Abductive reasoning
for speculative minds

From semiotics to speculative
design practice

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Speculative infopoetry

Attolico Nicolas

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Graduation Paper:

Attolico Nicolas

Thesis Advisor:

Zingale Salvatore

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ABSTRACT

Over the last few years, there has been an increasing interest in a non-traditional design practice which focuses on the development of a discussion rather than the realization of a product.

This practice, named "Speculative Design", focus itself on the creation of a constructive discussion based on a fictional scenario set in a probable future, where a specific technology, which is now being developed, is domesticated. Starting from a simple "what if?", the designer is then able to investigate social and ethical issues existing on the hypothetical scenario, addressing challenges and opportunities that otherwise would never be taken into account.

This research paper will inquire the features that define this design practice, focussing on how it is connected with critical and traditional design, trying to overlap common feats and characteristics.

OVERVIEW

The analysis will begin with an overview on semiotics, where attention is paid on the concept of semiosis and sign, examining the process of production of meaning.

After a brief introduction, the study will move forward inspecting how inferences work, with emphasis on how abductive reasoning, being the cornerstone of the design approach, could be the link between semiotics and speculative design.
Moving from the concepts of synthesis and sensemaking to the five steps of design thinking, the essay will then delve into the core of the design thinking discovering the implications it has on the design process. The discussion will then focus on critical and speculative Design, with an overview on the history of the practice, followed by an analysis of the characteristics that define the discipline, highlighting how abductive thinking and its features are used inherently in the speculative practice.

The second part of this paper will present a speculative work, "Project ABACUS", and will put attention on how the project was developed. After a brief digression on the importance of data visualization and the power it has to convey meaning, the research will end with the introduction of the concept of infopoetry, a brand new take on infographic.

PART ONE

ABDUCTIVE REASONING
FOR SPECULATIVE MINDS

1. SEMIOTICS

> " *If it looks like a duck, swims like a duck, and quacks like a duck, then it probably is a duck.*
>
> – James Whitcomb Riley (1849)

"When I see a bird that walks like a duck and swims like a duck and quacks like a duck, I call that bird a duck."

– James Whitcomb Riley (1849)

1. SEMIOTICS

.I Introduction

Semiotics is the study of signs and their processes, how they're produced, acknowledged and connected. It also examines how humans think, communicate and interpret the world. This science further investigate signs and their meaning, their messages and their significance. It's possible to say that semiotics inquires every element that constitutes a connection.

Even if the practice is some kind of a "new" subject (It was defined as a "doctrine" by philosopher John Locke in 1690[1], but the modern semiotics analysis comes from the second half of the nineteenth century, thanks to Charles S. Peirce and Ferdinand de Saussure), it already existed implicitly in Aristotle's work and it left its mark on philosophers that came later.

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1   Locke, J., 1690, "*An Essay Concerning Human Understanding*" vol.4, Chapter 21.

The terms comes from σημειωτικός (sēmeiōtikos) "observant of signs" and it was defined by Peirce as the "quasi-necessary, or formal doctrine of signs" that studies "what must be the characters of all signs used by [...] an intelligence capable of learning by experience" (*CP 2.227)²*.

Charles Sanders Peirce is renowned as one of the greatest American philosophers and one of the most influential contemporary thinkers. Considered to be the founding father of pragmatism and semiotics, Peirce reflected on how our mind works when new knowledge is generated.

In his take on semiotics, Peirce has built a distinction between the interpretant and the interpreter (*CP 5.289*). The interpretant is the internal representation that connects the object and its sign. The interpreter is the human who is creating the interpretant, and that could change based on every interpreter and its culture/past experience.

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2   Peirce, C.S., 1931, *"Collected papers of Charles Sanders Peirce"* vol. 2, paragraph 227. (From now on, it will be shortened as CP 2.227).

> *"Logic will here be defined as formal semiotics. A definition of a sign will be given which no more refers to human thought than does the definition of a line as the place which a particle occupies, part by part, during a lapse of time. Namely, a sign is something, A, which brings something, B, its interpretant sign determined or created by it, into the same sort of correspondence with something, C, its object, as that in which itself stands to C. It is from this definition, together with a definition of "formal", that I deduce mathematically the principles of logic."*
> – Charles S. Peirce (1976)[3]

Ferdinand de Saussure conceived "semiology" (de Saussure 1916), thinking about it like it was a social science, not only a discipline, for it's possible to understand how humans create concepts from the physical world. He supposed that no word is intrinsically meaningful, rather it is only a "signifier", a representation of something, and it must be joined inside the mind of the user with the "signified", here intended as the thing itself, in order to form a meaning-imbued "sign".

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3   Peirce, C.S., 1976, *"The New Elements of Mathematics by Charles S. Peirce"* vol. 4, 20-21.

Saussurean semiotics is a two-based system, seeing in sign/syntax and signal/semantics its core (de Saussure 1916), while Peircean semiotics is a three-based system, composed by sign, object and interpretant, and from that point it started to be conceived as a philosophical discipline. Peircean semiotics is not only focused on sign's external propriety, but it addressed the sign as a whole system.

One final adjustment to the subject was made by Thomas Sebeok when joined both concepts of "semiology" and "semiotics" as he focused on how communication was made possible by the relationship between an organism and the environment in which it lives.

It's safe to say that semiotics is an enormously broad topic and its approach enables the understanding of deep concepts like "meaning, cognition, culture, behavior, even life itself"(Ess 1996).

.II Sign

> *"The entire universe is perfused with signs,*
> *if it is not composed exclusively of signs."*
> - Charles S. Peirce (1931) CP 5.449

The sign is the basic entity in every semiotics process/study. According to Peirce, a sign is "[...] something which stands to somebody for something in some respect or capacity" (CP 2.228).

Even if this definition is not entirely clear, we can perceive different sign's features.
The sign stands for "something", called the object and it creates an interpretant (second "something"), a meaning constituted inside the mind of the interpreter ("somebody") that is able to decode the sign reading and understanding the information ("some respect or capacity").

The quote continues as "It addresses somebody, that is, creates in the mind of that person an equivalent sign, or perhaps a more developed sign. That sign which it creates I call the interpretant of the first sign. The sign stands for something, its object.

It stands for that object, not in all respects, but in reference to a sort of idea, which I have sometimes called the ground of the representation", highlighting the concept that will aid Peirce with his thoughts about the meaning infused in sign and how the sensemaking process.

It's safe to assume that every experience is mediated through signs and that their interpretation is generated in the mind of the interpreter, being different every time, based on experience and culture. Therefore a sign does not portray a static meaning, its definition is not isomorphic (Brown 2009) with its object, instead the sign is created every time and it could also hold a different interpretant after few days or after something happens.

Signs can be perceived through any of the senses, visual, auditory, tactile, olfactory or taste, and their meaning can be intentional or unintentional. This variety of possible input shows the arbitrary of the relations between sign and its object even more, underlining their "generative" feature. Different interpretations of the same object are unavoidable, not only possible, and the true outcome of the sign relation itself.

.III Semiosis

> *"Semiosis is a process which characterizes all varieties of life."*
> - Myrdene Anderson (1984)

Any activity that involves signs and the production of meaning is defined as semiosis. The term was introduced by Peirce (cp 5.213-263) in order to describe the process of interpretation of signs in relation with the object portrayed. It concerns the building of sense-structure from and with signs.

The use of signs is what separates the sentient beings from the non-living, since every action/interaction produces signs or is comprised by signs. Signs are not isolated entities, they create an always-changing organic structure that mediates every experience.

Humans, as it is known, have the most unique semiosis sense in the universe (Shank 1997). The signs that are created go beyond the immediate experience of the cognitive organism. Words, images, body movements, text et cetera can generate interpretants for objects that do not require bases in the "real" world and that can be manipulated independently.

Following this description, language and speech are semiotics processes as well, since there are signs (letters) with a coded meaning that are not strictly connected to the shape of a single sign, but they depend on the user's background and its understanding of said code.

The use of semiotics systems (like language, for example) allows the creation of culture: institutions, governments, armies, universities, parties and so on. In turn, culture influences how and what is experienced with semiosis, creating a never ending cycle[1].

The fact that humans can use arbitrarily-chosen signs and that there is no need for them to be already experienced or already coded, is what makes thought possible. Ideas can be analyzed and taken into consideration even without being experienced directly.

> *"The entire universe is perfused with signs, if it is not composed exclusively of signs."*
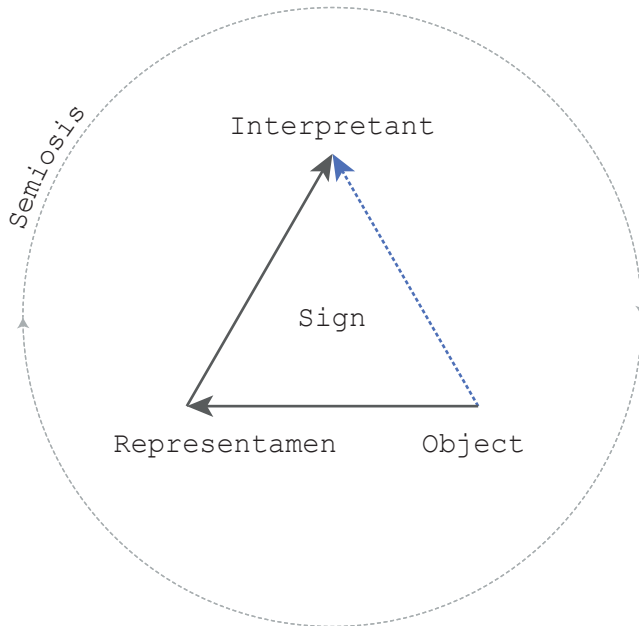> - Charles S. Peirce (1931) CP 1.302

For Peirce even hypothesis could be seen as a sign, inferred from the world and mediated through experience in order to give it an original meaning.

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1   Champagne, R. A.; Eco, U. 1980, *"The Role of the Reader: Explorations in the Semiotics of Texts" in "World Literature Today".*

Fig.1: Triangle of Reference

"The repeated action responding to a given sign becomes in its turn a new sign, the representamen of a law interpreting the former sign and giving rise to new processes of interpretation."

- Umberto Eco (1955)

.IV Inferences

Delving into the inferential process can shed a light on how semiotics and design are connected. Inferences are considered the way the mind works. They're a mental process, through whom hypothesis are formulated and, based on specific evidences, it's possible to reach a conclusion.

> *"We infer motives, purpose, and intentions."*
> - Dan Kurland (2000)

Interpreting actions, behavior, characteristics, expressions or feelings is an inferential activity that occurs on a daily-basis, as follows it's essential to being human.

Inferring means seeking purposes and reasons, it's walking step by step inside the mind, reasoning and, eventually, moving from premises to consequences, from an hypothesis to a conclusion.

The result may or may not be correct, or it may be correct in certain situations or even not entirely correct. If the inferred path is walked multiple times, it could be possible to reach another conclusion, or, at least, test the correctness-degree of the first hypothesis (Kurland 2000).

Conclusions are never reached with mathematical accuracy, and they do not have the certainty deriving from the deductive reasoning. Inferences generally reflect previous knowledge and experience, as well as personal beliefs and hypotheses and, therefore, they are incline to reflect the proportion of the involvement of the interpretant in a situation or its interests in the result.

Inferences are not random intuitions. Even if they could mysteriously come to fruition with a sudden insight, they follow a certain path (even if sometimes it's not clear or completely hidden). Inferences can be assumptions, but they are founded on supporting evidence. The object imply, the interpretant assume.

Even if this image suggests an influence or some kind of power coming from the evidence (that, as it is known, it does not exist (CP 5.253)) how can said evidence eventually lead to a certain conclusion? As it was stated, the sign does not have a fixed meaning, hence it only depends on the interpreter and his background, underlining how, starting from a clue, it's possible to infer a conclusion.

Deductive Thinking

> *A is B.*
> *All Bs are Cs.*
> *A is, deductively, C.*

Deductive thinking enables the interpreter that starts from one or more premises to reach a certain conclusion. It's possible to state that this conclusion is certain thanks to the logic that is applied to this inference.

It starts with a known fact or hypothesis and it follows a fixed path, creating a specific conclusion that will be true for every time the same inference takes place. A deductive argument works only if the premises presented are valid, that way the conclusion will be true.

> *"Deduction can draw a prediction which can be tested by induction."*
> - Charles S. Peirce (1931) CP 5.171

This logical argument is self-contained, the conclusion is already contained in the arguments. That means that this logic cannot offer a conclusion that was not considered before.

Inductive Thinking

> *Each time I do A under the same conditions,*
> *B occurs.*
> *Inductively, the next time I do A under*
> *these conditions,*
> *B will occur.*

With an inductive argument is possible to find evidences on a fact that might be true, but it's based on experience, thus is not certain. It's the form of logic usually associated with the scientific method.

> *"Inductive thinking is a kind of reasoning that constructs or evaluates general propositions that are derived from specific examples. Inductive reasoning contrasts deductive reasoning, in which specific examples are derived from general propositions."*
> - Matthew Weprin (2016)

Different try could prove this all argument wrong, so it's safe to assume that, in an inductive process, the premises do not guarantee the truth of the conclusion (Kolko 2010). Just like deductive thinking, induction is not able to create any new knowledge since all the findings are comprises in the premises.

Abductive Thinking

> *I've done something like A before, but the*
> *circumstances weren't exactly the same.*
> *I've seen something like B before, but the*
> *circumstances weren't exactly the same.*
> *I'm able to abduct that C is the reason B is*
> *occurring.*

Unlike deductive and inductive thinking, the abductive process occurs with an incomplete set of assertions and proceeds trying to find the best answer possible for each set of premises. It could be intended as the "inference to the best explanation"(*Harman 1965*).

Within the abductive process, the findings are not contained in the argument, so the premises could not guarantee the conclusion. Abductive logic enables the creation of different knowledge and new insight.

C is an external factor that represents one of the reasons why B is happening (usually it represents the best one), and even if A is true, C might still turn out to be false, since it's only an assumption.

.V Abductive Thinking

> " *The abductive suggestion comes to us like a flash. It is an act of insight, although extremely fallible insight.*

- Charles S. Peirce (1988)

Peirce, C.S., 1988, *"Pragmatism as the Logic of Abduction,"* in "The Essential Peirce: Selected Philosophical Writings, 1893—1913, by Charles S. Peirce", Bloomington

.V Abductive Thinking

> *"The surprising fact, C, is observed; But if A were true, C would be a matter of course, hence, there is reason to suspect that A is true."*
> - Charles S. Peirce (1931) CP 5.189

Abductive reasoning is the only way humans can create new knowledge. That being said, it's necessary to delve deeper into the abductive process to analyze its feats in order to compare them with design.

According to Peirce, abductive reasoning is the "first stage" of any interpretative process and it is believed to be the fundamental aspect of scientific inquiries (CP 6.469). It's the process of finding and adopting an explanatory hypothesis (CP 5.145) and it is articulated in two different tasks: selection and formation of a plausible hypothesis.

Every time an hypothesis gets formulated, it's immediately followed by a guess. Abductive Thinking starts with an observation and seeks to find the most likely explanation, yielding a plausible conclusion without being able to positively verify it. Abductive conclusions are thus qualified as having a remnant of uncertainty or doubt, which is expressed in retreat terms such as "best available" or "most likely"(Lipton 2003).

Abductive reasoning aims to explain the observed facts, hence it infers the cause from the effect: it is an inference that, starting from a surprising fact, jumps to an hypothetical condition that could explain it. With this abductive method, the object of its discovery is of a different nature from that of the observed elements, and that's why this inference is the only way the mind could try and reach new heights, expanding general knowledge.

Any hypothesis "consists in examining a mass of facts and allowing these facts to suggest a theory. This way we get new ideas, but there is no forcing in reasoning" (CP 8.209). The hypothetical reasoning has the power to advance knowledge, but it is always a gamble, a guess, which can fall back into error and therefore requires subsequent inductive verification and deductive legitimation.

Considering abductive thinking, it's mandatory to address the fact that it is the semiotics phenomenon that allows the subject's universe and the surrounding environment to mediate and meet. That occurs in every kind of interpretation, as it turns a supposition (that allows the user to read anomalous or unexpected data) into the circumstance of a certain general rule or reference code, thus establishing a new level of continuity or generality.

Discussing the abductive process means reflecting on a particular cognitive and interpretative practice that, starting from details, marginal data and revealing clues, allows the reason to conquer a new readability of the world. Peirce enables the understanding on how abductive thinking is a valuable instrument,being able to advance humanity's cognitive heritage, being able to approach the truth and to conquer new way to read reality (Zanirato 2011). The ability to solve problems is "a creative ability to produce new guesses, and more new guesses"(Popper 1979).

The interpretive process of abduction could be described in four different stages:

1. A curious/unexplainable fact is encountered.

Based on the background and the knowledge possessed at the time of the encounter, it's not possible to understand the fact.

2. An hypothesis is formulated.

Suggested by the fact itself, the assumption is instinctive, *almost* like an act of insight.

3. The hypothesis is applied deductively.

Using deductive reasoning, it's possible to infer the consequences that would follow from the hypothesis that's being considered. While few experiments could validate the thesis, an infinite series could turn the same experiment invalid.
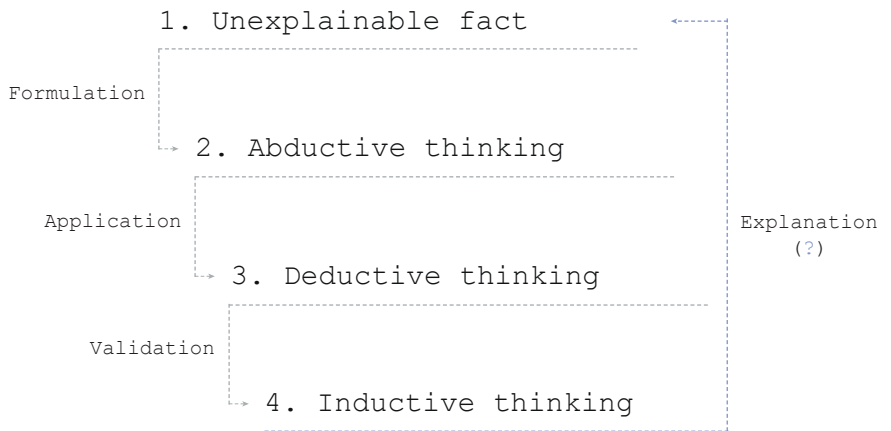
4. The hypothesis is verified inductively.

Finally, following an inductive process, it's possible to conclude if the results verify the initial hypothesis, or at least if the conclusion could provisionally verify it[1].

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1   Everaert-Desmedt, N. 1990 "*Le processus interprétatif. Introduction à la sémiotique de Ch.S. Peirce*".

Fig.2: Abductive Reasoning Process

1. Unexplainable fact

Formulation

  2. Abductive thinking

Application

Explanation
(?)

  3. Deductive thinking

Validation

  4. Inductive thinking

2. DESIGN THINKING

> **"** *We can't solve problems by using the same kind of thinking we used when we created them.*

- Albert Einstein (1946)

"A new type of thinking is essential if mankind is to survive and move toward higher levels."

- Einstein A., 1946 *"Atomic education urged by Einstein"*

2. DESIGN THINKING

Now that the cornerstones of abductive process are set, it's needed to delve a little into the design thinking practice, being it the method of practical resolution of problems connected to the design practice.

Finding a definition of design thinking is not an easy task, but various designers, as well as researchers and entrepreneur tried to explain it.

> *"Design Thinking can be considered a process as well as a mindset, and is widely viewed as a holistic and creative approach for addressing 'wicked problems' [where multiple spheres and fields collide] and exploring better future."*
> - Catherine Docherty (2017)

> *"Design thinking utilizes elements from the designer's toolkit like empathy and experimentation to arrive at innovative solutions. By using design thinking, you make decisions based on what future customers really want instead of relying only on historical data or making risky bets based on instinct instead of evidence."*
> – David Kelley (2018)

Tim Brown, CEO and president of IDEO, spent a lot of time and resources on design thinking research and application, turning his company into one of the most profitable one between those who "export" the Design thinking approach.

