork. On the other hand, and to my surprise, most people were drawn to the back of the physical structure and attempted to see what was going on inside the chains.

Notably, a few users did become totally engaged in exploring the installation, interacting with themselves in the mirror and with the delayed projections triggered by their movements. The users who fully immersed themselves in the environment often contacted me later to describe how unique the experience was, especially how they experienced their own perceptions of time and space in new ways.

*Mixing Realities* was again shown to the general public in the Westchester Community College Fine Arts Gallery in Valhalla, NY, as part of the WCC *Faculty Selects* exhibition from March 14 to April 23, 2011. In preparing for this installation, the first issue that I had addressed was blocking the back of the artwork with dividers so that users would not have access or even see the back (Figure 6). By this time, I had launched my dissertation research and was determined to create the intimate semiotic dance between the artwork, user and myself. Unfortunately, I didn't realize that by blocking the only area where users could passively observe the interactions and create their own understanding of the artwork, I had inadvertently prevented users from transmutating the artwork's (object) "raw state" into a sign-vehicle (representamen) that promoted meaning (interpretant).

From its earliest inception, *Mixing Realities* was developed to be an exchange on any level that the user might possibly perceive, as the "primary motivation was to start a dialogue, to set feelings and ideas in motion" (Ascott 2007, p. 111). Nonetheless, it was simply frustrating to once again see so few people really engaging with the artwork. The installation aim was to combine physical and digital elements in an intuitive, user-friendly, and relatively private HCI system. In its development, I followed all the current



**Figure 38.** Prospective users checking inside *Mixing Realities* (2014) installation at Arts Westchester, White Plains, New York, USA. In this version a TV screen showing what happens inside the installation was placed outside the environment in an attempt to address what was observed with the understanding of the cybersemiotic experience.



approaches in second-order cybernetic feedback processes, user experience (UX), and interaction design, yet I remained puzzled why the first connection between the user and the interface did not happen more frequently.

As I also design dynamic interactive digital information environments, I eventually began to realize that the disconnect between the user and the interface that I observed in *Mixing Realities* in 2009 and 2011 was very similar to the disconnect users frequently experience when facing any new interface (whether a gadget, computer application, or website). It seemed that the disconnect from the information—either for lack of knowledge about or lack of interest in it—accentuated the discomfort with the interface. That is when I became aware that something more than optimal second-order cybernetic feedback processes, information design, and user experience guidelines and rules was needed to conceptually ground and move my artistic practice forward, so that the user would be fully integrated into the work as originally intended.

Looking again at Duchamp's Creative Act equation, where  $Ubl-UE=Ac^{88}$ , it appeared that I had committed the same mistake that I criticized the Naumann gallery curators for making when they isolated Duchamp's Trébuchet from potential users and, in the process, prevented the Art coefficient (Ac) from moving beyond its "raw state" and realizing the potential of the semiotic dance. But in the case of the Naumann gallery and Trébuchet, the transmutation of the artwork had actually happened previously through Duchamp's initial showings and conceptualizations, such as the Creative Act. Only those user/spectators who didn't read the artwork's description in the Naumann gallery or catalog would experience Trébuchet in its "raw state." In the case of the exhibition of *Mixing Realities* at the Westchester Community College gallery,

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88 Unexpressed but intended [Ubl] concept, unintentionally expressed [UE] work, art coefficient [Ac]. See chapter 2, section 2.4.2.

I realized that by not making the visualizations projected inside the installation available to all users to see independently if they were actively interacting with the work, I too limited the Ac's potential by restricting it to its "raw state."

When the *Mixing Realities* prototype was first shown in the SVA open studio in 2008, people could passively interact with what was going on inside the installation and embody that experience, thus creating their own meaning and promoting new accumulating meanings for the artwork through the semiotic dance and consequently through their desire to actively interact with the artwork. This awareness became more palpable and conceptually rich as I learned to deploy the Cybersemiotic framework with its four aspects: physical, biological, perceptual and cognitive. This framework allowed me to observe and analyze dynamic interactive hybrid environments more closely and to conclude that relying on conceptualizations of the interface as (1) replicating and reinforcing physical perceptions of embodiment and also as (2) the sole mediator of the digital/physical experience<sup>89</sup> actually limits the possibilities of interaction. The users' apparent need to embody their own experience made me realize that to promote the semiotic dance I had to passively engage the users even if that meant loss of the exclusive, intimate, and fully enclosed experience (whatever that meant for me). So in the next two showings of *Mixing Realities*, I placed a monitor outside the installation to make public the users' experience inside the structure (Figures 7, 8 and 38).

In 2014, *Mixing Realities* was shown in two different but related venues. From May 20 to August 16, it was part of the *STEAM* exhibition at the ArtsWestchester Gallery in downtown White Plains, the county seat and commercial hub of Westchester

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<sup>89</sup> See chapter 1, footnote 6.

County, NY. From there, it was transported to nearby Tarrytown and reinstalled in the main building on the Regeneron campus, where it was exhibited from August 20 to November 5. I visited the installation frequently with family, friends, and colleagues while it was exhibited at ArtsWestchester. There I observed that most people stood for at time looking at the external monitor before getting into the installation. Some did not enter at all but stayed passively observing others inside, which I could conceptualize through the semiotic dance as promoting the Art coefficient and consequently influencing how the next user might interact with the artwork. This process, in turn, changed how the passive user experience of the artwork completed the semiotic dance and promoted a uniquely new cybersemiotic experience. The user is the one who completes the artwork and, as such, needs to address the creation of meaning. These understandings are further elaborated in the next two chapters through ontological analysis of user-information-interface relationships and space-time aesthetics in interactive hybrid environments.

### 3.4.5. Overview

In 2008 I started to develop *Mixing Realities* a large dynamic and interactive hybrid physical-digital installation that relies on the productive influence of the user's perceptions of the information being generated to function. The aim of this technoetic<sup>90</sup> artwork is to expand consciousness by engaging the user in a private dialogue with his or her own perceptions of spatial-temporal reality as well as the possible different realities that can exist around us—and which we integrate into our own perceptions—by interactively combining the present and the past, the real and the virtual, through cyberperception.<sup>91</sup> This initial attempt to expand the consciousness of users through an

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90 See chapter 2, section 2.6.4.

91 See chapter 2, section 2.6.3.

artwork became the starting point for a journey toward an enhanced artistic practice and a reconceptualization of the possibilities of interactive hybrid environments to mediate shifts in perception and consciousness.

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### 3.5. Conclusion

Serving as the hermeneutical phenomenological basis for reflection and analysis of HCI; more precisely interactive hybrid environments, this chapter introduced the migration from, and connection between, practice and theory in the production of new knowledge. Deployed Kuhn, Goodman, Ascott, and Brier to argue for a non-reductionist interdisciplinary framework to equate user, information and interface in meaning creation. It also shared my personal hermeneutical phenomenological account of observing, analyzing and mapping my creative process and meaning production. Grounded on formal aesthetic analysis and the cybersemiotic framework introduced the different roles user, information and interface exercise mediating meaning production. Presented the interactive hybrid environment, *Mixing Realities* as a critical case study with its objectives and limitations. Introduced Duchamp's creative act on the production of the *Ac* and the aim of establishing the semiotic dance to promote an optimum exchange between user, information and interface.

Aiming to reconcile different understandings of the world, especially the binaries mundane/sublime, virtual/real, digital/physical, spacetime, the next chapter describes the current domains utilized to address HCI, focusing on the ontology and methodologically employed when observing interactive hybrid environments through space-time experience. Establish the need for observing HCI transdisciplinary context,

## CHAPTER 3 | MIXING REALITIES

calls for defying the elements involved in interactive hybrid environments and the integration of these elements (user, information and interface) as a complex adaptive system called meta-environment. It observes and defines events that enhanced physical embodiment in HCI and elaborates on departing from such experiences when integrating perceptions and processes.

## CHAPTER 4 | SPACE-TIME EXPERIENCE IN THE META-ENVIRONMENT

### Contexts, Subject Matter, and Issues

- 4.1. Introduction
- 4.2. Transdisciplinary Context
  - 4.2.1. Introduction
  - 4.2.2. Computer Arts and Telematic Aesthetics
  - 4.2.3. Interactive Hybrid Environments
  - 4.2.4. Human-Computer Interaction
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- 4.3. The Meta-Environment
  - 4.3.1. Introduction
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- 4.4. Space-Time Experience
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  - 4.4.3. Semiotics of Embodiment
  - 4.4.4. Art and Science Boundaries
  - 4.4.5. Space and Time Experience
  - 4.5.6. Overview
- 4.5. Combining Perceptions and Processes

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### 4.1. Introduction

Addressing Roy Ascott’s call for artists “to navigate consciousness and create new structures, images and experiences within” (2010, p. 4) their art practices exploring the concept of cyberperception,<sup>92</sup> this chapter defines interactive hybrid environments, contextualizes the phenomena surrounding the development of such environments, and defines their elements, calling attention to the ontological and methodological issues that arise from attempting to accord them appropriate and balanced attention.

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<sup>92</sup> Cyberperception is introduced in chapter 2, section 2.6.3. Telematic Discourse and Cyberperception.

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The commoditization of digital information through dynamic databases such as Google Amazon, Facebook, and Ebay, among many others, has added greater complexity and urgency to the study of human-computer interactions. In general, the study of humans and digital machines tends either to focus on logical processes, paying little attention to phenomenology and experiential consciousness or, alternatively, to focus on cognitive perceptions, disregarding self-organization, autopoiesis, and feedback loops (Brier, 2008).

Coming as I did from computer arts, the field of HCI seemed at first to adequately address such divides in the study of the interaction between humans and digital machines, but on closer examination, I began to perceive a complex evolving system with boundaries shifting fluidly among contrasting fields, thus revealing a disturbing pseudo-transdisciplinarity.

At this point, there is a need to create a clearer distinction among the adjectives multidisciplinary, interdisciplinary and transdisciplinary employed to describe how diverse academic disciplines can be combined to create knowledge. Oxforddictionaries.com defines *multidisciplinary* as “combining or involving several academic disciplines or professional specializations in approach to a topic or problem.” Interdisciplinary is defined as “of or relating to more than one branch of knowledge” and transdisciplinary as “relating to more than one branch of knowledge.” The boundaries seem vague but Willie Caldwell further elaborates on such differences.

Multidisciplinarity contrasts disciplinary perspectives in an additive manner, meaning two or more disciplines each provide their viewpoint on a problem from their perspectives. Multidisciplinarity involves little interaction across disciplines.

Interdisciplinarity combines two or more disciplines to a new level of integration suggesting component boundaries start to break down.

Interdisciplinarity is no longer a simple addition of parts but the recognition that each discipline can affect the research output of the other.

Transdisciplinarity occurs when two or more discipline perspectives transcend each other to form a new holistic approach. The outcome will be completely different from what one would expect from the addition of the parts. Transdisciplinarity results in a type xenogenesis where output is created as a result of disciplines integrating to become something completely new (2015, n.p.).

The discussion of the proper term to define how interactive hybrid environments are created is relevant to this dissertation since it summarizes the way we have been addressing the ontology and methodology employed in combining the many different fields involved in such environments.

Our understanding of HCI is continually evolving as digital technologies increasingly permeate the different domains of life, from art, media and education to transportation, security surveillance, medicine, and health, to name a few. HCI is pseudo-transdisciplinary as it borrows theories, methods and ontologies from different fields such new media, computer science, cybernetics, information systems and theory, artificial intelligence, cognitive psychology, library science, linguistics, communications theory, and semiotics, and so forth. Unfortunately, these fields don't necessarily share the same methods or fundamental views about what is involved in describing and analyzing such exchanges between humans and machines.

The aim of this chapter is to define interactive hybrid environments and highlight some of the fields of study employed to analyze such environments. I begin by observing and describing current practice in implementing such environments and why HCI superficially seems to cover the different divides. In this chapter I acknowledge the boundaries and limitations of HCI and delineates its reductionist approach and its



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restricted transdisciplinary context when addressing the subject matter in interactive hybrid environments: humans and computers. Thus, in this chapter I define and address the elements involved and the domains utilized to analyze such environments, and it focuses on the ontological and methodological gaps observed when attempting to describe HCI, more specifically interactive hybrid environments.

In 1990 Roy Ascott wrote an article entitled “Beyond Time-Based Art” addressing how telematics was changing our perception of time and highlighting the need to move “from the older frame of time and representation to multiple and layered frames of parallel time-worlds, creating the ceaselessly bifurcating semantic pathways of virtuality and simulation” (2007, p. 231). Like Ascott, Negroponte and McLuhan also predicted a change in our time perception.

What they didn’t count with is our need for embodiment has made us perceive computer interfaces as extensions of ourselves, restricting digital technologies potential to expand our perceptions of space and time beyond the linear continuum. Mike Phillips describes the impact and implications of technology on our space and time perception:

[T]he shifts in our perception of time and space caused by [digital technologies] can be compared to the impact of the ‘machine’ had at the turn of the 20th century. . .

The ‘global embrace’ of McLuhan’s (1973) extended nervous system, which contracted the globe into ‘no more than a village’, did not actually liquidate space and time. It gave the ‘linearisation of time’ another ‘dimension’, the ability to pass through many streams of ‘geographical time’, but was still linear” (Phillips, 1999, p. 133-134).

Phillips was introducing *The Humming of Strings*<sup>93</sup> which proposed a system “suggesting the opportunity to jump in and out of the space-time fusion, by adding another

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93 The artwork proposal is presented on Mike Phillips blog <http://www.mike-phillips.net/blog/humming/>

‘dimension of time’” (p. 134). Non-linear and asynchronous interactions have been flattened and embodied as space by the interface. Instant message applications allow for non-linear and asynchronous interactions, yet, the medium delivers the exchanges in a linear and somewhat emulated synchronous format with line of text after line of text. In this chapter we will also look at how space-time aesthetics dictate processes and perceptions that are still limiting and linear in scope, influencing a balanced integration among the elements in the meta-environment: user, information, and interface.

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## **4.2. Transdisciplinary Context**

### **4.2.1. Introduction**

At 45 years old, I was able to experience digital technologies through the eyes of twenty-something peers in the M.F.A. program in Computer Arts at the School of Visual Arts (SVA) in New York City. At that time, I had almost twenty years of intimate involvement with computers, using graphical interfaces and/or code to create with and through computers. The revelation at SVA was that my younger peers had nearly the same length of experience that I had, yet the content and nature of their experience was qualitatively different from mine. They were able to immerse themselves in digital environments in ways that were totally alien to me. Computers were an integral part of their culture and language, their understanding of themselves and the world. Up to that point, computers had been merely tools for me. The experience of technologically augmented perception—cyberperception—changed my practice and artistic processes and allowed me to more fully embrace computer arts and telematic aesthetics and the potential of HCI and interactive hybrid environments.

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The aim in this section is to formally introduce computer arts in conjunction with Ascott's telematic aesthetics as the initial framework within which to observe and define interactive hybrid environments and HCI as a field of study for such environments. Different aspects involved in implementation of such environments and presents the fuzzy and evolving boundaries of the field are addressed.

### 4.2.2. Computer Arts and Telematic Aesthetics

Chapter 3, introduced the interactive hybrid environment *Mixing Realities*, describing the various aspects of the installation and revealing the skills needed to actualize such environments. It pursued an authentic, transdisciplinary approach since 2D and 3D design, woodworking, practical applications of the physics of mirrors and lights, physical computing and electrical components, programming, user interface and user experience design, and feedback processes were observed to promote cyberperception. This was the final thesis project and culmination of my MFA in Computer Arts at SVA. The site for the program offers the following chair's statement:

We place a strong emphasis on personal exploration by encouraging students to push their preconceived boundaries and embrace early experimentation as a critical part of the iterative process.

The MFA Computer Arts program emphasizes creativity and a multidisciplinary approach to producing innovative animation, motion graphics and fine art within a collaborative state-of-the-art production environment. Our goal is to develop artists who will continue to challenge norms, question standards, and surprise people long after they leave SVA (Masson, 2017, n.p.).

This statement gives the background for the understanding of how digital technologies are seen and explored in the context of the program. Words such as push boundaries, experimentation, collaborative production environment, challenge norms, reveal infinite possibilities of contexts, approaches, and fields. It was with these very fluid boundaries that *Mixing Realities* was conceptualized and produced.

At that time (2007), computer art, multimedia art, digital art, interactive art, media art, and new media art, were some of the labels used to describe the broad arena of artistic production utilizing digital technologies. Art historians such as Oliver Grau, Margot Lovejoy, Lev Manovich, Christine Paul, Edward Shanken, and Mark Tribe attempted to define these phenomena with precise terms, focusing on how technologies were employed or created in aesthetic production. Today some of the preferred terms are *digital art* (Paul), *new media art* (Manovich, Tribe), and *media arts* (Lovejoy). Ironically, their boundaries today are even fuzzier than in the past since digital technologies permeate all aspects of artistic production, either to inform or produce artworks, or both. As hard as it is to define a field of study which involves computer processes integrated with and in artistic practices, computer arts opens up a world of possible transdisciplinary approaches since it focuses on the characteristics of the processes employed instead of defining the boundaries of the media. As Nick Lambert observes:

[T]he characteristics of “Computer Art” were as follows:

- i) The artist manipulates information directly, without the limitations intrinsic to a physical medium;
- ii) The computer can interact with and react to the viewer after production, or even as a creative agent in its own right if programmed to do so (Lambert, 2009a).

Computer artists promote cyberperception through the creation of new structures which themselves become agents of change transforming data into information without the physical limitations of hardware (or any particular structure or device) but incorporating software and/or programming. This perspective reflects Shanken’s understanding of how Ascott’s telematic aesthetics integrate process and information in the production of meaning:

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One must also recall Ascott's emphasis—for some forty years—on process, on the phenomenology of interactive participation in aesthetic encounters, and the discursive production of meaning as the result of information exchanges within systematic contexts. (Shanken, 2007, p. 85).

Telematic aesthetics link computers and communication networks, expanding computer art to a participatory global network where linking minds generates a collective consciousness with dense layers of meaning and implications (Ascott, 2007).

According to Lambert (2009b), Ascott's telematic aesthetic parallels computer art in understanding the participant's integration with the artwork, thus creating a syncretic relationship between artist and spectator in the production of meaning.<sup>94</sup> Computer art also expands the understanding of the medium in the production of the artwork, as the computer "operates simultaneously as medium, tool and context, in addition to its organizational and interactive elements" (Lambert, 2009c), reinforcing the semiotic dance between object, representamen and interpretant introduced in chapter 2, section 2.4.2.

*Mixing Realities* was conceptualized in the syncretic context of computer art and telematic aesthetics, since the expansion of cloud computing and wireless communication have blurred the line between these two fields. Even if a computer artwork is not connected to networks, its concept and/or development is grounded or depends on networks to come to fruition. To better understand the implications of the syncretic context of computer art and telematic aesthetics, it is necessary to define the scope and content of interactive hybrid environments as the term is used in this research.

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<sup>94</sup> The relationship artist-spectator is introduced in chapter 2, section 2.4.2. through Duchamp's Creative Act and developed in section 4.3. to establish the user.

### 4.2.3. Interactive Hybrid Environments

As mentioned in the previous section, computer art as a telematic art form promoting cyberperception informed the initial development of “Mixing Realities.” As established in the previous chapter, the most appropriate term to describe the characteristics and relationships of such an artwork is *interactive hybrid environments*, defined and understood as aesthetic constructions aiding human attempts to navigate consciousness.

*Interactive* refers to the fluid exchanges between its elements as well the collaboration between artist and spectator dynamically creating meaning through perceptions and/or processes. The word reflects Ascott’s understanding of interactive art as a “cybernetic system, consisting of [art, culture and society as interconnected systems of] feedback loops that included the artist, the audience and environment (Shanken, 2007, pp. 26–27). It also reflects Peirce’s “semiotic paradigm ... focuse[d] on the possibilities of meaningful communication in living and social systems” (Vidales, 2017).

The term *hybrid* is inescapable when promoting cyberperception and compels us to look at these elemental characteristics: spatiality, temporality, essence, sign processes, embodied cognition, and level of dynamic complexity.

- Spatiality refers to how an element manifests as either physical (matter) or energy (digital).
- Temporality refers to the distinction between temporal and atemporal qualities, as well as synchronous and asynchronous interactions.
- Essence refers to the elements’ core biological atoms or bits Negroponte,

1995).

- Sign processes refers to the linguistic-cultural-social structuralism (semiotics) and constructivism, relating to subjective or objective sign interpretation and meaning creation.
- Embodied cognition reflects how we embody information (meaning) as opposed to disembodied digital information.
- Dynamic complexity refers to creativity, aesthetic, design, usability and purpose of such environments, focusing on the predictability and linearity of their interactions (Brier, 2008; Vidales, 2017).

In practice, hybridity reflects the physical (atoms, hardware, peripherals, humans) and/or digital (bits, software, data transmission) characteristics; as well as how information is perceived, either as individualized meaning—qualia (perceptions) or data (processes). The term also relates to how space and time are presented, as space-time continuum where physicality may not always be linear and synchronous.

The term *environment* is essential due to the complexity of the elements and processes observed in such artworks, experienced, perceived and embodied by their users (creator and spectator),<sup>[95]</sup> revealing autopoietic systems structurally coupling human-human, human-information, information-information, human-computer, information-computer, computer-computer interaction (Dubberly & Pangaro, 2015a). This understanding reflects cybernetician Gordon Pask's "aesthetically potent environment" concept. Pask's assumed that an environment can be revealed in any human related activity, yet a cybernetic conversation among the user and artwork needed to exist for the environment to be "aesthetically potent" (Rosen, pp. 227–232).

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95 Section 4.3.2. elaborates on the term *user*.

Following Pask's "aesthetically potent environment," whether creating or analyzing interactive hybrid environments, the boundaries between artist-artwork-spectator and information and computer become fluid and translucent, making us rethink their respective roles. As Ascott argues:

Art does not reside in the artwork alone, nor in the activity of the artist alone, but is understood as field of psychic probability, highly entropic, in which the viewer is actively involved not in the act of closure in the sense of completing a discrete message from the artist (a passive process) but by interrogating and interacting with the system "artwork" to create meaning. (Ascott, 2007, p. 179).

It may feel satisfying for an artist to view her artworks as unique pieces of creative insight, but the perspective of telematic aesthetics, where phenomenological collaborative exchanges aim for production of meaning, takes us in a different direction (Shanken, 2007; Ascott, 2007). From a telematics perspective, the creative process is decentralized in interactive hybrid environments and as such artistic practice becomes inherently collaborative practice, no different in kind from exchanging on crowdsourcing environments, social networks, or content and learning management systems.

Alexa, Amazon's Echo intelligent personal assistant analyzed in chapter 3, section 3.2.4, is trained by its user in the household, who asynchronously collaborates with the user-creator (designers developing the interface and its skills), making Alexa unique in the production of meaning for each of its various end users in the household.

*Mixing Realities* just like Alexa and the different social media and content management systems that employ dynamic databases, relies on the user-spectator exchange to asynchronously collaborate with the user-creator in the production of meaning. In such interactive hybrid environments, the creative process and outcomes are collaborations outputting unique meanings. Christiane Paul argues that:



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One of the inherited characteristics of digital art is the tension between the hierarchical structure of instructions and data sets and the seemingly infinite possibilities for reproducing and reconfiguration the information contained in these structures (Paul, 2015, p. 179).

The potential of different meanings and relationships to the user is introduced in chapter 2, section 2.4.4 and further discussed in this chapter in section 4.3 in relation to the presentation and analysis of the meta-environment. In Paul's approach, the focus is on the language of computer science—"hierarchical structure of instructions and data sets...information contained in these structures"—employed here to describe a field of art. Such language indicates that an expansion beyond strictly artistic domains is needed in order to observe and describe these environments. This aesthetic lens offers the freedom to employ the language of computer systems, mixing and matching with other domains of study without the scientific rigor of sticking to a specific ontology or methodology.

This freedom is possible because artists can interpret and define the meaning of such languages based on their hermeneutical phenomenological perceptions and intuitions (Ascott, 2007). "But to fully orientate himself in the modern world, the artist must turn to science as a tool and reference" (Ascott, 2007, p. 100). In 1964, Ascott recommended cybernetics as a field that would help artists ground their understanding and language when creating interactive environments because of its integrative characteristics.<sup>96</sup> Over fifty years later, interactive hybrid environments have permeated all aspects of life, from artistic practices to self-driven cars, video-games and watches, to name a few. This expansion broadened the areas of approach to many different fields, including biological and chemical. In this sense, interactive hybrid environments can also refer to moistmedia "compromising bits, atoms, neurons, and genes in every kind

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<sup>96</sup> Ascott was referring to second-order cybernetics. More later in this chapter, section 4.4.2. Learning to Embody the Digital.

of combination” (Ascott, 2007, p. 363). The challenge is to include such broad fields in creative practices while respecting the demands of scientific fields that inform such practices without reducing the sphere of creative practice. Artists and designers of interactive hybrid environments need a framework which allows a non-reductionist approach to the elements and processes involved.

Today, at first glance, HCI seems to be the appropriate umbrella for studying such eclectic hybridity since digital technology has already permeated all aspects of aesthetic creation. HCI attempts to comprehend such diverse hybridity by offering different ways to reconcile the integration of computational processes with meaning creation. However, HCI is self-limiting insofar as it examines distinct aspects of such interaction without taking the whole into consideration.

#### **4.2.4. Human-Computer Interaction**

Human-computer interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them (Hewett et al., 2009).

Quite often HCI is the filter for discussions involving the design of digital technologies ranging from artistic practice to medical science because of its broad reach. Initially presented as a specialized concern within several disciplines and consequently framed as an interdisciplinary area with different emphases (Hewett et al., 2009), HCI does at first glance seem to be the encompassing field to which artistic practitioners should turn when working with interactive digital technologies. Artists certainly need to have a domain of this nature available in order to develop such artworks. Just as painters need to have a deeper understanding of brushes, canvases and paints, as well as light to represent value and color; artists creating interactive hybrid environments need

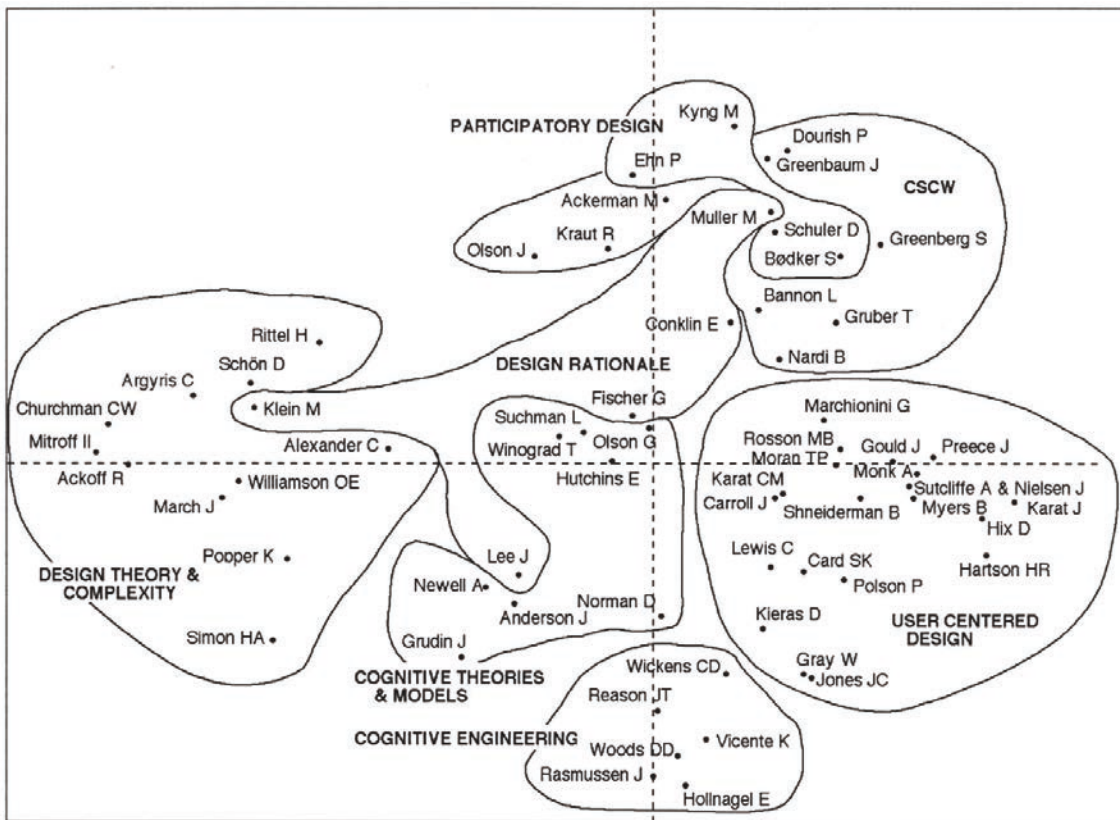


Figure 39. Author Cocitation Map (Wania, et al., 2007).

a deeper understanding of human computer interactions in order to enhance the experience of such works.

