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Animation, Sustainability and Neurodivergence – animation as becoming with environment

This essay explores the correlation between animation, neurodivergence and ecological perspectives. Through analyzing animation practices and my own motivation for animating I have seen more and more that this correlation is due to animations affording of sensorimotor cognition and processing, a common neurodivergent trait, that renders the self as intrinsic part of the world.

Introduction:

Ecological crisis

In August 2014, I sat on the Tokyo subway with my animation students from Stockholm university of the arts, heading to the suburbs to visit a small anime studio. My attention was caught by an advertisement featuring cheerful young people in a picturesque landscape, holding baskets of beautiful fruit. The ad promoted fruit orchards in Fukushima. For me (the foreigner), Fukushima was inextricably linked to radioactivity and the recent nuclear meltdown in Daichi, the ad's message seemed absurd and left me with lingering feelings I could not quite make sense of.

1945 in New Mexico the first atomic bomb test was detonated. It is also the moment of the transition into a new geological epoch of the Earth.¹ It even impacted Earth's fundamental 7,83 Hz frequency, sometimes referred to as Earth's heartbeat. After 12,000 years in the Holocene epoch, Earth enters an era where human's activities have fundamentally changed Earth in its core.

Throughout the 20th century, industrialism and capitalism—underpinned by colonial and patriarchal ideologies—have reshaped the Earth on a planetary scale.

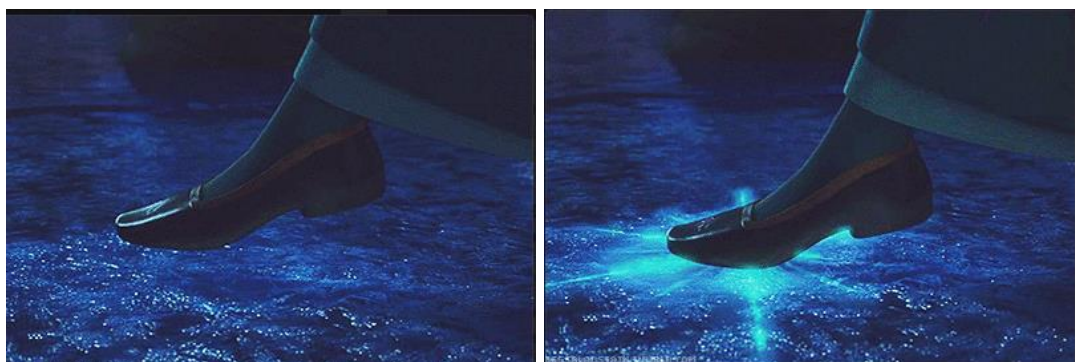


Image: *Frozen* (2013)

The sense of human's omniimpact is echoed in *Frozen*,² by how the climate changes in all that the princess Elsa touch or step on. Every action effect everything around us.

Earth's new radical geological shift can be detected in changes in methane and carbon levels in the atmosphere, sea levels, glaciers melting, average temperatures, pollen from agriculture, microplastics integrated into human cells, chemical waste from industries in the Earth's sediments, species extinction and of course; the background radiation.

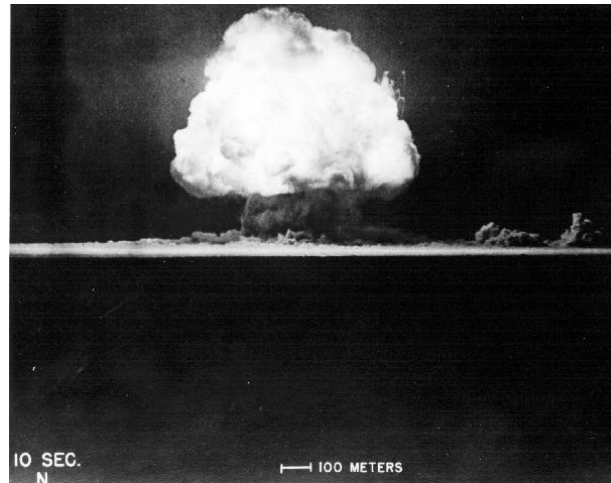


Image: *Trinity detonation* (1945)

The image of the mushroom cloud has come to define crisis imagination. This way the atomic bomb can almost be accepted; from a distance, separated from me as I over-look this monumental sublime mushroom cloud. But does this image bring me any closer to making sense of it with my human senses? Radioactivity continues to exist long after the disaster and is so extensive in both time and space that is difficult for us to grasp in the human lifecycle. It pierces bodies and landscapes, yet we cannot see it, it is spread over great distances and remain for the foreseeable future, yet we cannot touch it. This situation gives rise to a paralyzing invisible horror, a “nuclear neurotic”.³ An inability to deal with and react accordingly to the situation.

The climate crisis is defined by hyper objects⁴ such as radioactivity and carbon dioxide. They are difficult to grasp with our human senses and images such as the photograph of the trinity detonation doesn't seem to assist in making sense of them.

Michelle Murphy's term “alter life” acknowledges the impossibility of trying to make sense of anything (especially in the current antropocene era) as an isolated thing, independent from our ongoing sense-making. Homo sapiens are a self-creating and world-creating species.⁵ We as both research subjects and the world we study are results of human-induced materials,⁶ and AI and robotics researcher Jitendra Malik believes that it is our “making”, our body's movements, that shapes the the brain and our cognition more than the other way around⁷. This condition compels us to carefully consider what methods for sense making we are using because *how* we make sense, affects how we act, and this enacts the world further.



Image: *Simpsons The Movie* (2007)

In *Simpsons - The Movie* (2007), Homer becomes disappointed with how Alaska turns out to be an oil field. He replaces the view with an idyllic advertising poster. The obscured visibility causes them to run off the road and they end up in a landscape that looks exactly like the poster. The image somehow transformed the actual reality! Image making is an important part of human sense making. Let's continue with looking at what roles our images play in how our new realities take shape and in what sense our climate crisis is also a crisis of imagination.

