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Storyboard of Thoughts: Using Photography and Illustration to Visualize the Mind

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Abstract

What does the artist see *that non-artists don't? What aspects of the seen and the unseen yield the essence of creative artistic invention? In the art world where a single, preselected polished work is introduced under the glow of anticipated presentation, the progressive search for that decisive moment displayed is seldom demonstrated. Taking a body of mixed media and photographic work as the initial point of departure to understand idea emergence and resulting representation, I present and discuss the visual stages of my own multidisciplinary creative process while in pursuit of questions and answers about the mind/brain. From literal, spherical, abstract, and squared to soft, harsh, sensual, and reflective, I reveal the explicit and implicit layered connections I make as a polymath Artist-Scientist between disciplines, history, artistic styles, visual perception, emotion, and form – the vast information networks that underlie our human experience.*

Introduction

In the world of photojournalism where the capturing of a single precious moment is one of the defining characteristics between a master and an amateur, Henri-Cartier Bresson's statement in 1957 about that decisive moment in street photography is particularly poignant:

> "Photography is not like painting. There is a creative fraction of a second when you are taking a picture. Your eye must see a composition or an expression that life itself offers you, and you must know with intuition when to click the camera. That is the moment the photographer is creative. Oop! The moment! Once you miss it, it is gone forever."

More specifically, Bresson associates that captured moment of an independently existing situation of the spontaneous moment to creative decision-making by the photographer [1]. This poses an interesting question in regards to *how* and *what* the photographer intuited was the ideal moment to detain. As a photographer myself who has worked in darkrooms for black and white and color printing, a second question arises: once rows and rows of images from a particular moment are seen on a contact sheet, what about the post-production process of intuiting to select the image that will be printed and presented to the world?

In contrast, art historian Ernst Gombrich discusses pictorial representation by visual artists (i.e. painters) as a progressive sketching process that eventually yields mapping of a scene as the stimulus being drawn changes on the canvas across time until it is "copied" [2]. Although not explicitly addressing creativity, the suggestion from "copying" a scene is that visual representation is an ongoing process of perceptual problem-solving and decision-making choices handled bit by bit to produce a final sketch or painting. This inspires the question of the representation's veridicality given not only the artist's perceptual interpretation of the scene being copied but fluid changes within the scene itself (e.g. weather, entering and exiting of people and objects, moods). With the introduction of Daguerreotype photography in 1839 and its popularization in subsequent years as it replaced classic portraitures of oil paintings for efficiency, photographs took on special status over that of paintings and drawings: they were –and are still considered– objects of immediacy and realism [3]. But paintings and drawings can look vividly 'real' and rightly so if produced by an expert who has mastered various graphic techniques. Questioning whether repetitive practice representing 'reality' affects perception, a study revealed that expert visual artists are just as affected by visual contexts as non-artists Moreover, extensive experience with visual artistic representation does not alter the visual system and free the artist to access the veridical, retinal image. Instead, an artist's visual advantage lies in a hyper-acute understanding of the various parts and proportions within and between objects in a scene [4]. Relating this to the photographer and Bresson's concept of intuitive creativity, the photographer's intuition –or cognitive advantage– lies in a keen understanding of what is unique in a visual situation and clicks of the shutter reflect the photographer's hopes of capturing the perceived uniqueness. Furthermore, a glance at a photographer's proof sheet with contact prints after viewing the presented final public image indeed reveals the choice selection entertained in post-production –for whatever emotional, intellectual, perceptual, and/or physical reasons, as known in the work, for example, of American photographer Diane Arbus [5]. Therein lies the crux of the matter and the issue I will address: the final representation is the conclusion of creative production and revealing whatever steps beforehand can help to uncover the storyboard of thoughts leading to the conclusion. What Bresson assumes and calls intuition, Gombrich begins to break down as a way to inquire on the nature of our reactions to the laws of nature. In this paper I take a merged perspective regarding veridical representation –what I perceive and what exists independent of me– and expand it to inquire on creative thinking and intuitive judgments. I put forward my own before notes and images, where available, as slices of transitory thoughts making way for the consolidated representation in the final image.

