

# iPhotograms: An Exploration of Technology Through Cyanotype

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## Abstract

Our technologies are becoming evermore ubiquitous and universal. Technology now composes our lives. At the same time, in a sense we become more separated from these technologies due to a lack of understanding of the hardware and software of which they are made. This paper introduces these ideas of the black boxing of technology through the lens of science and technology studies along with media archaeology. These ideas form the conceptual framework behind *iPhotograms*, a series of cyanotype photographs examining the black box of an iPhone 5. In this project, a modern camera, the iPhone, was disassembled, dissected, and documented using one of the oldest photographic processes.

## Keywords

Media archaeology, science and technology studies, photography, cyanotype, historic photographic processes.

## Introduction

Our technologies are becoming evermore ubiquitous and universal. As Roger Burrows explains, our social “associations and interactions are now not only *mediated* by software and code they are becoming *constituted* by it” (Burrows 2009). Technology now composes our lives. At the same time, in a sense we become more separated from these technologies due to a lack of understanding of the hardware and software of which they are made. We may understand the basics of a Raspberry Pi or simple coding, but much of the physical components composing and the underlying algorithms governing our smart phones, tablets, computers, watches, gaming consoles, and cameras remains hidden from view and outside the understanding of the average person.

This paper introduces these ideas of the black boxing of technology through the lens of science and technology studies along with media archaeology. These ideas form the conceptual framework behind *iPhotograms*, a series of cyanotype photographs examining the black box of an iPhone 5. In this project, a modern camera, the iPhone, was disassembled, dissected, and documented using one of the oldest photographic processes. This work peers into the inner workings of our technology and asks how much we can know or need to know. This paper will begin with an overview of the theoretical underpinnings of the project,

introduce related work, visit the historic process of cyanotypes, and offer an overview of the *iPhotograms* series.

## Exploring the Black Box

Latour discussed this black box in 1987, noting that ‘cyberneticians’ used the term when the physical components of a system or the set of commands in software became too complex. By black boxing the complex inner workings, they could focus on only the input and output (Latour 1987). Social constructivists revisited this idea, calling for the opening of the black boxes of our technology and exposing the systems and processes by which they came to be (Pinch & Bijker 1987). Some found this exercise to be unremarkable and without any insight, suggesting that theorists and philosophers need a better understanding of the technologies examined (Winner 1993). Others highlight how important understanding these social constructions are and how much human participation and interaction with technology depend on the way these systems are organized (Kallinikos 2002).

If we think of our technology as a combination of hardware, software, and wetware, then these ideas of the social constructivists begin to unpack the human (wetware) component of our technology (Winthrop-Young 2010). While social constructivist discussions around black boxes may focus on the hidden or underexplored social forces at play in the development and adoption of technology, others are examining the black box quite literally and physically.

Matthew Kirschenbaum describes electronic textuality, explaining that there is physicality to it even if it exists on a scale too small for us to normally consider (Kirschenbaum 2008). He explains,

*Bits can be measured in microns when recorded on a magnetic hard disk. They can be visualized with technologies such as magnetic force microscopy... When a CD-ROM is burned, a laser superheats a layer of dye to create pits and lands, tiny depressions on the grooved surface of the platter. The length of these depressions is measured in microns, their width and depth in nanometers.*

Media archaeology is also an approach researchers use to study new media and technology. Erkki Huhtamo and Jussi

Parikka explain the practice of media archaeologists as rummaging through

... *textual, visual, and auditory archives as well as collections of artifacts, emphasizing both the discursive and the material manifestations of culture. Its explorations move fluidly between disciplines, although it does not have a permanent home within any of them* (Huhtamo & Parikka 2011).

Hertz and Parikka later explore the possibilities of media archaeology as an artistic method. They draw on Latour's ideas of *punctualization*, of bringing a complex system together to serve as a single object. They look at the disassembly, or depunctualization, of these single objects and what this process means in our current paradigm of planned obsolescence of consumer electronics (Hertz & Parikka 2012). With products that are designed to be unfixable without serviceable parts, disassembling them becomes almost subversive. It involves opening up the black box that the manufacturers never wanted us to see or explore. DIY enthusiasts, tinkerers, and circuit benders all incorporate this idea of media archaeology in their practices of breaking open and modifying technology in engaging and expressive ways.

### Related Work

Along with the concepts and ideas discussed thus far, *iPhotograms* is inspired and informed by a number of artists and researchers working with alternative photographic processes and digital photography.

Adam Fuss is one such artist who returns to historic processes as part of his work. This movement of the "antiquarian avant-garde" uses the history of photography for metaphors and insight in visually exploring the present (Rexer, 2002). Fuss incorporates the photogram in his work. Photograms are images produced with photographic processes but without a camera or lens (Neusüss 1994) often involving the placement of objects directly onto photosensitive paper. Barbara Tannenbaum interprets the photogram as a "conveyor of literal fact; the actual physical presence of the object or the light is recorded directly onto the paper" (Tannenbaum 1992).

In Fuss's series, *Love*, the light and chemistry of the photogram can be viewed as a metaphor for something spiritual, or metaphysical, something otherwise unseen or barely perceived. In this series, Fuss disembowels rabbits and arranges them on sensitized paper. In this literal dissection, exposure changes depending on the translucency of the various parts of the body, and the acids of the innards further impact the paper with rainbow effects (Modrak & Anthes 2011). I extend this idea by using photograms as literal fact to document the process of dissection by taking apart common technology and exploring what hidden or

unknown information might be revealed during the process.

Trevor Paglen is a photographer who explores ideas of counter surveillance in his work, photographing things we are not supposed to see. Kafer (2016) discusses his Paglen's work *Limit Telephotography* that documents military bases from afar, noting that Paglen is exploring the limitations of photography in its ability to document government secrets or reveal truths or knowledge about information that is being hidden from the general public (Kafer 2016). Using lenses of up to 7000mm while shooting in the desert at night, the resulting images are blurred, vague shapes of vehicles and structures. *iPhotograms*, too, plays with this question of what we can actually know and document visually when powerful institutions, whether commercial or military, are in place to keep that information under wraps.

