Wonderstrucker

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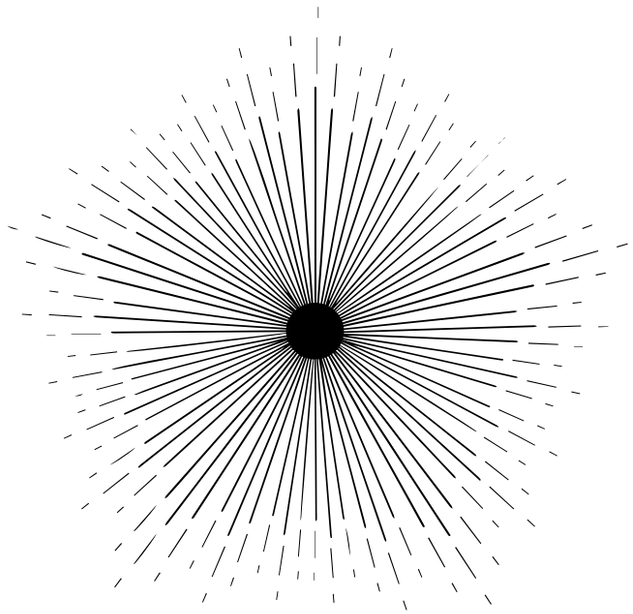
stimulate wonder when
designing for space



THE WONDERSTRUCKER

A MODEL FRAMEWORK TO STIMULATE
WONDER WHEN DESIGNING FOR SPACE

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Submited in the fulfilment of
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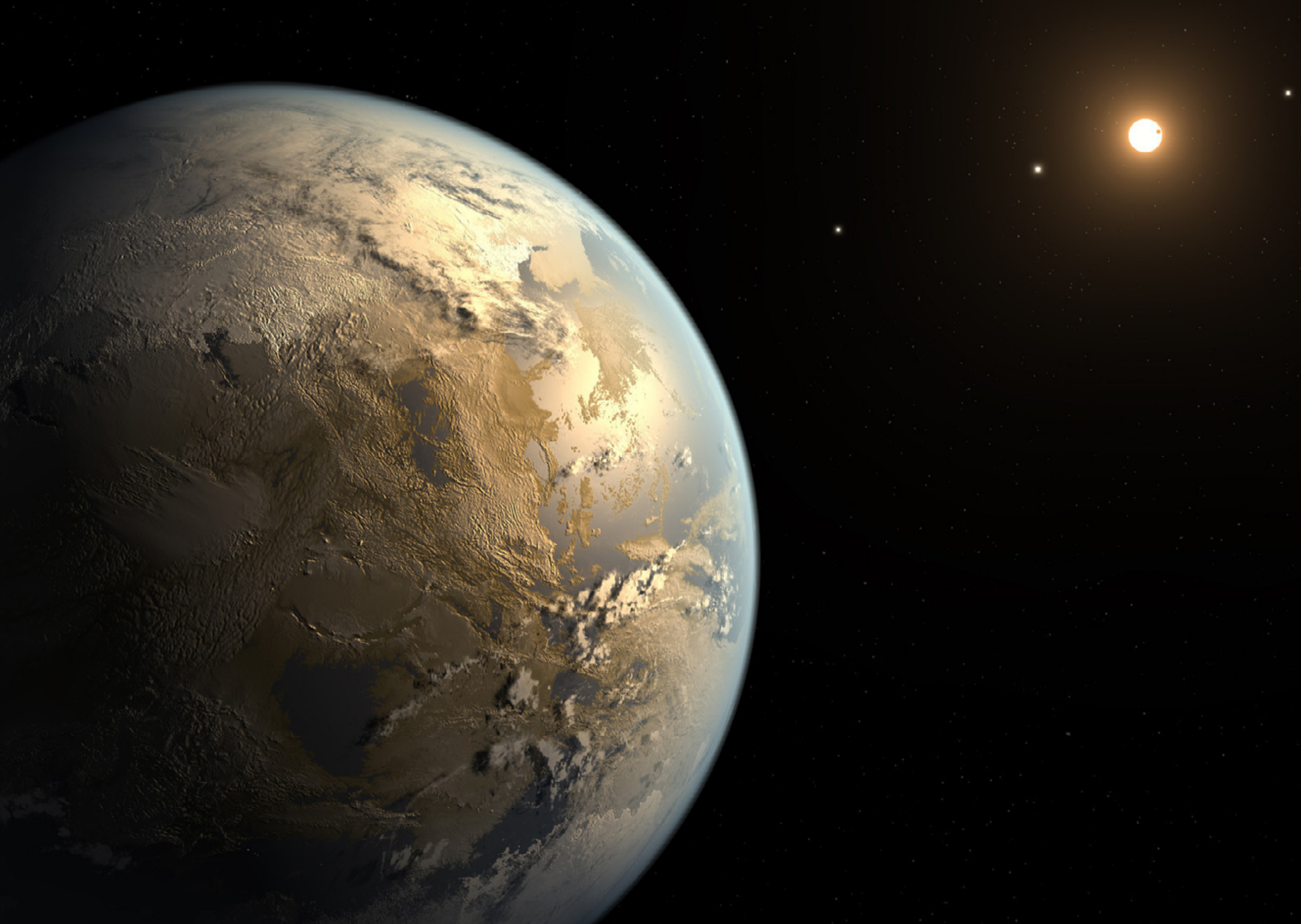
"... Perhaps
what is essential
is a foundation
of sensible, if vague,
ideas and orienting
attitudes –correct in
their broadest sweep
if not in their precise
predictions."

Jack P. Hailman



Abstract

What do we need to design for space beyond Earth's orbit? Perhaps a *shift* on our perspectives to reload our imagination? But, how can we accomplish that?

Design characterises for its openness to complex possibilities to thrives on them. Still, we should be aware that to cause the next leap, it exists a *knotty beginning* that can turn minds and inspire to move. In this study, I try to point out and make perceptible that vital, emotional act which can impulse designers to make that *shift-view* possible. Nevertheless, the way we practice and learn Design has left behind this emotional experience. Richard Buchanan expressed that education in Design *does little to cultivate the sense of Wonder as the initial moment in inquiry when a new idea emerges* (Buchanan, 2007).

The study will show how little is advanced in the Design field to help the designer to engage with —*the experience of Wonder.* Therefore, the purpose of this study is to *explore how to stimulate the experience of Wonder to influence on designer's initial position before start dealing with a space design challenge.* Expecting designers to *expands the space of what is possible for their thinking* (Glăveanu, 2019b).

To achieve this purpose, I drafted a *model framework* to stimulate wondering, composed of the following activities. First, a *Workshop* designed to introduce a space design challenge. The second, a *Game* to explore collaboration and imagination. And last, a speculative *Object* to provoke participants' creation of meaning. The data gathered will come from the observation during the workshop, interviews and open-end digital questionnaires. The results will be analysed, expecting that the following themes will arise—Curiosity and Invention, Growth Mindset and, Suspension of Disbelief.

These themes will be useful to advance in the study of Wonder and its practical application in Design. This experience facilitates designers to emotionally open to other possibilities and cope with unfamiliar challenges. Such as the ones when we —Design for Space—.

Contents

Prologue

That second of Wonder! When at the end of the reading “Envoi” of Octavio Paz in Henri Lefebvre’s book (Lefebvre, 1991), the tip of a conductive thread emerged from an entangled constellation. Perhaps by chance, or because of a mind seeking enlightenment, suddenly arouse a moment of, “A-ha!”. Therefore, excitement and action drove his imagination amidst intertwined connections between designers, astronauts, psychologists, algorithms, deep space, and Moon.

“The writer of thought” described the cardinal points in such an emotional yet concise way that took him by surprise.
Immediately, the poem flew him to a place where he could gaze all —a picture beyond his faith—.

> He saw the astronaut wondering if his rocket represents that prison. Or if facing it to the North, the rocket is the medium of encounter other worlds.
> At the other end was the designer. Discerning if his mind was indeed the four walls that imprison him alone —wondering why all the signs that he sent out have no reply? Even if the message was not an emotion itself.

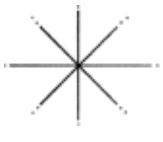
One second, and he travelled far from home. He found in Wonder what he is not supposed to, yet through the galaxies, recognized the stars once invisible before. He went far; somehow, he is not the same anymore.

Curiously odd, impressively strong, the experience of Wonder changed it all. It changed design and designer, the other, the invisible, the familiar, the possible, and why not, accidentally the world.

“Imprisoned by four walls

–to the North, the crystal of
non-knowledge a landscape to
be invented
to the South, reflective memory
to the East, the mirror
to the West, stone and
the song of silence–

I wrote messages, but
received no reply.”



Envoi
Octavio Paz

1

Introduction

STATE-OF-THE-ART

Research Topic

Admittedly, wondering about Wonder and Design for Space, began the process of establishing bridges to find connections between them. When the designer faces the challenges that represent design for space —a total, utter views are not the possible answers to find solutions. We need to be aware of other potential views. Some designers often are unconscious bias[1] by the energy of the everyday world. Thus, forms blind spots that prevent them from imagining beyond their perspectives and neglect others perspectives —resulting in replication rather than innovation or narrow-mindedness instead of receptive open-minded.

Therefore, what drives this study is the excitement to find new potentialities that the experience of Wonder could allow. And seek for tools or methods that foster this experience. So, if Design foster Wonder, it can be an essential component to mobilize designers' potential and succeed when Designing for Space, heading to the next giant leap in space exploration.

1 About "unconscious bias" and blind spots watch Helen Turnbull. (Turnbull, 2013)

So, the topic for this research it summarizes as follows: "*The experience of Wonder, a unique starting point, when Designing for Space*".

Problem Statement

Wonder has been a topic of discussion in Philosophy throughout history from Socrates and Aristotle to contemporary thinkers such as Heidegger and Arendt[2]. Recently, Wonder brought a significant interest to researchers in Psychology as well as in Science. However, despite its close connection with Wonder, Design *does little to cultivate the sense of Wonder as the initial moment in inquiry when a new idea emerges* (Buchanan, 2007) and triggers the process of Design.

Even though *Wonder has the potential to change one's perspective on life* (Reinerman-Jones *et al.*, 2013), only few studies explore this emotion. Their focus was directed more to the emotion of awe. For instance, an experimental study in psychology proposed the use of Virtual Reality to elicit the great *transformative potential*

2 See (Glăveanu, 2019, p.20)

(Chirico *et al.*, 2018) of awe, but with less consideration to its cousin emotion *wonder.* Another significant study attempted to describe the phenomenon of awe and wonder to understand it better —by using a neurophenomenology approach to the research (Gallagher *et al.*, 2015a)—. Last studies about creativity, said that experiencing Wonder enables creativity in Art and Science. And it is also proposed as a model where Wonder can *decentre singular perspectives and open up to difference* (Glăveanu, 2019a).

In a different study —strictly to the field of Design— it was built an Immersive Installation to create awe. They were combining scientific and artistic practices to tried to *identify awe-inspiring traits* (Quesnel *et al.*, 2018). Their results were positive and useful for future studies. Nevertheless, Wonder remains in shadows and is not considered influential to the aim of the study mentioned above. Possibly its ambivalence did not let scientists to use it. Additionally, it is essential to mention that the previous studies recurrently used the Outer Space as a thematic trigger as a representation of vastness, unknown and uncertainty to elicit the emotions of Awe and Wonder.

So far, little is advanced in the Design field to seek in Wonder an experience to embrace change or as a tool to incite imagination neither propose a device or a method that help the designer to engage with the experience of Wonder.

Therefore, the purpose of of this study is to explore how to stimulate the experience of Wonder to influence on designer's initial position before start dealing with a space design challenge.

Expecting designers to *expands the space of what is possible for their thinking* (Glăveanu, 2019b) and, form a *growth mindset* (Dweck S., 2015).

The following questions guide the study:

1.- How do we recognized that the experience of wonder is taking place?
2.- What actions do designers express at the initial inquiry?
3.- How can we cultivate the experience of wonder?

Finally, it is proposed that engaging a consciousness of Wonder should be the first of all design actions. Because, we must remember that the first of all process[3]—Design—, finds in Wonder its motor.

This experience of *wondering fully*[4] facilitates designers to emotionally open to other possibilities and cope with unfamiliar challenges. Nowadays, one of those challenges is evident to us as career adaptability[5] in fast-changing work environments or new job requirements. The Space Industry, with its increasing necessity to find alternatives to its constant changes and goals, is one of the beneficiaries of embrace the experience of Wonder.

3 On describing the practice of Design by Ken Friedman and Erik Stolterman in the Foreword of the book *"Adversarial Design"* (DiSalvo, 2012)
4 See (Glăveanu, 2019b)
5 Space industry is only a part of many changes in the society and economical structures. But it is at least an example where adaptation is fundamental. For more about career adaptability see (Nota and Rossier, 2015)

Structure of the Thesis

The thesis is arranged in five chapters. The first one —the introduction—, called "*3,2,1, Ignition*" refers to the classic count down of NASA Space Shuttle launches. It represents the opening and starting point of the research work. Introduces us to the research topic, problem statement, the motivations to do the research, the goals and the limitations that the research has. It also summarizes the approaching procedure I developed to achieve the purpose of the research.

The next, Chapter 2, titled "*Houston, We've had a problem here!*" — one of the most famous phrasing in space's missions "Apollo 13" precisely— presents the theoretical framework of the study. It aims to identify, among the studies reviewed, the conditions that could indicate that the experience of Wonder is occurring inasmuch as there is too little research in the field of Design studying the emotion of Wonder. And finally, it presents what could be a gap in knowledge in the design field, which helped to frame the problem to be tackled with this research.

Chapter 3, "*We're working on a procedure down here for you, do you copy?*" —the reply of the Apollo control room on Earth, solving the problem— This third section establishes the basic concepts to develop a model that helps satisfy the purpose of the study. The research follows a qualitative strategy as a method and three research questions guide the research. And finally, sets the procedures to follow for findings and the collection of data during the research.

The next Chapter, 4, "*Houston, tranquillity base here, the eagle has landed*". This section described the *Model* —The Wonderstrucker— proposed to address the purpose of the study.

Finally, Chapter 5, *"Tranquillity base, mission concluded. Ready to bring you home"*. —regards to a conclusion and recommendations of the research. Shows the findings of the observations of the data and discusses the implications for further studies.

The Approaching Procedure.

To achieve the purpose of the study—*explore how to stimulate the experience of Wonder to influence on designer's initial position before start dealing with a space design challenge*— It is designed an "*model framework*". This model encompasses three different activities that aim to affect each other to stimulate and engage the participant with the experience of Wonder when designing for space. Every activity aims for a specific objective and follows a procedure.

The first activity; *the Workshop*—learn by participating— has the objective to set the conditions to introduce the participants to the experience of Wonder as a novel approach when Design for Space.

Inside the Workshop, the second activity will take place; *the Game*—imagination in collaboration—. Its objective is to encourage participants to explore through their imagination possible options for resolving the challenges presented in the Game alongside their allies.

The last activity—suspension of disbelief— is a speculative *Object* place in the salon where the Workshop is running. It has the objective to make evident participant's perspectives and provoke questioning.

The data gathered will come from the observation during the workshop, interviews and open-end digital questionnaires. The results will be analysed, expecting that the following themes will arise. Encourage imagination, curiosity on the topic, unfixed mindsets and, suspension of disbelief.

These themes will be useful to advance in the study of Wonder and its practical application in Design. This experience facilitates designers to emotionally open to other possibilities and cope with unfamiliar challenges. Such as the ones presented from space exploration and which form the increasing stress of the Space Industry to find alternatives to solve their queries.

Motivations

Design for Space represents a blue ocean[6] for designers. As technology rapidly advances, the New Space Economy is becoming the most prominent economies for the next decades[7]. The possibilities to integrate Design into this economy are enormous. Many changes are happening now, and Design is one of the disciplines that have the skills to cope with those changes. Moreover, the traditional role of Design needs to be amplified; and Wonder has the transformative potential that could initiate this improvement.

Goals

This research aims to set the first attempts to experiment with the emotion of Wonder in the Design field. And with the proposed *"model framework"* encourage design practitioners, students and teachers to experiment Wonder before starting the process of Design for Space.

6 Blue Ocean is the term used for a strategy that refers to the vast marketing options of a new industry.
7 See

Limitations

As a Pilot Study, it will have only a small sample to study. This first exploration lacks established procedures to accurately gather and analyse the data produced by the observations and interactions with participants. Therefore, the results expected could only give us hints in implementing what a next more prominent study can achieve.

Then, for the *"model framework"* and its first attempt to introduce the experience of Wonder to the participants, only prototypes will be developed with the ultimate purpose of improving in a later stage, after their test with the participants' sample.

2

Houston, we've had a problem here!

“ There are the rushing waves
mountains of molecules
each stupidly minding its own business
trillions apart
yet forming white surf in unison

Ages on ages
before any eyes could see
year after year
thunderously pounding the shore as now.
For whom, for what?
On a dead planet
with no life to entertain.

Never at rest
tortured by energy
wasted prodigiously by the Sun
poured into space.
A mite makes the sea roar.

Deep in the sea
all molecules repeat
the patterns of one another
till complex new ones are formed.
They make others like themselves
and a new dance starts.
Growing in size and complexity
living things
masses of atoms
DNA, protein
dancing a pattern ever more intricate.

Out of the cradle
onto dry land
here it is
standing:
atoms with consciousness;
matter with curiosity.

Stands at the sea,
wonders at wondering: I
a universe of atoms
an atom in the Universe.”

Richard Feynman

Orienting Lenses

THEORETICAL FRAMEWORK

It is not uncommon that under the shelter of the Politecnico de Milano, many international students had broadened their perspectives in many ways. At design school, students confront and explore many concepts about design culture—studies and practices. And while some of those concepts are forgotten, others reverberate more intensively in students' minds, becoming the seeds that will build new, better perspectives and unique blend of cultures.

This research gathers some of those approaches such as critical and speculative design, life design from a social psychology perspective and the confrontation of two different cultures —Mexican culture as researcher's backdrop and Italian as the action scene— different societies amid constant changes. All previous, set and shape the foundation of the research's vision and its composition.

