The Heart's Knowledge Will Never Decay

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I have always felt a deep connection to archeology and anthropology—the passionate search for what we were, to know better who we are and what we may become.

That fascination flourished in me as a young boy because I had a mother and grandmother—my archetypes of love and empathy—that kept my curiosity satisfied. It was in a few of the garage-sale books they brought me, and which I would often layout on the kitchen floor to look at, that I saw two things in particular that had a profound effect on me.

Anthropologists tell us that humans started to intentionally bury each other around 100,000 years ago. Not long after, adornments begin to appear on the bodily remains, in particular, red ochre and small seashells with holes for threading as necklaces. These adornments signified a true milestone in human behavior when it was no longer acceptable to leave the dead—the *loved*—on the ground, but instead deserved a process of ceremony, remembrance, and the expression of loss as a creative act.

It was these images of tiny seashells with perforations for threading—a type of portal to a new way of caring for each other—that made me feel my heart beating in my chest, my cheeks blush, and tears well up. There was no way around it: I was sitting on the floor of the kitchen and mourning for a 100,000-year-old stranger.

Years later, I would learn of the technical difficulties and extraordinary amounts of time these people experienced when performing such tiny surgeries on fragile shells with the era's blunt tools. Some bodies were discovered with thousands of such shells.

With my own heart still thumping, in another book about cave paintings, I stumble upon an image that will profoundly influence my life as an artist: A picture of likely the oldest visual representation of a heart. First drawn tens of thousands of years ago by the Aurignacian (upper Paleolithic) people in what is now known as the Cave of Pindal in Altamira, Spain, it was discovered and reproduced by the French priest and archeologist Henri Breuil in the early 20th-century. This heart, drawn in ochre, was embedded in the outlined form of a mammoth, and we are left to speculate why this organ was so prominently displayed. Was it a teaching tool to young hunters of the best place to aim the spear? Was it the first realization that life and death were somehow related to the heart's pulsatile movement, by its change in temperature? Was it the beginning of mystical or proto-religious associations tied to the heart (the literal location of the soul and emotions) that would come to dominate the way we conceive of and relate to our own and each other's hearts today? Or was it a reckoning with what living would mean: the death of another creature and an effort to honor and perhaps even empathize with this being's sacrifice?

Like the delicate burial seashells, witnessing this mammoth heart gave me a glimpse of a profound truth I would only come to articulate after years of reflection as an artist: Art is (or rather can be) a behavior and vessel for sharing lived compassion. Over the years, as I found a wealth of ancient images and objects that produced these feelings in me, another question started to take hold: Are there temporal and spatial limits to love, care, compassion and empathy? In other words, do they diminish with time? These objects were conveying an answer: no.

We often speak of empathy as a present tense behavior for obvious reasons, but can it be historical as well, extending to the past and even to the future? If so (and I believe it can), then what is my responsibility as an artist to this knowledge? What is the empathetic pact I have now

made with all those who have come before, and the pact I hope the future will one day make with myself and all reading this today? The pact is this: If you remember, I'll remember. For it is not a question of *if* empathy survives within objects and gestures of the past; it is a question of if I, if *we*, are open to acknowledging empathy as a continuum that links us through time and for which we are each responsible for carrying forward. Objects such as these ask us to break free of our tendencies to segment time and experience, only concerned with the here and now. There is a past, and there will be a future of which we are temporary but crucial conduits. When we segment time, we hinder our ability to be morally engaged, to acknowledge and feel responsible to those before us, to be *loyal* to the evolution of empathetic behavior.

These objects and images challenged my assumptions on the limits of care and the concept of a "stranger." They demanded I bear witness to the fact that no matter the clan or tribe, city or nation, ethnicity or religion, we have all loved and lost, pondered and feared, dreamt and hoped. They also revealed that creativity in all its forms—utilitarian or symbolic, ephemeral or physical—allows us to know we are not alone in these experiences. It is genuinely humbling to feel that connection from distant ancestors.

On their respective days, tens of thousands of years ago, the humans that carved those seashells and drew that heart formed profound questions about social behavior, responsibility, creativity, and the function of art. How, through the gestures, objects, and images we create, do we represent our own and another's emotional states, display care for each other through that ability while also inventing new ways to empathize in our moment and through time? These questions are part of an empathetic continuum I feel responsible for pondering as an artist and to which I should contribute.

