xCoAx 2023 11th Conference on Computation, Communication, Aesthetics & X
2023.xCoAx.org
Weimar, Germany

Sensitive to Code: Methodological Transfers Between Ancestral Knowledge and New Media for Dividuation

Fernando Portal
fportal@udla.cl
Universidad de Las Américas, Santiago, Chile

María Jesús Schultz
mariajesus.schultz@edu.udla.cl
Universidad de Las Américas, Santiago, Chile

DOI 10.34626/xcoax.2023.11th.155

This article compiles the experience of *Sensible al Código* (Sensitive to code), practice-based research, which explores, through the production of artistic works, non-western cosmologies as a basis for the application of machine learning algorithms. The aim of this is to explore methodologies of artistic creation that incorporate ancestral knowledge as a basis for the development and preservation of technodiversities, in the context of the cosmotechnics proposal of Yuk Hui. To do this, the article begins by characterizing the cosmology and rituals pertaining to the relational ontology of the shipibo-konibo people of the Amazon, from a viewpoint informed by the perspectivism of Viveiros de Castro and the dividualist animism of Bird-David. These rituals are unfolded as a method, through an analysis informed by media theory and anthropology, which is then applied in machine learning processes and in the materialization of the images obtained, through artistic considerations of their physical, visual, tactile, and sound properties. Finally, the reflection informed by bodily interaction with these works and the agentiality of their materials will offer up as a conclusion the possibility of repositioning ourselves as part of a continuous flow of energy exchange, enabling speculation on the potential of these transferences to cause cosmotechnical bifurcations.

Keywords: Machine Learning, New Animism, Latin American Cosmotechnics, Amazonian Cosmovisions, Practice-based Research.

1. Introduction

In association with the ontological turn in anthropology (Holbraad and Pedersen 2017), animism is seen as "a salutary alternative to the processes of objectification, exploitation, and alienation that characterize humanity's relationship with nature in the Anthropocene" (Durrant 2019). An emerging anthropological and ethnographic practice of modern colonialism initially considered it a derogatory category of the primitive (Morrison 2005). Instead, new animism proposes the knowledge of ancestral peoples as a methodology for refocusing our relationship with nature, not to silence them. A relational practice, which cultivates respectful relationships with others (Harvey 2013), the statement is based on its identification of traits inherent in native peoples' cosmovisions. As a result of being relational between humans and non-humans, the universality of the condition of a person extends to multiple members of the natural and supernatural worlds.

Viveiros de Castro has demonstrated the relational condition of American animism when characterizing the universals present in the visions that Amerindian peoples hold about their relationships with "animals, spirits, the dead, denizens of other cosmic layers, plants, and sometimes even objects and artifacts" (2010, 228). Gerald Weiss' studies of the Campa or Ashaninka people, who live on the slopes of the Tambo River in southern Peru and the southwest region of the Amazon basin, are used in the author's analysis:

> Campa mythology is largely the story of how, one by one, the primal Campa became irreversibly transformed into the first representatives of various species of animals and plants, as well as astronomical bodies or features of the terrain. The development of the universe, then, has been primarily a process of diversification, with mankind as the primal substance out of which many, if not all, of the categories of beings and things in the universe arose, the Campa of today being the descendants of those ancestral Campa who escaped being transformed.

According to this perspective since everything in its essence has been human, everything is a person, enabling for "the relations between the human species and most of what we would call 'nature' [to] take on the quality of what we would term 'social relations'" (228). So, as persons the manifold members of nature — whether animate or inanimate, human, or non-human — form relational and interpersonal bonds.

