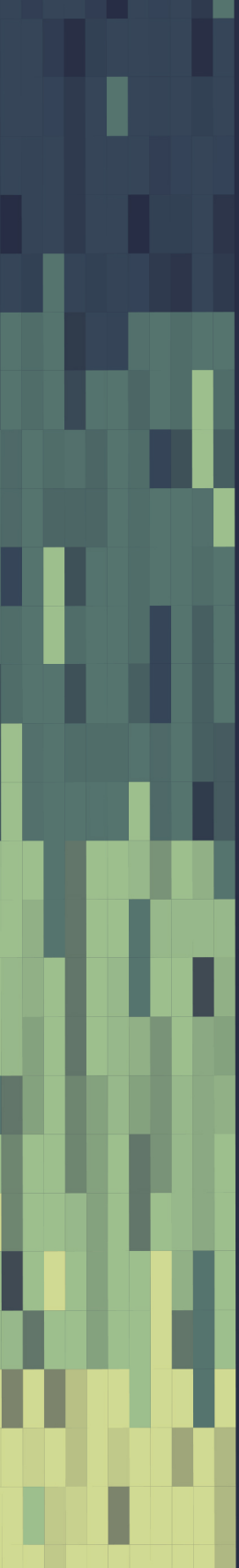

Working between Science and Design

by Abbie Thibodeaux

Working
between
Science and Design

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For my love,
to whom I owe everything

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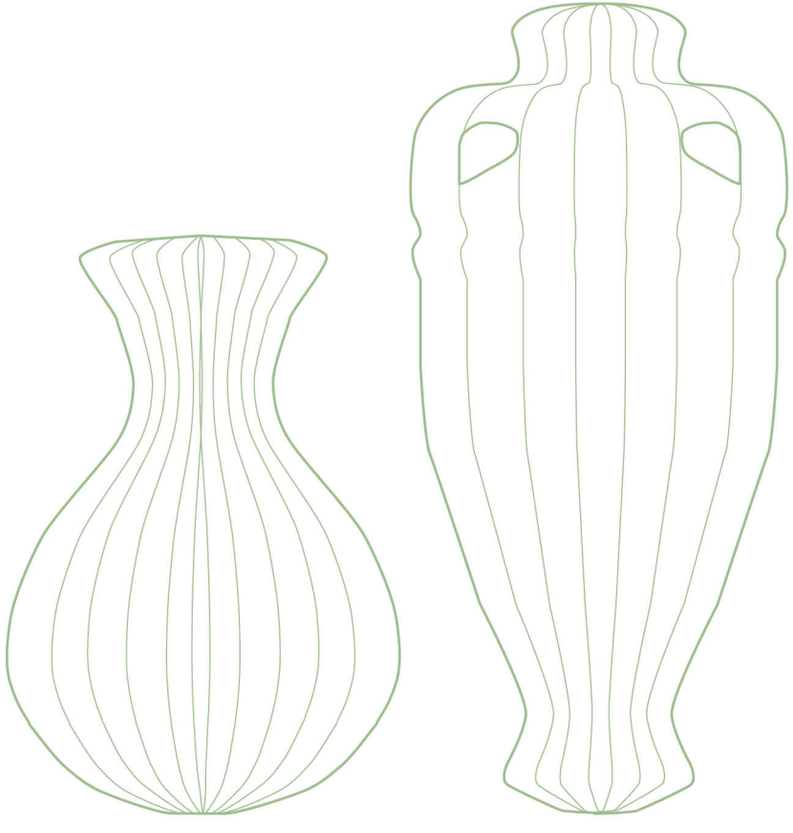
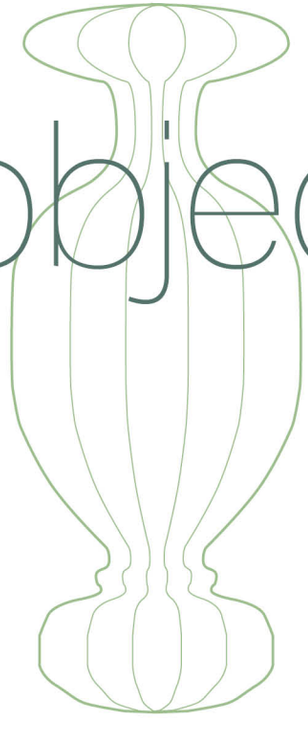
/dəˈzīn/

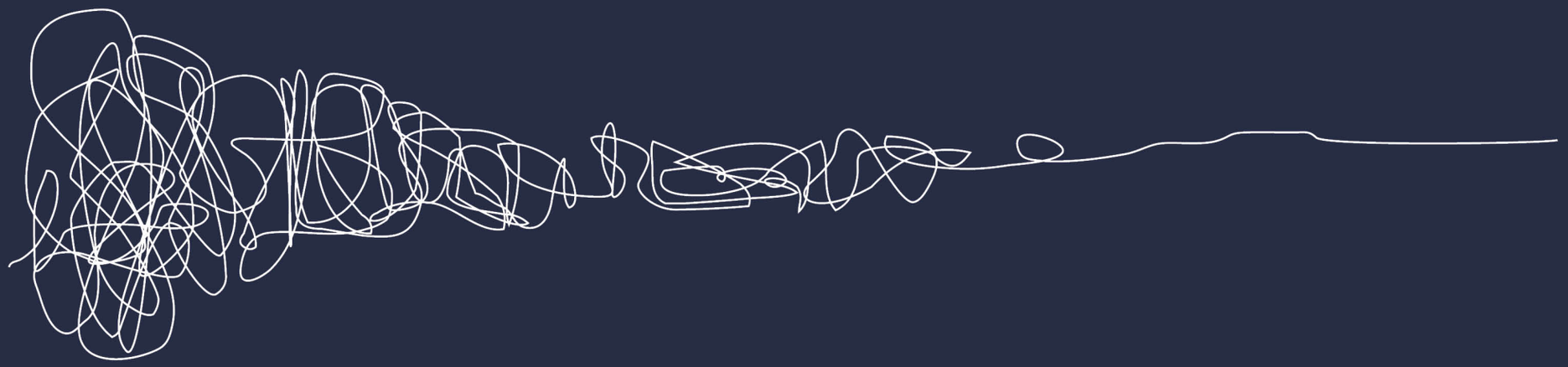
v. describes a process of thought and planning

Design is NOT an object ...





Design is a process ...



Defining Design

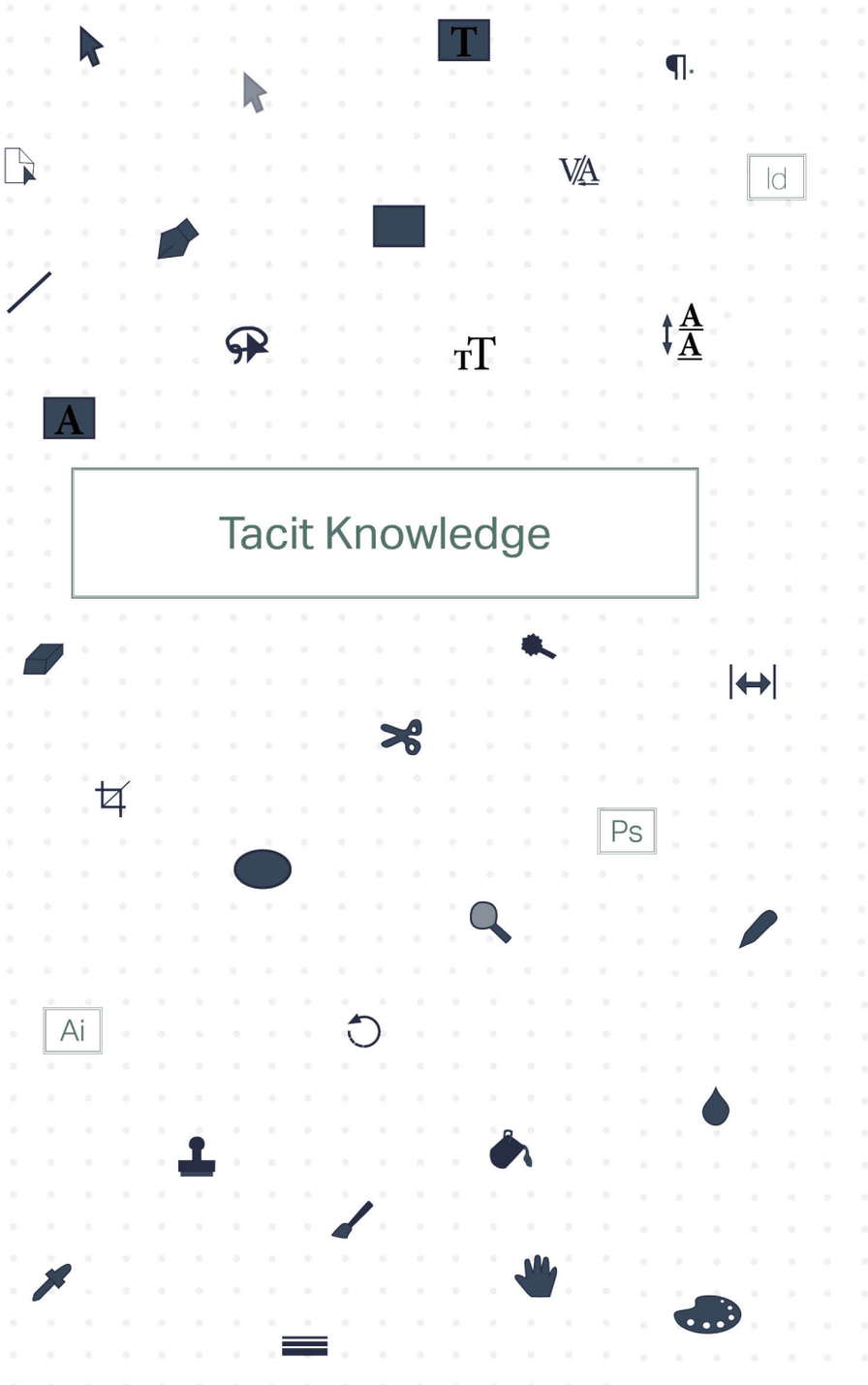
1

[1] Things we know how to do but perhaps do not know how to explain.

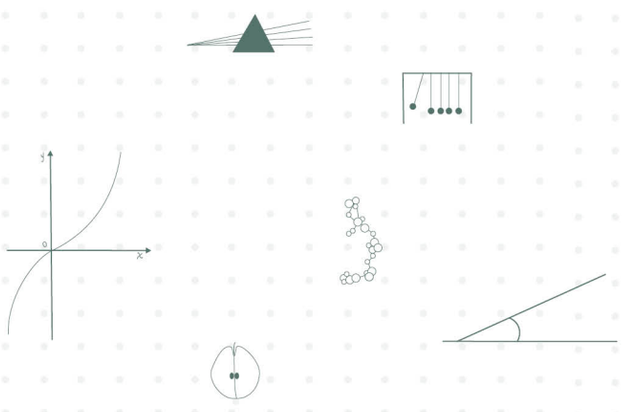
Design, not as a craft; Design, not as artifact; Design, as a process and a discipline through systematic thinking...