When in 1992 the Association for Computing Machine (ACM) Special Interest Group on Computer-Human Interaction (SIGCHI) developed its curricula for HCI, it saw the field as interdisciplinary.

Because human-computer interaction studies a human and a machine in communication, it draws from supporting knowledge on both the machine and the human side. On the machine side, techniques in computer graphics, operating systems, programming languages, and development environments are relevant. On the human side, communication theory, graphic and industrial design disciplines, linguistics, social sciences, cognitive psychology, and human performance are relevant. And, of course, engineering and design methods are relevant (Hewett et al., 2009).

As a counterpoint to the understanding that HCI is an interdisciplinary field, Wania, Atwood and McCain (2007) introduce it as multidisciplinary, combining theories and

practices from computer science, cognitive and behavioral psychology, anthropology, sociology, ergonomics, and industrial design.

It is revealing that Wania, et al. (2007) call HCI multidisciplinary, attesting that is a unique field with many different sub-communities or specializations (Figure 39). By drawing the parameters of HCI so broadly, theorists of the field attempt to prevent the design of such interactions from being divorced from the context and problems being addressed in the design (Hewett et al., 2009), yet it privileges some aspects while ignoring others in order to integrate its many domains.

John M. Carroll critiques such attempts at broad scale integration in HCI in his analysis of the scientific fragmentation of the field.

An ironic downside of the inclusive multidisciplinary of HCI is fragmentation. This is in part due merely to the expansion of the field and its scientific foundations. In the 1980s, it was reasonable to expect HCI professionals, particularly researchers, to have a fairly comprehensive understanding of the concepts and methods in use. Today, it is far more challenging for individuals to attain that breadth of working knowledge. There are too many theories, too many methods, too many application domains, too many systems. Indeed, the problem of fragmentation may be a bit worse than it has to be. Some HCI researchers, faced with the huge intellectual scope of concepts and approaches, deliberately insulate themselves from some portion of the field's activity and knowledge. This tension between depth and breadth in scientific expertise is not unique to HCI, but it clearly undermines the opportunity for multidisciplinary progress (Carroll, 2003, p.6).

The consequences of the fragmentation of HCI are sometimes most acutely observed in the fields of neuroscience and artificial intelligence, where the same language is employed to define and describe radically different elements and processes.

The text below is an example of how a language of computer science is appropriated to describe biological phenomena in an attempt to connect the two fields as if they share the same ontology and methodology.

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According to the researchers, the new learning theory may lead to advanced, faster, deep-learning algorithms and other artificial-intelligence-based applications, and also suggests that we need to reevaluate our current treatments for disordered brain functionality. The brain learns completely differently than we've assumed, new learning theory says (The Brain Learns Completely Differently than We've Assumed, New Learning Theory Says, 2018).

Flattening the two fields as if their essences are one is broadly parallel to how humans use the techniques of linear perspective to represent the three-dimensional world in a two-dimensional medium. The technique is a great solution for the problem of 3D representation but falls short of being a reproduction of reality. Such techniques are just attempts to create realistic representations of reality. This Renaissance technique has helped humans perceive the 3D world through more realistic 2D representation. It has also taught us to simplify reality and accept the absurdity of the distorted planes created with linear perspective.<sup>97</sup>

The use of linear perspective in 2D representation helps us visually perceive the representation of the world more realistically while also disregarding our other senses and consequently flattening our perception of the 3D world. In a similar manner, employing the same language to analyze and describe such dichotomous areas as neuroscience and artificial intelligence may help our understanding of these two fields while simultaneously limiting our understanding of the singularities of their inherent characteristics.

HCI is a multidisciplinary framework that facilitates the understanding of interactive hybrid environments but also restricts its aesthetic potential since it does not promote a genuinely syncretic exchange among the fields involved.

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<sup>97</sup> The techniques of atmospheric perspective, value pattern sizing and overlapping when employed with linear perspective help reduce the visual distortion it creates and consequently visually render more realistic representations of reality.

#### 4.2.5. Overview

As a technoetic artist coming from computer arts and pursuing a telematic aesthetic to promote cyberperception through interactive hybrid environments, I was initially drawn to HCI as the one-stop framework to inform and support my practice in creating new structures and experiences to navigate consciousness. Unfortunately, HCI's multidisciplinary falls short of realizing the project of embracing cognitive perceptions while also addressing logical processes.

An analogy for HCI's multidisciplinary is a dark room illuminated by a flashlight. The flashlight may illuminate one side of the room, but the other sides remain dark, and even though the flashlight may have the potential of illuminating the whole room it does not and can not accomplish it. If we consider that painters rely on observation and the understanding of wholeness to inform their practices and consequently define the best composition, it is important to first get a broader view of the elements involved in interactive hybrid environments and address their characteristics and methods of interpretation.

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### 4.3. The Meta-Environment

#### 4.3.1. Introduction

In the curricula for Human-Computer Interaction five interrelated aspects of human-computer interaction are introduced:

- (N) the nature of human-computer interaction,
- (U) the use and context of computers,
- (H) human characteristics,

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(C) computer system and interface architecture, and

(D) the development process. (Hewett et al., 2009)

These different aspects of HCI reveal how the elements are separated and broken down in even more precise areas of study for a more detailed focus. The index for the curricula for Human-Computer Interaction shows not only how segmented the fields are but a language mostly restricted to computer science.

- N The Nature of HCI
  - N1 (Meta-)Models of HCI
- U Use and Context of Computers
  - U1 Human Social Organization and Work
  - U2 Application Areas
  - U3 Human-Machine Fit and Adaptation
- H Human Characteristics
  - H1 Human Information Processing
  - H2 Language, Communication, Interaction
  - H3 Ergonomics
- C Computer System and Interface Architecture
  - C1 Input and Output Devices
  - C2 Dialogue Techniques
  - C3 Dialogue Genre
  - C4 Computer Graphics
  - C5 Dialogue Architecture
- D Development Process
  - D1 Design Approaches
  - D2 Implementation Techniques

- D3 Evaluation Techniques
- D4 Example Systems and Case Studies
- P Project Presentations and Examinations (Hewett et al, 2009)

The titles of the different focuses of HCI reveal the segmentation of the field highlighted by Carroll (2003) as well as the strong emphasis on logical processes since humans are seen as “processors of information” (Hewett et al., 2009). This table reveals both the segmentation of the field and its information processing bias, where cognition is not directly addressed. Even though cognition and Gestalt psychology are amply studied in HCI when looking at the human information processing, if we consider that artists and designers are usually the ones initiating the creation of interactive hybrid environment, it seems faulty that a discussion of qualia is missing in the table above. It is also interesting to see how information is dissociated from the whole and presented as either a human process or as embedded in the architecture of the machine. Lastly, the language employed reveals that, for the most part, methods and ontologies of computer science are employed to describe and analyze human interactions.

It is important to also note that the dissonant natures and aspects of the fields subsumed by HCI render invisible the ludic interactions envisioned by Duchamp and his Creative Act as well as the aims of a technoetic aesthetic as proposed by Ascott to intentionally promote an individualized phenomenological experience. The dissonance starts with the subject matter of phenomena, which focuses on a dyadic human-computer relationship but ignores the depth and breadth of information. Søren Brier critiques the manner in which technological developments not only create extra layers of complexity but also affect communications and information.

The scientific endeavor in the postmodern age is becoming increasingly complex and transdisciplinary. Researchers and practitioners within the fields of the



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arts and natural, medical, and social sciences have been forced together by new developments in communication and knowledge technologies that broke the traditional limits of professional knowledge. They are further forced together by problems arising from the limitation of the kinds of knowledge that we have cherished so far. The shortcoming of traditional information and communication analysis based on data or information-flow theories is raising fundamental problems with respect to the construction and organization of knowledge systems. New concepts of communication can help us understand and develop social systems such as self-organizing and self-producing networks, and we need a deeper understanding of the ethics and aesthetics foundational to the existence of these new systems. Instead of communication of information, we might speak of a jointly actualized meaning (Brier, 2008, p. 20).

A painter attempting to reproduce a landscape will spend time observing the environment and sketching what is seen in a much-simplified form in order to establish the composition. In this research study I propose to simplify subject matter in HCI by focusing on the three main elements addressed in interactive hybrid environments, so they can be defined and isolated for ontological clarification. These three elements are the user, the interface and the information.

The communicability among these three elements (user, information and interface) reveals a complex adaptive system with many levels of exchange among its elements. I call this relationship the meta-environment since it involves the processes of storing, relating, inputting, and outputting information as well as the users' actions and the many elements of the interface, such as software and hardware. The meta-environment includes the relational processes of data (information), metadata, database, applications, user interaction, and information communication existent in the triadic relationship amongst user, information, and interface.

In an attempt to sketch the subject matter of this research—interactive hybrid environments—and elaborate on its elements, the ontological use of the terms user, information and interface is introduced in the following subsections.

### 4.3.2. User

Duchamp's Creative Act<sup>98</sup> established the inclusion of the spectator in the artistic creation of meaning, which through the lens of Peirce's semiotics reveals the potential for a semiotic dance among object, representamen and interpretant with the possibility of infinite exchanges among the artist, the artwork and the spectator. For Duchamp as well as for Ascott, the artwork is only completed when the spectator is included in the process. Artist and spectator become, then, co-creators of meaning and thus the terms artist and spectator begin to seem inadequate to capture the potentiality of this co-creation process.

Calling for a reconceptualization of terms due to the advent of digital technologies, Stephen Wright argues that "with the rise of networked culture, users have come to play a key role as producers of information, meaning and value, breaking down the long-standing opposition between consumption and production" (Wright, 2013, p. 1).

Artists and art historians (Ascott, Lovejoy, Paul, Shanken, etc.) use the terms spectator, participant, viewer, audience and user almost interchangeably to describe the person experiencing an artwork, but such usage obscures the potential of co-creation in the production of meaning. These terms are associated with their ontological medium, often restricting the experience of co-creation. Spectator seems to be the most widely adopted term, yet it too falls short of adequately conveying the dynamic potentiality of co-creating the coefficient of art defined in chapter 2, section 2.4.

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98 The Creative Act is introduced in chapter 2, section 2.4. Marcel Duchamp: Conceptualism and the Interactive Act.

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In a discussion of the terms employed today to identify the people involved in the coefficient of art and consequently the passive (consumption) and active (production) roles they play, Stephen Wright acknowledges that “spectatorship continues to enjoy almost self-evident status in conventional discourse as a necessary component of any plausible artworld” (Wright, 2013, p. 60). Yet he rejects the dominant ontology of spectatorship, arguing instead that contemporary art “practices seem to break with spectatorship altogether, to which they increasingly prefer the more extensive and inclusive notion of usership” (Wright, p. 60).

The *Merriam-Webster Dictionary* defines user as: “one that uses.” Assuming that the definition refers to one who uses something, the something used in this context is the interface as well as to the information. The term user is borrowed from HCI and computer sciences and embraced by user interface design (UI) and user experience (UX) curricula, which are more appropriate foundations for the design of interactive hybrid environments. The concept of the user in UI and UX is further expanded by the semiotic view of the sign user, which reflects “Peirce’s definition of the sign [as] something that stands for something else in some capacity for someone (or some organism) [user]. It could never leave the user” (Cobley, 2010b, p. 11).

The user is any and every person who experiences and relates to the information and interface in any of a variety of dynamic ways. This definition is more expansive than the passive recipient of information mediated by a computer, known in HCI and computer science as the end-user. It includes not only the person who interacts with the interface and passively consumes digital information (end-user) but also the one(s) originally producing the interface and information. From the perspective of Duchamp’s coefficient of art (Figure 37), *user* can refer to the passive end-user as

well as the professionals developing and implementing information and interfaces, with the understanding that at a certain point the roles will change and exchange in the production of meaning—the semiotic dance (Figure 19).

Ubiquitous computing has been continuously thinning the line between passive or end-user and active *front* and *back-users* (designers, programmers and professionals developing interfaces) through open source and server-based applications, apps and widgets. For example, a user might be a student researching an academic topic on the web, a client doing online banking, a financier managing someone's money, a designer developing a web interface, an educator implementing an online course, a computer programmer developing an application, a teenager hacking an I-phone app, and so forth.

Cybernetics<sup>99</sup> contributes the illuminating concept of structural coupling, which describes “recurrent interactions leading to the structural congruence between two (or more) systems” (Maturana & Varela, 1992, p. 75). This concept reinforces the user's (artist-spectator) co-creation potential, which may be further considered an organism constituted in an autopoietic fashion and developing relationships of mutuality with the other elements of the meta-environment (Guddemi, 2000; Bopry, 2007). T

he user, from both a semiotic and cybernetic perspective, actualizes the potential of the interface and information (Huhtamo, 2007). What is being perceived and how it became possible to perceive can be exemplified by the culture of video games with many different interfaces (e.g. Nintendo, Xbox) and genres. The satisfaction a user gets of playing a game is only actualized by that user who came into buying the game based on his or hers own experience with similar situations portrayed by the

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99 Second-order cybernetics.

game. Parallel, the process of playing a game enhances and diminishes this satisfaction based on how the system works and how the game's storyline develops.

### 4.3.3. Information

Information is somewhat like the child of divorced parents who is pressured to conform to the views of one parent at a time but never both at the same time. With the advent of digital technologies, this "child" has grown up enough to be its own entity, yet the parents' lack of communication among themselves still constrains its voice from standing on its own. In this analogy, the parents are human perceptions, on one hand, and technological processes, on the other. Each offers a fundamentally different view of information. This reflects C. P. Snow's famous account of the divide between the two cultures of the sciences and the humanities. Despite the manner in which the advent of human-computer technologies and interactions have been closing this divide (Vesna, 2011), information frequently appears to still be subject to a bitter custody dispute.

Comprehending information as seen in the meta-environment requires that we look at communication processes through the lens of human beings, digital technologies and the exchange between human beings and digital technologies as systems. Semiotics, cybernetics and systems theories each address such processes but only through their individual lenses, which obscure as much as they reveal about the potential of such interactions.

In 1948 when introducing cybernetics, Norbert Wiener (1965) defined digital information as zeros and ones transmitted by electromagnetic signals with infinite options of decisions, communication and control. Later, Wiener advanced the

thesis that the physical functioning of the living individual and the operation of some of the newer operation machines are precisely parallel in their analogous attempts to control entropy through feedback. Both of them have sensory receptors as one stage in their cycle of operation: that is, in both of them there exists a special apparatus for collecting information from the outer world at low energy levels, and for making it available in the operation of the individual or of the machine...In both of them, their performed action on the outer world, and not merely their intended action, is reported back to the central regulatory apparatus. This complex of behavior is ignored by the average man, and in particular does not play the role that it should in our habitual analysis of society; for just as individual physical responses may be seen from this point of view, so may the organic responses of society itself. I do not mean that the sociologist is unaware of the existence and complex nature of communications in society, but until recently he has tended to overlook the extent to which they are the cement which binds its fabric together (Wiener, 1954, p. 26–27).

First-order cybernetics understands information as a statistical property of a particular message, but the message itself (what is exchanged and its meaning) is irrelevant to the theory (Vidales, 2017). Wiener continues:

One of the simplest, most unitary forms of information is the recording of choice between two equally probable simple alternatives, one or the other is bound to happen—a choice, for example, between heads and tails in the tossing of a coin. We shall call a single choice of this sort a decision. If we then ask for the amount of information in the perfectly precise measurement of a quantity known to lie between A and B, which may with uniform a priori probability lie anywhere in this range, we shall see that if we put  $A = 0$  and  $B = 1$ , and represent the quantity in the binary scale (0 or 1), then the number of choices made and the consequent amount of information is infinite (Wiener, 1965, p. 61).

Looking at information from a systems perspective, Claude Shannon (1949) added entropy to quantify information in any form of communication:

The concept of information applies not to the individual messages (as the concept of meaning would), but rather to the situation as a whole, the unit information indicating that in this situation one has a freedom of choice, in selecting a message, which it is convenient to regard as a standard or unit amount (Shannon, 1949, p. 100).

Based on Wiener's and Shannon's concepts of information, we can define information in the meta-environment as that entropic transmission of data and metadata in binary format which generates communication as a whole.

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Metadata is not only the description of the content but also the description of the structure of the content. Of course, using an extra layer of information to describe information is not new. Footnotes, references, bibliographies, and key words are some of the extra layers of information that have been routinely found in academic texts since long before the birth of the digital age. The index organization in a book can be considered a meta-structure describing that content. In the context of this study, digital information refers to data and metadata—as meta-content and meta-structure—and also to the ways that data and metadata together reflect digital information as a whole.

Second-order cybernetics thoroughly addresses information from a human perspective:

Information is, of course, the process by which knowledge is acquired, and knowledge is the processes that integrate past and present experiences to form new activities, either as nervous activity internally perceived as thought and will, or externally perceivable as speech and movement (Von Foerster, 2003, pp. 200–201).

The shift from “the science of observed systems” in cybernetics to “the science of observing systems” in second-order cybernetics (Von Foerster, 2003, p. 298) adds living systems with the potential of autopoiesis, self-organization, and the emergence of meaning (Brier, 2008) to the understanding of information.

Different fields approach information in different ways. In cybernetics, computer science, and natural sciences information is seen as

an objective, quantitative information concept and works with algorithmic models of perception, cognition, and communication. Semiotics, in contrast, is based in human language’s meaningful communication and is phenomenological as well as dependent on a theory of meaning (Brier, 2008, p. 42).

When cybernetics is complemented by semiotic study of signs and language, information and communication evolve beyond being a description of human information processes because the observer is the one creating meaning (Guddemi, 2000; Bopry, 2007; Brier, 2008; Vidales, 2017).

We could add to Wiener’s statement that (in itself) ‘information is information, neither matter nor energy’—that information is also not meaning until it has been interpreted by a living system (Brier, 2008, p. 76).

The description of sign processes and entropic transmission of data and metadata in binary format allows for one understanding of information in the meta-environment.

The creation of meaning is seen as separate from information since it relies on the user experience (observer) to emerge.

#### 4.3.4. Interface

According to the *Encyclopaedia Britannica*, *interface* is described in physics as a “surface separating two phases of matter.” As matter can only be applied to machines but not digital applications, the use of the term interface here reflects a concept in computer science where it encompasses the physical machine—computer, cell phone, tablet, etc.— as well as the software, applications and processes utilized by these machines to facilitate the interaction between humans and information.

This understanding of the term also reflects how the materiality of computers is being immediated (Bolter & Grusin, 1999). As we embrace digital technologies, the trend is for computer mediated interfaces to become even more transparent to the user.<sup>100</sup> “In this sense, a transparent interface would be one that erases itself, so that the

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<sup>100</sup> This claim is based on ubiquitous computing trend of embedding the interface into everyday objects. Cars are good examples of such trend of immediating the interface. Disguised as a mechanical car, newer cars immediate the computational processes, such as camouflaging the digital-computational interface.



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user is no longer aware of confronting a medium, but instead stands in an immediate relationship to the contents of the medium” (Bolter & Grusin, 1999, pp. 23-24).

Pervasive computing, also called ubiquitous computing, is the growing trend of embedding computational capability (generally in the form of microprocessors) into everyday objects to make them effectively communicate and perform useful tasks in a way that minimizes the end user’s need to interact with computers as computers. Pervasive computing devices are network-connected and constantly available (Rouse, Shea & Tang, 2016).

In this case, the interface with its hidden physical components becomes one unit with the task of mediating humans and information. The curriculum of interface design expresses such relationship by including the term user before interface in an attempt to more strictly define their connection.

Each time someone uses an application, or any digital product, he carries on a conversation with the machine. It may be literal, as with a command line or phone menu, or tacit, like the “conversation” an artist has with her paints and canvas—the give and take between the craftsperson and the thing being built. With social software, it may even be a conversation by proxy. Whatever the case, the user interface mediates that conversation, helping users achieve whatever ends they had in mind (Tidwell, 2010, p. 1).

In chapter 5 we will question the claim of the interface being the sole mediator between humans and information, but for now the point is to establish the term interface as representing both physical and digital elements interacting with users and information.

### 4.3.5. The Meta-Environment

In attempting to interrogate and fully comprehend the elements in interactive hybrid environments, a cybersemiotic approach (Brier, 2008) is used here, taking into consideration that a human, either the creator or participant in such an

environment, carries the same weight in creating meaning as the other elements of such environments. In order for this to happen, information must be seen as a physical expressions of computer or human language, signs and symbols, which through feedback loops allow the communication (Guddemi, 2000; Bopry, 2007; Brier, 2008; Vidales, 2017) mediated by an interface to be established.

Any sustained attempt to combine such hybrid elements reveals autopoietic systems structurally coupling and emerging within systems (Guddemi, 2000; Bopry, 2007; Brier, 2008; Vidales, 2017). The term meta-environment is here then introduced to express such strict relationship among user, information and interface with its infinite potential. As Jennifer Tidwell observes:

As the user interface designer, then, you get to script that conversation, or at least define its terms. And if you're going to script a conversation, you should understand the human side as well as possible. What are the user's motives and intentions? What "vocabulary" of words, icons, and gestures does the user expect to use? How can the application set expectations appropriately for the user? How do the user and the machine finally end up communicating meaning to each other? (Tidwell, 2010, p. 1)

The long-established segmentation of information has in fact restricted how we embrace interactive hybrid environments by either relating information to human perception or to interface processes. This study proposes meta-environment as a complex system that encompasses the triadic relationship, interactions and processes among user, information and interface and addresses the question posed by Søren Brier:

whether the functionalistic and cybernetic research must be viewed as complementary to a phenomenological-hermeneutical-semiotic line of theorizing on signification and meaning that ignores ontological questions outside culture, or whether these might be united within one paradigmatic framework through a revision of the ontological and epistemological foundations of both classical and modern sciences, as Peirce attempts (Brier, 2008, p. 37).

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Today, the term meta-environment is used in the field of computer science to describe “the interactive development environment for constructing language definitions and for generating and testing particular testing environments” (Klint, 1991, p.109). It refers to a series of processes and syntaxes that not only describe but also facilitate the exchange of information in complex information systems. I propose to expand the concept of meta-environment to include the relational processes of data/information, metadata, database, applications, user interaction, and information communication existent in the triadic relationship among user, information, and interface. In practice, this concept implies the overall communicability among the different elements involved in the processes of storing, relating, inputting, and outputting information as well as the user’s actions and the many elements of the interface, such as software and hardware.

### 4.3.6. Overview

In attempting to sketch the elements in interactive hybrid environments, the ontological use of the terms user, information and interface revealed a complex adaptive system identified here as meta-environment. The meta-environment includes the relational processes of data, metadata, database, applications, user interaction, and information communication existent in the triadic relationship among user, information, and interface. Concepts of cybernetics, semiotics and systems theory were used to ground this relationship, in the process revealing the framework of cybersemiotics as an integrative approach facilitating the connections with the ultimate goal of meaning creation.

In my practice as information designer, I have been exploring the transformation of data into knowledge through the development of web interfaces in Open Source

content management systems (Drupal, Joomla, Wordpress, etc.), which aim at the implementation of complex digital information environments derived from multiple interacting elements based on generative processes and adaptive systems. It is through my ongoing practice and growing sense of frustration and puzzlement at the difficulty of expanding digital data into knowledge that my need for a deeper understanding of the meta-environment and the discrepancy between physical-digital and space-time paradigms became manifest.

In planning the development of meta-environments, the first step is to design the information architecture, which involves organizing and categorizing the data through site maps, hierarchies, categorizations, navigation, and metadata. This process involves a good amount of research, design thinking and experimentation, yet, independent if the information architects are a collaborative group or a solo designer, the logic of the structure of the interface will be based on the designers' view, and inescapably limited. Considering that the interface will be designed based on the information architecture, chances of distancing from promoting a true complex adaptive system become heightened. Today the most positive examples of interactive web interfaces are found in online banking, yet they also are the environments with the most restricted access to information. In this case, the user can only interact with a limited amount of possibilities: check account balance, deposit money, transfer money, pay bills, and retrieve statements. Besides being able to access the bank account 24 hours a day seven days a week, the offered actions are similar to the ones performed in-person when visiting a bank. It is frustrating that the bank interactions still follow the physical bank paradigm and the potential of the medium for helping a client to expand and organize finances is not attained. In turn, an examination of the complex

and adaptive structure of the meta-environment system reveals the need to rethink the current and established paradigms for representations of space and time.

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### 4.4. Space-Time Experience

#### 4.4.1. Introduction

To ground a critical interrogation of narratives of embodiment and the different mediation capabilities of the meta-environment requires another brief examination of recent history. Marshall McLuhan provided one starting point from which to understand how and why space-time perceptions need re-examination when he observed:

During the mechanical ages we had extended our bodies in space. Today, after more than a century of electric technology, we have extended our central nervous system itself in a global embrace, abolishing both space and time as far as our planet is concerned (McLuhan, 1964, p. 3).

It is fascinating to consider that in 1964, twenty years before Apple's first graphical interface computer, McLuhan believed that the future of new communications media and digital technologies would involve abolishing perceptions of space and time grounded in the embodied experience of the mechanical age. This is understandable as in 1964 embodied space-centric perceptions were inscribed and reinscribed by media and communications developments in photography, film, TV, radio, telephone, and so forth. Perceptions of time as linear and interval-based and the perceived qualities of these communications media (electric technologies) were qualitatively different from

the Euclidean space-centric and cyclical time perceptions, and it seemed logical that new understandings needed to emerge.

Interesting enough, even as we transition to the digital age, instead of negotiating new space-time understandings, we chose to immediate<sup>101</sup> the experience by representing digital media through embodied narratives and by pretending that the media exhibit qualities identical to those of the physical world and consciously embodied human experience.

Our need for embodiment restricts our perception of digital information to being physically constrained, linear in scope, and synchronous. In *The Language of New Media*, Lev Manovich defines some tendencies in digital information: numerical representation, modularity, automation, variability, and transcoding (Manovich, 2002), which suggests that digital information is potentially omnipotent (not subject to physical limitations), omniscient (capable of knowing all things at once), and omnipresent (manifesting anywhere and at any time). These descriptions obviously depict a bodiless entity. We can even diverge here a moment to acknowledge the god-like qualities being attributed to a putative digital entity, re-imagined as an almighty being that can navigate on a plane reserved for the sacred.

Despite the profound implications of such attributions, information—with its vast possibilities—remains bound by the medium, whether human or machine, where sign-objects are seen as representing either brain or computer processes. It is difficult to disentangle information from embodiment, particularly for the human observer

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<sup>101</sup> The practice of attempting to make the medium transparent to the user is not new. According to Jay David Bolter and Richard Grusin, immediacy is a “transparent interface [that] would (be one that) erases itself, so that the user is no longer aware of confronting a medium, but instead stands in an immediate relationship to the contents of that medium. ... the desire for immediacy itself has a history that is not easily overcome. At least since the Renaissance, it has been a defining feature of Western visual (and for that matter verbal) representation” (Bolter & Grusin, 2000, p. 24).

who is intimately involved in bringing meaning to the exchange even as it is happening. This close proximity does not allow the observer to perceive form and details with maximum clarity (Merleau-Ponty, 2015). But what if in our need to represent reality as we see it, we are too close to the subject matter to see the whole? Or just as in the use of linear perspective, introduced earlier to exemplify how in attempting to reproduce reality humans actually learned to see it in a distorted manner, our need for embodiment may be restricting the possibility of developing new paradigms of space and time representation.

This section analyzes space-time experiences that have been brought about with the advent of digital technologies and points toward possible alternative modes of representation. Looking back in the history of HCI, we can find how and why we users learned to perceive and relate to computer interfaces as embodied mediators.