In their design research, Pierce and Paulos apply the idea of counterfunctional things to the digital camera. The two explore severely limiting the functions of the camera, such as an ultra-low resolution camera (some as low as 1x1, 2x3, 4x4) or a wooden camera that requires the photographer to saw open and break the enclosure (Pierce & Paulos 2014). These processes would render the images so abstract they would be unrecognizable or destroy the camera itself in the process. In my work with *iPhotograms*, I, too, explore the destruction of the camera as part of the photographic process and investigate the meaning that can be found within abstracted images or outlines.

### History of Cyanotypes

The use of cyanotypes is not without meaning in *iPhotograms*, so I will briefly explain the history of the process. The term cyanotype comes from Greek, meaning "dark blue impression." Indeed, the result of this photographic process is a distinctive blue and white image. Sir John Herschel invented the process in 1842. Light interacts with ferric ammonium citrate and reduces it to a ferrous salt, which in turn reduces the potassium ferricyanide. The insoluble Prussian blue pigment, ferric ferrocyanide, is left as a precipitate. Areas not exposed to light stay in a ferric state, and the remaining unreduced salts wash off with water during the development process. As it dries, the ferric ferrocyanide re-oxidizes (Hirsch 2008).

Along with the development of the cyanotype process itself, the use of cyanotypes also has roots in technology and the sciences. Herschel used the process to duplicate intricate notes, and architects and shipbuilders used the process to create multiple copies of line drawings – literal blueprints. Anna Atkins is often credited with the first example of using cyanotypes in an aesthetic way. In 1843 she published the first book illustrated photographically, *British Algae: Cyanotype Impressions*. Given her background in botany and the careful cataloging of the algae images,

though, these illustrations seem more like documentation of various specimens rather than a purely aesthetic pursuit (Modrak & Anthes 2011). Indeed photography is an ambiguous “half-art, half-science” with constant innovations (Rexer 2002).

### The Process of *iPhotograms*

The process of creating *iPhotograms* involved disassembling an iPhone and documenting the exploration with cyanotypes. This first involved obtaining the necessary equipment. I purchased the chemicals online via a craft supply website, the tool kit for smart phones at a specialty electronics store, developing trays at camera store, and paper and other supplies at an art store.

Once I had obtained the supplies, I prepared the solutions of Potassium Ferricyanide and Ferric Ammonium Citrate by adding water and waiting 24 hours to fully dissolve. When the solutions were ready for use, I mixed them in equal parts and applied the resulting sensitizer to the paper, which dried in my darkened bathroom.

While the paper was drying, I would sit at my desk in front of my laptop computer to watch a YouTube video on how to take apart the iPhone 5. These instructions, while quite basic in terms of their purpose, still offered an account of what each part of the phone was. After completing a step, I would pause to create an arrangement with the different pieces on my work surface. Once I settled on an arrangement, I would transport the pieces into the darkened bathroom and transfer them to the coated paper.

The next step in the process was exposing the paper in the sun. Given the cloudy and sometimes rainy weather, I would place the paper on a covered porch for anywhere from 45 to 90 minutes. During this time, I photographed the arrangement on the paper as it was developing to later use these photographs in the cyanotype process as negatives. Once the chemicals turned from a light green to bronze color, I would remove the phone from the paper and fix the image by agitating the paper in a tray of water.

I then repeated this process of taking apart the next section of the phone, arranging it, developing the photogram in the sun, and photographing this part of the process. Once the phone was complete disassembled, I printed the photographs taken of each step. These were printed on regular computer paper, rubbed with olive oil, and placed on top of chemical-coated paper to create a more detailed cyanotype. The printer negative and the paper were clamped between sheets of plexiglass and again placed in the sun to develop and fixed with water. I also began experiments with using macro photography to shoot extreme close-ups of the small parts with the intention of again using these as printer negatives for cyanotype prints. Further work will build on these detailed, macro shots.



Figure 1: Photogram from *iPhotograms*

### Reflection

While the resulting images in the *iPhotograms* series may not offer a better understanding of how our current technology—photographic technology in particular—works, the process and the images do serve to illustrate various ideas and concepts around new media.

Perhaps one of the most surprising parts of the process to me was the difficulty of obtaining the necessary tools to take apart an iPhone. Certainly there were kits to purchase online, but most shipped from China with a delivery window that failed to meet necessary time constraints. Eventually I was able to find a kit through connections in the DIY community. This seemingly simple step nearly thwarted the timely completion of the initial tests, and it speaks to the ideas raised by Hertz and Parikka. Consumer electronics are not meant to be fixed or repaired, at least not by an untrained individual (i.e. an ordinary consumer). There are, as they noted, communities of people who tinker as I found through my investigations into local electronic supply stores and YouTube instructional video searches.

The process itself was also an exploration of the layers of black boxing technology as well as black boxing information. When first developing the project idea, I had a very clear notion that I wanted to explore modern cameras and photography by taking apart the necessary technology that many people today do not understand. As noted, there are so many complex systems in place that result in a single object that we use to take photos. Yet to take a photo today, all we have to do is take out our phones and tap the screen a few times. The simplicity of producing a cyanotype fits nicely with this idea of simply tapping to create an image. Two chemicals are mixed in equal parts with little possible hazard, and after that, all one needs is sunlight and

water. But much like the complex system that is involved with our ability to take a photograph simply by tapping our phone, a complex chemistry process is still the foundation of the cyanotype process. I admit that part of the reason I included the history and background of the cyanotype process in this paper is to remind readers how unfamiliar even natural systems may seem! This project questions how much we know or need to know about the black boxes of technology, but it also reiterates how much knowledge we have already put away into similar black boxes.



Figure 2: *iPhotograms* image using printer negative

## Conclusion

In this paper, I discuss ways our current technology is hidden from our understanding and how difference scholars open, or at least tease apart, the complex systems that convert our inputs to outputs. I also look at other artists and researchers who are grappling with similar questions in creative ways and detail the photographic historical context for my artistic process.