Design in the traditional sense has been viewed as a craft. A skill that is learned through practice and observation. The traditional design curriculum is a very hands on style of learning with an emphasis on producing and reproducing objects, knowledge of the craft comes from a trial and error method. This style of learning facilitates the know how to produce something. One becomes an expert on the tools of their trade. For example, the tools of a Graphic Designer, are computer-based programs such as Photoshop, Illustrator, InDesign, etc. These are all aesthetic tools. Massimo Vignelli, an Italian Moderniest designer, is reported to have said that much design is about getting the scale right - little bigger, or smaller, or moving something a little.

This activity just described is tacit knowledge[1]. With tacit knowledge, the designer designs based on reactionary actions. The role of the designer is not about aesthetic results. This is merely the final stage of the design process.



In *Design Knowledge: Context, Content, Continuity,* Ken Friedman recounts the historical use for the word design. Design (v.) describes a process of thought and planning. The first written citation of the verb design dates from the year 1548. The *Merriam-Webster* dictionary defines the verb design as "to conceive and plan out in the mind; to have a specific purpose; to devise for a specific function or end." Half a century later, the word began to be used as a noun. The first cited use of the noun "design" occurs in 1588. The *Merriam-Webster* dictionary defines the noun, as "a particular purpose held in view by an individual or group; deliberate, purposive planning; a mental project or scheme in which means to an end are laid down."



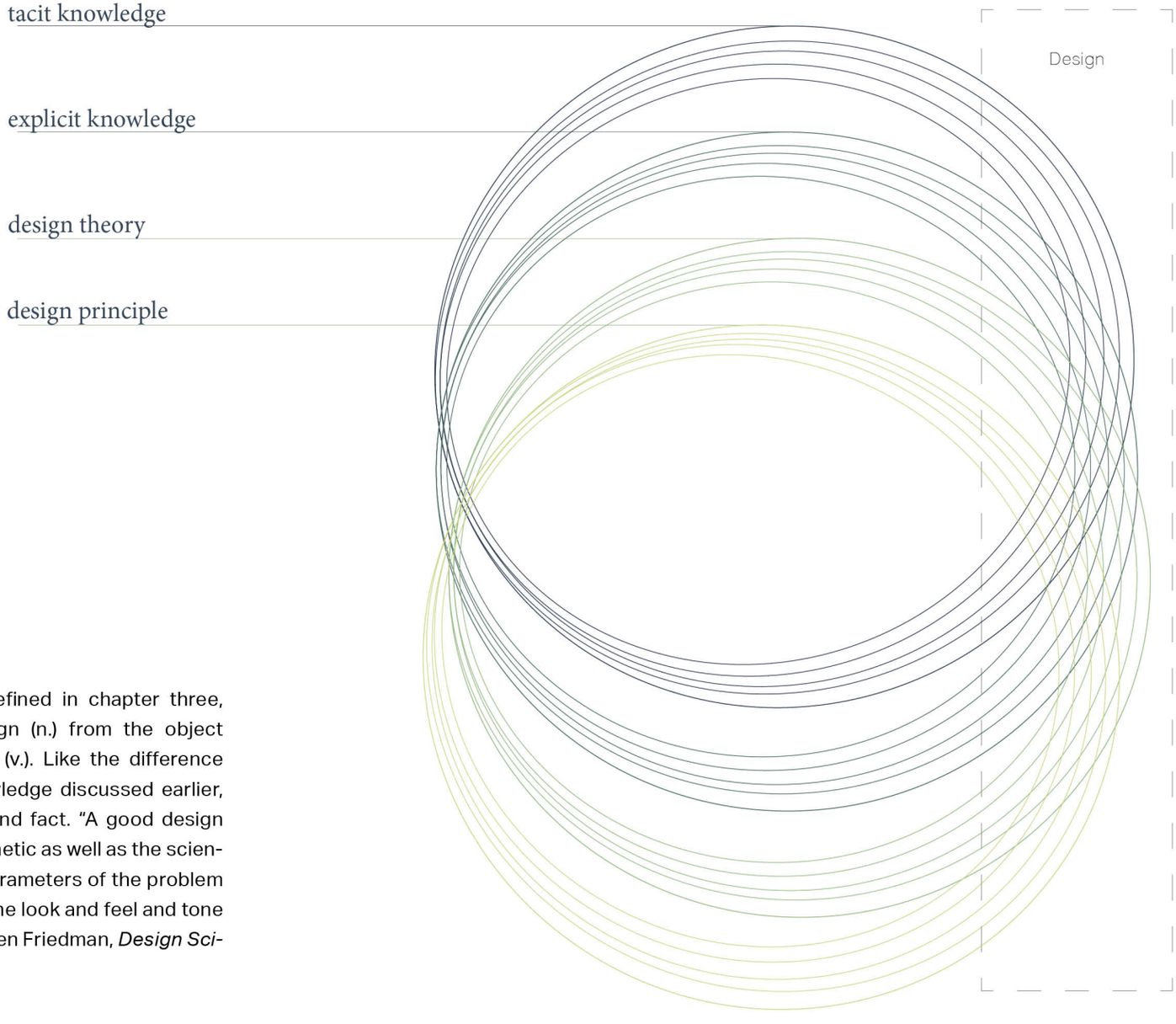
Explicit Knowledge

The word design refers to process rather than product, it has become a popular shorthand for designed artifacts. While the outcome of the design process may be a product or a service, it may also be an artifact or a structure, the outcome of the design process is not "design."

Design is a process that suggests quality, control, judgment, evaluation, and paradigmatic[1] definition. Disciplines involve the knowledge and practice to perform a certain skill. It is knowing why something is exercised, not just how to perform the exercise. In the process of design it is of greater value to know and understand why you are adjusting scale or repositioning something than it is to know how to do the exercises. Design as a process also extends beyond the aesthetic quality of something. Design as a process requires a foundation in theory, principle, and method including intelligent integration of the inherently tacit.

The design process employs explicit[2] knowledge rather than tacit knowledge. Design requires "a discourse that is responsible to history, uses scholarly apparatus (definitions, references, bibliographies, footnotes, etc.), reports research intelligently, support dialogue between academia and practice, opens issues critically for examination, and builds knowledge, not only for its own purposes, but also to share with others with different disciplinary perspectives" (Sharon Poggenpohl, *Time for a Change*).

[1] Greek word for pattern. Often used to describe something that is an ideal or standard.



The design process, further defined in chapter three, shifts the perspective of design (n.) from the object of design to the act of design (v.). Like the difference between tacit and explicit knowledge discussed earlier, design includes both intuition and fact. "A good design process must embrace the aesthetic as well as the scientific. One must begin with the parameters of the problem then resolve the look and feel. The look and feel and tone emerge in the solution phase" (Ken Friedman, *Design Science and Design Education*).

"The effective designer has as much in common with Isaac Newton as with Picasso, and more in common with either than with Philippe Starck" [1]

— Ken Friedman, *Design Science and Design Education*

[1] French designer known for his interior, product, industrial and architural design work.

Design Theory, specifically General Design Theory (GDT), is just one example of how the design approach is mathematically formalized. General Design Theory has evolved from the Axiomatic school of thought. Axiomatic Design Theory has been used in the development of software, hardware, machines and various other manufacturing systems. "It has provided designers with logical and rational thought processes and design tools" (Nam Suh, *Theory and Applications*). Axioms have been used as the basis of understanding for many scientific fields; such as, physics, chemistry and biology.

Axiomatic Design Theory is the connecting thread between design as a science and Sir Isaac Newton. Sir Isaac Newton (1642-1727) formulated three laws or axioms of mechanics. The third law of mechanics or law of motion basically states that for every action, there is an equal and opposite reaction. In Design, this translates as Feedback loop. A relationship between variables in a system where the consequences of an event feed back into the system as input, modifying the event in the future.

Science and Design

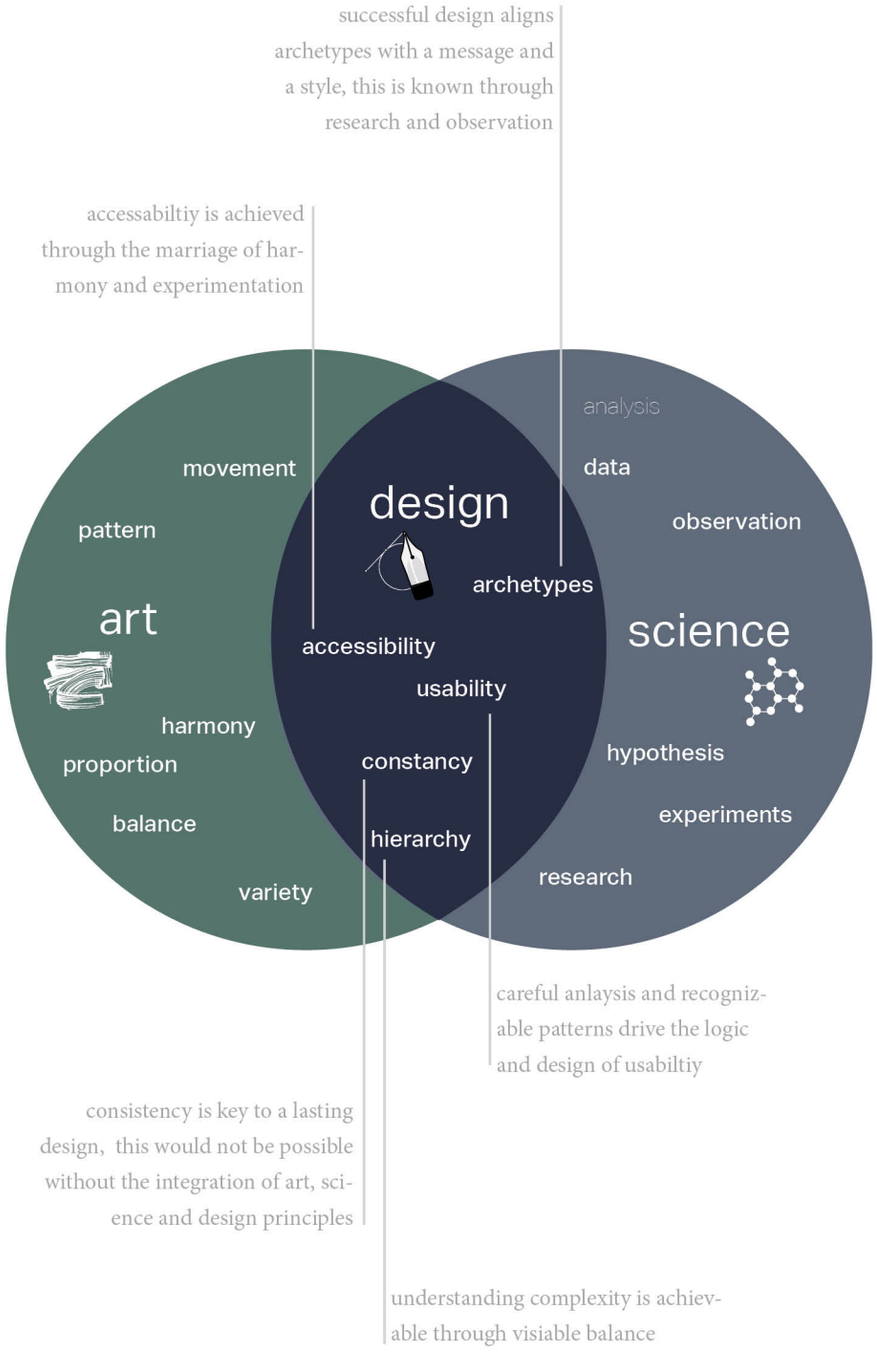
2

[1350-1400; ME < L *designare* to mark out]