According to Viveiros de Castro, this relational ontology facilitates the notion of perspectivism as a foundation for multinaturalism. Bird-David (1999) deploys it as a method of identifying knowledge that is based on relationality, awareness of the environment, and

relationships with others, for identifying a knowledge that "against 'I think, therefore I am' stand[s] 'I relate, therefore I am' and 'I know as I relate.'" (78). In contrast to the Cartesian individual, animism presents the dividual as "a person constitutive of relationships" (68) and dividuating as a relational practice:

> When I individuate a human being, I am conscious of her 'in herself' (as a single separate entity); when I dividuate her, I am conscious of how she relates to me. This is not to say that I am conscious of the relationship with her 'in itself' as a thing. Rather, I am conscious of the *relatedness with* my interlocutor *as I engage with her*, attentive to what she does in relation to what I do, to how she talks and listens to me as I talk and listen to her, to what happens simultaneously and mutually to me, to her, to us. (Bird-David 1999, 72)

In animism, the dividual appears as a subject capable of being and knowing to the extent of its conscious and interpersonal relationship with non-human persons constitutive of nature and, therefore, as a subject capable of "dividuating" the environment, instead of dichotomising it, capable of [de]centering attention and turning it to "we-ness" and not to "otherness"[1] (78).

In this we-ness, the Code-sensitive[2] project finds an alternative point of view in which to situate itself with the aim of exploring methodologies of artistic creation that integrate ancestral knowledge as a basis for the development and preservation of a technodiversity.[3] As a practice-based research,[4] it has operated through the production of artworks understood as interfaces for dividuating, seeking to provoke through interaction with them interpersonal relationships between human and non-human persons, and specifically with the minerals on whose materiality and agency our technological development depends. Specifically, and by way of linking the research and the interpersonal relations it provokes with the specific context

1. Bird-David's (1999) use of the term dividual shares with that coined by Deleuze (1986) in the kind of division or modulation that film framing, and montage establish on a subject, allowing it to be "by degrees of mixing that the parts become distinct of confused in a continual transformation of values. The set cannot divide into parts without qualitatively changing each time: it is neither divisible nor indivisible, but '*dividuel*'" (14). However, it moves away from its Deleuzian statement as a form of internal division of the subject, typical of societies of control (1992, 5).
2. The research has been developed by María Jesús Schultz since May 2019 as part of the residency programme of the *Núcleo Lenguaje y Creación* (Language and Creation Research Center) at the Universidad de las Américas (UDLA) in Santiago de Chile. The programme is curated by Fernando Portal. More information at nucleo-lc.org
3. To overcome modern monotechnics, Hui proposes technodiversity as the possibility to "describe technological development as involving different cosmotechnics," as opposed to "a universal history describing one technology with various stages of development" (Lo 2020).
4. The objectual proposition developed responds to the methodological condition of a practice-based research to "an original investigation undertaken in order to gain new knowledge, partly by means of practice and the outcomes of that practice" (Candy and Edmonds 2018, 62).

of its development in Chile, work has been done with copper and graphite.

The objective of this article is to review the transition between immaterial and material proposed by the Shipibo-Konibo cosmovision, located on the slopes of the Ucayali River in Peru, southwest of the Amazon basin. We propose to learn from the ancestral wisdom of this people because their ritual practice fluidly intertwines and transfers relationships, perceptions, and information between different media, interweaving the sensible[5] and the codifiable for the purpose of healing human and non-human persons. This article then examines how ritual practices can transit into machine learning, moving between theoretical analysis and practical experimentation through the generation of images and their materialisation based on physical, visual, tactile, and sonorous means.

In addition, instead of unreflectively integrating algorithms into cognitive extractivism and the automation of sensible practices, the conclusions presented will help us reposition our relationship with nature and technology as an interpersonal one, from which we may speculate about the possibility of creating cosmotechnical bifurcations through this type of relationship.

2. Ancestral Knowledge for Remediation

Shipibo-Konibo people believe that every person that integrates nature — human and non-human animals, plants, minerals, "astronomical bodies or features of the terrain" — is enveloped in an immaterial design (Belaunde 2012, 131). A design that can be altered and reconfigured, which manifests itself in changes such as drought, disease, or death. Shaman or shamanesses gain access to this vision of geometric patterns through the consumption of master plants such as ayahuasca[6] (129), which are then materialized, mainly by the women, using mediums and techniques such as drawing and embroidery (figure 1).