Essential Idea

The *basic set of beliefs that guide the action* (Guba, 1990) of this research, comes from the impression that critical societal metamorphosis is occurring. And within it the design discipline, starting a transformation in a designer's role too. Additionally to this rush of changes, stands out measuredly yet hungry, the Space exploration industry. An industry that, not precisely noticeable in the ordinary life, but which for many years had represented *the fountain of Earth's technology development* [1].

Outer space exploration is developing faster than ever and it is near to set the next leap in human evolution (International Space Exploration Coordination Group (ISECG), 2018). Thus, Design, as one of the practices embedded in the development of human species, needs to rethink its first purposes. So it can well adjust with the fast race that technology is pushing onto the human evolution. Consequently, the need to develop new perspectives on this upcoming transformation asks to bring awareness and critical thinking to the forthcoming

1 Those were the words of Amalia Ercoli during a presentation celebrating the fifty years of Apollo Moon missions. At Politecnico de Milano.

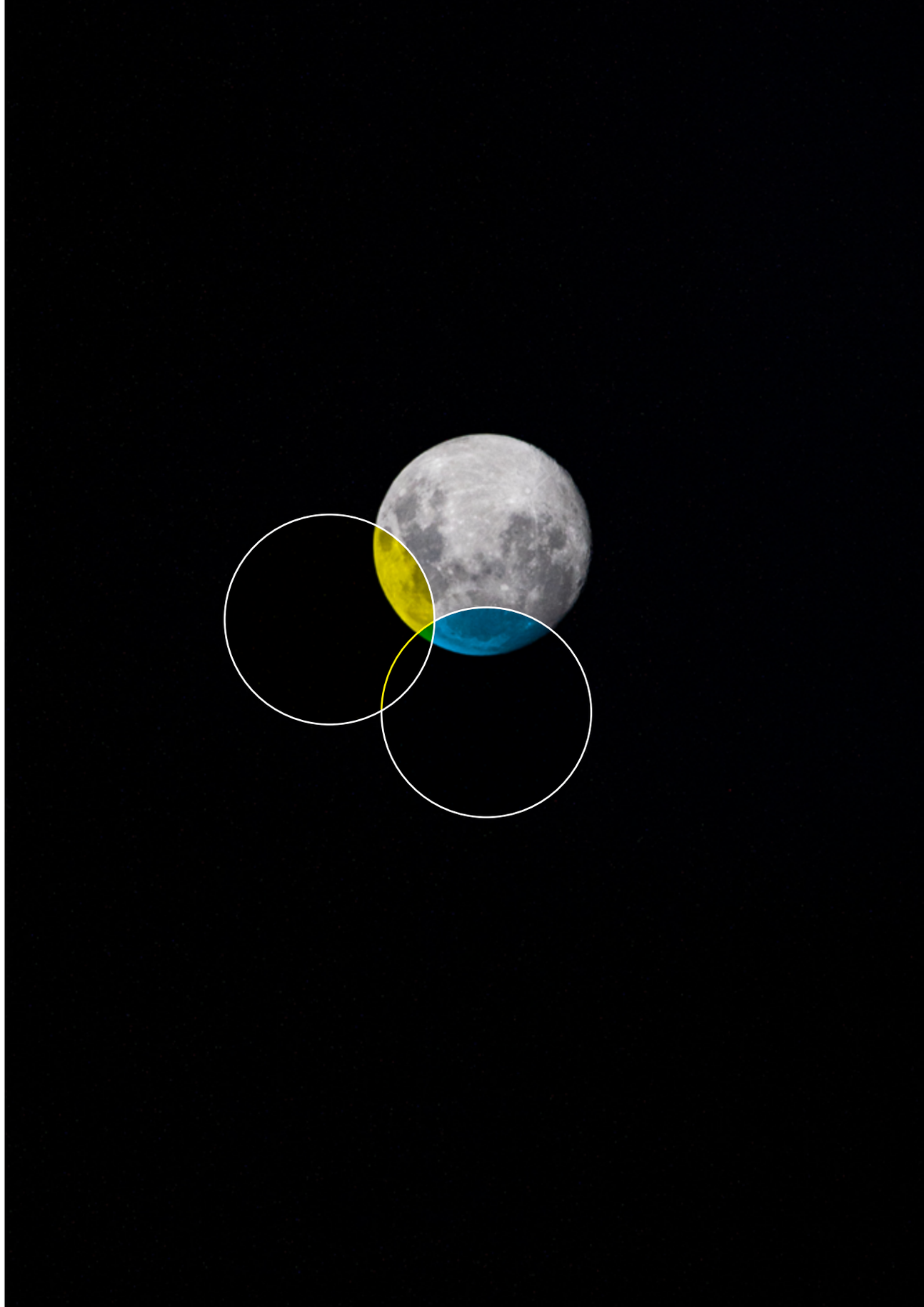
issues. The *experience of Wonder* can afford us the means and stimulus to face the next giant leap.

Therefore, what drives this study is the excitement to find new potentialities that the experience of Wonder could allow. And seek for tools or methods that foster this experience. So, if Design foster Wonder, it can be an essential component to mobilize designers' potential and succeed when Designing for Space, heading to the next giant leap in space exploration. Perhaps, the next leap will be to share our successes in space with either a superior or synthetic intelligence?

As we seek for an understanding of the world in which we live and work (Creswell and Creswel, 2018), the goal of this qualitative research, is to look for the complexity in perspectives and meanings, subjectively developed by the individuals based on their experiences either with objects or things. Moreover, rely on their views of the situation proposed by the research to construct meanings of it. And foster interaction and discussion with other persons to socially negotiate their meanings in a broad and general way.

Considering that cultural norms can emerge from those interactions, it is essential to be aware of the specific contexts from where the participants' creation of meanings arises. In the end, the research intent to interpret the meanings about the world. And link different perspectives from them developing new forms of exploration.

So, to spring the first exploration, the developed topic for this research it abstracts the three key elements to scrutinise —Wonder, Design and Space—as follows: "The stimulus of Wonder, as a unique starting point, when Designing for Space".



Exploring Other's cosmos

ACADEMIC LITERACIES REVIEW

1. Marvellous Differences

"—Fred ... have you had a moment, that moment of revelation! in that particular time, when in a complicated problem, quite suddenly, the thing comes into your head and you are almost sure you have got to be right!

—Richard ...Oh Yes! Yeah! and then, you try to figure out what the conditions were on that moment that you can do it again, for example...[1]*"*

The beforementioned has two common expressions to describe those kind moments. The former, the Eureka[2] Moment (Rorres, 2004) coined by Archimedes –when he was taking a bath– which later was studied as the A-ha! Effect. As a kind of sudden emotion, experience understanding of something previously inexplicable; also, an expression closely related to geniuses and their fortunate discoveries. The latter reveals a sense of *wonder.* Such experience explained by Parsons aims at putting into meaningful form the relative disorder of the emotion (Parsons, 1969). Moreover, especially for this study, it is important the distinction made by Hadzigeorgiou between curiosity and the two attitudes of wondering. He argued that one of the attitudes –*wondering at*– can be identified with astonishment or admiration in an instant of static movement. The second reveals the difference with curiosity. This latter attitude, –*the wondering about*– starts with awareness of the situation than a feeling of uncertainty or doubt (Hadzigeorgiou, 2012). Otherwise, to what drives curiosity, which is just one feeling and stops there once the knowledge is built. Therefore, considering what Glăveanu explained, the moment described above, reveals the combination of the two attitudes. Both are integral to wondering (Glăveanu, 2019b). Hence, without *wondering about* the person stays static without *wondering at* the person feels purposeless.

1 It was part of a conversation between Richard Feynman and Sir Fred Hoyle (An Astronomer and Science Fiction Writer). For further interest visit https://youtu.be/mvqwm6RbxcQ
2 Eureka in ancient Greek means "I have found it"(Liddell, Scott and Jones, 1940)

This first example aims to try to find and understand the experience of wonder, showing us, how wonder can be easily confused with other emotions. Therefore, leaving aside the opportunity to experience a full wondering moment, denying us engagement with the possibilities that could appear from that thinking. Nevertheless, to enlighten this path of understanding the phenomenon of wonder, some sources can serve as a guide. So, it is useful to set a brief overview about wonder to start to clarify how wonder had been represented through history and thus, begin to recognize wonder in daily life.

What is Wonder?

There is no easy answer to this human phenomenon. According to Glăveanu, Wonder is an experience, an inquiry process about us and the world. It has a purpose, understand things better and explore the unknown. To wonder, one needs the immersion into an experience to be matched by reflective distance (develop and use of meanings and, understanding of one's self) so it is immersion and detachment. Continuing:

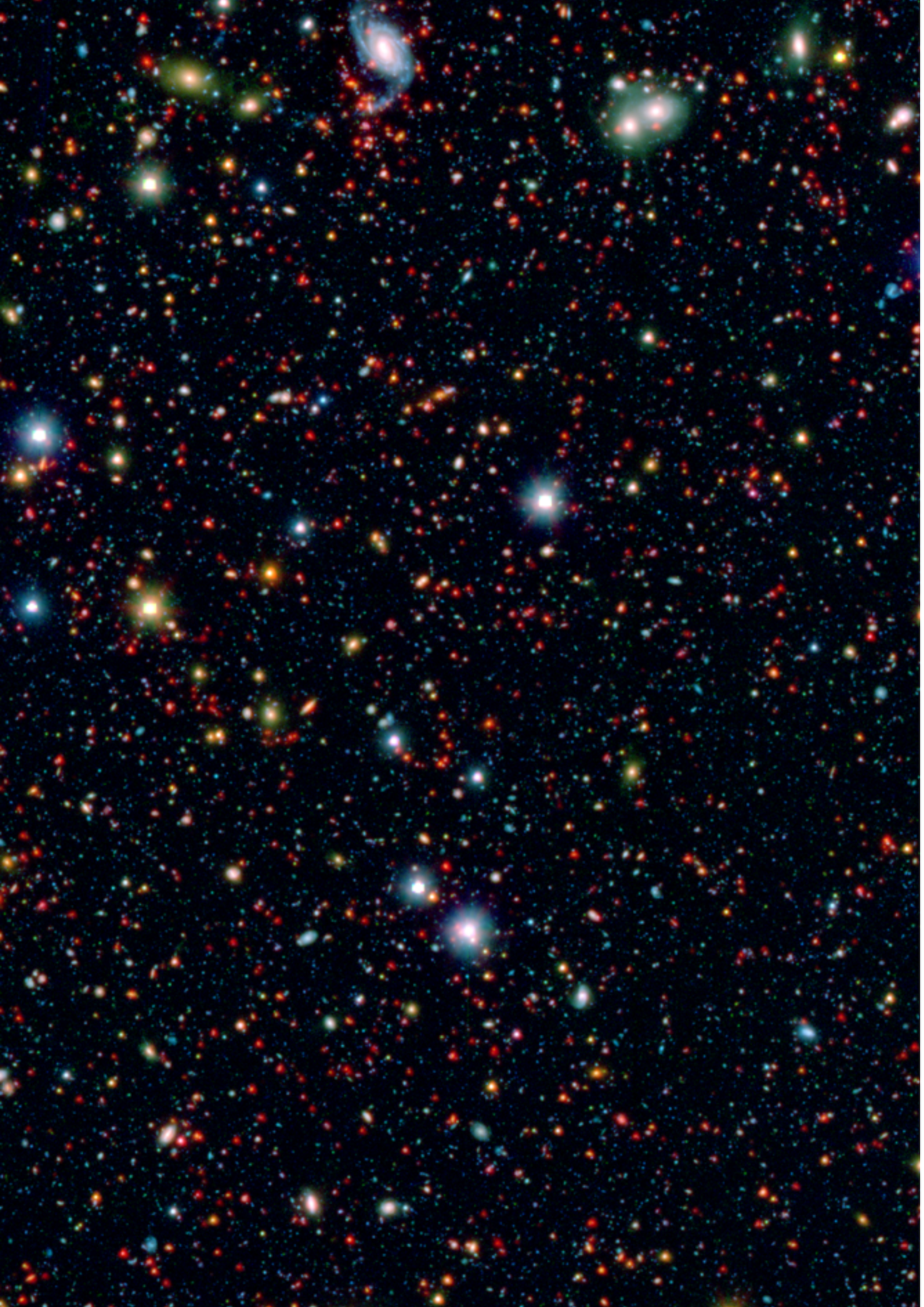
> *Wonder is to be unsettled by something emotionally, and able to explore that something physically or imaginatively and create meaning of it. It is our own involvement in the world. Stimulate intellectual, moral, artistic growth and make life better and more worth living. Being able to wonder relates to mental health, well-being and creativity. Also, being able to understand and enjoy instead to integrate and solve. It helps us to develop new perspectives on ourselves and on the world. However, the uses of these perspectives depend on personal inclination and circumstances. Wonder is an experience of wanting to know more and be open to possibilities.*
>
> *It helps to engage with the possible. It makes us aware that our experience of the world is among many, and the perspectives developed are just perspectives, not an absolute truth.*
>
> *But Wonder is also considered useless and dangerous. It let us confuse about what is it and ambivalent to what is it for (mixed feelings, contradictory ideas about it). We need to avoid become disconnected from reality and being incapable to make opinion or decisions*[1].

Wonder seems to be quite complicated. And certainly, it navigates between good and evil, curiosity, awe, surprise, contemplation. But knowing Wonder better is the key to take advantage of it.

On the other hand, Design has the duty to embrace the complexity of this world, because creative people can tolerate and thrive on ambiguity and contradictions—something that noticed Glaveanu. So that is why it is essential as training to deal with confusion, uncertainty and complexity. It helps us to face what we really are and from there explore and shift. Doing good what we know we are capable of and know that what we lack.

If the world is indeed open to multiple interpretations and actions, then we need at least to consider them and sometimes, at least, change the way we think, act and live.

1 The paragraphs are a short synthesis from the words of Glăveanu in his book Wonder*(Glăveanu, 2019b)*



" Wonder goes well beyond the wonderer – it constitutes a bridge to the world, one that transforms person and world through their relationship.

Vlad P. Glăveanu

Origins[3] of wonder

For ancient Greeks, the word for wonder was *Thaumazein.* It derives from the descendant of Earth and Sea (Gaia and Pontus), *Thaumas.* He is the first depiction of wonder. A sea god that stands for the wonders and dangers of the sea. Later, Thaumas' offspring with Electra—an Oceanid, were Iris and the Harpies. They embody the contrast of what forms *wonder. "The rainbow and the storm, the light and darkness".*

Other roots for wonder, are the Latin's words *mirari* and *miraculum.* Meaning, miracle and admiration. Also, the German word *wunde,* in which the English word, *wonder,* is associated. Considering all together, gave to us the starting point to the experience of accepting the entanglement meanings of wonder—miracle, transcendence, light, storm, violence and wound.

The Philosopher's view of wonder

The next chronology follows the beautifully organized work of Dr. Glăveanu in his book "*Wonder*[4]".
Wonder, according to thinkers Socrates, Aristotle and, Descartes agreed that is *the beginning emotion* that start philosophy and quest for knowledge. On behalf of Socrates, the experience of wonder was a state of constant doubt and in search of wisdom. Aristotle added together a full stop to the doubt; once it was cleared, understood it and knowledge has built (more closely to what curiosity is). Then, defined it as a passion was listed it as first among all "primary passions[5]", René Descartes' view, summed and considered that the experience of *unusual objects* was a trigger to activate wonder. Next to him, Baruch Spinoza correlated with the above saying that the emotion we felt became from when we are faced with *strange or exceptional things* (These two points of views, has a strong relation with Design and Art and how wonder and object are correlated). Moreover, particular overwhelming experiences, caused by landscapes or the view of sky[6], leaving us feel both delighted and terrified, was what Edmund Burke defined as the sublime, the highest level of astonishment. So, he considered it the strongest emotion we can feel. But Immanuel Kant argued that the sublime is reason. Because by experience it we try to understand what lies beyond our imagination and this process of inquiry thus become the source of the sublime. Originated within the mind and not in the outside world. Continuing with Martin Heidegger; seeking and founding the *strangeness of the ordinary in the familiar of everyday,* was the main function of wonder for him. However, for Hanna Arendt the mysterious of the ordinary distracted us from the ability of been critical and aware to confront opinions on social concerns. This key process of *critical judgement over opinions* is what for Arendt wonder is about.

In perspective, what constitutes the experience of wonder, lies in a range that covers: *an emotion to start a process, constant doubt and the search of the unknown, a passion that has to be stopped to avoid been static, a feeling triggered by the unusual object or the strange or exceptional things. The sublime of overwhelming experiences and the*

3 This overview follows the work of Glăveanu. For extended reading see his upcoming book *"Wonder: the extraordinary power of and ordinary experience"*
4 For extended reading see (Glăveanu, 2019b)
5 Descartes primary passions considered irreducible to other emotions. The list includes love, hatred, desire, joy and sadness.
6 This notion is strongly associate with space views, astronauts' views. Throughout the study I will made more relations on how space, wonder and design have common particularities.

reasoning of the mind, looking for strangeness in the familiar and the critical judgement to prevent distraction of what is in front of us.

More briefly, *curiosity, surprise, awe and, astonishment* are the range where Wonder fluctuates. And in between; the benefit of knowing or getting to know, a passion that obstacle a process or a moment to think, separated from or conditioned for a reason. A game played by contradictions and dichotomies is what nourish the foundations of Wonder understandings. This entanglement results for some disciplines too much to embrace. However, Design discipline has in wonder, the benefit of better understand its role. But, how could Design find support in Wonder?

Design's gaze on wonder

There is some familiarity with the term wondering in the Design field. But, as may it probably have thought, "*there is a little talk of wonder in contemporary Art and Design*[7]". Richard Buchanan argues that "*wonder and astonishment deserve greater attention*[8]" from artists and designers. Because he considers that these emotions are the "*sign and the source of creativity and originality*".