### 4.4.2. Learning to Embody the Digital

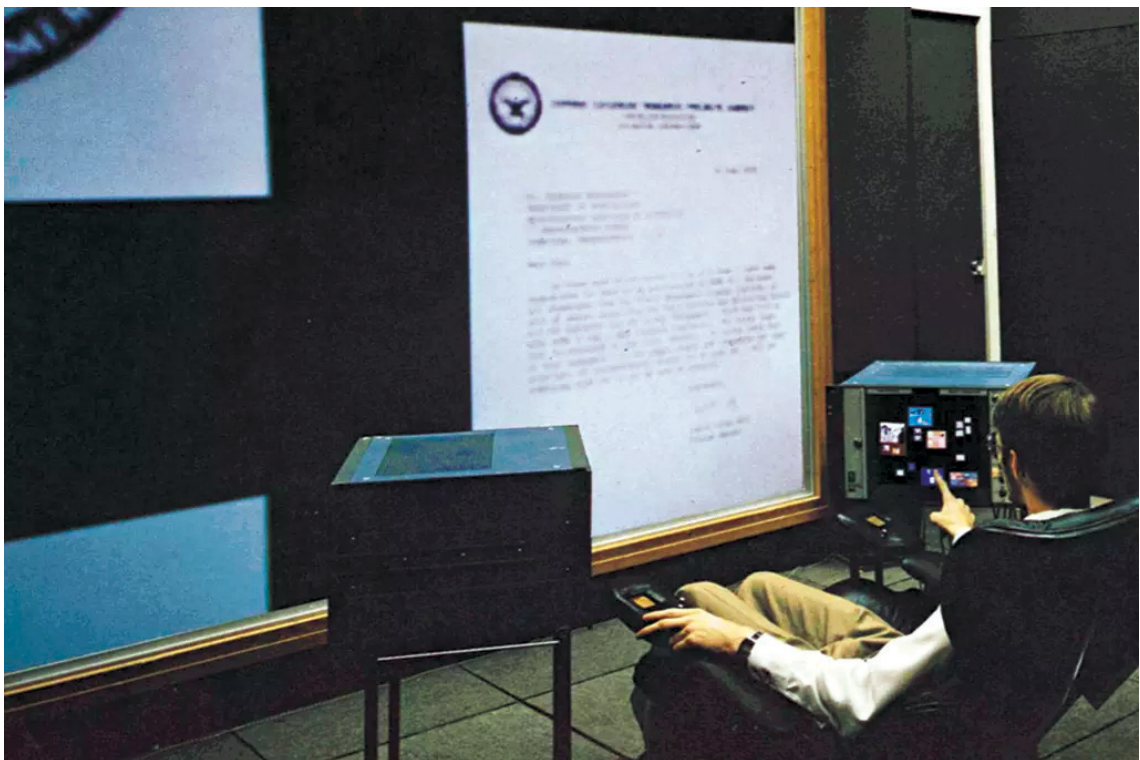
On January 24, 1984, Apple Computer introduced Macintosh,<sup>102</sup> the first personal computer with graphical interface (Figure 40). This was an historic event because the advent of graphic interfaces freed the user from having to learn computer languages and codes and to think in terms of linear digital processes. In effect, this also released the user from being a conscious mediator in HCI. Even though this event can be considered a milestone in the development of digital computer interfaces, much of the research, hopes and expectations for digitally mediated technologies were already in full development at that time.

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<sup>102</sup> Source: The original TV advertisement for the first Apple Computer Macintosh. (Apple, 1984)



*Figure 40.* 1984 Mac Computer. Retrieved March 25, 2018 from: <http://www.mac-history.net/top/2011-01-24/the-history-of-the-apple-macintosh>.



*Figure 41.* MIT Architecture Machine Group “Media Room”. Retrieved March 25, 2018 from: <https://www.theverge.com/2012/5/24/3040959/dataland-mits-70s-media-room-concept-that-influenced-the-mac>.



Four years earlier, at the 7th ACM SIGGRAPH Conference proceedings, Richard Bolt described his collaboration with Nicholas Negroponte and the MIT Architecture Machine Group “Media Room”<sup>103</sup> (Figure 41) as “a physical facility where the user’s terminal is literally a room into which one steps, rather than a desk-top CRT before which one is perched” (Bolt, 2003, p. 434). HCI at the time was limited to accessing data banks through command lines requiring the user to learn computational languages to communicate with the interface. Attempting to depart from the restriction of accessing data through word commands and referencing it by name, Bolt describes the concept behind the Media Room:

The basis of spatial data-management is accessing a data item by going to where it is rather than referencing it by name. [ . . . ] Consider how people ordinarily find items on their desk tops: the appointment book is up and to the right; the telephone is in the lower right corner; high priority memos are kept in an “in” box immediately to the left of the desk blotter; less urgent items are in the file folder, top middle of desk; and so forth. The person who uses this desk has organized the layout of items in a more or less systematic way. He or she refers to them constantly throughout the working day: reaching in that direction, that far, up, down, to the right, to the left. Through this activity, a mental image of the layout of the desk is elaborated in the “mind’s eye.” Additionally, through constant tactile interaction with the items, reaching for and touching them, a “motor memory” of where things are arises as well. A script for the act of retrieval becomes encoded into the musculature, as it were, according to where the the item is located. (Bolt, 2001, p. 187).

By immediating the qualities of the interface, the designers of the Media Room attempted to address HCI issues and created an environment that was more intuitive and appealing for the user. Two decades later, Bolt’s article was republished, this time with an introduction by Nick Montfort (Wardrip-Fruin & Montfort, 2003). Montfort’s introduction is revealing. It offers some clues on the reasons we have been interacting with computer interfaces as if they are physically embodied mediators of HCI experiences, and it unintentionally suggests a key point that we have been missing.

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<sup>103</sup> Led by Nicholas Negroponte of MIT, the Massachusetts Institute of Technology Architecture Machine Group was an avant-garde research center for the study of human-computer interactions and is the precursor of today’s MIT Media Lab.

Data is represented spatially on all graphic computers today, but it is almost always represented in two-dimensional space. The Media Room set up by Nicholas Negroponte at MIT's Architecture Machine Group, and described by Bolt's essay, was spatial in at least two ways. It used two-dimensional screens to provide a view into a simulated three dimensional-space. It also employed an arrangement of screens and speakers situated in the architectural space of the room. By creating an extravagant computing environment, rather than doing more focused study of specific communications modalities considered separately, researchers in the Architecture Machine Group were able to arrive at a surprisingly different, and extremely useful, concept of human-computer interaction, in which these two types of space are experienced by the user as one. (Wardrip-Fruin & Montfort, 2003, p. 233; emphasis added).

In an attempt to create a more user-friendly interactive experience, Negroponte and the Architecture Machine Group decided to ignore the specific individual qualities of the different elements (communications modalities) in the Media Room while representing the HCI experience as if it were physically embodied via a simulated three-dimensional architecture.<sup>104</sup> It was a brilliant solution at the time, but it left a legacy of conceptual and terminological confusion to describe the new layer of embodiment in HCI, which didn't necessarily exist, thus limiting the medium exclusively to its physical qualities.

#### 4.4.3. The Semiotics of Embodiment

Apple's graphic interfaces and MIT's Media Room are examples of how we have learned to perceive the computer interface as an embodied mediator in HCI. Thirty-five years after Bolt's article, art and design practitioners working with digital interfaces as well as scholars addressing HCI and related fields such as cybernetics, information theory, semiotics, and new media still rely primarily on physical narratives emphasizing embodiment to describe and represent the architecture of digital information environments and HCI.

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<sup>104</sup> Please see footnote 8 on immediacy.

## CHAPTER 4 | SPACE-TIME EXPERIENCE IN THE META-ENVIRONMENT

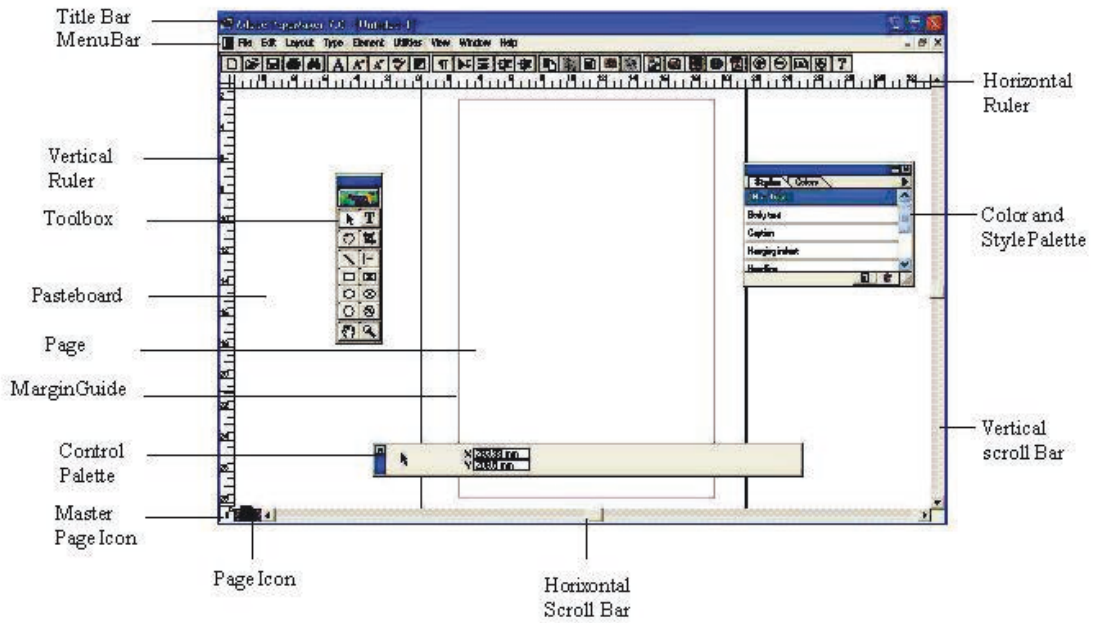
Apple, Microsoft, Adobe, Autodesk, Google, to name a few, have invested extensively to develop graphic user interfaces (GUI) and in the process have adopted a sign system of icons and terminologies, all referring to physical objects and qualities to represent the digital world. Such practice in UI design where a digital interface emulates its physical counterpart it's called skeuomorphism and flourished in 1980's with the development of GUI. The first Apple computer was based on skeuomorphic objects simulating its use (affordance): trash can to represent delete file, floppy disk to represent save file, file folder to represent the location where a file could be saved. Skeuomorphism promoted the creation of a system of representation that relies heavily or even exclusively on the physical world to define completely new actions, processes and perceptions introduced by digital technology, and has facilitated the development of human-computer interactions, yet as time has passed and new generations are born into the digital age, much of the commonly employed language begins to seem obsolete. Nevertheless, we keep using skeuomorphism to develop digital interfaces in an attempt to facilitate HCI. Digital technologies appear to call on our bodies to position ourselves in the manner and relationship that best facilitates our perceiving and experiencing them (Merleau-Ponty, 1978).

The history of personal computers and GUI and the attendant terminologies consistently reflect symbolic representations of the physical world. Terms such as desktop computer or laptop computer refer to a physicality that is specific to the human body in the physical world.

Almost thirty years ago, when I started to teach graphic design applications such as Adobe (formerly Aldus - Figure 42) PageMaker,<sup>105</sup> it made sense to employ

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<sup>105</sup> Initially developed by Aldus in 1985 (Fox, 2015) and later (2004-2005) bought by Adobe Systems, PageMaker was a desktop publishing application introduced with Apple Macintosh computers. Today Adobe PageMaker is superseded by Adobe InDesign.



**Figure 42.** Aldus PageMaker interface showing the terminology used based on the physical world.

Retrieved March 25, 2018 from: <https://computerhindinotes.com/%E0%A4%B0%E0%A5%82%E0%A4%B2%E0%A4%B0%E0%A5%8B-%E0%A4%95%E0%A4%BE-%E0%A4%89%E0%A4%AA%E0%A4%AF%E0%A5%8B%E0%A4%97-using-rulers/>



**Figure 43.** Hot type press composer ready to print showing the leading between the letters. Retrieved March 25, 2018 from: <http://www.thewindowpanepress.com/>

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certain specific terms and graphic representations to describe the interfaces. The skeuomorphic objects attempted to mimic a designer or draftsman's working table with a tool box on the left, letter set types on the top of the table, the pasteboard area around the document, and color palettes to mix colors. These terms allowed a much easier transition from the physical world to the digital world, but today, when introducing graphic design to students, these same terms seem obsolete, as they don't represent anything for the new apprentices in the field.

The evolution of the graphic interface has been accompanying the advent of digital environments. We can observe such evolution through the lens of Peirce's semiotic sign objects and an analysis of how our human need to embody the world through signs affects our embracing of the digital world from icons, to indexes, to symbols.

One very important triad is this: it has been found that there are three kinds of signs which are all indispensable in all reasoning; the first is the diagrammatic sign or icon, which exhibits a similarity or analogy to the subject of discourse; the second is the index, which like a pronoun demonstrative or relative, forces the attention to the particular object intended without describing it; the third is the general name or description which signifies its object by means of an association of ideas or habitual connection between the name and the character signified (Peirce, 1991, p. 181).

In the initial need for embodiment, these signs may have the same likeness as the physical world, imitating in form and purpose what they stand for. For example, the term leading, which refers to a metal bar made of lead used to separate the lines of text in hot type press printing,<sup>106</sup> can be said to initially be a sign-icon as the word refers to and resembles the metal used. In the sixties, even though hot presses were

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<sup>106</sup> Hot type press is a somewhat obsolete printing press process where the type setting composition is made of metal melted into type molds where the text is composed manually, character by character. In the late 1800, the Linotype machine, a line by line metal press, was introduced revolutionizing the newspaper industry (Roberts, 1980).



already in decline in favor of cold type presses,<sup>107</sup> the term *leading* was still used to reference the physical object (Figure 43). As the hot and cold type press processes gave way to digital processes, the term became a sign-index, a synonym of separating lines of text. Today most people only know the sign-symbol for leading as the space between lines. The context changed, and so did the observer, who now can't find the same meaning in these sign objects. A parallel conversation can be added about the semiotics of emoticons but that would detour from the aim of this discussion which attempts to highlight the choices to describe and communicate the digital world and experiences.

Amazon Echo voice service, Alexa, was introduced in chapter 3, section 3.3.3 to highlight the dichotomies of a voice activated interface and here I call attention to how Amazon's choice of embodying the system as a female server defines how we potentially use the system. The fact that the system is embodied as a specifically female server impinges on social-political-cultural issues that are deeply ingrained in our society and full of implication for feminist or cultural studies investigation, although this is not the purpose or approach of this dissertation. In Alexa's case, the disembodied body, embodied as a female server, at first glance may seem a clever marketing ploy, but in reality, such embodiment reinforces social and cultural representational norms difficult to ignore.

Much of the terminology employed in the digital world correlates closely with the physical world, yet the original reasons for such terminology are slowly fading away with the rapid development of digital technologies. As these new technologies continue to permeate our everyday lives, they strengthen the relationship and interaction among user, information, and interface and expand the mediation capabilities of the

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<sup>107</sup> Cold type presses appeared in 1960s and are officially known as phototypesetting. There is a great movie from the era introducing the new system to the press labors. <https://vimeo.com/127605644>

## CHAPTER 4 | SPACE-TIME EXPERIENCE IN THE META-ENVIRONMENT

meta-environment. At the same time, its interaction with the physical world, objects or actions diminishes or ceases to exist, giving rise to new challenges and opportunities to reconceptualize how we represent the digital realm.

### 4.4.4. Art and Science Boundaries

Humans haven't abolished space and time as McLuhan predicted (1964).<sup>108</sup>

In reality, despite the potential of digital technologies, our need for embodiment has dictated how we have been shaping digital technologies as seen in the previous section. It is interesting to realize that the user's presumptive need for a language and aesthetics of physicality (Heidegger, 2010; Merleau-Ponty, 2015) dictates processes and perceptions that reinforce the space-time continuum representational paradigm which is limiting and linear in scope, restricting information's potential and preventing a more balanced integration among user, information, and interface.

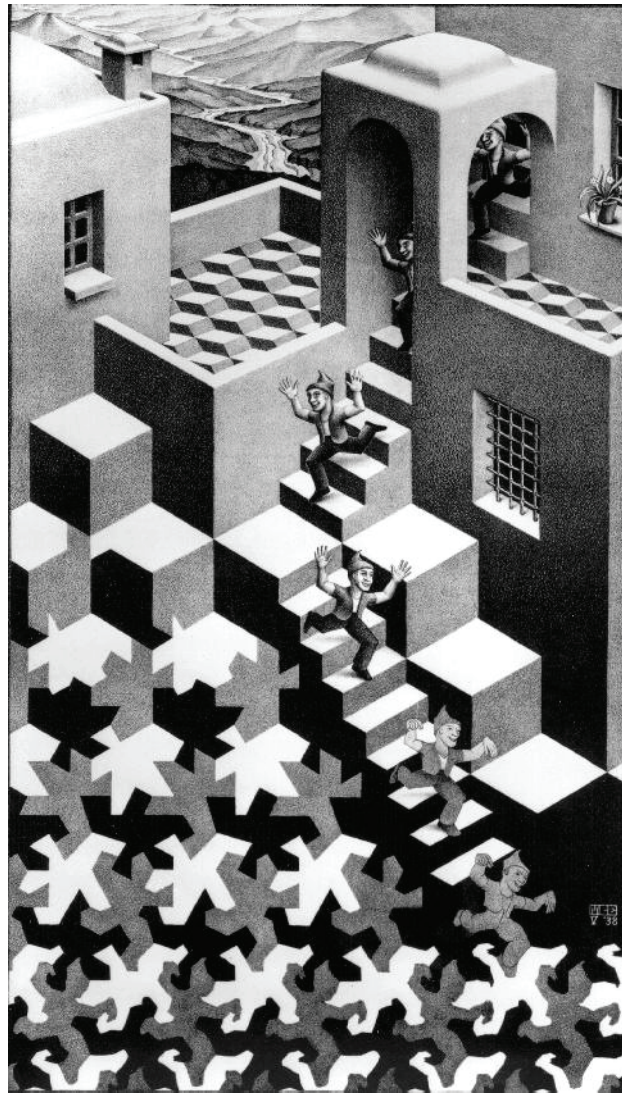
Approaching space and time from an aesthetic angle may seem daringly innovative or radically inappropriate since these are normally considered domains of physics, but as Leonard Shlain argues:

Both art and physics are unique forms of language. Each has a specialized lexicon of symbols that is used in a distinctive syntax. Their very different and specific contexts obscure their connection to everyday language as well as to each other. Nevertheless, it is noteworthy just how often the terms of one can be applied to the concepts of the other. Volume, shape, mass, force, light, color, tension, relationship and density are descriptive words that are heard repeatedly ... (Shlain, 1991, p. 19–20).

This shared language is unsurprising since both domains attempt to address the physical world. Scientists seek to explore and interpret the physical world, and artists

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<sup>108</sup> Section 4.4.1.



*Figure 44.* *Cycle* (1938). M. C. Escher. The M. C. Escher Company—the Netherlands. All rights reserved. Used by permission (<http://www.mcescher.com>).



*Figure 45.* Ouroboros from across different cultures.



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utilize a parallel language to create new structures to comprehend the world<sup>109</sup> and create new structures within it (Ascott 2000, 2011). M. C. Escher and Roger Penrose are illuminating examples of how artists and scientists can separately develop complementary descriptions of related phenomena. M.C. Escher's 1938 lithograph *Cycle* (Figure 44) is a striking illustration of what mathematical physicist Roger Penrose calls impossible objects (Jacques, 2012).

The illusion of three-dimensionality, the innovative use of tessellation, and the incorporation of traditionally figurative elements in Escher's work induce the viewer to perceive the lithographic print as depicting a visually plausible reality built on the deconstructive metamorphosis of man into cube.

It is Escher's ability to paradoxically combine the radical oppositions of man and cube, landscape and geometric abstraction into an apparently harmonious composition where shapes repeat with subtle variation and almost imperceptibly transition into radically different shapes that I want to use as a visual paradigm for conceptualizing the shifts in human consciousness in the digital age.

Navigating through such shifts, the users in art, both art practitioners and co-creating spectators, require greater awareness of the total context, of the myriad and changing interactions of art, science, and technology, to fully comprehend the import and implication of new artworks created and new aesthetic conceptualizations that accompany them. Art historians contextualize art according to the historical moment, shifting the aesthetic intentions accordingly. From pre-history and ancient times to today's digital reality, if we strip context from art, we are left with the understanding

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<sup>109</sup> It is relevant to highlight that even though it seems that Ascott shares Goodman's concept of worldmaking, Sani Murrani elaborates on the difference between their views affirming that "Roy Ascott opposes the need for the centrality of the existence of the body in the system of perception" (2018, 311) where Goodman relies on the physicality of the body as reference for the hermeneutical perception.

that art is a medium, a vehicle of communication. This means that there is an intention of conveying information. Reinforcing the creative interconnection of art and science, Nelson Goodman opposes Kant who segregated art and science by asserting that art, like science, can contribute to the creation of new knowledge since they both constitute ways of world making (1984, p. 5). In questioning how world making is related to knowledge, Goodman (1978, p. 1) affirms that “knowing cannot be exclusively or even primarily a matter of determining what is true [ . . . ] But an advancement of understanding [where knowing] is as much remaking as reporting” (1978, pp. 21-22). In Goodman’s view art is a form of information; cognitive and perceptual information that is not limited by its medium or message.

The creation of aesthetic structures and experiences that emphasize space allow the artist to communicate our embodied perception of the world. The creation of aesthetic structures and experiences that emphasize time allow the artist to navigate the changes we actually perceive in the digital age. How we embodied space and time in the past and are experiencing them today are shaped by the technologies around us and expressed in the aesthetic creations that emerge from such experiences. When, in the sixteenth century, Giorgio Vasari documented Leonardo da Vinci’s technological advances in aerial perspective, foreshortening, and use of light and darks to create volume and depth, he was contextualizing the employment of new technologies and highlighting the new aesthetic experiences that artists were promoting (Vasari, 1998).

Da Vinci’s artworks maximized the potential of the technologies of his time and, along with some of his peers, helped change how humans perceive space and their sense of self in it. Since the Renaissance, naturalistic representations of space have been the norm, and, as seen in chapter 2, such representations advanced quickly with

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the advent of the mechanical age and the many new tools and innovations brought to bear in artistic creation, leading to changes in human consciousness regarding aesthetic perceptions of space and time and the self in relation to space and time.

### 4.4.5. Space and Time Experience

Over human history, we have learned to perceive space and time differently. Eastern and ancient indigenous cultures relied on the knowledge of nature to guide their aesthetic understanding of space and time. In Zen teachings, space may be empty but at the same time carry the potential for entropy and as such for life and death—empty again (Shlain, 2007). The Japanese principle of Notan, which is “the interaction between positive (light) and negative (dark) space,” offers the potential of balance and harmony. The Chinese symbol Yin-Yang embodies the principle of Notan. The opposing forces “that have equal and inseparable reality” (Bothwell & Mayfield, 1991, p. 6). The space is infinite and so is time. A variation of the Egyptian or Greek symbol Ouroboros (a serpent swallowing its own tail) can be found in different Eastern and indigenous civilizations to represent infinite time (Figure 33.) In Aztec culture, the circle apparent in Ouroboros reinforces the whole and represents the infinite cycles of life; the return of the seasons, of the sun, of the flowers and fruits; time without beginning or end, sustained by the balance between the all and the nothing.

Initially in the ancient Greek civilization, time and space were entangled with the gods, existing in non-linear time in a space without earthly boundaries, yet sharing the essence of the Ouroboros. “Aristotle straightened out the arabesque shape of time [by demythologizing] the Three Daughters of Necessity. These three Fates were Lachesis, who guarded what had been, Clotho, who guarded what is, and Atropos who oversaw

what is yet to come” (Shlain, 2007, p. 32). In doing so, Aristotle straightened the circle of time, giving the sequence of past, present, and future. Giving birth to geometry, “Euclid organized space by connecting it through an imaginary web of straight lines that in fact do not exist in nature” (Shlain, p. 31).

Euclid’s geometric straight lines coupled with Aristotle’s arrow of time shifted the ancient notion of space and time represented on one plane and with movement in one direction. The geometric space and linear time aesthetics of the ancient Greeks were reflected in their sculptures, architecture, and proportional forms. Euclidean points in space instigated the all or nothing duality which was embraced by Christianity.

Early in the history of Christianity, Saint Augustine brought God into the perception of space and time. Space was no longer measured but instead split between heaven and hell. Time lost its linearity as it became God’s divine and eternal events supported by Genesis and Judgment Day. Human events ceased to be relevant. Pagan artworks were destroyed along with books and knowledge of earthly events. Illiteracy called for simplified images to tell Jesus’ story on earth and the story of heaven and hell. This new aesthetic of time and space gave rise to segmented pieces that only have meaning when experienced in their totality. Tapestries, mosaics, and triptych paintings reflected this segmentation of space, which became reflected in the socio-political hierarchies of the feudal system. The Dark Ages (A.D. 400 to A.D. 1250) utilized art to represent the divine, tell its story, and define its understanding of time. The science of the ancient world was replaced by a theological system of belief (Shlain, 1991; Heelan, 1988).

The vacuum created in Medieval times instigated a need to rediscover the knowledge of the ancient Greeks, giving way to “Renaissance artists [like] Giotto

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di Bondone (1276-1337), Alberti (1404-1472), and Leonardo da Vinci (1452-1519) rediscovering the science of pictorial perspective and predictive measurement of space that ultimately enable Copernicus (1473-1543) to correctly identify the center of the solar system” (Shlain, 1991, quoted in Mauldin, 2011). Space and time became again linear, converging in the horizon and on to death. The technologies introduced in the Renaissance changed human perception,<sup>110</sup> the artist unique point of view became the divine, freezing time on a canvas, wall, ceiling. Linear perspective, use of value scale to portrait volume, added a third dimension of space, depth.

In the nineteenth century Manet (1832-1883) and Cezanne (1839-1906) begin to flatten pictorial space and deny the use of a single viewpoint and mathematical perspective (a stylistic standard for centuries). Their stylistic achievements lead Georges Braque (1882-1963) and Pablo Picasso (1881-1973) to develop cubism representing completely fractured space and time and perspective. Physicists exploring non-Euclidean space and Einstein’s (1879-1955) development of his theory of relativity (and proof of physical impossibility of a single viewpoint of space) follow these great changes in traditional use of pictorial space. Not that any particular physicist studied the paintings of Giotto, Cezanne or Picasso, but that the painting styles of these artists provide a visual representation of developments in theoretical physics. (Shlain, 1991, quoted in Mauldin, 2011)

The advent of the mechanical age gave rise to enhanced aesthetic perceptions of space and time intrinsically connected along a continuum and represented by linear perspective positioning the viewer as an observer outside the frame and experiencing one specific moment in time. Our sense of episodic memory expanded through the mnemonic aid of the space-time continuum and developing media and communications such as photography, film, TV, radio, and the telephone. When in 1964 McLuhan wrote of “a global embrace, abolishing both space and time” (McLuhan, 1994, p. 3), human computer interactions were not yet mediated by graphic user interfaces. Thus, McLuhan’s notion of abolishing both space and time reflected the raw qualities of

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<sup>110</sup> See chapter 2, section 2.2.

the digital medium as non-embodied, atemporal bits. My own research suggests that abolition of space and time is closer to a futuristic fantasy. A more grounded, defensible, and productive formulation is found in Thomas Kuhn's (1970) notion of a paradigm shift: The developing technologies of the digital age are underpinning a transformative shift in human perceptions and aesthetic representations of space and time. The development of GUI was—somewhat paradoxically—accompanied by narratives of physicality and embodiment that McLuhan had not foreseen. Decades before McLuhan's bold prophecy, Henri Bergson approached the question this way:

If you abolish my consciousness ... matter resolves itself into numberless vibrations, all linked together in uninterrupted continuity, all bound up with each other, and traveling in every direction like shivers. In short, try first to connect together the discontinuous objects of daily experience; then, resolve the motionless continuity of these qualities into vibrations, which are moving in place; finally, attach yourself to these movements, by freeing yourself from the divisible space that underlies them in order to consider only their mobility – this undivided act that your consciousness grasps in the movement that you yourself execute. You will obtain a vision of matter that is perhaps fatiguing for your imagination, but pure and stripped of what the requirements of life make you add to it in external perception. Reestablish now my consciousness, and with it, the requirements of life: farther and farther, and by crossing over each time enormous periods of the internal history of things, quasi-instantaneous views are going to be taken, views this time pictorial, of which the most vivid colors condense an infinity of repetitions and elementary changes. In just the same way the thousands of successive positions of a runner are contracted into one sole symbolic attitude, which our eye perceives, which art reproduces, and which becomes for everyone the image of a man who runs (Bergson, 1994, pp. 208–209).

Bergson and McLuhan mark different moments within the larger context of a shift in representational paradigms and also different methodological emphases. McLuhan emphasized the transformative role of communications media in themselves, whereas Bergson focused on the centrality of human consciousness, which is to say that he proceeded from a phenomenological-hermeneutic perspective.

### 4.4.6. Overview

To return for a moment to the technological advances in aesthetic representation associated with the Renaissance, it must be noted that Bergson's view leads to the conclusion that the observer outside the frame is, in actuality, a constituent element of the reality depicted within the frame.

This brief examination of transformations in the human perception of space and time proceeding in close parallel with changes in modes of aesthetic representations of space and time underscores the need for transdisciplinary reconceptualization of the ontology and methodology brought to bear in the search for adequate understanding of this watershed moment in human history, marked by the commoditization of digital information and its cultural ubiquity.