This paper, and the *iPhotograms* series, is an exploration of modern camera technology in the spirit of media archaeologists. Using the cyanotype process to examine the literal and theoretical black boxes of our technology, this project builds on the work of other artists, academics, and researchers to question what we need to know and what we can know about the inner workings of the technology that constitutes our lives.

## References

Burrows, R. (2009) Afterword: Urban Informatics and Social Ontology, in M. Foth (ed.) *Handbook of Research on Urban Informatics*, pp. 450–4. Hershey, PA: Information Science Reference.

Hertz, G., & Parikka, J. (2012). Zombie media: Circuit bending media archaeology into an art method. *Leonardo*, 45(5), 424-430.

Hirsch, R. (2008). *Photographic Possibilities: The Expressive Use of Equipment, Ideas, Materials, and Processes*. CRC Press.

Huhtamo, E., & Parikka, J. (2011). *Media Archaeology: Approaches, Applications, and Implications*. Berkeley, US: University of California Press.

Kafer, G. (2016). Documenting the Invisible: Political Agency in Trevor Paglen's Limit Telephotography. *Contemporaneity: Historical Presence in Visual Culture*, 5(1), 53-71.

Kirschenbaum, M. G. (2008). *Mechanisms: New media and the forensic imagination*. MIT Press.

Latour, B. (1987). *Science in Action: How to Follow Scientists and Engineers Through Society*. Harvard University Press.

Modrak, R., & Anthes, B. (2011). *Reframing Photography: Theory and Practice*. Taylor & Francis.

Neusüss, F. M. (1994). "From Beyond Vision," *Experimental Vision: The Evolution of the Photogram Since 1919*. Denver Art Museum.

Pierce, J., & Paulos, E. (2014). Counterfunctional things: exploring possibilities in designing digital limitations. In *Proceedings of the 2014 Conference on Designing Interactive Systems* (pp. 375–384). ACM.

Pinch, T. & Bijker, W. E. (1987). The social construction of facts and artifacts: Or how the sociology of science and the sociology of technology might benefit each other. In W. E. Bijker, T. P. Hughes, and T. Pinch (ed.) *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, pp. 17-50. Cambridge: MIT Press.

Rexer, L. (2002). *Photography's antiquarian avant-garde: the new wave in old processes*. Harry N Abrams Inc.

Tannenbaum, B. (1992). *Adam Fuss: Photograms*. Akron Art Museum.

Winner, L. (1993). Upon opening the black box and finding it empty: Social constructivism and the philosophy of technology. *Science, Technology, & Human Values*, 18(3), 362-378.

Winthrop-Young, G. (2010). *Hardware/software/wetware*. *Critical Terms for Media Studies*, 186-198.

# Through the Aleph: A Glimpse of the World in Real Time

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## Abstract

This paper presents the motivation, background, and implementation of [Through the Aleph: A Glimpse of the World in Real Time](#), a net art project offering an unprecedented visual and interactive experience where many places on Earth and in space can be seen simultaneously in an instant. Built in an open source environment with live data, this project visualizes the diversity of human civilizations (microcosm) and the unity of humanity without borders in the ever-changing universe (macrocosm). With an unexpected approach to surveillance cameras and global networks it draws the connections between individuals and the global environment, Earth and outer space, eternity and time, and art and science. In a virtual world, this meditative web project merges multiple layers of dynamic imagery related to culture, cosmology, and technology in a globalized society into an abstract landscape. It not only embraces the dream of peace on Earth but also explores the bond between humankind and nature through time and space in the present moment.

## Keywords

net art, web, real time, data, open source, media, interactive, webcam, surveillance, environment, multi-cultures, humanity, microcosm, macrocosm, literature, Aleph, Borges, space, time, coexistence, unity, peace, landscape, global, climate, networks, science, technology

## Introduction

### What Is an Aleph?

The letter Aleph is the first letter of the Hebrew alphabet, which symbolizes oneness and unity. Every letter in the Hebrew alphabet also has a numerical value, so the numerical value assigned to Aleph is one. On the other hand, the root of the word Aleph is also connected to many other words in the Hebrew language. The word *eleph* means a thousand; the word *aluf*, which also comes from the same root, means a (military) general or a champion. Thus, despite the fact that the letter Aleph only has a small numerical value of one, it also has connotations of greatness. (Hebrew Today, 2018)

In his short story *The Aleph*, Argentine author Jorge Luis Borges described that “an Aleph is one of the points in space that contains all other points” (Borges, 1970, p. 23)—the single gigantic instant where millions of acts in the unimaginable universe can be seen simultaneously

from every point and angle. He later explained in the story that “for the Kabbalah, that letter stands for the *En Soph*, the pure and boundless godhead; it is also said that it takes the shape of a man pointing to both heaven and earth, in order to show that the lower world is the map and mirror of the higher; for Cantor’s *Mengenlehre*, it is the symbol of transfinite numbers, of which any part is as great as the whole” (Borges, 1970, p. 29).

## Rationale and Objective

As an avid traveler, the artist followed her curiosity to explore and study many places in the world. She has experienced diverse cultures and the beauty of nature, but also observed the lost wilderness, cultural globalization, and the growth of human population, while global tourism and global warming continuously increase.

Meanwhile, recent creative and research works by artists, such as [Kurt Caviezel](#), [Nye Thompson](#), and [Pierre Derks](#), on live surveillance cameras and global networks (and how these emerging technologies affect people’s privacy) have caught the artist’s attention. Inspired by the life changing power of seeing Earth from space, she started to wonder: Where were the eyes of the Earth? How could we see the world in real time at a glance? How could she offer a different perspective on life using surveillance cameras? From then on the seed of this project was planted.