He agrees with Descartes that Wonder "*is a beginning, a differentiation in our perception*". Importantly too, Wonder signifies for him, "*the beginning of our creation of meaning*". Also "*the power for sustained engagement*[9]" and *"the initial moment in inquiry when a new idea emerges"*. Finally, to end on a high note, he pointed out:

> *Unfortunately, most education in art or design, in the haste to prepare a suitable professional, does little to cultivate the sense of wonder or astonishment in students. Problem solving takes priority over problem finding. Interpretations abound, and little time is given to the free play of invention and discovery. Thus, invention and discovery appear to be a matter of chance rather than disciplined artistic and intellectual exploration. Only the best teachers understand that time and silence are needed by the student to open imaginative space for finding the problems that are most important for their creative work (Buchanan, 2007).*

It is noticeable the intention of Buchanan, indicating the importance of the moment of inquiry and the time needed for exploration. Also, how wonder and astonishment can influence in the intellectual side of the designer. Which in fact, this action, follows the idea about Wonder from Hannah Arendt. Meeting a process of *critical judgement* over others' priorities instead of only over ours.

Wonder, in this sense, shifts the attention towards a better understanding of ourselves and the process of design. A process that is deeply engaged with intellect. This process of critical judgement as Arendt describes as wonder, has some interrelation with works by Anthony Dunne, exploring societal issues while critiqued them, nonetheless, in a designed way[10] —as we can see in his book "*Hertzian Tales*".

From then, he coined the term *"Critical Design"* and with Fiona Raby—fellow research at Royal College of Art in London— explained to Matt Malpass[11] what does critical design means for them:

7 Buchanan, R. (2007) "Anxiety, wonder and astonishment: The communion of art and design," *Design Issues*, 23(4), pp. 39-45.
8 Ibid., 44.
9 Ibid., 45.

10 See his book *"Hertzian Tales"* (Dunne, 1999)
11 A conversation in his book *"Critical Design in Context"* (Malpass, 2017)

> *For us critical design now is a useful term to describe a practice that uses design as critique. But at the same time, we're very wary of it becoming a label or a kind of a shorthand. I think the idea of design as a form of critique is really important and special. I'm worried that the label critical design is too narrow a form. Obviously, that particular phrase came from us and characterizes the type of way that we work. It would be much more exciting to see other forms of design that critique. That maybe challenges what we do or offer something different. (Dunne and Raby Interviewed by Matt Malpass, 2009)*

Also, this practice shares its vision with Buchanan's observations on preponderate problem-finding over problem-solving. As Dunne and Raby point out in their definition: *"Critical design is located outside terms set by capital or production and counters conventions of utility, technology, and fiscal gain. Produced for exhibit rather than sale, these designs are less about problem solving and more about problem finding within disciplinary and societal discourse."* (Malpass, 2017)

Although the fact that the act of wonder seems too distant from Dunne's critical design perspective, it has some points to link. For instance, when Malpass describes this approach arguing that *the purposive function of the work has a social and political orientation, rather than a commercial focus*...(Malpass, 2017). Therefore, it is possible to affirm that the orientation of *Wonder* in Arendt's vision applies finely and goes across the practice of Critical Design. It is making us aware of what is around us while performing a process of inquiry and critical judgement within our minds. Without forgetting that, also a sense of reason[12] has a share in the process of wonder. Thus, *Wonder* becomes a supporting actor developing an essential role in the practice of Design.

12 As Kant claimed when re interpreted the definition of the sublime from Burke.

Another point is the role of objects. Which are fundamental for experience Wonder. So, as already seen, for Descartes, Spinoza, Buchanan and, Dunne and Raby, objects are or aim to be triggers of awareness, critique and inquiry. But also, objects are forms to incite emotion or astonishment. Therefore, objects can be triggers as well for Wonder. So, the next exciting examples can serve us to explore the conditions for *the experience of wonder* with objects.
First, the polemic readymade[13] piece of art by Marcel Duchamp in 1917. A porcelain urinal called *Fountain*. This common object, rejected from the Independent Exhibition of modern art in New York, was enfolded by Duchamp's critical vision and sceptical attitude towards modern art. He, through the object, was trying to stimulate discussion about the meaning of art. Dawn Ades—Exhibition co-curator for the Royal Academy of Arts in 2017— guided us to the instant that caused the turmoil.

> *"... this second issue of the little journal called The Blind Man was focused on the exhibit that was refused by the Independents. ... Mr Mutt's Fountain... he took an ordinary article of life, placed it so that its useful significance disappeared, and under the new title and point of view, created a new thought about object. That was a very new idea, and that's probably been one of the most influential gestures of 20th century's art [14]".*

Acting that way, as Duchamp did, constitutes another essential for experience wonder—turning object's usual identity into something else, make a familiar object and transform it into an unfamiliar one to start a dialogue—. This playful act serves *to springboard for wonder*

13 The "readymade" objects are diverted from its original function to another character. Surrealism used to use this kind of objects.
14 For full interview watch https://youtu.be/NSKxJc_J0No

and also set the environment to make unconventional connections between the objects and their meanings (Glăveanu, 2019b).

The second example concerns more to the process of giving a specific purpose to the object to provoke emotions. In this case, while using it, makes you wonder how serious it could be and remember us what it stands for, so it begins to create conflict in the wonderer. The *Huggable Atomic Mushrooms*— designed by Michael Anastassiades with Dunne & Raby for a collection called *Design for Fragile Personalities in Anxious Times* in 2007/08—, was inspired in treatments for phobias. Those treatments require to confront the patients with their fears. Consequently, the mushrooms were designed and thought for people with specific phobia; in this case, the dread of nuclear destruction. Needless to say, that irony was well tested in this example. Furthermore, as Dunne & Raby have demonstrated, the positive use in what they called *Dark Design*, questions the limits of emotional experiences offered through design products. So, *design can play an active role and aims to trigger shifts in perspective and understanding that open spaces for unthought possibilities* (Dunne and Raby, 2013).

Not precisely cristal clear, however, is noticeable the similarities and the delicate entanglement between Design and Wonder. Both aim for similar goals. Like the beginning of all processes, Design finds its source of initial power in Wonder and, Wonder, the medium in Design to expose its invisibly character and influence. Both support each other and definitely are in the realm of what Paola Antonelli once defined as Knotty Objects[15].

15 In knot theory, knots are closed loops. To an extended explanation see (Oxman, 2016)

However, not only Design or Art can be entangled, touched, influenced or changed by Wonder. Engineering and Science are not saved from their influence.

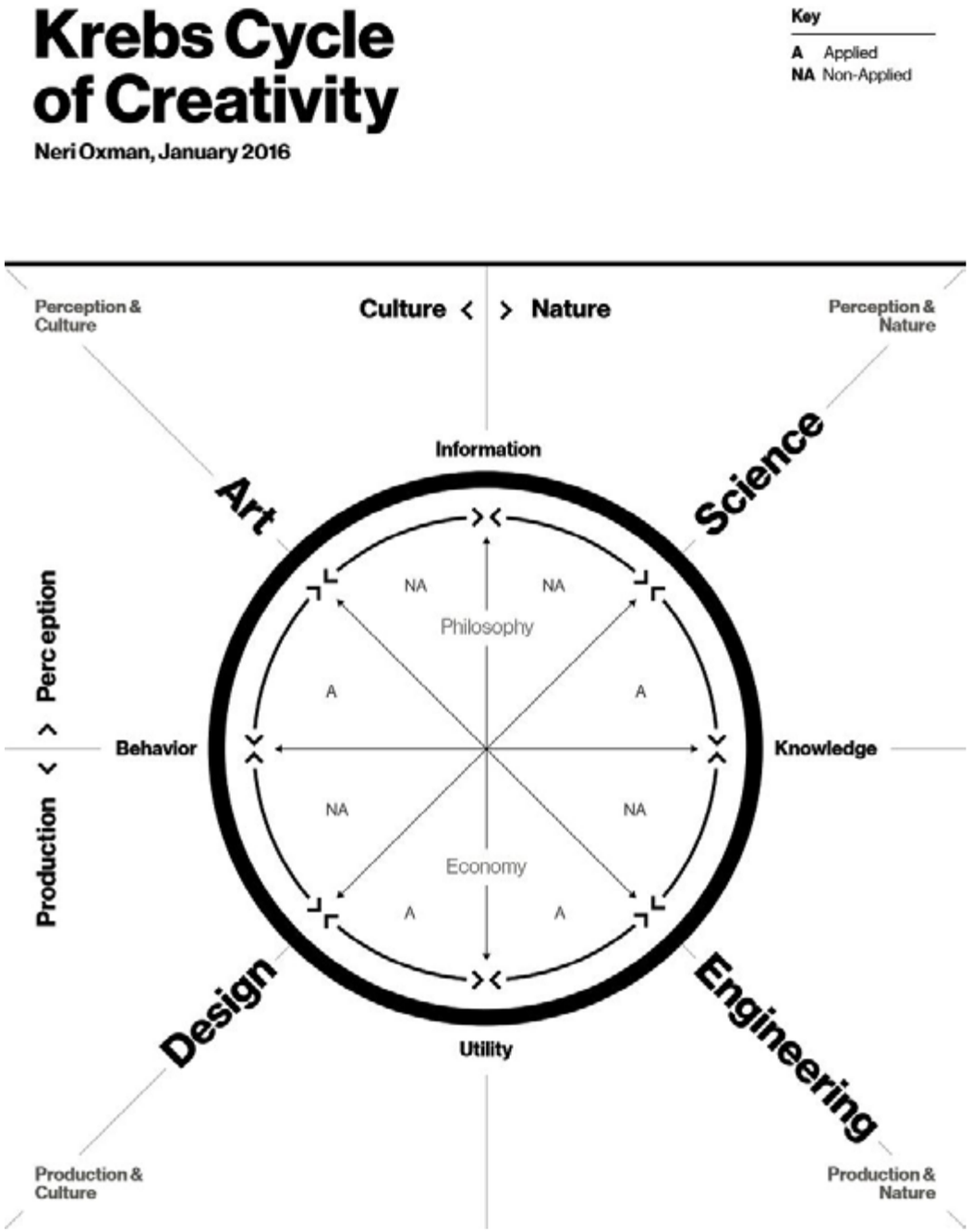
Science's Microscope

In 2016, Neri Oxman[16] wrote an article named "Age of Entanglement". There, she took us to explore and analysed her *speculative and abstract map*. She defined it as the *Krebs Cycle of Creativity* or KCC. This map describes the perpetuation of *creative energy or CreATP*— analogue to the original cycle, which perpetuates chemical energy in the form of ATP (Adenosine Triphosphate)—. It shows four quadrants; each one stands for *Art, Science, Engineer and Design*, respectively. Also, as Oxman explained, represent *the four modalities of human creativity* (Oxman, 2016). Then, following the analogy, all the modalities replaced the carbon compounds of the Krebs' Cycle[17]. Thereby, the author portrayed the "modalities" in the following terms:

> *The role of Science is to explain and predict the world around us; it 'converts' information into knowledge. The role of Engineering is to apply scientific knowledge to the development of solutions for empirical problems; it 'converts' knowledge into utility. The role of Design is to produce embodiments of solutions that maximize function and augment human experience; it 'converts' utility into behaviour. The role of Art is to question human behaviour and create awareness of the world around us; it 'converts' behaviour into new perceptions of information, re-presenting the data that initiated the KCC in*

16 A designer and professor at the MIT Media Lab, where she leads the Mediated Matter research group.

17 Krebs Cycle is the sequence of reactions by which most living cells generate energy during the process of aerobic respiration. It takes place in the mitochondria, consuming oxygen, producing carbon dioxide and water as waste products, and converting ADP to energy-rich ATP.



Science. At this 'Cinderella moment'—when the hands of the KCC strike midnight—new perception inspires new scientific exploration[18].

Subsequently, in the intent of revision the map and provoke debate about it. Oxman showed us the KCC as a circle divided into four quadrants, each one preserving the four modalities beforementioned, where is possible to transitions from one into the other. Then, she explained how to see the circle or map through different lenses. Such lenses could work as a Clock, a Microscope, a Compass and a Gyroscope.

The first lens, interpreted as a Clock, in the sense of mobility around the circle over the quadrants, can be used bidirectionally. So, the time understood as motion, can be a standstill, reverse, bend, foreshortened or jump in time. That means that it is possible to move freely through the map. However, to "jump in time" or make a jump between quadrants—for instance, from Science directly to Design—it is necessary a boost. This excess of energy, in Oxman's explanation, comes from *what we do*, particularly when *we do it good*!

In the next paragraph, an excerpt from Oxman's work, it is easy to find the invisible magic of Wonder reflected in things well designed. Even if it never was intended to make use of the emotion explicitly. And it will result quite stimulatingly—especially when the mind remains open— be able to perceive how could Design entangled with Wonder.

Good Design, for example, is good exploration: it questions certain belief systems–physical and immaterial–about the world.

18 Curiously, a cycle quite like the experience of wonder and the dynamic model of (Glăveanu, 2019a).

Then it releases some embodiments of theses speculations into the world, contributing to the build-up of what we know as culture. If done well, good Design can establish new basic Science without going through Art.

So, we can presume that to be good in what we do; it is necessary a mix of components such as curiosity, awe, astonishment and the capacity to *wondering about*. These components form the intellectual flexibility power that can take us further. More importantly is, to understand that Wonder indeed is what moves us forward to explore, integrate and persist. So, it is possible to think that Wonder can broaden our intellect to a "quantum leap[19]".

Next example depicts the KCC map as a Windrose[20], displaying the orientation of the cardinal directions. We have the axis from North to South and another from East to West. This circle map is divided into two hemispheres. First, the Perception hemisphere on the north represents the sky. Second, the hemisphere of Production on the South depicts the Earth. The northern hemisphere is the *climax of human exploration into the unknown*, theoretically or philosophically. The south one is the *outcome of creative solutions and deployments based on exploration* (Oxman, 2016).
But why do we use this example? Is there anything to do with Wonder? Let's explore.

19 In physics, a quantum leap is the abrupt change of particle from one state to another. Here I intend to use as a metaphor.
20 A compass rose, sometimes called a windrose or rose of the winds, is a figure on a compass, map, nautical chart, or monument used to display the orientation of the cardinal directions and their intermediate points. It is also the term forw the graduated markings found on the traditional magnetic compass.

If we remember, Octavio Paz wrote a poem, an envoi to his friend Lefebvre for his book. There, he described the "North" as *the crystal of non-knowledge, a landscape to be invented. Then the "South", as the reflective memory and so on.*

So, Is there any coincidence? Perhaps not, nevertheless, there is awareness and excitement of what interrelation could exist between two influential minds—*Paz's and Oxman's*—. Both probably start inquiry when looking at the sky and make reflections with feet on the ground —feet on Earth.

These commonalities keep us on the path of exploration. So, we can say that we are experiencing the emotional dynamics of wonder[21], aren't we?

Next with the last example, the lenses of a microscope. In this example, two ways will be illustrated on how could be explored and experience wonder using the same subject. The first uses the microscope's lenses as an augmentation of a fragment of a simple body or object. Therefore, it will make visible the invisible or, visualized the world of the unknown. The second uses the lenses as a metaphor of choice. So once decided which lens you will use, your focus and your perspectives will mould your actions in consequence.

Furthermore, in this matter, Oxman's argues that *"choice is not a naïve or innocent act"* so, the decision of see through any type of lens has a significant consequence on how we act upon the world. Therefore, a "*singular way to act upon it.*" (Oxman, 2016)
So, we might wonder: What could happen if we decide to see through the lens of Design? Could wonder add one dioptre to sharpen that perspective? Let's remember, Buchanan expressed that wonder is the

21 See Practices of Wonder (Vasalou, 2012) chapter 2. The experience of wonder, the most profound and subtle of all human experiences.

source of creativity and originality, therefore, through the lens of Design—we are aware of the effects of wonder—. Wonder indeed will place us in creative advantage, providing us with a new vision, new perspective thus a unique position to observe. A position that can be correlated with what Glaveanu called "meta-position [22]". Hence, from this point of view—Design—, yes! Wonder sharpens positively on our attitude.

On the other hand, if we choose to use a different type of lenses, the Science's one for instance—in the realm of philosophical perception—, the act would be to understand and explain the world around us. Trying to generate questions to inspire new explorations. Maybe, in an attempt to this kind of inquiry, Oxman will set a question such as: If both views—Designs and Science—, while acting differently upon the same living reality; Could both link their different outcomes? If they could see through their own lenses' views simultaneously? I presume, Glăveanu will answer to her that "*indeed is possible.*" (Glăveanu, 2019a). Probably, this is how he would explain:

> *...creativity emerges out of difference (Glăveanu & Beghetto, 2017)*[23]*. This difference is fundamentally embedded in the fact that multiple perspectives are possible on the same reality. To create, according to this conception, means to exploit such differences by placing multiple perspectives in relation or dialog with each other ...repositioning ourselves—symbolically and/or physically—in relation to the world and acting on it from this new position.*
>
> *A capacity not only to entertain more than one perspective on reality but also, mainly, to view that multiple perspectives are indeed possible.*

22 In short, the metaposition is the capacity to view that multiple perspectives are indeed possible. See (Glăveanu, 2019a)
23 See (Zosh *et al.*, 2017) pp. 37-54

Furthermore, *the possible* is what the first example aims to illustrate. It shows that the opportunity to see beyond our abilities provides us with *the means of a plethora of wonders* (Vasalou, 2012). Therefore, those new radical perspectives, magnify the opportunities to make scientific discoveries—the bacteria, for instance. Hidden to our naked eyes, invisible, but influencing our everyday life from its microscopic cosmos.

Diagram of imaginary lenses to explore meanings.