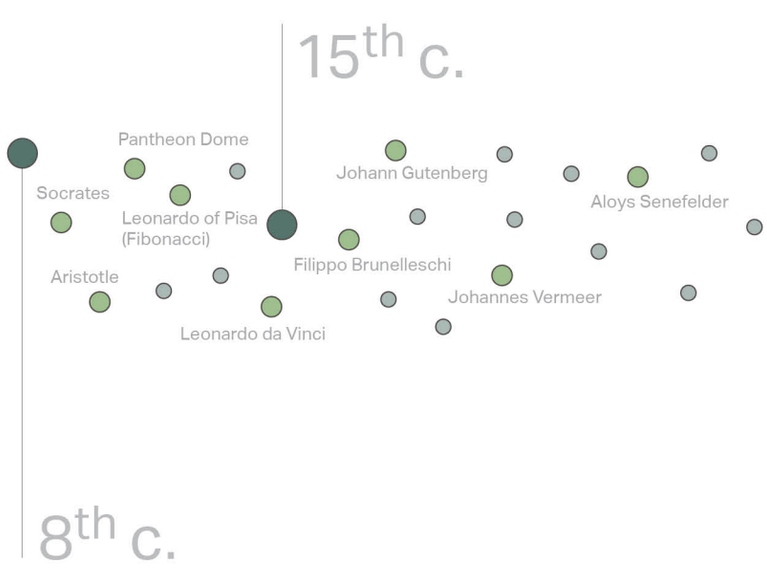
What would happen if a scientist, someone who problem solves primarily through logic is paired with a designer. The designer is someone who can think beyond logic, someone who learns the rules only to break them and dares to explore the most unlikely resolutions. This combination of beautiful minds actually have more in common than previously credited with.

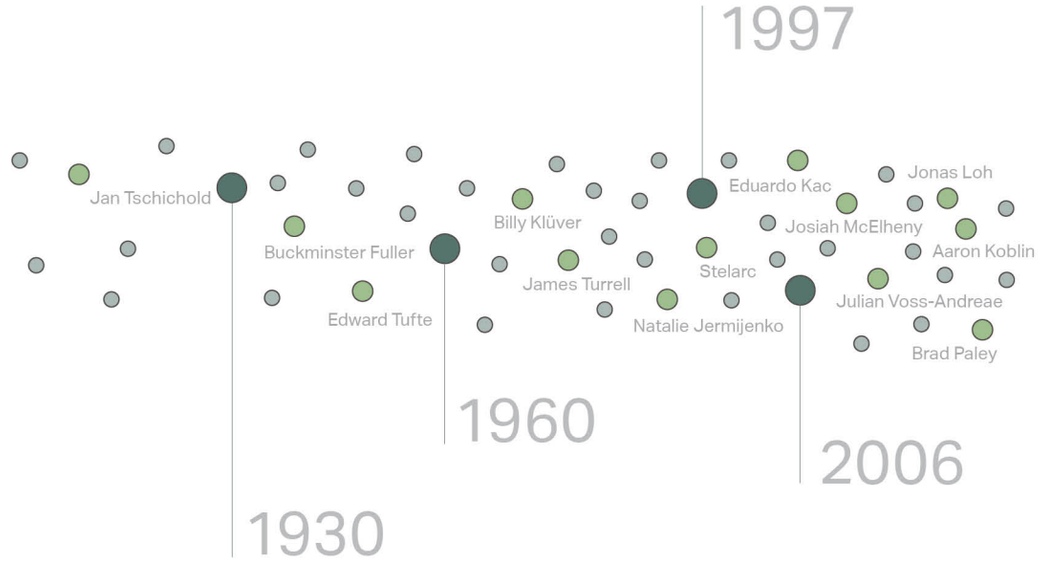
Though in modern times, the fields of Art and Science are often seen as two opposing schools of thought. Their are individuals working within the realms of Science and Design and it is the product of this collaborative thinking that both ask and resolve the most thought provoking questions. These are the individuals that are shaping our tomorrow.

Currently, Science is defined as a systematically organized body of knowledge on a particular subject. The term Science has derived from the Latin word scientia which is defined as knowledge, a knowing; expertness.



Currently, Art is defined as an expression or application of human creative skill and imagination, typically in a visual form such as painting or sculpture, producing works to be appreciated primarily for their beauty or emotional power. The term Art derives from the Latin word Artem (nominative ars) which is defined as a practical skill; a craft. Based on these contemporary definitions and their origin, the partition between these two fields is that one field has a direct correlation to knowledge and the other field is directly tied to the practice of a skill. Can Art be created without knowledge and Science practiced without skill?





During the era of Ancient Greece (8th c. BC - 600 AD), the term Techne is often used in referring to an act that is practiced with great skill and knowledge. Techne is the root of “technique” and “technology”. The inclusion of skill and knowledge is equally recognized as essential tools for both but not limited to Art and Science. Someone knowledgeable in the field of pharmacology, capable of turning a fungi into a cure for an infectious disease and someone who is knowledgeable in carving and stone, capable of turning a block of marble into a statue of a god, both qualify as technicians. For Aristotle, “techne is equivalent to ‘a productive habit’ (exis poietike); ‘productive’ in the sense that it brings something which could

equally well not have existed (i.e. is not necessary) and would not exist by nature — something whose existence depends on the maker (the technician)" (S. Cuomo, *Technology and Culture in Greek and Roman Antiquity*). In Xenophon's Socratic works, *Memorabilia and Oeconomicus*, knowledge is intimately tied to the know-how of how to do things, especially the more organized kind of know-how designated by techne. Socrates explicitly identifies technai activities as playing the harp, piloting a ship, cooking, medicine, managing an estate, smithing, and carpentry (Richard Parry, *Episteme and Techne*).

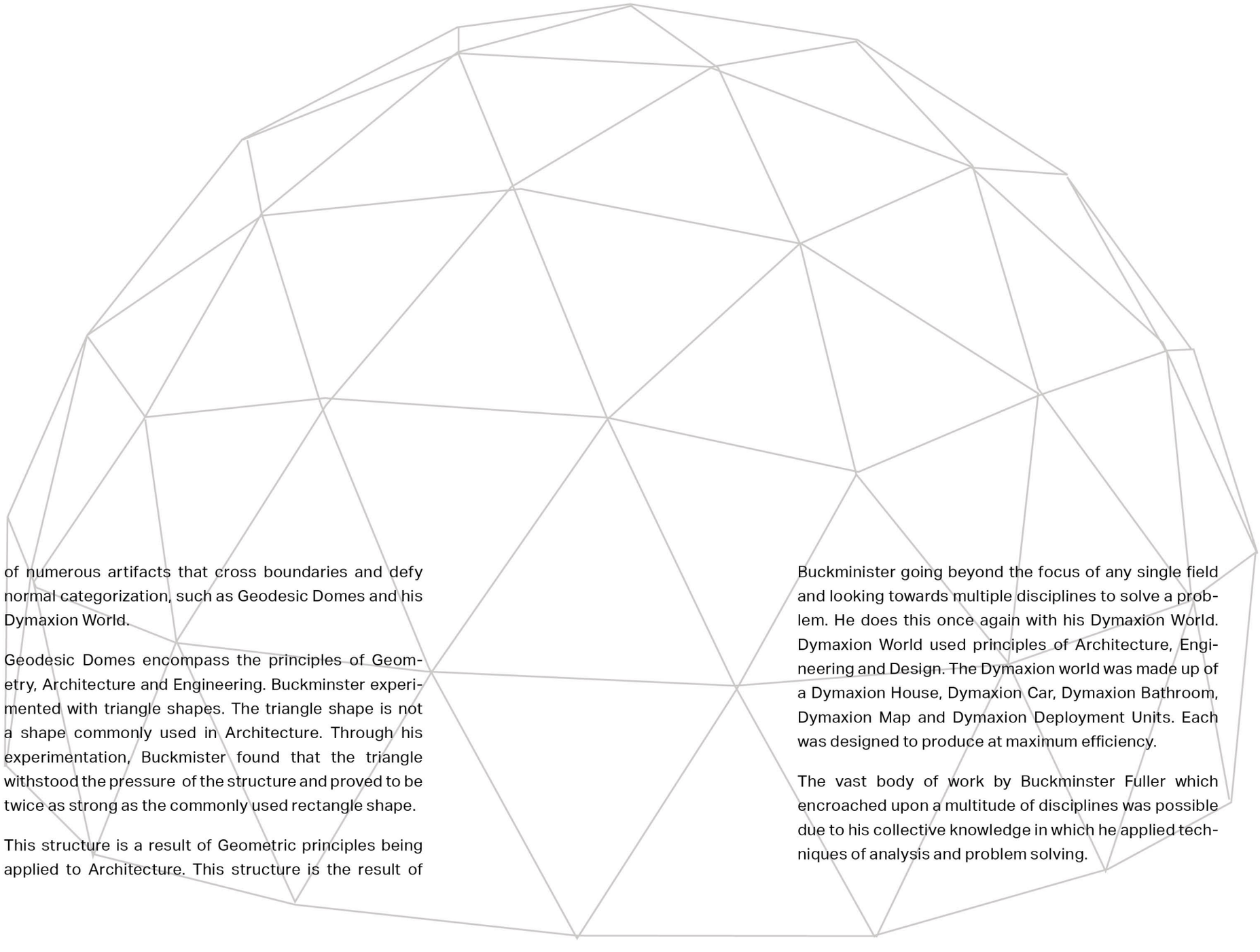
This philosophical mind set of seeing Art and Science as complementary to one another allows for the possibility of discovering the unimaginable. No one better understood this and embodied this than Leonardo da Vinci. During the Renaissance (15th c.), an era that did not recognize Art and Science as polarizing fields, Leonardo da Vinci became a master painter and a scientist well beyond his time. He used his knowledge of Science and Math to improve his techniques for mixing and using oil paint. His mastery of Geometry to create illusion and three-dimensionality in painting. His skill of drawing to create anatomical drawings that provided brilliant scientific insights. His understanding of design to invent machinery.

Absolute ground breaking achievements and some of the greatest though provoking projects are the result of works that follow 4 basic principles. (1) Go beyond any single field of study. (2) Work in collaboration. (3) Solve problems. (4) Recognize the projects as works of Art and Science.

Go beyond any single field of study

To fully respond to and answer some of the most complex problems, you must widen your view rather than look through the lenses of a microscope. Drawing upon the possibilities that are offered through related fields of study, allows you the ability to create building blocks that become stronger and increasingly dynamic.

During the years of 1930s through the 1960s, Buckminster Fuller practiced within the fields of Architecture, Engineering, Geometry, Design, Cosmology and many more areas of study. Fuller also disliked describing his work as a specialization in any one field, preferring instead to describe his output as that of a "comprehensive anticipatory design scientist - an emerging synthesis of artist, inventor, mechanic, objective economist and evolutionary strategist." This approach resulted in the creation



of numerous artifacts that cross boundaries and defy normal categorization, such as Geodesic Domes and his Dymaxion World.