Imagination crisis

Scientists and the general public agree that climate change is real and that it is caused by humans. But still the part of humanity that needs to change seem unable to act on this knowledge and bring about the necessary change to turn it around. How we have made sense of this situation does not seem to aid a proper response. There are of course many reasons to why this is the case. It could be argued that the problem lies in our collective imaginations and in storytelling conventions based on domination and power: George Marshall for example, argues that it's because our familiar stories teach us to act in situations with distinct heroes and villains rather than offering narratives based on shared common purposes.⁸ A study by Kahan et al. suggests that it is because the idea of anthropogenic global warming goes against people's cultural identity and ideology to make a breakthrough regarding acting on perception.⁹ Moreover, Rob Nixon describes climate change as 'a slow violence that affects the poor' – a population that are rarely in positions to be in control of their own story narration.¹⁰ Or maybe the long-term perspectives of earth's cycles, which reach beyond human lifecycles, are not dramatic enough for film narratives?

In cinema the camera often has an actively narrative role. A cinematographer controls the camera, moving into the picture, approaching people and objects, examining them. It is this movement into the world that Virilio calls ballistic.¹¹ Like the bullet from a firearm, it penetrates the world. In her classic text "Visual pleasure and narrative film", Mulvey describes how the camera movements represent the viewer's gaze and make the audience identify with the camera.¹² She also describes how the conventions of cinema storytelling developed according to dominant perspectives. How cinematography taught cinema audiences to identify with a male gaze. The portrayal of women's bodies emerged through a male perspective in a way that allows for the female body to be consumed as object, without being disturbed by a subject looking back.

Why do we have this distancing and destructive conventions in our cultural collective imaginations?

The dominating world-view in these conventions can partly be traced back to colonial exploitation, going back to the origins of Western civilization and accelerated during post-Enlightenment modernity.¹³ It's foundation is an ideal human, defined as opposed to

primitive nature, where elite white males of European descent were considered more human,¹⁴ while women, indigenous people or other divergent individuals were considered less human and closer to nature. This hierarchy and divide between human and nature underpins colonial modernity and defines much of its unconscious collective imaginations.

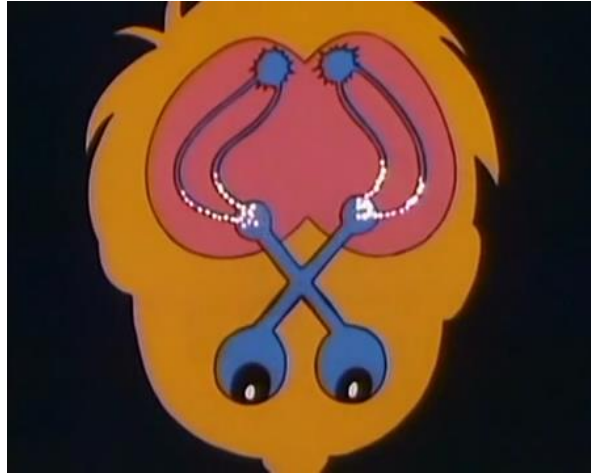


Image: *Once upon a time... man* (1978)

During the recent decades, this dominant human-centric worldview has been increasingly questioned from within western modernity. Alternatives have been explored from various post-human and new materialist perspectives with concepts like more-than-human, nature-culture, object-oriented ontology, ecofeminism, speculative realism, quantum-animism, resonance theories of consciousness, primordial quantum language, the living world beyond humans is acknowledged in a multiverse of ways. These theoretical approaches often reconsider and affirm primordial and indigenous cosmologies that were initially discarded as primitive, as not based on reality and not compatible with modern science.

In animation on the other hand, these other-than-human perspectives have been prevalent all along. Animation has a rich tradition of conveying agency and connection with non-human objects. Human and the environment are interwoven. In what follows, I will provide a few examples that illustrate this.

The more-than-human world of animation

Life and agency of objects

Media theorist Thomas Lamarre takes the camera's role as starting point when defining the difference between animation and other film. He calls the camera's tendency to move in parallel with the image in animation *animetism*. The camera's ballistic tendency to move into the picture in cinema he calls *cinematism*.¹⁵ In the animatist image the objects tend to be active, while the mounted camera renders the audience's gaze passive.



Image: *Sailor Moon Chrystal* (2011)

In animation our attention is often directed towards how things out there may have more agency than they first appear to have. We may often think of things as having qualities and properties, for example, that a heart shaped jewel is red. But what if you think of it as powers instead, that the jewel has the power of ‘red-ing’¹⁶? This is easy to go along with in the anime series *Sailor Moon Chrystal* (2011), where an object’s powers materialize in sudden lines and abrupt colors.



Image: *Panda Kopanda* (1972)

When Miyazaki’s papa Panda sits down, the chair breaks with a crash. He says, “this chair did not like being sat upon”, inviting us to take the perspective of our co-existing things. Just as when Mei is lifted by the forest spirit Totoro, they invisibly fly over the fields, she yells: “We are the wind!”

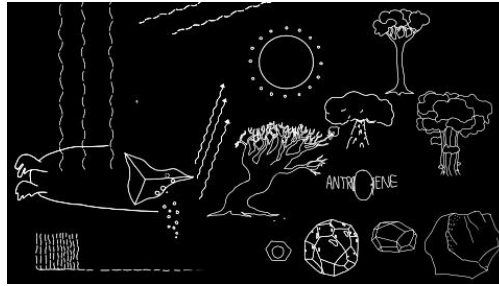


Image: *Wolf wind stone shudder* (2015)

In my installation *Wolf wind, stone shudder* (2015) I draw on natural elements expressing active agency from works such as *Future Boy Conan* (1978), *Betty Boop* (1934), *Mumin* (1991).

Without boundaries

Not only are objects and environments lively and expressive in animations, they can also avoid definite borders and fixed categorization. Bodies are perforated membranes, substances go in, through and out of us. All that interact change each other in the process.¹⁷ Like the little fish Ponyo in *Ponyo on the Cliff by the Sea* (2008) transforms into a human during the film. Through love, DNA exchange and pure will a new body materialize for Ponyo.