"Act upon it"

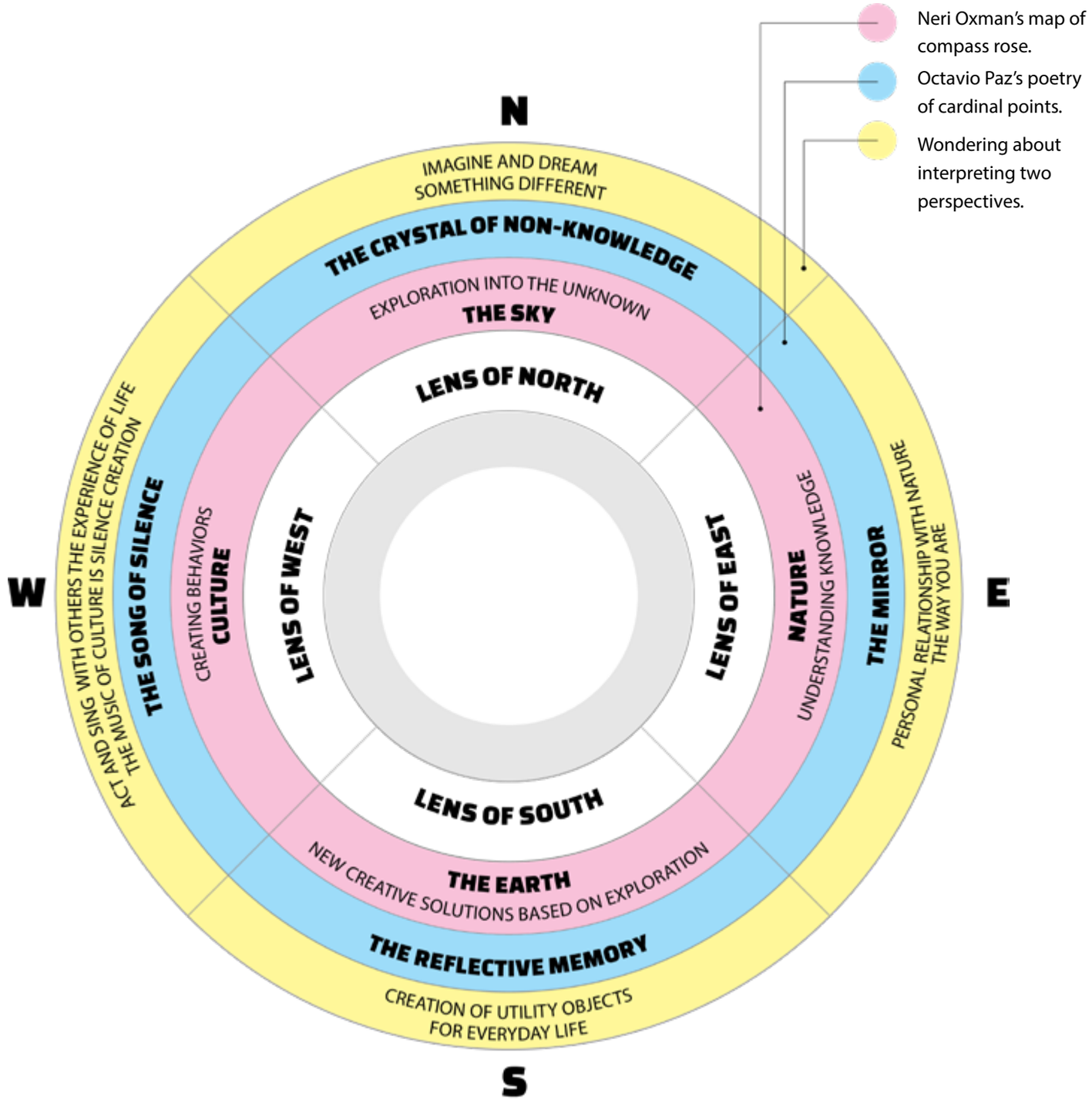


Figure 1 Diagram of imaginary lenses

As Glaveanu accounts, *the microscope and telescope opened up a space of new knowledge beyond our senses*[24]. Both made us think from another point of view as Feynman would have wanted. Thus, acting in consequence as Oxman proposed. We are step by step, recognizing Wonder in words and actions.

Engineering a Telescope

As we saw earlier, the objects around us— from tiny insects to sky views, planets and galaxies— are triggers of wonder. However, the attitude upon the world and our choices can also awake our curiosity to explore more about the effects of wonder. Nevertheless, while trying to bring scientific knowledge into utility and, intent on framing the elements of wonder, the phenomenon remains challenging to tame. However, there are particular efforts that aim to recreate the conditions that trigger the emotions of awe and wonder. Looking for *transformative experiences* (Quesnel and Riecke, 2018) and *better understanding of well-being on individuals* (Yaden *et al.*, 2016), the studies proposed the use of Virtual Reality VR (Chirico *et al.*, 2018) in the design of immerse installations. In some cases artistic and scientific methods were bond to improve the process (Quesnel *et al.*, 2018) to achieve their goals. Then, establish the beneficial influence of those emotions on human behaviour that, in some cases, promote change on individuals.

Curiously, most of the studies have in Awe, their subject of exploration. They are leaving aside the influence of wonder in the results. Perhaps of its complex nature or untamed condition, nevertheless it worth to explore how these studies developed techniques to recreate conditions and elicit results.

24 See (Glăveanu, 2019b)pp. 76

Also, the majority of the studies reviewed had in common one exciting work by Frank White "The Overview Effect". Which very often served as a conceptual framework to develop the methodologies used on those studies. The author, after reflecting on the views he had onboard a flight crossing the country and, with the many insights obtained, he concluded as follows:

> *The Overview Effect is a cognitive shift in awareness reported by some astronauts and cosmonauts during spaceflight, often while viewing the Earth from orbit, in transit between the Earth and the moon, or from the lunar surface. It refers to the experience of seeing firsthand the reality that the Earth is in space, a tiny, fragile ball of life, "hanging in the void," shielded and nourished by a paper-thin atmosphere.*
>
> *The experience often transforms astronauts' perspective on the planet and humanity's place in the universe. Some common aspects of it are a feeling of awe for the planet, a profound understanding of the interconnection of all life, and a renewed sense of responsibility for taking care of the environment (White, 2006).*

With this in mind, it would not be strange to aim to be in that position and experience its effect. Unfortunately, it is not easy for everyone to experience that position. At least not yet. So, the approaches on the studies tried to mimic that kind of environments and conditions. The first two studies found that for controlled environments or laboratory conditions, the use of Virtual Reality (VR) was the ideal tool to induce emotions, *thanks to its ability to provide the subjective feeling of being displaced in another physical or imaginary place* (Chirico *et al.*, 2018). Also, both studies proposed to stimulate the emotion of Awe because of its *transformative potential* and *self-transcendence qualities* (Quesnel and Riecke, 2018). Coincidently, the vastness of natural views such as snow mountains or seeing the earth from space

was recurrent in the virtual reality environments to elicit Awe in the participants of the studies. As mentioned before, the overview effect phenomenon had a key role within the design of the immersive VR experiences. Fortunately, the positive outcomes from the studies confirm the effectiveness of used virtual reality as a trigger of awe and probably either for wonder.
Only one of the above studies named wonder—beside astonishment— as a "collateral" feeling of awe. Nevertheless, I believe that in both cases, the influence of wonder is still part of the experiences stimulated by virtual reality. The immersive experiences probably need to redesign the interaction to trigger the experience of wonder in the immersants entirely. If what it wants is elicit wonder.

To Continue with another study; Wonder appeared again next to its cousin awe as a probable emotion but with no attempt to be elicited by the experience of the virtual reality's immersions. However, this time the approach slightly changed. By mixing art and scientific methods revealed positive engagement and a better understanding of the experiences thanks to the shared perspectives over the same challenge. Part of the conclusion of that study suggests that *scientific practice is often lacking the comprehensive understanding of what elicits emotional responses, which can be complemented by artistic intuition. And Artistic practice can sometimes lack the grounding in the scientific literature that can refine the goal of the work and motivate design, but more importantly, the scientific practice contributes to validation methods for assessing if the desired effect was achieved* (Quesnel *et al.*, 2018).
This statement by Quesnel makes it clear that different approaches and singular perspectives can be joined towards a common goal. Hence trigger wonder. These combined practices make us aware of our shortcomings and strengths to open us up to differences, create new perspectives and explore them. Like scientists did with the telescope and the microscope. They got thrilled with a gaze inside the instrument's infinite universes.
Nevertheless, what was unfortunate for this research is that the overview effect was unexpectedly less engaging for the immersants than its counterparts —the mountains and forest— in the beforementioned studies. It seems that only the real experience can elicit overwhelming emotions, as we can see in the studies from David Yaden[25] exploring the overview effect in space flights. Also, it worth to try to understand and reflect on why the overview effect was less engaging with the immersants of the VR experiences. Therefore, find other ways to engage with the sense of wonder. But unlike the previous studies, it is always needed to consider that the feelings of awe and curiosity are essential for fully experience the dynamics of wonder.

So far, we can assume that an entirely different perspective —as it was presented in the book *"A neurophenomenology of Awe and Wonder*[26]"— could give us a hint of how wonder interacts with awe and curiosity. Such perspectives derive from a change in position. Tightly to what Glăveanu point out as (mental or physical) the meta-position (Glăveanu, 2019a). In this case, they are indeed in a physical position. Because the participants were positioned or were already outside the Earth (i.e. space station, moon), from these perspectives, the researchers discovered that this kind of experiences are life-transforming (Gallagher *et al.*, 2015b) and, that awe and wonder are self-transcendence experiences. For this reason, this thesis is in the quest of multiple ways of stimulating wonder and use the outer space as its first reference to incite transformation in the discipline of Design and designers who aim to design for space.

25 See (Yaden *et al.*, 2016)
26 See pp. 2 (Gallagher *et al.*, 2015b) Views from outside the Earth. Astronauts' perspectives.

Figure 2 The Overview Effect. View from lunar surfice.
NASA

Figure 3 The Overview Effect. Tracy Earth view from cupola ISS. NASA

2. Wonderful Relationships

If you could see the earth illuminated when you were in a place as dark as night, it would look to you more splendid than the moon.

Galileo Galilei, Dialogue Concerning the Two Chief World Systems, 1632.

Space and Design and Wonder

Long way back to 1950, we could see, an influence coming from the space race. Not only in the technology field but also in the life and dreams of designers that were wondering about the future. Design had a significant role in this matter. Developing ideologies and proposing alternate ways of living. Product and Fashion Design permeated and influenced society to the point where flying cars were a possibility. Space Race made us wonder about the possible and uncertainty when seeing the sky and think what could find beyond the orbit.

Origins of Space Race

Right after World War II, Space became new territory for combat. Cold War started to draw competition on superiority between greatest economic and technological national supremacies—USA and URSS—. Therefore, since 1957 with the launch of the "Sputnik"– meaning, the traveller in Russian– the Space Race began.

Ongoing setting milestones, such as, the first person who orbit the Earth, Yuri Gagarin from Russia in 1961, and the first American in space Alan Shepard–one month later during the same year– sparked the fire of the race. After that, both countries developed more programs to reach their goals[1]. However, Apollo programs—especially the mission 11— from America concluded the race, leaving to the humanity the spectacle of the Moon landing, while listening to the transcendence words of the first man, Neil Armstrong, saying; "That's *one small step for a man, one giant leap for mankind*" in 1969. The next years, Apollo-Soyuz Test Project initiated spaceflight cooperation agreements. And later in 1995, with the docking of Space Shuttle Atlantis with the Russian Space Station resulted in the catalyst for the building of what today's named the (ISS)International Space Station (Seedhouse, 2009). Pioneer of great research and develop of technology and science.

Along with these events, Design plays an interesting role in the behaviours of the spectator society on this race. They were fully imaging and producing a massive number of products related to

1 For more visit https://www.history.com/topics/cold-war/space-race

space. They form ideas on changing the way of living on Earth to thinking the life in any other planet, asteroid or galaxy. Space had an incredible influence on society, thanks to Design's transformative ability to change and modify human behaviour. However, the end of the space race diluted the great expectations of society and Design.

What is so Special about Space?

When we think about space, no matter if the thinker is a child or a grownup, it is considered the last frontier for human exploration. Thinking about space, make us see the fragile crystal that we are. But it also stimulates our imagination together with our fears and emotions. In a conference, Amalia Ercoli expressed "*Space is not only the boost of technological development and knowledge pursue, but it is also precisely the idea to imagine something novel and completely diverse. That is what drives the great human explorer's spirit"* (Ercoli and Cristoforetti, 2018).

The space, in my view, has the potential to trigger the experience of wonder and also trigger the spirit of exploration, which is the same spirit that moves Design.

Today with Design and Space

After many years of low expectations, space agencies are engaging in space exploration activities again, with renewed energy. This time, they are expanding the human presence beyond the earth's lower orbit (Miranville, 2019). This will stimulate new opportunities for collaboration among international space agencies and private companies that have similar objectives (International Space Exploration Coordination Group (ISECG), 2018).

Organizations, such as SpaceX, Virgin Galactic, and Blue Origin, among others, are slowly increasing the participation of those involved in Design Practice, whereas for many years, it has only been reserved for Engineers and Scientists. Certainly, today's programs require new collaboration, a new vision, and a fresh perspective to accomplish such an effort.

One example of the collaboration between NASA and private companies have been the initiatives of Axion Space[2]. In pursuit of improving its space tourism program, it has hired the multi-faceted designer, Phillipe Stark, to redesign the ISS crew sleeping quarters. In this way, Axion Space has opened itself up to the advantages of Design and has put Design on the map of space exploration.

Closer to this thesis work, there is a study which shows that Design for Space *provides the transformative lens for applying lessons learned from one extreme scenario to another* (Dominoni, Quaquaro and Fairburn, 2017). They argued that based on the experience when they design for space, which most of the time are framed in the unfamiliar or extreme environments, can generate a new method of training designers for unexpected events. However, even if the unfamiliar—a characteristic that triggers wonder—is part of this new method, the missing elements blocked the immersion in the cycle that let experience the wonder. Similarly, in another study, Fairburn and Dominoni aim to generate spin-off and innovate products as an outcome of the application of unfamiliar design scenarios to find ways to aid imagination (Fairburn and Dominoni, 2015).

In a different study, made by Silvia D. Ferraris, she aims *to improve the astronauts wellbeing* (Rando *et al.*, 2005) by highlighting and

2 (Hill, 2018) https://www.elitetraveler.com/features/philippe-starck-designing-axiom-space-hotels-interiors

demonstrating main problems when living aloft[3]. In this case, she proposed that Industrial Design discipline might be part of the projects of space missions. Definitely, is a significant step to demonstrate that Design, in collaboration with other disciplines, leads to improve space project strategies. This interaction and cooperation among different disciplines exposed another characteristic of Wonder. The differences between others and its perspectives are *clashing and fusing* (Verganti, 2017); however, producing meaningful solutions.

The Arcturus IV Case Study

The last case study encompasses a variety of interactions that stimulate—in my perspective— the experience of wonder. John E. Arnold incorporated this compelling case in a Product Design course for Engineering class at the MIT. The project's name was Arcturus. It was a Science Fiction course where the final products should be thought for extra-terrestrial beings. The designed objects should meet the needs of the inhabitants of Arcturus IV. An extract of this study complements the description.

> *The work of students and teachers is represented in the case study but not obviously, as one might expect. Rather, they become participants (often under assumed names; e.g., J.E. Arnold becomes J. R. Arnold or Arnold Edward, depending on the role being played) in a science fiction story, 1000 years in the future, of intergalactic trade with the inhabitants of the fourth planet of a star in the constellation, Arcturus, some 33 light years from Earth. Life there, as you will see, differs greatly from our experience here. The story develops through correspondence between Earth organizations and their representatives on Arcturus IV and elsewhere, and principally concerns itself with the studied needs of the Arcturian inhabitants and the products the Earth groups (the students) can design and successfully market to them in non-exploitative fashion in exchange for high grade uranium and platinum. (Arnold, 2016).*

Its exemplary fusion of imagination of the unfamiliar, suspension of disbelief, accommodation of new perspectives and embrace differences, is what we call a gem that stands for wonderful relationships leaving us a hint of how to stimulate the emotion of wonder.

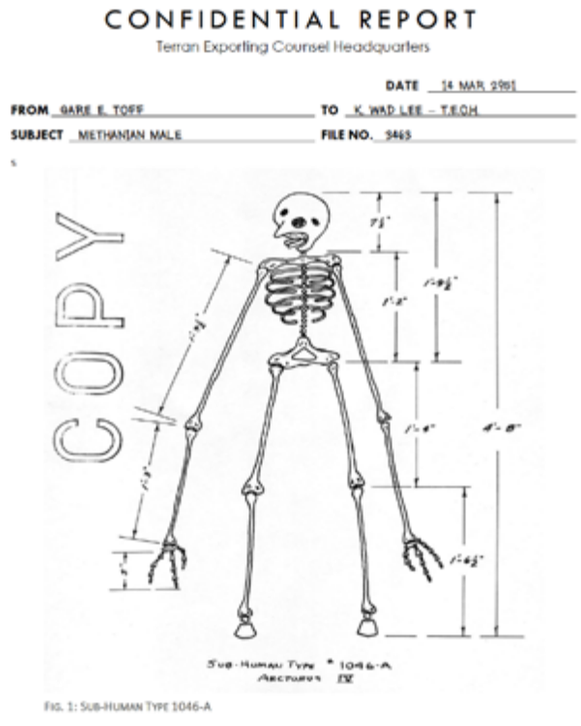

CONFIDENTIAL REPORT
Terran Exporting Counsel Headquarters
DATE 14 MAR 2961
FROM GARE E. TOFF TO K. WAD LEE – T.E.C.H.
SUBJECT METHANIAN MALE FILE NO. 5465
COPY
Sub-Human Type # 1046-A Arcturus IV
FIG. 1: SUB-HUMAN TYPE 1046-A

Figure 4 Page from the Project Arturus IV

3 Living Aloft is a term used for the astronauts or crewmen living on the skylab (Connors, Mary M. Harrison, Albert A. Akins, 1985)

Something is missing

KNOWLEDGE GAP

Wonder seems to be an unidentified topic in the design field; thus, little is advanced in its study. Glăveanu noticed that creative people, designers among them, tend to *describe their processes in terms of wonder* (Glăveanu, 2019b) *(awe, contemplating, pondering, marvelling, curiosity)* Still, as well as he noticed, neither in Design nor Psychology wonder has been theorised. Richard Buchanan noticed too, pointing out that Design *does little to cultivate the sense of wonder as the initial moment in inquiry when a new idea emerges* (Buchanan, 2007).