> *"Design thinking is a human-centered approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success."*
> — Tim Brown (2011)

Design thinking is an iterative process that has it final goal in understanding the user, questioning premises and reconsidering problems in order to find different strategies and solutions compared to the ones that could appear immediately in one's mind (that might include the need of a different level of understanding). In the meantime, Design Thinking offers a solution-based way to deal with issues.

Design thinking has its roots into questioning. Questioning everything, from the problem to the hypothesis, from the implications to the premises, helps the user to face the problem from a different point of view, re-framing the issue and allowing different ideas to flow.
Challenging the fundamental aspects of a problem, starting from the user's preconceptions, enables the analysis of a completely new set of options.

Fig.3: IdeoU Venn
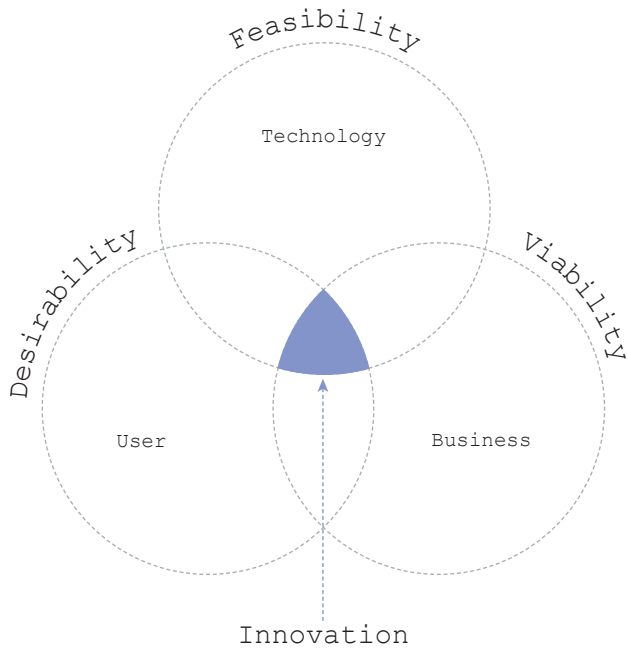
Brown, T., 2011, *"Why Design Thinking?"* Ideo U Online school

As it was stated, DT consist in a solution-based thinking approach (Waloszek 2012), able to work effectively on a problem in order to find a constructive solution. The complete opposite of this practice is the problem-based way of thinking, that, as stated in its name, tend to focus on the problem itself, trying to analyze and define the issues' limitation before trying to come up with a solution.

> *"It's an iterative process which favours ongoing experimentation until the right solution is found."*
> - Emily Stevens (2018)

It's possible to trace design thinking methodology back to Herbert A. Simon, Nobel Prize in Economics, when he outlined one of the first models of this process in *"The Sciences of the Artificial"* (Simon 1969). In his take, Simon proposed 7 different stages: define, research, ideate, prototype, choose, implement, learn.

Since then, multiple researcher gave their contribution to this topic, developing different take on the same process. From 3 to 7 stages, the core of every variant was the basic "Understand, explore, materialize", that has always been able to describe the practical, creative development of solutions.

Fig.4: Design Thinking Cycle
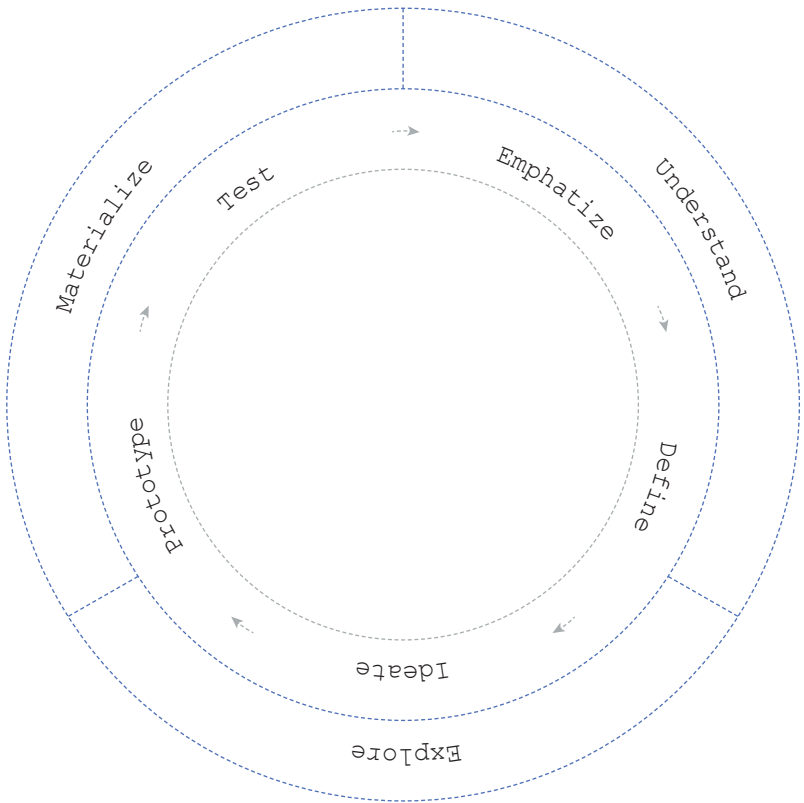
dschool.Stanford's Design Thinking Bootleg 2018[1]:

1 Empathize

Empathy is the foundation of human-centered design. The problems you're trying to solve are rarely your own, they're those of particular users. Build empathy for your users by learning their values.
To empathize, you:
Observe.View users and their behavior in the context of their lives.
Engage.Interact with and interview users through both scheduled and short 'intercept' encounters.
Immerse.Wear your users' shoes. Experience what they experience for a mile or two

2 Define

The define mode is when you unpack your empathy findings into needs and insights and scope a meaningful challenge. Based on your understanding of users and their environments, come up with an actionable problem statement: your Point Of View. More than simply defining the problem, your Point of View is a unique design vision that is framed by your specific users. Understanding the meaningful challenge at hand, and the user insights you can leverage, is fundamental to creating a successful solution

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1   Doorley S. et all, 2018 "*Design Thinking Bootleg '18*"

3 Ideate

Ideate is the mode in which you generate radical design alternatives. Ideation is a process of "going wide" in terms of concepts and outcomes—a mode of "flaring" instead of "focus". The goal of ideation is to explore a wide solution space—both a large quantity and broad diversity of ideas. From this vast repository of ideas, you can build prototypes to test with users.

4 Prototype

Prototyping gets ideas out of your head and into the world. A prototype can be anything that takes a physical form—a wall of post-its, a role-playing activity, an object. In early stages, keep prototypes inexpensive and low resolution to learn quickly and explore possibilities.Prototypes are most successful when people (the design team, users, and others) can experience and interact with them. They're a great way to start a conversation. What you learn from interactions with prototypes drives deeper empathy and shapes successful solutions

5 Test
Testing is your chance to gather feedback, refine solutions, and continue to learn about your users. The test mode is an iterative mode in which you place low-resolution prototypes in the appropriate context of your user's life. Prototype as if you know you're right, but test as if you know you're wrong.

The fact that the design cycle is a sequence of steps does not imply that they have to be followed in fixed order. They are not sequential, they can often be repeated and they can occur at the same time. These steps could be understood as stages that constitute a project, granting the designer/user to jump from one to another based on what is needed.

This 5-step model works also as a project-flow reminder, since it lists all the steps one needs to follow in order to achieve a complete project, working on its cultural background and proposing different point of views.

The creative process that every designer approaches and adopt, can be visualized in a Double Diamond scheme (Design Council 2005) that was mapped out by the Design Council in 2004. This double shape was an attempt to gather different procedures transversal to every design discipline and visualize them in a map that could be accessed by everyone, working as a "to-do list" and a reminder of how a project should be structured, similar to the 5-steps model.

Design thinking mindset holds the iterativity and the non-linear feature that was discussed before in its core. Every step is a mode that contribute to the building of the project, granting the possibility to go back to the previous one, or skip another one, if it's needed. This way, every project could benefit from data and insight gathered during the development, continually updating the premises and the designer's point of view based on its assumptions.

The problem can be re(de)fined and the solution can be altered or fixed.

It's then possible to conclude that design thinking is an abductive sense making process of manipulating, organizing, pruning and filtering data in an effort to produce information and knowledge (Kolko 2010).

Using data, the designer is able to work on it turning it into something related; some of the data manipulation processes are common between users, and the actions include organization, trimming, interpretation and reframing from a personal point of view.

British Design Council's Double Diamond[1]:

1 Discover

The first quarter of the Double Diamond model covers the start of the project. Designers try to look at the world in a fresh way, notice new things and gather insights.

2 Define

The second quarter represents the definition stage, in which designers try to make sense of all the possibilities identified in the Discover phase. Which matters most? Which should we act on first? What is feasible? The goal here is to develop a clear creative brief that frames the fundamental design challenge.

3 Develop

The third quarter marks a period of development where solutions or concepts are created, prototyped, tested and iterated. This process of trial and error helps designers to improve and refine their ideas.
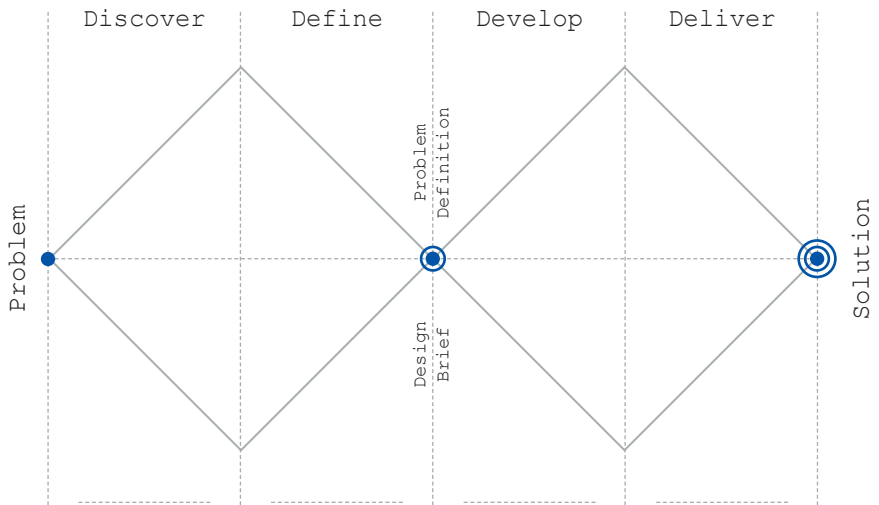
4 Deliver

The final quarter of the double diamond model is the delivery stage, where the resulting project (a product, service or environment, for example) is finalised, produced and launched.

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1   British Design Council, 2005 "*Eleven lessons. A study of the design process*"

Fig.5: Design Council's Double Diamond

"In all creative processes a number of possible ideas are created ('divergent thinking') before refining and narrowing down to the best idea ('convergent thinking'), and this can be represented by a diamond shape. But the Double Diamond indicates that this happens twice—once to confirm the problem definition and once to create the solution."

- Design Council

3. SENSEMAKING

> **"** *Sensemaking is an internal, personal process, while synthesis can be a collaborative, external process.*

- Jon Kolko (2010)

Kolko, J., 2010 *"Abductive Thinking and Sensemaking: The Drivers of Design Synthesis."*

3. SENSEMAKING

Sense making and framing play a key role in the synthesis of designs in order to create a behavior theory inside and outside the specified field. During the process of design synthesis, this process turns from a subjective and personal work into a collaboration and, thanks to this evolution, is able to create one or more frameworks for the design a group is working on, since they are active, adaptable and responsive to the specific project conditions.

> *"Sensemaking is an action-oriented process that people automatically go through in order to integrate experiences into their understanding."*
> - Jon Kolko (2010)

This personal phenomena gives meaning and framing, and, as a results, the design team is able to build a common understanding of the data at the beginning of the project summary and gathers all the different points of view and understanding on the subject in order to take advantage of them. The design team, moreover, will develop a number of artificial limitations, intrinsically created from a cooperative synthesis work The final result is a sort of regulatory framework, that allows the design team to begin to solve the problem.

Considering a design project, it's possible to assume that the synthesis process is a way for the designer to insert abductive reasoning into a problem he's trying to process.

All the boundaries and limitations imposed by oneself or by the group start to work as premises, and when the designer's past experience, background and culture are added, the abductive process begins. It's necessary for the designer's mind to be open to different interpretations and logical leaps in order to fill incomplete data or missing informations, but that's what's required to a designer in every occasion.

The abductive process is guided by premises and the user's experience, but it's important to highlight the fact that said past experience does not have to be related to the matter of the problem, in fact sometimes the mind works at its best if the subject is new.

> *"The abductive suggestion comes to us like a flash. It is an act of insight, although extremely fallible insight. It is true that the different elements of the hypothesis were in our minds before; but it is the idea of putting together what we had never before dreamed of putting together which flashes the new suggestion before our contemplation."*
> - Charles S. Peirce (1931) CP 5.181

Starting from this quote, it's possible to extrapolate some features. Working exactly like a divine intervention, the act of insight that Peirce magnifies is the fundamental value of the abductive process.

It's possible, though, to think about this "flash" from a different perspective. Despite being something new, a completely different point of view, an alternative take on the subject, this act of insight is actually a method of problem solving that stands at the heart of the design synthesis.

Johnson-Laird, professor of psychology and author of notable books on human cognition and the psychology of reasoning, argued that this "flash" is not a simple act of insight (Johnson-Laird 2005), but instead it's a four step process that everyone is able to apply in a design synthesis process:

> *1. The current problem solving strategy fails to yield a solution, given the existing constraints.*
>
> *2. There is a tacit consideration of the new constraints in the strategy.*
>
> *3. The constraints are relaxed (or changed) in a new way, thus broadening the problem space and allowing for further consideration.*
>
> *4. Many changes in constraints lead nowhere, but, with perseverance, a change may be made that leads at once to a solution of the problem.*

The logical and cognitive background described above points to an action-framework of synthesis: there are specific types of actions taken by the designer during synthesis that yield a positive result in terms of both abduction and sensemaking. These are the acts of prioritizing, judging, and forging connections.

In his "Abductive Thinking and Sensemaking: The Drivers of Design Synthesis", John Kolko highlights the steps the designer has to walk:

> ***Prioritizing.*** *A large quantity of data is gathered while approaching a given design problem. Stakeholder interviews, user interviews, market research, cultural trends, and forecasting all produce quantities of data. During the process of synthesis, the designer must decide that one piece of data is more important than another. This is accomplished by using an often implicit scale of importance, or a set of guidelines upon which to compare the data.*
>
> *The scale of importance is subjectively derived (but identified in a "reasonable" manner—not arbitrarily), but the use of this scale is then generally objective. (Within the system each element is compared on a consistent basis).*

Data prioritization will eventually identify multiple elements that can be seen as complementary, and thus a hierarchical data structure is created.

Judging. *Not all of the data identified in a discovery process is relevant. The process of synthesis forces the definition of relevance, as the designer will pass the gathered data "through a large sieve" in order to determine what is most significant in the current problem solving context. Synthesis methods, then, require a constant reassessment of the current state as compared to the unknown end state.*

Forging of connections. *During synthesis, it is not the discrete elements of data that are interesting so much as the relationship between these elements. Identifying a relationship forces the introduction of a credible (although rarely validated) story of why the elements are related. This is an abductively logical story, positing a hypothesis based on inference. The activity of defining and forging connections actively produces knowledge, in that new elements (gleaned from prior experiences in life) are combined with existing elements.*

4. CRITICAL DESIGN

" *Critical design can never be truly popular, and that is the fundamental problem. Objects that are critical of industry's agenda are unlikely to be funded by industry.*

- Dunne and Raby (2001)

Dunne, A.; Raby, F., 2001 *"Design Noir: The Secret Life of Electronic Objects."*

a/b MANIFESTO

(a)

affirmative
problem solving
design as process
provides answers
in the service of industry
for how the world is
science fiction
futures
fictional functions
change the world to suit us
narratives of production
anti-art
research for design
applications
design for production
fun
concept design
consumer
user
training
makes us buy
innovation
ergonomics

(b)

critical
problem finding
design as medium
asks questions
in the service of society
for how the world could be
social fiction
parallel worlds
functional fictions
change us to suit the world
narratives of consumption
applied art
research through design
implications
design for debate
satire
conceptual design
citizen
person
education
makes us think
provocation
rhetoric

Dunne, A.; Raby, F., 2014, *"Speculative everything: Design, fiction, and social dreaming"*.

4. CRITICAL DESIGN

> *"If Affirmative Design is problem solving, then Critical Design is problem finding, [...] it is a critique of the context and culture in which the designed object exists."*
> *– Ian Gonsher (2016)*

Critical design is a design practice that seeks to challenge user's perception in order to spark a debate. It confronts traditional design with new assumptions, trying to modify the image in the mind of the user, instead of reinforcing it.

Its main goal is the exploration of social implication that new technologies and designs have on society, sparking the debate about what would be the preferable outcome of the domestication of said technology. It provokes the public and engages it in heated debates. It gets its "critical" part from the fight it pursue against the status-quo, trying to challenge common conceptions.

This discilìpline was theorized by Anthony Dunne in 1999, but two years were needed to find some bibliography on the topic (Dunne 2001). As illustrated below, it retains a lot of connection with the traditional design practice, but it acts like the "other side of the coin" of discursive design.

In "Speculative Everything" (Dunne; Raby 2014), it's possible to find a visual representation of how different design practices are connected, and it's an incredibly useful schematization, since it renders perfectly every design practice's philosophy.

Traditional Design

Before trying to explain the characteristics and the possibilities that a critical design process held, it's necessary to delve a little into its counterpart: traditional design.

From a critical design point of view, TD is seen as some kind of "affirmative" design, it's a design process that conforms itself to the cultural level of society, trying to strengthen its status-quo. It works as an instrument for the commercial industry, aiming to solve the customer's problem by addressing one undertaking the issue. It's a problem-solving kind of design practice.

Discursive Design

Discursive design is somewhere in between between the traditional design practice and the critical one. It's a design method that try to design products in order to encourage a discussion, share ideas and communicate a purpose.
Social debate is the ultimate goal of a discursive design project, and its production is not centered only on physical products. It refers to a wider spectrum of outputs, like a service, a concept or a prototype.

Fig.6: Different Design Practices

Traditional Design

Discursive design practice

Critical design practice

Speculative design practice
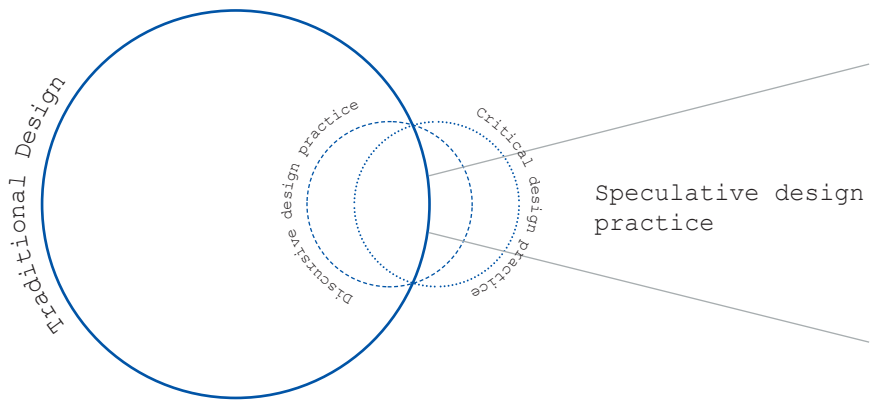
Dunne, A.; Raby, F., 2014, *"Speculative everything: Design, fiction, and social dreaming"*.