Image: *Ponyo on the Cliff by the Sea* (2008)

Love and desire between species rarely appear abnormal in the animated realm.

In the eco-sexual movement¹⁸ sexual desires towards nature and objects are lived out. But how can consent be ensured in a world where ecology is enslaved? How can we achieve what Michelle Murphy calls consensual entanglement¹⁹ or interact in a way that give the other the ability to respond, as in Barad's response-ability?²⁰ This requires a careful listening that is often part of the animation practice. Like Pom says in *Laputa: Castle in the sky* (1986) "*The earth speaks to everyone.....The stones have small voices*".

Sexual intercourse between humans and plants may not lead to offspring, but the fruit is the plant's sexual organ, when I eat a fruit, my body serves a function in its reproduction. As the intercourse between a wasp and an orchid in Deleuze's thoughts is a possibility of becoming, of escaping fixed identity,²¹ eating fruit is a transcorporeal²² becoming part of, in Alaimo's thought, and *is* part of the evolution of the human being. We are symbiotically intertwined in each other's development.²³



Stanley (2000) Suzie Templeton



Image: *Asparagus*, (1979)

The human body overlap with other bodies, with nonhuman beings and with landscapes in constant becomings.²⁴

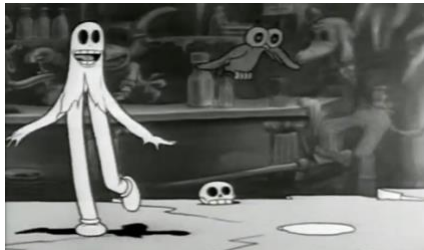


Image: *Snow white, betty boop* (1933)

In Fleischer's *Snow white* (1933) the character becomes the bottle he drinks from, in Signe Baumann's stories about sex the character acts in a world made from her own body. Body and landscape are turned inside out in a transcorporeal weave.



Image: *Teat beat of sex* (2008) Image: *Suzume* (2022)

Radioactivity is the ultimate example of borderless existence, the merging of bodies and environment. But as humans it is hard to acknowledge that. I am returning to my mixed feelings about Fukushima's fruit here, to test how I can shift my perception of radioactivity from an external threat that lurks at the horizon into accepting it as something that has been part of me all along.

Becoming “other” in animated radioactivity

After the week in Tokyo with our animation students, the journey continued to the Hiroshima Animation Film Festival—another place doomed to be associated with atomic technology. Radioactivity has left its mark here as well. Its presence prevails also in the animated images.



Image: *Pica Don* (1979)

In these frames from *Pica Don* (1979), we are in Hiroshima moments before and after the detonation of *Little boy*. A mother breastfeeding her baby. When the disaster occurs, using her body as a shield, the mother embraces her baby to protect it against the external danger. But radioactivity dissolves her body and cells. The embracing movement is continued by the atomic bomb in a total merging. In *Akira* (1988), bodies are constantly transforming in the presence of the bomb.



Image: *Akira* (1988)

These animations don't shy away from close encounters with the nuclear. But they are still dominated by human perspective on radioactivity as an ungraspable threat. The relationship is still neurotic without the sensible possibilities of making sense of the reality we share with radioactivity.



Image: Shiriagari Kotobuki, *Manga Ever Since*: 2011.3.11 (2011)

In the project *Manga Ever Since*: 03/11/2011 (2011), Shiriagari Kotobuki moves closer to the atomic technology and even identifies with it. In this story, the accident at Daichi, Fukushima is a happy coincidence that releases the atomic particles into the world after a tedious life locked up inside the reactor. Grandfather Plutonium, big sister Cesium, big brother Strontium and the toddlers Iodine are the main characters in this story about the accident.²⁵

Here we get to imagine radioactivity in a different way than from inside a human that separated itself from the rest of the world. Here the nonhumans speak for themselves, and they are not defined by their relation to humans. This is a world where humanity is not the center but just one existence among others. Things are not categorized according to their value and usefulness to humans. All that exists exists. There are no degrees in existence, we all equally exist. This perspective drives Harman's Object Oriented ontology that breaks with dominant strains of 20th-century phenomenology that tended to deem things as real based on how they are sensible to human subjects.



Image: *Once upon a time... Toxin wars* (1978)

As in *The toxin wars* (1978) non-humans are simply going on with their own lives, the human body reduced to a passive backdrop. The feeling is a bit more familiar, a bit less neurotic. Something a bit easier to deal with and accept that I share the world with. I get over the fear and deal with these troublesome relatives. Get to know them because they will affect me, whether I'm talking about them or not.

These characters hint at a possibility to rehabilitate our separation with the environment. A possibility to embrace unrestorable landscapes that have been disabled by environmental destruction without deeming them abnormal²⁶ as in other cultural expressions such as, disaster tourism, ruin porn photography or film genres such as eco-horror and nature's revenge.

Perhaps it can help me reconsider the fruit of Fukushima as well. I imagine Big sister cesium introducing herself to a Fukushima apple. They hit it off. I imagine feeling curiosity by the thought of taking a bite of that apple.

As we've seen here, animated films have a longstanding tradition of bringing inanimate objects to life—teapots gain eyes, sponges sprout feet, and decayed bones begin to dance. This tendency is often attributed to animation's freedom from the constraints of “reality,” allowing imagination to play freely. By “reality,” people then sometimes mean all what human senses can perceive, and sometimes they mean the part of the reality that we can capture with the help of cameras. However, this explanation doesn't fully account for why it is these particular realities beyond human perspectives that thrive so vividly in animation.

The word animation came from the Latin word meaning living or breathing and refers to how the illusion of movement, thus life, is created by the rapid display off sequences of images with slight changes within each frame. But it is not this illusion of life, of achieving the effect of the lifelike, in (by modernity deemed dead) objects that these examples are significant of. These examples rather exemplify an imagination that takes its starting point outside the sense of self, in-between the self and the surrounding things. In the sense of animation as an animist practice, a practice of relations.²⁷

To me, this rather suggests that animation offers unique access to a *broader range of realities* than to the ones limited to human centric perspectives or cameras.