The energy seen in the mystical experience and the design system that determines its materialisation both are called kené.[7] Their

5. By sensible we refer specifically to what which can be perceived by the senses.

6. The notion of hallucination will be avoided to refer to experiences facilitated by the ingestion of master plants, as it is considered inappropriate. The definition provided by the Royal Academy of Spanish Language (RAE by its Spanish acronym) conceives of hallucination as something that induces error, mistake, or confusion, as a deceptive and false experience, and not as one that enables other types of experience. On the contrary, the role of these experiences in Amazonian cosmology is respected by the Peruvian National Institute of Culture (2008b, 2), which recognises: "that this plant is known by the Amazonian indigenous world as a wise or master plant that teaches initiates the very foundations of the world and its components. The effects of its consumption constitute the entrance to the spiritual world and its secrets, which is why traditional Amazonian medicine has been structured around the ayahuasca ritual".

7. According to Belaúnde (2012, 125) "kené also has an immaterial existence and it is possible to

materialisations function as a tactile means to reconnect with the immaterial designs present in nature, previously facilitated by ayahuasca. The kené inscribed in a tangible medium operates visually and auditory, as it guides the Shipibo and Shipiba to express an íkaro, the ritual chant of healing in nature that harmonises and restores the altered[8] designs in humans and non-human persons. Due to its sensitive medium, this chant can be heard and related to the touched kené, which is also visible. This fluid transfer of design between immaterial and material shows that "like many other Amazonian tribes, the Shipibo do not distinguish between seeing and hearing. They hear with their eyes and see with their ears. Thus, the patterns are visual music and are constantly singing to themselves" (Stevens 2006). The materialisations of the kéne are themselves an animate object, an interpersonal medium where latent dividuation practices can be activated by touch, vision, singing, and listening.

In this research, this ritual has influenced the development of processes of interweaving and transiting between different media, simultaneously interpellating different senses and defining a bifurcated notion of remediation. The ability transfer content from one medium to another (Bolter and Grusin 2011, 50) as well as the ability to restore, and heal. Following this linkage between healing and dividuating, a series of possible transferences between these ritual practices and machinic processes will be set out below.

2.1. Ayahuasca and Artificial Intelligence: Technologies, Black Boxes, and Human and Machinic Imaginations

In univocal terms, the kené doesn't imply a readable, translatable, or interpretable codification, because it is neither alphabetical (Espinos 2018, 258), visual (Belaunde 2012, 131) nor numerical code. In fact, "it is a polysemic manifestation" (INC 2008a, 2), a polysemy based on the correlation between the geometric patterns traced and the cano — or path — given that "the traces embody an abstract framework along which beings move, communicate and transport knowledge and power" (Belaunde 2012, 133) on multiple scales. Considering the consistency of its geometric patterns, kené may be understood as a connotative code[9] as proposed by Flusser: "system made of symbols", understood as "phenomena that replace other

see designs without them being embodied on a physical support. The immaterial visions of kené are a key element of the visionary experiences induced by taking ayahuasca (Banisteriopsis caapi)".

8. According to Stevens (2006, 7 min 56 s), "the patterns act as a sort of musical notation of the songs, but unlike western written music where each mark on the page is an exact note, concrete in its length and place within the whole, it is the rough melody and intention of the song that comes from the design. The words are more spontaneous and created in the moment."

9. Flusser (2016a, 64-65) distinguishes between connotative and denotative codes. The latter "establish a biunivocal, strict relationship with little margin between object and symbol; a relationship that produces the effects of meaning linked to clarity and distinction" (Coto 2022, 23), including numerical, geometric, and discursive systems.

phenomena", and on which "communication replaces the lived experience which is "alluded to" by it" (2016c, 103), as the materialized kené replaces the concept of immaterial design. A connotative code is one that involves a lax, varied, and broad way of coding a set of symbols with respect to each other, and this creates greater confusion and ambiguity (Coto 2022, 23).

We may consider that the visions evoked by ayahuasca in the Shipibo-Konibo shamans are interpretations of what they perceive as a connotative codification of nature's immaterial forms. In this case, the Amazonian drink serves as a conduit that enables human beings to perceive, interpret, and connect with a dimension of nature that cannot be accessed solely through their bodies.