Wonder, like Awe, or both together, can have the *transformative potential* (Chirico *et al.*, 2018) *to change one's perspective on life* (Reinerman-Jones *et al.*, 2013). For that reason, I find valuable its study and its application in the Design field, especially in the branch of Design where coexist most of the characteristics that help us to immerse in the experience of wonder—Design for Space—.

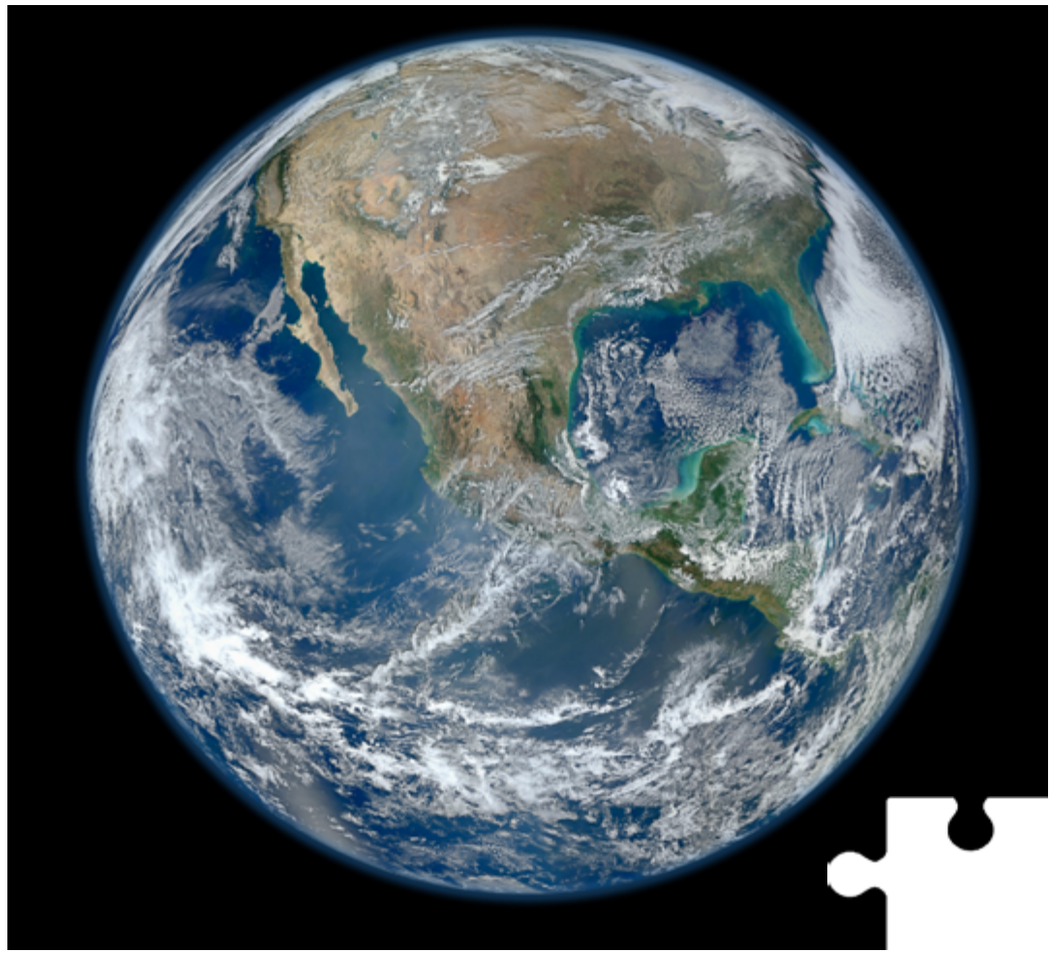


Figure 5 Earth-NASA

“ Space is not only the boost of technological development and knowledge pursue, but it is also precisely the idea to imagine something novel and completely diverse. That is what drives the great human explorer's spirit ” (Ercoli 2018).

3

We're working on a procedure down here for you, do you copy?

Wonder, the starting point

RESEARCH DESIGN

Very often, we are guided by the traditional problem-solving mentality, or we are biased for fixed methods as a starting point to approach problems leaving aside the need for an alternative point of view. And most of the times, we neglect the importance of the initial step—the initial inquiry.

In the pursue to enable this practice, and consider that the experience of wonder demands different states of action —Awareness, Excitement and Exploration as Glaveanu displayed— the development of a system that encompasses the interaction of those states propose three activities to allow to engage with the experience. So, it suggests three ways to enhance those actions: a workshop, a game and an object. And all these establish the Model framework.

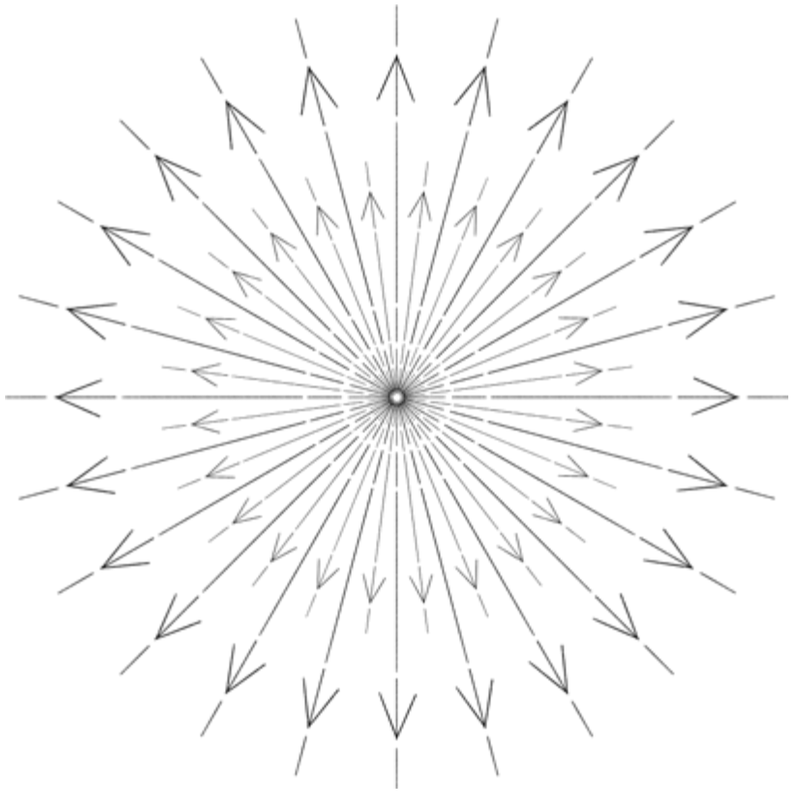
One of the research methods that can help to achieve the goals of the study is Art-based research. It showed us how people could create meaning in different ways (objects, music, dance). Therefore, I believe that *creative expression extends the limiting constraints of discursive communication* (Merrian, 2016).

In the Model Framework, the expectations are that the participants can create meaning as an effect of understanding the phenomenon of Wonder by experiencing it.

The designed Model Framework aims to provide a basic understanding of wondering and affordances theory from (Glăveanu, 2016) and (Norman, 1999).

During the activities—the workshop, game and object—, cooperation and imagination become fundamental for the advance in the challenge proposed in the Workshop. This way, it is possible to reflect and re-think on questions such as —Why we want to live like on Earth in a place that is not the Earth? (Moon, Mars, etc.)—.

Thinking about space and wonder with others, means to experience doubt about how space is, excited about how it could be, and hope that it will be so one day. Uncertainty keeps us in a state of openness and Wondering expands the space of what is possible for our thinking and our collective action. Without the possible, there is no wonder and the opposite[1].



1 This last paragraph was altered from its original to fit this section. The original is in the Glaveanu book “Wonder”.

In quest of action

PURPOSE OF RESEARCH

Background

Wonder has been a topic of discussion in Philosophy throughout history from Socrates and Aristotle to contemporary thinkers such as Heidegger and Arendt[1]. Recently, Wonder brought a significant interest to researchers in Psychology as well as in Science. However, despite its close connection with Wonder, Design *does little to cultivate the sense of Wonder as the initial moment in inquiry when a new idea emerges* (Buchanan, 2007) and triggers the process of Design.

Few studies explore this emotion even though *Wonder has the potential to change one's perspective on life* (Reinerman-Jones *et al.*, 2013). For instance, an experimental study in psychology proposed the use of Virtual Reality to elicit the great *transformative potential* (Chirico *et al.*, 2018) of awe, but with less consideration to its cousin emotion *wonder*. Another significant study attempted to describe the phenomenon of awe and wonder to understand it better —by using a neurophenomenology approach to the research (Gallagher *et al.*, 2015a)—. Last studies about creativity, said that experiencing Wonder enables creativity in Art and Science. And it is also proposed as a model where Wonder can *decentre singular perspectives and open up to difference* (Glăveanu, 2019a).

In a different study —strictly to the field of Design— it was built an Immersive Installation to create awe. They were combining scientific and artistic practices to tried to *identify awe-inspiring traits* (Quesnel *et al.*, 2018). Their results were positive and useful for future studies. Nevertheless, Wonder remains in shadows and is not considered influential to the aim of the study mentioned above. Possibly its ambivalence did not let scientists to use it. Additionally, it is essential to mention that the previous studies recurrently used the Outer Space as a thematic trigger as a representation of vastness, unknown and uncertainty to elicit the emotions of Awe and Wonder.

So far, little is advanced in the Design field to seek in Wonder an experience to embrace change or as a tool to incite imagination neither propose a device or a method that help the designer to engage with the experience of Wonder.

1 See (Glăveanu, 2019, p.20)

Therefore, the purpose of this study is to explore how to stimulate the experience of Wonder to influence on designer's initial position before start dealing with a space design challenge.
Expecting designers to *expands the space of what is possible for their thinking* (Glăveanu, 2019b) and, form a *growth mindset* (Dweck S., 2015).

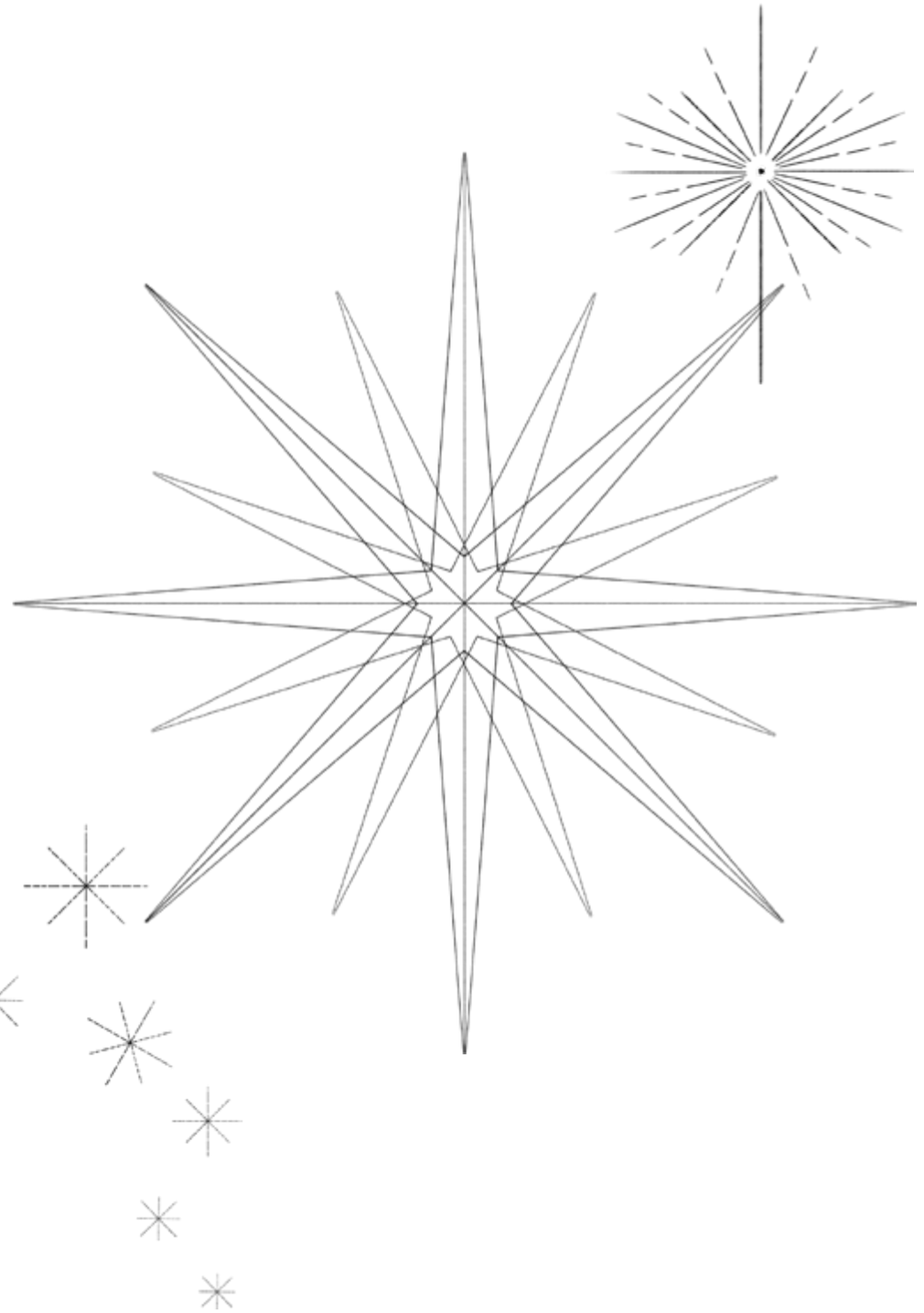
The following research questions aim to guide the study:

1.- How do we recognized that the experience of wonder is taking place?

2.- What actions do designers express at the initial inquiry?

3.- How can we cultivate the Experience of Wonder?

Engaging a consciousness of Wonder should be the first of all design actions. Because, we must remember that the first of all process[2]—Design—, finds in Wonder its motor.



2 On describing the practice of Design by Ken Friedman and Erik Stolterman in the Foreword of the book *"Adversarial Design"* (DiSalvo, 2012)

4

The Wonderstrucker

MODEL FRAMEWORK

Model

Many authors coincide that, models are generated from ideas that are in the minds of individuals. Also, they are a representation of an object, or event designed with a specific objective or purpose (Gilbert, K. Boulter, 2000)

People and society are in constant evolution, future teaching and learning requires adaptation to new trends, so that their actions can respond to current demands and not to the repetition of worn and low impact models (Pérez, Mazzarella and Ojeda, 2013). Developing a model that can evolve accordingly with their users to not become useless is one of the aims of the study. Facing new challenges and changes at present time requires models that can adapt easily to meet the needs of the users.

The designed Model is the representation of one idea—stimulate wondering— but aims to be transformed by the user and evolve.

To achieve the purpose of the study—*to explore how to stimulate the experience of Wonder to influence on designer's initial position before start dealing with a space design challenge*— It is designed a *"model framework"* . This model encompasses three different activities that aim to affect each other to stimulate and engage the participant with the experience of Wonder when designing for space. Every activity aims for a specific objective and follows a procedure. (See Figure 6)

What is the Wonderstrucker?

First, the idea of the name came from the German word, —Wunderkammer—the cabinet of curiosities[1]. However, the reconstruction of the expression derives from the English word Wonderstruck[2] which means experiencing a sudden feeling of awed delight or wonder. Additionally, the -er ending on the name denotes that is a person or a thing that does something and has a unique quality[3]. So, Wonderstrucker is the result.

As a concept, the Wonderstrucker is a "thing", an entity that is everywhere around. Its unique quality is to paralyze the mind by causing either an unexpected delight or sour displeasure. It suddenly emerges as a form of vastness distraction or as a feeling of timeless absorption.

As a product, it is a board game. Likewise, it is also what gives the name to the game. It is the game's title and the scoundrel of the game.

1 This word was formerly defined as "cabinet of curiosities" or more descriptively, "private room of curiosities" where can be found a notable collection of objects–exotic objects–.
2 Definition by Oxford Dictionary Online see https://www.lexico.com/definition/wonderstruck
3 See https://www.lexico.com/grammar/nouns-ending-in-er-or-and-ar

The Wonderstrucker

Why is the Wonderstrucker important?

One reason is to influence designers to perceive and understand their position and perspective in this world. In doing so, it can be possible to understand others' position and face differences from ample perspectives. A way to do it is to decentre from their perspectives. Consequently, we can embrace exploration—which is an essential part of the human spirit— with imagination and, initiates the cycle of Wonder.

It is a source of change in attitude. It is an attitude that accepts changes, able to detach and engage again to its own centre by itself and within others.

Because in an ever-changing world, disciplines and practitioners changed too. So, the role of design and designer is equally on the edge of change. For that to happen, the designer needs to stretch his mind and action. *Amplify ideas and arguments to make them forceful, thus engage with change* (Halstom, 2017).

Be aware that Wonder is the primary source that complements the point of departure when developing rhetoric and arguments.

For whom is designed the Wonderstrucker Model?

It is designed for practitioners and researchers of Design and all the disciplines that cross with Design. Everyone has its own language, vocabulary and approaches, but Design is intrinsic and embedded since the beginning.

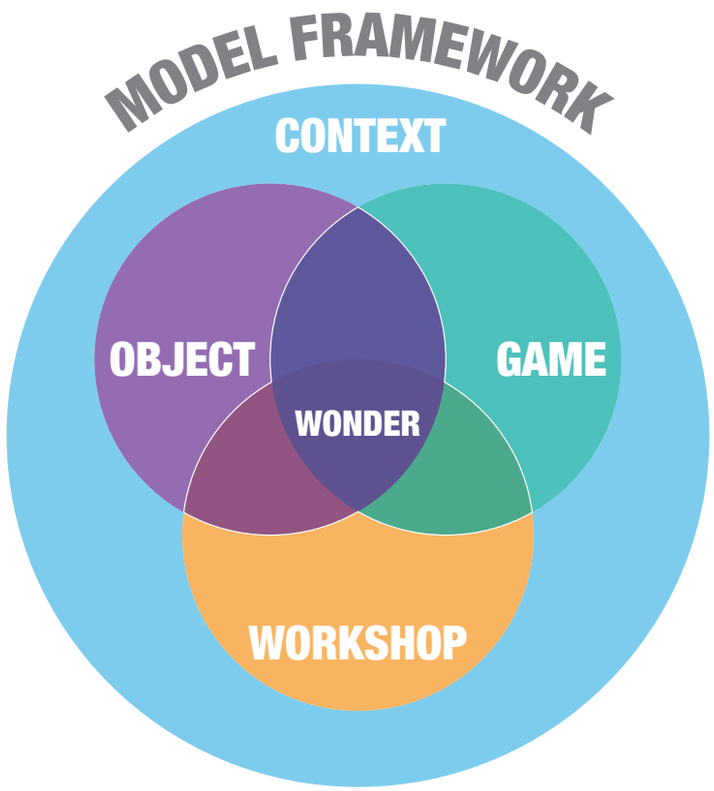


Figure 6 Representation of the designed model framework.