Drawing on results from my artistic practice and research I propose that the reason for this is how animation affords a specific sensorimotor cognition that enables a *thinking and making together with* our outer world, our environment and others. It is animation as a type of cognitive processing, that un-disciplines the animator's imagination from western epistemologies and imaginations.

Animation practice as animist relational cognition

I suggest that animation has this capacity due to ways in which animation practice channels a kind of animist relational neural processing and cognition. Animation practice is a way of knowing that reaches beyond modernist separations of the self and the other, the outer and the inner. I base this conclusion on my own motivations for practicing animation and observations of the correlation between animation and neurodivergence as I shall continue to explain now. I will start by describing some processes from my own artistic research and then continue by laying out how established correlations between animation and neurodivergence support this theory.

Animation practicing as visual artist

As a visual artist I have had the privilege of grounding my work in animation practices which has greatly emancipated my thinking and being. There was something deeply compelling in the craft of animation that drew me to the field many years ago—something that fulfilled me and supported my exploration of environmental themes, which has always been my main interest.

Industry's focus on production

In 2012, I became the head of the animation program at Stockholm Uniarts. Its Film and Media Department has a close relationship with the Swedish film industry, and students' degree films are often expected to meet professional industry standards. This production-oriented approach requires students to pre-plan their project before beginning and adhere strictly to the plan to meet deadlines with a completed film.

However, animation is a meticulous and time-consuming craft, where unforeseen developments often occur—new ideas, unexpected opportunities, and creative openings. This exploratory nature sometimes clashed with the rigid production pipelines of the school. Students frequently found themselves forced to choose between exploring the new possibilities that arose during the work or meeting the expectations of delivering a finished film on time. Sometimes industry trends favoring efficiency emerged as solutions to these challenges. Practices such as outsourcing manual animation to cheaper, faster labor markets or adopting technologies like motion capture and AI generation are popular ways to streamline production.

Resistance to Outsourcing and Automation

While these methods may allow for faster and cheaper production, I couldn't help but feel that something vital would be lost in the process.

This tension drove me to explore the historical roots of cost-cutting measures in animation in the film industry. By examining these developments, I wished to uncover other implications of these trends. I organized the workshop "Outsourcing Animation",²⁸ where we discussed and critically examined what is gained—and what is sacrificed—when we prioritize speed and economic efficiency over the embodied, exploratory, and transformative potential of artistic practices in animation. Here is a summary of that history followed by a section with some of the reflections from the workshop.

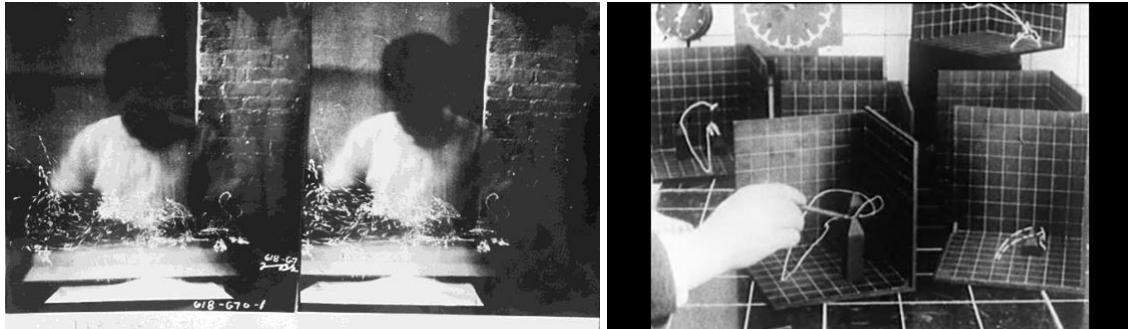
History of efficiency measures of animation

Motion capture became popular in the beginning of this millennia and became a cornerstone in the production of digital moving images with films like *Avatar* (2009). It is an animation technology where you record movements in bodies that is later applied to 3d modelled characters. This process can cut cost and streamline production by automating the animation process and outsourcing the labor.

The predecessor of motion capture, the chrono cyclograph, a camera connected to a large number of light bulbs, was developed by Frank and Lilian Gilbreth in 1913. These lights

could be distributed on a body performing a movement. The purpose was to study the workers movements at the assembly lines in factories.

Gilbreth's studies of movements were combined with Fredrick Taylors time study and resulted in the business efficiency technique" time – motion study".²⁹ The time-motion study was a foundation in Taylorism. The purpose was economic efficiency, centralizing and specializing every part of the production according to scientific studies.



Time study by Frank & Lillian Gilbreth

The aim was to develop standards for everyone to follow. An ideal movement would be without any unnecessary hesitation or detour, every worker would exactly repeat the most efficient version of the operation, like a mechanic loop. Animation production became absorbed into such looping assembly lines.



Image: Funny little bunnies (1934)

These use of loops and cycles even made it into the animated stories. In early Disney films there are many examples of where the whole narrative circles around this idea of streamlining and looping the labor extensive animations. In *Funny little bunnies* (1934) the entire universe of the film is reduced to a single assembly line.

The workers, however, seemed discontent with this Taylorism. They resented the confinement of being trapped in these loops. They felt alienated from the outcomes of their labor. The constant monitoring, surveillance, and control over every physical movement made them feel reduced to machines, without possibility of independent thought or self-

organization. This growing dissatisfaction fueled the labor movement. Workers began to protest, organize strikes, and form unions.



Protest sign (1938)

For the animation workers in the US, the screen cartoonist's guild was founded in the in 1938. Art Babbitt was one of the animators at Disney that supported fair wages for the animators³⁰. When he was fired due to his protests the whole Disney studio went on strike.



Art Babbitt

This was in the middle of the production of *Dumbo* (1941) in which we can recognize some of the striking workers portrayed as clowns that wants to “hit the big boss for a raise”.³¹ In the end though, a deal was signed in the worker's favor.

Oh, we're gonna hit the Big Boss for a raise!
Yeah, we're gonna hit the Big Boss for a raise!
Oh, we're gonna get more money, 'cause we know that we're funny
Oh, we're gonna hit the Big Boss for a raise!