This research study emphasizes, in particular, the manner in which an apparent need for narratives of physicality and embodiment may be restricting the vast possibilities within the new technologies. Such a realization calls for the development of alternative conceptualizations of this spatial paradigm and the human-computer interaction dyad. The focus for such reconceptualization in this dissertation is hybrid interactive environments, framed as instances of the broader construct of the meta-environment, a complex adaptive system whose elements consist of the triad of user, information, and interface. To understand how these elements interact with one another in constantly changing ways requires an integrative framework of analysis that accords due weight and balance to human perceptions and digital processes. This framework is cybersemiotics.

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#### 4.5. Combining Perceptions and Processes

Examining technological change in an earlier era of human history, Wolfgang Schivelbusch (2014) describes how the advent of the railroad changed the way humans perceive time and space.

Annihilation of time and space was the *topos* which the early nineteenth century used to describe the new situation into which the railroad placed natural space after depriving it of its hitherto absolute powers. Motion was no longer dependent on the conditions of natural space, but on mechanical power that created its own new spatiality (Schivelbusch, 2014, p.10).

Schivelbusch's theory is based on what was once the radically new experience of connecting two cities through a train ride. As people began to travel from one point to another at much higher speeds than by earlier means of transportation, the time they spent in travel diminished qualitatively. And as more areas were incorporated along the track line, people also had qualitatively expanded access to towns and cities previously inaccessible. The impact on human consciousness was that, through the expansion of access, "Space [was] killed by the railways," (Schivelbusch 2014, p. 37) leaving only time. Traveling had become little more than a subjective experience, reduced to the perception of the time spent between departure and arrival. This contradiction between expanding access to new spaces and diminishing the time spent between two points transformed perceptions of the time-space continuum.

Examining recent technological innovation, Paul Virilio (1995) suggests that we may be experiencing a new and very different annihilation: the destruction of human interaction. He argues that the advent of the cyber world is distracting our perceptions and alienating us from one another. Virilio believes that, because of new technological tools, authentic perception is lost, leaving only a fundamental disorientation (Virilio, 1995), a physical state of numbness, as human interaction ceases to occur, even with



## CHAPTER 4 | SPACE-TIME EXPERIENCE IN THE META-ENVIRONMENT

ourselves. Virilio's rationale is that easy access to electronic devices and technological tools from cell phones to virtual reality interfaces may be amplifying our interaction with the various mediums, but concurrently diminishing our interactions with ourselves and others. Means of electronic communication are getting faster and cheaper, allowing us to isolate ourselves from reality. Instead of being in the here and now, we are each in our own isolated world, with our phones, headphones, computers, and e-books, attempting to relate to something, but not necessarily to ourselves or anybody in particular. This phenomenon represents an expansion of technological interaction but an annihilation of human interaction.

Ascott has long argued that the world was already mediated by computers and that this is the stark reality we must confront. In an article entitled "The Architecture of Cyberperception" (Ascott, 2007, p. 319), he described how human perception was being transformed by the advent of information technologies and the internet, especially the influence of cybernetics feedback processes. Ordinary perception, "... the awareness of the elements of the environment through physical sensation, [was becoming] computer-mediated and computer enhanced" (Ascott, 2007, p. 320). Ascott's concept of cyberperception may have seemed futuristic and utopian in 1994, but in 2018 it is commonly accepted that our perception of reality is indeed thoroughly integrated with the computer world, totally mediated by computer and information technologies. The question artists must confront is how best to effect a balance between mind and matter, how to call attention to the enormous positive potential in the use of technological tools to generate and enhance human interaction.

In the previous sections, the experience and practice of embodiment in the meta-environment were introduced, highlighting the dissimilarities among user,

information, and interface and the knowledge that it is the user who actualizes the interactions in the meta-environment. As a system, the syncretic interactions among the elements in the meta-environment experience structural coupling, yet it is “the role of the individual interpreter [user] that grounds both semiotics and second-order cybernetics in the phenomenology of experience” (Bopry, 2007).

Constrained in the humanities/art and science divide, which was exposed by C. P. Snow in *The Two Cultures and the Scientific Revolution* (1959), it is almost impossible to break this divide without re-thinking how we address human users, information, and interface. As Paul Cobley asserts, in his search for a generative and integrative framework:

Cybersemiotics is a truly transdisciplinary project. It is not so much that it criss-crosses the sciences and the humanities and invokes knowledge from both (although it does do that), but rather it is transdisciplinary because it explores, through expertise in philosophy of science, concepts which have a purchase right across nature and culture (Cobley, 2010, p. 2045).

Connecting art and science, perceptions and processes, Cybersemiotics transdisciplinarity allows for a formal analysis<sup>111</sup> of interactive hybrid environments by introducing methodological tools and ontological language to integrate the physical world with the creation of meaning without having to discard or reduce their inherent characteristics of space and time, atoms and bits, subjective and/or objective sign interpretation, and embodied cognition and meaning creation.<sup>112</sup>

Duchamp’s creative act calls for the Ac<sup>113</sup> (meaning creation) through interaction among creator and spectator (user) in active and passive exchanges with the interface (artwork.) The potentialized Ac transmutes the interface into a sign-

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111 Subject matter, content, form and context. See chapter 3, section 3.3.1.

112 See the four aspects of the Cybersemiotic star on chapter 1, section 1.1. Context/Overview.

113 Art coefficient. See chapter 2, section 2.4.2. Conceptualizing the Creative Act.

vehicle (representamen) promoting the interface to reflect (interpretant) meaning (information) to the user. In turn, this new reflected meaning promoted by the interface, transmutes into promoting to the user an even new meaning that could be related to the new information on itself, to the interface, to the user, to their interaction, or any partial or total interaction among these elements; which in turn becomes a new sign-vehicle reflecting new meaning with potential for new meaning.

This semiotic dance where the interaction among user, information and interface potentially promotes new meaning in unlimited semiosis<sup>114</sup> establish the need for a transdisciplinary framework to allow the formal analyze of the meta-environment characteristics: physical (atoms, hardware, peripherals, humans) and/or digital (bits, software, data transmission); as well as how information is perceived, either as individualized meaning—qualia (perceptions) or data (processes) promoting the semiotic dance. This transdisciplinary, holistic analysis of the meta-environment highlighted the cognitive dissonance between human perceptions and computer-mediated processes while revealing the potential of the meta-environment to function as a complex adaptive system.

This theoretical approach underpinned a further realization that in the implementation of interactive hybrid environments, information is generally translated to the user through a design architecture that assumes embodiment and relies primarily on physical narratives that privilege space over time. It also showed how the elements in the meta-environment comprise a complex adaptive system with different levels of interactions and processes, affecting and mutually influencing each

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<sup>114</sup> See chapter 2, section 2.4.4. Semiotic Interaction and chapter 3, section 3.4.4. Project outcomes.

of the individual elements, similar to the manner in which the elements of an artwork influence and affect perceptions of that artwork.

In the implementation of web interfaces, information is translated to the user through a design environment that assumes embodiment. In this case, the user's need for physicality appears to dictate processes and perceptions that are limiting and linear in scope, restricting information's potential, and consequently the need arises for a more balanced integration among the elements in the meta-environment: user, information, and interface. I believe that looking at the triadic relationship in a meta-environment as a complex adaptive system through the lens of cybersemiotic analysis will lead to a multitude of interacting elements that can possibly expand space-time perceptions and facilitate the conversion of information into knowledge.

When we rethink how the elements of the meta-environment relate to each other and their representational properties of space and time, we start seeing the implications that these elements have on each other and on our human understanding of consciousness.

## CHAPTER 5 | CYBERSEMIOTIC ANALYSIS

### Theory into Practice

#### 5.1. Introduction

#### 5.2. The Cybersemiotic Framework

##### 5.2.1. Introduction

##### 5.2.2. An Integrative Framework

##### 5.2.3. Mediated Properties

##### 5.2.4. Overview

#### 5.3. Analysis: The Cybersemiotic Experience

##### 5.3.1. Introduction: Context, the Fourth Element

##### 5.3.2. The Cybersemiotic Star in Practice

##### 5.3.3. The Development of the Cybersemiotic Experience

##### 5.3.4. Promoting the Cybersemiotic Experience

#### 5.4. Conclusion

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### 5.1. Introduction

The previous chapter introduced the ontological and methodological issues surrounding interactive hybrid environments and proposed the ontological deployment of the terms user, information, and interface for the core elements in a complex adaptive system identified here as meta-environment. The meta-environment includes the relational processes of data/information, metadata, database, applications, user interaction, and information communication existent in the triadic relationship among user, information, and interface. Concepts from cybernetics, semiotics, and systems theory were used in successive attempts to ground these relationships, yet these attempts only revealed the fundamental need for an integrative framework that can facilitate the connections with the ultimate goal of meaning creation. This framework is cybersemiotics.

Space-time aesthetics were also examined in the previous chapter in an attempt to portray the dissociation between our established modes of perceiving

interactive hybrid environments and the actual potential of their multiply interacting elements—user, information, interface—to constitute new complex systems with generative processes and adaptive structures. At the center of this analysis is the critical interrogation of narratives of physical embodiment habitually employed to represent digital media. Our apparent need for such embodiment restricts our perception of digital information to being physically constrained, linear in scope, and exclusively synchronous. As we transition ever further into the digital age, the need to negotiate new space-time understandings and new modes of representing physical/digital and space/time binaries becomes increasingly urgent. The integrative framework of cybersemiotics contributes essential insights needed to devise an appropriate methodological approach to solving this problem.

This chapter analyzes the elements in the meta-environment, presenting a description of the process employed, which is grounded in formal analysis as well as my own creative process through a hermeneutic phenomenological approach, as introduced in chapter 3.

Hermeneutic phenomenology is concerned with the life world or human experience as it is lived. The focus is toward illuminating details and seemingly trivial aspects within experience that may be taken for granted in our lives, with a goal of creating meaning and achieving a sense of understanding (Wilson & Hutchinson, 1991, n.p.).

Here we can observe that the framework of cybersemiotics reinforces the concept that anything that involves or is involved with human cognition and communication inevitably becomes part of a complex adaptive system. In an attempt to elaborate this understanding, I propose an ontology which balances biological, cybernetic, and semiotic views in order to integrate the user's experience as embodied cognition and to consider information as both process and perception.

Scholars in art theory and history, as well as in design and media (film and video), agree that formal analysis involves observing the elements employed in a work of art,<sup>115</sup> defining their characteristics, and identifying how they are organized in the composition or medium, independent of subject matter, intention of representation, resulting perceptions, or context. Unfortunately, these scholars don't necessarily share the same vocabulary or interpretive stance. During my sixteen years researching and teaching fundamentals of 2D design to first-year college students, I adopted the terminology and approach of Ocvirk, et al. (2009) to define the components of art: subject matter, content, and form. I also include context as art historians and scholars in humanities do in order to help my students—and the development of this thesis—"interpret art in terms of the culture of its time" (D'Alleva, 2005, p. 46). In this dissertation, grounded in the design approach, I utilize the individual components of art—subject matter, content, form, and context—in order to effectively develop a formal analysis of the meta-environment while also aiming to establish the influences, implications, and applications of the creative process. Utilizing this methodology, my aim is to generate new knowledge by:

- surveying the influences on the analysis, interaction background: context,
- defining the focus of the analysis, interaction: subject matter,
- identifying the elements involved in the analysis, interaction: form,
- establishing the perceptions and understandings generating and generated by the analysis, interaction: content.

In the previous chapters, I introduced the context by surveying the influences and background for this research. I also addressed subject matter by defining the focus of the analysis as interactive hybrid environments. In this chapter, I continue an

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<sup>115</sup> Called Elements of Design or Art they are as follows: line, shape, space, form (used only to describe 3-dimensional work), texture, value, color, type (used only in design), and time (used only for describing time-based media).

analysis of form that I began in the previous chapter where I identified the elements involved in creating interactive hybrid environments. I will proceed to establish the cybersemiotic framework as the methodological lens that enables reconceptualization of the mediation potential of the elements of the meta-environment and also promotes a qualia experience, which I call the “Cybersemiotic Experience.”

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## **5.2. The Cybersemiotic Framework**

### **5.2.1. Introduction**

The previous chapter introduced the fields utilized to initially inform the observation and analysis of interactive hybrid environments. With my background in Computer Arts and my intention to incorporate the theoretical conceptualizations of New [Digital] Media and HCI, it was a challenge to determine how to address the different facets of interactive hybrid environments and simultaneously embrace their complexity and potential to promote qualia without an integrative framework.

This section formally introduces cybersemiotics as the integrative framework that allows us to examine and accord equal weight to the elements of the meta-environment, in general, and of interactive hybrid environments, in particular. The terms human-computer interaction (HCI), user interface (UI), user experience (UX), and graphic user interface (GUI) are commonly used to describe and define interactive hybrid environments.

Ontologically, these terms describe the elements and properties of humans interacting with physical interfaces that mediate digital information, yet they all have



an exclusively dyadic human-machine focus wherein information is either conceived as human cognitive perception or as a logical process. Søren Brier elaborates on this divide:

Science is still faced with the problem of meaning. The background of cybersemiotics is the recognition that Western philosophy of science is in a state of crisis. Western culture is at a turning point when it comes to taking the final step into a knowledge culture based on information and communication technology. Rather than basing our culture on the conception that the highest goal of knowledge is an abstract, non-embodied and globally available (artificial, impersonal) intelligence of information programs, I believe that we should ground our culture(s) on embodied human living (personal as well as interpersonal), i.e. on semiotic intelligence as part of both living nature and human culture, rather than only on the physical science and the worldview behind it.

The current dominant objectivist science, which to me includes physicalism, eliminative materialism, cognitive sciences based on the information processing paradigm, cannot encompass self-aware consciousness and social-communicative meaning as causal agents in nature. Current cognitive science attempts to explain human communication from the outside without recognizing the phenomenological and hermeneutical aspects of existence. Its conception of human (meaningful) language and communication as a sort of culturally developed program for social information processing between computational brains/ minds cannot explain the evolution of embodied consciousness and (meaningful) human language and communication (Brier, 2013, p. 222).

Attempting to depart from the dualistic mind and body, “inner” and “outer” worlds divide reflected in Kant’s understanding of living beings as self-organized autonomous systems, which places knowledge and meaning construction outside biological and social worlds and into the transcendental worlds (religion); or where meaning creation is seen as computational functions attributed to mechanistic physical states and properties of the brain; Brier calls on the “embodied human living” to equate humans biological qualities shared with other species; unique inner thoughts, perceptions and feelings manifested as mind and consciousness; physical and chemical information of the world; and the cultural world of meaning creation based on linguistic and computational processes. (Brier, 2009).

While researching potential frameworks to integrate perceptions and processes, I resonated with the statement that cybersemiotics provides: “a transdisciplinary theory of Information, Cognition, Meaning, Communication and Consciousness that integrates Cybernetics and Peircean Semiotic paradigms in a common framework” (Brier, 2008).

Brier’s acknowledgment of the complexity surrounding the integration of fields of study segregated through human history, is reflected in this research as the foundation to:

- observe and develop a Creative Act model to establish the collaboration between artist and spectator (user) in transmutating and transubstantiating the artwork Ac (meaning creation);
- observe Ac’s fluid, yet complex, interactions with user and artwork in an endless production of meaning – semiotic dance;
- establish the elements involved in interactive hybrid environments and possible interactions meta-environment;
- address their individual qualities and differences in mediating meaning production in the meta-environment taking into account that together they are a complex adaptive system;
- establish practical implications to improve the creation of interactive hybrid environments in the production of qualia.

Insights from cybersemiotics enabled me to recognize the cognitive dissonance between human perception and the interactive hybrid environment *Mixing Realities*. By observing the artwork based on the creative act model<sup>116</sup> I was able to understand and address why so few people were able to fully experience *Mixing Realities* as I

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<sup>116</sup> See chapter 3, section 3.4.4. Project Outcomes.

had intended. My best efforts to make the installation appealing to user exploration, that is, to make it human-friendly, were undercut by the fact that while focusing on interactively presenting the information through feedback processes, I was not phenomenologically or experientially engaging the user. In practice, this means that while aiming to create an intimate experience, I didn't offer to the user an easy opportunity to embody the artwork. I assumed the artwork in itself would be the mediator triggering the users' actions which would complete the interaction. As seen through the creative act and semiotic dance, the artwork was just a potential. The cybersemiotic framework gave me the awareness that in order for the interaction artwork–user to happen the user (embodied human living) needed to be seen as the initial mediator since it's the one who interprets the experience and perceives meaning creation.

All the ontological attempts to create objective concepts of information result in concepts that cannot encompass meaning and experience of embodied living and social systems. There is no conclusive evidence that the core of reality across nature, culture, life and mind is purely either mathematical, logical or of a computational nature. Therefore, the core of the information concept should not be based only on pure logical or mathematical rationality. We need to include interpretation, signification and meaning construction in our transdisciplinary framework for information as a basic aspect of reality alongside the physical, chemical and molecular biological (Brier, 2015, p. 1).

Brier's explanation enables my understanding that humans are a complex adaptive system and anything that involves or is involved with humans becomes an integral part of this system. This statement can be translated into practice by taking into consideration that, when dealing with dynamic interactive hybrid environments, the manner in which we perceive the information or relate to the interface can be significantly affected by such subjective factors as a headache, excessive noise, a feeling such as anger, the type size of text (if one is reading), the amount of light in the environment, and so forth. Failure to comprehend that humans are essentially

a dynamic complex and adaptive system has limited the full understanding of our existence and exchanges with the world.

### 5.2.2. An Integrative Framework

Chapter 2 introduced the idea that the primary motivation of the artist and the art-object is to connect with the audience, thereby engendering interaction and communication among artist, artwork, and audience (Ascott, 2007). This idea draws on Duchamp's notions of the role of interaction in art and also helps support an interpretive stance on the artwork emphasizing relativity and change (Shanken, 2007).

This stance refocuses representation from static to dynamic and acknowledges the manner in which form gives life to meaning through the artist's and spectator's individual perceptions and consciousness (qualia).

Ascott's call to integrate the user-creator with the user-spectator in interactive artworks derived from the need he sees of applying second-order cybernetics to such art practices. Defined as "the study of the control and communication of complex systems, whether they are living organisms, machines or organizations, paying special attention to feedback as the main way of regulation" (Brier, 2011), first-order cybernetics allowed the integration of processes between humans and machines and consequently might have seemed the appropriate framework to study HCI. Initially concerned with observing the feedback processes that self-regulate and control the system, cybernetics evolved into second-order cybernetics in order to include the observer in the system. Elaborating on the differences between first and second order cybernetics, J. M. Díaz Nafría interprets Heinz von Foerster pointing out that first-order cybernetics questions "What and how are the mechanisms of feedback of the studied

system?” whereas the second-order questions “How are we able to control, maintain and generate this system through feedback?” (Nafría, 2009, n.p.).

When developing interactive hybrid environments, the concepts employed by the discipline of user interface design (UI) attempts to address Brier’s questions concerning first- and second-order cybernetics. A simple detail such as where a button to apply a change in the system is placed can be a continuation of the feedback processes or a break in the communication. Unfortunately, when a break happens, the user experience gets compromised since the process is broken and communication ceases.

At this point, we need to take into consideration that the user exchange with the system and with information happens on an objective level (informational) as well as a subjective level (phenomenological) (Brier, 2008, 2011). This exchange—and consequently the information that is created—has the potential to be more than the amount of disorder or randomness in a system (entropy) as seen in cybernetics. Information can be perceived as meaning when “organized into something recognizable and usable (words, symbols, gesture, etc.)” (Danesi, 2011, p. 312).

[Cybersemiotics] uses meaning as the overarching principle for grasping the complex area of cybernetic information science for nature and machines AND the semiotics of all living systems’ cognition, communication, and culture. Cybersemiotics is an integrated transdisciplinary philosophy of science allowing us to perform our multidisciplinary research, since it is concerned not only with cybernetics and Peircean semiotics, but also with informational, biological, psychological and social sciences (Brier, 2013, p. 222).

The cybersemiotic framework allows the analysis of the elements of the meta-environment both individually and as a wholistic system as it understands that information is not just “objective data, [since it needs] a context and a living system’s interpretation to yield meaning” (Garcia, 2013, p. 34).

Nicholas Lambert reminds us that for computer arts, the computer has a broader function than simply being a medium.<sup>117</sup> It “operates simultaneously as medium, tool and context, in addition to its organizational and interactive elements” (Lambert, 2009c, n.p.), opening the possibility that when examining interactive hybrid environments and the elements of the meta-environment, it may be discerned that the interface is not the only element mediating the interactions, that in fact human users and information mediate as well and meaning arises beyond data, beyond the exchange. This understanding reveals a complex adaptive system which can only be fully comprehended through the integrative lens of cybersemiotics.

### 5.2.3. Mediated Properties

Jennifer Tidwell observes that:

Each time someone uses an application, or any digital product, they carry on a conversation with the machine. It may be literal, as with a command line or phone menu, or tacit, like the “conversation” an artist has with her paints and canvas—the give and take between the craftsperson and the thing being built. With social software, it may even be a conversation by proxy. Whatever the case, the user interface mediates that conversation, helping the user achieve whatever ends he or she had in mind (Tidwell, 2013, p. 1).

Tidwell speaks to the understanding, emergent within the field of computer arts, that a computer or any digital product does not function only as a medium reinforcing Lambert’s expansion of computers beyond just a medium.

Cybersemiotics enables the understanding that the three elements in the meta-environment—user, information, interface—are part of a complex adaptive system and need to be equally balanced and analyzed, by factoring in the user’s essential influence in the system and by considering the manner in which information functions as both

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<sup>117</sup> In *A Philosophy of Computer Art?* Dominic McIver Lopes (2010) questions established concepts of the medium in computer art and calls for a broader understanding of computers as medium, reinforcing Lambert’s views. Lopes is not discussed in here in more depth because his focus is in the defense of computer art which detours the subject of this research.

human perception and logical process. Broadly speaking, cybersemiotics seeks to close the gap between art and science through combining the four approaches below:

1. A physico-chemical scientific paradigm based on third person objective empirical truth and mathematical theory but with no conceptions of experiential life, meaning and first person, embodied consciousness and therefore meaningful linguistic intersubjectivity.
2. A biological and natural historical science approach understood as the combination of genetic evolutionary theory with an ecological and thermodynamic view based on the evolution of experiential living systems as the ground fact, engaged in a search for empirical truth, but with no theory of meaning and first person embodied consciousness and thereby linguistic meaningful intersubjectivity.
3. A linguistic-cultural-social structuralist constructivism that sees all knowledge as constructions of meaning produced by the intersubjective web of language, cultural mentality and power, but with no concept of empirical truth, life, evolution, ecology and a very weak concept of subjective embodied first person consciousness, but taking conscious intersubjective communication and knowledge processes as the basic fact to study (the linguistic turn).
4. A phenomenological (Husserl) or actually phaneroscopic (Peirce) first person point of view taking conscious meaningful experiences before any distinction between subject and object as the ground fact, on which all meaningful knowledge is based, considering all result of the sciences including linguistics and embodiment of consciousness as secondary knowledge. This includes an intersubjective base in that Peirce considers all knowledge as intersubjectively produced through signs only emotions are Firstness (Brier, 2011, n.p.).

Thus, from a design perspective, I propose we rethink the mediation capabilities of the elements in the meta-environment and their space-time and/or physical-digital characteristics based on Brier's cybersemiotic framework, which allows for the following analytical categories and correspondent mediation capabilities, as seen in Table 2. In this analysis, the meta-environment is seen as a closed system<sup>118</sup> with three distinctive interactive elements, and individually each element has many distinctive interactive parts. As such, it can be regarded as a dynamic complex adaptive system, where the influence of the individual elements on the system as a whole is greater than

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<sup>118</sup> Meaning without exchange of matter.

the sum of these elements (nonlinearity) and affects the system's predicted stability (chaos) (Gershenson & Heylighen, 2005).

1. Physico-chemical focus:

Spatiality – Refers to how the element occupies the space, physical matter or digital bits.

Temporality – Distinction between temporal and atemporal qualities.

2. Biological and natural historical science focus:

Life/Living System – Essence: The element's core structure, matter (atoms) or bits.

3. Linguistic-cultural-social structuralist constructivism focus:

Sense/Meaning – Sign Processes: Relate to subjective or objective sign interpretation and meaning creation.

4. Qualia: Phenomenological – phaneroscopic first-person point of view focus:

Embodied Cognition – The process of meaning creation from “one mental space to another” (Brier, 2008, p. 303).

5. Focus on the complexity of elements – user, information, interface – in relationship to the whole system.

Dynamic Complexity – Distinction between predictable/linear dynamics and chaotic/nonlinear dynamics.

A common characteristic of models of complex systems is that they are nonlinear. This means that the elements of a system interact in ways that are more complex than additions and subtractions. In a linear system, we just add the properties of the elements, and we can deduce and predict the behaviour of the system. Nevertheless, when there are many interactions, and these are nonlinear, small



differences multiply overtime, yielding often chaos and unpredictability. In a nonlinear system, causes are not directly proportional to their effects. Big changes can have little or no effect, while small changes can have drastic consequences. This makes complex systems to be not completely predictable. (Gershenson & Heylighen, 2005, n.p.).

Table 2 shows the mediation capabilities of the elements of the meta-environment according to the categories presented above. It reveals that even though we have been relying on the interface as the sole mediator of spatiality, essence, embodied cognition, and temporality to promote human knowledge, information also mediates sign processes that convey cognitive meaning to embodied living beings (subjective) or binary codes (objective). In a similar manner, only the user can mediate dynamic experiential complexity, as it is the only element that presents predictable and linear dynamics as well as nonlinear dynamics.

Categories/ Elements	User	Information	Interface
<b>Spatiality</b>	Physical	Digital	Physical + Digital
<b>Temporality</b>	Temporal	Atemporal	Temporal + Atemporal
<b>Essence</b>	Atoms	Bits	Atoms + Bits
<b>Sign Processes</b>	Subjective	Objective + Subjective	Objective
<b>Embodied Cognition</b>	Embodied	Disembodied	Embodied + Disembodied
<b>Dynamic Complexity</b>	Linear + Nonlinear	Nonlinear	Linear

**Table 2.** Mediation capabilities of the elements in the meta-environment with their characteristics and mediation capabilities.

#### 5.2.4. Overview

This section describes and justifies the use of Soren Brier's cybersemiotics as an essential component of the methodology employed in analysis of interactive hybrid environments such as "Mixing Realities." This study frames such hybrid artworks as instances of a broader construct denoted as the meta-environment, consisting of the fundamental elements user, interface, and information. Brier's (2008) transdisciplinary theory of information, cognition, meaning, communication and consciousness flexibly integrates a wide variety of perspectives, including not only cybernetics and Peircean semiotics but also fundamental insights from biological, informational, psychological, and social sciences. Its broad scope and integrative aim make cybersemiotics a uniquely valuable tool for mapping the apparent divide between the perceptions of human users and the logico-mathematical processes of digital interfaces.

The cybersemiotic framework allows the analysis of the three elements of the meta-environment both individually and as a wholistic system since it understands information as not just objective data but the meaning derived in specific contexts and dependent upon interpretation by living systems. Cybersemiotics enabled this researcher to move beyond the limited insights of such fields as human-computer interaction (HCI), user interface (UI), user experience (UX), and graphic user interface (GUI), all deployed by various theorists and practitioners to describe and define interactive hybrid environments. Ontologically, these terms describe the elements and properties of humans interacting with physical interfaces that mediate digital information, yet they all have an exclusively dyadic human-machine focus wherein information is either conceived as human cognitive perception or as a logical process.

Cybersemiotics enables the understanding that the user, interface, and information are part of a closed system with three distinctive interactive elements, and individually each element has many distinctive interactive parts. This system is complex, dynamic, and adaptive. Its three elements need to be equally balanced and analyzed, by factoring in the user's essential influence on the system and by considering the manner in which information functions as both human perception and logical process. From the design perspective, employed as a central methodological element, I propose that we rethink the mediation capabilities of these elements in the meta-environment and their space-time/physical-digital characteristics. Broadly considered, this goal responds to Ascott's call to integrate the user-creator with the user-spectator in interactive artworks, a call derived from the need he sees of applying second-order cybernetics to such art practices.

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### **5.3. Analysis: The Cybersemiotic Experience**

#### **5.3.1. Introduction: Context, the Fourth Element**

In exploring the mediation capabilities of these elements in Table 2, I started to look at the meta-environment with the new understanding that to expand consciousness within interactive hybrid environments, it is necessary to ensure that user and information are also being seen as mediators in the system. It also became apparent that the context<sup>119</sup> surrounding the three core elements should also be accounted for as a fourth element influencing the meta-environment.

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<sup>119</sup> The *Oxford Dictionaries* online define context as: "The circumstances that form the setting for an event, statement, or idea, and in terms of which it can be fully understood and assessed" (Context, 2016).

The context can be described as external circumstances influencing user, information, and interface that are not regulated by them. Examples of context in interactive hybrid environments include lighting, temperature, background noise, and type of space.