The object has to be related to the topic of the workshop and been represented in the game.

The Workshop sets the topic and leads the interaction between the game and the object. The first activity is playing the game and then after set the challenge the object could be explored.

The game is related to the topic and the object. One of its elements should represent the object.

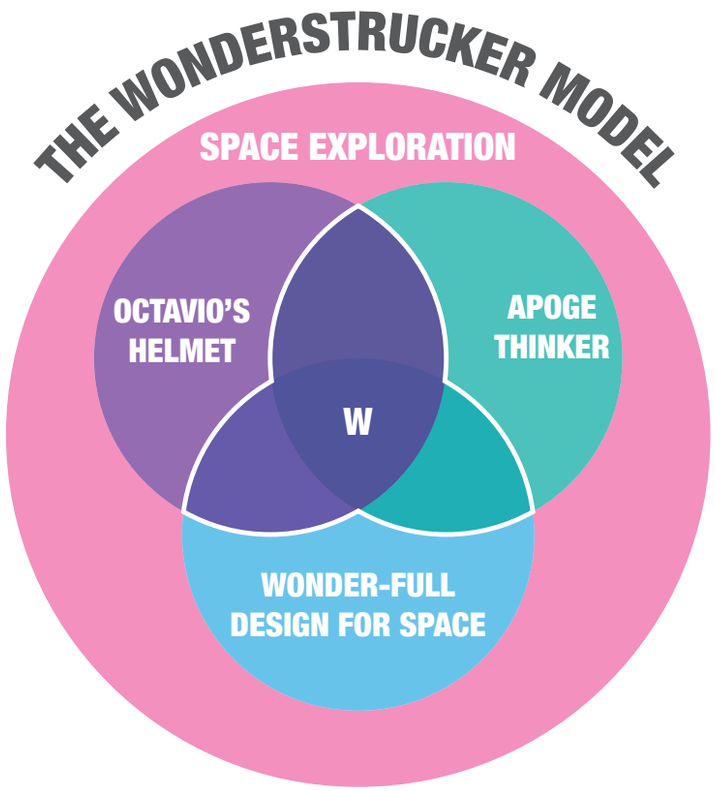


Figure 7 Representation of the Wonderstrucker Model for the project.

Octavio's helmet is a space helmet. A representation of astronaut's helmets and is and object designed as a shield.

The topic is design for space. the game is about travel to mars. and the object is space helmet.

Apogè thinkers means think or design when away for earth. Space exploration. And octavio's helmet is the statue element for represent the players.

Wonder-full Design for Space

THE WORKSHOP

The Workshop—learn by participating— has the objective to set the conditions to introduce the participants to the experience of Wonder as a novel approach when Design for Space. The intention is to learn by participating in the activities within the workshop—play the game, and explore with the object. The name of this workshop is on the one hand, a sense of continuing the legacy of other researchers of wonder.

How to structure a workshop

The workshop follows five questions that help to develop its contetent and its structure.

1.- What do we want the immersants to learn?
Theme Definition: Sinthesis of the Topic
Clasify into categories: Concepts, Models, Applications and evidence

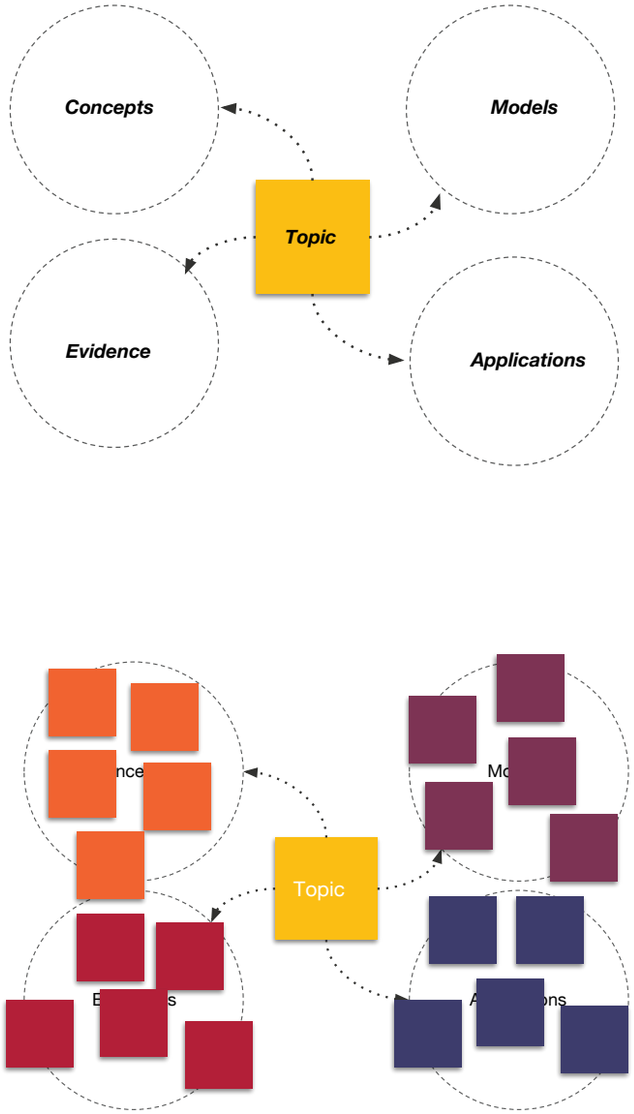
2.- Who do we want to be transformed?
Define the audience
Persona: Represent their needs, expectations, behaviours
Draw a matrix to visualize how we want to transform the audience with the workshop (Figure 8). For expample: Matrix of Atitudes | Behaviours
From a fixed mindset to a growth mindset or from fulfill to learn.

3.- How deep do we want to explore the topic?
Define learning Outcomes: From the categories we define the learning outcomes. For instance: Problem solving vs problem finding
Then we decide how deep we present the learning outcomes.
For this we map them.

4.-How to evidence the learning topic?
From the mapped learning outcomes we define activities that help to learn the topics:
Simple Learning Outcome 01 > Activity and tools 01
Complex Learning Outcome 02 > Activity and tools 02

5.- What did we learn?
What do the participants take away from the workshop?
By means of a format the participants will be able to make an evaluation of the workshop. This feedback will help to make improvements to the workshop.

Theme Definition: Sinthesis of the Topic
Clasify into categories: Concepts, Models, Applications and evidence



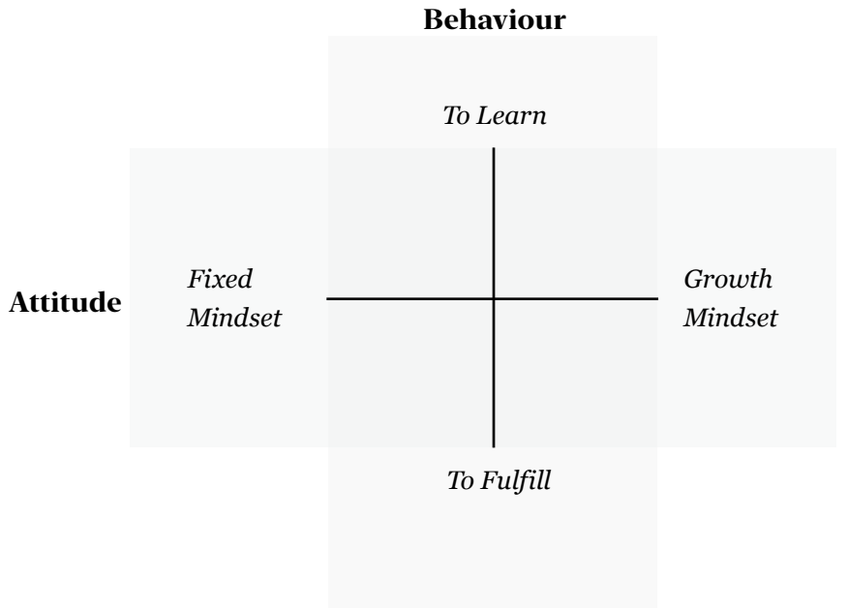
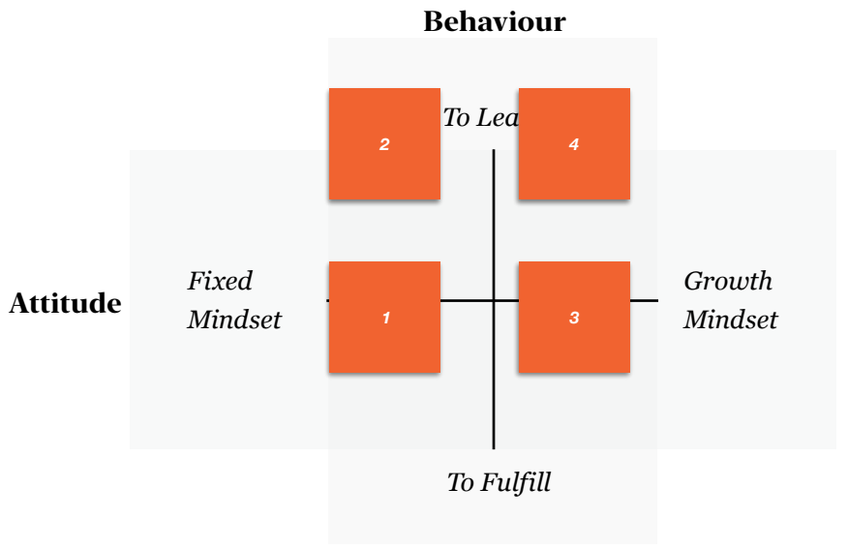
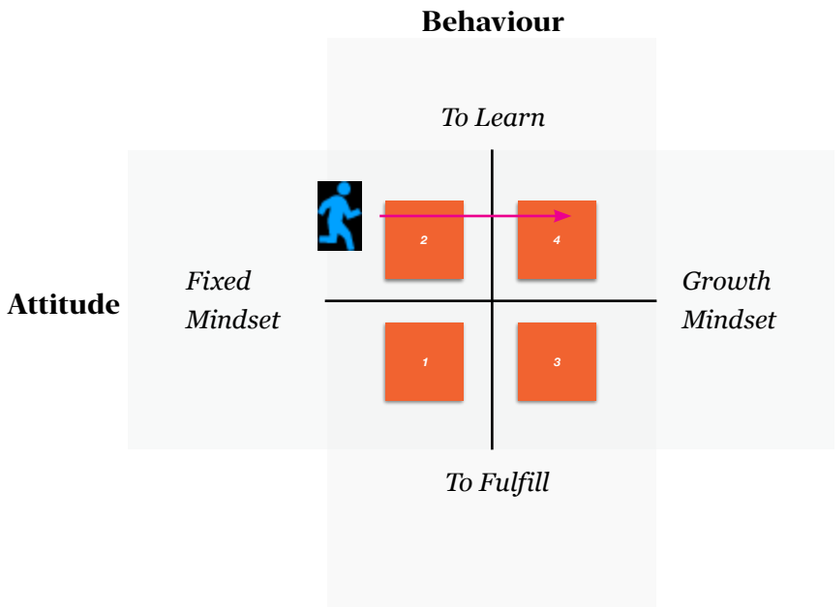


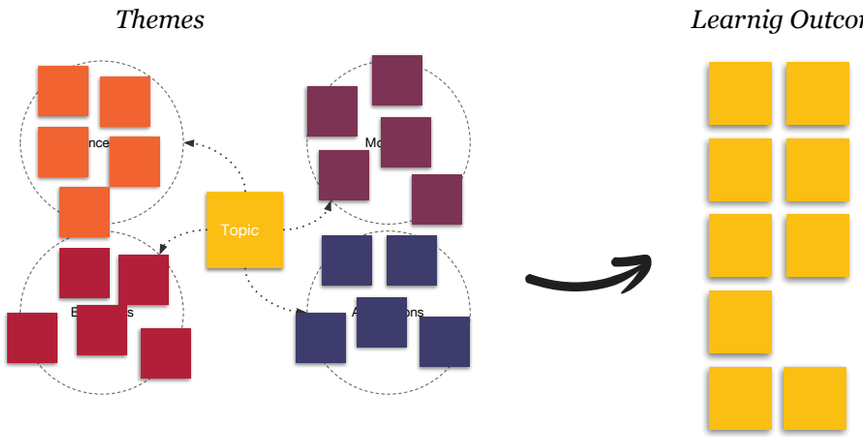
Figure 8 Transformation matrix example

Draw a matrix to visualize how we want to transform the audience with the workshop





Define learning Outcomes: From the categories we define the learning outcomes.



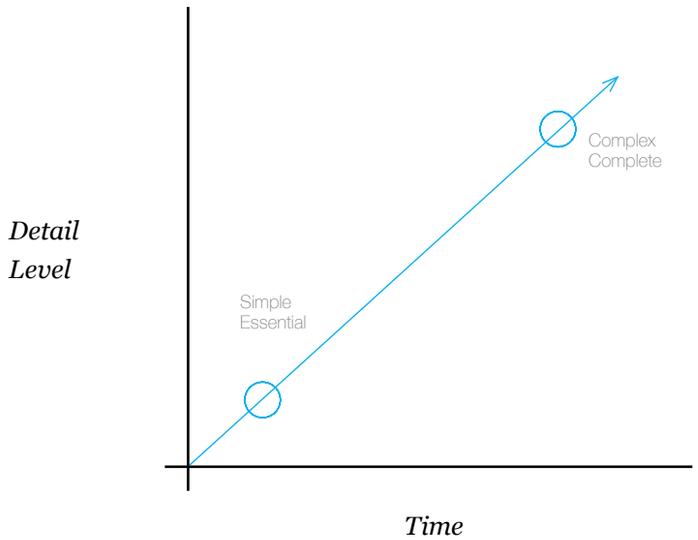
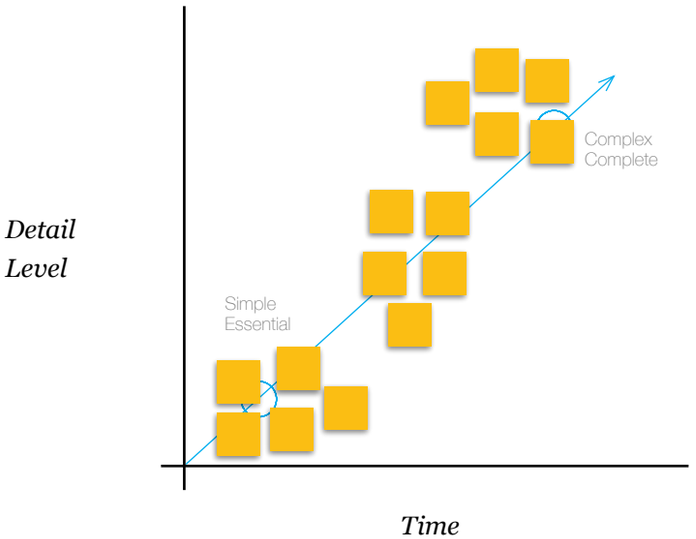
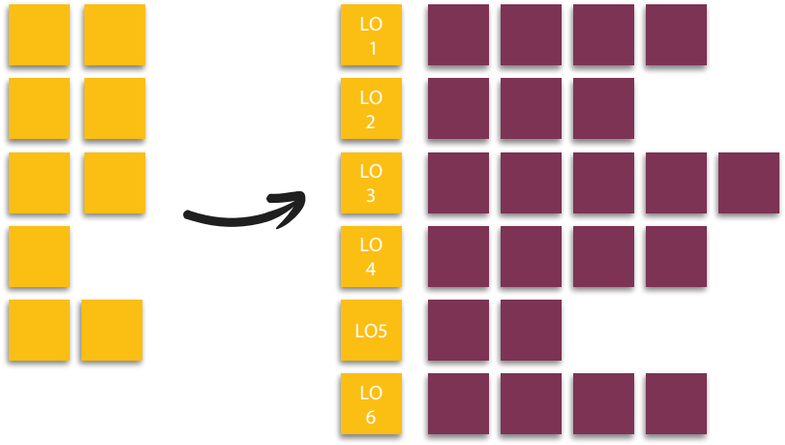


Figure 9 Complex matrix example



From the mapped learning outcomes we define activities that help to learn the topics:

Learning Outcomes *Activities and Tools*



Prioritize activities and tools

Hierarchize Activities

A workshop to design for space.

Name: Wonder-full Design for Space

Theme: Influence of wonder in design for space.

Concepts: Begin with wonder is the source of design
wonder as a bridge between person and the world.
The starting point.
Awareness, observation, recognition, exploration.

Models: Dynamic model of wonder (awareness, exitement, exploration)
Speculative Design
Meta-position

Examples: From coffee bag to coffee cup
Make the familiar unfamiliar
Play with object meaning
Video how seals suicide
Affordance and possibilities

Applications: Produce an speculative object.
playing a game

Audience: Multidiciplinary teams designing for space.

Learning Outcomes: Wonder as starting point in design. Finding problems. Personal inquiry and status quo. Not define wonder but experiment. Innovation vs replication.

Activities to evidence the LO: Playing the game. Explore the helment. Watching videos. Small lecture to introduce the concept of wonder. Economy of space.