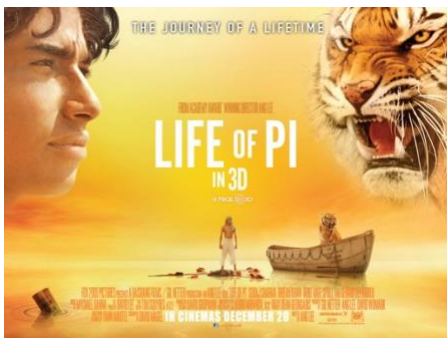


Image: *Dumbo*, Disney (1941)

But in the 1980's neoliberalism allowed multinational companies to move their production worldwide in order to cut costs for wages. If workers are too demanding in one place, a company could move its production elsewhere.

The free trade market has had effects on every industry. In animation The Hollywood FX industry has created a diaspora of migrant workers with nonexistent job security. They work 60- 120 hours a week, without getting paid overtime.³² Even though 47 of the top 50 films of all time are visual effects-driven and billions of dollars of profits are generated yearly, the artists who create the effects describe their work as sweatshops, with inhuman schedules and without health insurance or pensions.³³

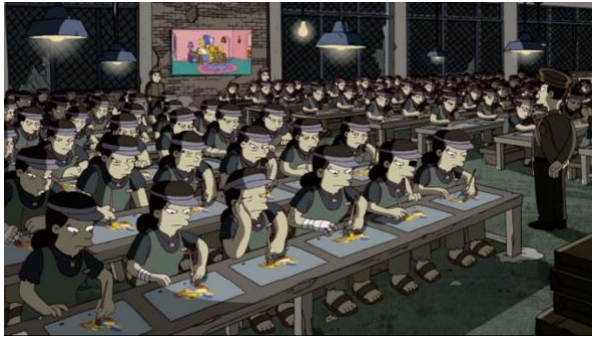
In internet forums FX workers blame themselves for not making more demands and organizing in unions and in 2012 the International Alliance of Theatrical Stage Employees started attempts to unionize the FX industry.



Film poster *Life of Pi* (2012) & protesters outside the Oscars 2013

In 2013 *Life of Pi* (2012) got an Oscar for best visual effects. Outside the Oscars American FX workers rally for a fair share of the profit.³⁴

But at the same time the company Rhythm & Hues Studios, who had provided the effects was forced to file for bankruptcy. Now American and European FX companies lay off workers and close down because they can't place the lowest bid, in spite of pressured wages for the workers. Now when workers in the west won't push their work efficiency further the labor of animation is exported to countries with lower standards for wages and workers' rights. Global digital pipelines are used to farm out labor-intensive work to Asia, where labor costs are as much as 60% lower. In a Simpsons couch gag artist Banksy comment on animators working conditions in this kind of outsourced production.



Films tills in *Simpsons couch gag*, *Banksy*

A country where most profit can be made is a country where wages are low, trade unions are suppressed, and the state willing to spend its funds on infrastructure projects that ensure that the factories can run nonstop and that goods can be shipped off.³⁵ The profit from the digital imagery is generated on behalf of workers bodies and their environment.

Animator and programmer Idiomdrottning³⁶ strikingly formulates how modern abstractions of digital interfaces make outsourcing, automation and AI image generation look clean and immaterial. But this is an illusion. This only obscures and further abstracts the hyper objects of climate change such as CO². As Hito Steyrl puts it:

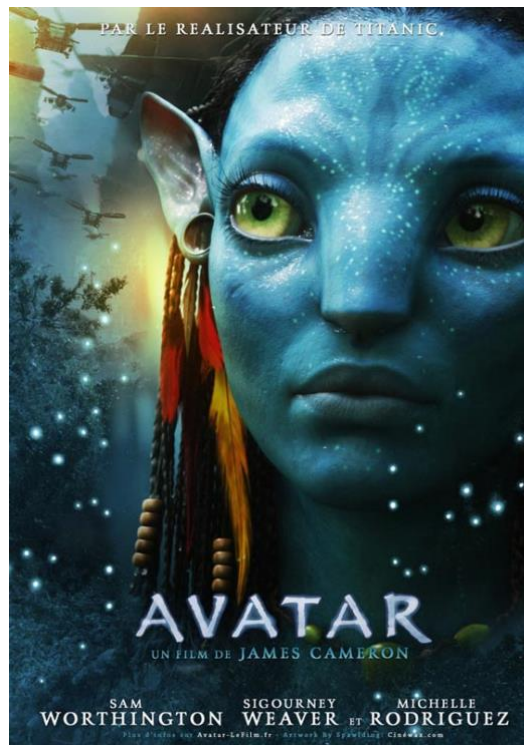
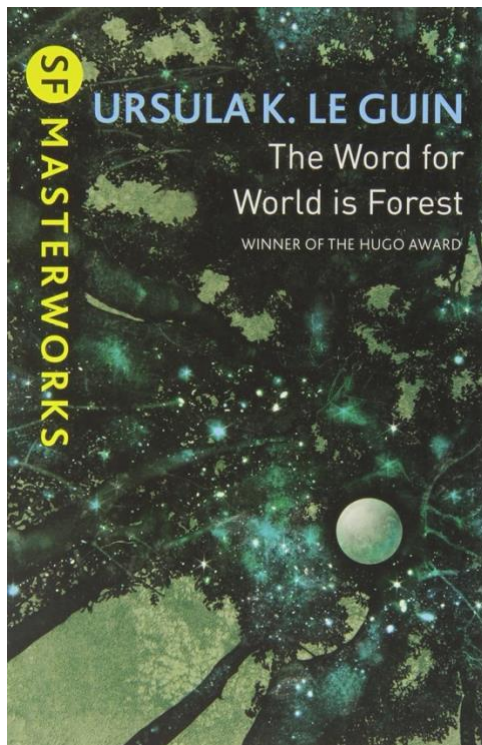
In the case of machine learning, the infrastructure consists of massive, energy-hungry, top-down cloud architectures, based on cheap click labour performed by people in conflict regions, or refugees and migrants in metropolitan centres. Users are being integrated into a gigantic system of extraction and exploitation, which creates a massive carbon footprint.³⁷

The environmental costs: reflections on what gets sacrificed when Profitmaximizing animations:

During the workshop “Outsourcing Animation”, we drew on Naomi Kleins book *This changes everything* (2014), where she highlights several ways in which free trade market industry’s harms, not only workers, but also the environment.