What follows is the presentation and analysis of two visual projects: a small body of mixed media work titled *Creating Connections* that visualizes the abstract conceptual connections between Art and Science as they relate to the mind/brain, and another small body of photographic work titled *Divided States* that highlights the interpretative relationships suggested between light and shadow, reflective surfaces, space, and body position. As an artist-scientist whereby Science informs my art and Art informs my science, I use technology and software from each (film, digital SLR, + point-and-shoot cameras and Photoshop + Illustrator and MRIcron + Matlab + SPM8 + Logic Pro). The outcome is a blend of information between mind and machines (camera + computer) transformed to communicate a new message that is balanced between functionality and aesthetic form.

A Vision All of One's Own

I present two different projects. Project 1: *Creating Connections* visualizes in an aesthetic manner various intersecting abstract concepts about the mind/brain. Project 2: *Divided States* is an improvised fashion-like photo shoot that used reflections, mirrors, and shadows to create illusive states.

Project 1: Creating Connections

Inspired by the merged Art-Science nature of my work on artistic creativity [6], [7], [8], I proposed the following challenge to myself more than half a year ago: *in the span of a week create one visual image per day –for a total of seven images– to illustrate some of the biggest questions surrounding the study of the mind/brain. No preparation beforehand, no long hours making notes or plans, simply illustrate as ideas come to mind with the tools you use as an Artist-Scientist*. Being that I study creativity, its processes, and its character, big questions are: *what* connections are made and *how* are they created. That is, how do the old and the new converge, combine, and transform to yield a new object that will invite interaction. I detail my thought processes below in an attempt to uncover how I connected concepts and visually represented them. I did not plan the order in which they developed and only realized after completion of the seventh image that I had unconsciously created an ordered narrative.

Image 01. Gear Woman

Woman as the universal doll in Figure 1. From the earliest inventions of humanoid automata to dolls/robots/marionettes in science fiction literature, film, and opera, the automata represented are disturbingly almost always in the form of a human female. Thinking to connect the traditional mechanical gears-and-pulleys concept with that of bio-motion vectors resulting from experiments conducted on human gait patterns, I started with the photograph of a gear. Then I digitally drew a female doll of the type used in fashion designing and a binary world. I placed my gear woman in front of the globe with her crank-like waist as if in rotation. She appears relaxed and poised yet static around the world –a constant reminder that female movement and liberation worldwide still has a long way to go…

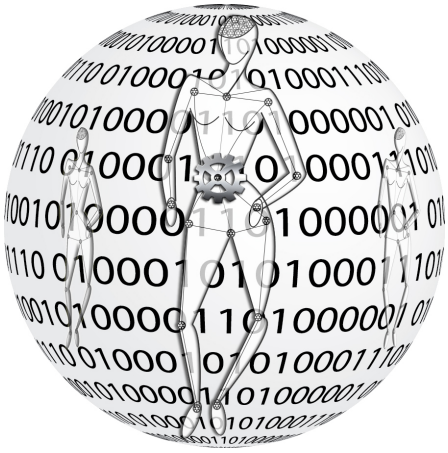

Figure 1. Gear Woman.

Image 02. Neural Eye

Returning to the beginnings of modern neuroscience of the late 1880s and zooming into the cells of the nervous system in Figure 2. Inspired by Santiago Ramón y Cajal, the father of modern neuroscience and an equally accomplished photographer, I was captivated by his groundbreaking work (both scientifically and artistically) in neuroanatomy. As if looking from beneath the glass plate under the microscope at neurons in Figure 3, I photographed my digital point-and-shoot camera in the mirror and superimposed a scan of neurons I had traced by hand and digitally dripped their axon fibers à la Jackson Pollock with an improvisatory twist of effects. There was no coincidence in my choice of subject matter – I had been consulting a book on Ramón y Cajal's neuroanatomical drawings [9] and reading about mathematical analyses on Pollock's paintings [10] several months before.

Figure 2. Neural Eye.

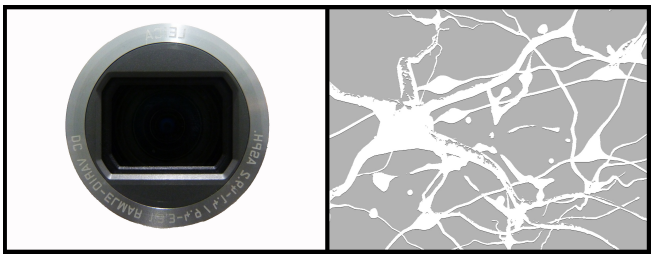

Figure 3. Initial set of images before overlaying to create 'Neural Eye'.