Borges’ inspiring short story *The Aleph* influenced the artist to broaden the concept of this artwork. After 70 years, Borges’ vision in the 1940s can be realized in this networked age—to visualize millions of acts from every point and angle in the unimaginable universe in a single gigantic instant. Through his perspective, we experience the totality and unity of humanity in the infinite space, which hopefully could hint at the brevity and fragility in life and raise questions about the reality of human existence. Although a real Aleph might never be found, the artist hopes that by observing humanity, Earth, and space from a distance this net art could stimulate deeper feelings and thoughts from the viewers.

“The trees of knowledge and of life grow together” (Lewis, 2010, p. 18). Although this project serves no practical and material end, it is an end in itself. It offers no purpose other than the joy of contemplation, the need of human consciousness, and the desire of knowledge. At the core of the creative process, the artist’s gratitude towards life brought the projects alive using a universal language—visual art—and digital technology. Meanwhile, it evokes

certain emotions and sub-consciousness—a psychological phenomenon that involves a sense of life. In *The Aleph*, Borges mentioned a feeling of “infinite wonder, infinite pity” (Borges, 1970, p. 28). This is one of the sensations that the artist wants the viewers to experience through her work. Perhaps with humbleness and egolessness we stand closer to the greatness and wonders in Life.

*Through the Aleph: A Glimpse of the World in Real Time* visualizes a pair of opposites through the global reach of technology—the diversity of human civilizations (microcosm) and the unity of humanity without borders in the ever-changing universe (macrocosm). Although in recent times some creative and research works have used IP camera live stream and their linkage to the social environment also with the political scope to highlight the implications of this technological Panopticon, the artwork here presented utilizes surveillance cameras and global networks from a grand viewpoint to observe people, environment, and space within a philosophical and literary framework. It not only embraces the dream of peace on Earth but also explores the bond between humankind and nature through time and space in the present moment. Using live data to portray the Earth’s pulse and human existence, this meditative web art creates an abstract landscape in an open source environment, reveals an emerging totality visible to the human eye through distant points of perceptions, and gathers all realities into the glimpse of the Aleph, where we could experience humanity as one in the unimaginable space—therefore, the unity in infinity (Figure 1).

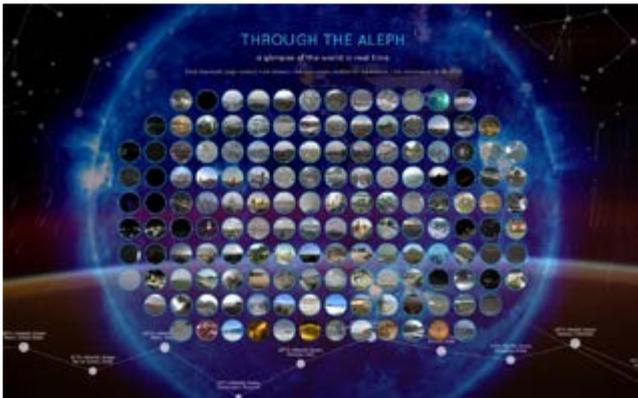


Figure 1. [A screenshot of \*Through the Aleph\*](https://vimeo.com/189509112). © Jing Zhou. (<https://vimeo.com/189509112>)

### Making of the Project

*Through the Aleph* unites two entities—a net art and a time-lapse video. The net art was built with HTML, CSS, jQuery, JavaScript, and Processing, while the time-lapse video with Adobe After Effects. The webpage refreshes every six minutes automatically.

Edward Tufte, a pioneer in information design and data visualization, stated that “among the most powerful devic-

es for reducing noise and enriching the content of displays is the technique of layering and separation, visually stratifying various aspects of the data” (Tufte, 1990, p. 53). Retrieving and collecting real-time data from multiple online sources, *Through the Aleph* interlaces live materials into three layers based on the “freshness” of the visual elements—the bottom layer holds static and dynamic graphics from the recent past; the middle layer displays near real-time data; the top layer generates real-time content.

In her well-known article *Grids*, art theorist and critic Rosalind Krauss pointed out that “logically speaking, the grid extends, in all directions, to infinity... by virtue of the grid, the given work of art is presented as a mere fragment, a tiny piece arbitrarily cropped from an infinitely larger fabric” (Krauss, 1979, p. 60). In *The Aleph*, Borges’ literary conception of infinity poses a representational challenge as the artwork *Through the Aleph* is limited by a finite range of visual elements via webcam feeds and data visualizations etc. Hence, the artist created a grid mapping system to be the primary focus of this project, where Borges’ boundless imagination could be reflected and presented using limited graphics and data.

### The Bottom Layer

This background layer (Layer 1 in Figure 2) empowered by HTML and CSS covers the entire browser window with a three-minute looping video, which captures the views of our planet Earth from NASA International Space Station (ISS) from 2011 to 2015. In order to keep the background atmosphere dark enough, the artist composed this video based on twelve nighttime ISS footages from [NASA’s websites](#). These royalty-free footages include seven continents except Antarctica, because the artist didn’t find footages of Antarctica during the time of making this project.

Within the top 30% of the webpage displays a transparent constellation map fading into the dark ISS video background. There are total twelve constellation maps stored online for this net art. All maps were captured based on the artist’s home location—the New York metropolitan area—through the website of the Astronomy Club of the School of Physics and Astronomy and [the Wise Observatory of Tel Aviv University in Israel](#). The original captured maps were colorful, complicated, and full of information unnecessary for this project. Thereby the artist simplified the maps and transformed them into a clean mono-color style. The twelve maps are synchronized with the twelve months of a solar calendar. Supported by JavaScript, the corresponding map is loaded automatically at the same location on the first day of the month.

Lastly, this layer holds a one-minute looping audio file invisible on the webpage, which produces the background sound—a white noise on low volume.

### The Middle Layer

This second layer in the middle stores two visual elements enriched by near real-time data.