Job security and democratic rights are inevitable for standing up for one’s environment. Exploited workers leads to an exploited environment. In free trade global capitalism where companies can leave as soon as workers starts to make demands, jobs will be offered on behalf of clean air and water.³⁸ If workers had other options, they would not sacrifice health and environment to rely on these companies to make a living. We noted that these issues applied to animation as well.

Also, we acknowledged that a profit maximized industry is unwilling to take risks. Only stories that attract broad audiences, follows established formulas and doesn’t challenge the current view on things is a safe investment.



In *Avatar*, for example, very similar in plot to Ursula le Guin's novel *The Word for World Is Forest* (1972) but with one big difference. In the novel the indigenous people also revolt against colonizers that try to exploit their environment, but it doesn't end there in a successful happy ending as in the film. In le Guin's version an irreversible shift has occurred. The colonizers violence can't be undone, the world has changed, and the book leaves us with open questions of how to continue. However, in *Avatar* the conventional Hollywood dramaturgy closes the story in a less complex understanding reduced to the quest of winning or losing a battle. In order to grasp and navigate the current ecological crisis we definitely need to challenge current views, conventions and formulas.

Above issues on the environmental costs of profit-maximized efficiency, most certainly contributed to my intuitive disdain towards such measures and explain why they are counterproductive in my artistic explorations into sustainable environmental perspectives. However, there was something more, an unexplained embodied concern, a deep, intimate connection to the process of animating frame by frame that are goes beyond the above issues. I am drawn to the iterative, cyclical gestures of this practice. At times, I feel a need to do them, but I have to do them in my own way, even if they are not always the most efficient. Why is that?

Modern western society often promotes the outsourcing or automation of repetitive tasks, but on the same note it also demands that individuals become increasingly standardized in how they participate in society. From the Taylorist movement's obsession with efficiency to new public management systems and even primary school education, I experience that my body was being micromanaged in how it interacted with the world.

So, to be honest my main reason seemed very selfish. I simply *liked* to hand draw animation frame by frame and *wanted* to continue doing it. This brings me to the question; why do I like it? The urge to find the answer to this question, to be able to focus less on production and get a deeper understanding of the practice, led me to approach the field of artistic research.

Animation practicing as artistic researcher

As an artistic researcher the demand to produce artworks and films shifted into a focus on the practice as ways of knowing and knowledge production. In my artistic research *Animated ecology*³⁹ and *Being Animated*,⁴⁰ I put huge effort into putting words to the rewarding physical and cognitive experiences of manual animation.

Being Animated and Animated Ecology

In these research projects I explored how the animation machinery gathered its experience and thinking from a wide variety of techniques and materials. From found objects to sculpture, performance, drawing, painting, photography, compositing. I analyzed the physical interaction with objects and materials that were so significant and sometimes so intense that it creates an identification with it.

For example, I described the stop-motion practice of building a set, a world that has the ability of coming to life. I described how I work the material, preparing it to become flexible, sculpting it, giving it joints. Then I animate, move and transform it in the small steps that make up every instance of its movement. As an animator, I feel the movements with my own body as I transfer it to the object I animate. As an animator, I experience it as becoming both an actor and director at the same time. Frame by frame I develop every detail in the action, transferring the movement from my body into the animated object. I often experienced this as if my *self* follows, as if my self gets transferred in this process, and I *become* the object that I animate. This may sound like mere projection, but without being able to explain how, I was convinced there was something more to it. In *Animating the Spirited*,⁴¹ Koji Yamamura describe similar experiences of transcending the dualism of mind and matter while animating.

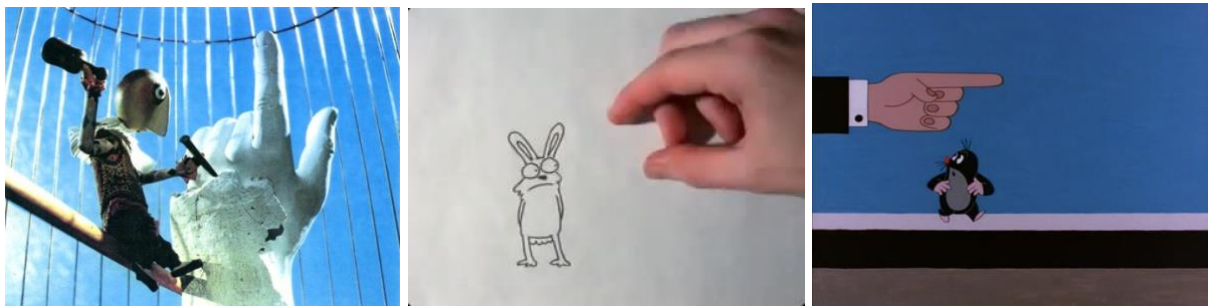


Image: *The Hand* (1965) / *Genre* (1996) / *Krtek filmova hvezda* (1988)

In terms of filmmaking this experience can take the form of a dialogue between the director and the actor, between the self that animates and the self that is being animated. I have recognized this dialogue portrayed in many animated films. The animator's hand has made its way into films such as *The Hand* (1965), *Genre* (1996), and *Krtek filmova hvezda* (1988). For each frame the consciousness of the animator oscillates between these two positions, experiencing a gradual merge of these two sides of a power relationship, grappling with the listening responsibility of omnipotence and control. But it also offers a transcorporeal enjoyment of seizing to exist as a separate entity and instead becoming one with something else.

This exchange and merging, shifts where a story can go. A story cocreated with my outer world will always be something else that what can ever be envisioned in a preplanned production.