Critical Design

Critical design was ideated by Dunne and Raby at the Londo RCA. It first appears in "Hertzian Tales", core book of the practice that inquires the aesthetic of electrical devices and how it affects everyday life, with some hint for the designer that, in order to achieve some kind of critical design, he's supposed to be "mixing criticism with optimism"[1].

Similar to discursive design, a critical design process should focus on criticism not in a negative connotation, but as a (kind of) gentle push toward something better.

> *"Instead of thinking about appearance, user-friendliness or corporate identity, industrial designers could develop design proposals that challenge conventional values."*
> - Dunne and Raby (2001)

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1   Dunne, A., 2008, *"Hertzian tales: Electronic products, aesthetic experience, and critical design"*.

The goal of a critical design practice is to challenge the status-quo, trying to go beyond what's given, questioning even the most basic aspect of society. Public debate is the core of this practice, since if it's able to spark a discussion, then it's possible to challenge even society's norms and values.

Speculative Design

Speculative practice is similar to the critical design practice (they share most of the characteristic and goals), but it's focussed on futuristic and alternative scenarios. This way it's possible to show a future where technologies that are being developed or ideated today are domesticated. In a speculative perspective that is the spark that ignites the debate wanted by the designer.

In their "A/B manifesto" (shown at the beginning of this section), Dunne and Raby tried to articulate this design practice characteristic in the B section of it. Speculative design complement to the traditional design practice, since it narrows its point of view and analyze how the implications of "mindless" decision could have effect on the world's future.

Critical design is a practice that attempts to explore different values and alternative social form, focusing on the ethic in the design practice. The critical attitude enables the designer to widen the scope he designs for, moving from the traditional product design to a design that sparks a debate and allows big issues to be discussed. It requires a diligent self-reflection from the designer's point of view, plus a critical attitude towards the world and the topics considered is required.

Nowadays, many different products are designed so that they're addictive and in a way that form some habits. Critical design tries to spot a light on this subject, not defining it wrong, but sparking a discussion on the matter, asking if this is the preferable way to develop the issue and, if this is not the case, what alternatives can be conceived.

> *"The utility value of products no longer is a differentiable factor.*
> *Instead, the semantic and social values are becoming increasingly important."*
> - Leon K. Johannessen (2017)

Critical design thinking is an old topic reframed. Its roots are to be found inside the radical design and anti-design movement from the 60's/70's, when design and engineering started to get heavily connected and those movements tried to fight against it. That positive industrial design was subverted by this new style of design, that tried to force people to think about the meaning and the scope of an object, not just admiring that as a work of art.

Traditional design tries to develop solutions in order to solve a problem, answering user's questions and requests. TD serves the user, but its success is valued by its profit in a commercial environment. Critical design aims to explore alternative ideas and to spark a debate in order to find a solution to certain issues. Its success is derived from the designer's ability to provoke its audience.

Designers rethink the role of technology in everyday life, without dealing with the applications of technology, but rather by considering its implications.

> *"Critical design turns away from the traditional commercial aspect of design, focussed on the demands of the market, aiming, instead, to a broader social context that enables new designers to use its critical process to create concept and artifacts that ask questions and inquire specific issues.*
> *If designers do not consider the implications of their work, they do so because of fallacies learnt in design schools: that all design is good, that design solves problems, and that design makes people's lives better. CD suggests that design can do all those things, but not if practiced "mindlessly", solely as a means to reach commercial goals."*
> - James Auger (2015)[1]

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1   Mitrovic, I. 2015, *"Introduction to Speculative Design Practice – Eutropia, a Case Study."*, Interview.

5. SPECULATIVE DESIGN

66 *As the dreams that fed the 20th century imagination begin to fade, we need to learn how to dream new dreams.*

- Dunne and Raby (2011)

Dunne, A.; Raby, F., 2011, *"What if... Exhibition catalogue: The First Beijing International"* Design Triennial, Beijing

5. SPECULATIVE DESIGN

Speculative design has its roots in the critical design practice (it could be consider as its future-oriented branch) and it comprises different practices: design fiction, future design, anti-design, radical design, interrogative design, discursive design, adversarial design, futurescape, design art, transitional design and many more.

Speculative design is closely connected to critical design for its methods, based on critical thinking aimed at generating a dialog/debate, but, at the same time, it questions traditional design practice by taking a speculative approach, thus moving one step forward inquiring alternative scenarios and possible futures.

Speculative futures are considered as alternative realities that present a shift from our timeline that happened at some point in the past and that allows the designer to re-imagine our present in order to inquire technological and social issues. In "Speculative design: crafting the speculation"[1] Auger states that SD uses fiction and speculative products, systems and services in order to reflect and examine the role and the impact of the technologies that are being considered could have on everyday life.

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[1]   Auger, J., 2013, *"Speculative Design: Crafting the Speculation. Digital Creativity."*

Speculative design tries to anticipate the future, helping the user to understand and re-think humanity status-quo. The question "what if?" allows the designer to examine how technological development could impact society, thus analyzing "what could be?/ what could have been?"

Instead of focussing only on a desirable future, the speculative approach perform better if the future that's considered is fearable, that could become true if humanity fails to keep up with new technologies and/or cannot understand its role in this ever changing world.

Speculative design process tries not to answer to consumer needs, but it focuses on translating today's world complexity into the considered future for "discussing and considering alternative possibilities and options, and imagining and redefining our relation to reality itself"[2].

> *"Through its imagination and radical approach, by using design as a medium, it propels thinking, raises awareness, questions, provokes action, opens discussions, and can offer alternatives that are necessary in the today's world."*
> - Elvia Vasconcelos (2017)

2   From "*SpeculativeEdu Introduction*" by Ivica Mitrović

Fig.7: Technology Domestication

Technologies get domesticated everyday. New technologies
may take years to enter everyday life, but, when they do
it, then it's almost impossible to go back to the "old
days". The speculative process enables the designer to
build a scenario in 1. a speculative future, where a
technology that's being developed now is domesticated or
2 in an alternative present where technology evolved in a
different direction.
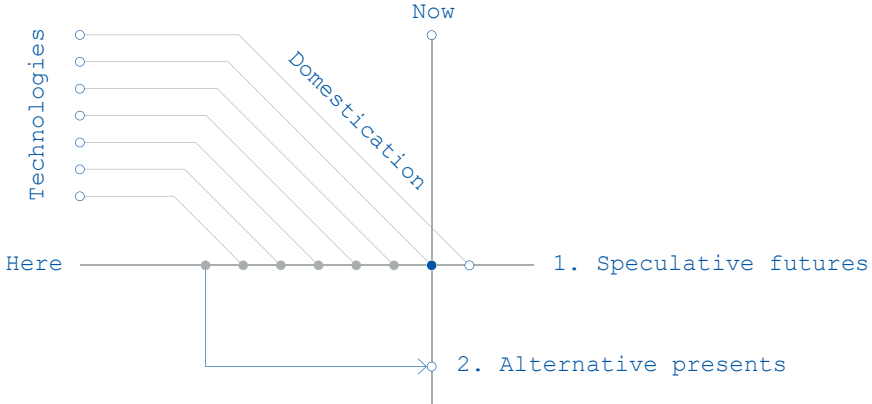
Auger, J., 2010, *"Alternative Presents and Speculative
Futures: Designing fictions through the extrapolation and
evasion of product lineages."*

Speculative scenarios gather their ingredients mainly from science fiction, since it has a long and prolific history of imagining worlds, future, different social situations and, most importantly, characters. From Mary Shelley's Frankenstein and the birth of Sci-fi as it's now understood, thousands of thousands of alternative worlds have been created.

> *"By the creation of imaginary worlds, and by designing fictions, we actually question the world we live in its values, functions, its metabolism, as well as the expectations of its inhabitants."*
> - Ivica Mitrovic (2015)

Dunne and Raby, ideator of speculative design (already parents of the critical design ideology), emphasized the power of the speculative approach in a social and political point of view. These scenarios enable the analysis and creation of different socio-political context, allowing the investigation of alternative realities or contrasting economic models.

It's possible to consider a different world, with a different capitalist model, and with speculative design is possible to start discussing and debating on how that scenario could have been, and what kind of social implication a new technology could have brought.

> **"** *Where typical design takes a look at small issues, speculative design broadens the scope and tries to tackle the biggest issues in society.*

<div align="right">

- Tony Ho Tran (2019)

</div>

Tran, H.T., 2019, *"Speculative design: 3 examples of design fiction"*, in *Inside Design by inVision.*

During the first period of Sci-fi literature, different kind of future were considered and both dystopian and utopian futures were investigated. Nowadays dystopian futures are preeminent in literature and movies, resulting in a generally negative mood and a passive way of thinking about the future. Speculative design should not focus on this good future/bad future dichotomy, but it should focus on dialogue and discussion on how the future could (or should) be.

This social dreaming underline the designer's desire to use imagination to discover how the world could develop, inquiring different social orders and community theories. By "expressing the unthinkable" (Dunne & Raby 2014) through the language of design, it's possible to reignite long-lost debates; using dystopian or utopian alternative realities, a critical designer is able to switch between different narratives to better focus on the issue.

Speculative design approach is considered as a stance more than "a traditionally defined methodology, especially since many designers practice the approach without using this term" (*Mitrovic 2015*). But it's already clear that it's possible to find abductive reasoning and design thinking methods at work here. SD uses every tool it is considered suitable for every given moment, rendering it available to develop different outputs that could suit each situation.

Quoting James Auger (2016):

> "*Speculative design borrows practical methods from its commercial counterparts like industrial and graphic design, but as a form of enquiry it de-couples this practice from direct market imperatives, in turn creating a space to:*
>
> *1- Arrange emerging (not yet available) technological 'elements' to hypothesise future products and artefacts, or*
> *2- Apply alternative plans, motivations, or ideologies to those currently driving technological development, in order to facilitate new arrangements of existing elements, and*
> *3- Develop new perspectives on big systems.*
>
> *With the purpose of:*
>
> *1- Asking 'What is a better future (or present)?'*
> *2- Generating a better understanding of the potential implications of a specific (disruptive) technology in various contexts and on multiple scales – with a particular focus on everyday life.*
> *3- Moving design 'upstream' – to not simply package technology at the end of the technological journey but to impact and influence that journey from its genesis."*

One of the primary goals of a speculative design project is the involvement of the user in order to spark a debate, thus re-thinking the future and reshaping the technological intertwinement. This stated, it's obvious that this practice has to deliver a case or a scenario that the public could experience, and it does not have to be confined into design studios and galleries. The believability of a speculative project is what impacts the target audience. The closer the future scenario is felt by the user, the easier it is for the public to accept it and suspend its disbelief, fully submerging itself into the speculation.

> *"Normalcy is super important. Bad design relies on fireworks and spectacle to create engagement. Good design uses the normal to build a relationship. Or a version of the normal, perhaps a kind of uncanny normal."*
> - Tobias Revell (2013)

Just like critical design, the speculative practice also has its roots in 60s/70s radical and anti-design practice, where the "resistance to the mainstream modernist practice and technological domination, focus on social topics, re-thinking of the profession, very often through a political prism as well"[3] were the core of an anti-establishment design movement that translated into today's speculative/critical design practice its processes.

---

3   Speculative Now!, 2016 *"Speculative Design in the "Real World" / Public Discussion"*

> *"And as the radical design was challenging
> or putting in question the modernist
> paradigm as the dominant ideology of the
> time, the new (speculative) design practices
> are confronting the dominant consumerist
> ideology."*
> - Ivica Mitrovic (2018)

Speculative scenarios take place in a specific future, with set features and characteristics, that abide certain rules, that the designer imposed and must never cross. But how is it possible to define a future that can feel close to the public without stepping the boundaries of science fiction?

Different authors, from the early 70's, tried to consider and study future taxonomy, in order to define it. Starting from "Making Sense of Future Studies" by Norman Henchley, four main classes of "futures" are outlined: possible, plausible, probable, preferable. This idea has been put into a graph by Hancock and Bezold in 1994[4], with one of the first illustrations of the future cone that it's used today.

---

4   Hancock, T.; Bezold, C., 1994, "*Possible futures, preferable futures*", The Healthcare Forum journal,37.23-9.

Joseph Voros, "Cosmic Evolutionary Physicist; Big History Futurist; Civilizational Transition Realist"[1], developed a cone that comprise seven different and alternative futures:

> *"Potential – everything beyond the present moment is a potential future. This comes from the assumption that the future is undetermined and 'open' not inevitable or 'fixed', which is perhaps the foundational axiom of Futures Studies.*
>
> *Preposterous – these are the futures we judge to be 'ridiculous', 'impossible', or that will 'never' happen. I introduced this category because the next category (which used to be the edge of the original form of the cone) did not seem big enough, or able to capture the sometimes-vehement refusal to even entertain them that some people would exhibit to some ideas about the future. This category arises from homage to James Dator and his Second Law of the Future—"any useful idea about the future should appear ridiculous" —as well as to Arthur C. Clarke and his Second Law—"the only way of finding the limits of the possible is by going beyond them into the impossible".*

---

1   Voros, J., 2017, *"The Futures Cone, use and history"* thevoroscope.com

Fig.8: Voros' Future Cone

Potential

Preposterous

Possible

Plausible

today ———→ *time*

Probable
Projected

Preferable

● Scenario
● Wild card scenario

Accordingly, the boundary between the Preposterous and the Possible could be reasonably called the 'Clarke-Dator Boundary' or perhaps the 'Clarke-Dator Discontinuity', since crossing it in the outward direction represents a very important but, for some people, very difficult, movement in prospection thinking.

Possible – these are those futures that we think 'might' happen, based on some future knowledge we do not yet possess, but which we might possess someday (e.g., warp drive).

Plausible – those we think 'could' happen based on our current understanding of how the world works (physical laws, social processes, etc).

Probable – those we think are 'likely to' happen, usually based on (in many cases, quantitative) current trends.

> *Preferable – those we think 'should' or 'ought to' happen: normative value judgements as opposed to the mostly cognitive, above. There is also of course the associated converse class—the un-preferred futures—a 'shadow' form of anti-normative futures that we think should not happen nor ever be allowed to happen (e.g., global climate change scenarios comes to mind).*
>
> *Projected – the (singular) default, business as usual, 'baseline', extrapolated 'continuation of the past through the present' future. This single future could also be considered as being 'the most probable' of the Probable futures."*

This classification is not divided into separate categories, instead it follows a top-down order, meaning that if the steps are followed in a descending order, it's possible to discover different futures "nested" inside the previous one.

6. FUTURE FUTURES

> **"** *Not in trying to predict the future, but in using design to open up all sorts of possibilities that can be discussed, debated, and used to collectively define a preferable future.*

- Dunne and Raby (2014)

Dunne, A.; Raby, F., 2014, *"Speculative everything: Design, fiction, and social dreaming".*

6. FUTURE FUTURES

The speculative practice is fairly new, but designers and artist pitched in from every place on Earth. The production of speculative projects has been great and very different. Since the nature of the practice urges the designer to find a new topic to start a debate, it's only logical the fact that hundreds of topics have been considered.

From genetics to AI, from biology to renewable energy, every project start a small fire, that the user, intertwined in a creative process with the designer, tries to evolve and analyze.

From here on, a selection of different Speculative project is presented, in order to explain and show how much difference is possible to find in project that, apparently, come from the same discipline.

Every studio has its own inquiry method, its own visual and its own way to portray the message, but the goal is always the same: to reflect on the scenario proposed and to think if the alternative world that's shown is something that needs effort in order to be achieved or avoided.

ABDUCTIVE REASONING FOR SPECULATIVE MINDS
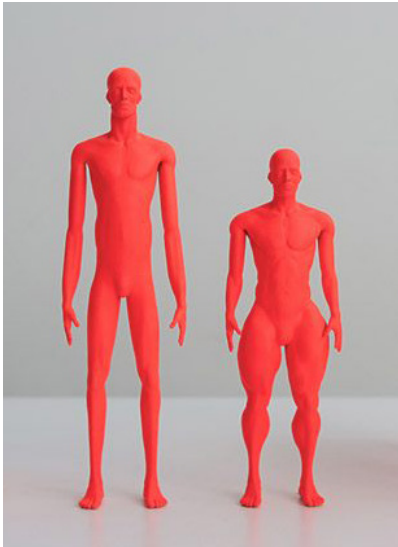
UNITED MICRO KINGDOMS

From://unitedmicrokingdoms.org
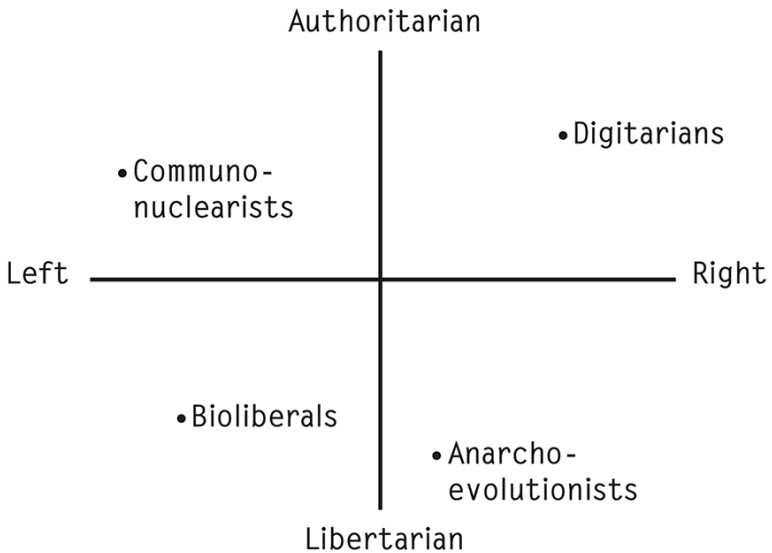
The United Micro Kingdoms (UmK) is divided into four super-shires inhabited by Digitarians, Bioliberals, Anarcho-evolutionists and Communo-nuclearists. Each county is an experimental zone, free to develop its own form of governance, economy and lifestyle. These include neoliberalism and digital technology, social democracy and biotechnology, anarchy and self-experimentation and communism and nuclear energy. The UmK is a deregulated laboratory for competing social, ideological, technological and economic models.
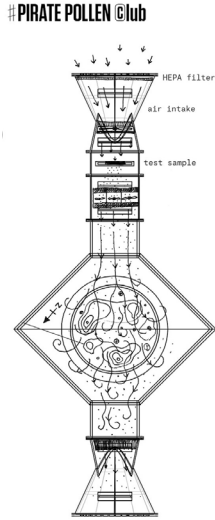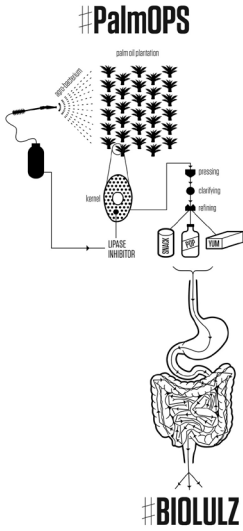
THE NEW WEATHERMEN

From://davidbenque.com

In the face of impending climate crises, environmentalists are becoming increasingly polarised in their ideas and beliefs. Bio-Conservatives argue for a curbing of consumption, a return to Nature and are suspicious of new technologies. Techno-Progressives on the other hand adopt an optimistic trust in progress, and promise to solve problems with newer and better technologies.

However, a number of emerging factors suggest possible alternatives for the relationship between environmentalism and science. Among these are the DIYBIO or Biopunk movements and the campaign for open access to science, as well as efficient, headless and cell-based networks of activists such as Anonymous.

This project explores relationships between ideology and science and how an alternative to current options might manifest itself. The New Weathermen is a fictional group of activists who embrace Synthetic Biology to push for radical environmental change. Challenging the borders between activism and crime, their actions aim to disrupt the status quo and propagate an ambitious vision for the greater good. Deliberately radical and ambiguous, they provide a starting point for discussion about our existing beliefs and ideologies.