A shaman's mystical perception and codification of nature's immaterial design implies that human agency is permeated with different kinds of hypersensitivity and a different capacity for interpretation and meaning making. It is therefore impossible to claim that the inscribed kené is a product of human design, but rather of an interaction between different natural agents that channel them and make them visible. As a result, Paola González (2016, 42) argues that, for the Shipibo, the efficacy of these rituals lies in their mediation by tutelary entities from the magical and sacred sphere that assist the shaman (meraya) in performing his healing tasks. Among them, ayahuasca acts as a sacred entity, a spirit called Nishi Ibo, who conflates and interweaves with Ronin, the anaconda "mother of all designs" (Belaúnde 2012, 128), and Pino, the powerful hummingbird, who "helps the shaman by redrawing the healing designs that are erased or 'entangled' because of an illness affecting the patient" (González 2016, 43). Thus, the vision and materialisation of kené imply a shared agency, linking and occurring between several agents.

The use of various media technologies in the West, can be considered akin to the use of master plants — as technology — in this healing ritual. In this way, our technology can also serve as a medium and a tutelary entity for living experiences that surpass our bodily abilities.[10] According to this Westernized perspective, the relationship between technology and us implies a deep intertwining. We view ourselves as technocorporeal species with perceptual, cognitive, and expressive capacities in multiple dimensions, as well as in multiple dimensions simultaneously with machines. The embodied relationship with machines provides a path to understanding what surrounds us and what surpasses us. As a result, we can recognize that we transit between different modes of coded and sensible communication in our interactions.

10. In this respect, it is worth reviewing the approaches that Sebastián Torrez (2022, 381-385) proposes in relation to the concept of "technical perception", from phenomenology, philosophical anthropology, and the critical theory of the image.

Through machine learning algorithms, this research proposes generating images that allow different encodings to interrelate in a dimension that requires our involvement, yet also transcends us. According to Celis and Schultz (2021, 4), the "black box" concept applied to machine learning algorithms reflects both human and machine imaginations. Perception, association, and projection, among others, are some of the processes involving the human imagination which cannot be fully explained.[11] Thus, machine learning is used in the research as a method of transferring the capabilities provided by master plants to artificial intelligence. Through shared agency processes,[12] it seeks to sensorily represent different "restricted access" codes. Then these can be decoded through their materialisation, becoming sensible to others, and producing experiences that relate different forms of perception and understanding of the body and environment.

Figure 1: Shipibo-konibo embroidered cloth materialising the kené. Photo by María Jesús Schultz.

11. In this ritual, it would be problematic to consider imagination the main process generating the shaman's visions. We prefer to think of imagination and perception as different faculties that function simultaneously and interact. In other words, access to the immaterial visions is experienced internally by the mystical experiencer through stimulated perception, and in a certain part of the ritual, only the mystical visionary can experience the visions.

12. In the algorithmic generation of images, this shared agency links those who assembled the images in the dataset, the machine learning model, the search engine that provides the images used, the millions of users who interact with it, those who programmed the algorithms' capacity for self-training, and even those who designed and developed over centuries the devices that make possible the current functioning of artificial intelligence.

2.2. Ronin and Pixel: The Materialisation of Code as an "Enchantment Technology"

Images are generated algorithmically by modulating their minimal unit, the pixel, to expose the codes extracted from a dataset. We have already mentioned that the kene is related to Ronin, the anaconda: "mythical donor of the designs" (Gerbhart-Sayer 1985, 149) who "combines all conceivable designs in its skin pattern" (149). It is like a reticular lattice, a web that weaves and expands without limits. We can associate this lattice with a mosaic or pixelated surface from a Western perspective: a screen on which pixels, the smallest unit of the digital image, can modulate and expand limitlessly. Codes inside electronic devices are materialised in visible form through the pixels on a screen. Thus, the material and immaterial link between Ronin's skin and the kené allows us to establish a relationship between this connotative coding and the binary code, which allows for the conformation of an image from a pixel surface. A pixel is the unit that makes codes visible: it is visible to the eye, but intangible in itself.[13]