Geodesic Domes encompass the principles of Geometry, Architecture and Engineering. Buckminster experimented with triangle shapes. The triangle shape is not a shape commonly used in Architecture. Through his experimentation, Buckmister found that the triangle withstood the pressure of the structure and proved to be twice as strong as the commonly used rectangle shape.

This structure is a result of Geometric principles being applied to Architecture. This structure is the result of Buckminister going beyond the focus of any single field and looking towards multiple disciplines to solve a problem. He does this once again with his Dymaxion World. Dymaxion World used principles of Architecture, Engineering and Design. The Dymaxion world was made up of a Dymaxion House, Dymaxion Car, Dymaxion Bathroom, Dymaxion Map and Dymaxion Deployment Units. Each was designed to produce at maximum efficiency.

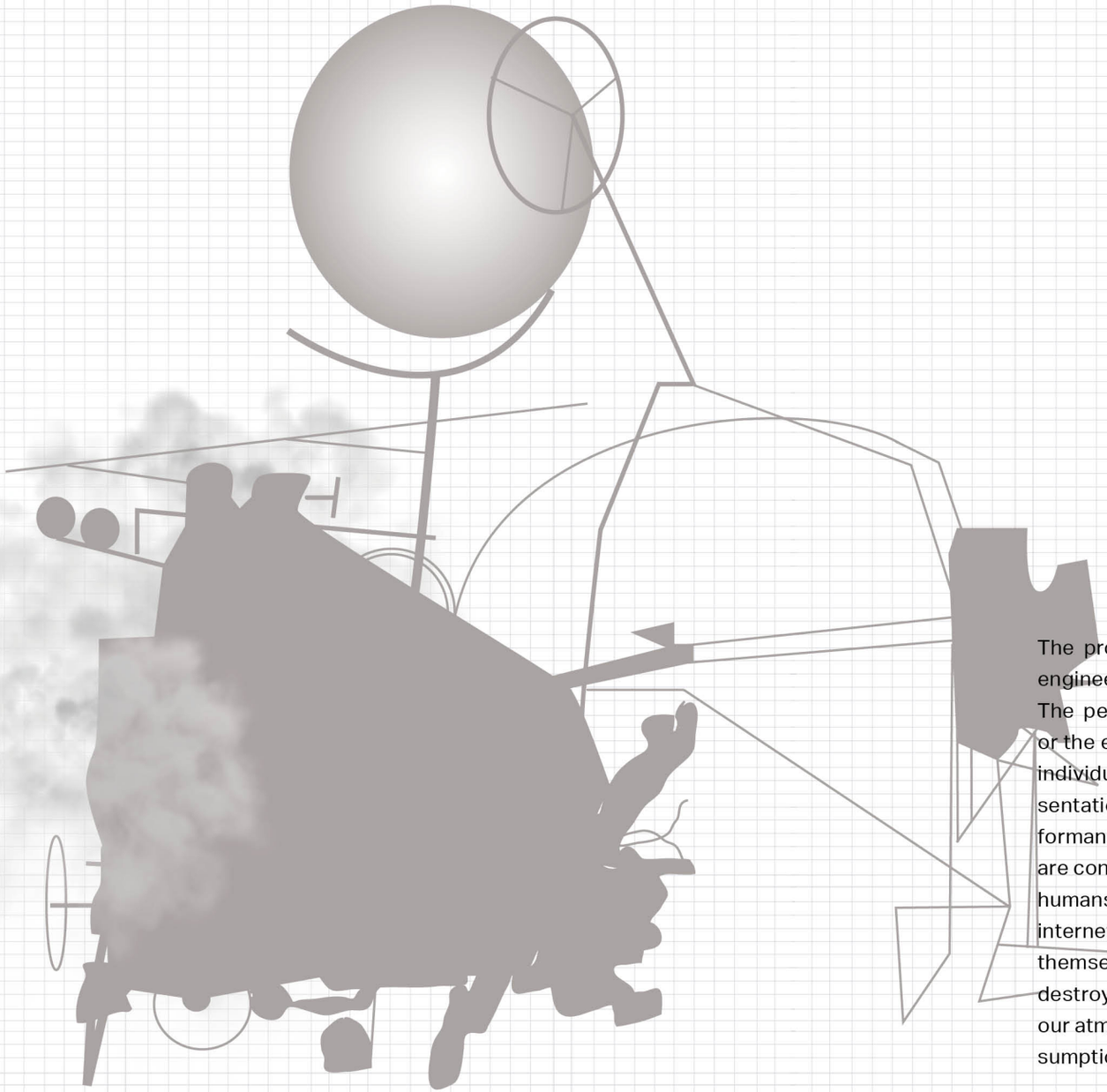
The vast body of work by Buckminster Fuller which encroached upon a multitude of disciplines was possible due to his collective knowledge in which he applied techniques of analysis and problem solving.

Working in collaboration with another expert not only expands your realm of possibilities but also expands your realm of thinking.

If your knowledge is limited to a single field of study, work in collaboration with an expert from another field of study. A partnership or team provides an environment where one can inspire and drive one another. Billy Klüver certainly believed this. In the late 1950s, Billy Klüver was an engineer working at Bell Laboratories in Murry Hill, New Jersey. While Klüver was increasingly becoming bored with the restraints of working in a laboratory, his interest in the art scene happening in New York was growing.

The 1950s was an exciting time for arts in America, New York in particular had a thriving community of artist. It was during this time Klüver ventured outside of the laboratory and befriended a number of artist, among them Robert Rauchenberg[1]. In 1960, Billy Klüver along with Robert Rauschenberg assisted Jean Tinguely in creating a work to be performed in the Sculpture Garden of the Museum of Modern Art in New York. They produced a self-destroying machine that performed for 27 minutes during a public performance.

[1]American painter, graphic artistist, sculputor, photographer and performance artist.



The product of this collaboration was a machine. The engineering of this machine became the performance. The performance became the message. The message or the experience, like all works of art, is unique for each individual. For me, the self-destroying machine is a representation of humanity. In viewing a recording of this performance, present day (11/2014), I am reminded of how we are constantly striving to create technology that imitates humans and human behavior. Their is more traffic on the internet by robots imitating humans than by humans themselves. I am also reminded that we as humans are destroying ourselves. We are destroying our planet and our atmosphere through pollution and our ravenous consumption of material things. We are destroying our selves

E.A.T.

Experiments in Art and Technology

through deteriorating health. We consume more chemicals through processed foods which have a direct correlation to the rise in diseases that are also at an all time high. For me, this machine represents the future of engineering and robotics which is to imitate humans and the reality of this future is self-destruction.

The partnership between Klüver and Robert Rauschenberg continued through the 1960s, producing some of the most ground-breaking art and technology works of the 20th c. The project by which their partnership will most notably be remembered by is Experiments in Art and Technology (E.A.T.). Klüver along with Robert Rauschenberg, Fred Waldhauer and Robert Whitman founded E.A.T.. E.A.T. encouraged the collaboration of artists and engineers, "the raison d'être of E.A.T is the possibility of a work which is not the preconception of either the engineer or the artist, but which is the result of the exploration of the human interaction between them" (Randall, *Art & Engineering*).

E.A.T. provided a platform for artist and engineers to meet. They also published a newsletter, fittingly giving it the title *Techne*. In the first edition of their newsletter *Techne*, E.A.T's mission statement was published. It reads: "Maintain a constructive climate for the recognition of the new technology and the arts by a civilized collaboration between groups unrealistically developing in isolation."

Solve problems of reference of Environmental outside of the frame most Social and Science

When one is focused in one field of knowledge the possibilities are narrowed. When one expands their focus beyond one field of knowledge the realm of possibilities expand. When working in collaboration or with a team, the possibilities are infinite. Once you begin to look at something whether it is a new idea or a problem that requires resolution, you can begin to see patterns. From these patterns that emerge, you can begin to pull a thread so to speak. This thread is the connecting idea or principle. Once this is identified, the product or resolution addresses so much more than an single need or problem.

Narrowly speaking scientist resolve scientific problems, Designers resolve problems of functionality or ascetics. For those drawing upon knowledge and techniques from both Science and Design should not limit their abilities to creating the next bottle opener. They must think much more broadly, creating on the level of socially conscious experiences.

Individuals like Buckminster Fuller, who was mentioned earlier, and Natalie Jerijenko, who we will meet shortly, are gifted in the fact that they can simultaneously operate from both an area of science and art. These individuals have the tools required to address the most complex social and environmental issues.

Natalie Jermijenko's knowledge and understanding, like Buckminster Fuller, comes from an array of academic and professional backgrounds. Natalie Jermijenko is an Engineer and Artist with a background in biochemistry, physics, neuroscience and precision engineering. She is an activist and has brought awareness to concerning environmental issues through her projects. A theme emerges throughout her projects of offering resolutions to important environmental concerns through artistic installations and environments.

Ag Bag, Natalie Jermijenko

Through Farmacy, Jermijenko addresses urban farming. She has designed AgBags which are bags that can hang from an abandoned facade, a railing or metal framework and produces vegetable, herbs, flowers, etc. AgBags are a complex system designed to improve the health of the environment and augment biodiversity.

Through the Environmental Health Clinic at NYU, Jermijenko addresses environmental concerns. Jermijenko describes the Environmental Health Clinic as "a clinic and lab that approaches health from an understanding of its dependence on external local environments rather than on the internal biology and genetic predispositions of an individual." It is modeled on other health clinics at universities, such as; you make an appointment, what differs is that you discuss you environmental concerns not your medical concerns and you walk out with a prescription not for pharmaceuticals but for actions.

By trade, Natalie Jeremijenko is an engineer, an environmentalist, a neuroscientist and an activist. But everything she does also achieves the condition of art.

Recognize these works of Art or but works of Art projects as not works of Science and Science

The solutions that come from collaborative thinking resolve important issues and ask even more important questions. The body of work from these projects are largely academic but equally artistic.

There is an inherent beauty to science. Their are a number of individuals that recognize and celebrate this beauty by showcasing it. Paola Antonelli is not an engineer or a scientist or a visual artist but currently the curator for Architecture and Design at MoMA, NYC. In 2008, Antonelli curated with Patricia Juncosa Vecchierini an important exhibition titled *Design and the Elastic Mind*. *Design and the Elastic Mind* explores the reciprocal relationship between science and design. It was much more than

a exhibition, like all design their was a process leading up to the final product. The exhibition being the final product.

Design and the Elastic Mind began in 2006. The Museum of Modern Art and Seed launched a series of monthly salons to bring together scientists, designers, and architects, so they could meet and present their work and ideas to each other. The event began with a presentation (discussion, panel or talk) on a particular theme of relevance to both artist and scientist. For example: visual complexity, information design, time and space. Then followed by a cocktail party to promote informal discussion and networking. The aim of these workshops was to explore the promising relationship between science and design and its increasing relevance.