Image: *La Planete Sauvage* (1978)

These insights allowed me to pinpoint a specific embodied way of processing and co-creating with my external world—a dialogue between the inner and the outer. I began to explore how this approach could be applied more directly, beyond producing animated artworks. I envisioned extending this method of interaction to social, everyday life and professional settings. My hope was that this approach would uncover overlooked ways of addressing aspects of my life and work that I wanted to change, such as reducing my carbon footprint. In essence, I sought to translate this method of discovering new possibilities through entangled relationships with the environment from animated storytelling into direct, shared experiences in life.

Climate-Just Worldings - expanding the animation practice

This desire became the starting point and aim of the research project *Climate-Just Worldings*,⁴² where I sought ways to address the climate crisis through my work. The most obvious response to the catastrophic heating of our planet due to CO² emissions was, for me, to stop emitting CO². However, every attempt I made in my workplace to achieve this was met with skeptical reactions, dismissed as impossible or naively unrealistic. I increasingly felt paralyzed and unable to appropriately respond to this problem.

Carbon facilitated the disconnect between humans and nature. It allowed factories to move away from flow-energy sources like rivers and winds, as well as from the raw materials and natural resources they depended on. Instead, production could be situated near labor and transportation. Workers were disconnected from their circadian rhythms, able to work day and night under electric lights.

Fossil fuels are treated as an externality because they work for free. Labor outsourced to fossil fuels becomes invisible and intangible. CO², itself invisible to the human eye, is an all-pervasive hyperobject, pushing us further into a new age of alter-life realities. I realized I needed better ways to make sense of this.

I turned to the iterative dialogue between inner and outer realities from my animation practice. But instead of animating films, I animated my social reality. I brought my inner vision of a climate-just world, *New Reactive Earth* (2011) into dialogue with my workplace environment. I called this process *Transtopian Worldbuilding*, a method that generates a looping interaction between an inner story-world and an outer shared reality. This process revealed overlaps and possible contaminations, allowing them to perpetually transform one

another. It enabled transformations, or “worldings”,⁴³ in the shared reality, challenging narrow definitions of the present.

I started with sensory explorations, such as holding my breath to physically connect with the concept of CO². In collaboration with Anna Björklund, Professor in Environmental Strategic Research, I logged, measured, and analyzed the carbon footprint of various aspects of my work. These outcomes continually prompted me to shift my practices to reduce my CO² emissions. In other words, CO² data was translated into motor actions, which in turn altered my sensory input and daily routines. This interplay of sensorimotor (A word I will come back to in the section below) feedback gradually expanded to include students, staff, and the incorporation of filmmaking across the entire Film Department at Stockholm Uniarts in our assessments. This culminated in the creation of ELSA,⁴⁴ a carbon calculator for film students. With ELSA, the environmental cost of film production was brought into the calculations, counterbalancing the usual emphasis on economic costs.

The prioritization of economic efficiency has driven the outsourcing and streamlining of animation processes, moving away from manual techniques. In the market capitalism of the film industry, environmental impacts are seen as “externalities” and excluded from calculations. However, when we included environmental costs in our calculations, the “real costs” of animation became clear. Manual animation emerged as one of the most eco-friendly, low-carbon approaches to animation.⁴⁵ Moreover, the more we reduced the CO² footprint of our productions, the more the environmental dependencies and relationships inherent in the process became visible and tangible.

At this point, I came across research in the field of neuroscience, which offered further insights into the underlying causes and meaning of this specific way of thinking and working—through iterative dialogue between inner and outer realities.

ahead

Suppression of sensorimotor cognition

Historically this kind of stimming-cognition has been stigmatized in western society. Ableist prejudices and norms has subjugated many bodies to hegemonic corporeal norms that disable them from accessing their full cognitive potentials. Tapping fingers, flapping hands, rocking from side to side has been seen as unwanted behaviours that should be suppressed and disciplined. In art practices such sensory needs could be expressed through weaving, dancing, singing et cetera. Within the animation field this kind of repetitive behaviour is a central part of the productive process. Frame by frame animation can offer a generous indulgence in such iterative motor actions. It served as a free range for autistic stimming until demands for effectivization banished it in favour of the automated mechanical looping of identical cycles as in the Disney pipeline. The manual frame-by frame animation enables a slight shift with each frame in a way that echoes sensorimotor adaptation to the environment, a thinking and becoming “with” the environment. Especially straight-ahead animation which (unlike pose-to-pose animation) doesn’t have a strictly predefined endpoint. In *Animation – Process, Cognition and Actuality*, Dan Torre describes Bruce Bickford’s improvised stop motion animations as so compelling exactly because it is not known on beforehand what will come next. It is worth quoting at length:

Some forms and approaches to animation, such as straight-ahead drawn animation and most examples of traditional stop-motion, do seem to actively

discourage the use of the cycle. And though the lack of the cycle can make their creation process more labour intensive, it can also lead to a much more fluid expression of animation – one that has not been subjected to the intensive pre-planning that the cycle generally requires.⁴⁶

This kind of open process that includes a sensory listening to the environments and responding to that environment leads to results that could never have been predicted or pre-planned by the animator alone but could only arise through the creative dialogue with the environment.

Miyazake brings this experience into his films. In an interview he explains the importance of the concept of MA (emptiness) in his films.⁴⁷ He describes it as is a gap, a pause, or a space between actions. The Ma-gap gives the audience space to prepare for what comes next and enable it to have a more grounded response.

This can give a meditative presence and a focus, oscillating iteration with an attention to what possibilities lies in each moment/frame. A being with the now. Each moment becomes open to a multitude of possibilities that often has been inaccessible in any preproduction or script writing. They are ideas that comes in a dialogue with the material and the conditions of that specific moment. Frame-by-frame animation enable a kind of calibration of frequency, similar to how stims are explained as a sensorimotor cognition process.