Image 03. And the Mind?

From churning gears to structural-functional relationships to functional connectivity in Figure 4 where are we now? Since 4000 B.C. humans have been inquiring about the origins of perception, emotion, and thought. Whether dissecting patients postmortem, performing lobotomy, or injecting and ingesting substances, we have been intent on finding a window into the inner workings of our mind/brain. As neuroscience researchers seem to ignore that our brains have minds and belong to bodies constantly interacting within different environments [11], I cannot but ask *and the mind*? Faceless and bodiless, I photographed a skull ornament with metal gears from above, then created a horizontal image from a generic brain model using MRIcron software, and drew an improvised functional connectivity map to highlight possible inter-regional relationships at play, as separately shown in Figure 5. How exactly do neural and computational networks make each and every one of us unique? Only a bigger picture and multidisciplinary perspective will solve such a complex question. Until then, they remain as faceless and bodiless and generic as the parts of this image.

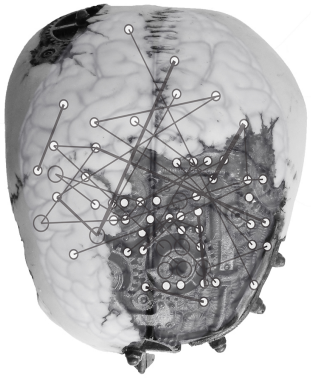

Figure 4. And the Mind?

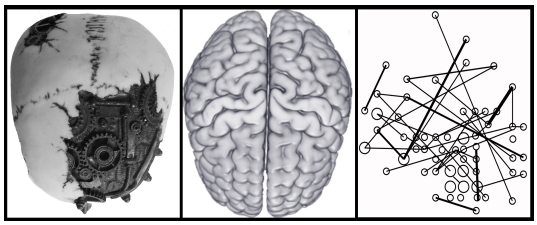

Figure 5. Initial set of images before overlaying to create 'And the Mind?'.

Image 04. Fan-Based Emotions

Online emotional cycles are currently on overdrive. Much like the blades of a fan or the petals of a flower, Robert Plutchik developed the now classic 3D wheel of emotions in 1980 to categorize primary human emotions according to similarity, opposition, and intensity [12]. He related them to the color wheel while I relate them to the zone scale of pure black (0) to pure white (10) and all its shades of grey in between in Figure 6 –inspired by years perfecting black and white film exposure, development, and printing. With the democratization of technology and the pluralization of social networks feeding us our emotions at every second, where intensity rises as 'likes' increase, we cycle around ad infinitum. It was my luck that I found a gleaming aluminum exhaust fan, arranged surrounding lights, photographed it spinning for its flower-like structure, and then digitally transformed it before superimposing a gear for dramatic effect.

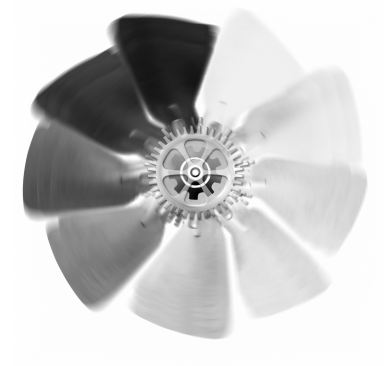

Figure 6. Fan-Based Emotions.

Image 05. Persistence of Fault

Persistence of memory could be argued to be all about repeated patterns, recursive structures, reiterated statements. Symmetrical, repeated, and self-similar systems (i.e. fractals) are found everywhere in nature from trees and coastlines to language and art [13]; even persistent stereotypes. "*She is a great man whose only fault is being a woman*" reads the speech stream I recorded beneath the tree, a subtle reference to the rumored statement French philosopher Voltaire is said to have made in describing the genius physicist Émilie du Châtelet. The speech stream drips like a chalked waterfall beyond the fractal branches of a syntactic tree in Figure 7. Figure 8 reveals the order of events when composing the image: the form of the speech signal triggered my memory of a film photograph I had taken years back of a post-snow salted staircase. Together, those images inspired me to create a highly stylized syntactic tree of the referent speech stream, an influence from studying linguistics for part of my graduate work in cognitive science.