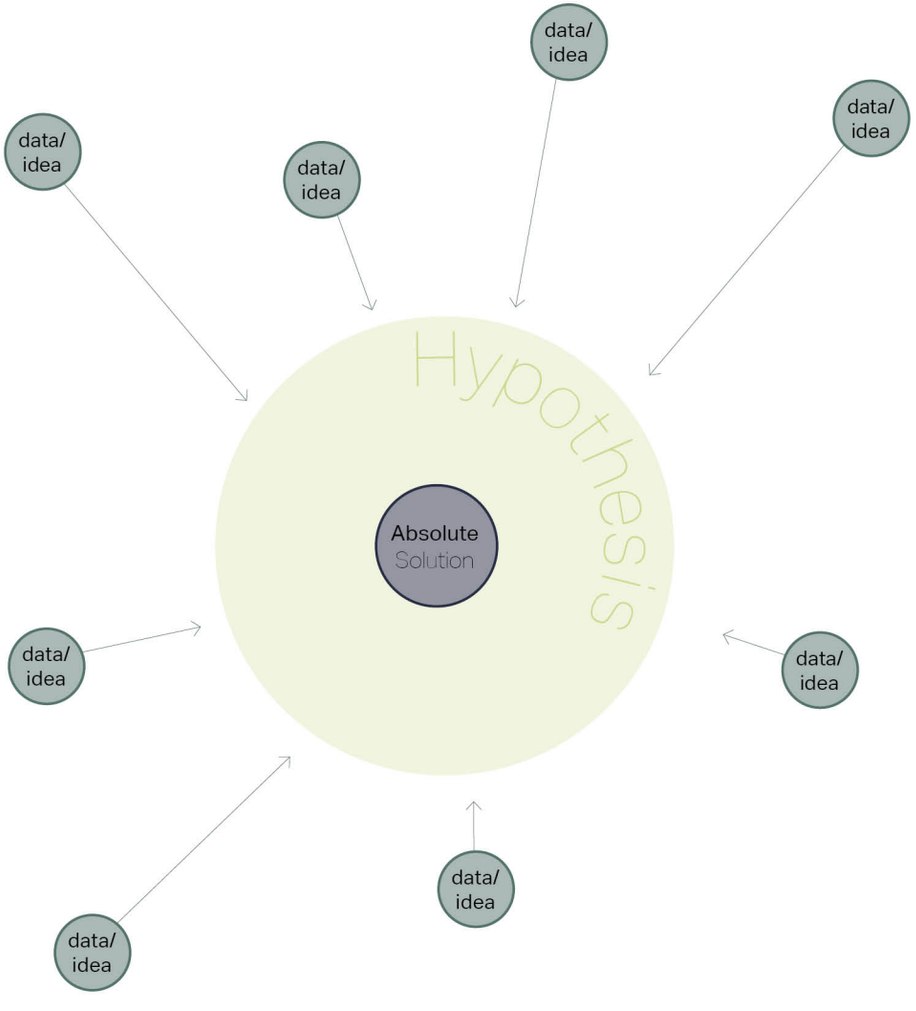
The figure of the designer is evolving to one increasingly informed by science and mediated by technology. The work of designers and collaborations with designers are transforming our visual and intellectual landscape.

Design Process

3

Scientific Approach

problem focused strategies



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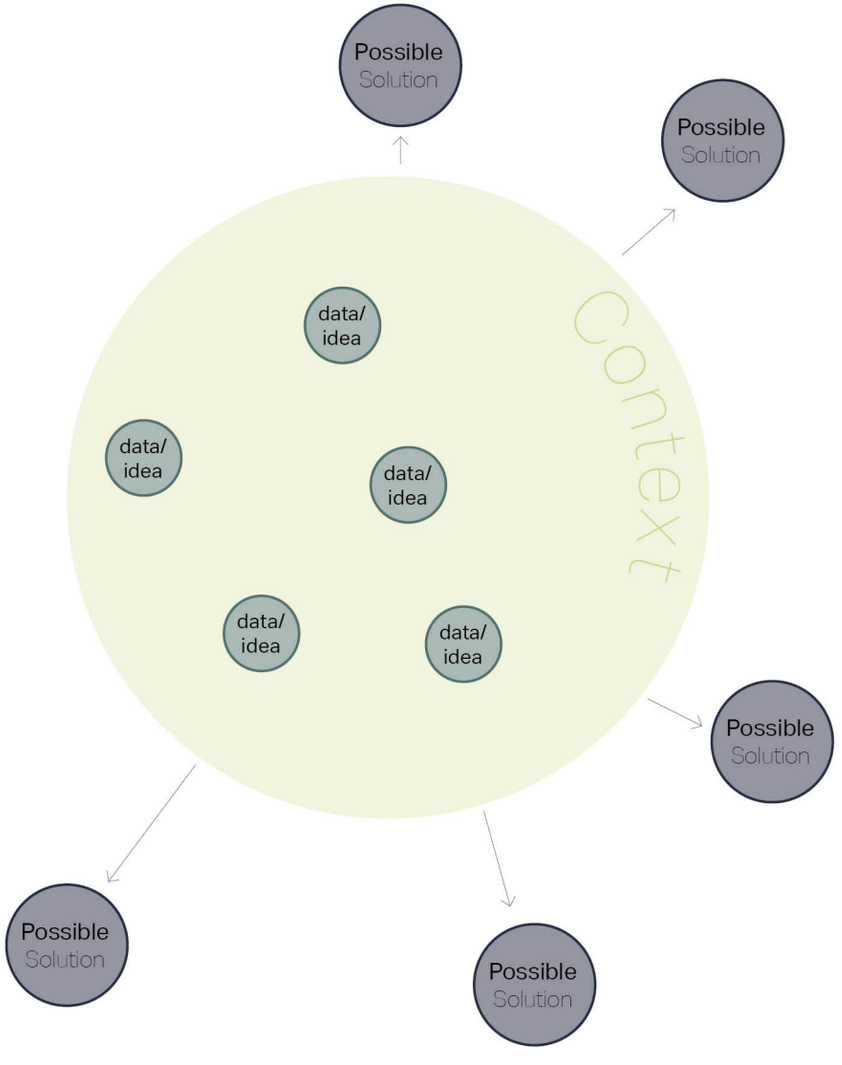
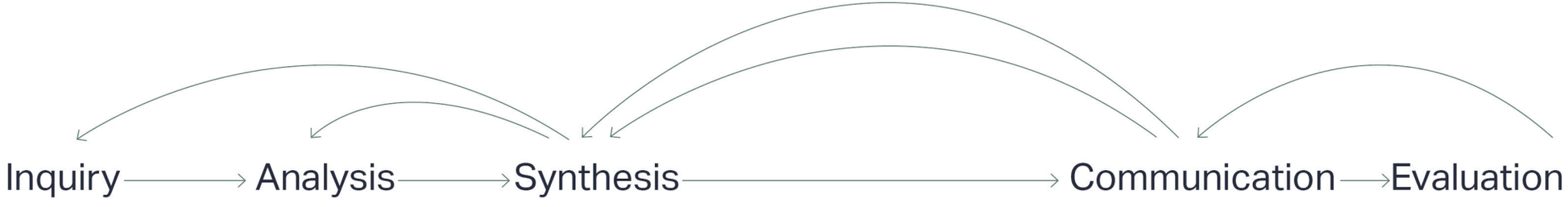
Design Approach

solution focused strategies



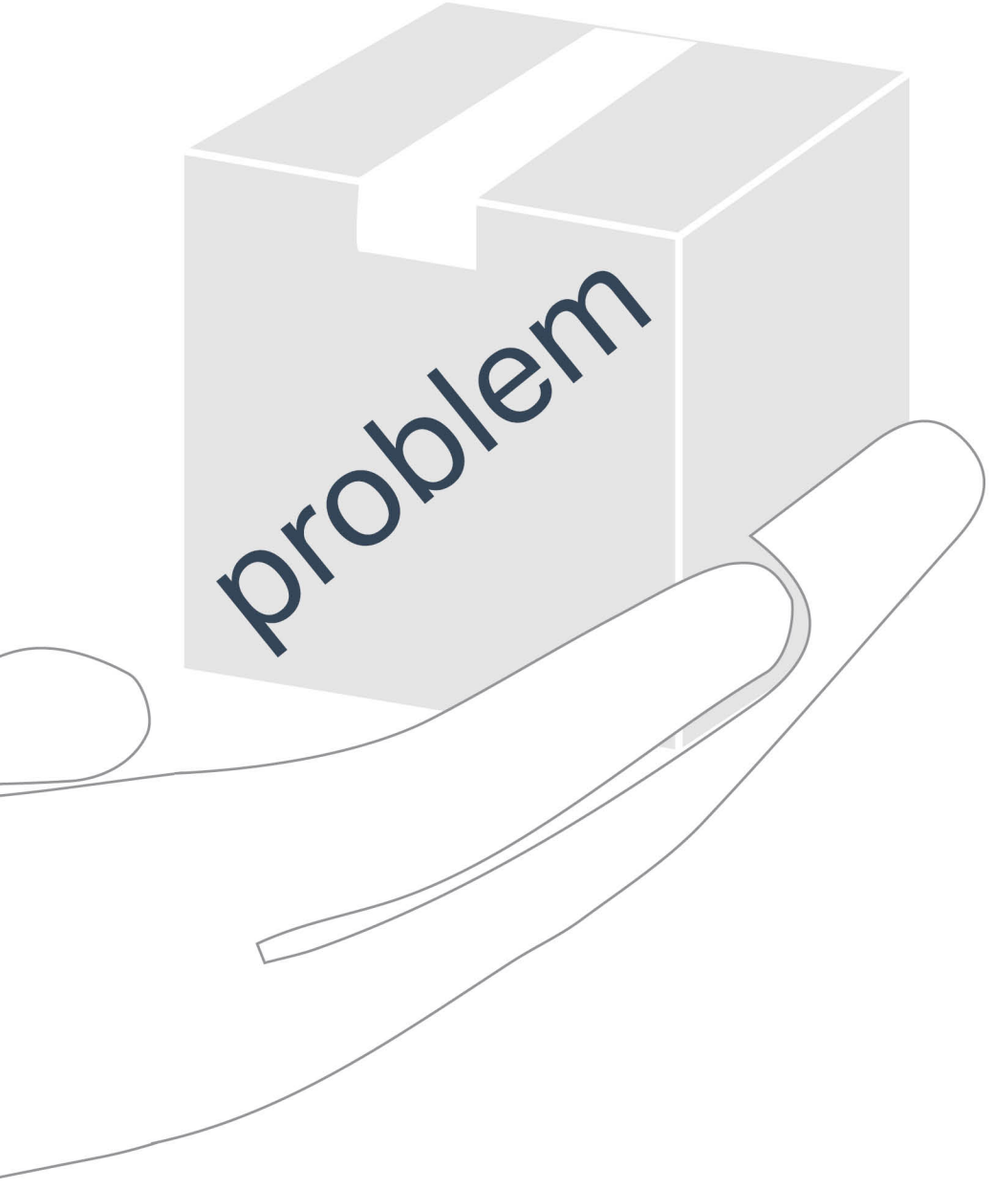
Iterative Design Process



The design process: A solution for solving problems

Designers are essentially creative problem solvers. The motivating factor that moves so many fields and professions forward is the ability to resolve a problem. This is the common thread that joins the art fields with the fields of science, business and technology. Through my analysis of problem solving techniques across these separate fields and my experience, I found a pattern emerging. I examined the connections and formulated what I will define as the design process. While design is a specific area of study, the design process I will lay out can be applied to a multitude of scientific and artistic disciplines. The fundamental need is all the same. The outcome may it be tangible or intangible, the process is all the same.