Although the deep connection between empathy and creativity is likely an ancient behavior in humans, each generation must contend with new variables that change how we create and what we expect from art. With the constant introduction of new technologies and economics, new

politics and policies, new ways to segregate and demean, or new instruments of war and oppression, we are encouraged—sometimes subtly, sometimes directly—to dehumanize each other, which can undermine the power of art as a societal tool of empathy and connection.

But art, like empathy, is expansive and mutable, allowing us to remain agile in how we express and care for each other no matter the vagaries of politics, time, and place. In my years as an artist committed to observing, making, and thinking, with art comes empathy and the opportunity to understand another's emotions, feelings and thoughts so completely that the "I" becomes "We," and real solidarity can occur. This connection also affirms the moral implications of art I continually search for as empathy makes it intolerable to accept another's dehumanization. Because of these reasons, art and empathy are two of the greatest triumphs of the human mind in all of evolutionary history, and we must work hard at affirming their connection and implementing them. For it would be a mistake to think that empathy is static. Its form and assumed limits in time, place, and culture must actively be challenged and expanded; indeed, empathy is a source of invention itself. This idea—the artistic responsibility to invent new ways to empathize—has become a defining feature in my practice.

I began this story with a reflection on early empathetic encounters with objects in books. But it was growing up around a highly loving and empathetic mother and grandmother that likely primed me to see such connections—an example of generational empathy passed through time. In the spirit of contemplating loss as a source of empathetic invention and connection through time, I'd like to further humbly share the personal evolution of my artistic commitment to art and empathy.

Maybe there is another way to ask the question that links the empathy embedded in those burial seashells and mammoth heart to our time, and in the way the creators may have pondered it as well: What does it mean to know another's heart, to lose it, and perhaps to find it again?

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On March 23, 2005, I held a heartbeat in my hand. It was the last heartbeat in a sequence of nearly three billion that had sustained a life for close to 81 years — a life I adored: my grandmother's.

After nearly two weeks in a loving vigil of patience and tending on hospice care, my mother, sister, and I knew something had rapidly changed. Her breathing was more labored and forced, frantic, and pleading—the rhythm of finality.

At this moment, for reasons I can't explain, without a single hesitation or fear, I instinctually placed my hand firmly on her chest over her heart and looked deeply into her already closed eyes. Without any warning, her heart receded from my still-reaching palm, from the love around her, from earthly concerns. Her ribs and sternum now purposeless with nothing to protect, except to allow my hand the resting place it would need for several minutes longer, hoping there were some beats I had missed.

As I felt my grandmother's last heartbeat reverberate through my hand, it occurred to me I really knew nothing about the heart, at least not in the way this moment demanded. And in those moments when we search for explanations to the unexplainable, I felt this deep void in myself that I could not comfort her, that *I did not understand her heart in its final breath*. I held her and made a vow that I would do everything I could to let her know she was not alone, that the true complexity of both her living and dying heart would be remembered.

With those memories of sitting on her kitchen floor pondering ancient love and loss, and now better versed as a young artist with the potential of art to test the boundaries of empathy through time, I felt the only worthy gift I could give her, for all she gave to me, was to search for and unite the most distant hearts, both backward and forward in time. If I could find and link those hearts (a notion that came to me in a sorrowful flash and which I did not yet fully understand), perhaps all hearts, both living or dead, had unexplored linkages through time, allowing me to pull my grandmother's heart back closer to mine.

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Whether a loved one or anyone is there to grasp our final beat, the harsh truth for the vast majority of hearts is that they share a similar physical and memory fate: Silence and forgetting through cessation. We take this for granted today, but the ability to see, hear, and record our living hearts is a relatively recent development. It was a religious taboo of the highest order to touch or look upon a living heart for most of recorded history, and science did not know how to do so without killing someone in the process. For billions of people, information about their hearts was never recorded because we had not yet developed the technology to do so. But can art find a way around this, opening new pathways to empathize with forgotten hearts by making them beat again?

Two iconic images that occupy that scarce space of near-universal understanding—the pulse wave and flatline—were not recorded until 1853 by the German physiologist Karl von Vierordt, and in 1870 by the French physician Paul Lorain, respectively. Through the same premise as a modern-day blood pressure device, Vierordt devised a way for the pulsing artery (and eventually the heartbeat through the chest wall) to activate a lever attached to a stylus for inscription on a moving piece of paper. The paper was blackened with soot particles from a candle flame, producing a white on black curvilinear trace. Considering what he was recording, and in a beautifully coincidental moment of history, the practicalities of science accidentally created a

poetic moment of astounding fragility. Driven to make adaptations to his device because he could not find a stylus that was delicate and responsive enough (other styluses ripped the paper), Vierordt turned to the most delicate things he could find: a human hair as stylus and soot from a flame. So the first time in history a human saw their pulse beating in real-time as a waveform was traced by a single human hair in the residue of a flame that burned and extinguished over 160 years ago. It is hard to imagine fragility stretched much further. Until these milestone images of the pulse wave and flatline, no one had ever conceptualized life and death represented through the curvature or tautness of a single line. The ancient desire to know one's own and another's heart, and all the avenues for care and empathy that implies, would never be the same.