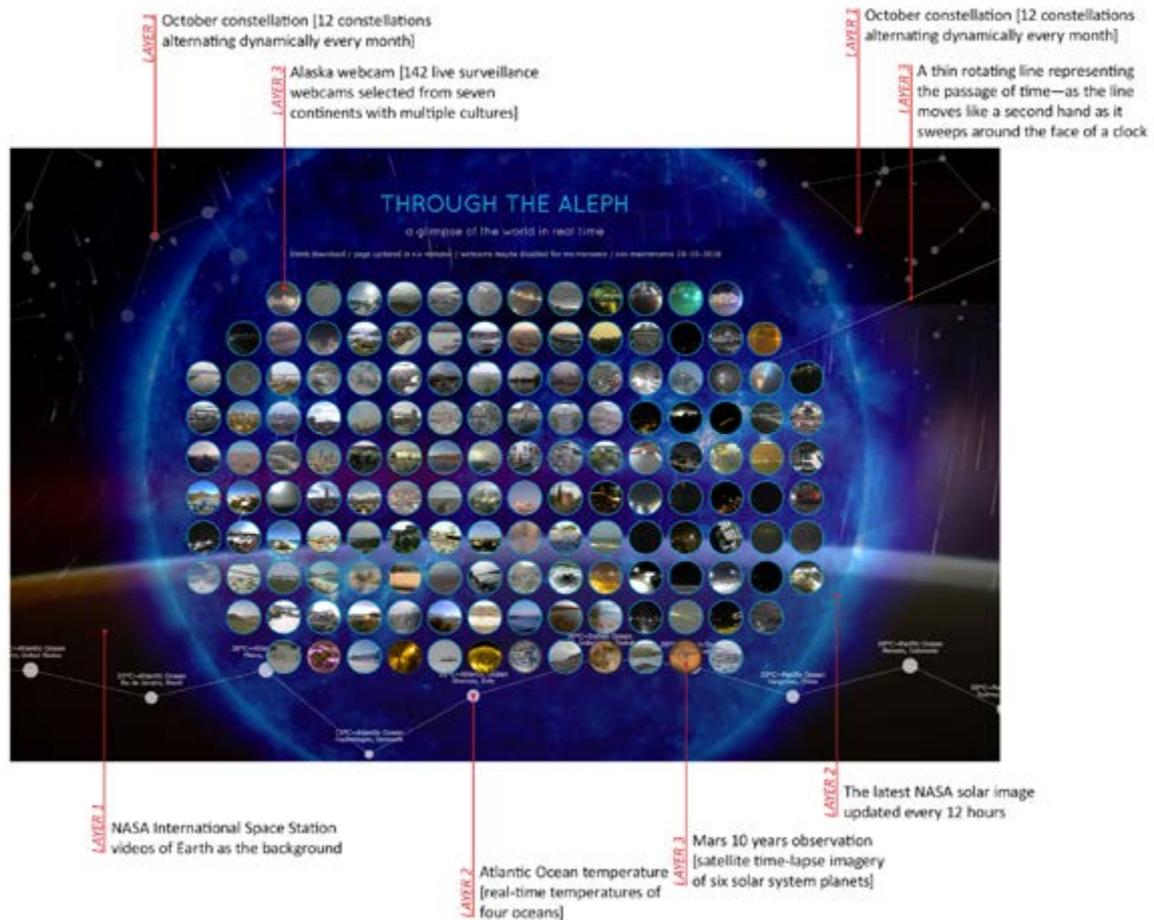


Figure 2. Diagram of *Through the Aleph*. © Jing Zhou.

At the center of the webpage resides a gigantic transparent blue sphere, shown in Figure 2. This is the latest solar image updated every 12 hours, provided by SOHO—Solar and Heliospheric Observatory, a project of international collaboration between European Space Agency (ESA) and National Aeronautics and Space Administration (NASA). This ever-changing image is retrieved dynamically twice a day from the [SOHO website](#) using HTML and CSS.

This royalty-free image is captured by SOHO's Extreme ultraviolet Imaging Telescope (EIT). All of the EIT images are actually produced by extreme ultraviolet (EUV) light from the Sun. EIT images are taken at four different wavelengths and four colors in order of wavelength (bluer—shorter wavelength, redder—longer) were assigned to represent each of them. (SOHO, 2018) The artist decided to use the bluest solar image in this project for three reasons. First, the Sun provides the primary source of energy to support life on Earth. Secondly, the deep blue color resembles the color of our planet Earth. Lastly, this very color matches well with the ISS video background, which enhances the aesthetic quality of the artwork.

Located at the lower portion of the webpage, the second visual element on this layer is a set of white dots. They represent the near real-time water temperatures of four oceans—Arctic, Atlantic, Indian, and Pacific Oceans—which play a crucial role in shaping the global climate change. Built with Processing, these dots linked by a thin

white line are in gentle motion, which forms a wave line representing the ocean water. The diameters and vertical locations of the dots alter perpetually depending upon the water temperature data, which updates dynamically every few hours supported by [the website of World Sea Temperatures](#). The artist selected twelve cities for the dots based on their latitude distributions and personal preference: Honolulu, United States; Miami, United States; Rio de Janeiro, Brazil; Pikine, Senegal; Copenhagen, Denmark; Siracusa, Italy; Dubai, United Arab Emirates; Mumbai, India; Hangzhou, China; Manado, Indonesia; Sydney, Australia; and Pevek, Russia.

### The Top Layer

Layer three on the top hosts two overlapping entities generating real-time content.

Originating from the center of the web browser, a boundless thin white line rotates like a second hand as it sweeps around the face of a clock, shown in Figure 2. Programmed in HTML and CSS, this line represents the passage of time; every 360-degree rotation indicates that one second has slipped away.

Embraced by the deep blue circle, at the center of the page lies the heart of this net art. Built with HTML, CSS, and jQuery, a carefully calculated grid mapping system is populated by 148 circular graphics. Among them are 142

live surveillance webcams selected from seven continents with multiple cultures and six satellite time-lapse imagery of the solar system planets. This grid system distributes the 142 webcam feeds—supported by [OPAG Online Promotion AG](#)—in accordance with the world map, shown in Figure 3. However, because the northern hemisphere has more countries and larger population than the southern half of the Earth, the northern hemisphere occupies seven of the ten rows, while the southern three.