Like the scientific method, the design process is based on a body of techniques. The stages of the design process are: inquiry, analysis, synthesis, communication and evaluation.



Inquiry

Defining the problem is the most critical step of the process. This step builds the foundation on which the entire process executes from. If the foundation is broken or unstable, the outcome will not stand.

One must begin with a basis of knowledge from which to ask the right questions. The success of many great designers, artist, engineers, scientist, theorist and philosophers is product of their ability to ask the right question. Those who succeed in these profession are by nature inquisitive. It is important to question everything

but more important to ask the right question. It is only from advanced knowledge and understanding that one can formulate a proper question. Knowledge provides operational and intellectual platforms for design practice. As Einstein put it, "If I had an hour to solve a problem and my life depended on it, I would use the first 55 minutes determining the proper question to ask, for once I know the proper question, I could solve the problem in less than five minutes."

The growth of any discipline from initiation to exploration depends on critical inquiry. To truly resolve the problem, you must as a problem solver know what the problem is. The problem which was presented to you is often not the issue that should be resolved. The problem that is often presented is a symptom of the real issue. If you do not ask the appropriate questions you may never uncover the true problem and all solutions you offer will be of wasted effort as the true problem remains a problem.

Nullius in Verba

Take nobody's word for it. See for yourself

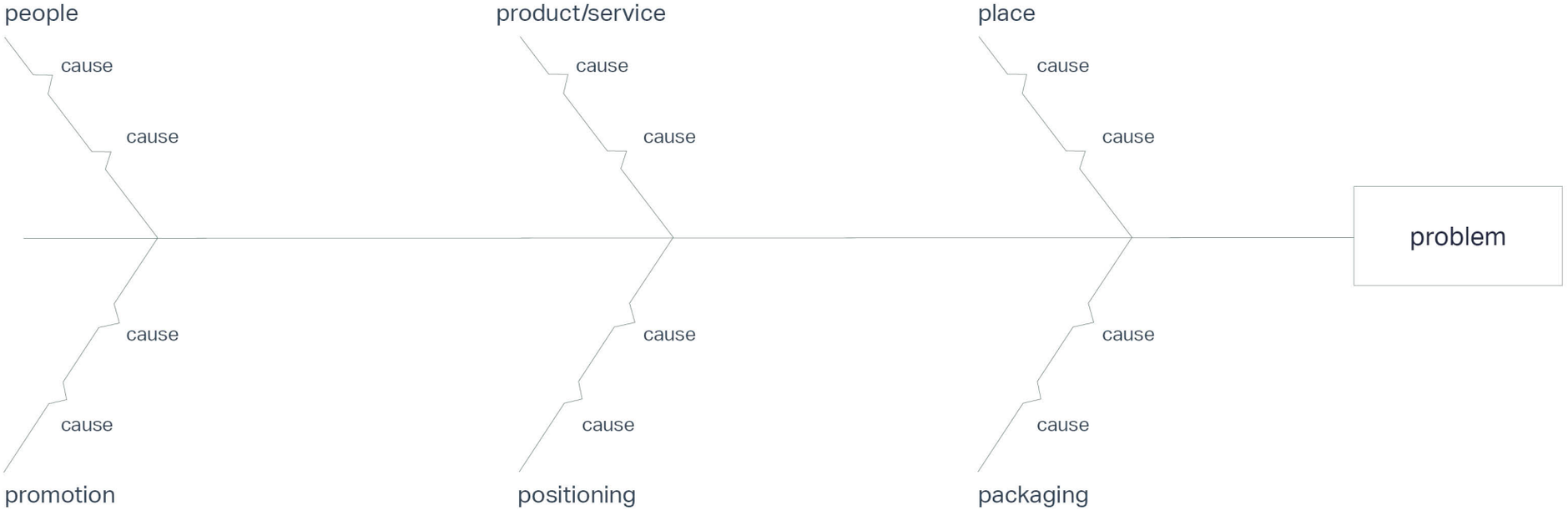
There are a couple of tools that can be very helpful in finding the root of a problem. One tool is the simple technique of asking why. Ask why often to both yourself and directed toward the subject matter expert. Just to clarify, you would want to ask specific why questions.

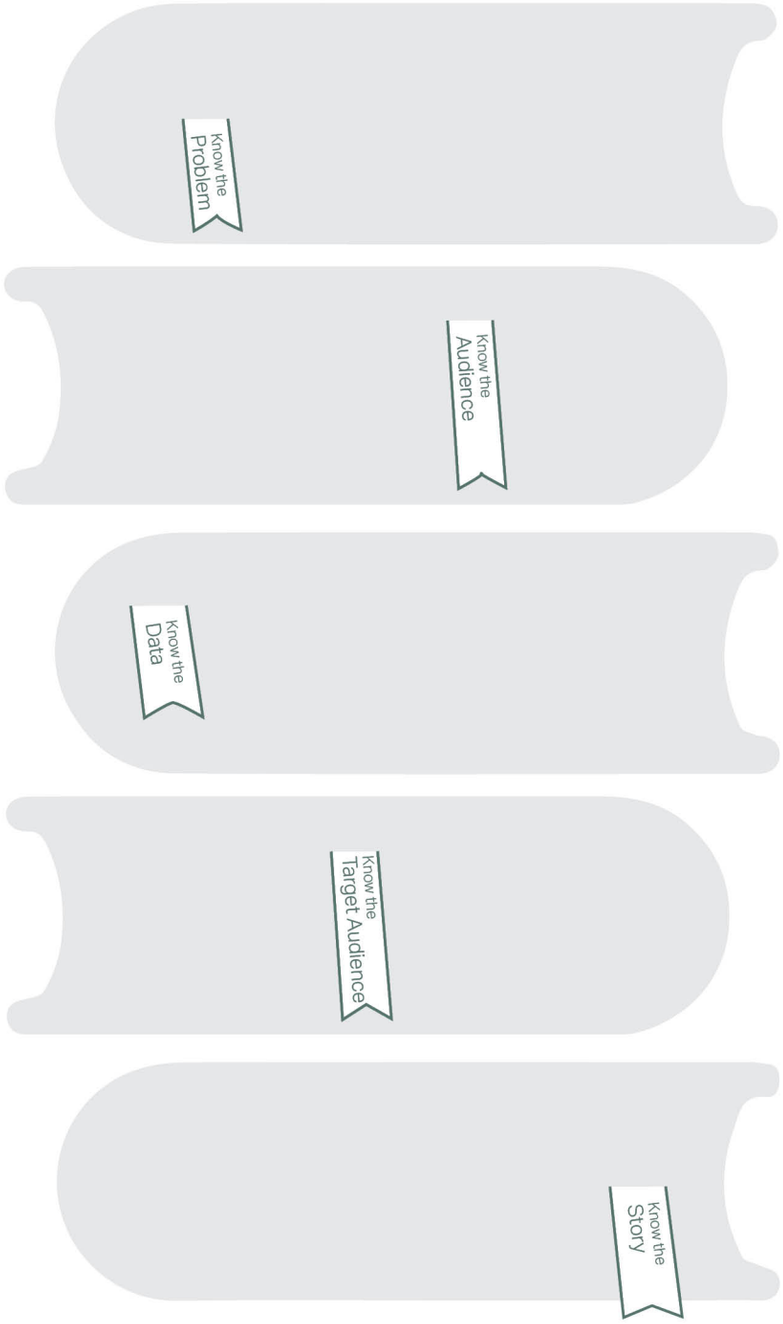
Another tool I have found helpful is to answer yourself questions and reply to them aloud. It is one thing to understand the concept of something and another to be able to verbally explain the details of that concept as if you were talking to someone with no prior knowledge of the subject matter. This will usually expose other questions you may have. Once you can speak through the entire process and their are no new questions, it is at this point you have the knowledge required to move onto the next step of the design process.

Yet another tool that can be applied is a simple cause-and-effect diagram. I have found the Ishikawa Diagram to be the most helpful. The Ishikawa diagram, also known as the fishbone diagram, is often used in quality control. To use this diagram, you would place the problem statement (the problem that was presented) at the head of the diagram. This typically states the gap that needs to be closed or the objective that is to be achieved.

Ishikawa Diagram

used to find what is a symptom and what is the problem



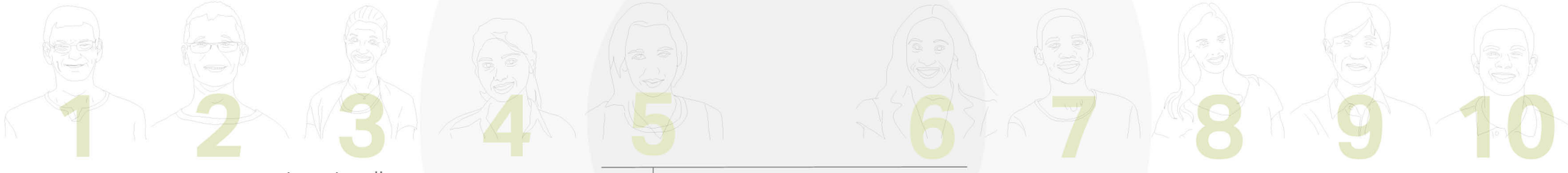


Analysis

Design research is a scientific engagement of analysis and knowing how this knowledge can be applied to the design. At this stage, you have acquired a foundation of knowledge regarding the product and have formalized the problem. The next stage is to continue the research reaching beyond the product, moving on to a larger scale. You must know your audience and the environment in which the product or solution will be utilized. The development of your artefact or solution is greatly dependent on who you are designing for. A great deal of time and effort should be spent on researching your audience or consumer by collecting the data, analyzing the data and finding the pattern or story within the data.

There are various approaches to design research, Theoretical, Methodological, Field Research, Case Study and Experimental. The Methodological approach is the most common of these approaches due to our current tracking and analytical tools available. There are a multitude of analytical tools tracking web behavior. This is valuable in knowing your audience, for example, you will have insight into their spending habits, interest and location. The advanced designer is skilled in knowing how to analyze what could potentially be a vast database of information; as well as, find the story or pattern the data is telling. Being able to write complex formulas and queries is just another tool of the designer, as much as the pen tool is in Illustrator.