ABDUCTIVE REASONING FOR SPECULATIVE MINDS
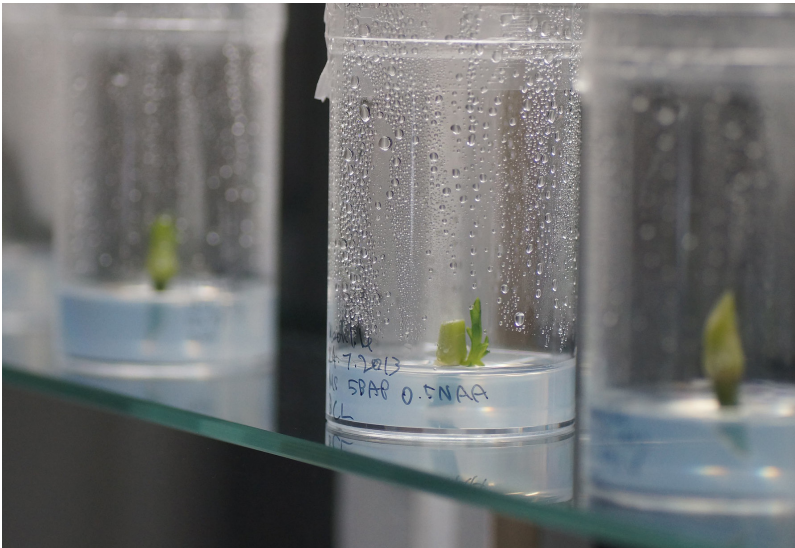
COMMON FLOWERS / WHITE OUT

From://common-flowers.org

The essay addresses the use of images in foreclosing imagination of the future and discusses practices attempting to introduce alternatives.

Neat speculations on perfect, technologically mediated future began to appear in magazines, postcards, cigarette pack and advertisements. These images proliferated through popular culture from cinema and early science fiction to world fairs. They became the backbone of the 'myth of progress', the social contract used to justify the increasingly destructive social and technological changes taking place.
Up until the modern era, governments and the upper classes had looked to emulate the past – the Romans, the Greeks – as the epitome of culture and society. In the industrial revolution, the future became an orientating set of images by which anything could be justified.
The early twentieth century was pockmarked with images of towering cities, hulking trains and massive factories fronted by proud and powerful workers each building towards the greatness of the US, USSR, Germany or whoever. As tens of millions died across Europe, governments and propaganda agents attributed the violence to the future that was to come.

ABDUCTIVE REASONING FOR SPECULATIVE MINDS

NEW MUMBAI

From://tobiasrevell.com

During the Indian Civil War, the Dharavi slums of
Mumbai were flooded with refugees looking to escape
the conflict. The Mumbai authorities, distracted
by defence of the city and facing an already
over-populated and poverty stricken slum could do
little to maintain a semblance of civilised life
in the area. Sometime later a cache of biological
samples appeared through the criminal networks of
Mumbai, in the vain hope that it might provide new
marketable narcotic opportunities. The collective
drive and expertise of the refugees managed to turn
theses genetically-engineered fungal samples into
a new type of infrastructure providing heat, light
and building material for the refugees. Dharavi
rapidly evolved its own micro-economy based around
the mushrooms. This documentary tells the story of
some of the characters involved from Mumbai and the
rest of the world and how Dharavi came to be such
a unique place.

Dolp-human Placenta

The placenta originates from the baby's side, which in this case is adolphin, and not from the human side. This avoids the ethical and legal difficulties associated with reproductive research involving human eggs.

The decidua is formed by implantation of the egg. Usually, foreign cells in the body (for example from other individuals) are attacked by the immune system, but inside the decidua, they are tolerated. However, even though the decidua accepts cells from other individuals, non-human cells would still be attacked. In the dol-human placenta's case, it has been modified to distinguish mammals from non-mammals, making it even more tolerant.

Normal human placenta: Oxygen, nutrients, hormones and antibodies (immunoglobulin Gamma, IgG) delivered to the baby. Dol-human placenta blocks delivery of IgG to the baby.

Decidua

Wastes and carbon dioxide delivered from the baby

Maui's dolphin (Critically Endangered)

The world's rarest and smallest known subspecies of dolphin.
As of 2012, it is estimated that 55 Maui's dolphins exist in the world.
Adults measure between 1.2 – 1.4 m and weigh up to 50 kg.
The newborn baby is almost the same size as a human baby (50 – 60 cm).
Llife span 20 years. New Zealand, West coast of North Island.
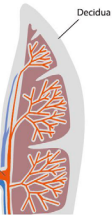
First milk

Dol-human placenta blocks delivery of human IgG to the dolphin baby. Usually Dolphin placenta does not pass the immune system from the mother. Instead it is passed by the 'first milk', which contains with high levels of several antibodies. Also, dolphin milk contains high levels of fat. The human mother needs to feed the synthesised first milk to the baby just after the delivery.

ABDUCTIVE REASONING FOR SPECULATIVE MINDS

I WANNA DELIVER A SHARK…
I WANNA DELIVER A DOLPHIN…

From://aihasegawa.info

This project approaches the problem of human reproduction in an age of
over-population and environmental crisis. With potential food shortages and a population of nearly nine billion people, would a new mother consider incubating and giving birth to an endangered species such as a shark, tuna or dolphin? This project introduces a new argument for giving birth to our food to satisfy our demands for nutrition and childbirth and discusses some of the technical details of how that might be possible.

I Wanna Deliver a Dolphin… imagines a point in the future, where humans will help this species by the advanced technology of synthetic biology. A 'dolp-human placenta' that allows a human female to deliver a dolphin is created, and thus humans can become a surrogate mother to endangered species. Furthermore, gourmets would be able to enjoy the luxury of eating a rare animal: an animal made by their own body, raising questions of the ownership of rare animal life, and life itself.

ABDUCTIVE REASONING FOR SPECULATIVE MINDS

CARBONIFEROUS ROOM

From://aihasegawa.info

The Extreme Environment Love Hotel simulates impossible places to go such as an earth of three hundred million years ago, or the surface of Jupiter by manipulating invisible but ever-present environmental factors, for example atmospheric conditions and gravity. A love hotel is a place for discrete intimacy but also a place for intensive physical and mental exercise. How might our bodies change, struggle or even adapt with varying conditions around us? For example, during the Carboniferous period, ancestors of the dragonfly Meganeura grew up to seventy-five centimeters due to the huge concentration of oxygen in the air, a tremendous boon to the insect but high levels of oxygen would be toxic to our fragile bodies.

Recent figures speculate that around 10% of children are now conceived by In Vitro Fertilisation. The world around us and our reproductive technologies have given rise to new ideas of what sex is or could be and where it stands between our biologically-programmed needs and inclinations and our human fetishes and desires. Perhaps the Extreme Environments Love Hotel might give rise to new evolutions and mutations of the human body and sex and give it a brand new role away from any of these historical precedents.

Jupiter Room Plan
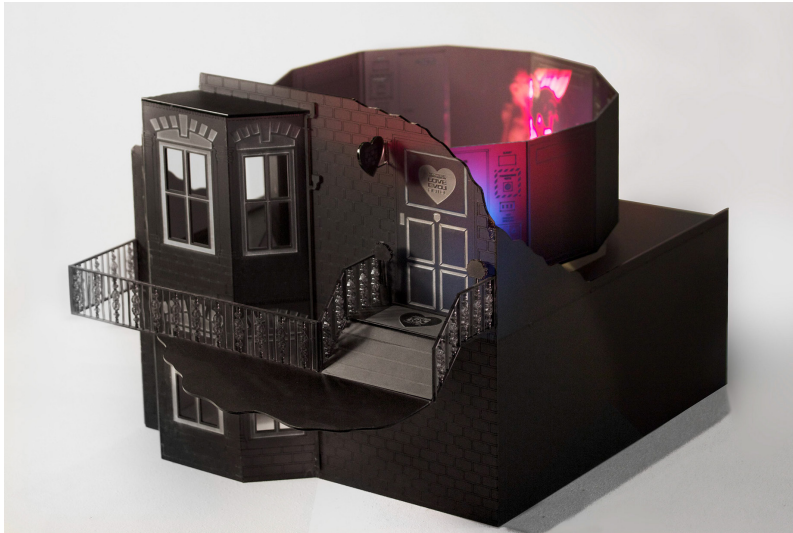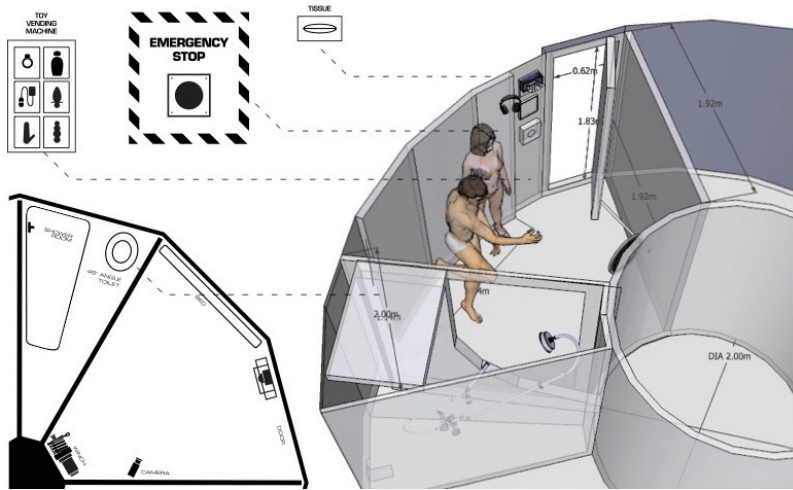
JUPITER ROOM

From://aihasegawa.info

The Jupiter Room is a huge centrifugal mechanism constructed inside of a Love Hotel, a place for couples to share intimate moments in fantasy settings. Jupiter's gravity is 2.34 times heavier than that of earth. This gravity is extreme for human beings but we may very well still be able to live and reproduce. Experiments with mice have shown that they are able to reproduce up to 2.5G. Over 3G the risk of mortality is increased for any conceived mice litter.

How do the effects of this new environment alter our perceptions of love and intimacy and the way couples relate emotionally in such a situation? And what might it mean for our evolution to entertain ourselves and potentially conceive new life in these extreme conditions?

The Extreme Environments Love Hotel is run by a research group who are studying human evolution in extreme environments. Government-funded research in space exploration for the purposes of human colonisation has dried up so the research group need to find a new funding source as well as testbeds for their work. Extreme Environment Love Hotel users are able to choose a discount service which entails cooperation with the researchers as case studies.

Making Mameko and Powako

Recent 3D data from parents' faces

Data manually edited to resemble childhood faces

Blend

Middle point face

Adjust parts according to SNPs/genotype data for each child

Finish

(IM)POSSIBLE BABY

From://aihasegawa.info

(Im)possible Baby is a speculative design project which aims to stimulate discussions about the social, cultural and ethical implications of emerging biotechnologies that could enable same-sex couples to have their own, genetically related children. Delivering a baby from same-sex parents is starting to not look like a sci-fi dream anymore – recent developments in genetics and stem cell research, such as the achievements of scientists from Cambridge University in England and Israel's Weizmann Institute of Science have made this dream much closer to reality. Jacob Hanna, the specialist leading the project's Israeli arm, said it may be possible to use the technique to create a baby in just two years.This project aims to design and inspire debate about the bioethics of producing babies from same-sex couples. In this project, the DNA data of a lesbian couple was analyzed using 23andMe to simulate and visualize their potential children, and then we created a set of fictional, "what if" future family photos using this information to produce a hardcover album which was presented to the couple as a gift. To achieve more public outreach, we worked with the Japanese national television service, NHK, to create a 30-minute documentary film following the whole process, which aired in October 2015.

ABDUCTIVE REASONING FOR SPECULATIVE MINDS

SPUTNIKO!
MENSTRUATION MACHINE

From://sputniko.com

It's 2010, so why are humans still menstruating?
As a female artist I had one intriguing question
I wanted to solve. When the contraceptive pill
first became commercially available in the 1960s,
it was deliberately designed to have a pill-free,
menstruating week every month. This was because
the doctors felt that users would find having no
periods too worrying and unacceptable. 50 years
have passed since then, and modern technology has
accomplished even more -- space travel, mobile
phones, internet, cloning and genetically modified
foods -- but women are still bleeding.
So what does Menstruation mean, biologically,
culturally and historically, to humans? Who might
choose to have it, and how might they have it?
The Menstruation Machine -- fitted with a blood
dispensing mechanism and electrodes simulating the
lower abdomen -- simulates the pain and bleeding of
a 5 day menstruation process.

ABDUCTIVE REASONING FOR SPECULATIVE MINDS

MUTO LABS

From://superflux.in

Mūtō imagined a scenario where the commercialisation of the individual is complete. Every aspect of a person's life is analysed, 'holistic' profiles are developed from big data analysis, and a value is placed on an individual's faculties right down to their genetic code. There are extremely profound consequences for a whole range of industries, and humanity itself in a scenario such as this. What if the data is stolen? What if the data is sold to insurance companies, and access to services like healthcare, and life insurance are restricted? How will the biases of the algorithms be revealed over time? What are the moral, ethical and societal consequences of relying on systems we don't understand any longer?

The project made the future visceral, it gave it form in the world, and the ability to be experienced as if it were real. Mūtō Labs is inspired by the near future, but it is very plausible today. It sits in a kind of conceptual, disembodied uncanny valley where things feel familiar and exciting, but at the same time they are unknown and rather scary. There were no clues that the company was anything other than legitimate, apart from a well placed Gordon Gekko reference here and there.

ABDUCTIVE REASONING FOR SPECULATIVE MINDS
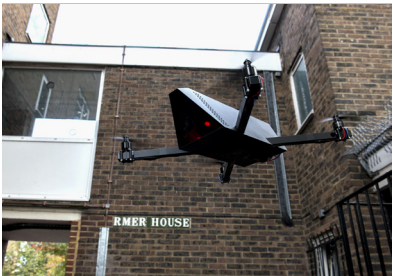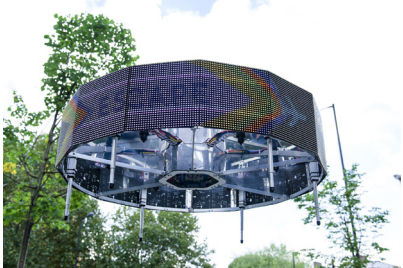
DRONE AVIARY

From://superflux.in

Through a series of ongoing installations, films and publications, the project aims to give a glimpse into a near-future city co-habit with 'intelligent' semi autonomous, networked, flying machines.
The installation at the V&A contains a family of 5 drones and an accompanying film. Each drone is designed to be symbolic of the convergence of wider social and tech trends with specific tasks and functions that are gaining popularity amongst drone enthusiasts and entrepreneurs.

Madison, The Flying Billboard
Newsbreaker, The Media Drone
Nightwatchman, The Surveillance Drone
RouteHawk, Traffic Management Assistant
FlyCam, Instadrone

NATIONAL HEALTH INSURANCE GMP POLICY GUIDELINES

$$Cost_{total\_individual} = \sum_{i=1}^{n} V_i P_i$$

P_i = risk of getting the disease (i)
$P_i = f(gene_x, gene_y, gene_z, ...)$
V_i = cost of a disease treatment (i)
n = number of diseases taken into account by the algorithm

$Benefits_{compensation(i)} = -(V_i) - Procedure$

cost-benefit analysis algorithm.

chromosome XIX price map.

DYNAMIC GENETIC VS. MANN

From://superflux.in

'In 'Dynamic Genetics vs. Mann', we offer a glimpse of a future Britain. Using the evidence gathered in a legal case brought against one Arnold Mann, the project extrapolates current trends to envisage a world of mandatory health insurance, algorithmically-determined genetic risk profiling, and backstreet gene-fixing. The project's protagonist, Arnold Mann, is a 'regular guy' who finds himself in an imposable situation when a government DNA spit test causes an unaffordable rise in his health insurance contributions. Trapped between inflated premiums and the costs of private genetic therapy, Mann approaches a black market clinic. Treated with a bootlegged therapy, the cost of Mann's insurance initially falls, but the illegality of his actions are quickly discovered, and evidence is gathered by the therapy's licence holder, Dynamic Genetics, in the case against Mann.

Comprising a range of photographs, artefacts, documents and video footage, the body of evidence asks the audience to explore the politics of power and control in a troublingly familiar future world. Pieced together, these evidential fragments question the ethical, political and economic implications of innovations in biotechnology that are quietly transforming our world.
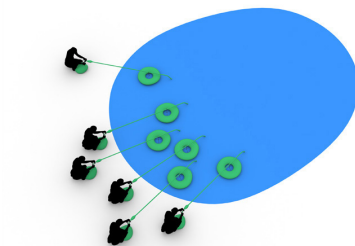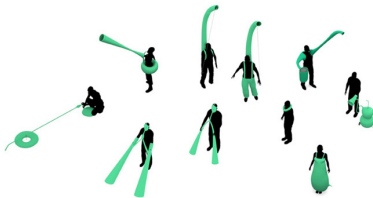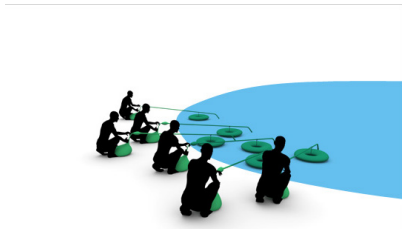
FORAGERS

From://dunneandraby.co.uk

The world is running out of food & we need to produce 70% more food in the next 40 years according to the UN. Yet we continue to over-populate the planet, use up resources and ignore all the warning signs. It is completely unsustainable. In this scenario, a group of people take their fate into their own hands and start building DIY devices. They use synthetic biology to create "microbial stomach bacteria", along with electronic and mechanical devices, to maximise the nutritional value of the urban environment, making-up for any shortcomings in the commercially available but increasingly limited diet. These people are the new urban foragers.

ABDUCTIVE REASONING FOR SPECULATIVE MINDS

STOP AND SCAN/
EM LISTENERS

From://dunneandraby.co.uk

Echelon is brought to the street. Em-listeners move through public spaces, they scan telephone calls, emails and anything else sent over the spectrum. Their highly visible antennae are intended to deter any subversive activities. Their presence is accepted because it means less risk from terrorists.

In this scenario the mind becomes a new site of interest for the state, requiring new protocols of ownership, access, protection and transparency. Police carry out random stop and search scans near crime scenes. Using a special scanner, people are shown images that only the criminal could know about. The device is based on brain fingerprinting technology where a scanner detects a characteristic electrical brainwave response whenever a person responds to a known stimulus. If the person being scanned appears to recognise an image, a light glows and they are taken away for further processing.

7. SPECULATE!

> **"** *This way of thinking about futures in plural changes our understanding of them from something happening to us towards something we shape.*
>
> *- Sarmite & Cruchade (2018)*

Cruchade, A.; Sarmite, P., 2018, *"Can Speculative Design make UX better?" in "UX Planet" @ Medium.com.*

7. SPECULATE!

Every different project tried to stay true to its
speculative nature, sparking a debate and watching
the users/viewer argue and discuss about the topic.

Some projects were emotionally heavier than others,
but that is not the point of a speculative work.
It could be the fairiest and simplest topic, but,
if it has the power of generating a controversy
in a not-so-much-defined close future, then it's
perfect.

Designers embraced this critical approach from
allover the world, fighting against the status
quo or against a future practice that they felt
"just not right", designing services/objects or
experiences today, hoping that they don't have to
do that in the future.

This, right here, is the power of speculative
design; designing something that may seem absurd
or completely out of mind, something that the user
would never think about. But this practice has the
incredible opportunity of being able to weight the
future, trying that before it is too late.

Even if it's a new practice, and there are no studies on the subject (there is still no wikipedia page, and as it's known, "If it does not exist on wikipedia, then it does not exists at all"), it borrows every tool from the traditional design practice, focussing a lot more on the abductive process.