Learn and feedback: questionarie for participants

Figure 10 Sheetofworkshop

Five day Wonder-full Design for Space Workshop

	Day 1	Day 2	Day 3	Day 4	Day 5
Block A **Framework and Topic**	What is Design for Space?				
	Constraints Set Challenges				
Block B **Idea Creation**		Team, tools and research Idea choice			
		Trigger action Play the Game			
Block C **Action**			Exploration & execution helped by the object		
			Design, 3d modelling, report and presentation		
Block D **Outcomes**					Delivery and Evaluation
					Exhibition and presentation

Apogē Thinkers

THE GAME

The Game—imagination in collaboration—. Its objective is to encourage participants to explore through their imagination possible options for resolving the challenges presented in the Game alongside their allies.Games are interesting tools to embrace social activities. That eventually cause a variety of experiences which can change behaviours. One of the main reasons is that in creativity theories are essential part in development.

The game will be used for experimentation and will be use as the second trigger of wonder during the Workshop.

How should this game be played?

In this game, the goal is to be eligible to travel to Mars. Going from the Earth to the new International Space Station (ISS2) then from the ISS2 to the Moon, to finally headed to Mars. So, the players must overcome the challenges described on a memorandum in the deck. To confront the Wonderstrucker, you need a sum of imagination and creativity.

Combination of personal perspectives, cooperation and imagination, will be key to take you to the end of the game.

Preparation

The players will take a figure of each colour; likewise they will have to take the numerical dice that corresponds to the colour of the figure that has been chosen previously. They must also use a block of notes and a pencil. And lastly, you have to grab the dice that DOES NOT contain the colour of your figure.

Lens Card Selection Phase.

1.- Players must roll the numerical dice to decide who starts taking the lens card, the highest number is the winner. This step must be repeated every turn.

2.- All players will receive an object card from the pile of object cards.

3.- Players must take a lens card that they cannot reveal until the creation phase begins.

4.- The players must roll the numerical dice again, the winner may roll their coloured dice, thus determining who their partner will be for the creation turn.

5.- Once the couples have been established, each of the couples must reveal their object card and decide which one they will continue with.

6.- When both couples have chosen which card they are going to use, they must turn the clock and the time will start to run.

Creation Phase

1.- Players must use their lens cards onto the object cards to see how many figures or objects they can find or form. Lens cards can be rotated or slided. Everything they find should be drawn in their blocks. One or two lens cards can be used; however, the score varies depending on how many they use. (Check in the section WHO WINS? The score)

2.- The Creation Phase will end once time runs out in the hourglass.

3.- The couples will review the responses of their opponents, making sure that what has been drawn makes sense.

4.- Once verified that the drawings in question work, the LENSES SELECTION PHASE would start again.

Who Wins?

1.- All players will start on Earth (start of the board).

2.- If they use one lens card, the value of the object they find will have 10 points, and in case 2 lens cards are used, 15 points will be added.

3.- Each player of the pair will add the same number of points per round.

4.-Inside the board indicates the number of points that each player needs to advance to the next square. Therefore, it must be essential to seek cooperation between couples to obtain as many points as possible.

5.- The necessary boxes will be advanced depending on the points they add.

6.- If during the creation turn, any of the objects drawn does not make any sense, not only will the points not be added but the points of the value of each drawing will be subtracted from the total amount they have added. However, the negative points cannot push back the player. You cannot move forward.

7.- The first player to advance until reaching Mars (end of the board), will be the winner of the game.

Good luck!

Figure 12 Game Board

Figure 11 Stages of the Game

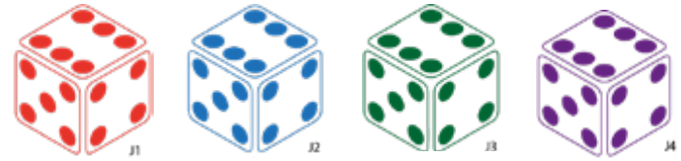


Figure 13 Numerical Dice

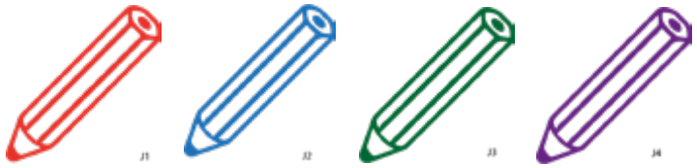


Figure 14 Pencil Colors

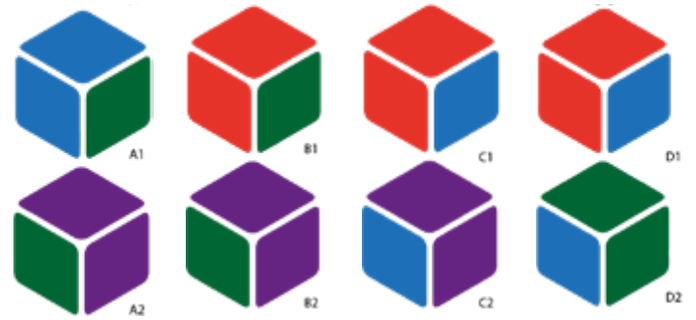


Figure 15 Color Dices to choose partner team

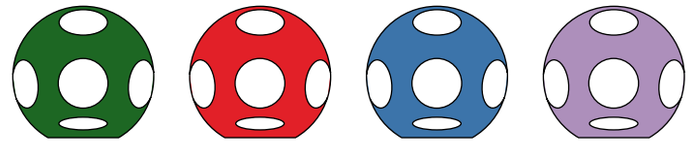


Figure 16 Action Figures for representing players

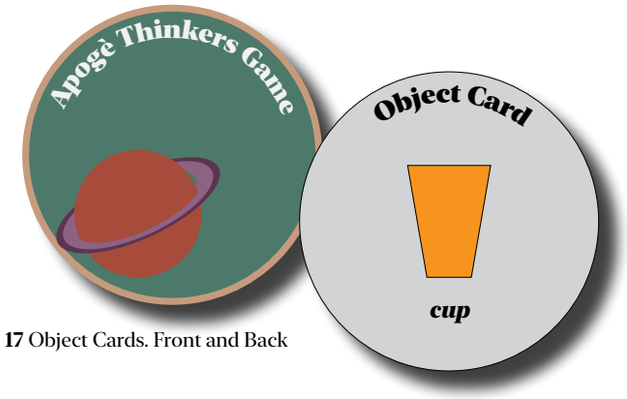


Figure 17 Object Cards. Front and Back

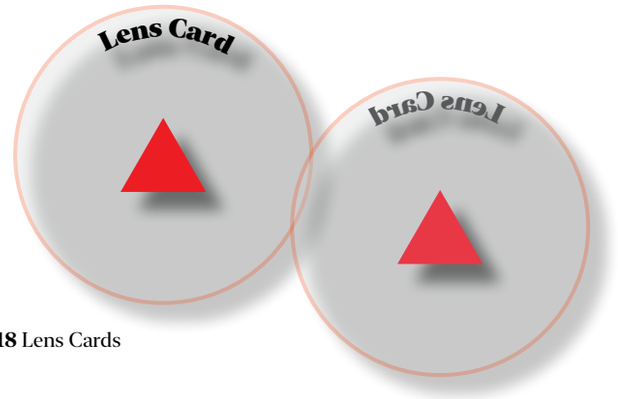


Figure 18 Lens Cards

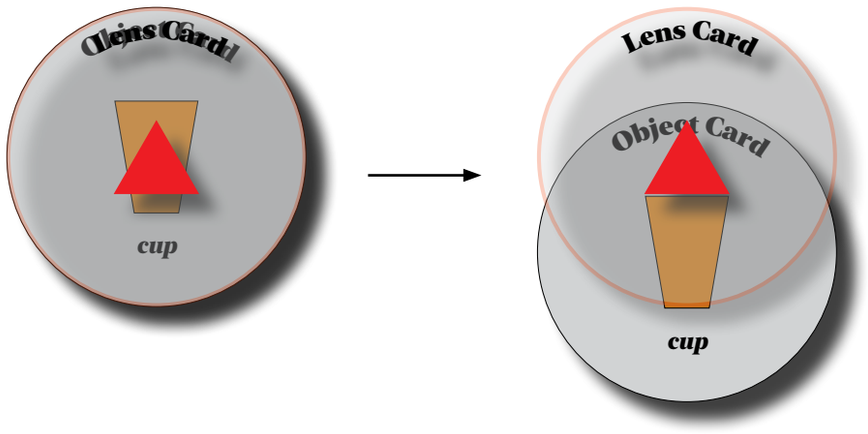


Figure 19 Combining Cards, move, slide lens cards.to find object

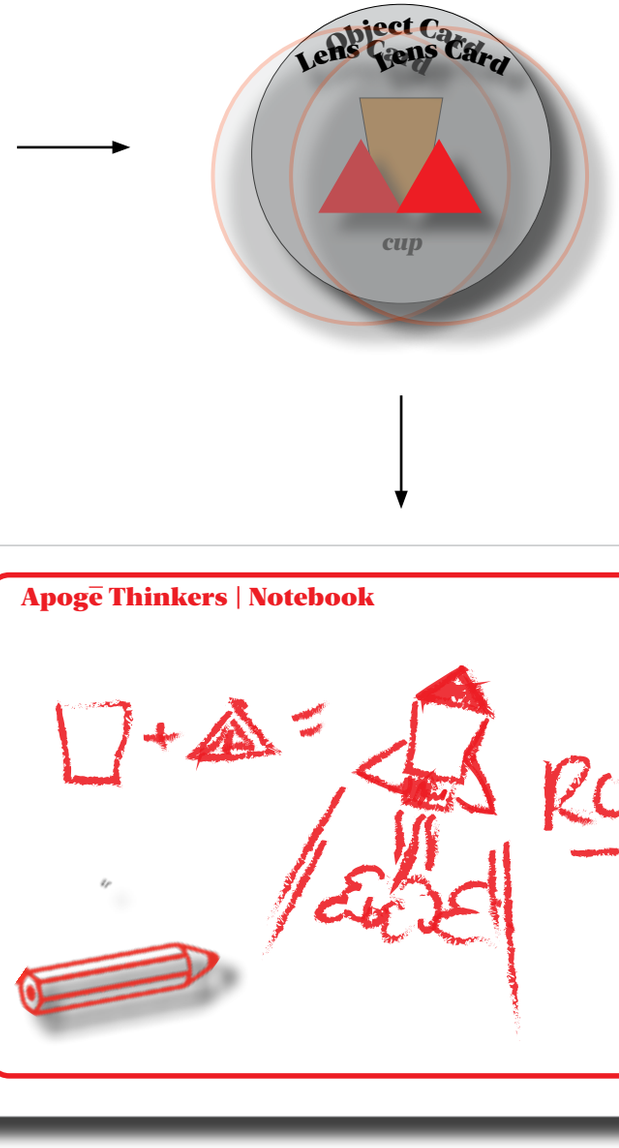


Figure 20 Notebook drawing the ideas that came from combining cards.

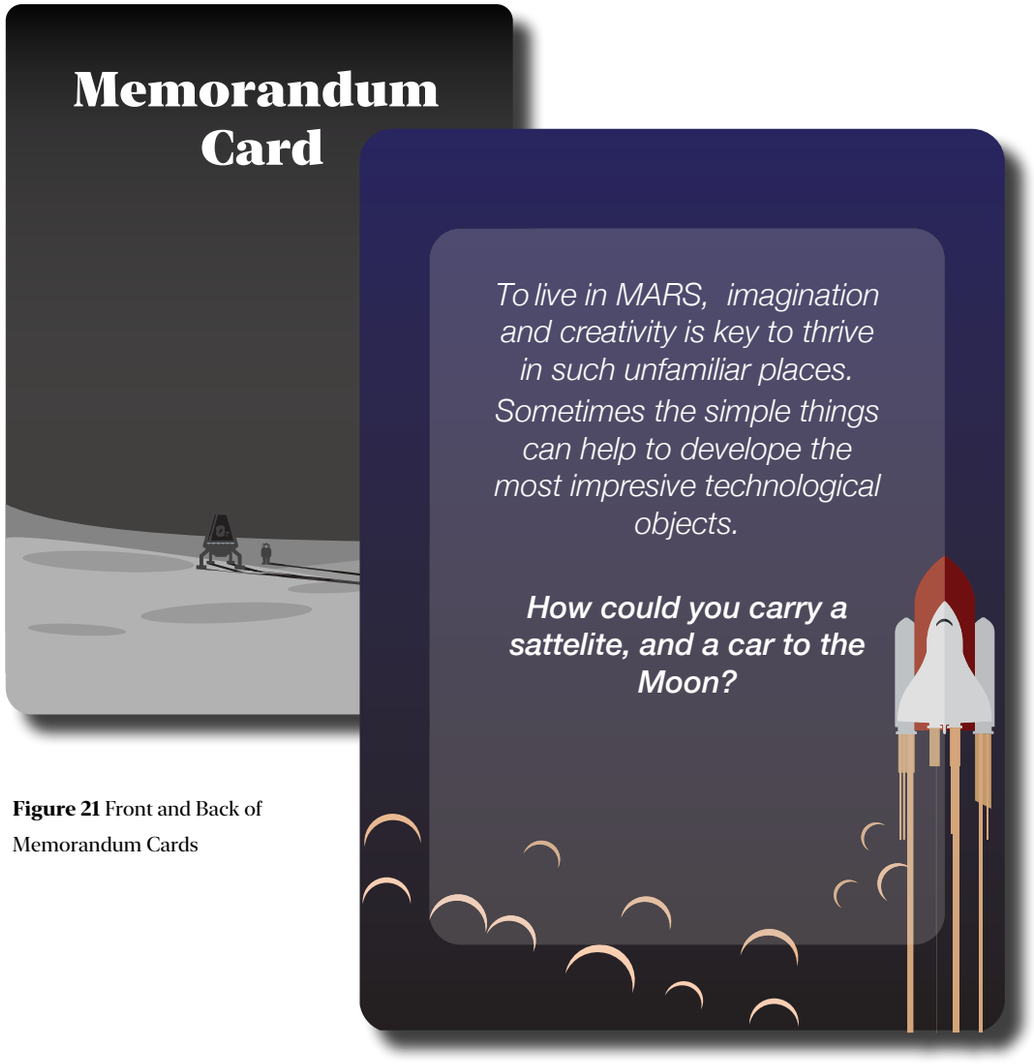


Figure 21 Front and Back of Memorandum Cards

Figure 22 Instructions

Octavio's Helmet

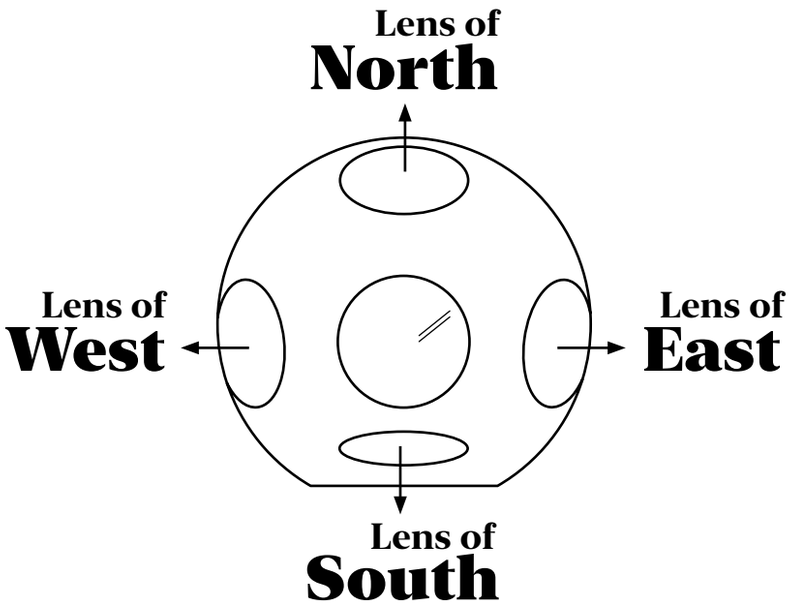
THE OBJECT

The Object—suspension of disbelief— is a speculative Object place in the salon where the Workshop is running. It has the objective to provoke questioning. The aim is depending on what lens you decide to look, is the perspective you can take to start your initial inquiry. It is the starting point. It helps to have a different view of the challenges.

A speculative tool

This Object is a helmet with a different lens. It lets the user gaze through different glasses which represent the cardinal points of the diagram designed in Chapter 2.

The lens on the front is your perspective. The lens of the North represents a way to perceive and act upon the world. Look at the sky means the need to know. It is a perspective to dream, imagine and look for the unknown. The South's lens, stands for the Earth, look through this lens signify your reflective intuition, applying the lessons learned to create solutions based on explorations. The lens of the East represents your need for understanding. A work of recognizing



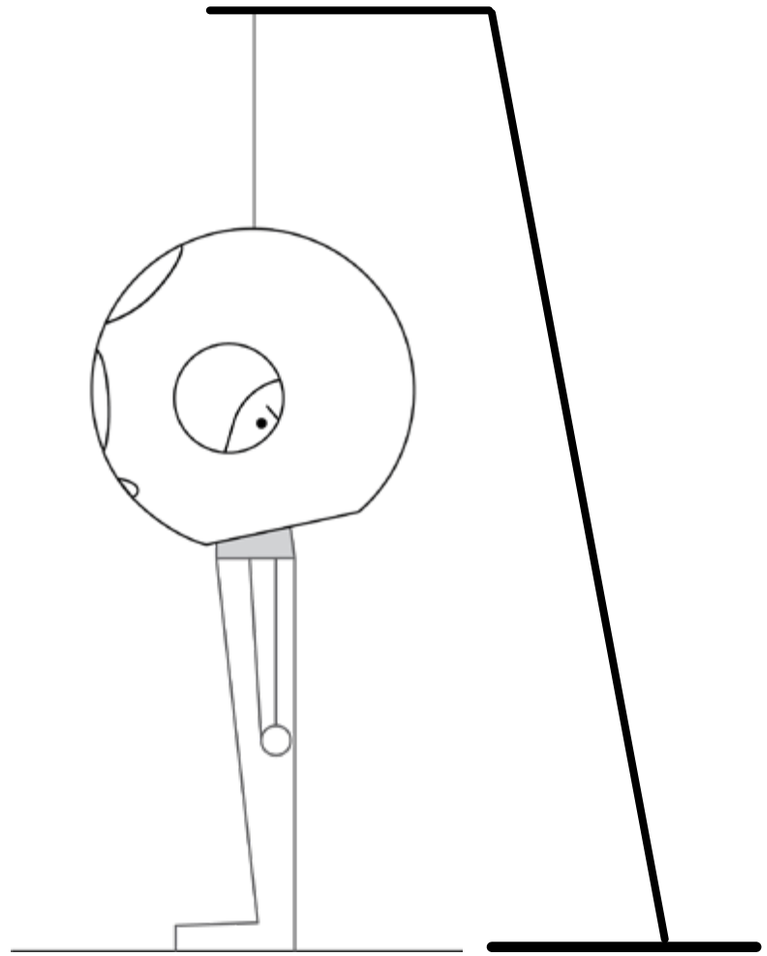
and accept yourself to understand Nature. An introspective. Finally, the lens of West reflects the interest for an interaction with others, experience life sharing the silent songs of Culture. Such as music create behaviours were sharing moments and emotions.