Integrating the four elements in the meta-environment—user, information, interface, and context—allows for the expansion of consciousness as the Cybersemiotic Experience of the meta-environment. This occurs simultaneously from outside, as active observation with some control over the intended object of observation (linear dynamics), and from inside, as the user participating in and constituting part of a whole. In the latter case, the user has little control over how interpretation, signification, and meaning are constructed or how his or hers physical, chemical, and biological nature influence and are influenced by the interaction process (non-linear dynamics).

### 5.3.2. The Cybersemiotic Star in Practice

As a visual artist, I think the best way to explain and illustrate how this paradigm shift might change the way we perceive and relate to the meta-environment is by exploring a three-dimensional representation of the cybersemiotic star (Figure 46) with the understanding that the arms of the star represent the four aspects (natural, biological, phenomenological, semiotic) that ground the cybersemiotic framework united in the center by the integration of human knowledge and consciousness.

The Cybersemiotic Experience can be represented by a three-dimensional tetrahedron (Figure 47) where each side of the figure represents one facet of the cybersemiotic star. This tetrahedron is an adaptive and dynamic self-regulating structure

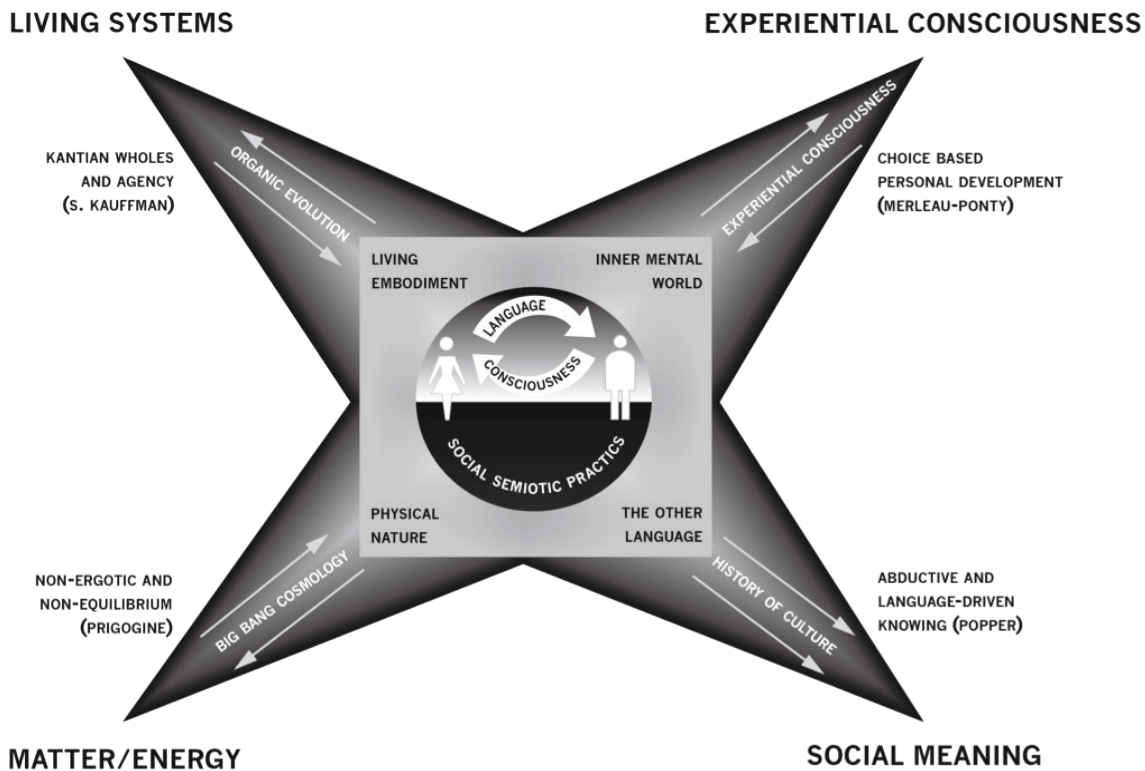


Figure 46. The Cybersemiotic Star (Brier, 2008).

that constantly experiences entropic changes in each of its four facets and is in constant change, (Figure 48) becoming more or less pointy, expanding or reducing its sides in order to maintain its original structure (Figure 49).

Artistic and HCI practices need to rely on and also call for the Cybersemiotic Experience. When in 1967, Nelson Goodman founded Project Zero at Harvard's Graduate School of Education "to study and improve education in the arts,"<sup>120</sup> his aim was to expose viewers [users] to the artistic process, aiming to "increase their sensitivity and discrimination, to encourage inquisitive looking and listening, to induce the experience of perceiving works and a world anew" (Goodman, 1984, p. 160). The Cybersemiotic Experience expands Goodman's aims beyond the artistic realm and into the information processing paradigm by attempting to reconcile:

<sup>120</sup> Project Zero is still vibrant today. More about the Project can be found at <http://www.pz.harvard.edu/who-we-are/about>.

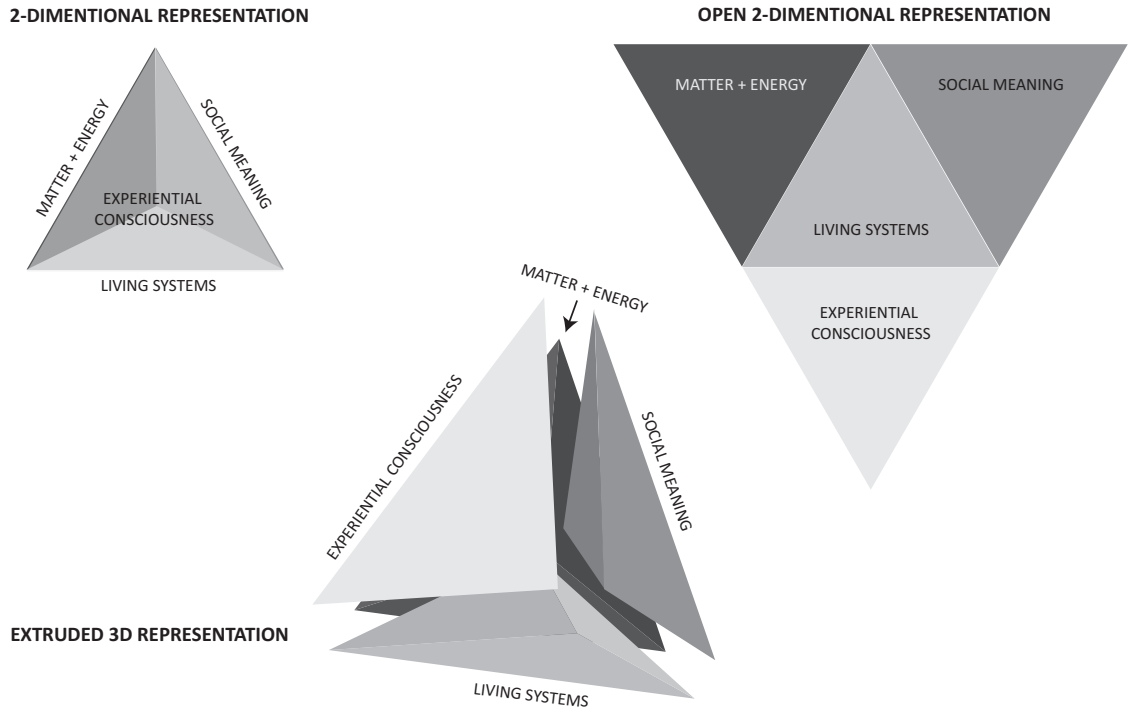


Figure 47. Proposed tetrahedron representation of the adaptive facets of the cybersemiotic star.

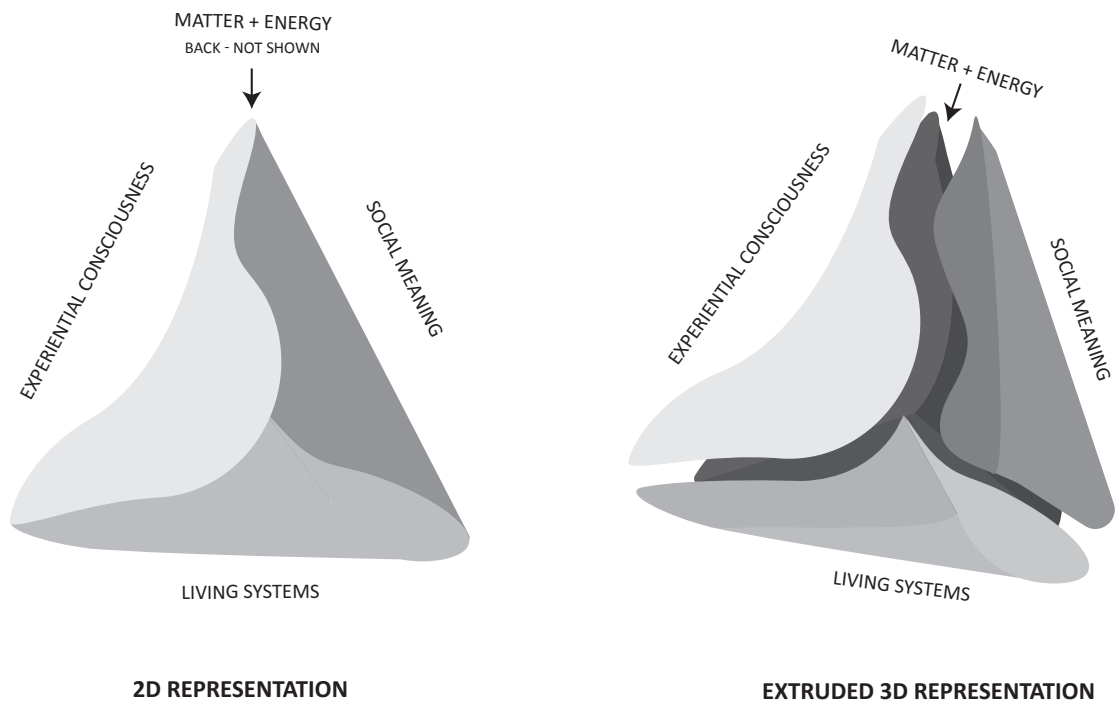


Figure 48. Proposed tetrahedron representation for the Cybersemiotic Experience.

- (1) human meaningful information [with] meaningfully algorithmic processing of information;
- (2) how humans embody information to make meaning, and how embodied and un-embodied information differ;
- (3) consciousness with perception and embodied human knowledge;
- (4) culture and embodied knowledge ... to integrate our knowledge of the role of first person experience, qualia, meaning and signification in our scientific knowledge of the evolution of life [humans] (Brier, 2011, p .4).

Figures 47 and 48 represent how each element in the meta-environment present its interaction characteristics (Duchamp's Ac potential) and capabilities (semiotic dance potential) based on the cybersemiotic framework. Grouping back the mediation capabilities introduced in Table 2, each of the elements of the meta-environment should be observed by the four categories defined in the cybersemiotic star: matter and energy (physico-chemical: spatiality and temporality); living systems (essence: atoms or bits); social meaning (linguistic-cultural-social structure, sign processes: subjective or objective); experiential consciousness (phenomenological qualia, embodied cognition or not) representing the four facets of the tetrahedron and "glued together" with more or less stability by the dynamic complexity (linear or non-linear) characteristics.

Even though the representations offered in Figure 47 depict perfect geometric shapes, in reality, each element will have a distorted representation of its geometric shapes because they don't have the same characteristics in the same amounts. For example, potentially, the element interface may have almost perfect facets when representing its matter and energy, living systems, and experiential consciousness characteristics, since these are the characteristics that the element has capability of mediating. On the other hand, the facet social meaning will be distorted since its

characteristic is only objective. Also, these characteristics composing the element (and the geometric shape) are linear and more predictable (less chances of change) based on its dynamic complexity. Imagining that each element in the meta-environment is composed by its cybersemiotic characteristics, reveals a more organic version of the tetrahedron as shown in Figure 48.

Once each element of the meta-environment is defined by its characteristics, they can be represented as whole as shown on Figure 49. Note that the fourth element is introduced in the representation: Context, which is a wild card since the kind of element and its characteristics are only defined when the system interaction is already in formation. The inclusion of Context is necessary, because interactive

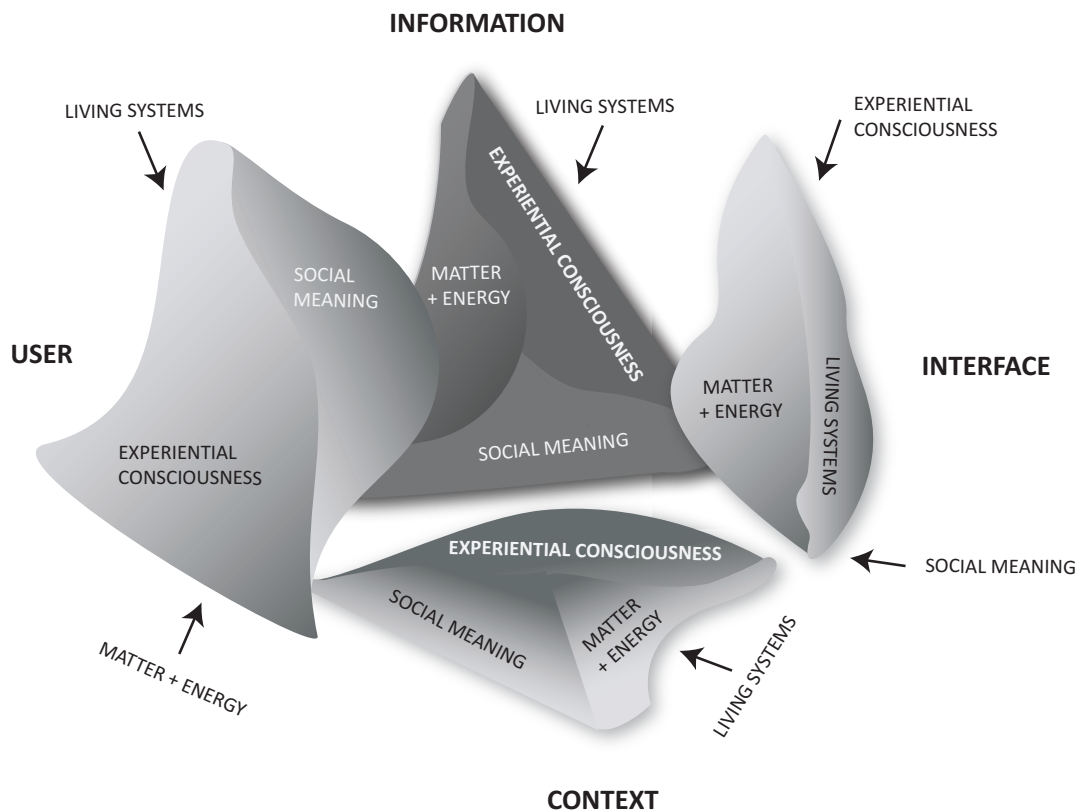


Figure 49. The cybersemiotic experience in the meta-environment: elements' facet interacting exchanges.

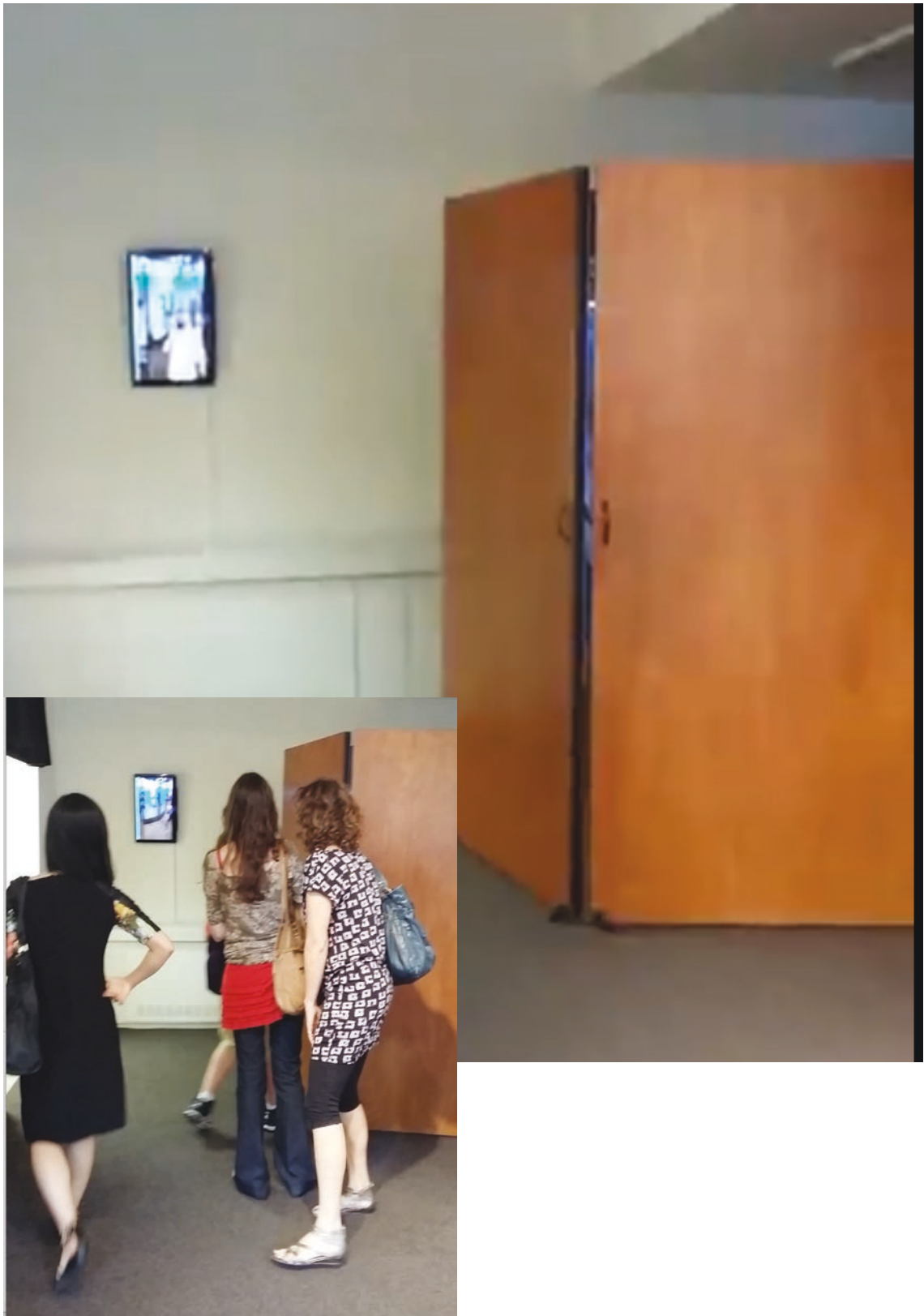


hybrid environments are not really closed controlled systems as the representation of the semiotic dance mobius spiral in constant change yet circumscribed by the user seems to show (Figure 20). In reality we need to understand that each mobius spiral is constantly being bombarded by other meta-environments and as such they also influence the construction of meaning and the expansion of consciousness. The mobius spiral represents the fact that when we attain consciousness we never lose it, but build upon it..

### 5.3.3. Promoting the Cybersemiotic Experience

When *Mixing Realities* was first made available for public use in 2009, I was surprised that only about half the people who passed by the installation would open the doors to peek inside. My expectation was that most people would have enough curiosity and motivation to check the physical environment and, according to their own perceptions, engage with the artwork on different levels. As expected, once the users took the initiative to explore the artwork, most of them would briefly look inside and, seeing their infinite reflections in the mirrors, would then become self-conscious and quickly leave the environment. Others would just stand inside, staring at themselves in the mirror without attempting to interact with themselves or the artwork.

A few became totally engaged in exploring the installation, interacting with themselves in the mirror and the delayed projections triggered by their movements. Users who fully immersed themselves in the environment would quite often contact me to tell how amazing and unique the experience was, especially how they experienced their perceptions of time and space in new ways.



**Figure 50 (top).** *Mixing Realities* set-up at Arts Westchester in White Plains, New York, 2014, showing the child in figure 60 interacting inside the installation through the external monitor and calling attention to the people on figure 51.

**Figure 51 (bottom).** A group interacting with *Mixing Realities* (2014) with the monitor outside the physical structure (interface) showing what was happening inside.

*Mixing Realities* was developed to be an exchange on any level the user could perceive, and my “primary motivation was to start a dialogue, to set feelings and ideas in motion” (Ascott, 2007, p. 111). Nonetheless, I felt frustrated that so few people really engaged with the artwork. I had attempted to combine physical and digital elements in an intuitive, user-friendly, and relatively private HCI system. I had followed all the current approaches in second-order cybernetic feedback processes, user experience (UX), and interaction design; nevertheless, the first and most fundamental connection between the user and the interface did not happen very frequently, and I could not understand the reason. As I also design dynamic interactive digital information environments, I eventually began to realize that the disconnect between the user and the interface that I observed in *Mixing Realities* is very similar to the disconnect users frequently experience when facing any new interface (whether a gadget, computer application, or website). It seemed that the disconnect from the information—either for lack of knowledge about or lack of interest in it—accentuated the discomfort with the interface. That is when I became aware that something more than optimal second-order cybernetic feedback processes, HCI, information design, and user experience guidelines and rules, was needed to conceptually ground and move my artistic practice forward, so that the user would be integrated into the work as originally intended.

Under the lens of cybersemiotic framework, *Mixing Realities* was analyzed as a meta-environment and each of its interaction characteristics (Duchamp’s Ac potential) and capabilities (semiotic dance potential) were observed. I concluded that when I made the artwork very private, I removed the interface’s capability to mediate embodied cognition, making it hard for users to relate to the artwork (Table 3). Placing the second monitor outside the installation added back the lost mediation capability.

It is also important to point out the influence of the context in mediating the experience. At the School of Visual Arts MFA Computer Arts Open Studio, *Mixing Realities* context was predominantly defined as friendly social environment which bares strong subjective sign processes, embodied cognition and potential for non-linear dynamic complexity, therefore putting enhancing user-user interactions over interface and even information.

At the ArtsWestchester and Regeneron shows I intentionally defined a context to help mediate the interactions by adding the external monitor screen to show what was going on inside *Mixing Realities*' structure. The monitor screen (physical, temporal, atoms, objective, embodied, linear) presented data (digital, atemporal, bits, subjective and disembodied) complementing the user's need for an enhanced objective and embodied experience (Table 4).

Observing users with the understanding that *Mixing Realities* is a vehicle of exchange and communication between them and their own perceptions revealed that a quantitative analysis of how the new version of *Mixing Realities* impacted the users would be limited "to analyz[ing] perception as an interpretative process" (Kuhn, 2012, p. 194). With Kuhn's understanding of Michael Polanyi's concept of tacit knowledge<sup>121</sup> underpinning my own reflective practice, I concluded that the latest iteration of *Mixing Realities* (2014) with the added screen was dramatically more successful as measured by users' interaction with the artwork. The great majority of people felt compelled to experience the artwork, taking turns between being passive observers and active users.<sup>122</sup>

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121 "Knowledge that is acquired through practice and that cannot be articulated explicitly" (Kuhn, 2012, p. 44 fn 1).

122 For further discussion and illustrations of *Mixing Realities* (2009) and *Mixing Realities* (2014), see Chapter 3, Sections 3.4.3 and 3.4.4.

CHAPTER 5 | CYBERSEMIOTIC ANALYSIS

Categories/ Elements/ Dominances	User	Information	Interface
<b>Spatiality/ Physical</b>	Physical	Digital	Physical (Digital)
<b>Temporality/ Even</b>	Temporal	Atemporal	Temporal + Atemporal
<b>Essence/ Even</b>	Atoms	Bits	Atoms + Bits
<b>Sign Processes/ Subjective</b>	Subjective	(Objective) Subjective	Objective
<b>Embodied Cognition/ Disembodied</b>	Embodied	Disembodied	(Embodied) Disembodied
<b>Dynamic Complexity/ Nonlinear</b>	Linear + Nonlinear	Nonlinear	(Linear)

**Table 3.** Mediation capabilities of the elements in *Mixing Realities* with their characteristics and mediation capabilities defined. In parentheses are the characteristics that were not potentialized and shifted the interactions dominances affecting the meta-environment potential for meaning creation.

Categories/Elements/ Dominances	User	Information	Interface	Context
<b>Spatiality/ Mostly Physical/</b>	Physical	Digital	Physical	Physical + Digital
<b>Temporality/ Even</b>	Temporal	Atemporal	Temporal + Atemporal	Temporal + Atemporal
<b>Essence/ Even</b>	Atoms	Bits	Atoms + Bits	Atoms + Bits
<b>Sign Processes/ Mostly subjective</b>	Subjective	Subjective	Objective	Objective + Subjective
<b>Embodied Cognition/ Even</b>	Embodied	Disembodied	Disembodied	Embodied
<b>Dynamic Complexity Mostly nonlinear</b>	Linear + Nonlinear	Nonlinear		Linear + Nonlinear

**Table 4.** Mediation capabilities of the elements in *Mixing Realities* with their characteristics and mediation capabilities balanced by the inclusion of a positive context.

The theoretical and visual understanding of how the meta-environment functions in practice, based on the parts of the cybersemiotic star's self-regulating capabilities to create balance in the system, made me realize that, in order to promote a Cybersemiotic Experience in the case of the interactive hybrid environment "Mixing Realities," it was necessary to enable mediation of the sign processes by expanding the information—which was originally perceived as embodied and confined within the interface—to the outside of the installation. Following this rationale, I rethought the dynamics and enhanced the installation with an added monitor outside the physical structure (interface) showing what was happening inside. This in turn acted as an enticing invitation to interact with the artwork by allowing the user to assume control over the predictable, linear dynamics while also negotiating the chaotic, nonlinear dynamics of the information being visualized (Figures 38 & 39).

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#### **5.4. Conclusion**

The understanding that interface mediation and representational paradigms that emphasize embodiment are limiting factors when representing the architecture of digital information environments and the user-information-interface relationship and that most current frameworks for analyzing these elements utilize a reductionist approach makes clear the need for reconceptualization.

Ubiquitous computing is expanding human-computer interaction to everyday life; turning refrigerators, cars, phones, doors, and so forth, into interfaces; which, in turn, is changing and affecting how humans perceive and interact with information. This expansion of HCI, coupled with Graeme Sullivan's assertion that artists theorize by

using “intuition and intellect, grounded in context-specific circumstances [to] provide an experimental base for constructing new frameworks of understanding” (Sullivan, 2005, p. 73), reinforces the need for creative new understandings of the relationship among user, information, and interface. Through the lens of cybersemiotics, it is possible to rethink how the elements of the meta-environment relate to each other, to explain their mediation properties, and to start seeing the implications that these elements have for one another and for the possibilities of expanding consciousness.

Grounded on the cybersemiotic star, the representations of the evolving and complex interactions among the elements of the meta-environment gave birth to the Cybersemiotic Experience. User, information, and interface can then be seen taking turns in mediating the interaction and promoting meaning through an inner-outer world exchange. Ascott describes this exchange as the “double gaze, seeing at once both inward realities and the outward surfaces of the world” (Ascott, 2007, p. 358) and consequently promoting two distinctively different fields of experience (double consciousness).

Brier presents the outer world as *Umwelt*, based on von Uexküll’s “objective life world of the animal mediated by interpretations in the context of what makes sense from a biological, evolutionary sense” (Garcia, 2013, p. 167) which, according to Thomas Sebeok, the father of biosemiotics (Brier, 2008, 2013; Copley, 2010b, 2012, Garcia, 2013), brings forth an *Innenwelt* (inner world).

In the creation of meaning, the possibility of new mediations and perceptions reflects the semiotic dance and the infinite possibility of interactions in meaning production. As hybrid interactive environments are shared physically and/or digitally (networked), the potential is for a meta-environment to interact with other meta-

environments, expanding the complexity in elements and interactions in the  
Cybersemiotic Experience and promoting the potential for shared consciousness.



**CHAPTER 6 | OUTCOMES**  
Designing for the Cybersemiotic Experience

- 6.1. Mediation Potentials
- 6.2. Syncretic Entanglement
- 6.3. Digital Ayahuasca

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**6.1. Mediation Potentials**

In the pursue of expanding consciousness promoted through interactive hybrid environments, the study of cybersemiotic and the application of the cybersemiotic star into practice yield the representations shown in chapter 5 (Figures 47, 48 and 49). These representations presented how the elements in the meta-environment are defined by their inherent qualities if analyzed under the cybersemiotic framework

Establishing the characteristics of these qualities allows for the elements' individual formal analysis revealing their mediation capabilities in the meta-environment. The representations translated into practice as the *mediation capabilities of the elements in the meta-environment table* (Table 2) revealed where the mediation capabilities were not properly activated in *Mixing Realities*, presenting the need for the inclusion of a positive context (the hidden and yet active element in the meta-environment, Tables 3 and 4) to balance the user's need for embodiment diminished in the first iterations of the artwork.