Once you have pulled the stories out of the data, you want to find your target audience. The best way to accomplish this is not finding the mean of the data or even the largest segment of the data but looking at all of the segments. You should lay the segments or potential consumers out with the most likely (largest segment of the data) in the center then the two extremes to the far left and right of the center. The remaining segments would be placed in order from the most likely at one extreme or the other. By looking at the full picture so to speak gives you more awareness of your target audience (largest segment). You would not want to design solely focused on just the target audience but also to the segments just left and right of

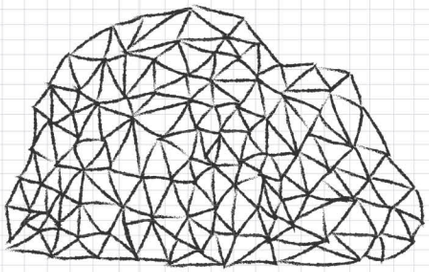


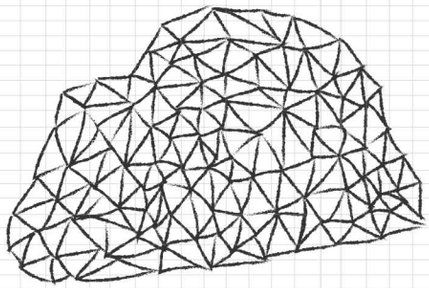
target audience

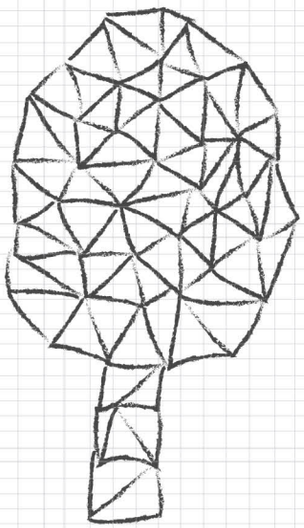
focus audience

center. For example, if 10 segments were identified. Segments 1, 2 and 3 would fall to the far left. Segments 4, 5, 6 and 7 would make up the middle. Segments 8, 9 and 10 would fall to the far right. The target audience you would want to design for will those in segments 4, 5, 6 and 7.

This concludes the research portion of the design process, next are the resolution stages.





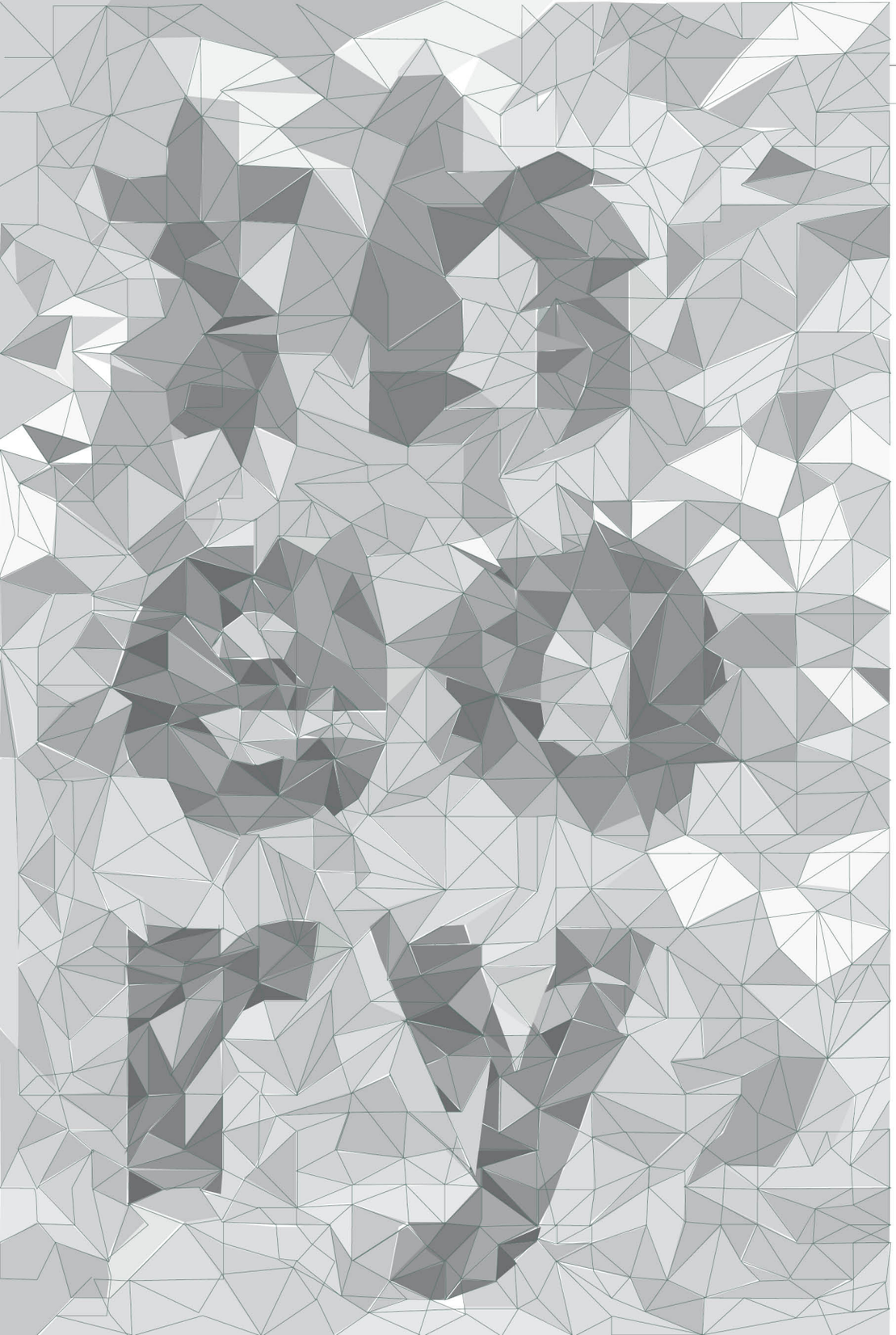


N° 21
Illustration

Synthesis

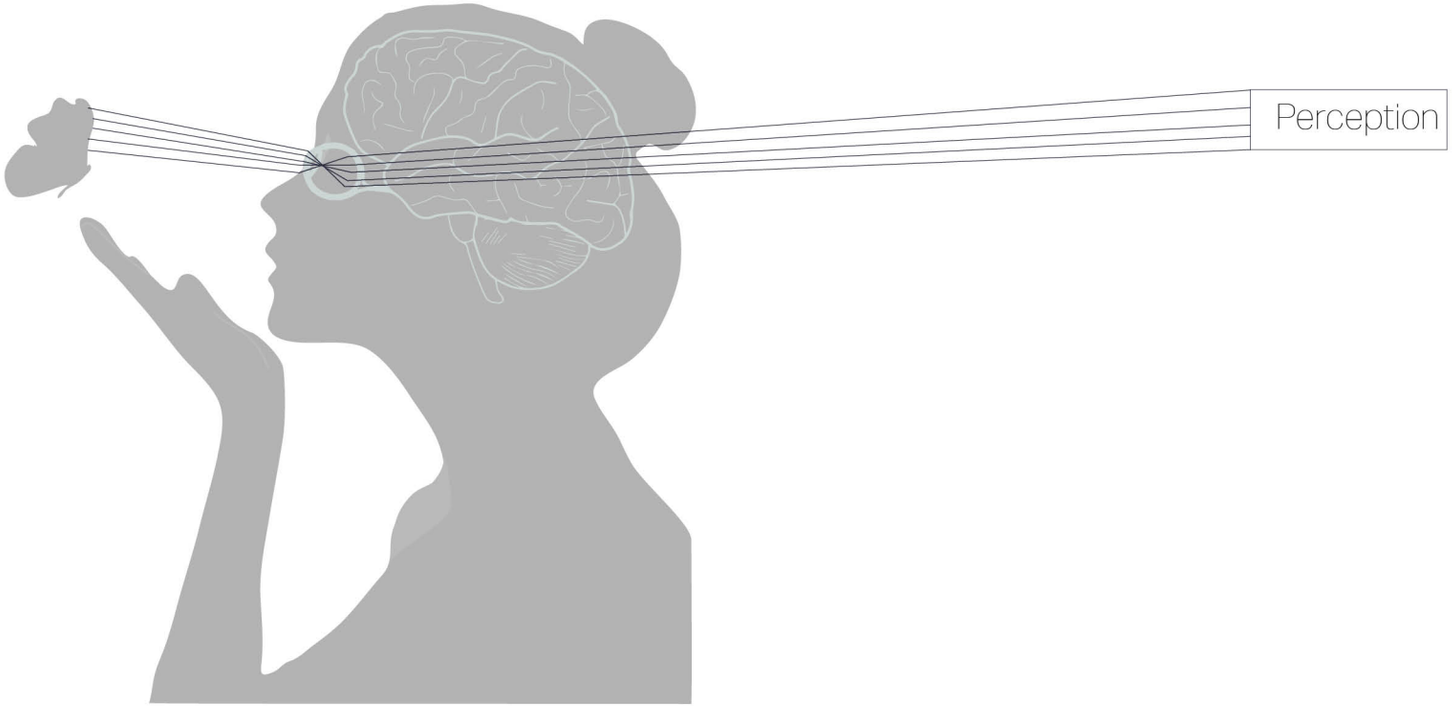
This stage is the most creative and requires one to really adopt the mind-set of anything is possible. There are no restrictions or limitations in this stage. The initiation into this stage is an exercise. That exercise is to doodle. This exercise is driven by instinct and reaction. Unlike the previous stages that required a lot of questioning and thought, you want to think less and react more during this exercise. It is imperative that one does not skip this step. Enjoy this step, doodling is a state of mind. I can say the same about brainstorming. Reread the above statements, replacing the term “doodle” with “brainstorm”.

The success of this stage is dependent on the dedication given to the previous stages, ensuring that you working to resolve the correct problem and you have the knowledge required to apply to this exercise. Though you may not be thinking actively, your subconscious is working with the knowledge you have and is driving your instinct. The end result or output of this process is an array of potential solutions. These potential solutions form a theoretical solution to the identified problem and are the input to the next practice, experimentation.



Experimentation is the method which makes it possible to shape theory. Through experimentation comes the possibility for a broad understandings of how things are and how they work. This is also accomplished through experimentations on how things do not work. This second point is one that is often overlooked and values repetition. Experiments on how things do not work. To understand the absolute function of a message or an artefact one but become equally familiar on how it works; as well as, how it does not work.

The exercise of this phase is to test/experiment with your ideas that came from the previous stage. It is at this point that the direction of the process is revealed. Through experimentation, you may discover a reason to return to the first stage of identifying the problem and repeat that step or rework that step. You many discover a need to gather more data and do more analysis. You may discover an insight that brings you back to the brainstorming exercise. You may even discover that all possibilities failed and you have to revisit all of the previous stages. The success of this stage is a formalized theory.



Communication

It is only after the completion of identifying the problem, conducting the analysis and synthesis that the designer is prepared to act upon their artistic skills. It is during this stage that artifacts are created and become the product of the design process. Though this may be the stage where greater artistic energies can be expressed, science almost remains at the core.

It is here that the designer can flex their knowledge and skill. Showcase their understanding of the science behind design and their mastery of tacit knowledge. It is also here that problems the designer is resolving multiplies. There is the initial and core problem that has driven all of the process to this point. The problems that the designer should now be conscious of are the perceptions of the artefact. What information will the artefact provide? What is the user experience? What is the appeal or uniqueness of the design?

There is an entire tool box of principles, law's, and techniques that can be used to address all of these problems, it is up to the designer as to which techniques to use and how to apply it. Perception is the interpretation of sensory information. Sensory organs, such as the eyes, the ears and the nose send signals through the peripheral nervous system to the brain. Perception begins with the firing of neurons but is shaped by our memory. This

leads us to psychology and how memory works. One tool borrowed from psychology that is used by designers is classical conditioning. Designers can use classical conditioning to control the perception of the output or the artefact. Pairing a product with an image of a farm and the image is flooded with the color green triggers a conditioned emotional response of health and wellness. Color is used not only for its direct tap into the subconscious but also a tool to attract attention, organize elements and indicate meaning. Color is the first element the minds sees and the last it forgets. (Lidwell, William, Kritina Holden, and Jill Butler, *Universal Principles of Design*)

Evoking an emotional response engages the audience and is helpful in the use of storytelling. Storytelling provides context to enhance learning and is helpful in making it memorable to the audience. Each element applied assist in telling the story. The decision of typeface can become the voice of the product. Selecting the right voice (typeface) that will appear on the artefact should be a very well thought out and careful decision.