What is conceptually important to understand, though, is that in this era, the act of "recording" meant something very different from today. Recording was understood as an effort to document sound or movement as a *visual* waveform, not in the sense we would understand sound recording and, crucially, audible "playback" today. (Thomas Edison's invention of audio playback technology would not be demonstrated until 1877.) With the ability to visually and permanently record these pulsations in a fixed medium, the ephemerality of movement and sound were challenged and could be studied anew. By translating sound into a visual medium, acoustic scientists could now see new nuances of sound, and physiologists could ponder if disease looked different in the shifting forms of waves emanating from the heart.

But even once we crossed the more difficult threshold of audio recording and playback in 1877, truly a milestone in the history of sensory preservation, it would be decades before listening to recorded heartbeats was introduced into medicine. The technology was just not sensitive enough yet. For an artist on a quest to find the first heartbeats and pulses ever recorded in history—meaning, as playable sound—the fact that the earliest physiological recordings predate Edison's invention of playback presented quite an obstacle.

For several years now, I have been working on this problem with my colleague and media

researcher and historian Patrick Feaster: Can we hear hearts beating before the invention of audio playback technology, thereby expanding the possibilities of empathizing through time? If so, how far back in time can we go? As we have discovered, there are numerous pre-Edison pulse and heartbeat waves unexplored as documents of sound.

As physics has long demonstrated, photons of light essentially travel forever, allowing us an incredible view into the past when we observe them through our telescopes. But sound waves do not operate the same way, dissipating moments after their creation and severing the present from ever truly hearing from the past. Unless that is, the sonic vibrations are registered into another medium, like the grooves of a record or the soot gathered from a candle flame, for example. In 2008, Feaster and his colleagues revolutionized the field of historical sound recording by demonstrating that these early visual tracings of sound made before Edison's breakthrough could be "played back" today as sound. With high-resolution scanning and innovative software programs to reconstruct the waveforms embedded in century-old soot, they invented a new field—sound archeology—and transformed our relationship to what we assumed was a physical limit to our sound history. Their proof of concept was made startlingly real when they resurrected audio of a scientist singing "Au clair de la lune" in his laboratory from 1860—seventeen years before Edison's breakthrough—from tiny waves embedded in soot on paper.

From an artist's point of view, I would also argue they invented a radically new way to empathize, allowing us to hear—to *feel*—the voices of people and places forever thought lost to time. Using Feaster's methods, to date, we have resurrected and made audible for the first time dozens of hearts that beat in the nineteenth century—the first sound of heart disease (1854); a heart experiencing an emotional state (1870); a heart while listening to a melancholic melody (1896); a heart smelling lavender (1896); and the first fetal heartbeat (1889).

But there is one recording in particular that expands our notion of empathy and accessing time in

the most ambitious ways and gets closer to the quest my grandmother's heart inspired.

Charles Ozanam is not a scientist most remember, but his interest in the aging heart would allow me to think about my grandmother's heart in a new way. In 1866, he introduced his "photo-sphygmograph," which contributed to solving a significant problem for physiologists of his era: How does one image and record a real-time, internal biological process without the need for cutting into the body? Ozanam was the first to introduce the still new technology of photography to heart studies, producing the earliest photographs of the movements of blood pulsing from a living human heart. Sphygmographs were the first machines to visually translate the changing pressures in the arteries, often using a stylus to inscribe the image into soot-covered paper. Ozanam's device ingeniously replaced the stylus with a beam of light. His machine was designed so that as an artery pulsed or a heart beat they would, through an air pressurized tube, cause the mercury in a thin glass vial (similar to a thermometer) to bounce up and down in unison. To photograph this process, Ozanam pulled photographic paper along a slider inside a small camera obscura. A light was then focused on the glass tube, and the undulating mercury column would block out, or let in, the light on the passing photographic paper, giving visual shape to the pulses' movements—literally the shadows of heartbeats.