The steps that have been followed in this paper were not set beforehand, but they've been "discovered" as the research went on. Starting with a Seealsology Network (shown in appendix a.), different topics were considered, but only after the entire research process it has been possible to trace a clear path through the incredibly vast and tortous world that the search for a connection between speculative design and semiotics creates.

Abductive reasoning is not just a tool, is a method and a way of thinking. As it was stated, AR is the only inference that can generate new knowledge.
Even if it works "like a "flash"" (Peirce 1931), it's now known that it follows a mental process, using other inferences in order to accomplish its task.

Speclative design relies heavily on abductive reasoning, embracing its philosophy and its core methodology, expanding it in order to imagine futures that would never be considered otherwise.

This union benefit both practices. Semiotics and its sensemaking process and its abductive thinking are, now more than ever, central in a design practice, while speculative design can profit using tools that have been studied for centuries.

From the beginning of time, humans everywhere abducted alternative ideas from the future in order to solve problems that they had. This is one of the first historical periods where it's possible to "mentally jump" in the future in order to design something that does not exist, and that will likely never exist. And that is beautiful.

Getting to know "what could be" will benefit everyone, from designers to workers, from teachers to doctors. It's a sort of "sneak peek" on what the future could have in store for us.

On the other side, opening a rift on a possible future, in order to discuss on what's happening in that future, can prevent that scenario to happen, but it's the risk of the speculative practice (and, after researching a lot of possible speculative scenario, maybe it's better this way).

The future is unknown, but if it's possbile to foresse it and adjust our route consequently, then the speculation is highly suggested!

PART TWO

ABDUCTIVE REASONING
FOR SPECULATIVE MINDS

8. PROJECT ABACUS

ABACUS

A new take on life

It's April 2037, the battle against bacteria has come to the point of no return.

Bacteria gained the ability to mutate faster than ever, and antibodies cannot keep up with their never-ending changing nature. The antibiotic resistance is roughly 100%, and there is no way to solve the problem. The only possibility is to keep the bacteria under control and to recombine a new antibiotic "on the fly", combining different solutions into a new one.

The ABACUS mask, combined with the internal sensor, enables this possibility, helping humans in this apparently unwinnable war.

.I Bacteria Insight

Bacteria are found all around us; in the air we breathe, in the soil and water, even inside and on our bodies. They are tiny single-celled organisms, only a few micrometers in size.

Antibiotics are important medicines for the treatment of bacterial infections in humans and animals. Since their introduction in the 1940's antibiotics have saved countless lives and has made many medical techniques possible and/or safer.

The discovery of antibiotics finally provided mankind with the means to treat many common bacterial infections efficiently. However, massive use of antibiotics since their introduction as medicines has lead to increased occurrence and spread of bacteria that are resistant to antibiotics.

Antibiotic resistance is the ability of bacteria to protect themselves against the effects of an antibiotic.

In the presence of the antibiotic, only resistant bacteria will survive (or at least multiply faster than susceptible bacteria) and increase in numbers. If a resistance mechanism gives an advantage to the bacterium it may be maintained, and will be passed on to coming generations as the bacterium divides, or be passed along by horizontal transfer. The resistant bacteria can spread via many routes, for example in food, water, by traveling and trade.

Bacteria grow and multiply fast and can reach large numbers. When bacteria multiply, one cell divides into two cells. Before the bacterium can divide, it needs to make two identical copies of the DNA in its chromosome; one for each cell. Every time the bacterium goes through this process there is a chance (or risk, depending on the end result) that errors occur; so-called mutations. These mutations are random and can be located anywhere in the DNA. Mutations can also form due to external factors like radiation or harmful chemicals.

Bacteria Population

Bacteria multiply fast and can quickly reach large populations.

Bacteria
100 generations   ≈   25 hours

Humans
100 generations   ≈   2,000 years

*Calculation based on a generation time of 15 minutes for bacteria and 20 years for man.

10 bacteria generation visualized.
It can grow from 1 bacterium to 256 bacteria in 2 hours

The resistance of bacteria and their ability to adapt to our medicines has been known since the first antibiotics were designed. It is not possible to solve the issue, it's only possible to try and stem the problem. The improper use of AB, the non-responsible disposal, in addition to the massive use on farms, are the main causes of the increase in the resistance of bacteria. The more medicine tries to fight them without following a logic, the stronger they become.

Antibiotics disrupt essential structures or processes in bacteria. This in turn either kills the bacteria or stops them from multiplying. Bacteria have in turn evolved many antibiotic resistance mechanisms to withstand the actions of antibiotics.

Infections with multidrug-resistant bacteria are hard to treat since few or even no treatment options remain, they facilitates spread of antibiotic resistance, and multidrug-resistance complicates efforts to reduce resistance.

It is important to understand that antibiotic resistance is a natural phenomenon. For as long as there have been antibiotics, there have also been microbes that can survive their action. Long before the introduction of antibiotics as medicines, resistance mechanisms could be found in environmental bacteria and as protective measures in antibiotic-producing microbes. However, antibiotic resistance was not common in pathogenic bacteria.

During the hundreds or so years that humans have used antibiotics, antibiotic resistance has become prevalent in environmental and pathogenic bacteria alike. There has been and continues to be a massive use of antibiotics within the health care, veterinary and agricultural sectors, which has created a strong selection pressure for resistant bacteria. Human use of antibiotics has also resulted in an accumulation of these drugs in many environments, where antibiotic resistant bacteria can flourish. This has also resulted in selection and spread of bacteria that are resistant to several different antibiotics.

Antibiotics are indispensable when treating bacterial infections in humans and animals, but antibiotics are often used when not needed, when ineffective and/or in the wrong way.

It is important to understand that the problem of antibiotic resistance cannot be "solved" by the discovery of one or a few new antibiotics. Antibiotic resistance will eventually develop to any antibiotic, but prudent use will slow the process.[1]

---

1   Adapted from: reactgroup.org

AMR deaths

AMR in 2050
10 million

Tetanus
60,000

Road traffic
accidents
1.2 million

AMR now
700,000
(low estimate)

Cancer
8.2 million

Measles
130,000

Cholera
100,000-
120,000

Diarrhoeal
disease
1.4 million

Diabetes
1.5 million
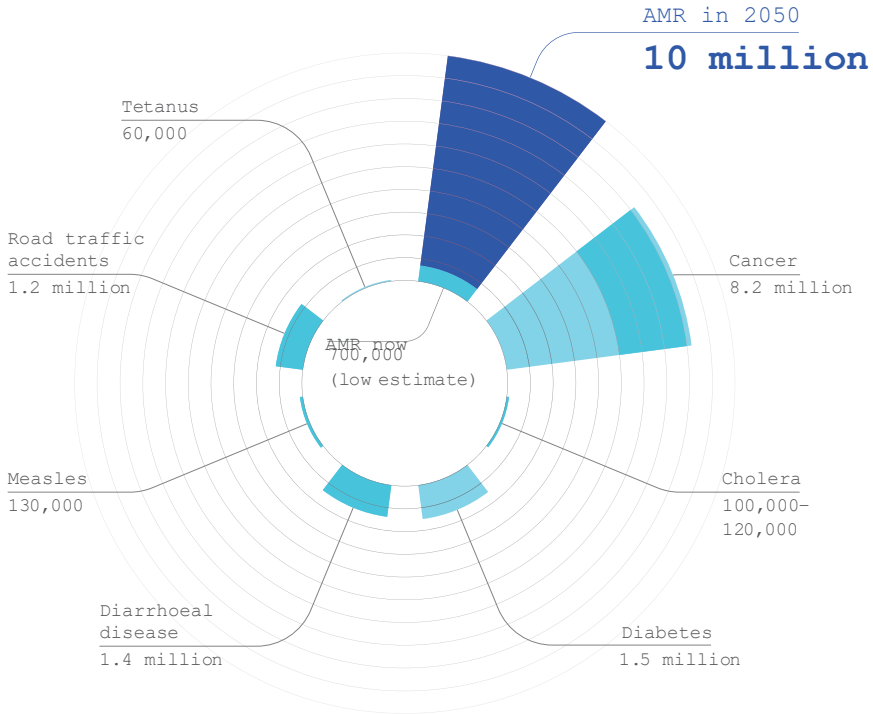
"Resistance has increasingly become a problem in recent years because the pace at which we are discovering novel antibiotics has slowed drastically, while antibiotic use is rising. And it is not just a problem confined to bacteria, but all microbes that have the potential to mutate and render our drugs ineffective."

- From "Antimicrobial Resistance: Tackling a Crisis [...]".
Review on Antimicrobial Resistance, 2014.

GDP loss

Total GDP loss
$100.2 trillion

2014　2020　2030　2040　2050

0

−2$T

−4$T

−6$T

−8$T

−10$T
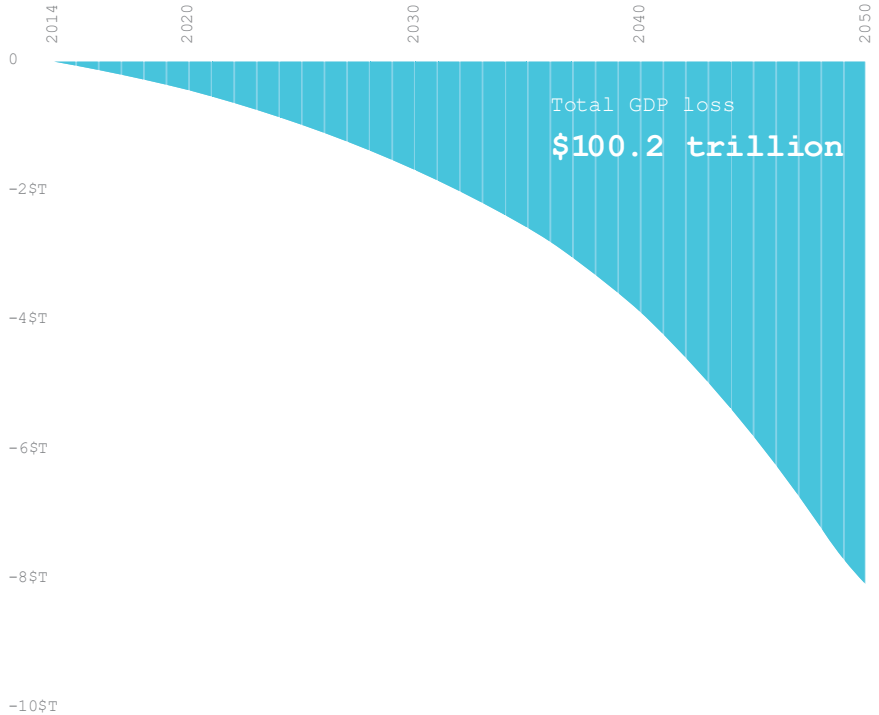
"300 million people are expected to die prematurely because of drug resistance over the next 35 years and the world's GDP will be 2 to 3.5% lower than it otherwise would be in 2050. This means that between now and 2050 the world can expect to lose between 60 and 100 trillion USD worth of economic output if antimicrobial drug resistance is not tackled."

– From "Antimicrobial Resistance: Tackling a Crisis [...]".
Review on Antimicrobial Resistance, 2014.

AMR mortality per country

in 2050

North
America
317,000

Latin
America
392,000
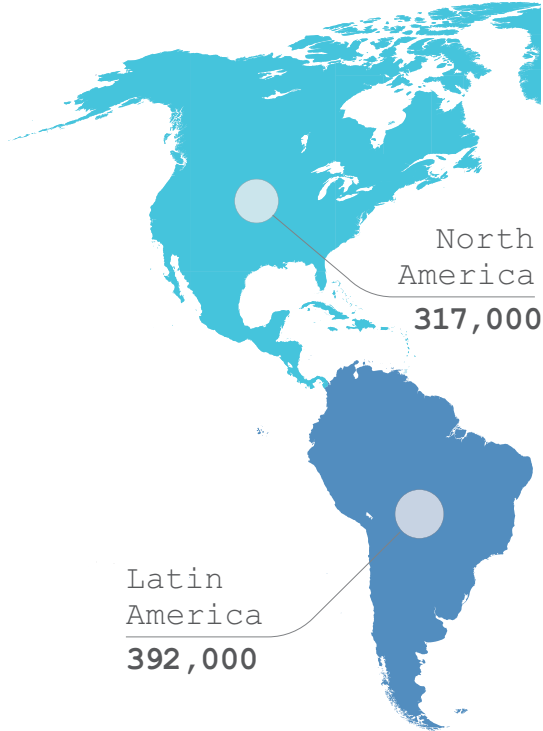
"Countries that already have high malaria, HIV or TB rates are likely to particularly suffer as resistance to current treatments increases. For countries in the OECD (Organisation for Economic Co-operation and Development), the cumulative loss of economic output by 2050 will amount to between USD 20 and 35 trillion."

- From "Antimicrobial Resistance: Tackling a Crisis [...]".
Review on Antimicrobial Resistance, 2014.

Europe
390,000

Asia
4,730,000

Oceania
22,000

Africa
4,150,000

Number of deaths

Mortality x 10.000 population

5   6   7   8   9   10   >
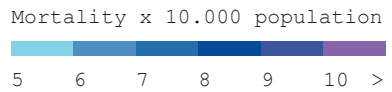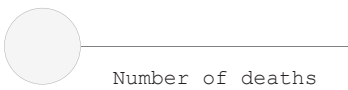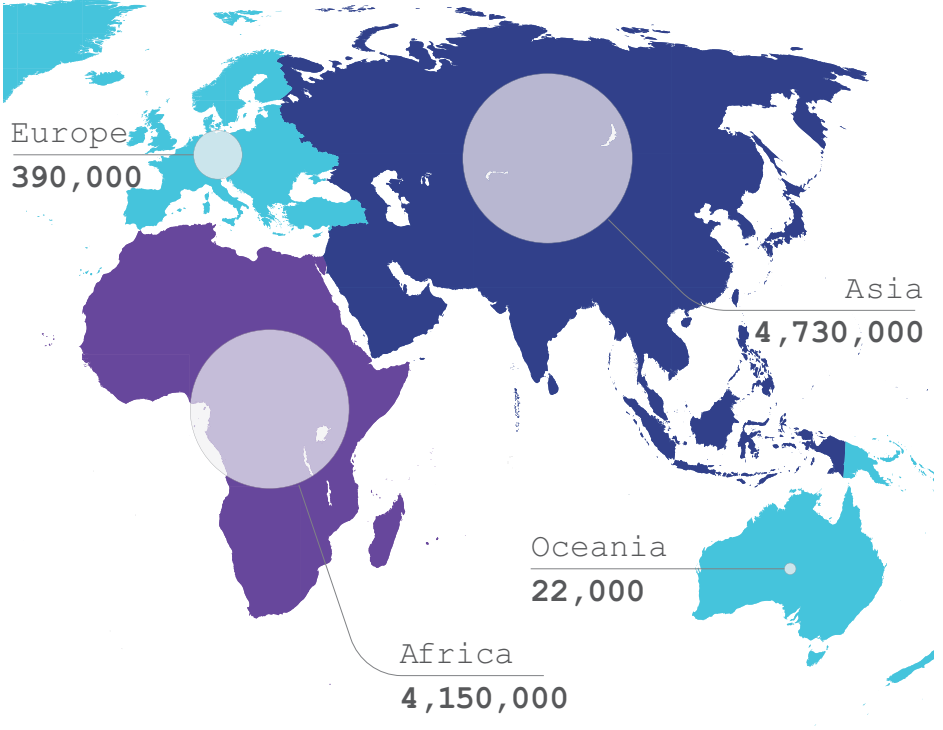
In 2019, after the discovery of the first new antibiotics for over 20 years and the introduction of the first quantum computers by IBM, the resistance of the bacteria had reached the lowest point of the last century.

After the cold winter of 2027, bacteria evolved. Being able to create a new generation in an average of 7/10 minutes, the resistant strains have increased exponentially. Even a slight variation could make the antibiotic ineffective.

In '36, after years of studies and interruptions due to legislation not keeping up with the technologies, ABACUS is finally marketed. Not being able to eradicate the bacteria, it keeps them under control slowing down the generation of new mutations releasing an exactly modulated antibiotic for the strain that must kept under control.

.II Project Timeline

During the early 2020s, discoveries in the field of medicine and genetic recombination substantially transformed the war on bacteria, allowing humans to eradicate resistant strains as soon as they changed.

In 2031, thanks to the advances in genetic recombination, it was made possible to create a antibodies recombinator (RiBod), that was able to follow the evolution of bacteria. The only problem was that the user had to stay connected to the machine constantly to avoid subsequently mutations.

ABDUCTIVE REASONING FOR SPECULATIVE MINDS

.III ABACUS Element

ABACUS enviroment is aways growing and learning, and it is comprised of:

ABACUS Element
     ABACUS Mask
          ABACUS Sensor
               ABACUS Refill

The system is constantly connected to the central AI, in order to monitor all the mutated strains across the globe. This way, ABACUS is able to predict where and when the next mutation could occour, and act before it spreads.

This ever-growing bacteria mutation database helps the central AI, but in turns it helps the personal intelligent assistant (ABACUS Element), that sits on every mask, to better moitor the user and correct the antibiotic it needs.

ABACUS Element can be connected to every smart device, from houses to cars, from smart-watches to mirrors. Learning user's habits and preferences allows the assistant to be sure to keep the mask always full and charged.

ABDUCTIVE REASONING FOR SPECULATIVE MINDS

ABACUS Mask

Equipped with compartments in which to insert the refills of the basic elements that make up the antibiotics, the mask recombines and releases the AB necessary to counter the strain of bacteria that resides in the user's body, keeping them under control slowing down the mutation.

With 10 small tanks that can carry different substances, this mask works perfectly for every user, adjusting the dosage and the composition based on biometric data coming from the ABACUS sensor.

ABACUS AI keeps the mask updated and deliever instruction on how to recombinate substances every time is needed.

ABACUS Sensor

ABACUS Sensor is implanted inside the users's arm and it keeps the AI updated on its conditions, giving indication on what kind of new antibiotic the Mask would need to recombine.

Once it's inserted, it only takes one day to sync with the host body. After 24 hours have passed, it starts monitoring the user, helping him fighting off every mutant strain.

ABDUCTIVE REASONING FOR SPECULATIVE MINDS

ABACUS Refill

ABACUS Refill allows the mask to run smoothly,
signaling the user when one antibiotic is almost
ended, so that he could refill it. With a single
entrance, it's extremely easy to charge the mask.
Just open the blister, squeeze it and it's done!

A pack of 10 antibiotics could last for almost a
month, and the user would be noticed daily on the
status of the ABs tanks.

9. SPECULATIVE INFOPOETRY

> 66 *You can read in the newspaper, you can be outraged and forget in 20 minutes. When it is visualized like this [...], it remains with you forever.*

> - Paola Antonelli (2014)

Antonelli, P., 2014, *"O'Reilly The New Frontiers of Design"* Solid 2014 Keynote.

9. SPECULATIVE INFOPOETRY

.I Data Visualization

The visualization of data, nowadays, is a common practice. It's possible to find pie charts, graphs and bars everywhere, but the meaning is always the same: trying to convey some sort of significance through a plain and clear visualization of something complex. Data visualization has always been used for understanding the meaning in a way that the human being can comprehend at first glance.

The beginning of this practice highlights its purpose. In 1786, a Scottish engineer, William Playfair (apprentice of James Watt, inventor who perfected the steam engine) used his ability in drawing patents to create different graphs that are still used today: line, area, bar and pie chart. His "Commercial and political atlas" has been used as an example for years in the economic field.

During mid 19th century, data visualization began to be used as a way to highlight issues and to show the size of said problems. For example, John Snow and Florence Nightingale were two of the most prolific scientist that used graphs as a tool in order to frame medical conditions or the causes of mortality in the army, bringing the attention of the broad public on pressing themes.

It's possible to realize the power and the impact that a good data visualization could have if it focuses on a hot topic, but since it's possible to visualize virtually everything, it's the designer goal to synthesize data in order to visualize it in a meaningful way. A visualization could be worth a thousand words, since it conveys a (more or less) powerful message. Data inherently include the meaning, but it's the designer job to extrapolate it.