Isolating the elements from their interactions, observing their individual qualities against the whole and intentionally addressing the limitations to improve their interaction capabilities follows a formal design analysis parallel to aesthetic analysis in 2D design. The goal in 2D formal analysis is to attain and aesthetic balance. In the

case of interactive hybrid environments is to enhance experiential perceptions and processes.

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## 6.2. Syncretic Entanglement

Cybersemiotics makes it possible to rethink how the elements of the meta-environment relate to each other, explain their mediation properties, and understand how these elements affect each other in the promotion of meaning and expansion of consciousness.

As Ascott (2007, p. 357) points out, it is “the artist’s imperative to explore every aspect of new technology that might empower the [user] through direct physical interaction to collaborate in the production of meaning and the creation of authentic artistic experience.”

Duchamp called for the inclusion of the spectator in the production of the artwork, which he called the art coefficient (Ac, Figure 37). Ascott pushes further, suggesting that only when the spectator is included is the artwork completed (2007). Brier offers an inclusive framework for examining the structural coupling<sup>123</sup> of user, information, and interface (Maturana & Varela, 1992, p. 75; Guddemi, 2000; Bopry, 2007; Ascott, 2007). Cybersemiotics also makes salient the manner in which the elements in the meta-environment interact as a complex adaptive system and assume different levels of mediation, thus creating a unique human experiences. Cybersemiotic analysis allows for the translation from theory to practice since new experiences give rise to

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<sup>123</sup> Which here is also seen as the syncretic entanglement.

new meanings, from which arise new experiences, and consequently new meanings, so forth and so on.<sup>124</sup>

This syncretic entanglement between humans and machines has been afforded by the speed with which new technologies emerge. This speed has left humans with little time to stop and observe HCI from a critical distance, even though its influences are strongly felt around the world and every day in the artistic, social, cultural, political, and economic realms. This thesis proposes a reflective discourse aiming to observe the changes and implications in HCI, which is greatly facilitated through employing the lens of cybersemiotics. Both Ascott (2007) and Brier (2008, 2013) call for the acknowledgment of the syncretic entanglement of our inner and outer worlds.

Attempting to expand the experience in *Mixing Realities* beyond its physical boundaries to promote a more effortless move between physical and digital I started to research how human brain waves work and biofeedback principles. Fascinated by the Brazilian native culture on Ayahuasca and its potential for group consciousness I started to conceptualize Digital Ayahuasca as meta-environment, promoting the Cybersemiotic Experience with potential for syncretic entanglement of the Umwelt and the Innenwelt or the double gaze, which in Ascott's view leads to double consciousness.

In classical anthropological terms, [double consciousness] describe[s] the shamanic “trance” in which a shaman is both in the everyday world and at the same time navigating the outmost limits of other worlds, psychic spaces to which only those prepared by physical ritual and mental discipline, aided often by “plant technology,” are granted access. In post-biological terms, this is mirrored by our ability, aided by computer technology, to move effortlessly through the infinities of cyberspace, while at the same time accommodating ourselves within the structures of the material world. (Ascott, 2007, pp. 357–358)

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<sup>124</sup> This refers to the semiotic dance introduced in chapter 2, section 2.4.4.

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### 6.3. Digital Ayahuasca

Ayahuasca is the plant technology Ascott refers to, which he considers to be a moistmedia. The Cybersemiotic Experience empowered me to conceptualize an interactive hybrid environment that digitally mimics double and shared consciousness experienced by ayahuasca users. This interactive hybrid environment aims to bring about “a whole new repertoire of senses, and a new kind of relationship between tools of seeing and building” (Ascott, 2007, p. 361), which Ascott calls techno-quality.

For over half a century, researchers in natural and social sciences have been studying altered states of consciousness in relation to individual perceptions of self, time, and space, and the possibilities of shared or group consciousness. In recent years, an important focus of these studies has been ayahuasca ritual practice as a mediator of altered states of perception due to the entheogenic effects of DMT (dimethyltryptamine) on the brain.

Translated as “the vine of the soul” (Ascott, 2007, p. 358), ayahuasca has been used for over 5000 years by the indigenous people of the Amazon region in South America to mediate a variety of situations and interactions (war, natural disasters, health crises) among people and tribes in the region. Since the 1870s with the advent of rubber and vanilla extraction in the region, ayahuasca ritual has syncretically entangled with Catholicism, Spiritism, and Afro-Brazilian religious expressions.

Indigenous ayahuasca use can only be understood within the context of indigenous spirituality. According to its worldview there is an underlying spiritual aspect to everything that exists, an intimate relationship and even dependency between the seen and the unseen, between the world of nature and human creation on one side, and normally invisible and intelligent forces. The preservation of the individual and the community, and therefore human action, depends on finding the proper balance in this complex reality. Sacred plants, such as ayahuasca, facilitate the perception of such complexity. Gifted

individuals may establish alliances with spiritual forces and interact for the benefit (or detriment) of others. They are able to interpret natural phenomenon finding hints that reveal the development of unseen forces that determine human existence. They are curious, interested in plants and animals, weather conditions, natural phenomena and the traditions of his community. They are therefore the recipients of the myths, narratives, songs, and spells. They have clear visions when under the influence of sacred plants, or are able to shed light upon the visions and experiences of others. They are intellectuals and humanists. These are the shamans or payés, both feared and sought for when the situation thus requires it. They undergo special training, which implies dietary restrictions, the avoidance of sex, sojourns with shamans of neighboring indigenous groups and the acquisition of helping spirits, powerful objects, magical arrows and metaphors that help them in their practice. They are both knowledgeable of their natural environment as the masters of complex normally unseen supernatural realms. (Luna, 2011, p. 8)

Ayahuasca is the name of the brew and also the main ingredient—Banisteriopsis caapi vine—of the psychoactive tea. The vine is boiled with the leaves from the bush Chacruna (*Psychotria viridis*), which contains DMT as its active principle. It is consumed in a ritual ceremony with an ayahuasquero (an ayahuasca shaman) to see the spirit world, provide guidance, and cure mental and physical ailments (Luna, 2011). Ascott describes the following concerning his experience with ayahuasca:

I entered a state of double consciousness, aware both of my own familiar sense of self, and of a totally separate state of being. I could move more or less freely between these two states. Similarly with my body: I was at one and the same time conscious of inhabiting two bodies, the familiar phenomenology of my own body sheathed as it were in a second body which was made up of a mass of multi-colored particles, a million molecular points of light. My visual field, my double gaze, alternated, at choice, between the coherent space of everyday reality and a fractal universe comprising a thousand repetitions of the same image, or else forming a tunnel in space through which I could voluntarily pass with urgent acceleration. I could at any point stop and review these states, moving in and out of them more or less at will. (Ascott, 2007, p. 358)

Experiences like Ascott's have been documented by anthropologists (Labate, Luna), neuroscientists (McKenna, Strassman) and portrayed by several artists fascinated by the inward/outward double consciousness and shared sensory experiences.

The understanding of the Cybersemiotic Experience, reflecting the potential of meta-environments to promote the construction of meaning through Ascott's techno-qualia, led me to research and conceptualize an art project—*Digital Ayahuasca*<sup>125</sup>—to explore parallels between (1) the vegetal reality experienced through the ayahuasca infusion and (2) DMT changes in the brain induced by an interactive hybrid environment designed to induce the double gaze by offering different visual, tactile, auditory, and olfactory stimuli. My intention is to explore the possibility of affecting perceptions of self, time, and space and promoting a shared consciousness similar to the ayahuasca experience but emanating from the experience of an interactive digital environment.

Hoping to advance connections between art and science in the understanding of mediated consciousness through technoetic aesthetics and cybersemiotic experience, *Digital Ayahuasca* is an immersive three-dimensional haptic holographic environment created out of visualizations, sounds, haptic feedback, and smells generated by the users' brain waves. Invited to initially sit meditatively, participants use an EEG (electroencephalogram) device to capture their brainwaves. Each brainwave frequency is represented according to documented interpretations of similar brainwave activities and visualizations reported in the ayahuasca-induced reality.

If only one user is participating in this installation, that user should be able to experience the corresponding visual, auditory, tactile, and olfactory representation of his or her current brainwaves. As the user immerses in the environment, either by choosing to stay in a meditative position or to physically respond to the installation's stimuli, the experience begins to influence his or her perception of self, space, and

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<sup>125</sup> The project proposal can be seen in Appendix 2.

## CHAPTER 6 | OUTCOMES

time and affect the brain waves and consequently the sensory experience. As the user engages with the installation, she or he will experience the double gaze by perceiving not only the environment but also their mental process, and how one influences the other.

Similar to the ayahuasca vegetal reality, this installation promotes group participation, not as a “public performance but a spiritual enactment” (Ascott, 2007, p. 360), following the model of the Cybersemiotic Experience, where each user is an entangled meta-environment, navigating through inner and outer worlds to create meaning; which in turn will be entangling with other users’ meta-environments. No individual controls the environment, yet all participants affect it.

This immersion in a controlled environment, affecting sight, touch, taste, smell, and hearing respectively, conferring on the mind the ability both to induce and create new conceptual and sensory structures (in philosophical jargon new “qualia”), while at the same time giving the freedom to step aside from the visionary experience, back into the “normal” field of experience. (Ascott, 2007, p. 359)

Digital Ayahuasca is an outcome of my research into the elements of the meta-environment and the potential of the Cybersemiotic Experience in “combining the sense of shamanic and semantic, the navigation of consciousness and the construction of meaning” (Ascott, 2007, p. 359). The conceptualization and physical planning of Digital Ayahuasca following the iterations and reconceptualization of *Mixing Realities* (2009, 2014) are milestone markers in the cycle from practice to theory to practice to theory and so on, characteristic of the work of a reflective art practitioner.

What follows is excerpted from the verbatim record of a written SKYPE conversation that took place between myself and British digital artist/architect Carl Smith late in 2014. After seeing my presentation on *Space-Time Aesthetics in the Meta-*

*Environment: A Cybersemiotic Analysis* at the Open University in Milton Keynes, UK in April 2013, calling me his nemesis for proposing ideas contrasting to his, Carl contacted me to exchange ideas on the subject. In this and several similar conversations intended to lay a groundwork for future collaboration, we explored the implications of *Mixing Realities*, more generally of interactive hybrid environments, and my emerging ideas for the new project *Digital Ayahuasca* for promoting changes in consciousness and perception in a manner that might promote intersubjective or group consciousness. This conversation (consisting primarily of Carl's questions and my answers, 12 in total) is included here as raw documentation of the potential next step in my journey as reflective practitioner and technoetic artist.

CS I. So where does your thinking on all this stand now and what really motivates you?

CJ I. The Tibetan Exercise of Paradox<sup>126</sup> was a “channeled” message from an angel. I have been studying the ascended masters and the Violet Flame<sup>127</sup> since I was a teenager. In search of writings and revelations, I came across the exercise. Even though I believe in these things, the exercise is simply intended as a guide for developing the visualizations to trigger an altered state of perception. Studies have shown that binaural beats, musicians playing instruments, dancers performing certain movements, and Ayahuasca users have all experienced the same kind of combination of brain waves. It is also interesting to me that light and energy are the source of this awareness rather than matter and embodiment. I have further observed that the visualizations described in Ayahuasca ritual and in the ascended master teachings are very similar visually.

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<sup>126</sup> [http://angelmessages.paradisenow.net/tibetan\\_exercise\\_of\\_paradox.html](http://angelmessages.paradisenow.net/tibetan_exercise_of_paradox.html)

<sup>127</sup> [http://en.wikipedia.org/wiki/Ascended\\_master](http://en.wikipedia.org/wiki/Ascended_master)) and [http://www.saintgermainfoundation.org/SGF\\_06a\\_IAMTeach\\_Daily-1-UsingVioletFlame.html](http://www.saintgermainfoundation.org/SGF_06a_IAMTeach_Daily-1-UsingVioletFlame.html)



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CS 2. Is there any research on brainwave activity during Ayahuasca at all?

CJ 2. Yes, there are a few but none conclusive and some are contradictory. I had spend a great deal of time studying this and what I concluded (at least for now) is that Ayahuasca is a very personal experience but at the same time there is a common level of group consciousness. Attached you find some resources.

CS 3. Different frequencies trigger different colors, images, sounds, depth and height?? - To be discussed

CJ 3. I am sharing a few pdf articles that deal with Ayahuasca process and visualizations to help you understand the kind of visualizations and how we can connect with brain waves.

CS 4. A brainmap is used to define the triggered areas of color etc.???

CJ 4. Binaural beats have been using brain waves to generate sounds and visualizations. Below is a link to an article on how to exercise brain waves:

<http://synthesislearning.com/article/brwav.htm>

CS 5. How are the multiple visualizations generated?

CJ 5. Here are some accounts of the experience and why I imagine that we need a combination of visualizations:

<http://ewwty.com/2012/02/24/dimethyltryptamine-dmt-experience/>

[http://www.dmtsite.com/dmt/experience/descriptions\\_of\\_experience.html](http://www.dmtsite.com/dmt/experience/descriptions_of_experience.html)

<http://sprott.physics.wisc.edu/pickover/pc/dmt.html>

<http://pickover.com/>

CS 6. Too many visual variations – need to choose and specify, I should think.

CJ 6. I can elaborate in detail on how the images and colors could interact after

I deliver my phd progress report at the end of this month.

CS 7. How are they projected into the space?

CS 8. Immersiveness??

CJ 7 & 8. Computer generates the visualizations and a 3d holographic projector projects into space. That is why it's immersive.

Example: <http://www.avconcepts.com/holographic-projection/>

CS 9. Training? As in neurofeedback?

CJ 9. No. It would be lovely to get someone in the team ;-)

CS 10. Do we do two setups with ayahuasca and without?

CJ 10. No. Studying Ayahuasca I found out that we all have what it takes to attain an altered level of consciousness and group consciousness. I truly believe that we can develop that and not need moistmedia but use digital media. Some people can experience altered states of consciousness easily (I am one), others have forgotten how to. Like a muscle I believe that we can use digital media (because of the energy and light properties) to help people develop DMT in the brain.

CS 11. What is the logistics of the project?

CJ 11. Technical: EEG head gadgets – so far what I found really clunky. Ideally a mesh cap that feels comfortable and is easy to fit nicely on the head.

Application to process the EEG: A generative algorithm application to develop

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the visualizations, process the EEG brain waves, feed the visualizations and sensations to the 3D holographic haptic projector.

A large scale 3D holographic haptic projector.

Scientific-Artistic: Study the connections between the ayahuasca visualizations, experiences and brain wave activities.

Use this study to feed the development of the visualizations and sensations.

Financial: Holographic technology is expensive and ideally we would be connected to a research center.

CS 12. What is the timeline of the project?

CJ 12. Depends on how many people are involved but ideally two years.



Figure 52. Digital Ayahuasca poster, 2013-2018.

**CHAPTER 7 | CONCLUSION****Final Analysis****7.1. Overview****7.2. The State of Consciousness****7.3. A Final Thought**

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**7.1. Overview**

Today most of our interaction with the world is mediated by digital technologies. As users, we must frequently interact with a new interface (a gadget, computer application, website, digital artwork, etc.), often experiencing frustration and disconnection from the interface similar to what I observed when I showed the interactive hybrid environment *Mixing Realities* to the public and also frequently experience a similar dissociation as a user-designer of interactive hybrid environments. My research suggests that the user's dissociation from the interface is related to a disconnect from an unnamed, but ever-present, third element: information. Users either lack knowledge (information) about the interface itself, or they are unprepared for or simply uninterested in receiving meaningful information from the digital data made available through their interaction with the interface. That recognition led me to an awareness that something more than optimal feedback processes, information design, and user experience guidelines and rules are needed to more fully integrate the user into the work as I originally intended and to more adequately conceptualize the interactive processes at work.

Led by my practice as a reflective technoetic artist and information designer developing interactive hybrid environments such as *Mixing Realities*, I applied in this dissertation an interpretative analysis through a design discourse grounded in the

framework of cybersemiotics. I specifically:

- introduced my artist/designer's conceptual and practice background to establish the understanding of interactive hybrid environments;
- described the different elements involved in interactive hybrid environments as user, information and interface;
- surveyed how different disciplinary fields define the different elements in interactive hybrid environments;
- observed the dynamic, complex adaptive relationship among user, information and interface and described this relationship as meta-environment;
- observed and described the meta-environment elements' space-time aesthetic qualities and properties;
- established the need for equal integration of these fields and elements through the transdisciplinary framework of cybersemiotics (Figure 46);
- explored the individual elements of the meta-environment's capabilities to mediate consciousness and redefine their "structures, images and experiences within it" (Ascott, 2000), using the framework of cybersemiotics;
- proposed new approaches to the elements' interaction to promote more holistic and integrated consciousness experiences;
- suggested that what I call the "Cybersemiotic Experience" (Figure 50) is an appropriate name for and likely outcome of these new approaches.

This dissertation started by introducing the contextual background and conceptual foundation to establish interactive hybrid environments as influenced by Marcel Duchamp's retinal-conceptual-interactive art experiments, Brazil's syncretic

Tropicalismo art movement led by neo-concrete artists Lygia Clark and Hélio Oiticica, and Roy Ascott's technoetic approach to interactive hybrid art practices. It defined its approach to consciousness and exposed my personal motivations for pursuing art as new knowledge focusing on the interactive hybrid environments *Mixing Realities* and this artist/designer's intention to conceptually bridge theory into practice.

It introduced Duchamp's Creative Act concept and the possibility of seeing an artwork as an interface for information, co-created by the artist and the spectator (Ac) offering endless possible conceptual interpretations of and interactions with the artwork (semiotic dance). It also paralleled the creative act with Peirce's semiotics to reveal the triadic exchange between user (artist + spectator), interface (artwork–medium), and information (meaning), proposed the creative act model with production of meaning – semiotic dance in the meta-environment-- promoting the cybersemiotic experience; explored how the complexity of such interrelationships can be expanded even further through an examination of Brazilian syncretism as it exposes the possibility of a multitude of levels and role shifts in such triadic relationships (represented by the semiotic dance Mobius spiral).

This research further incorporated Ascott's identification of syncretic exchange between humans and technologies as cyberperception, enhancing perception to “empower the viewer through direct physical interaction to collaborate in the production of meaning and the creation of authentic artistic experience” (Ascott, p. 357). It presented Ascott's conceptual visual framework for exploring this syncretic reality through his four-sided star (Figure 27) representing the different aspects of interactive art and its influences on the construction of human consciousness as a complex adaptive system. It further correlated Ascott's representation with

## CHAPTER 7 | CONCLUSION

Søren Brier's four-sided representation of the cybersemiotic framework called the Cybersemiotic Star to establish the complex multi-level dialogue needed to develop interactive hybrid environments as technoetic aesthetic processes and experiences.

This research analyzed my creative practice and methodological background through my designer's view of and practical experience with the interactive hybrid art installation *Mixing Realities* as a contemporary example of an interactive hybrid environment, with its physical and digital components, aesthetic and conceptual goals, and reception by various users. It interrogated the work's interactive potential for expanding consciousness and creating new knowledge as well as the conceptual limitations of current-traditional physical narratives that emphasize embodiment to represent the architecture of digital information environments and the user-interface relationship. by applying the creative act model and analyzing the artwork's mediation capabilities under the cybersemiotic framework.

It presented a critical review of the current frameworks used to describe and analyze interactive hybrid environments in the promotion of consciousness and suggested the need for a new structured view of the field of study within a transdisciplinary context.

This thesis analyzed the theoretical contexts, subject matter, and issues through the first statement of the problem, which defines parallels between the industrial and digital revolutions as a way to contextualize existing space-time representational paradigms, suggesting that as products of the mechanical age, physical narratives rely on linear visualization and episodic memory, thereby restricting digital information's potential and preventing more balanced integration among user, information, and interface.

It addressed the second statement of the problem by introducing the meta-environment with its individual elements in interactive hybrid environments, proposing that this triadic relationship be identified as meta-environment; taking into consideration its different elements, characteristics, and overall interactive relationships.

In describing and denoting my technoetic art practice, this dissertation employed the term hybrid as inescapable when promoting cyberperception, an insight which further compels us to define these elemental characteristics: spatiality, temporality, essence, sign processes, embodied cognition, and level of dynamic complexity.

- Spatiality refers to how an element manifests as either physical (matter) or energy (digital).
- Temporality refers to the distinction between temporal and atemporal qualities, as well as synchronous and asynchronous interactions.
- Essence refers to the elements' core biological atoms or bits (Negroponte, 1995).
- Sign processes refers to the linguistic-cultural-social structuralism (semiotics) and constructivism, relating to subjective or objective sign interpretation and meaning creation.
- Embodied cognition reflects how we embody information (meaning) as opposed to disembodied digital information.
- Dynamic complexity refers to creativity, aesthetic, design, usability and purpose of such environments, focusing on the predictability and linearity of their interactions (Brier, 2008; Vidales, 2017).



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This research project further connected practice to theory and back to practice, offering the description and justification of the research methods by establishing that an adequate analysis of the meta-environment requires an integrative theory. It establishes a comparative analysis of the meta-environment's individual elements and mediation properties within the framework of cybersemiotics. It presents the transitions from theoretical findings into practice by creating connections with established practices and integrating with an aesthetic/design approach. It also analyzes Brier's Cybersemiotic Star, a three-dimensional representation of the four aspects that ground the cybersemiotic framework (natural, biological, phenomenological, semiotic) united in the center by the integration of human knowledge and consciousness (Brier, 2008, p. 361) to define the Cybersemiotic Experience and the potential of the meta-environment to expand consciousness.

It established its grounding in the cybersemiotic star, the representations of the evolving and complex interactions among the elements of the meta-environment that gave birth to the Cybersemiotic Experience. User, information, and interface can then be seen taking turns in mediating the interaction and promoting meaning through an inner-outer world exchange. Ascott describes this exchange as the "double gaze, seeing at once both inward realities and the outward surfaces of the world" (Ascott, 2007, p. 358) and consequently promoting two distinctively different fields of experience (double consciousness).

Brier presents the outer world as *Umwelt*, based on von Uexküll's "objective life world of the animal mediated by interpretations in the context of what makes sense from a biological, evolutionary sense" (Garcia, 2013, p. 167) which, according to Thomas Sebeok, the father of biosemiotics (Brier, 2008, 2013; Copley, 2010b, 2012, Garcia, 2013), brings forth an *Innenwelt* (inner world).

In the creation of meaning, the possibility of new mediations and perceptions reflects the semiotic dance and the infinite possibility of interactions in meaning production. As hybrid interactive environments are shared physically and/or digitally (networked), the potential is for a meta-environment to interact with other meta-environments, expanding the complexity in elements and interactions in the Cybersemiotic Experience and promoting the potential for shared consciousness.

Finally, as a venture in reflective art practice, this thesis reflects on the implications and potential applications of the Cybersemiotic Experience for technoetic art and described Digital Ayahuasca, a conceptualized interactive hybrid environment intended to promote and call for expansion of art practices to telematic, digital, genetic, vegetal, moist or linguistic interactions.

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### **7.2. The State of Consciousness**<sup>126</sup>

I entered into this research attempting to intersect (1) my artistic experimentation in altering human perception and consciousness through creating interactive hybrid environments and (2) the theoretical inquiry into the nature and implications of human-computer interactions (HCI) in the navigation of consciousness and construction of meaning. During my research, gaps between these two broad areas of inquiry (human perceptions and digital processes) were identified and explored in order to interrogate the validity of current ontological and methodological approaches. Utilizing formal design analysis and grounded in the framework of cybersemiotics,

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<sup>126</sup> An earlier version of this analysis appears in Jacques (2012a).

## CHAPTER 7 | CONCLUSION

I focused on space-time aesthetics in an attempt to connect theory and practice and reflect on the implications and impact on consciousness of such frameworks for integrating these broad areas of inquiry. I spent almost five years elaborating the Cybersemiotic Experience with Søren Brier. In order to do that, I started to observe every technological interaction I experienced, either as the user-creator or user-spectator, aiming at the “possibility of eroding the boundaries between states of mind, between conception and construction, between the internalization and the realization of our desires, dreams and needs of our everyday existence” (Ascott, 2007, pp. 359–360). This process of navigating and promoting qualia made me look into the current state of consciousness in these transition times.

In the winter of 2011, I visited the Berkshire Museum in Pittsfield, Massachusetts, to see the show M.C. Escher: Seeing the Unseen. Since 2001, I have been using some of the Dutch artist Maurits Cornelis Escher’s artwork to exemplify to my 2D Design students at Westchester Community College the concepts of contrast and transition in relation to the principles of organization in design. Until this visit to the Berkshire Museum, I had only experienced Escher’s woodcuts, lithographs, and mezzotints through books, magazines, and Internet. The experience of being immersed in a collection of his prints not only made my appreciation for his work even greater, but also instigated an awareness of the infinite variety of transitions and transformations in life. Escher called these transitions metamorphoses; I will use his 1938 lithograph *Cycle* (Figure 44) as visual paradigm for conceptualizing one artist’s apprehension of the emerging shifts in human consciousness.

*Cycle* depicts a visually plausible reality that is actually built on the deconstructive metamorphosis of a human figure into a cube, that is, an organic

form into a geometric form. The contrast between traditionally figurative elements and geometric shapes is achieved through tessellation. The *Merriam-Webster Online Dictionary* defines Tessellation as “a: mosaic; b: a covering of an infinite geometric plane without gaps or overlaps by congruent plane figures of one type or a few types.” In *Cycle*, Escher uses human figure tessellation where each tile is a graphic element in itself, carrying the visual information that is needed to perceive that element.

The combination of all these elements covering the two-dimensional surface without overlapping or leaving gaps creates a mosaic three-dimensional illusion of metamorphosis. It is interesting to note that each graphic element is a unique shape in itself but also a variation of the surrounding shapes. In isolation these shapes have no special visual meaning (Figure 53), but together they create that plausible reality. Escher’s ventures in developing visualizations of mathematical principles and his fascination with paradox and impossible figures inspired mathematician, physicist, and path-breaking theorist of consciousness, Roger Penrose, who in turn inspired Escher.

Roger Penrose first saw Escher’s work in 1954 during the International Congress of Mathematicians at the Stedelijk Museum in Amsterdam. *Relativity* (1953) (Figure 54) was one of the artworks that caught Penrose’s attention. The lithographic print defies the laws of gravity by depicting a plausible three-dimensional space that actually has three different centers of gravity. In 1992 Penrose recalled:

I remember that I was absolutely spellbound by his [Escher’s] work, which I was seeing for the first time. On my journey back to England, I determined to make something “impossible” myself. ... I showed my father the triangle at the next possible opportunity. He immediately sketched a number of variants and eventually came up with the drawings of an impossible flight of stairs leading continually downwards (or upwards). (Penrose quoted in Ernst, 1992: pp. 71–72)

## CHAPTER 7 | CONCLUSION

Inspired by Escher, Roger Penrose and his father—Lionel S. Penrose, a psychiatrist, medical geneticist, mathematician, and chess theorist—started playing with tessellations and tri-bars (three-dimensional triangles with relationships that make the object impossible to be three-dimensional), which today are also known as the Penrose Triangle (Figure 55). Based on the tri-bars, in 1958 Roger and Lionel Penrose published an article in the *British Journal of Psychology* entitled “Impossible Objects: A Special Type of Visual Illusion,” which inspired Escher to create two lithographs, *Waterfall* and *Up and Down*.

More recently, Penrose’s Triangle was reproduced in the 2010 Christopher Nolan film *Inception*. The movie portrays the endless possibilities of dreams within dreams. In a couple of scenes, the protagonist is being chased by, but also chasing, the antagonist in an infinite loop of stairwells. It was interesting to experience Penrose’s impossible stairs in a movie of endless and infinite loops of reality in the same year that Penrose released his book *Cycles of Time: An Extraordinary New View of the Universe*. There he proposes an infinite loop in the creation and end of the universe. Describing the conformal cyclic cosmology, Penrose suggests that

there is a physically real region of space-time prior to B- [Big Bang] that is the remote future of some previous universe phase, and that there is also a physically real universe phase that extends beyond our I+ [end of the universe] to become a big bang for a new universe. (Penrose, 2010, p. 147)

As a technoetic artist, I am interested in the relationship between art and science, exemplified by the Escher-Penrose pseudo-collaboration. I also look at Penrose’s theories as a significant piece in the puzzle of consciousness. Penrose has dedicated his life to the research of consciousness, time, and gravity and to understanding the physical world from different angles. He wrote two books on the understanding of

human consciousness and the conscious brain: *The Emperor's New Mind: Concerning Computers, Minds, and The Laws of Physics* (1989) and *Shadows of the Mind: A Search for the Missing Science of Consciousness* (1994).

In *The Emperor's New Mind*, Penrose proposes that the functions of the conscious mind in the physical brain are non-algorithmic, cannot be explained by classical physical science and consequently cannot be reproduced by binary computational machines, a striking parallel to Brier's cybersemiotic insights.