When the viewer uses a computer mouse to hover over one of the circular webcam images, it enlarges gracefully to reveal a bigger size of the same image with a brief description of the webcam's location; when it is clicked, a popup box appears in the center of the same browser window and showcases the source website of that webcam. (Figure 4) This body of surveillance webcams needs frequent maintenances, because any webcam could be disabled unexpectedly due to various reasons at anytime.

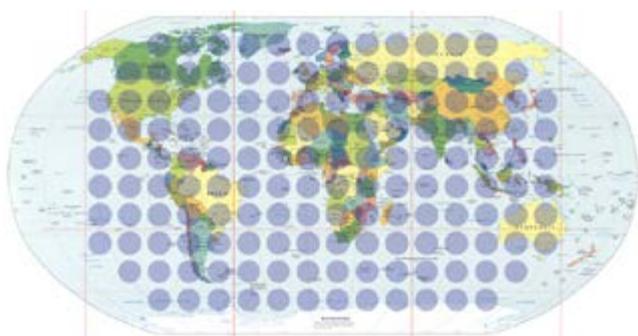


Figure 3. [Webcams' Geographic Distribution](#). © Jing Zhou.



Figure 4. [Two screenshots](#) demonstrating the interactivity of *Through the Aleph*. © Jing Zhou.

### The Time-Lapse Video

The video component of this project consists of twelve-day time-lapse screenshots of the net art in twelve months—one day per month—from September 2016 to August 2017. It captures not only the shift of day and night, but also the change of seasons—the infinite and transitory nature of life on Earth.

### Installation

*Through the Aleph* can be presented on monitors and projection screens. (Figure 5) The background sound of the installation is white noise, which can be silenced during an exhibition, if necessary.



Figure 5. [Installation shots](#) of *Through the Aleph*. © Jing Zhou.

### Conclusion

The net art project presented in this chapter connects the potential of digital technologies with literature, culture, and scientific studies, in order to create aesthetic and meaningful experiences for the viewers of various backgrounds. *Through the Aleph: A Glimpse of the World in Real Time* visualizes Borges' *Aleph* in the networked age and touches the core components that matter today: building an environment for consideration of data in cultural and temporal realms, presenting a visual framework in a literary context, and packing universal visual components and conceptual thinking into a limited presentation space. Furthermore, it translates the dynamic virtual landscape through new approaches to enhance human cognitions and perceptions of the universe and humanity of our time.

### References

- Borges, J. L. (1970). *The Aleph and Other Stories, 1933-1969: Together with Commentaries and an Autobiographical Essay*. New York, New York: E. P. Dutton & Co., Inc.
- Hebrew Today (2018, April 15). *The Hebrew Alphabet - The Letter Aleph (א)*. Retrieved from <http://www.hebrewtoday.com/content/hebrew-alphabet-letter-aleph-%D7%90>.
- Krauss, R. (1979). Grids. *October*, Vol. 9 (Summer, 1979), 50-64.
- Lewis, C. S. (2010). *The Abolition of Man*. Las Vegas, Nevada: Lits.
- SOHO (2018, April 15). *Frequently Asked Questions (FAQ)*. Retrieved from <https://soho.nascom.nasa.gov/explore/faq.html>.
- Tufte, E. R. (1990). *Envisioning Information*. Cheshire, Connecticut: Graphics Press LLC.

### Author Biography

Born in China, Jing Zhou is an interdisciplinary artist, designer, and professor in USA. Her work has been shown and collected internationally including: Triennale Design Museum, Milan; Asian Cultural Center, New York City; British Computer Society, London; SIGGRAPH Art Gallery; ISEA; CAA; Les Abattoirs Museum, France; Mons Memorial Museum, Belgium; Royal Institution of Australia; Danish Poster Museum; GAMEC Modern and Contemporary Art Gallery, Italy; Athens Digital Art Festival, Greece; Taksim Republic Art Gallery, Istanbul; FILE, Sao Paulo; Korea Visual Information Design Assn.; Goethe Institute Alexandria, Egypt; Stanford University; public collection of the WRO Media Art Center, Poland; Waikato Museum, New Zealand; Moravian Gallery in Brno, Czech Republic; SDAI Museum of the Living Artist, San Diego; and Chinese Culture Center of San Francisco. [[www.jingzhoustudio.net](http://www.jingzhoustudio.net)]

# Transdisciplinary Collaborative Practices in Art, Science and Technology

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## Abstract

The present panel seeks to problematize what constitutes transdisciplinary collaborative practices in contemporaneity. We will examine their increasing emergence; their methodologies, their challenges and propositions, and what it means to work jointly and why it is important. The aims of this panel are to open discussion on facilitating creative collaboration between different areas of knowledge; on heightening social inclusion in scientific and technological development; and on stimulating pertinent collective local actions based on transdisciplinary collaborative work. We intend to discuss some practices and methodologies used on the development of an artistic board game about the city of Salvador, Brazil; to describe the alternative forms of financing culture characteristics and explore what they can contribute to fostering the cultural commons, while also pointing to possible developments and new collaborative financing forms that can evolve in the future; and to question how we can really and effectively develop innovative and useful ways to do research and apply our findings having a creative approach. Thus, we look to dialogue based on the multiplicity and diversity of expression inherent in the minor and the socially micro-political which differ from identity posturings that are polarized and proprietary and which serve the interests of totalitarian development models.

## Keywords

Collaborative Practices, Transdisciplinarity, Art, Science, Technology, Community, Commons, City, Game Practice, Experimental Transdiscipline.

## Introduction

### Andreia Machado Oliveira e René Smith

The present panel seeks to problematize what constitutes transdisciplinary collaborative practices in contemporaneity. We will examine their increasing emergence; their methodologies, their challenges and propositions, and what it means to work jointly and why it is important. By incorporating this panel in the *Hybridisation and Purity* sub-theme, we focus our concerns on the intersection of practices in art, science and technology.

In order to problematize what constitutes collaborative practices in contemporary art and its transdisciplinary engagements, we adopt a procedural and paradoxical position towards activities which embroil the collective and the

singular, the global and the local, or the mental and the embodied. The positional strategies are based on the multiplicity and diversity of expression inherent in the minor and the socially micro-political which differ from identity posturings that are polarized and proprietary and which serve the interests of totalitarian development models.