What also adds distinction to Ozanam's research was his particular interest in the aging pulse and heart. Although physicians of past centuries had noted the pulse's behavior at varying ages, no one of Ozanam's time, and, crucially, with the new technologies of sphygmographs and photography, had attempted systematic cataloging of the pulse and heart of every possible age. In the long history of symbolic images depicting the heart—from cave walls, canvases, or cathedrals—Ozanam's scientific "atlas" of photographs forms an entirely original portrait of life: the movement of the living human pulse and heart as it ages.

Like descending depths to study invisible waves at the bottom of an unexplored sea, the images he captured are hauntingly beautiful as a heart moves from birth to death—two, five,

twenty-eight, thirty-five, sixty-two, seventy-two years old. In these images of the pulse were mysteries to unravel about time's effect on the heart.

As useful as it was to physicians to gather an atlas of the heart's history, it was in the final photograph of the sequence that Ozanam captured something that allows us to stretch back even farther in accessing new sensory and empathetic pathways through time: A pulse tracing of a heart born in the eighteenth century.

Because he was on a quest to register the heart at every age, he had the foresight to record a rare nineteenth-century centenarian. He recorded Monsieur Léger in 1870, who was at the time one hundred years and eight months old, giving him a birth year of 1769. Monsieur Léger's pulse portrait is likely the earliest known photograph of the earliest-born heart from which a pulse was recorded.

The eight pulse waves captured from Monsieur Léger's heart offer new ways to view our shared pasts and empathize through time. In this photograph of an otherwise unremembered heart, we are allowed access to a tiny fraction of a real, lived life. If we could imaginatively retrace the pulses that preceded these eight and follow them back to their inception in the womb, we would see the grand and the mundane consequences of life registered through the heart.

Based on the birthdate of 1769 and residing in Paris, this is a photograph of a heart that would surely have beaten a little faster at the original news of the storming of the Bastille in 1789, and the execution of Louis the XVI in 1793 during the French Revolution. He would have been twenty-four years old when mass conscription was introduced in France for the Napoleonic Wars, of which he's likely to have been a veteran.

As each beat begets the next, and the next, these moments and the billions of others that formed his life now residually lay within these final few slowing pulses; the echo never disappears. Time would take its final toll on Monsieur Léger's body only a few months later, but these few shadows from his still-living pulse would immortalize him in a way that the etchings on a gravestone never could.

After much research locating the image and testing different playback methods, in the summer of 2015, Patrick and I were able to revive Léger's pulse wave. First flickering on in the eighteenth century, frozen and preserved as shadows in the nineteenth, mostly forgotten about in the twentieth, finally, his heart was heard and felt in the twenty-first century. It was one of the most beautiful, time-expanding, and empathetic moments I have ever experienced.

Rediscovering and engaging with Monsieur Léger's heart—perhaps the furthest back in time we can hear such a sound—completely reordered my thinking about the creative possibilities of stretching our empathy backward in time. I want to end with another boundary-expanding heart, one that challenges our ideas about how love and empathy can be extended forward in time.

When I returned to the memory of feeling my grandmother's final heartbeat, I reflected that as her Earthbound heart stopped, there was another one, recorded years before and now hurling past the edge of the Solar System, that would carry the memory of all human hearts, including my grandmother's, forward at a time scale that is as close to "eternal" as we may ever realize.

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Since 1977, racing at roughly 39,000 miles an hour away from the Earth, is a human

heartbeat-in-love. I don't mean as a symbol or metaphor but as a tangible audio recording embedded in the grooves of a gold record.

In 1977 NASA launched the space probes Voyagers 1 and 2 as part of its "Grand Tour" initiative to explore the Solar System's outer planets. The mission rewrote our textbooks about our Solar System and is one of the most remarkable scientific feats humans have ever accomplished.

Originally designed to last five years, they are now in their fourth decade of exploration. But there is another aspect that distinguishes their accomplishments: Once completed with their missions, the Voyagers will be in the incredibly rare position to exit the Solar System by breaking free of the gravitational pull of the Sun. To date, only five human-made objects will obtain this status.

Realizing the potential symbolism of such an occasion, NASA asked astronomer Carl Sagan to lead a team to design an "interstellar message" to be placed on board as an act of goodwill greetings meant for any possible intelligence that ever happened upon it. On a more poetic level, though, it was a scientific attempt to build an ark that would potentially be our planet's last remnant of our existence. The goal was a billion-year life span, and the medium was a gold-plated LP record—what came to be known as the "Golden Record." Embedded in its grooves are a small group of scientists', writers', and artists' humble attempts to account for the vast complexity of Earth's history through language, images, music, and sounds of the natural world; all in the data limitations of two sides of a record.