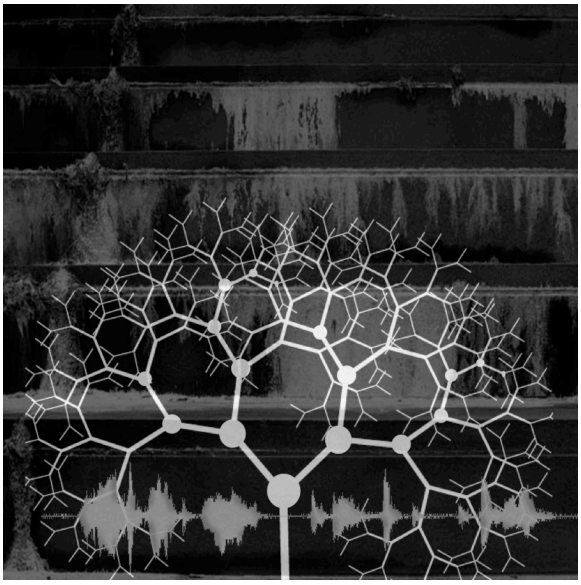

Figure 7. Persistence of Fault.

Figure 8. Initial set of images before cropping, overlaying, and using editing effects to create 'Persistence of Fault'.

Image 06. Imprisoned Connectome

Trapped by our own technology and with no clear answers in sight. Playing with object perception à la René Magritte and the push, pull, and dismantling of narrative expectations of Alain Robbe-Grillet's surrealist novel "La belle captive / The beautiful captive" within the themes of cognitive neuroscience, are the brain and its neural fibers behind, in front of, or somehow interwoven between the bars in Figure 9? Brain imaging with functional MRI can tell us the *what* and *where* of particular mental processes. Diffusion MRI can help us build the network map ("connectome") of neural connectivity between anatomy and function. But *how* does unique behavior arise from those particular structures? With varying spatial and temporal resolutions from brain imaging technology can we really make confident inferences about abstract

thought? How enslaved are we by our own cognition to solving who we are as human beings? Remembering a black and white photograph I had taken of the inside of a grand piano for yet another project, *Anatomy of a Piano*, I clashed the rigid structure of piano strings with the fluid pathways and undulations of the mind/brain to highlight the elusive nature of neural networks and the rigid way in which the mind/brain is studied. No accident in my influences of visual art and literature as an aficionada of French art and culture. Figure 10 shows the original piano image, a sagittal image from a generic brain model in MRIcron, a diffusion MRI experiment image filtered through a black and white layer, and the initial visualization I had created before deciding on the one in Figure 9.

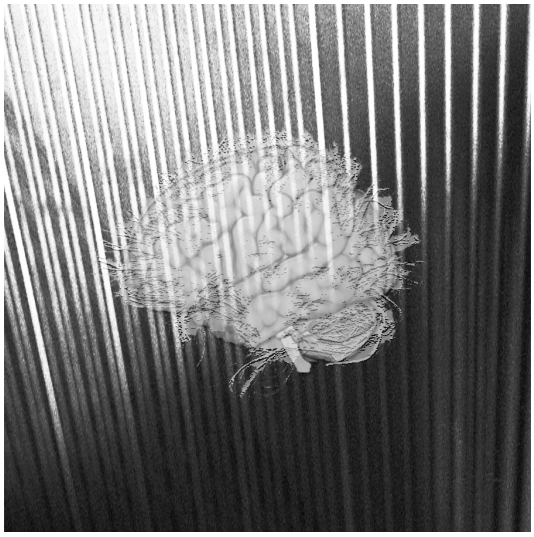

Figure 9. Imprisoned Connectome.

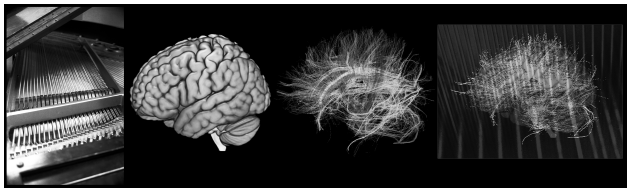

Figure 10. Initial set of images before cropping, overlaying, and using various editing effects to create the final version of 'Imprisoned Connectome'.