In her intervention at O'Reilly's Solid 2014 Keynote, Paola Antonelli use "Million Dollar Blocks" as an example of how much a visualization could convey more emotions than words and data.

Left: John Snow's "Deaths from cholera"

Below: Florence Nightingale's "Causes of mortality in the army"
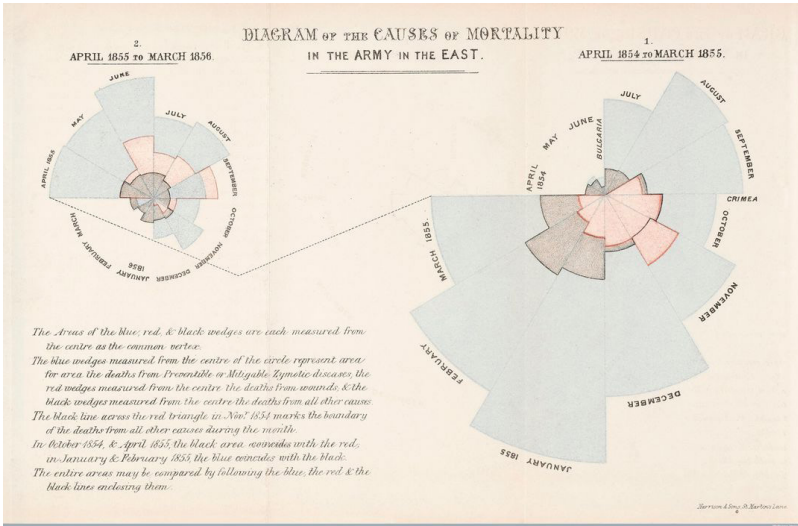
ABDUCTIVE REASONING FOR SPECULATIVE MINDS

MILLION DOLLAR BLOCKS

From://chicagosmilliondollarblocks.com

In Million Dollar Blocks, Laura Kurgan and her collaborators take the prison-industrial complex to task by visualizing the geography of incarceration and the city-prison-city-prison migration flow in Phoenix, Wichita, New Orleans, and New York City. Constructed by joining GIS coordinates of prisoners' home addresses to census tracts, Kurgan and Cadora's incarceration maps explore the intersections between poverty, race, prison admissions, and prison expenditures to reveal how the government spends over a million dollars to imprison a specific demographic of city dwellers, often those living within one census block.

What would the city look like if less money was spent on incarceration and more was directed to developing these neighborhoods?, Kurgan asks. Million Dollar Blocks exposes the dissonance between crime maps and incarceration maps and calls for a reexamination of the role of the criminal justice system in the displacement of over two million people in the United States.

.II Poetry Concept

The idea that a visualization can portray emotion is simply an evolution of its utility. The hardest the topic considered is, the more the infographic could move spirits.

This concept, also known as Infopoetry, enables the designer to "investigate more specifically the relationship between a given content and its possible forms of expression and discourse, as well as a research field on the emotional and cognitive effects on the reception of visualization artifacts"[1]

The object would be to see and internalize the phenomenon, not only in a visual way, but also in a meaningful and emphatic sense.

A series of different visualizations that tried to insert the poetry concept are shown below, and, as it's possible to see, the topic, just like the "feel", is always different.

1   Infopoetry Exibition 2019 @ PoliMi

ABDUCTIVE REASONING FOR SPECULATIVE MINDS

LINES (57° 59' N, 7° 16'W)

From://niittyvirta.com

By use of sensors, the installation interacts with the rising tidal changes; activating on high tide. The work provides a visual reference of future sea level rise.

The installation explores the catastrophic impact of our relationship with nature and its long term effects. The work provokes a dialogue on how the rising sea levels will affect coastal areas, its inhabitants and land usage in the future.

This is specifically relevant in the low lying island archipelago of Uist in the Outer Hebrides off the west coast of Scotland, and in particular to Taigh Chearsabhagh Museum & Arts Centre in Lochmaddy where the installation is situated. The centre cannot develop on its existing site due to predicted storm surge sea levels.

RAIL DELAY SCARF

From://twitter.com/sara__weber

Sarah Weber posted a picture of a scarf that her mom knit to represent rail delays. Weber's mom knitted two rows per day and used color to indicate the delay. Grey was under 5 minutes, pink was 5 to 30 minutes, and red was over 30 minutes.
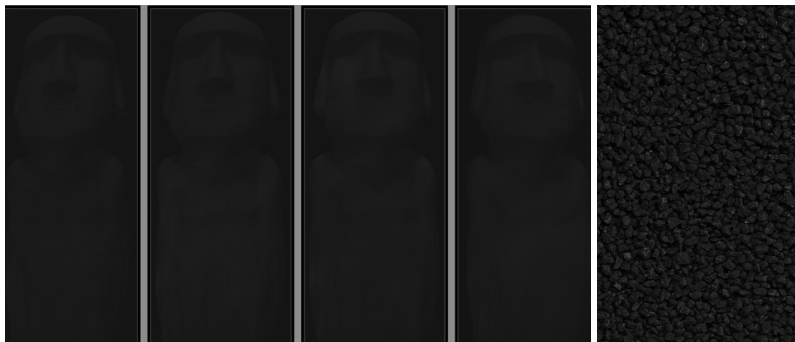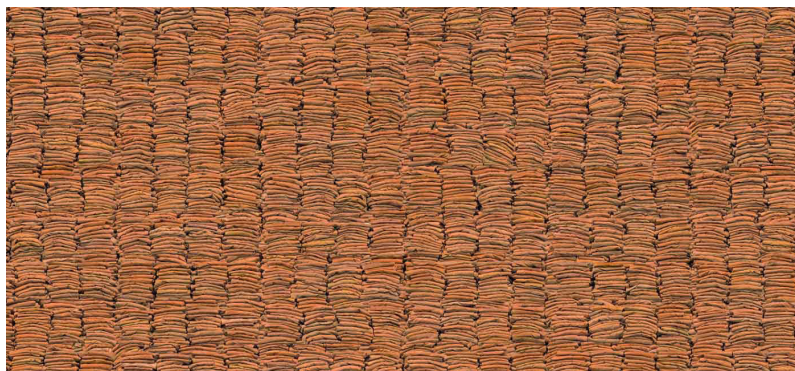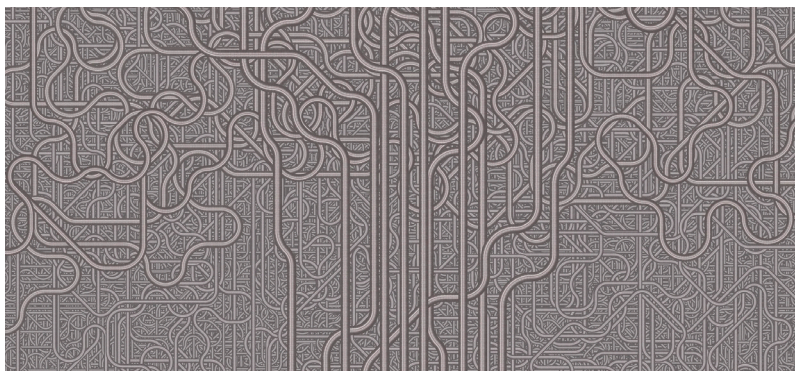
RUNNING THE NUMBERS II

From://chrisjordan.com

This ongoing series looks at mass phenomena that occur on a global scale. Similarly to the first Running the Numbers series, each image portrays a specific quantity of something: the number of tuna fished from the world's oceans every fifteen minutes, for example. But this time the statistics are global in scale, rather than specifically American.

Finding meaning in global mass phenomena can be difficult because the phenomena themselves are invisible, spread across the earth in millions of separate places. There is no Mount Everest of waste that we can make a pilgrimage to and behold the sobering aggregate of our discarded stuff, seeing and feeling it viscerally with our senses.

Instead, we are stuck with trying to comprehend the gravity of these phenomena through the anaesthetizing and emotionally barren language of statistics. Sociologists tell us that the human mind cannot meaningfully grasp numbers higher than a few thousand; yet every day we read of mass phenomena characterized by numbers in the millions, billions, even trillions.

Compounding this challenge is our sense of insignificance as individuals in a world of 6.7 billion people. And if we fully open ourselves to the horrors of our times, we also risk becoming overwhelmed, panicked, or emotionally paralyzed.

20/200	**EMANCIPATION**	200 ft / 61 m — 1
20/100	**REBELLION PROCLAMATION**	100 ft / 30.5 m — 2
20/70	**COURTS WHITE STATED**	70 ft / 21.3 m — 3
30/50	**DISBURSMENTS INSURGENTS GIVES COLORED**	50 ft / 15.2 m — 4
20/40	LOYAL EFFICIENCY INSURRECTION CENT REGION	40 ft / 12.2 m — 5
20/30	JUDICIAL LET INSURGENT SAY CASH BEGINNING	30 ft / 9.14 m — 6
20/25	FOREVER ASK KENTUCKY SOURCES NEITHER HOW LABORERS	25 ft / 7.62 m — 7
20/20	OPEN CLASS MARYLAND CERTAINLY POSTAL SAVE ABUNDANT TEMPORARY	20 ft / 6.10 m — 8
20/15	BLOCKADE SUBMIT KNOW SUPPRESSION WANT VIRGINIA PENSIONS FRIENDS SEVEN	15 ft / 4.57 m — 9
20/13	MAINTAINED COMPLETE TELEGRAPH BONDS PENSIONERS DISLOYAL EXPEDIENCY RESTORATION TENNESSEE WHY	13 ft / 3.96 m — 10
20/10	VITAL COME PLACES GO KNOWN TOTAL KNOWS SALES LARGELY PERSON MODE	10 ft / 3.05 m — 11

ABRAHAM LINCOLN / 1861–1865

	BANK	1		**RESULTS**	1
	MONEY PAYMENT	2		MILLIONS SPECIE	2
	CHAMBERS INSTITUTIONS MESSAGE	3		MONEYS SUSPENSION BANKING	3
	RELATION BANKS SURPLUS HERETOFORE	4		PAYMENTS CIRCUIT PRIVILEGES SUCCESSFUL	4
	CURRENCY HOPED DIFFERENT SECURE BILL	5		KEEPING PRICE ABROAD ISSUE CONNECTION	5
	REMOVAL APPLICATION REPUBLIC FUNDS CALCULATED	6		EMBARRASSMENTS EFFORTS ENTIRE EXISTED SPECIAL EXIST	6
	POSSIBLE CONTROL LOCAL AGENTS RULE TARIFF PASSED	7		CARRY BELIEVE ANTICIPATED NOTICE PROMPT CREATION PRICES	7
	KING BENEFICIAL LONGER EXCHANGE DISTRIBUTION EXPECT MOTIVES ASSURANCES	8		POSTMASTER PAPER DIFFICULTY SETTLED EVENTS MEXICAN CAREFUL PRACTICABLE	8
	POINTS PRESERVE CARE ADOPTION MATTER FEEL SAVE USES STIPULATIONS	9		HELD CAPITOL DIFFERENCE EFFECTS HOME EFFICIENT ENABLE COMMISSION IMPORTANT	9
	PRODUCE COSTS STUDENT RULE HIGHS MINTS OFFICIAL EFFORTS EFFICIENCY SUPERIOR	10		CHAMBERS ACCOMPLISHMENT HONGLE KEY BACK RIGHT PREFERENCE MINDS START CUSTOMERS	10
	KNOWN EXPENSE WAY GOVERNED FINE LOWER HERBS AREA INTERESTS DOING MONEY	11		DISTURBED RESPONSIBILITIES DUTY EXECUTION ORDER EXPENSES READY GROUP MERRY END FARMERS	11

EASTERN NATION / 1820-1838   MARTIN VAN BUREN / 1837-1841

HINDSIGHT IS ALWAYS 2020

From://lukedubois.com

Hindsight is Always 20/20 is a work I developed using data from the American Presidency Project at the University of California, Santa Barbara. The piece consists of 41 Snellen-style eye charts, plus title and essay, showing the top 66 words of each American presidents' State of the Union addresses from George Washington through George W. Bush. The charts reflect the themes, ideals, and topics of their age, allowing viewers to experience American history through political rhetoric.
The piece has been touring nationwide since 2008 in two versions. The first is a large- scale public sculpture of 43 steel light boxes illuminated with fluorescent tubes backlighting a Lexan screen containing each president's eye chart. The light boxes are built to Snellen scale, allowing viewers to test their vision against that of the presidents. As the essay for the piece states, the project was envisioned as a way to emphasize the State of the Union address as a significant aspect of the power relationship between the executive and legislative branches of the U.S. government, as well as comment on the metaphor of "vision" in evaluating leadership throughout history.

167

ABDUCTIVE REASONING FOR SPECULATIVE MINDS

TAKE A BULLET FOR THIS CITY

From://lukedubois.com

In New Orleans, there have been, as of this time of writing (September, 2014), 2262 calls to 911 reporting a "Discharging Firearm" since January 1st. The bulk of these shootings occur at night, on weekends, and in the wee hours of the morning. In much of this city, this data tells us, though it may be three o'clock, all is not well, and hasn't been for a very long time.

Take a Bullet for This City is a proof-of-concept for a piece that could serve New Orleans, or any community plagued by gun violence. A simple computer-driven mechanism pulls the trigger of a gun loaded with blanks in response to a shooting in the city, ejecting a spent cartridge into a vitrine that accumulates empty bullets. The noise and flash of the gun provides an alarm that is itself meant to alarm; the vitrine resembles a wishing well, only it represents wishes taken away, not granted. This piece is hard data in both senses of the word: it is based on facts; facts that are, by their very nature, intended to hurt us. This piece could listen to any city, and it could run for years, and it belongs, perhaps, out-of-doors. The new town crier, but in reverse; all will be well only when this gun finally falls silent.

.III Infopoetry

This is a take on infopoetry applied to a speculative project.

The data comes from different sources: AMR review from HM government, AMR global report from WHO and several other papers (wich will be listed later), but they've been adapted in order to suit the speculative scenario.

Right now, the mutation index in listed around 0.0006 per generation, meaning that every generation has 6‰ of different bacteria. This said, it takes (quite) a long time for a mutation to be effective, considered that if it's weak, the traditional antibiotic could destory it.

For the purpose of this visualization, the index has been modified to 0.003, in order to enhance the power of the visualization.

There are two different reading layers:

1- The abnormous number of bacteria that can be generated in such a short amount of time.

2- The extremely high rate at wich bacteria can mutate, rending our antibiotics ineffective.

1

2

15 min

4

8

16

32

64

128

256

512

1024

2048

4096

8192

3 h 45 min
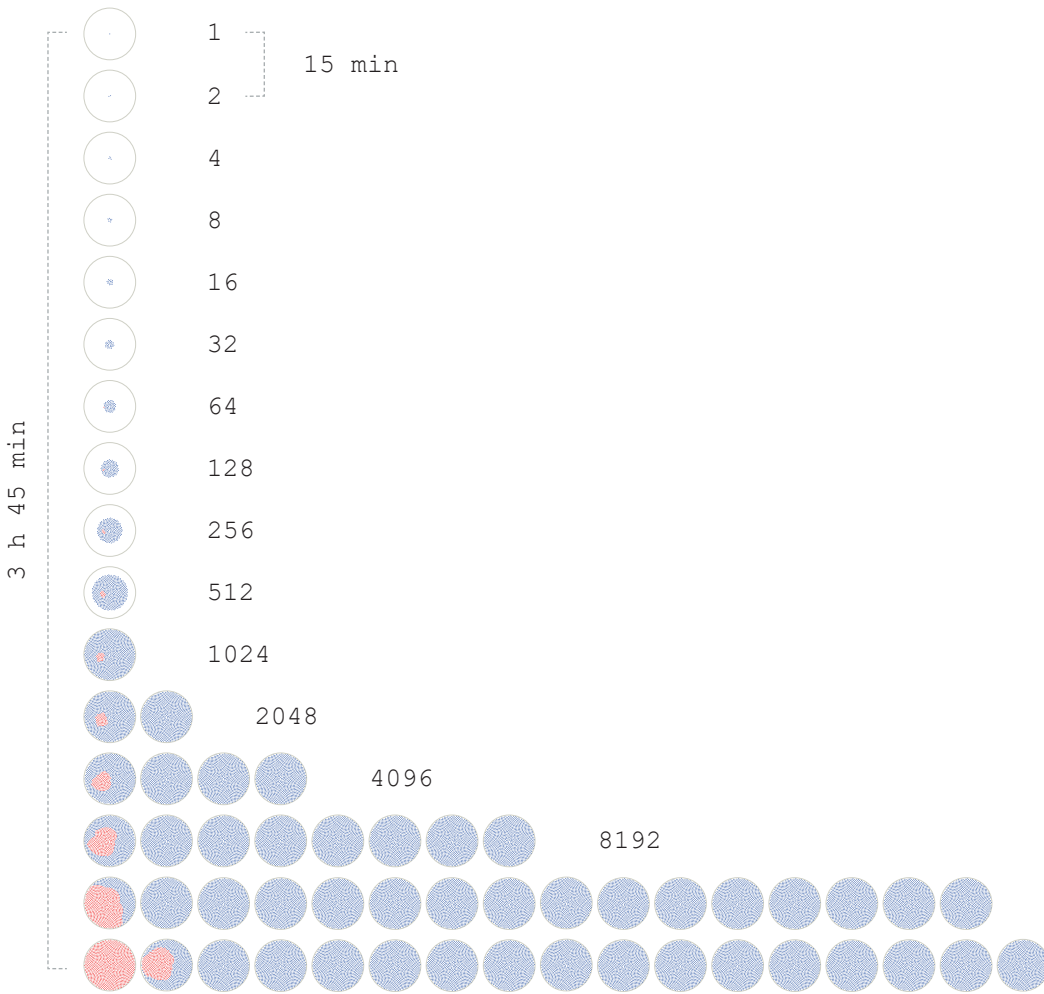
Bacteria population

This visualization shows the exponential growth of a bacteria in a safe environment. Only 15 minutes passes between every generation, so it takes only 4 hours for a bacterium to grow exponetially untill it reaches 32.768 speciments.

At this rate, it's easy to understand how dangerous and disruptive bacteria can be, if they're not treated properly and/or they're left to reproduce.

16384
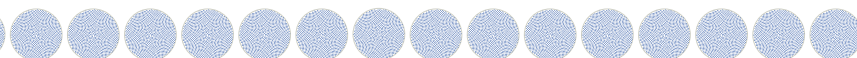
32768

Mutation growth

The mutated bacterial strain grows alongside the growht of the bacteria itself.

In only 9 generation, it reaches more than 1400 speciments, showing that the mutation could turn into an indipendent strain in a few hours.
The mutation index does not indicate the percentage of mutant bacteria for each generation, but, instead, it shows how much different is the new bacterium compared to the parent.

The visualization highlight this difference with a different color, meaning that, after 15 generation, the new bacterium will be 5% different from its parent, giving him an extremely high chance to generate a resistant strand.
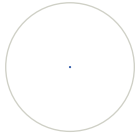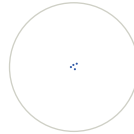
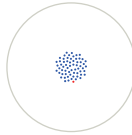**Gen 00**
0

Gen 01
0

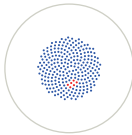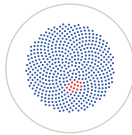**Gen 02**
0

Gen 03
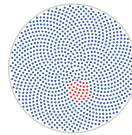0

Gen 04
0

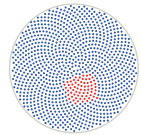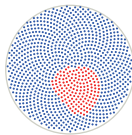**Gen 05**
0

Gen 06
1

Gen 07
2

Gen 08
6

Gen 09
14

Gen 10
30

Gen 11
67

Gen 12
147
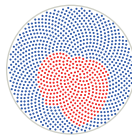
Gen 13
319

Gen 14
671

Gen 15
1441

Gen 00

Conta batterica: 1
Indice Mutazione: 0
Tempo da 00:   0
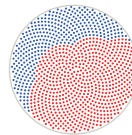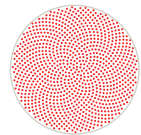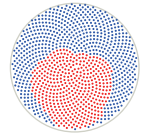
Infopoetry

A total of 72 petri dishes, filled with handsoap covered with an acrylic printed disk, were used for this visualization.