Penrose also hypothesizes that the understanding of the conscious brain lies in the theories of quantum mechanics and elaborate a relationship between quantum mechanics and Einstein's theory of relativity.

*Shadows of the Mind* expands the hypothesis presented in *The Emperor's New Mind* by elaborating even more on the relationship between quantum mechanics and describing gravity as a geometric property of space-time. Penrose calls this relationship objective reduction, a process where the perception of consciousness in the brain happens after going through a quantum process of possibilities and through gravity forces picks only one option. This theory questions string theory with its many levels of reality. Stuart Hameroff collaborated with Penrose on the development of orchestrated objective reduction theory (Orch-OR) trying to validate through physical experiments the effects of quantum gravity in microtubules to consciousness.

Scientists like Max Tegmark (2000), Danko Georgiev (2006) and Victor J. Stenger challenge the theories of Penrose and Hameroff, but for an artist like me, it is exciting to see scientists investing their careers in connecting our subjective mind processes—consciousness—with physical and quantum theories in hope of

## CHAPTER 7 | CONCLUSION

understanding and expanding the possibilities of our human perception. In a somewhat similar manner, cybersemiotics facilitates the transdisciplinary exchange between the physical world and the creation of meaning, and the Cybersemiotic Experience, where user, information, and interface take turns mediating human experiences and have the potential of expanding technological advances to aid the expansion of consciousness.

Today, Penrose questions the validity of quantum mechanics to explain the conscious mind and sees the need for another explanation. For me this means that he sees his and his colleagues' theories just like one of Escher's tessellation tiles, marking the shifts in human consciousness occurring in the digital age.

Penrose's provisional concepts of consciousness, time, and space can be visually compared to Escher's earlier man-cube renderings, where each of these individual design elements allows the transition to another shape. In other words, Penrose's theories, like Escher's design concepts, illustrate a moment of transition in consciousness theory. As in Escher's *Cycle*, the individual elements are continually redefined, reshaped, and revealed. Each may be a unique distortion of the previous, but this does not mean that it is disconnected or independent of the final outcome.

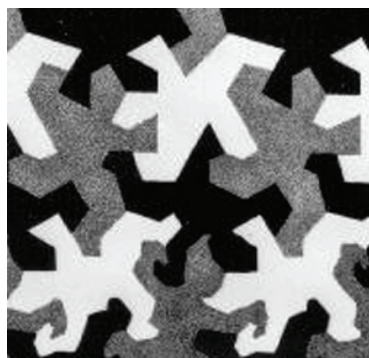
Radical transformations and developing connectedness along the boundaries between art, technology, and science function like the individual elements in Escher's *Cycle*. This research study hopes to aid such transformations and developments by promoting shifts in how HCI is conceptualized and deepening the understanding of the potential role of interactive hybrid environments in the creation of meaning and expansion of consciousness. As we try to define the shifts in human consciousness occurring in the digital age, visually speaking, we are focusing on only one element right

in the middle of an Escher metamorphosis unable to see exactly how this element will become part of the completed design. This thought can be both frightening and liberating: frightening since we humans are used to relying on boundaries and predictable outcomes to feel a sense of control, liberating because anything and everything is possible, and the changes will occur naturally as part of the transition. If Escher teaches us anything, it is that each piece in the metamorphosis is needed to complete the big picture.

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### 7.3. A Final Thought

Rethinking the space-time aesthetics in the meta-environment through the cybersemiotic framework, adds qualia to HCI. A scary thought to the control of systems since science still has a long way to catch up to the human mind and consciousness. Yet, in these transition times, observing HCI with the understanding that independent of the efficiency of the computer system, the ultimate outcome is an



*Figure 53.* Cycle detail showing that the shapes decontextualized from the whole seem to have no meaning. These distortions are transitional elements that lead us visually to the other side of the composition.



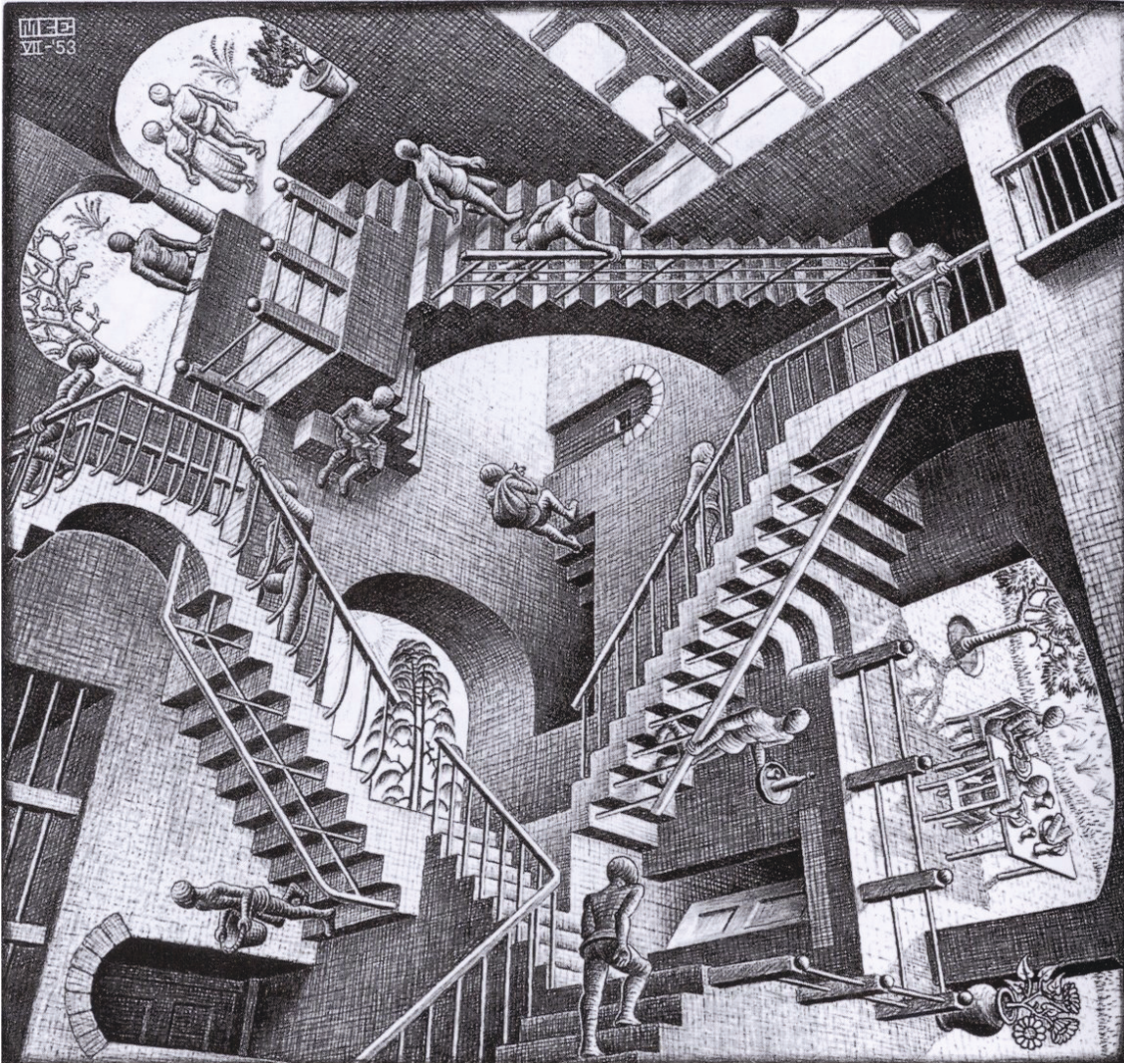


Figure 54. *Relativity* (1938). M. C. Escher.

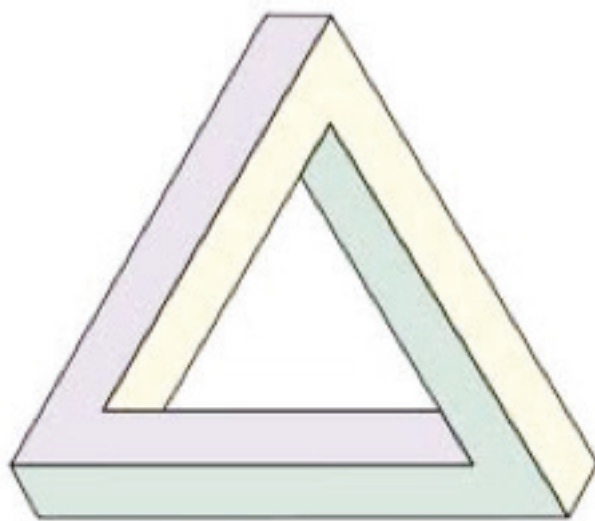


Figure 55. Penrose Triangle.

hermeneutic phenomenological qualia experience — Cybersemiotic Experience. Thus, intentionally integrating the user to the system as the ultimate mediator creates the possibility to transform HCI even further.

**APPENDIX I | RELEVANT RESEARCH, CREATIVE &  
ACADEMIC WORK**

- AI.1. Composite Sessions Attended
- AI.2. Courses Attended
- AI.3. Publication List
- AI.4. Presentations and Lectures
- AI.5. Grants and Awards
- AI.6. Exhibitions
- AI.7. Affiliations
- AI.8. Interactive & Instructional Environments Created
- AI.9. Courses Taught

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**AI.1. Composite Sessions Attended**

- No. 1. April 19 to 28, 2010: Guimarães, Portugal
- No. 2. July 9 to 18 , 2010: Plymouth, United Kingdom
- No. 3. October 28 to November 7, 2010: Trondheim, Norway
- No. 4. April 7 to 17, 2011: Kefalonia, Greece
- No. 5. August 20 to 30, 2011: Shanghai, China
- No. 6. November 25 to December 5, 2011: Lisbon, Portugal
- No. 7. November 28 to December 9, 2012: Prague, Czech Republic
- No. 8. March 27 to April 10, 2013: Cairo, Egypt
- No. 9. July 12 to 21, 2013: Syros, Greece

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## A1.2. Courses Attended

**Cybersemiotics and Transdisciplinarity II: Focus on New Developments in Biosemiotics and Culture Analysis;** August 2013. Professor Søren Brier. Copenhagen Business School – Frederiksberg, Denmark.

**Cybersemiotics and Transdisciplinarity: Applications in Linguistics, Communication, Semiotics, and Art-technology Analysis;** August 2012. Professor Søren Brier. Copenhagen Business School – Frederiksberg, Denmark.

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## A1.3. Publication List

*Reflections on cybersemiotic experience in the meta-environment.* Cybernetics and Human Knowing Journal, 23(4), 57–75, 2016.

*Art+science: An emerging paradigm for conceptualizing changes in consciousness.* Technoetic Arts: A Journal of Speculative Research. Vol. 10: 2+3 (2012): 221-227, doi: 10.1386/tear.10.2-3.221\_1, 2012.

*Meta-Environment.* Technoetic Arts: A Journal of Speculative Research. Vol. 10: 1 (2012): 93-99, doi: 10.1386/tear.10.1-3.93\_1, 2012.

*Brazil's Tropicália movement: Reflections on anthropophagic syncretic reality.* In R. Ascott & L. M. Girao (Eds.), *CR12 Presence in the mindfield: Art identity and the technology of the transformation* (pp. 139-143). Aveiro, Portugal: Universidade de Aveiro, 2011.

*Cyberperception, Technoetic Aesthetics & Consciousness in 'Mixing Realities': Theory into Practice.* In R. Ascott, E. Gangvik and Margarete Jahrman (Eds.). *Making Reality Really Real, Consciousness Reframed II* (pp. 43-45). Trondheim, Norway: TEKS Publishing, 2010.



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#### **A1.4. Presentations and Lectures**

*Visualizing The Cybersemiotic Experience* – presentation. Cross, Inter, Multi, Trans: 13th World Congress of Semiotics IASS. International Association for Semiotics Studies, Kaunas, Lithuania, June 27, 2017.

*Black Chicago History Meta-Environment* – presentation. Roosevelt University, Chicago, IL, June 26, 2016.

*Connecting the Drops* – co-presentation. Water World 2016, water-wheel.net, Worldwide, online. March 19, 2016.

*Discovering the Early History of Black Creative Expression in Chicago* – co-presentation. Westchester Community College, Valhalla, New York, USA. February 25, 2015.

*Update on the Website for 'Social Origins of Chicago's New Negro* – presentation. NEH, Black Chicago History Forum and Carter G. Woodson Regional Library event. Carter G. Woodson Regional Library of the Chicago Public Library, Chicago, IL, USA. October 26, 2014.

*A Case for Knowledge Art: A Cybersemiotic Analysis of Space-Time Aesthetics in the Meta-Environment* – presentation. Living in Cybernetics 2014 Conference: American Society for Cybernetics. George Washington University, Washington, DC, USA. August 4, 2014.

*Education, Arts, Technology* – E.A.T. Forum, keynote speaker and forum panelist. SUNY Westchester Community College and Arts Westchester. White Plains, NY. USA. May 22, 2014.

*Root, Branch & Blossom: Social Origins of Chicago's New Negro Artists and Intellectuals* – presentation. The Black Metropolis Research Consortium. University of Chicago, Chicago, IL, USA. June 12, 2013.

*Space-Time Aesthetics in the Meta-Environment: A Cybersemiotics Analysis* – presentation. The Difference That Makes a Difference 2013 Conference: Interdisciplinary workshop on Information: Space, Time, and Identity. The Open University, Milton Keynes, UK. April 8, 2013.

*Semiotics of Embodiment in the Meta-Environment* – presentation. CR13 Consciousness Reframed 2013: Art & Consciousness in the Post-Biological Era, International Research Conference. German University in Cairo; New Cairo, Egypt. March 31, 2013.

*From Greenwich to Google: The Aesthetics of Time and the Meta-Environment* – presentation. Mutamorphosis: Tribute to Uncertainty International Conference. Academy of Sciences of the Czech Republic; Centre for Science, Technology and Society at the Institute of Philosophy, Prague, CZ, December 6, 2012.

**Connecting the Dots** – presentation. The Fourth State of Water Symposium: UCLA California NanoSystems Institute (CNSI), UCLA, Los Angeles, CA, USA. March 22 & 23, 2012.

**Brazil's Tropicalia Movement: Reflections on Anthropophagic Syncretic Reality** – presentation. Art, Identity and the Technology of Transformation. 12th Consciousness Reframed International Research Conference. Centro Cultural de Belém, Lisbon, Portugal. December, 1, 2011.

**Escher's Way: A New Paradigm for Conceptualizing Changes in Consciousness** – presentation. Transcultural Tendencies | Transmedial Transactions - Consciousness Reframed: Art and Consciousness in the Post- biological Era: Shanghai Institute of Visual Art, Wenxiang Road, Songjiang, Shanghai, China. August 25 to 27, 2011.

**Teaching with Social Media Workshop** – co-presentation. Westchester Community College Faculty Development: Westchester Community College, Valhalla, New York, USA. May 19, 2011.

**Perception of Self, Time & Space: An Ethnographic Case Study of Stream of Group Consciousness Mediated by Ayahuasca Ritual Practices** – poster presentation. Ionion Centre for Arts & Culture: Kefalonia, Greece. April 9, 2011.

**Teaching with Social Media** – co-presentation. Westchester Community College Adjunct Faculty Showcase: Westchester Community College, Valhalla, New York, USA. December 9, 2010.

**Cyberperception, Technoetic Aesthetics & Consciousness in 'Mixing Realities': Theory into Practice** – presentation. TEKS – Trondheim Electronic Arts Centre – Making Reality Really Real: Consciousness Reframed II: Trondheim, Norway. November 4 to 6, 2010.

**Mixing Realities** – presentation. Skilled Art – Talks about Art, Consciousness & Transdisciplinary Practices: Guimarães, Portugal. April 23 & 24, 2010.

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### **A1.5. Grants and Awards**

**2017 David Bermant Foundation Short-term Residency and Grant.**

*Intro to ArtSciTech digital environment.*

David Bermant Foundation, Santa Ynez, CA, USA.

**2014 – 2017 National Endowment for the Humanities Collaborative Research Grant.** *Social Origins of Chicago's New Negro Artists and Intellectuals.*

NEH through Roosevelt University, Chicago, Illinois, USA.

**2013 Cybersemiotics & Human Knowing Short-term Fellowship.**

*Cybersemiotics & Transdisciplinarity in Art.* Copenhagen Business School.  
Frederiksberg, Denmark.

**Andrew W. Mellon Short-term Fellowship.**

*Social Origins of Chicago's New Negro Artists and Intellectuals: A Photographic Survey.*  
Black Chicago Metropolis Consortium, University of Chicago, Chicago, Illinois.

**Di-Egy Fest 0.1 Artist Grant.**

*Me, Myself & Maybe I: Mixing Realities.*

Di-Egy Fest 0.1 + German University, Cairo, Egypt.

**2012 WCC 2011 Adjunct Faculty Excellence in Teaching Award.** SUNY

Westchester Community College, Valhalla, NY, USA.

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## AI.6. Exhibitions

- 2018** Strong as a Woman, Beam Runner Café, Peekskill, NY  
*Roll the Dice*. Giclée of Mixed Media
- 2017** World Water Day Waterbodies.org. Co-curator.  
  
Strong as a Woman, Beam Runner Café, Peekskill, NY  
*Hen: Jacques + Lispector*. Giclée of Mixed Media
- 2016** CURRENT:LA Water  
ArtSci Collective with Waterbodies.org  
  
Water World 2016! water-wheel.net. Invited Co-curator.
- 2013–2015** Artists in the Archives: Alternet – USA traveling group show.  
*Cogitar* series; 2012/13. 356 mixed media library cards.
- . Horrmann Library, Wagner College, Staten Island, NY. August to October, 2015.
  - . Galesburg Civic Art Center, Galesburg, IL. June to August, 2015.
  - . Butterfield Library, Cold Spring, NY. March to April, 2015.
  - . The Desmond Fish Library, Garrison, NY. February to March, 2015
  - . The Teaneck Public Library, Teaneck, NJ. December, 2014 to January, 2015.
  - . Cohen Library Archives, City College, New York, NY. October, 2014.
  - . Asheville Book Works in Asheville, NC. August to September, 2014
  - . Tompkins County Public Library, Ithaca, NY. Spring 2014.
  - . The Field Library, Peekskill, NY. November, 2013 to January, 2014.
  - . The Chappaqua Library, Chappaqua, NY. October to November, 2013.
  - . The Greenburgh Public Library, Greenburgh, NY. April to September, 2013.
  - . Hart Library, Shrub Oak, NY. February to March, 2013.
- 2015** Next Nature. Ionian Center for the Arts and Culture, Kefalonia, Greece.  
*Homo Conscious*; 2015 version. Composite of brain scan with algorithmic rendering digital print.
- 2014–2015** Brains, Boobs and Backbones  
Mezzanine Gallery, Paramount Hudson Valley Theater, Peekskill, NY, USA.  
*Diva Faces*. Newspaper, color pastels, pencils and markers on fiber paper composite.



## APPENDIX I | RELEVANT RESEARCH AND CREATIVE WORK

**2014** Retrospective Faculty Show. The Center for Digital Art Gallery, SUNY WCC Peekskill Extension Center, Peekskill, NY, USA.

*Homo Concious*; 2014 version. Composite of brain scan with algorithmic rendering digital print.

STEAM at Regeneron. Regeneron Pharmaceuticals, White Plains, NY, USA.

*Mixing Realities* Second Generation; 2014. Hybrid interactive video installation.

STEAM at ArtsWestchester, White Plains, NY, USA.

*Mixing Realities* Second Generation; 2014. Hybrid interactive video installation.

[inter]sections

SUNY Westchester Community College Fine Arts Gallery, Valhalla, NY, USA.

Curator.

**2013** Carson Grubaugh's Hermeneutics

The Open University & MK Gallery, Milton Keynes, UK.

*The Homo Concious*; 2013. Composite of brain scan with algorithmic rendering digital print.

Digitalizing Egypt

Gezira Art Center, Cairo, Egypt.

*Me, Myself & I: Mixing Realities*; 2013. Interactive video installation.

**2012** The Ballot Box: 20 Artists Consider the Presidential Election.

The Bean Runner Cafe Gallery, Peekskill, NY, USA.

*Hanging Chad*, 2012. Mixed media installation.

COCA & The Fourth State of Water

Centre of Contemporary Art, Turon, Poland.

*Waterbodies.org*. Interactive net interface.

**2011** (Inside) Joke

Augusta Savage Gallery, UMass, Amherst, MA, USA.

*What?*; 2010. Video installation.

Faculty Selects

Westchester Community College Gallery, Valhalla, NY

*Mixing Realities*; 2009. Physical/digital interactive video installation.

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### **A1.7. Affiliations**

**Bronx Community College at City University of New York (CUNY)** –  
Adjunct Associate Professor of Digital Art, August 2016 to Date.

**Cybernetics and Human Knowing: A Journal of Second Order Cybernetics,  
Autopoiesis & Cybersemiotics** – Art & Web Editor, January 2013 to Date.

**ArtSci Center at University of California, Los Angeles (UCLA)** –  
Associate Director, January 2016 to Date.  
Instructional Designer, September 2011 to Date.

**State University of New York (SUNY) Westchester Community College** –  
Senior Adjunct Faculty of Studio and Digital Art, January 2001 to Date.

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### **A1.8. Interactive & Instructional Environments Created**

- <http://waterbodies.org/>
- <http://davidbermantfoundation.org/>
- <http://artsci.ucla.edu/summer/>
- <http://cybersemiotics.com/>
- <http://chkjournal.com/>
- <http://sunywccft.org>
- <http://blackchicagohistory.com/>
- <http://wractso.org/>
- <http://biotechart.artscinow.com/>
- <http://biotechdesign.artscinow.com/>
- <http://intro.artscinow.com/>
- <http://collegistics.com/>

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## AI.8. Courses Taught

### 2D DESIGN

A variety of 2D design concepts and tools are introduced to foster visual literacy, and deepen appreciation of the role of design in art and culture. Students create projects that explore elements and principles of design, including line, shape, space, value, sequence, and color, while developing fluency in the handling of media, and an increased awareness of craftsmanship. Lectures and critiques cultivate verbal communication skills to foster a facility with the language of art and design, and basic computer skills are introduced in the creation of an online portfolio. 4 hrs. SUNY Westchester Community College. Spring 2001 to date. <http://sunywcc2ddesign.com/>

### USER INTERFACE DESIGN

This course focuses on the aesthetic design of user interfaces for web and mobile. Students learn the process of planning and designing interactive systems, creating flowcharts and mockups, and are introduced to professional Web Design software. Projects include various graphics for the Web, UI (User Interface) Design, HTML templates, and more. 4 hrs. Bronx Community College, CUNY. Fall 2016 to date. <http://bccart87.claudiajacques.com/>

### TYPOGRAPHIC DESIGN

This course focuses on the aesthetic design of user interfaces for web and mobile. Students learn the process of planning and designing interactive systems, creating flowcharts and mockups, and are introduced to professional Web Design software. Projects include various graphics for the Web, UI (User Interface) Design, HTML templates, and more. 4 hrs. Bronx Community College, CUNY. Fall 2017 to date. [https://bcc-cuny.digication.com/portfolio/require-password.php?return\\_url=/art79\\_jacques/home/ \(password: Bronx\).](https://bcc-cuny.digication.com/portfolio/require-password.php?return_url=/art79_jacques/home/ (password: Bronx).)

### DIGITAL PHOTOGRAPHY AND MOTION GRAPHICS

This course will emphasize the basics of composition, lighting, color correction and output. Students will study composition and lighting both in the field and in a commercial studio setting. Students will also examine various methods of digital image presentation including the use of graphic and audio elements in time-based media. This course requires students to have access to a digital camera. 4 hrs. Bronx Community College, CUNY. Fall 2016 to date. <http://bccart72.claudiajacques.com/>

### WEB DESIGN I

Introduction to design concepts and production techniques for the world-wide web. Topics include understanding web environments and technologies, site structures, navigation methods, layout conventions, and the creation of fully functional web pages using HTML. Animation and multimedia considerations are discussed. 4 hrs. SUNY Westchester Community College. Fall 2008 to Spring 2011. <http://claudiajacques.com/teach/ArtI69A/index.html#>

## APPENDIX 2 | RELEVANT CREATIVE PROJECTS

### A2.1. Mixing Realities

### A2.2. Digital Ayahuasca

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#### A2.1. Mixing Realities

##### Specifications

Mixed media interactive installation – wood, acrylic mirrors, screen, computer with MaxJitter and camera. Figure 51 shows the installation set-up at Arts Westchester in 2014. Figure 56 shows a sequence of people observing the monitor with a person interacting inside.

##### Description

*Mixing Realities* is an interactive artwork that responds to each person's individual engagement with the installation. The piece combines images from two sources: One is your reflection in multiple mirrors and the other a digitally generated projection on the screen. Both images are mixed together inside the installation, producing a kaleidoscopic effect.

Your movements control the digitally generated projection on the screen, which can be **The Now**, **The Echo**, **The Past**, **The Paint** or a combination of all these different realities. How: **The Now** Stay still and you will see the projected image of yourself in **The Now**. **The Echo** Make small, slow movements and you will experience an image **Echo** of yourself in the immediate past of one second ago. **The Past** Make bigger, faster movements



*Figure 56.* Different people negotiating their interaction with *Mixing Realities*. It is interesting to see that the cybersemiotic experience is shared and built upon. People taking turns interacting with the artwork, are at the same time interacting with each other, and again with the artwork, revealing in practice Bopyr's semiotic dance (the possible infinite semiosis loop.)

and you will produce an image of the installation from the **Past** of three minutes ago. This past may be yourself, the empty installation, or another person who previously interacted with the artwork. **The Paint** Make even bigger and faster movements and you will increase the color saturation of the projected image. Your body movements can create the experience of “painting” psychedelic, organic forms. Step inside the installation to create your own “Mixing Realities.”

### Observation

The images recorded are only stored in the system (Max MSP Jitter) for three minutes. The ephemeral aspect of *Mixing Realities* is intentional since the goal of the artwork is not to document but promote a new space-time qualia experience. It is common for the user to get time disoriented not knowing which image is the past and which is the now. This loss of time perception is surprising for the users and yet revealing of a new time experience.

The next two figures (57 and 58) show a sequence of still photographs of videos recorded through the monitor outside the installation, which was added as result of the understanding of the cybersemiotic experience and how users are the ultimate mediators of the interface and information, and as such need to have a motivation to interact with the interface.

The hope for the future of *Mixing Realities* is to have different meta-environments networked with different locations so users interact with time in different spaces.





Figure 57. Stills of a child interacting with *Mixing Realities*. It shows her discovering *the past* and starting to interact with her past self. At a certain point she opens the door and we have a glimpse of the people looking at the monitor outside, which is incorporated in the visualization.



Figure 58. Stills of another child interacting with *Mixing Realities*. Here the child is trying to control the past which he has brought in as shown in frame 2 of this series.



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## A2.2. Digital Ayahuasca

### Context

For over half a century, researchers in natural and social sciences have been studying altered states of consciousness in relation to individual perceptions of self, time and space, and the possibilities of shared or group consciousness. In recent years, an important focus of these studies has been the Ayahuasca ritual practice as a mediator of altered states of perception due to the entheogenic effects of DMT in the brain.

### Objective

The *Digital Ayahuasca* project aims to explore parallels between the vegetal reality experienced by the Ayahuasca infusion and DMT changes in the brain with an interactive augmented reality that promotes induced altered state of consciousness by offering different perceptions of the individual self, time and space as well as the possibility of shared consciousness.

This art project hopes to advance connections between art and science in the understanding of mediated consciousness through technoetic aesthetics and cybersemiotic experience. Like in the Ayahuasca ritual, users interacting with their own, as well as with other participants brainwaves, experience different visual, auditory, tactile and olfactory sensations promoted by the artwork, influencing and being influenced by their creation of meaning, and corresponding brainwaves.

**Description:**

*Digital Ayahuasca* is an immersive interactive haptic holographic environment created out of visualizations, sounds, smells and tactile sensations generated by interpretation of the users' brain waves and by the different users interactions with the environment. Through biofeedback and Tibetan Exercise of Paradox<sup>110</sup> the users' interaction with the environment aim to attain the same brain wave states as experienced in Ayahuasca induced realities.

Participants use an EEG – electroencephalogram – device to capture their brainwaves. The EEG send the brainwaves information to an application being developed in Max MSP Jitter which in turn outputs the different brainwaves as different visualization, sounds, haptic sensations and smells. Each brain wave frequency (see tables 4 to 6 below with the different states) are visually, auditory, tactile and olfactory represented according to the artist's interpretations of similar brainwave activities and experiences reported in the Ayahuasca induced reality.