Image 07. Precipice Unknown

Ascending with piles and piles of separate pieces of knowledge towards what? An optical illusion I happened upon on in an abandoned building instantly reminded me that perception is all about connecting what we know, what we think we know, and what we want to see. Science and technology are tools for deciphering "truth." Culture and society mold our mindsets in many more ways than we wish to admit. And when we disrupt norms and rules? We quiver with fear in frantic search for stable patterns and categories. So I flipped my original black and white photograph of the building's ceiling vertically and then horizontally and then digitally drew an improvised enigmatic curved figure in semi-flight while viewing the black emptiness in my scanned negative in Figure 11 – its beauty lies as much in the unknown of its meaning as the unknowns of the mind/brain that fuel my curiosity for exploration. Figure 12 shows the original angle from which I took the photograph, looking upwards at the ceiling and its quasi-upside-down staircase, and the curved figure I digitally drew out, inspired by the many paintings, sketches, and model buildings I had seen in an exhibition of architect Zaha Hadid's design and engineering work.

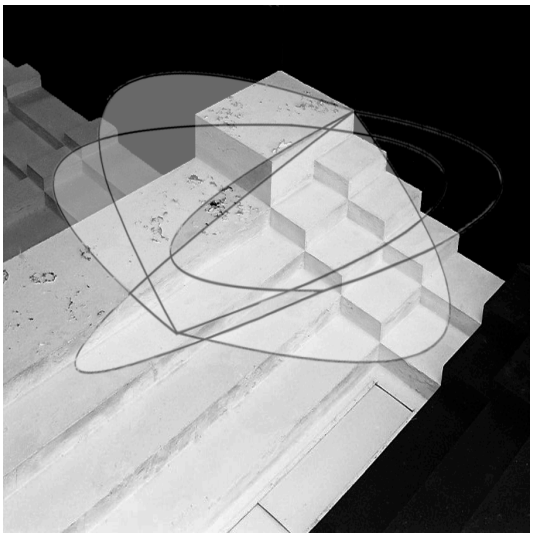

Figure 11. Precipice Unknown.

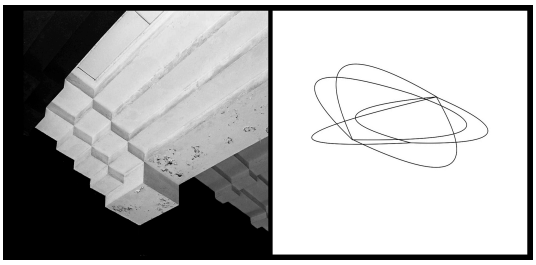

Figure 12. Initial set of images before flipping, overlaying, and using various editing effects to create 'Precipice Unknown'.

Because of the multiple images used to create a single image and the premise of the project, *Creating Connections* stands more as an exercise in abstract concept interpretation through visual means than in represented 'truth' (in the sense of being "a mere transcript of nature" [2, p. 2]) typically attributed to paintings and photographs of, for example, any in/outdoor scene. Moreover, this project highlights a four-tier process from ideation to production that occurred for each image: (i) definition of concept and overall narrative goal, (ii) literal representation of concept(s) based on personal knowledge/experience/memory, (iii) connecting of links, associations, and relationships between images resulting from (ii), and (iv) decision-making steps for aesthetic and narrative effect.

Project 2: Divided States

Before turning to digital photography and mixed media work, I worked with black and white and color film. The eleven images below come from a body of work made with the following objective: to capture slices of thoughtful moments surrounded by reflective surfaces and/or stark chiaroscuro lighting to give the illusion of screenshots taken from classic yet-to-be-made black and white films. Prior to each photo shoot I scouted out locations in search of reflective surfaces and areas in which I could quickly set

up lighting so each shoot would be entirely improvised and require minimal technical preparation and a single roll of 24 exposures. All photographs, Figures 13 through 23, were digitally scanned from 35mm black and white film negatives and required minor digital editing to clean dust or scratch spots. Once on location, I directed the model to stand and/or sit, spontaneously improvising a narrative for her 'character'. Then I carefully framed every shot through the viewfinder to achieve the greatest level of visual impact: enigmatic female characters dressed and positioned to suggest a narrative beyond the single captured instant and open to interpretation by the viewer. The result was an interesting revelation of unexpected visual illusions otherwise rarely captured and aesthetically documented. While aware of the reflective surfaces and/or shadows in the frame, as I had explicitly sought them out, I was not completely aware of their illusory effect on visual narration (i.e. the divided emotional states between surround and model) until I printed them as 11"x14" prints.

Figure 13. Image shot against the reflective door of a bathroom stall.