Every dish depicts the right amount of dots to equal the number of bacteria grown until that generation.

The red ones were used to represent the percent value of the potential difference a bacterium could have from its parent on the next generation.

ABDUCTIVE REASONING FOR SPECULATIVE MINDS
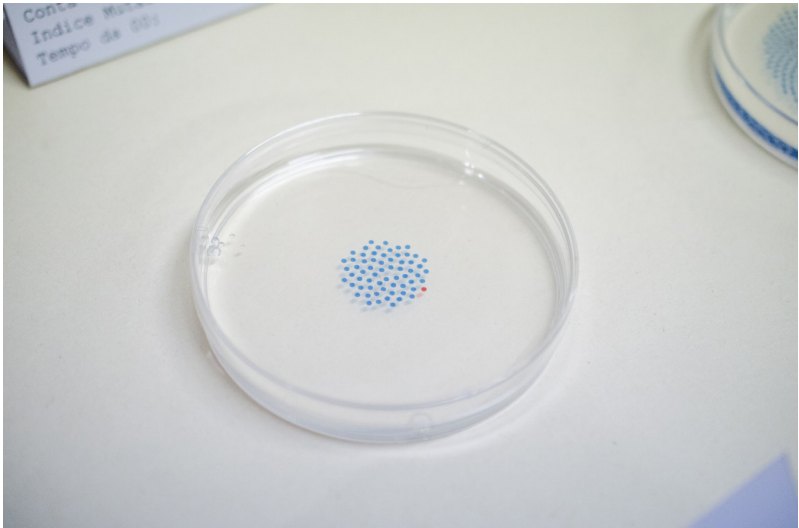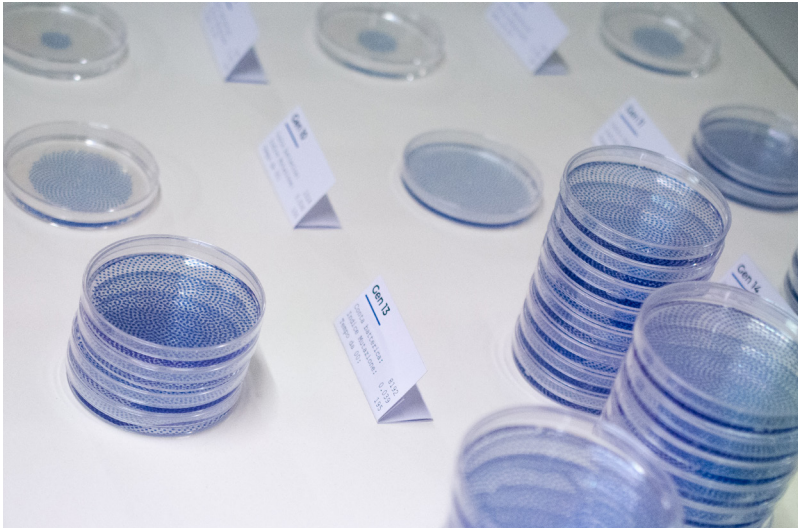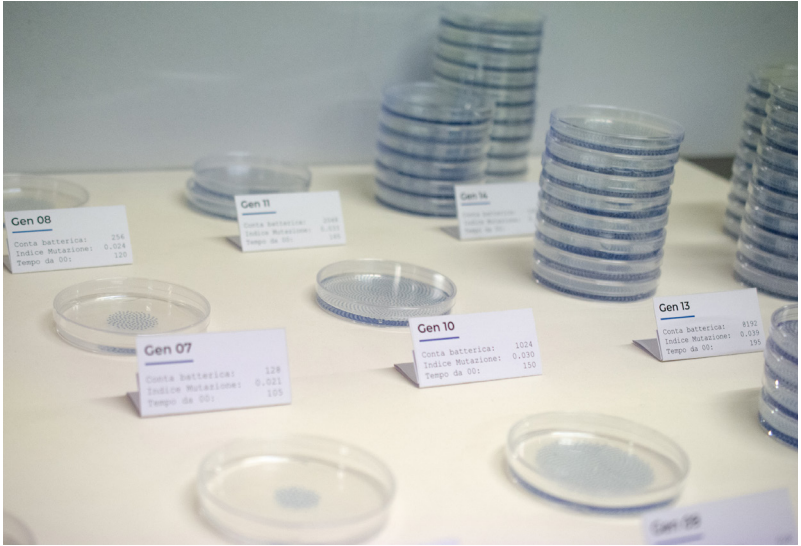
APPENDIX

ABDUCTIVE REASONING
FOR SPECULATIVE MINDS

a. CONCEPT VISUALIZATION

This concept visualization tries to find a path that connects all the topic analyzed in this paper.
With a Seealsology network it's been possible to find related argouments and see the connection between them.

Starting from the visualization, the entire project was built. A lot more topics could have been researched or even mentioned, but the logical trail that has been followed was the shortest (in number of topic connected).

The single-term visualization were designed in order to underline the weight the topic has online and its importance during the past years.

The final visualization tries to confront every topic, but based on the results found on Google search. The peculiar result is that it does not matter if it's an old topic with hundreds of years of study behind its back, it all comes down on how it resonates in today's society.
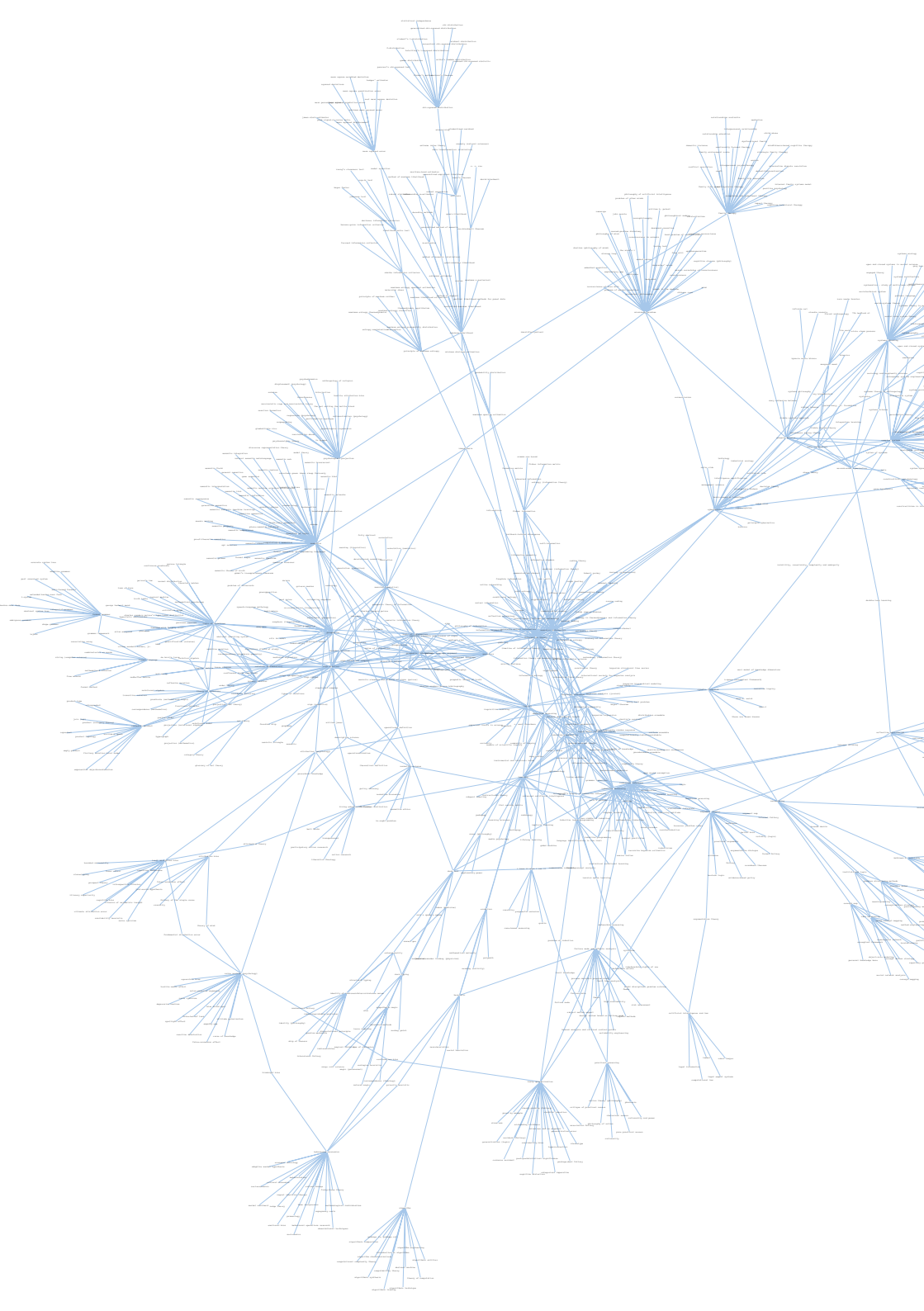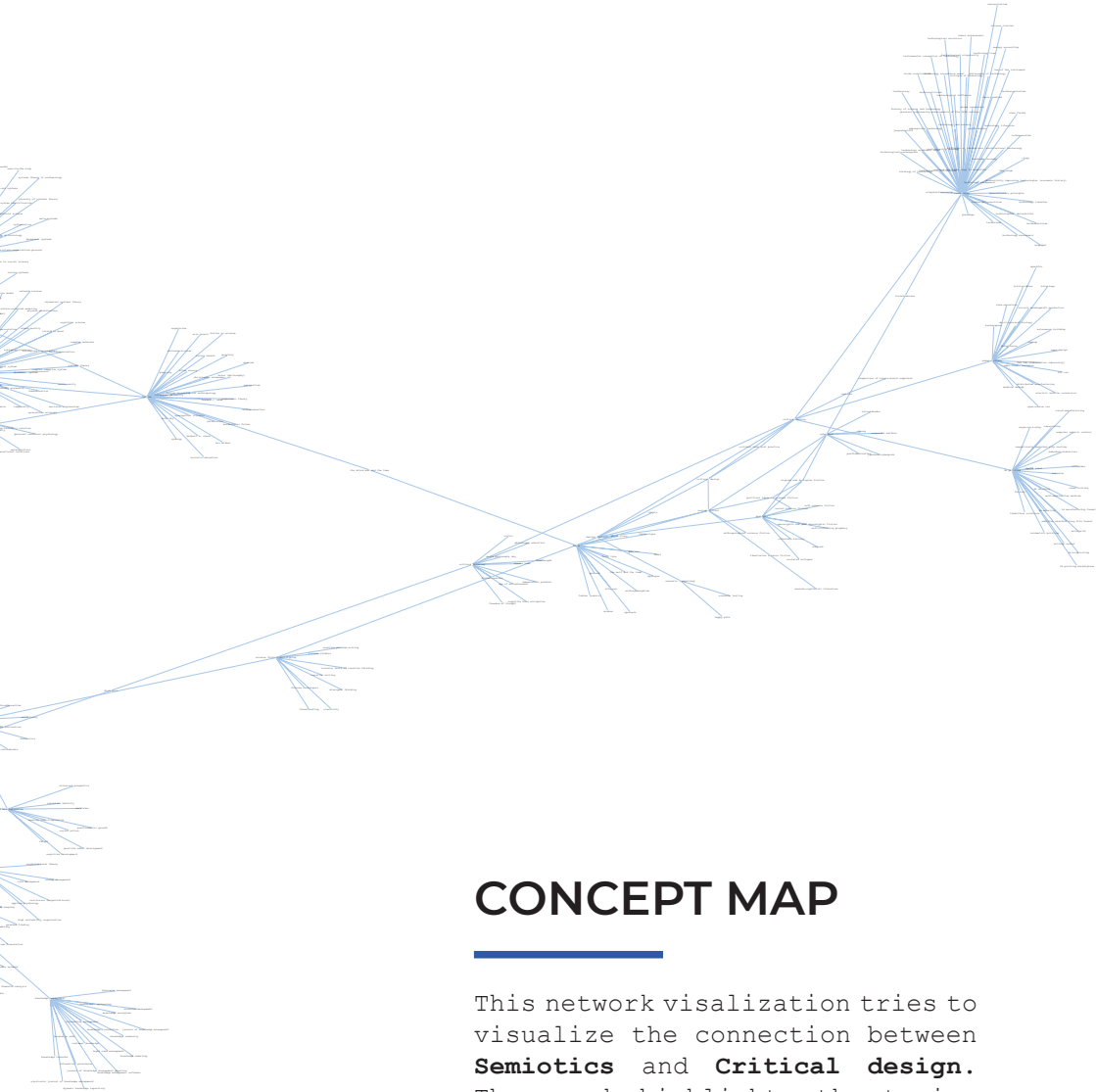
CONCEPT MAP

This network visalization tries to visualize the connection between **Semiotics** and **Critical design.** The graph highlights the topics related to each term, showing how they're logically connected.

meaning (semiotics)

charles sanders peirce
semiosis
sign
semiotic information

triadic relation
semiotics
sign relation
semeiotic
semiotic elements and classes of signs (peirce)

abductive reasoning

lateral thinking

inductive inference
inductive reasoning
deductive reasoning
sensemaking

social mea
meaning

duck test

idea networkin

concept m

technology
techno-progressivism

critical making

critical design

social fiction

design fiction
fable

critical thinking

scenario (computing)

cognitive bias mitigation

creative problem-solving
futures studies
science fiction prototyping

futures techniques

ning-making
(non-linguistic)

apping

FOCUS

The black-labeled terms are the
ones that have been studied and
analyzed in this paper.
It's possible to perceive the
path that this research followed.

SEMIOTICS

1.   The study of signs and symbols as elements of communicative behavior; the analysis of systems of communication, as language, gestures, or clothing.
2.   A general theory of signs and symbolism, usually divided into the branches of pragmatics, semantics, and syntactics.

Interest
Word search frequency on Google

Growth
Characters on relative Wikipedia page

Source_1: Google Trends Source_2: Wikipedia

Related Topics

Conceptual Net Visualization, 2 degree of separation

aui (constructed language)
characteristica universalis
somatosensory system   esperanto
universal translator   facial expression
universal grammar
body language gibberish
sign language

code ido (language)
universal language
global language system
interlingua

traffic sign
semiotic theory of charles sanders peirce
asemic writing
structuralism
theseus' paradox
claude lévi-strauss
symbol
synchronicity
roland barthes
sorites paradox
representation (arts)
sign   edmund leach

semiotics

social anthropology

ethnosemiotics   ethnography
oneiromancy
national symbol
religious symbolism   semiotic elements and classes of signs   ethnology
commercial signage
mary douglas
neon sign   icon
identity of indiscernibles   ferdinand de saussure   private language argument
logotype
map-territory relation   icon (computing)
ideogram

language-game (philosophy)

medical sign
biomarker

focal neurologic signs

weltanschauung   medical findings
medical test
radiologic sign

INFERENCES

1.   The act or process of inferring.
2.   Something that is inferred.
3.   Logic

Interest
Word search frequency on Google
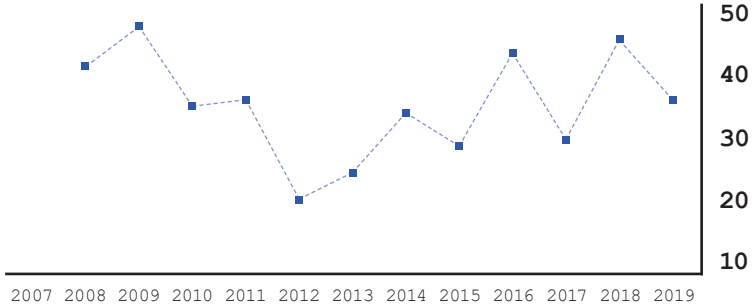
Growth
Characters on relative Wikipedia page

Source_1: Google Trends Source_2: Wikipedia

Related Topics

Conceptual Net Visualization, 2 degree of separation

inference
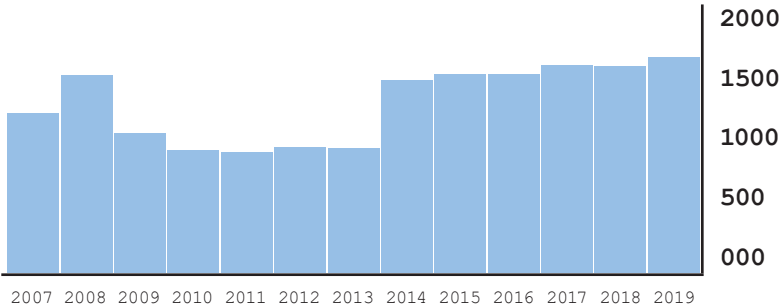
Source: Wikipedia

ABDUCTIVE REASONING

1.   A syllogism whose major premise is certain but whose minor premise is probable.

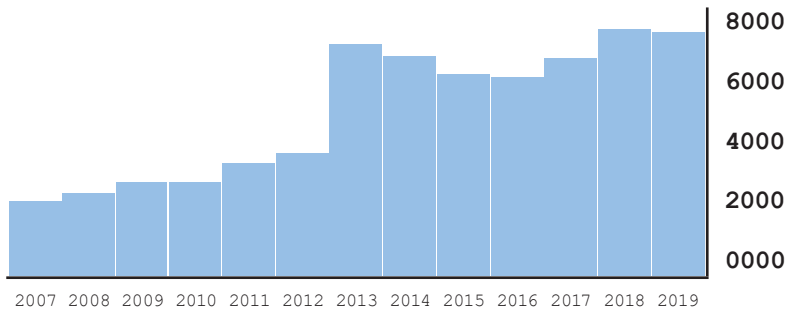**Interest**
Word search frequency on Google

Growth
Characters on relative Wikipedia page

Source_1: Google Trends Source_2: Wikipedia

Related Topics

Conceptual Net Visualization, 2 degree of separation

abductive reasoning

Source: Wikipedia

SENSEMAKING

1.   The action or process of making sense of or giving meaning
to something, especially new developments and experiences.