We propose three issues to be considered: how do methodologies of collaborative practice come about within emergent transdisciplinary relations (often in workshops with shared projects)? how to deal with joint authorship in which the artist/scientific researcher is not the author of the conception of the work, and less of its production, but still consider themselves co-creators along with the communities involved? and how does the documentation, distribution and dissemination of collective techno-aesthetic objects happen?

Aiming to differentiate between the Common and the modern idea of society, we look to mesh with the thought of theorists Gilbert Simondon, Bruno Latour, Antonio Negri and Michael Hardt whose works articulate concepts such as the transindividual, the collective and multitude and direct them to power the Common.

The Common refers to what is not in the public or private domain, but to the dimension of what is common to many. It is not linked to party organizations or established institutions, and does not organize itself spontaneously; it requires routine practices and organizational projects specific to each community and which involve the community—in other words, the common requires the constitution of specific practices proper to each community.

We ask what is the place of art, science and technology in the construction of the Common? How does one participate in the Common, in the transmission of transdisciplinary knowledge, in the dissemination of social experience? How does one position art in terms of producing an aesthetics of plurality and not one of universality?

Thus, the aims of this panel are to open discussion on facilitating creative collaboration between different areas of knowledge; on heightening social inclusion in scientific and technological development; and on stimulating pertinent collective local actions based on transdisciplinary collaborative work. We look to dialogue on how to share processes, not products; share singularities and not identities; produce difference and not more of the same in order to activate the powers of the collective.

From this point of view, this panel looks forward to contributions that enrich the problematization the theme in different ways: on the question of siting of art, science and technology towards the production of the common, author Lenara Verle, raises highly pertinent issues in "Towards a commons financing of art & intellectual commons"; with his focus on transdisciplinary practices, professor Ricardo Dall Farra in "Experimental Transdiscipline", brings previous experiences that think the relation between art and other disciplines; and to examine methodologies of collaborative practices, Karla Brunet discusses the development of an artistic board game in Salvador/Brazil, in "Collaborative game practice and the city". The objective is to generate informed exchange, relevant discussion, and applicable insights that lead us to think together how transdisciplinary collaborative practices are occurring today and how they may be put into action.

## Collaborative game practice and the city

**Karla Schuch Brunet**

This panel intends to discuss some practices and methodologies used on the development of an artistic board game about the city of Salvador, Brazil. Having psychogeography and the art of walking as a starting point, we have produce a collaborative artistic board game. The game is based on the experience of moving through a place, in this case, the city of Salvador, and feeling its environment. It is an art game based on environmental aesthetics, *flâneur* and experiencing the city as art, as a game. It is the *Topophilia* popularized by Yi-Fu Tuan, to appreciate the place, loving it. Unlike a mere contemplation of the place, this project aims to raise issues of mobility, urbanism, environment, aesthetics and pollution. Here we discuss collaboration in three levels, on the creation and development of the game, on its playability - it is a cooperative game - and, on its replicability, anyone can copy the game or create his/her own, we published an open source GDD (Game Design Document) on how to construct one.

First, we had an open call for people interested in developing a game. People from different backgrounds and disciplines showed up to collaborate. They were invited to brainstorm, think about their territory and decide which parts of the city were important to be in the game. Later, we made field trips to these places to collect materials / experiences. The GPS trails of these outputs helped us create the map of the game board. Project participants photographed and drawn objects they found on these paths. These have become counters of the board game. Subsequently, the objects chosen as parts were modeled and printed on a 3D printer. We have competitive-cooperative goals and the movements of a player can deprive or rewards all players. The player in this game will be able to help another player, distribute their winnings, and donate their objects and experiences in the city. Collaboration here is mandatory to win the game.

"*Descaminhar*" is the name of the game. It's about leaving one's way, being a *flâneur*, and wandering. Many board games have the concept of a path, of going in a move. A large number of them have "movement" as the main action. Considering our own geographic spaces, experimental cartography and cognitive maps, we have created the main drawing of the board. At the same time, we thought about the strategies, objectives and problems to be solved during the game, always related to the city of Salvador. The objectives can be individual or collective. And the tasks can be related to enjoying the city, solving a problem, improving the situation or creating an experience.

The game consists of board, cards (challenge, narratives, events and item description), pins, 3D counters, time marker, tokens, and the box along with the manual. The board or modules of the game consists of places of the city of Salvador that need to be unlocked throughout the match. The 3D counters symbolize the items that each player achieves during the match, and the cards guide us to the movements to be made. All the material of *Descaminhar* board game can be download. We also encourage players to create their own board game, about their city or location that interested them.

After having done some game tests in different locations - lab, university, school, and art events - we perceived that this art game is a stimulus to practice and discuss collaborative action. In the beginning of the match, the great majority does not like or understand the cooperative goals. After the match is over, their attitude has changed; they are very open to collaboration. When thinking about environment issues and global warming, art is a great method for raising questions about our place, surroundings and collaborative practices.

## Towards a commons financing of art & intellectual commons

**Lenara Verle**

We have today an artificial scarcity imposed on digital intellectual goods by way of DRM and copyright laws. Copyright evolved historically as a response to reproduction technologies such as the printing press and the phonograph. Since those times, authors faced a balancing act. In order to make a living from the sales of their work, part of the profits should find a way back to them through royalties and copyright practices. But too tight of a control might mean the work would not get distributed widely and therefore miss the opportunity to enrich and develop the culture in its full potential (not to mention the artist him/herself). This dilemma still exists. Art and culture is a type of commons and enclosures in the form of copyright laws harm our collective heritage and our access to this cultural wealth. On the other side, artists and authors need the means to live and produce their work.