Figure 14. Image shot from a staircase against the reflective surfaces of marble and glass walls.

Figure 15. Image is of the inside of a piano's reflective lid.

Figure 16. Image shot on a terrace with a displaced mirror.

Figure 17. Image shot in a river.

Figure 18. Image shot in a living room.

Figure 19. Image shot in a dance studio.

Figure 20. Image shot in a library.

Figure 21. Image shot in a lounge area.

Figure 22. Image shot in a museum's patio.

Figure 23. Image shot in an abandoned alleyway.

A slight change of angle and contrasting surface tones and textures –all consequent of a reflection or shadow– combined with the model's body position reveal how little information is consciously used to interpret general emotions and moods. This suggests that the unconsciously seen (i.e. unattended area) at the moment of shutter clicking by the photographer later becomes the consciously seen and analyzed during long-term examination as the mind/brain attempts to construct meaning from all the visual elements available. Under this perspective, intuitive creativity à la Bresson might be more clearly described as a keen understanding of *something* unique within a visual situation resulting from years of careful analyses of scenes and the current task at hand –immediate framing to encapsulate that unique thing identified– is meant to capture that perceived uniqueness with the possibility that

something *else* unidentified and left to chance may arise. With *Divided States* I artistically expressed a known reality of visual perception to advantageous aesthetic effect: my own selective processing of the main object in focus, the model, during image capturing somewhat precluded me from attending to the surround area –despite my explicit intention to capture a reflective or shadowed image because of its altered effect on the original image. This resulted in significantly adding narrative emotional power to the image as a whole. Serendipity is as much a favorable consequence to the artist as anyone else and the unseen is very much an element of the creative process.

Formalizing the Storyboard Frames

Creating Connections and *Divided States* reveal that artistic expression is the very reflection of an artist's own mind/brain; in a way, the realized amalgamation of the artist in her environment as she dynamically shifts through and uniquely merges her perception of incoming bottom-up sensory and learned top-down knowledge information. Figure 24 visualizes the creative process in four states. In State 1, external bottom-up information (ei) and top-down knowledge, experience, memory, and emotion combine to generate concepts relevant for the current goal, its final 'look' unknown. In State 2, different representations of the identified concepts are generated. In State 3, new ideas arise, some ignored and/or incomplete, as the identified concepts are combined and transformed. In State 4, an idea is selected, along with any unseen elements, and the goal is accomplished in the final represented object. All throughout, the artist may move back and forth fine-tuning her concept and/or representations.

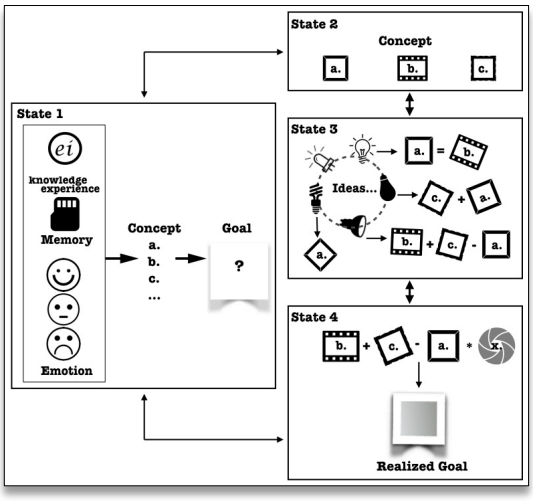

Figure 24. A storyboard of cognitive processes (states 1 through 4) throughout the artistic creative process.

The decisive moment of what to spontaneously capture or produce across a span of time, therefore, is the perceived ideal synthesis of the many smaller moments that occur during creative production.

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Author Biography

Mónica López-González received her BAs (2005) in Psychology and French, MA (2007) and PhD (2010) in Cognitive Science, all from Johns Hopkins University. She has a Certificate of Art in Photography from Maryland Institute College of Art (2009). She held a postdoctoral fellowship at Johns Hopkins University School of Medicine from 2010 to 2013. Since then she has worked as a cognitive scientist, multidisciplinary artist, public speaker, educator and entrepreneur as Co-Founder and Executive Scientific & Artistic Director of La Petite Noiseuse Productions. In 2016 she was recognized as a "particularly imaginative polymath" by the Imagination Institute based at the University of Pennsylvania's Positive Psychology Center. She is a committee member of HVEI.