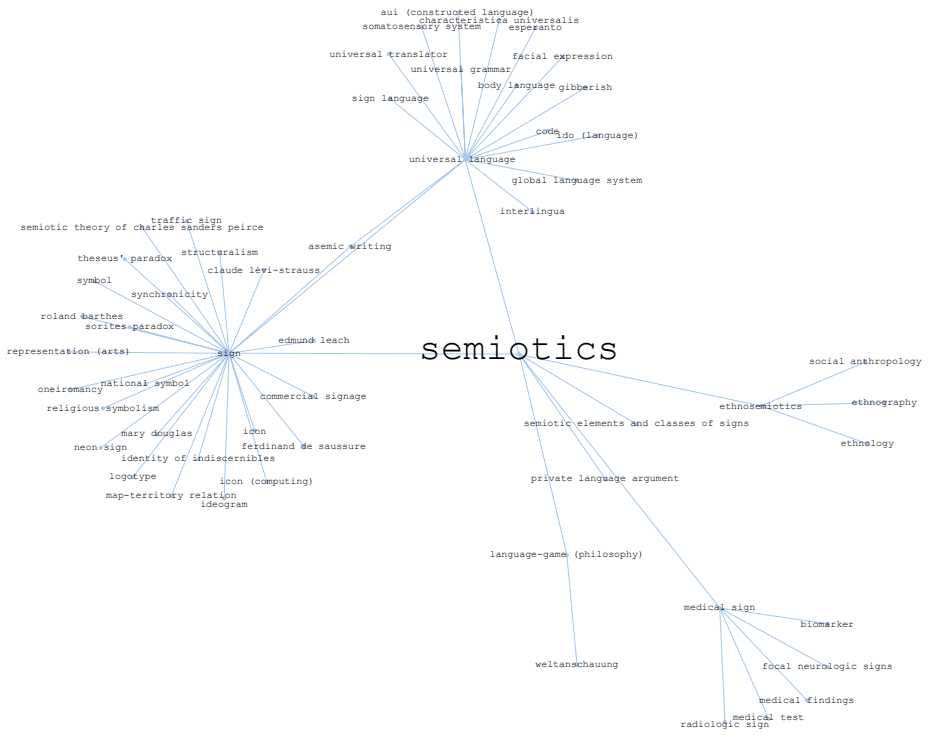**Interest**
Word search frequency on Google

Growth
Characters on relative Wikipedia page

Source_1: Google Trends Source_2: Wikipedia

Related Topics

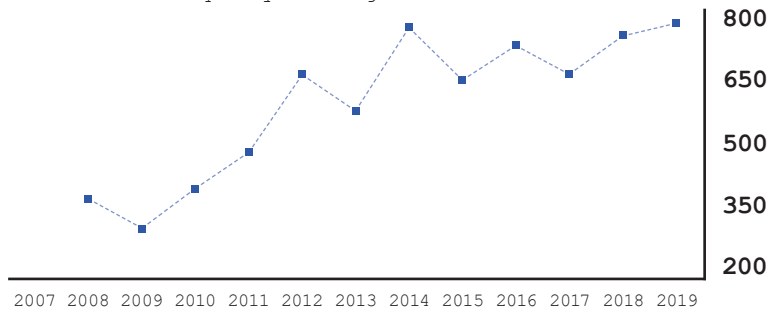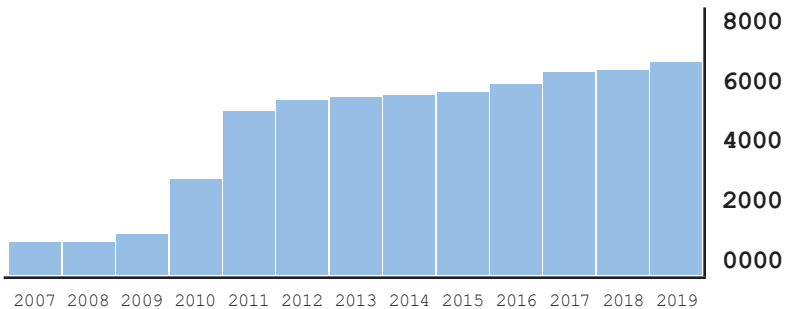Conceptual Net Visualization, 2 degree of separation

there are known knowns
i-space (conceptual framework)
volatility, uncertainty, complexity and ambiguity
uncertainty
seci model of knowledge dimensions
vpac-t narrative inquiry
inquiry

thematic analysis
concept mapping
pathfinder network
concept driven strategy
brainstorming
social network analysis
repertory grid

karl e. weick

cynefin framework

foundherentism
dialectics
double-loop learning

rational reconstruction

meaning-making
concept-driven strategy
business model
idea networking

narrative identity
ikigai
anabaedromia
universal pragmatics
posttraumatic growth
meaning (non-linguistic)
verstehen
cognitive development
positive adult development
social action

object-role modeling
institutional logic

reflective equilibrium

conceptual framework
concept map
personal knowledge base
group concept mapping

social meaning making

high reliability organization
change management
organizational theory
resilience (organizational)
kathleen m. sutcliffe
nomological network
applied psychology
risk management

brenda dervin

sensemaking

problem structuring methods
problem-finding
participatory modeling
problem-shaping
method engineering
problem formulation

semiotic elements and classes of signs
semiotics
medical sign sign
ethnosemiotics
universal language
private language argument
language-game (philosophy)

maximum likelihood
heuristic
abductive reasoning
gregory bateson
rich text
doug walton
sign relation
charles sanders peirce bibliography
defeasible reasoning
attribution (psychology)
inductive probability

dynamic knowledge repository
knowledge management
knowledge ecosystem
ignorance management
knowledge modeling
knowledge management software
knowledge community
knowledge cafe
knowledge engineering
legal case management
archives management
knowledge transfer
customer knowledge knowledge translation
journal of knowledge management practice
electronic journal of knowledge management
journal of knowledge management
information management
information governance

Source: Wikipedia

DESIGN THINKING

1.   Process of creating new and innovative ideas and solving problems.

Interest
Word search frequency on Google

Growth
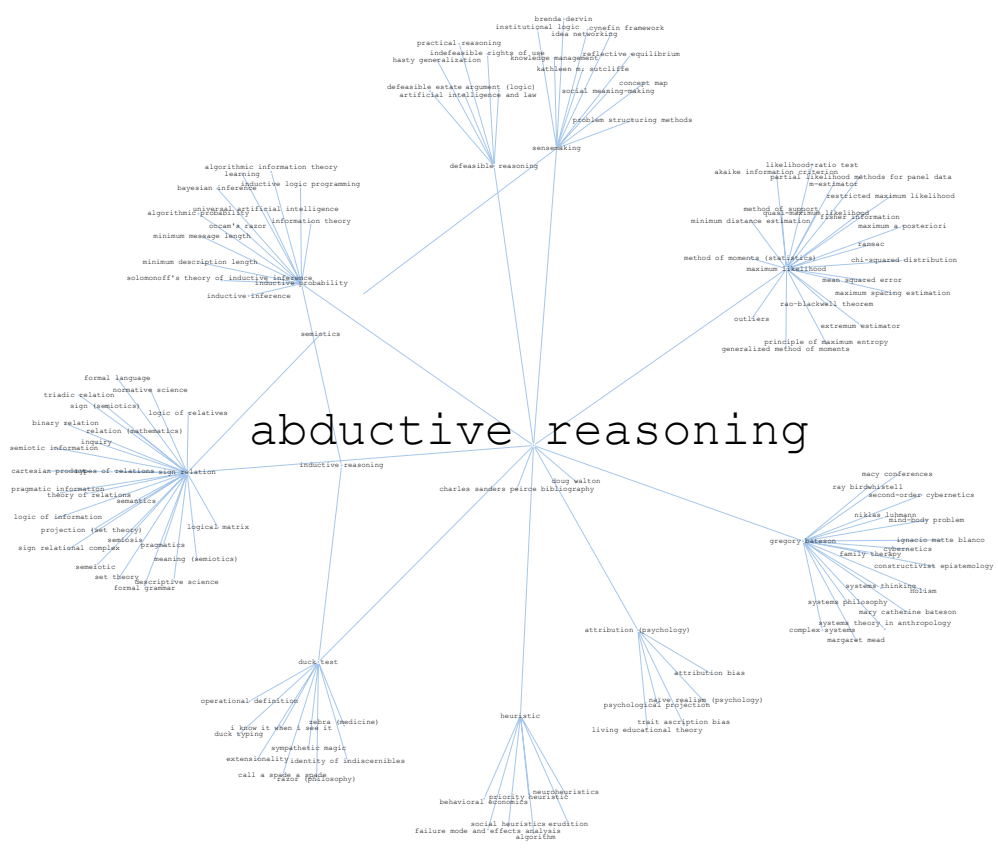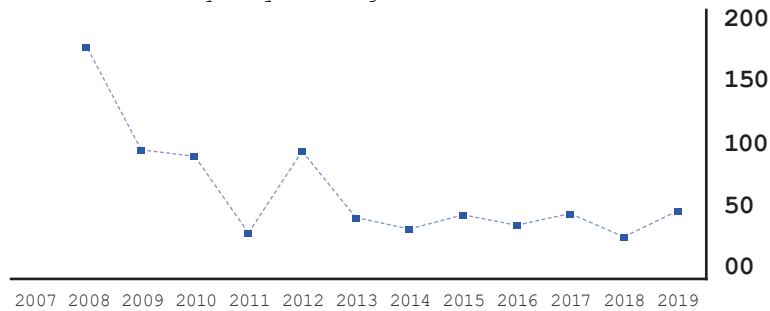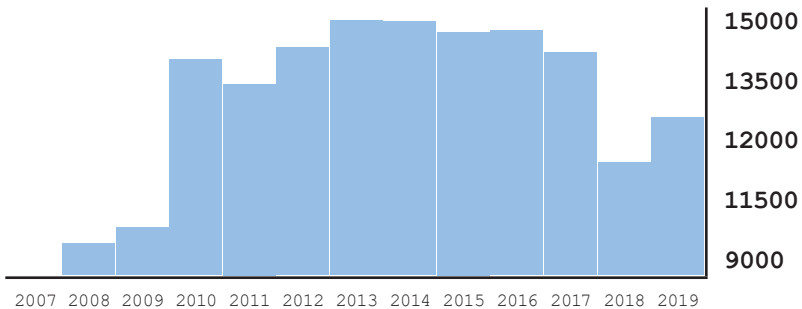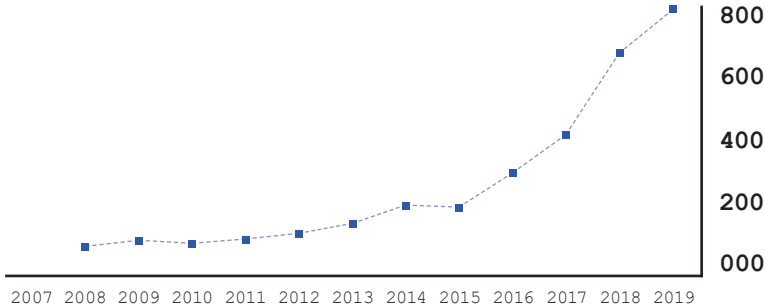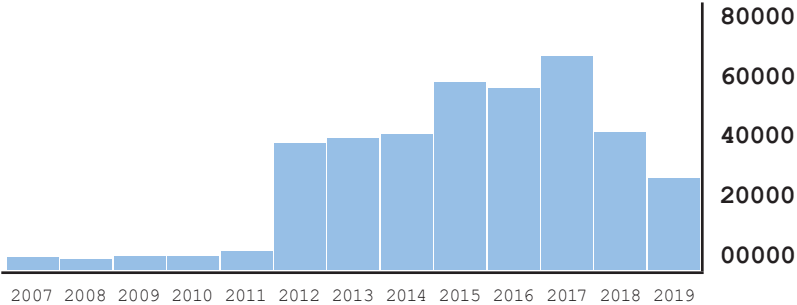Characters on relative Wikipedia page

Source_1: Google Trends Source_2: Wikipedia

Related Topics

Conceptual Net Visualization, 2 degree of separation

design thinking

Source: Wikipedia

CRITICAL DESIGN

1.   The development of non-obvious design concepts that challenge the status quo.

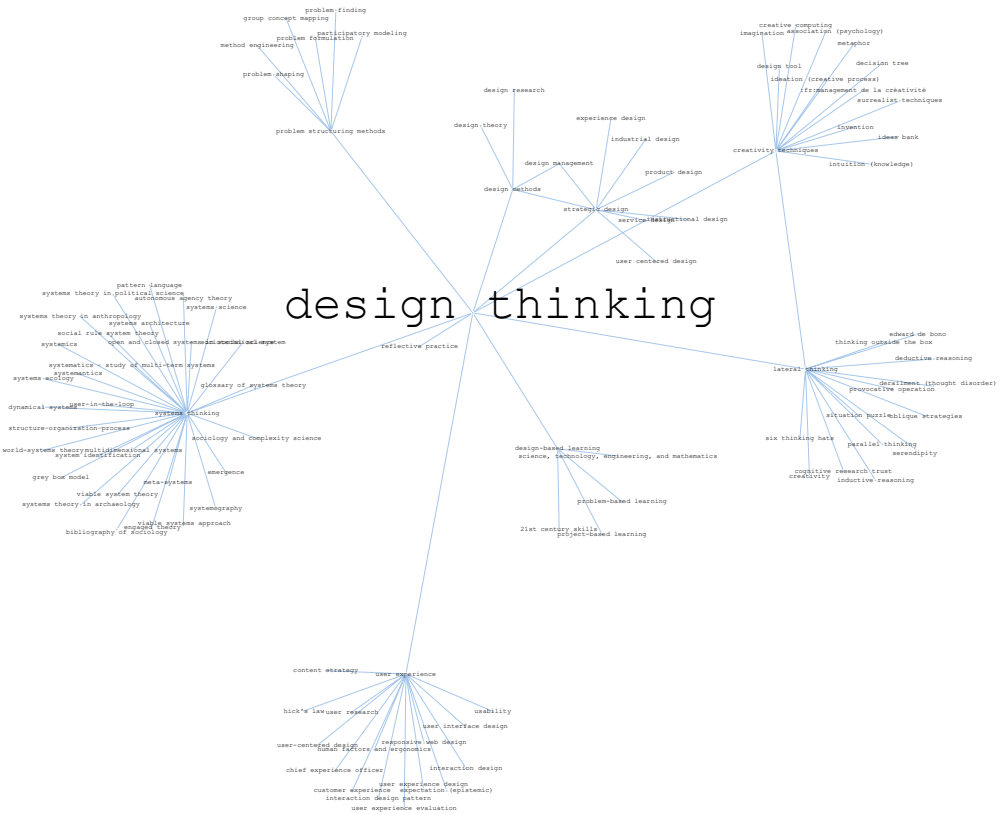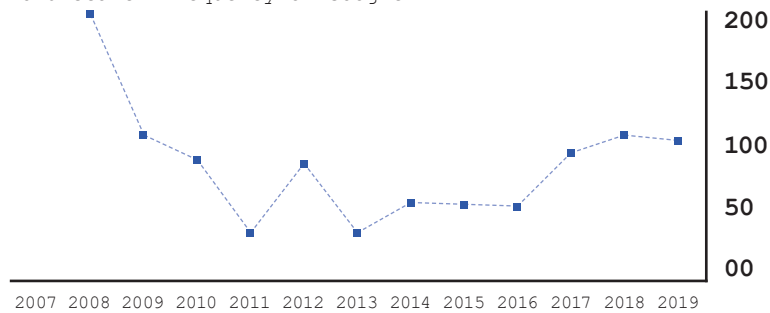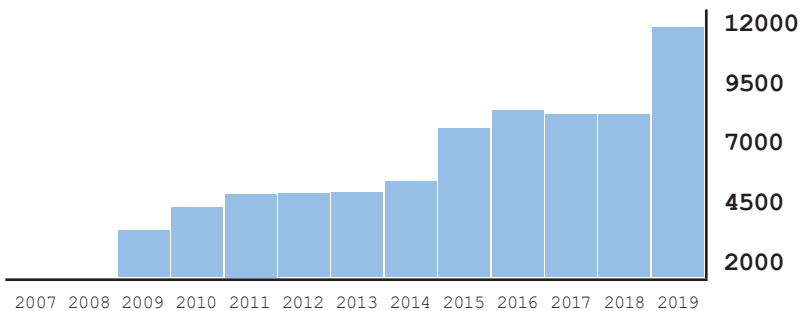**Interest**
Word search frequency on Google

Growth
Characters on relative Wikipedia page

Source_1: Google Trends Source_2: Wikipedia

Related Topics

Conceptual Net Visualization, 2 degree of separation

science fiction prototyping

dystopia

maker culture

scenario (computing)

technology

utopia

3d printing

design fiction

critical making

critical design

arduino

fable

critical technical practice

social fiction

critical thinking

cyberpunk

political ideas in science fiction

libertarian science fiction

anthropological science fiction
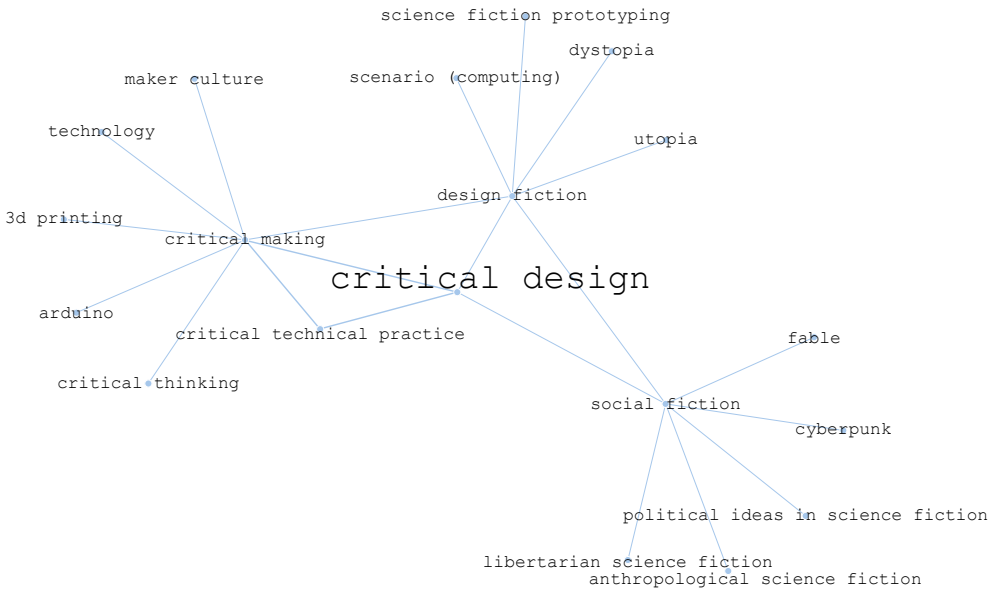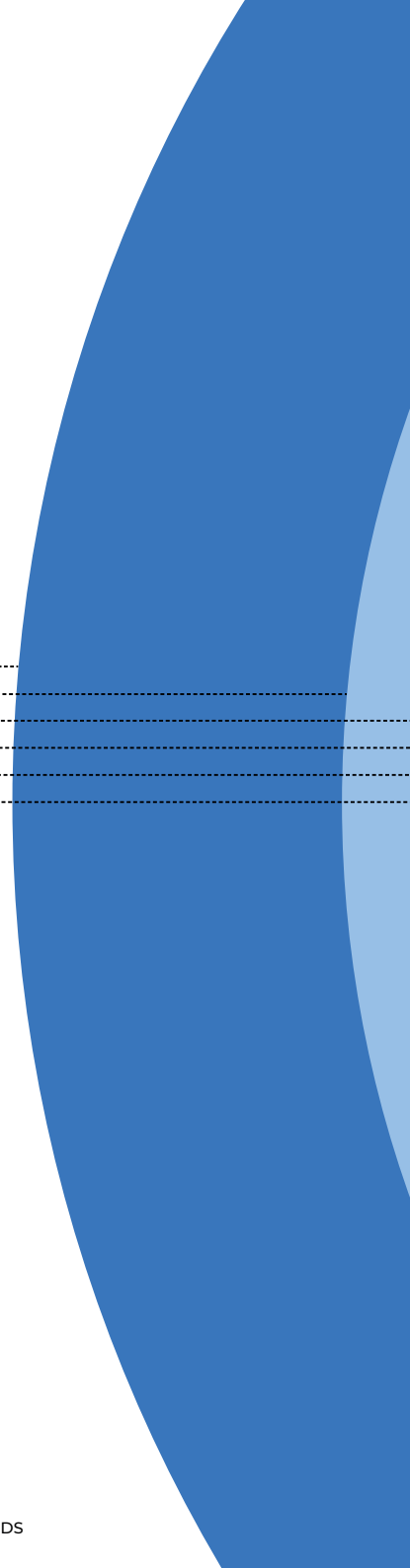
Source: Wikipedia

Topic	Results
Design Thinking	1360000000
Critical Design	829000000
Inferences	63300000
Semiotics	13900000
Sensemaking	2360000
Abductive Reasoning	516000

WEB RESULTS

Visualization that shows the amount of topic-related Google Results.

The interest in the topic isn't directly related to the number of result availaible.

Source: Google

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Politecnico di Milano, School of Design
Master of Science in Communication Design