Options for alternative forms of financing culture are emerging and being tested, making use of digital and networked technologies available in the present. This panel

aims to describe their characteristics and explore what they can contribute to fostering the cultural commons, while also pointing to possible developments and new collaborative financing forms that can evolve in the future. Some of the structures reviewed are: crowdfunding (from product reward only to alternatives highlighting the creation of commons), patronage (content-based or more geared to generating monthly income), cultural funds (and their forms of curation and governance) among others.

Authors have the choice to release their works with copyleft and commons-friendly licenses, and several initiatives are working to develop and refine such licenses in the framework of current national and international law. If new forms of collaborative financing can provide both the living means for artists and allow their work to be disseminated freely, enriching the global cultural commons, that can mean an end to the dilemma and a new paradigm for the distribution and access to culture.

## Experimental Transdiscipline

### Ricardo Dal Farra

Life is about communication and mutual understanding or disagreements. Humans have created systems and regulations in trying to understand how this world works, but we are far from finding answers to complex issues. The traditional academic structure based on rigid disciplines has proven not to work well to face problems such as climate change or poverty, naming here only two among many multi-dimensional challenges we are facing.

Can we really and effectively develop innovative and useful ways to do research and apply our findings having a creative approach? The solution to complex problems is being explored, increasingly, from multi and interdisciplinary perspectives. However, those strategies are not enough in many cases, and therefore developing a transdisciplinary approach becomes an essential tool.

There are different definitions about multi-, inter-, cross- and transdisciplinary research. The approach of considering transdisciplinary research as a way to create a unity of intellectual frameworks looking beyond a disciplinary perspective seems to be appropriate and useful also from the arts perspective.

It took centuries to build the complex system we have today for the teaching and learning of the various fields of knowledge, as well as to support the research that has been allowing us “to advance”, at least in the terms that we understand it in our Western civilization. At the same time, it is necessary to recognize the different visions that people have of the world, and even if sometimes could be hard for us to understand or accept it, some of that can teach us and can be reflected in our academic or professional activity.

Art helps us to connect with the world or to isolate ourselves, to understand and embrace or to dissent, to make sense or to confuse, it can be an engine to free our creativity or to lock it. Art is linked to politics and economy, it can

convey feelings and emotions, can also lead us to think about human biology or complex mathematical equations; it can apply principles of fluid mechanics and key elements from game creation, and can open new spaces, make use of very simple or extremely complex techniques, be based on serendipity, and navigate between the accidental or casual and causal, too.

We need to learn about crossing borders again and going beyond the limits, even if some of them are strong as walls. We should be able to understand different perspectives about the world and generate knowledge from a broader apprehension of reality.

The conceptual proposal of transdisciplinarity might be interesting to some but still too far from a possible practical implementation. Some examples of activities developed considering a transdisciplinary approach follows. Activities that have been bringing art and disciplines apparently far from each other close enough to work from a unified but large conceptual framework:

(a) The Transdisciplinary Creation and Performance class offered by Concordia University in Montreal.

(b) The Transdisciplinary Workshop realized as part of the Interactive Design and Creation Master program at the University of Caldas, Manizales.

(c) The international symposia Balance-Unbalance that “bring artists together with scientists, economists, philosophers, politicians, management and policy experts, sociologists and engineers from across the world with the intent of engendering a deeper awareness and creating lasting intellectual working partnerships in solving our global environmental crisis”.

Art as an engine of change, as a key element that adds and helps to build the web of life. The route of uncharted territories, where certain signs could open new paths or stop us, following our experience and desires but also according to the way we see, we listen, we act.

## References

- Attali, J. (1977). *Noise. The Political Economy of Music*. Translated by Brian Massumi, 1985. United States: University of Minnesota Press.
- Bollier, D. & Helfrich, S. (2017, April 18). *The Wealth Of The Commons: A World Beyond Market and State*. Retrieved from [http://wealthofthecommons.org/sites/default/files/the\\_wealth\\_of\\_the\\_commons.prc](http://wealthofthecommons.org/sites/default/files/the_wealth_of_the_commons.prc)
- Dal Farra, R. (2015). Breaking Paradigms: Electronic Arts & Humanitarian Actions. *Balance-Unbalance 2016*. Colombia. Retrieved from: [http://www.balance-unbalance2016.org/docs/Dal\\_Farra\\_BunB\\_Breaking\\_Paradigms\\_2015.pdf](http://www.balance-unbalance2016.org/docs/Dal_Farra_BunB_Breaking_Paradigms_2015.pdf)
- Hardt, M. & Negri, A. (2004). *Multitude: war and democracy in the age of empire*. Nova York: Penguin Press.
- Latour, B. (2012). *Reagregando o Social: uma introdução à teoria do Ator-Rede*. Tradução de Gilson César Cardoso de Sousa. Salvador - Bauru: EDUFBA – EDUSC.

- Kreutzer, Till. (2018, January 04). *Open Content - A Practical Guide*. Retrieved from [https://meta.wikimedia.org/wiki/Open\\_Content\\_-\\_A\\_Practical\\_Guide\\_to\\_Using\\_Creative\\_Commons\\_Licences/Introduction:\\_From\\_theory\\_to\\_practice](https://meta.wikimedia.org/wiki/Open_Content_-_A_Practical_Guide_to_Using_Creative_Commons_Licences/Introduction:_From_theory_to_practice)
- Oliveira, A. M. (2017). Arte e Comunidade: Práticas de Colaboração Implicadas no Comum. *PÓS:Revista do Programa de Pós-graduação em Artes da EBA/UFMG*. v.7, n.14, 42-60.
- Negri, A. (2009). Para uma definição ontológica da multidão. *Lugar Comum*, Porto Alegre, n. 19-20, 15-26.
- Neuwirth, R. (2011). *Stealth of Nations: The Global Rise of the Informal Economy*. New York: Pantheon Books.
- Simondon, G. (1964). *El individuo y su genesis Físico-Biológica – La individuación a la luz de las nociones de forma y de información*. 1 ed. Tradução Ernesto Hernández B. Paris: Universitaires de France.
- Tuan, Y. (1974). *Topophilia: a study of environmental perception, attitudes and values*. New York: Columbia University Press.