If only one user is participating in the installation that user should be able to experience the visual representation of his/hers current brainwaves. As the user immerses in the installation, his or hers perception of self, space and time will start to shift altering his or hers brain waves and consequently his or hers sensations. As the user engages with the installation he or she will start to understand how the interaction with the installation influences his or hers own brain activities through visual, auditory, olfactory and tactile perceptions.

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<sup>110</sup> The Tibetan Exercise of Paradox is a guide for developing visualizations to trigger an altered state of perception. It is interesting that studies have shown that Binaural beats; musicians playing instruments, dancers and Ayahuasca have been dealing with the same kind of combination of brain waves. It is also interesting to me that light and energy are the source of this awareness and not matter and embodiment. The other interesting thing is that the visualizations described in Ayahuasca and in the ascended master teachings are very similar visually.

## APPENDIX 2 | RELEVANT PROJECTS

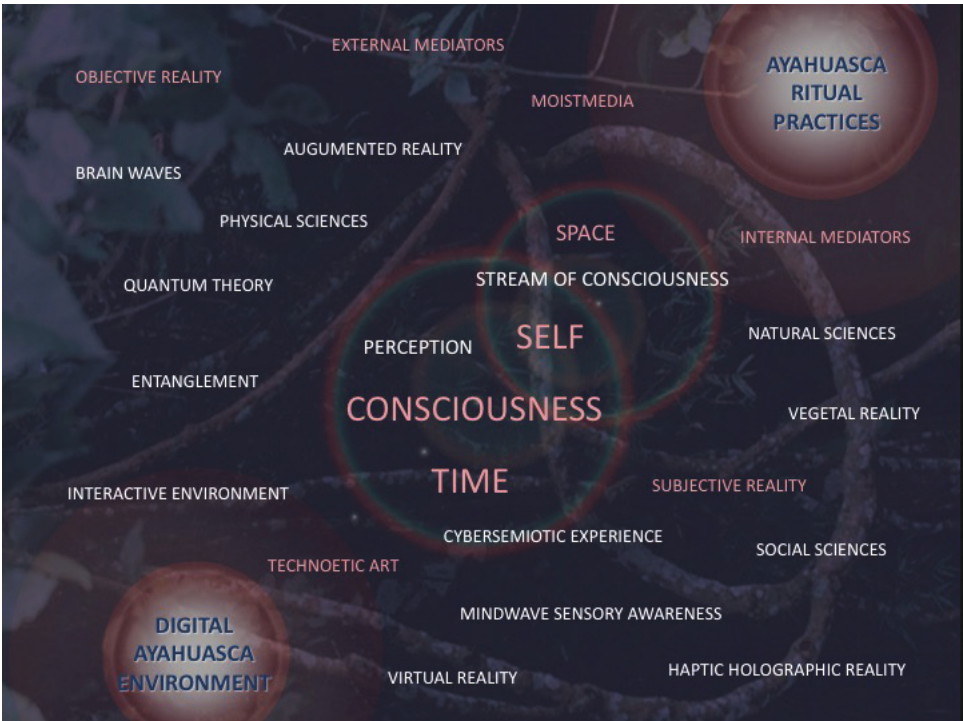
When more than one person is experiencing the installation, the individual user experience will also be influenced by the other users experiences. As different people experience reality in different ways (one may find a smell pleasant when another may not), different brain activities will interact differently creating a more or less harmonious experience. Users will experience Ascott's *double consciousness* through cybersemiotic experience promoted by:

- Cybernetic feedback loops between the brains inputs and system's output: visualizations, sounds, smells and tactile sensations.
- Users observing the system and all the parts involved, including their responses, mediation and interaction with their brainwaves, as well as others.
- Users observing and also reacting to the different events (context) happening inside and around them. As example, a second person joining the installation may make the person who was already experiencing it more shy, changing the his or hers input, but also making the user aware of this change.

Assuming that each user is a meta-environment, (the interaction among user-information and interface), as more users join the installation, meta-environments adapt and are adapted by other meta-environments, revealing how some processes can trigger perceptions and vice-versa, as a dynamic complex system.

The idea of ayahuasca and group consciousness can than be reproduced if the different people participating create a syncretic environment (all the conceptualizations combine with each other) and we can interact with people's own and group consciousness.

Proposal Presentation



## Context

For over half a century, researchers in natural and social sciences have been studying altered states of consciousness in relation to individual perceptions of self, time and space, and the possibilities of shared or group consciousness. In recent years, an important focus of these studies has been the *Ayahuasca* ritual practice as a mediator of altered states of perception due to the entheogenic effects of DMT in the brain.

## Objective

The *Digital Ayahuasca* project aims to explore parallels between the vegetal reality experienced by the *Ayahuasca* infusion and DMT changes in the brain with an interactive augmented – mindwave, haptic holographic reality that promotes induced altered state of consciousness by offering different perceptions of the individual self, time and space as well as the possibility of shared consciousness.

This art project hopes to advance connections between art and science in the understanding of mediated consciousness through technoetic aesthetics to promote a Cybersemiotic experience.



## Background:

Consciousness  
 Space & Time  
 Consciousness & Time  
 Consciousness & Physics  
 Consciousness & Quantum Theory  
 Brain Waves

Digital Ayahuasca

## Consciousness:

### Early Ideas:

Aristotle, (c.350 BC) On the Soul  
 Homer, (c.800-900 BC) The Iliad and Odyssey  
 Plato (427-347BC)  
 Siddhartha Gautama c.500BC Buddhist Texts

### Seventeenth and Eighteenth Century Philosophy:

Rene Descartes (1596-1650)  
 John Locke (1632-1704)  
 Gottfried Wilhelm Leibniz (1646-1716)  
 George Berkeley (1685 – 1753)  
 Thomas Reid (1710-1796)  
 David Hume (1711-1776)  
 Immanuel Kant (1724-1804)

### Nineteenth and Twentieth Century Philosophy of Consciousness:

ER Clay (E. Robert Kelly)  
 William James (1842-1910)  
 Alfred North Whitehead (1861-1947)  
 Edmund Husserl (1859-1938)  
 Francis Crick (1916 – 2004)  
 Thomas Nagel (1937-)  
 Daniel Clement Dennett (1942 -)  
 Ned Block (1942- )  
 David J Chalmers (1966-)

## Space & Time:

The world (the universe) is the collection of objects consisting of the body-mind and all other objects. The world appears to exist in time and space.

However, time and space are nothing but concepts. They are not real.

Time is the concept of change. Since all objects change, all objects are temporal concepts.

Space is the concept of extension (size and shape). Since all objects are extended in space, all objects are spatial concepts.

(Sobottka 2009)

## Consciousness & Time:

“How can we account for the fact that a presently occurring experience in one's consciousness called "recollection" makes us conscious of a not-present event and indeed makes us aware of it as past?”

And how is it that in the "remembered" moment, that sense can be included in an evidential way with the sense: "have earlier perceived"?

How are we to understand the fact that a perceptual, that is to say, bodily characterized present can at the same time contain a copresence with the sense of a perceivability that goes beyond the <immediate> perceivedness?

How are we to understand the fact that the actual perceptual present as a totality does not close out the world but rather always carries within itself the sense of an infinite plus ultra <more beyond>?”

(Husserl 1928)

## Consciousness & Physics:

“External reality is necessary for science to function and to flourish.”

### Reality:

“...existence of any external, objective reality is **unverifiable** by observation.

... if the existence of an external, objective reality can never be verified by observation, it can have **no effect** on any observation.

... the world is made up of a **series of observations**.

... it is only because the mind **conceptualizes** these observations into objects that they appear as objects to us.”

(Sobottka2009)

## Consciousness & Quantum Theory:

Copenhagen interpretation requires consciousness to be **universal** as well as **nonlocal**.

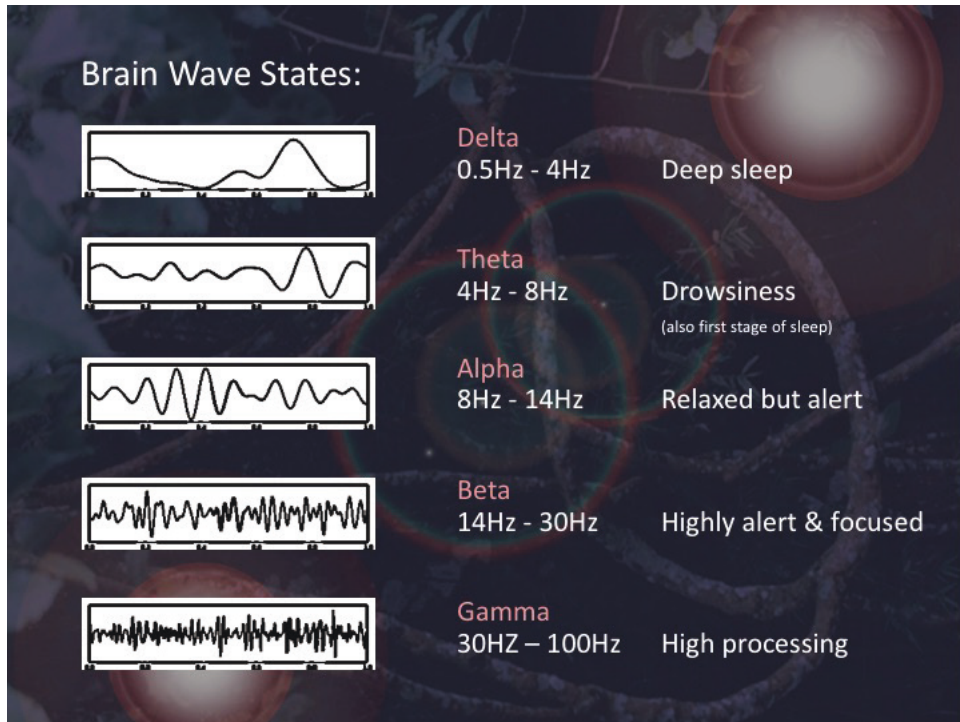
There are **no objects**. There is only a series of observations. There is **no observer**. There is only nonlocal universal consciousness.

In Advaita, nonlocal universal consciousness is called pure **Awareness**.

In Mahayana Buddhism, it is called primordial consciousness, or Buddha-nature.

(Sobottka2009)





### Ayahuasca:

- Pronunciation
- Etymology
- Definition
- Areas of Scientific Research
- Chemistry
- DMT Characteristics
- Effects
- Ritual Practices
- Induced Reality
- Brain Waves

Digital Ayahuasca

## Ayahuasca

**Pronunciation:** A-YA-HWAS-KA

**Etymology:** Death + Vine  
 'the vine of death' or  
 'the vine of the spirits'

**Definition:** Infusion/brew of two Brazilian native plants:  
*Banisteriopsis caapi*, a liana/vine of the  
 Malpighiaceae family,  
*Psychotria viridis*, a bush

## Ayahuasca

### Scientific Research Areas:

#### Natural Sciences:

- . Botany
- . Ethnobotany
- . Biochemistry
- . Pharmacology
- . Neurophysiology
- . Medicine

#### Social Sciences:

- . Anthropology
- . Social Psychology

## Ayahuasca

**Chemistry:** Alkaloids N,N-Dimethyltryptamine or DMT, harmine, harmaline and beta-leptafluorine.

**DMT Characteristics:**

- naturally occurring psychedelic compound
- tryptamine family
- found in plants & trace amounts in humans and other mammals (originally derived from the essential amino acid tryptophan, and ultimately produced by the enzyme INMT during normal metabolism.)
- The natural function of its widespread presence remains undetermined.

## Ayahuasca Effects:

Hallucinatory Effects in All Perceptual Modalities: (Shanon 2002)

- Psychological
- Intellectual
- Spiritual Uplifting
- Mystical Experience attributed to enhanced Creativity

Non-cognitive Effects  
Powerful Visions



## Ayahwasca Ritual Practices:

**Indigenous Peoples of Brazil** | Used for all major decisions of a tribe:

- Locating game for hunting & declaring war
- Initiation Rites
- Healing

**Syncretic Religions** | Used as sacrament:

- Santo Daime
- União do Vegetal – UDV / Centro Espírita Beneficente União do Vegetal
- Barquinha – Afro-Brazilian rituals

## Ayahwasca Induced Reality

1. Bursts, puffs, and splashes of colour.
2. Repetitive, multiplying non-figurative elements.
3. Geometric designs and patterns.
4. Designs with figures.  
[Figures are visual elements that look like things, plant, animal, human, and so forth.]
5. Rapid figural transformations
6. Kaleidoscopic images.
7. Well-defined, stable, single figurative images.
8. Proto-scenes.
9. Full-fledged scenes.
10. Interactive scenes.  
[The visionary has limited interaction with things in the scene.]
11. Scenes of flight.  
[The visionary is flying over the scene and has a subjective sense of flight, though he or she is, in fact, immobile. One may become transformed into a bird.]
12. Celestial and heavenly scenes.
13. Virtual Reality.  
[One moves from being a spectator to full immersion and action in the scene.]
14. Supreme light.

(Shanon, 2002)



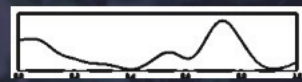
Ayahuasca Induced Reality:

. . . more complex and sophisticated visions require experience with ayahuasca. One has to learn how to deploy the drug's visionary power. The ability to act in a scene comes with experience.

. . . while one can act in scenes, and even become fully immersed in them, one cannot will images or scenes into being.

(Benzon 2003 on Shanon 2002, p. 307)

## Brain Waves in Ayahuasca induced states:



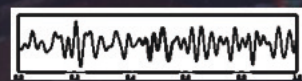
**Delta**  
0.5Hz - 4Hz      Deep sleep



**Theta**  
4Hz - 8Hz      Drowsiness  
(also first stage of sleep)



**Alpha**  
8Hz - 14Hz      Relaxed but alert



**Beta**  
14Hz - 30Hz      Highly alert & focused



**Gamma**  
30Hz - 100Hz      High processing

## The Project:

Digital Ayahuasca is an immersive interactive haptic holographic environment created out of visualizations, sounds, smells and tactile sensations generated by interpretation of the users' brain waves and by the different users interactions with the environment.

Through biofeedback and Tibetan Exercise of Paradox the users' interaction with the environment aim to attain the same brain wave states as experienced in Ayahuasca induced realities.



## Technical Aspects:

Input

Processing

Output

## Input:



EEG device such as offered by Open BCI  
<http://openbci.com/>

Users wearing EEG devices have their brain waves transmitted to the CPU.

Brain frequency ranges from 0.5 to 50 Hz.

User intuitively engages with the system through the visualizations and haptic sensations feedback into the environment.

Multiple users generate multiple inputs.

**Input:**

**DELTA (0.1-3 Hz)**  
**Distribution:** generally broad or diffuse; may be bilateral, widespread  
**Subjective feeling states:** deep, dreamless sleep, non-REM sleep, trance, unconscious  
**Associated tasks & behaviors:** lethargic, not moving, not attentive  
**Physiological correlates:** not moving, low-level of arousal  
**Effects of training:** can induce drowsiness, trance, deeply relaxed states

**THETA (3.5-7.5 Hz)**  
**Distribution:** usually regional, may involve many lobes, can be lateralized or diffuse;  
**Subjective feeling states:** intuitive, creative, recall, fantasy, imagery, creative, dreamlike, switching thoughts, drowsy; "oneness", "knowing"  
**Associated tasks & behaviors:** creative, intuitive; but may also be distracted, unfocused  
**Physiological correlates:** healing, integration of mind/body  
**Effects of Training:** if enhanced, can induce drifting, trance-like state. If suppressed, can improve concentration, ability to focus attention

<http://www.nhahealth.com/science.htm>

**Input:**

**ALPHA (8-12 Hz)**  
**Distribution:** regional, usually involves entire lobe; strong occipital w/eyes closed  
**Subjective feeling states:** relaxed, not agitated, but not drowsy; tranquil, conscious  
**Associated tasks & behaviors:** meditation, no action  
**Physiological correlates:** relaxed, healing  
**Effects of Training:** can produce relaxation  
**Sub band low alpha:** 8-10: inner-awareness of self, mind/body integration, balance  
**Sub band high alpha:** 10-12: centering, healing, mind/body connection

**LOW BETA (12-15HZ)**  
**Distribution:** localized by side and by lobe (frontal, occipital, etc)  
**Subjective feeling states:** relaxed yet focused, integrated  
**Associated tasks & behaviors:** low SMR can reflect "ADD", lack of focused attention  
**Physiological correlates:** is inhibited by motion; restraining body may increase SMR  
**Effects of Training:** increasing SMR can produce relaxed focus, improved attentive abilities

<http://www.nhahealth.com/science.htm>



**Input:**

**MID BETA (15-18hz)**  
**Distribution:** localized, over various areas. May be focused on one electrode.  
**Subjective feeling states:** thinking, aware of self & surroundings  
**Associated tasks & behaviors:** mental activity  
**Physiological correlates:** alert, active, but not agitated  
**Effects of Training:** can increase mental ability, focus, alertness

**HIGH BETA (above 18hz)**  
**Distribution:** localized, may be very focused.  
**Subjective feeling states:** alertness, agitation  
**Associated tasks & behaviors:** mental activity, e.g. math, planning  
**Physiological correlates:** general activation of mind & body functions.  
**Effects of Training:** can induce alertness, but may also produce agitation

**GAMMA (above 30hz Hz)**  
**Distribution:** very localized  
**Subjective feeling states:** thinking; integrated thoughts  
**Associated tasks & behaviors:** high-level information processing, "binding"  
**Physiological correlates:** associated with information-rich task processing  
**Effects of Training:** not known

<http://www.nhahealth.com/science.htm>

**Processing:**

CPU to process generative outputs in Arduino, Max MSP Jitter, Processing, or NodeBox Python, etc...  
<http://weavesilk.com/> (interactive visualization sample)

Different frequencies trigger different colors, images (3D – depth and height), sounds, smells and tactile sensations.

A brain map in conjunction with the frequencies is used to define the triggered areas of color, images (3D – depth and height), sounds, smells and tactile sensations following Shanon's Ayahuasca Induced Reality.

Multiple users brain waves frequencies interact with the system to generate multiple visualizations.

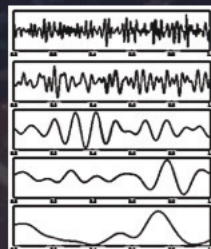
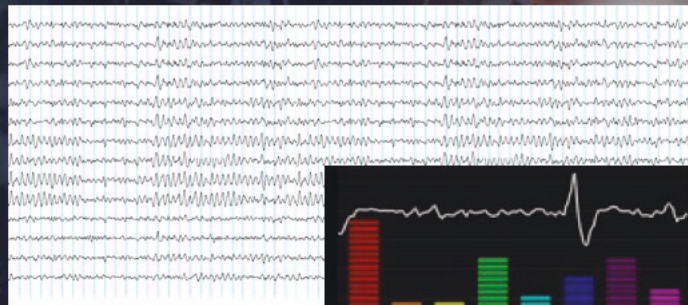
## Processing:

Brain waves input generates visualizations in the order below according to the user's state of mind:

1. Bursts, puffs, and splashes of colour.
2. Repetitive, multiplying non-figurative elements.
3. Geometric designs and patterns.
4. Designs with figures.  
[Figures are visual elements that look like things, plant, animal, human, and so forth.]
5. Rapid figural transformations
6. Kaleidoscopic images.
7. Well-defined, stable, single figurative images.
8. Proto-scenes.
9. Full-fledged scenes.
10. Interactive scenes.  
[The visionary has limited interaction with things in the scene.]
11. Scenes of flight.  
[The visionary is flying over the scene and has a subjective sense of flight, though he or she is, in fact, immobile. One may become transformed into a bird.]
12. Celestial and heavenly scenes.
13. Virtual Reality.  
[One moves from being a spectator to full immersion and action in the scene.]
14. Supreme light.

(Shanon, 2002)

## Processing:



gamma	inspiration   higher learning   focus
beta	alertness   concentration   cognition
alpha	relaxation   visualization   creativity
theta	meditation   intuition   memory
delta	healing   sleep   detached awareness



Processing:

Name	Location	Functions
Frontal Lobe	right under the forehead	How we initiate activity in response to our environment Judgments we make about what occurs in our daily activities. Controls emotional response & expressive language. Memory for habits and motor activities.
Parietal Lobe	near the back and top of the head	Location for visual attention & touch perception. Goal directed voluntary movements. Manipulation of objects. Integration of different senses.
Occipital Lobes	at the back of the head	Vision.
Temporal Lobes	Side of head above ears	Hearing ability. Memory acquisition. Some visual perceptions. Categorization of objects.

Processing:

# Output:

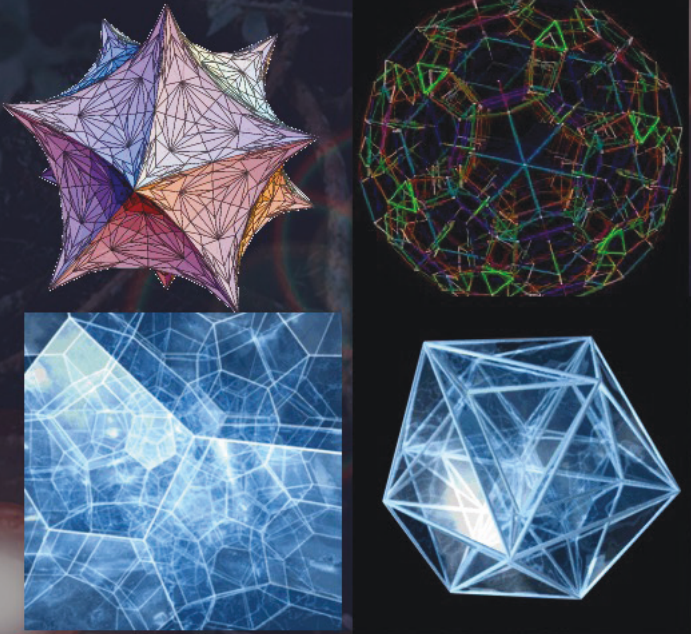
Interactive Haptic Holographic Projection  
<http://analemagroup.wordpress.com/>

Generative 3D Haptic Visualizations are projected in the environment creating an immersive and interactive reality.

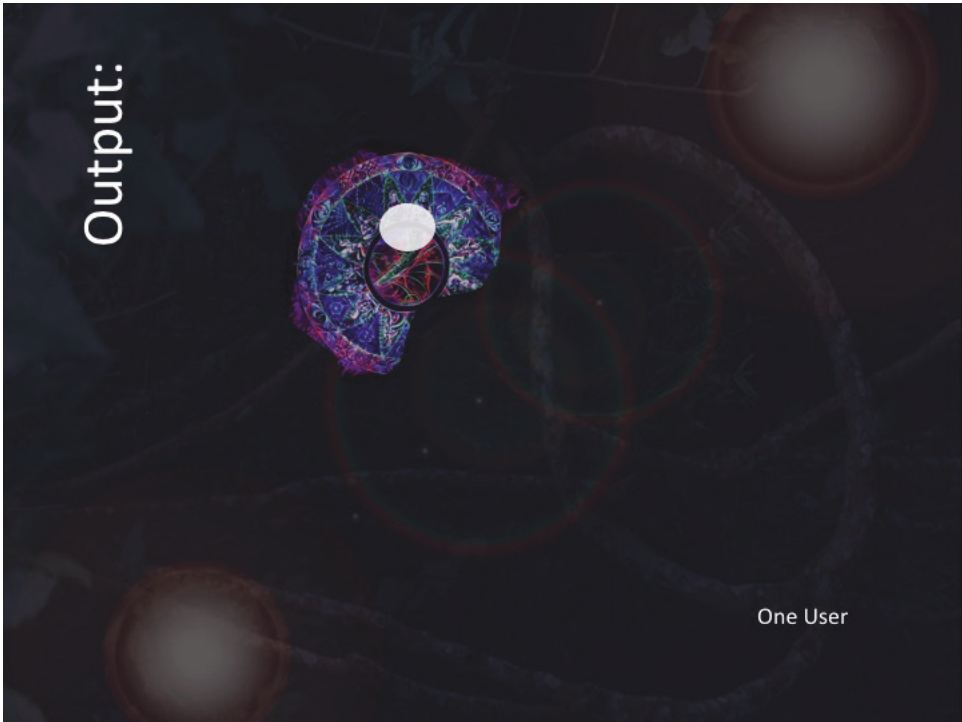
Multiple users generate only one output.

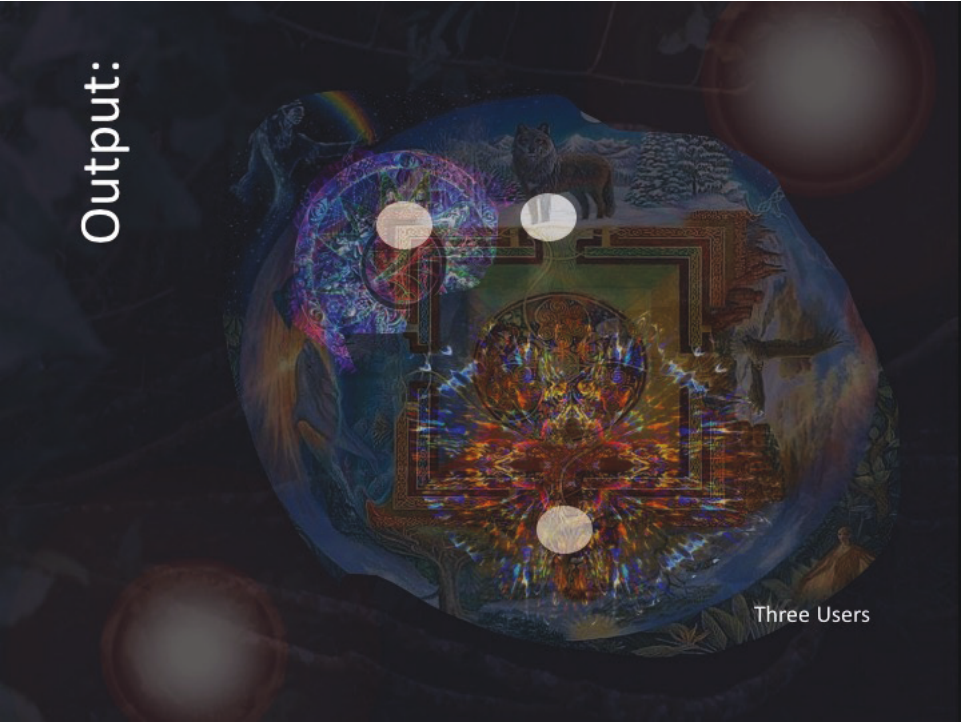
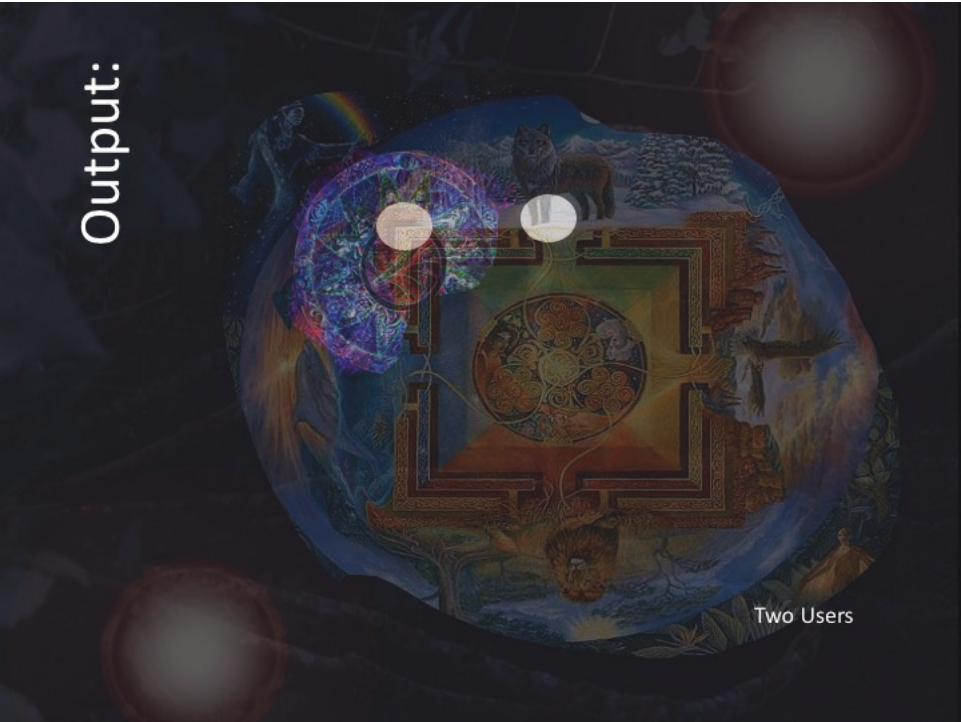
Projection area, colors, images, sounds, width, height, smells and haptic feedback are defined by user(s) brain wave frequencies.

# Output:









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