This approach to animation connects with broader theories of resonance and consciousness. Quantum physics, as interpreted by theorists like Karen Barad,⁴⁸ suggests that all things in our universe are constantly in motion, oscillating and vibrating at a multitude of frequencies. When different entities come together with their different frequencies the rhythms will start to affect each other. For reasons of joint efficiency, they may synch up and vibrate together through spontaneous self-organisation. Psychologist Jonathan Schooler's "resonance theory of consciousness" suggests that resonance (another word for synchronized vibrations) is at the core of not only human consciousness but also animal consciousness and of physical reality more generally.⁴⁹ This supports premodern beliefs of Panpsychism: that consciousness exists in all matter. And it seems as if this specific kind of vibrational consciousness is also shared by all matter.⁵⁰ A "transconscious" acknowledgement of the transcorporeal?

There is an irony to this. The fact that if there is any universal property to being human, it is precisely the opposite of the universalism proclaimed by modernity. It is a property that we share with other beings, and rather than as isolated, individual selves, this essence emerges through rhythmic, relational becoming with the world. It is through this interconnected process, that we come closer to the reality of this world.

Animation & neurodivergence - an established correlation

A correlation that support the theory of animation as an affording environment for neurodivergent cognition is the longstanding consensus around the link between animation and neurodivergence. This connection has been widely discussed, with numerous theories exploring why they are so closely intertwined. As an animation teacher for many years, this correlation has been apparent. Countless discussions on online neurodiversity forums address the correlation between animation and autism, sparking debates about whether this connection is merely coincidental or rooted in deeper causes. Some of the observed connections include:

“Asocial” interest in the non-human world

The object-oriented approach often seen in animated films is also a common trait among autistic perspectives. In autism research this “empathy with things” is often interpreted as “Object personification”⁵¹ the attribution of human characteristics to non-human agents. But I want to suggest that this conclusion is based on a neurotypical perspective that does not recognize the possibility to actually “feel with” other, nonhuman materials, objects, environments, without imagining them as humans. In the anthology *Neurodiversity- A the New Critical Paradigm* (2020), Anna Stenning gives examples of and proposes such an “autistic ethics” that expands its empathy to the other-than-human animals and nature.⁵²

Other Relatable themes

Animation often addresses themes that resonate with neurodivergent audiences. The ‘Exceptional Individuals’ webinar on “Neurodiversity in Anime and Manga” highlights how anime frequently explores issues like bullying, alienation and other struggles that are particularly relatable for neurodivergent individuals.⁵³

I agree and recognize with these various connections and commonalities that have been observed between animation and neurodivergence. Building on the neurological research discussed earlier, I propose that it is the sensorimotor affirming animation procedures that initially attracted a higher proportion of neurodivergent individuals to the field. Over time, this has likely resulted in neurodivergent creators forming a critical mass—possibly even a majority—within this niche community. This concentration fosters an environment where neurodivergent perspectives and ideas are more readily recognized and valued, allowing these unique viewpoints to be included in the storytelling. Consequently, these perspectives make their way to audiences who may rarely encounter such representation in mainstream media and this continue to further the attraction and concentration of the group.

Conclusions:

This essay has explored the intricate correlations between animation practices, sustainability and neurodivergent cognition. By recognizing and analyzing animation as a practice of sensorimotor cognition, I have argued that it’s processes afford a embodied and relational form of sense-making that renders the self as an intrinsic part of the world. This quality allows animation to challenge capitalist modes of thinking about the environment. It also helps us to grapple with the overwealming hyperobjects of climate change, revealing sensorial ways of responding, acting and engaging in accordance with them, by removing the distances created by for example fossil fuels.

A society that depends on profit, economic growth and nature as resource also depends on the majority’s acceptance of the gradual depletion of earths ecosystem. It cannot afford having its citizens building relational ties to that ecosystem. While this has its purest expression in the genocidal removal of indigenous relationships to land, I have in this text highlighted the subtle and often unaware supression of sensorimotor practices and cognition.

Ableist suppression of stimming, the less-than-human-othering of the autistic⁵⁴ and the profit driven outsourcing of animation labor, are but a few examples of this, that fit within the scope of this text. But of course it also extends across many more practices and areas of life, of which many has found their refuge in the arts.

Even if these are subtle, socially nudging, everyday restrictions of our interacting bodies they still cripples our relationship with our environment. This explains why we can accept the ruthless destruction of it. The issue, then, is not merely a human-centered worldview, but rather that there are only very limited and constrained aspects of human cognition permitted to engage in our sensing, processing and acting in the world.

Only if an organism engages with the environment on its own sensorimotor terms can a meaningful world be brought forth or enacted.⁵⁵ When I am not allowed to interact with the environment through *my own* movements, through *my own* body, the environment stops being *my environment*. It creates a distance in how it cripples my relation to the world and the environment. If it's not just me, but maybe many of us, it explains to me how we can deplete each other and our environment so ruthlessly and insensitively. It explains to me how we have ended up in this very broken place where we are even in our imaginations separated and isolated from the world. Where we can't even imagine alternatives to this dysfunctional system much less act on changing it.

But human neurology is flexible and adaptable. Animation can be a neuroqueering⁵⁶ practice in affording and enhancing an ocillary resonant relationship between the self and the material contexts, giving rise to in-betweens and entangled relationships with the environment expanding on imaginations that don't create a separation between human and nature. Though some people may be more aligned to this cognition biologically, there is also the possibility to queer one's cognition in this direction, through practicing animation. Animation can activate this ability that colonial capitalism has disabled.

As a visual artist and artist researcher I have had the privilege of grounding my work in animation practices, which has greatly emancipated my sensorimotor cognition. Thanks to this research it has become clear to me that my real motivations for animating were as a way of making sense. This example of how I reached knowledge about something I didn't know that I didn't know (unknown unknowns) shows how artistic research can intuitively facilitate forms and structures that respond to needs that are not yet defined, categorized, or conscious, even to the researcher themselves. Research that has the ability to channel and materialize marginalized insider perspectives that are not yet represented in the individual or collective consciousness allows the pursuit of knowledge before definition—prescience—something that is more important than ever in these times, when we cannot continue to build on the old. When we need to carefully consider how to make sense in ways that enable responding in accordance with our experiences and with the crises we are facing.

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