Among the gems that made it onboard is, in my mind, the most poignant recording of all: The compressed brainwave (EEG) and heartbeat (EKG) electricity of a twenty-seven-year-old woman who had just fallen in love. In a moment of real creativity and vision, Ann Druyan, the

creative director of the Record, who only a few days before had secretly professed her love to Sagan while working on the Record (and he to her which also marked their engagement, the eventual birth of two children and marriage until he died in 1996), had the imagination to wonder if a future unknown technology could somehow take the audible recordings of the electrical signatures of her heart and brain and decipher the meaning and emotional content of human thought. Stated more provocatively, Ann was essentially asking if aliens could read her mind. Considering what was at stake with this once in a lifetime opportunity, perhaps even once in the lifespan of an entire *species*, it is a real testament to Ann and Carl's vision that they decided it was worth a shot—an optimism in the face of uncertainty that defined the whole endeavor.

Only days later, with time running out to turn in the master tapes to NASA, Ann made an appointment at a New York hospital to be hooked up to an EEG and EKG machine to record her body's electricity as she sat alone in a darkened room. With the weight of possibly being humanity's last representative of a unique human thought, one that would quietly wander a billion years in the darkness of space, Ann rose to the solemnity of the occasion, and, intertwined with dutiful world-historical facts and deeply empathetic reflections on people and places, she also could not help but reflect on falling in love with Carl only a few days earlier.

Like the question of the origin of matter and time—reluctant to be known too soon, without the effort—embedded in the grooves of the Golden Record is a natural mystery nearly as imponderable: What is human love? In the astronomically remote chance the Voyager is ever found, there will remain the further astronomically small chance such an abstraction as the concept of human love—as heart and brain electricity converted to sound—can be deciphered. Assuming this now unknowable future intelligence can figure out how to build a record player and give the record a spin, when it reaches Ann's grooves on the Record, it will hear relatively unremarkable and innocuous static. But with the right rosetta stone, these beings may realize they are hearing the memory and staggering beauty of how other lifeforms once displayed care and love to each other.

On September 13, 2013, the *New York Times'* front page read, "Exiting the Solar System, and Fulfilling a Dream: NASA Craft, Aloft 36 Years, Enters Region Between the Stars." And there it was: A human mind and heartbeat-in-love, lunging toward an "afterlife" in a region of space and time that no art or religion had ever accounted for.

The hope embedded in this recording is unlike any other a human has attempted. For Ann to give the electricity of her heart and mind while reflecting on others and, more specifically, the beginnings of her love for Carl—literally the electrophysiology of care and empathy—to the truly unknown is to ask something deeply profound of empathetic behavior: Is it universal? If found, can another intelligence understand its message, that even with the pain we caused, we were also social creatures that loved and empathized with each other and wanted that effort to be remembered? Before the Voyager finally runs out of power in a few years, NASA will have an opportunity to give it one last nudge to the nearest star system. It will take 60,000 years to arrive and an untold number more before the next system aligns with its path. Speeding by both long frigid and newly igniting stars, the dust of never-finished planets and perhaps moons harboring water and sparks from lightning, the Voyager will no longer loyally observe and beam back to us what it encounters—its battery long dead—but simply be with this dark void and its possibilities.

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As I laid out at the beginning of this chapter, empathy is the act of internalizing another being's thoughts and emotions. The full potential of that gesture—understanding, communion, and compassion through time—is realized when it inspires the same in others. In these stories and objects—carved seashells, cave drawings, captured shadows of eighteenth-century heartbeats, and a gold record carrying the electricity of a heart and mind past the edge of the solar system—we have meaningful evidence of how rich the legacy of empathy is in each era's own

time and place. Objects such as these serve as reminders to each generation that they are a small but essential part of a legacy of our ever-evolving and inventive capacity to care for and empathize with each other—empathy that should extend in all directions.

My quest to find and link hearts across time as a gesture to empathize with my grandmother's dying heart was a personal way to think about the collaborative and historical possibilities of empathy. Although it is personal, it would not be empathetic if it remained insular. Through sharing, I hope this process is illustrative of the creative possibilities at play when each of us genuinely embraces empathy as an expansion of one's time and perspective. If, through art, we can challenge our assumed limits of how we empathize historically and see that it is a continuum that hinges on our loyal participation, then it can change how we empathize today, ensuring it further expands tomorrow.