Interaction

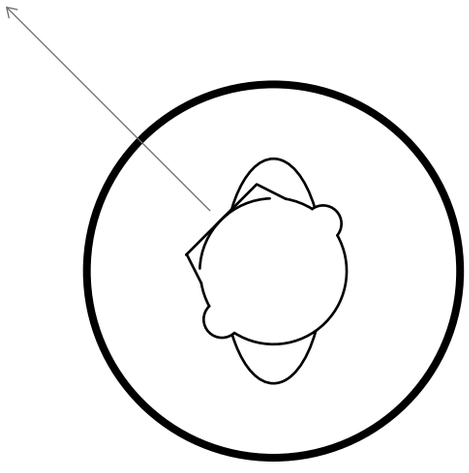
The object must be hanging on the attached structure. This will allow free access of the participants to the interior of the helmet.

Upon entering the helmet, the names of each window or lens can be seen. There will also be a short phrase explaining the meaning of seeing through that lens. (see Figure 25)

Each lens represents a choice of how to see and act. When deciding which lens to look at, it will be the principle you must follow to start the design process to solve the proposed problems. Also, it is possible to develop your own meaning of looking through the chosen lens. So reinforce the beginning of the questions you may have about the problem.



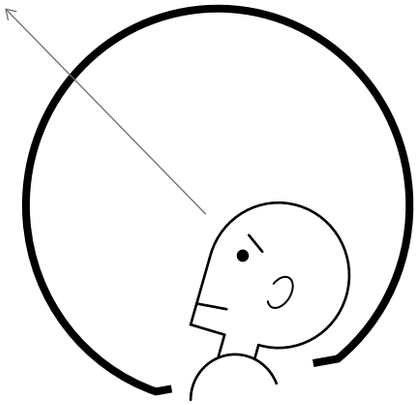
West



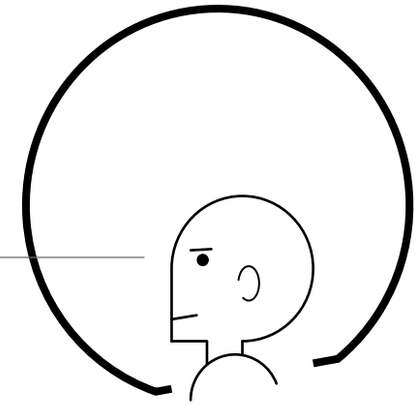
East

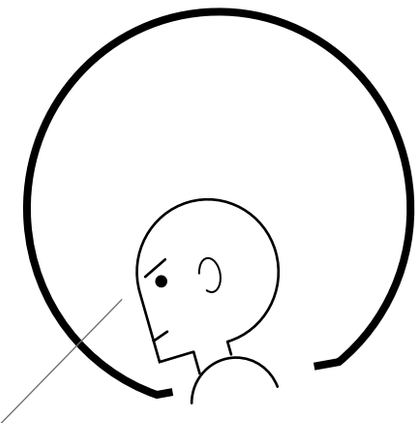
Figure 23 Cut helmet views-Top

North



Your View





South

Figure 24 Cut helmet views- side

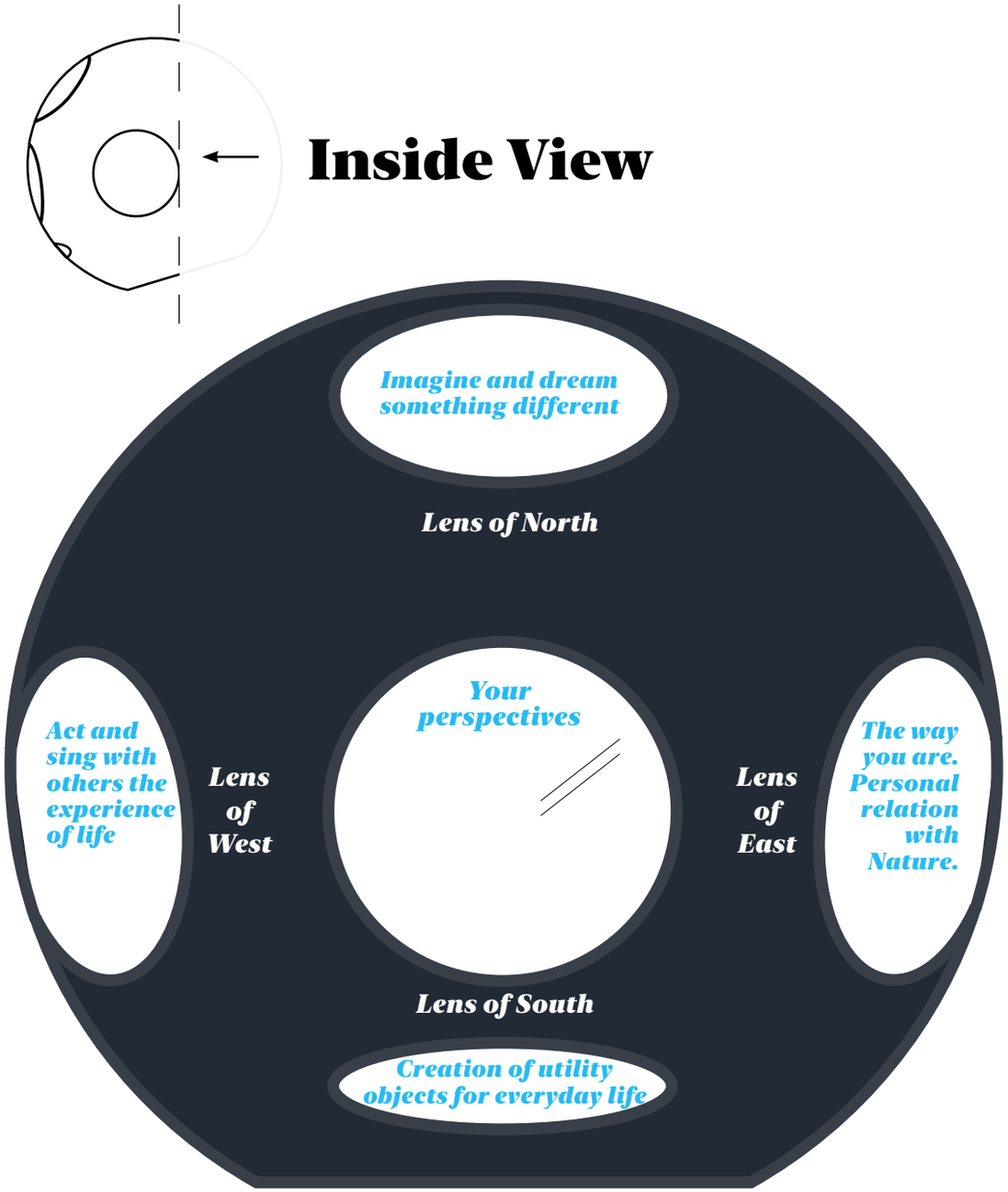
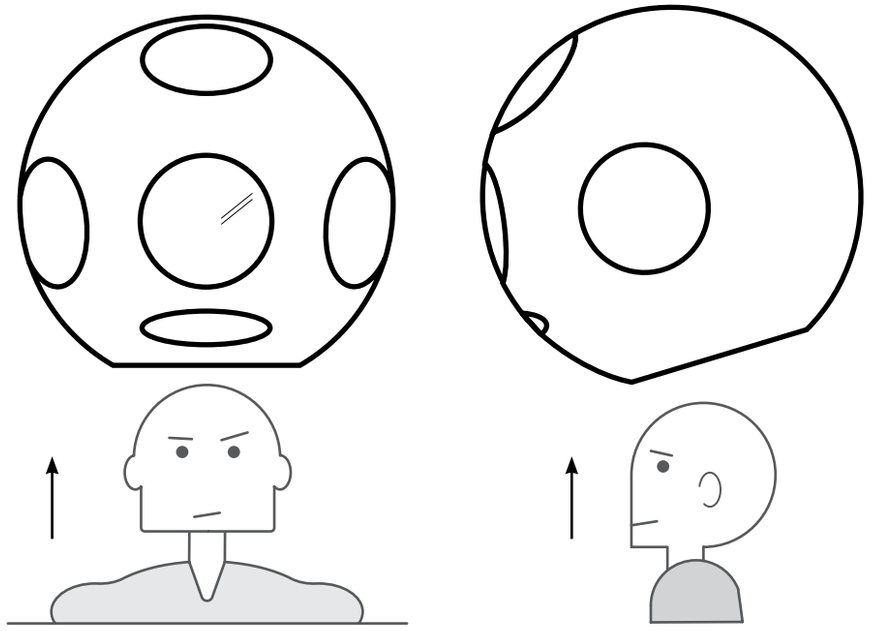


Figure 25 Cut helmet / Inside View. Labeled to identify the type of lens you want to explore the world.

The lens of North

Look at the north, means imagine and dream something different, completely new.
Look at the sky, is the emotion and excitement of explore.
We are taking a stance according to that perspective, thus act upon the world and life.



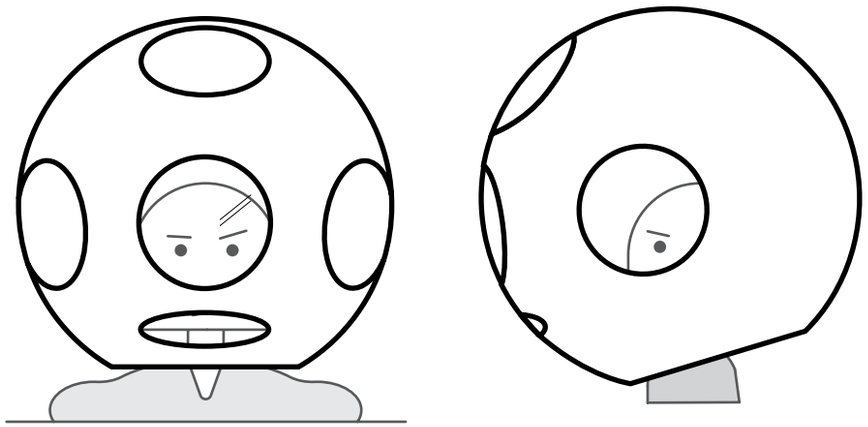


Figure 26 Using helmet-front&side

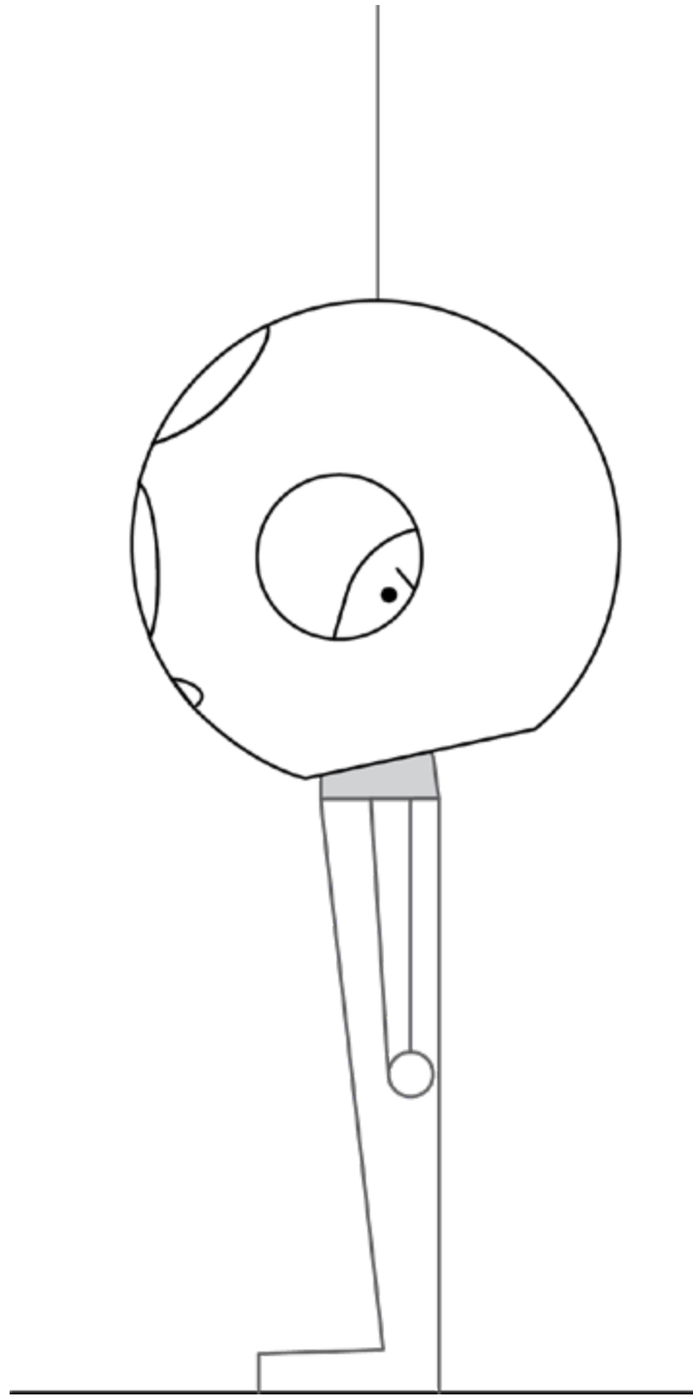


Figure 27 Using helmet-stand

5


Tranquillity base, mission completed. Ready to bring you home.

Final Stimuli

CONCLUSIONS

Imagine something new and completely diverse. Get excited about going into the unknown and exploring it to the last element, and while you do it, you keep wondering and imagining. What other connections could it have with the world?

This enthusiasm has been part of humanity and its evolutionary path into their well-being. This emotion of seeking and finding knowledge in the unknown, it is intrinsic to the discipline of Design. Even full of uncertainties and risks; yet is strengthened and improved from them. Thus provide creative solutions to human needs, creating behaviours that in turn, form the foundation of Culture.

This enthusiasm represents the source of originality and creativity. Indeed, a starting point, a beginning, a differentiation in our perception, the beginning of our creation of meaning and, the power of sustained engagement. It has the potential to change one's perspective on life and, open to others' perspectives, to other possibilities.

And is that potential to openness, where human explorer's spirit, designer's spirit, found its strength to continue looking beyond knowledge —seeing beyond their dwelling, their environment,

their mainland, their oceans, their planet— in the search for the last frontier.

Looking the sky now— to that infinite— does not seem that far away nor a dream to explore either. Technology has also allowed us to open those restrictions or limitations. The pioneers on this new period are private companies such as SpaceX or VirginGalactic, already changing the way we used to think about space. So in the future, more and more people will be able to travel and be part of space exploration.

However, that leads to developing better living conditions on spacecraft and space stations. The improvement of human well-being in such challenging and troublesome conditions brings us back to the point where these circumstances demand Design, because of its tolerance to uncertainty and its natural entanglement involvement in such kind of challenges. And it is the power of sustained engagement —Wonder—how Design improves life— except now in different environments.

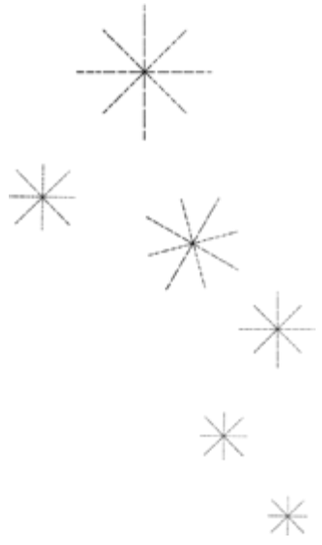
The experience of Wonder will ease in rethinking the acquired knowledge, modifying it and relearning to align with the unusual circumstances. Therefore, foster innovation and not repetition.

Advices

RECOMMENDATIONS

Open yourself and Wonder with others, Design with others for the last frontier. Thus, live your design process differently. That will allow —in a more natural way— to understand other human beings and why not, non-humans. Perceive in the differences the subtle connections. Merge them—words of poets, engineer sketches, majestic overviews, behaviours tinted with rainbows or greyed them with storms.

Imagine massive cosmos in a snowflake. We altogether imagine something novel and unconventional. And wonder why we wonder when we wonder.



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Dad, his always massive silent support. Mom, invaluable faith in me. Wife, her incredible force to elevate me to the moon. Sisters, their charm words.

To Marita, Carmen and Vlad. Wonder-full teachers.

The Good-Morrow

I Wonder by my troth, what thou, and I
Did, till we lov'd? were we not wean'd till then?
But suck'd on countrey pleasures, childishly?
Or snorted we in the seaven sleepers den?
T'was so; But this, all pleasures fancies bee.
If ever any beauty I did see,
Which I desir'd, and got, t'was but a dreame of thee.

And now good morrow to our waking soules,
Which watch not one another out of feare;
For love, all love of other sights controules,
And makes one little roome, an every where.
Let sea-discoverers to new worlds have gone,
Let Maps to other, worlds on worlds have showne;
Let us possesse one world, each hath one, and is one.

My face in thine eye, thine in mine appeares,
And true plain hearts do in the faces rest,
Where can we finde two better hemispheares
Without sharpe North, without declining West?
What ever dyes, was not mixd equally;
If our two loves be one, or, thou and I
Love so alike, that none doe slacken, none can die.

John Donne

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Table of Figures

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