All communication involves the creation, transmission and reception of information. The designer has control over how this information is consumed. This is accomplished by visually minimizing the elements that are not meaningful and bolding the essential elements. This is a basic technique and the principles for Signal-to-Noise Ration. Like all elements , there must remain a balance of harmony.

N° 24
Illustration

The practice for laying out the information in the order the audience should receive it is through hierarchial structures. Creating hierarchy organizes complex information and visually creates relationships. Clear visibility of a hierarchial structure is one of the most effective ways to increase understanding of a system and knowledge of the message. Weather you are telling a story, laying out a user interface or presenting information, layers can be helpful. Consider linear layers when telling stories and presenting sequences of time-based events, and use nonlinear layers when emphasizing relationships within the information.

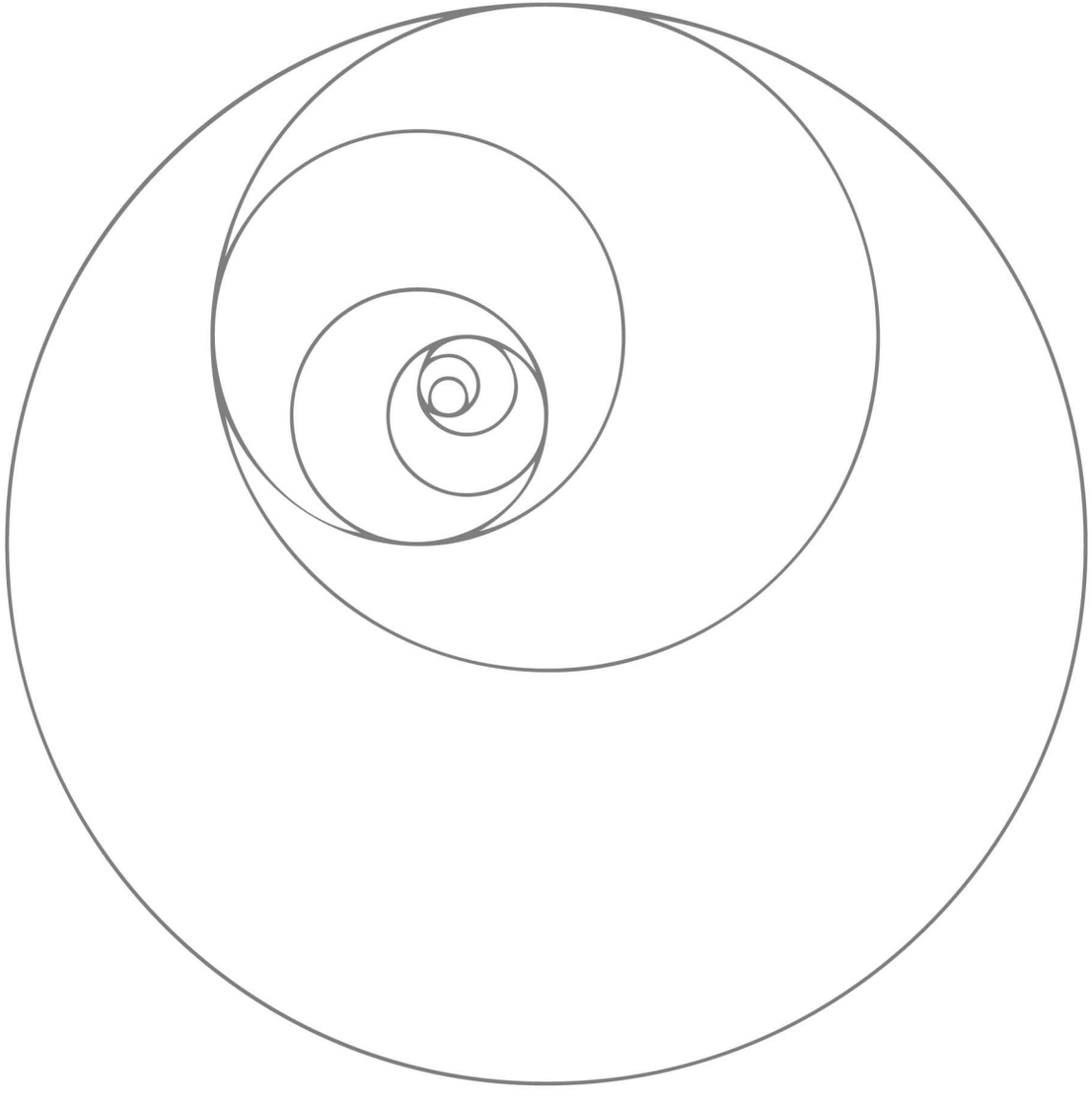
How the audience interacts with the product or artefact define the users experience. During each phase of the process, especially the communication phase, the designer must always be mindful of the user experience. Consistency improves usability and creates a foundation that be leveraged in learning the system. For example, if

1 1 2 3 5 8 13 21 34 56

the logo that appears in the upper left hand corner of the web page takes one back to the home page. Navigation back to home from any page is know without having to explore every page to find the way back home. Consistency enables people to efficiently transfer knowledge to new contexts, learn new things quickly, and focus attention on the relevant aspects of a task.

Science has proven that aesthetic designs are perceived as easier to use than less-aesthetic designs. People perceive more-aesthetic designs as easier to use and have a more pleasant user experience than less-aesthetic designs even if the less-aesthetic design is more functional. There are several principles that can aid a designer in creating aesthetically pleasing artefacts. Principles such as Fibonacci Sequence, Golden Ration and Rule of Thirds.

The Fibonacci sequence is a sequence of numbers in which each number is the sum of the preceding two. It appears in nature, in a startling variety of places. You can find it in the branching patterns of plants and in the arrangement of scales on a pineapple. Most flowers have a Fibonacci number of petals, and the golden ratio describes the curl of spiral shells and elephant tusks. These patterns are intrinsically beautiful. The golden ration is a ratio within the elements of a form, such as height to width, approximating 0.618.



The golden ratio, like the Fibonacci sequence is found throughout nature, art and architecture. Seashells, the Mona Lisa and the Parthenon all show the golden ratio. Our faces and bodies are also proportional to the golden ratio. It's so omnipresent that it's even found in sounds and intervals of time. If there ever was a mathematical way to explain and express natural beauty, the golden ratio is it.

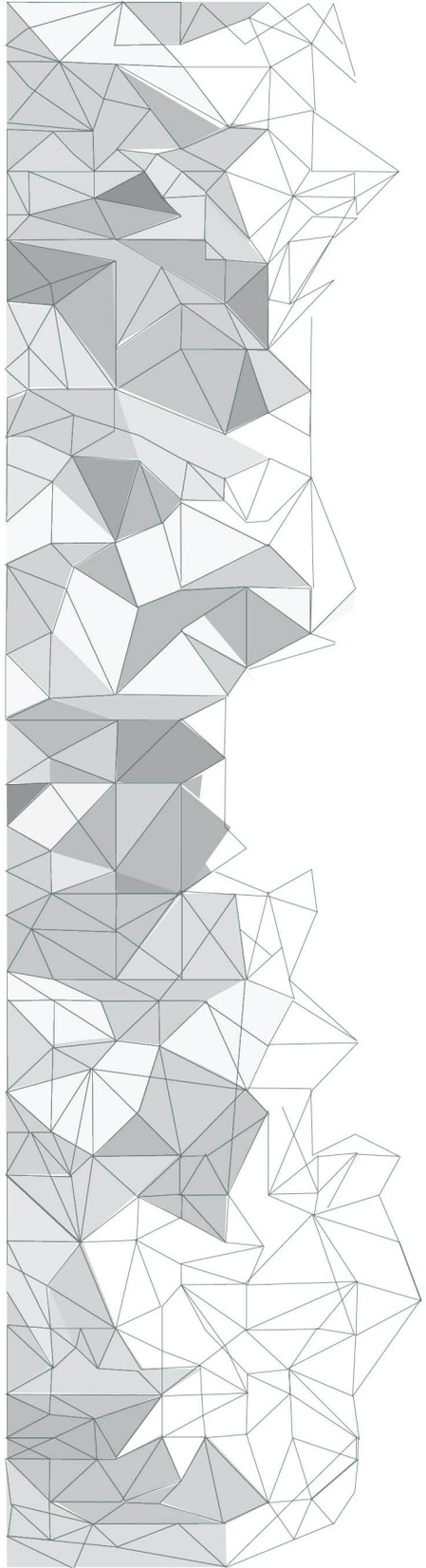
A simple way to apply the golden ratio when creating a grid is to use the rule of thirds. It is a rough approximation of the golden ratio. It is a technique of dividing a composition into thirds both vertically and horizontally. This creates a grid of nine rectangles and four intersections. When working with a primary element and a secondary element, they should be placed at opposing intersections on the grid to balance the composition and create a relationship between the elements.

Evaluation

Once the artefact or final output is complete. There is one final quick step that should always be completed to successfully complete the design process. The evaluation stage consist of a formal documentation of the project. A key activity that takes place during this process is that lessons learned are identified and documented. It is essential at this point to reflect upon the project when the events are still recent, as is it will be easier to recall each phase. While it is important to document any problems that were challenging, it is equally helpful to document any aspect that had a notable positive impact.

When completing the lessons learned activity, one should in an almost grid like fashion list each challenge experienced down the first column then in columns to right of, add a description of the challenge, any actions that were taken and a recommendation. Laying it out in this fashion makes it easy to come back to and review prior to initiating a new project.

One does not evolve by repeating past mistakes. One evolves by learning from and applying those lessons to future endeavours. This is a lesson that transcends design and can and should be applied to everything from project management, to medicine, and to life. By formalizing this practice, it becomes part of the consciousness. By continually utilizing this practice, one becomes not only a better designer but a better person. The principles we trust and abide by effect not only ones work but also, may it even be on a subconscious level, how one approaches everything out side of work.



Afterword

A few years ago, one evening I was sitting in a large lecture room on the campus of UCONN attending a symposium on Science. I was accompanying a friend and had not expected what I was going to hear to have had such a great impact on my life.

I had just completed my undergraduate in Art History and on various occasions studied the art of the Renaissance. During the course of these lectures I heard the term Golden Ratio a number of times. I had a basic understanding of the meaning and only knew of the art from the Renaissance as a reference for this term. Yet as I listened to the speaker in the lecture hall, I was hearing this term referenced in a whole new paradigm.

I have forgotten the name of the speaker and have forgottne the title of symposium but I do remember that it was pertaining to the subject matter of astrology. The speaker was describing the distance of the planets from one another was the same ratio as the Golden Ratio. Like two worlds colliding, I mind exploded.

I then independently researched the Golden Ratio and discovered how common these patterns existed in nature. I soon after, began my graduate studies and here again I am taught this concept on yet another paradigm. I have since concluded that this connection was just one small thread in the tapestry of Art and Science.

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