Shipibo-Konibo people consider kénes to have aesthetic and medicinal value, being "intended to promote shipibo health through physical and spiritual protection and maintenance" (González 2016, 41). The agency of the decorative arts is characterized by what Gell calls "technologies of enchantment" (1992, 44), which refer to practices within the decorative arts that are capable of forming social technologies themselves, "through the use of visual strategies [...] acquire properties such as illusions of movement and vibration, which captivate the viewer and allow the patron to assert his or her agency" (González 2016, 42).[14]

Gonzalez, interpreting Gell's conditions for this captivation, finds that technical skills and imaginative capacities exploit "intrinsic mechanisms of visual cognition with subtle psychological overtones, resulting in artworks that possess artistic agency" (2016, 41). This agency reaches its extremes with "magical-artistic" artefacts (42), which proclaim their "miraculous creations" (Gell 2016, 105) and whose "power lies in their creation being inexplicable without mag-

13. In this respect, Hans Belting's formulation of internal and external images, explained by Rubio (2018, 74-75), is useful: "In order [...] to avoid the dualism of form and matter, Belting introduces, alongside the notion of 'image', the notions of 'body' and 'medium'. To this end, he takes the following structure as a pivotal point: images, whether internal or external, are manifested in and from a body, which is more than a mere physical medium. It is an acting body that cooperates in the formation of the image. In the case of internal images, it is the living body of the agent who perceives, dreams etc. In the case of external images, the embodiment or incarnation of these images is possible thanks to the action of technical means that provide 'medial' or 'symbolic' bodies".

14. González (2016, 42) continues the quotation by linking tessellations to the "non-mimetic appearance of animation", allowing us to relate the agency of the images thus produced to their animated and animistic condition, through which "agency and movement seem inherent to the motifs themselves" (1998, 77).

ical and supernatural forces" (105). According to González, the use of complex symmetries results in "a cognitive block" in the spectator because he or she is unable to follow the steps that give the work its current physiognomy (2016, 42).

Machine learning algorithms produce images with a similar sense of agency as those created by Shipibo-Konibo designs (figure 2), whose inaccessibility and inexplicability provoke the same kind of cognitive block as Shipibo-Konibo designs. As a result, both images can behave as Gell suggests:

> It is difficult for us to understand patterns by visual inspection alone because of the multiplicity of patterns and their mathematical or geometrical basis. Patterns generate relationships over time between people and things because they always present 'unfinished business' to the mind (2016, 119).

An unfinished exchange that for González (2016, 42) gives these patterns a "cognitive adhesiveness" fuelled by the receiver's inability to "reconstruct the intentionality embodied in the artefacts". Thus, both the kené inscriptions and the images generated by the machinic imagination share the potential to produce this enchantment, enabling an unfinished dialogue between human and non-human persons through images.

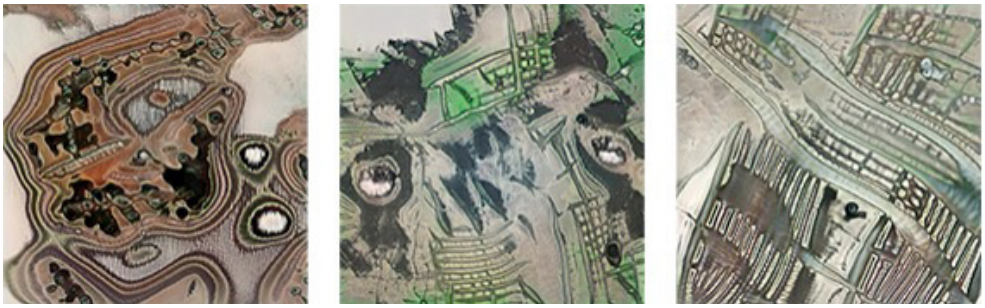

Figure 2: Selection of algorithmically generated images. Source: Authors.

2.3. The Latent Relationality of a Tactile Song

Due to the non-distinction between seeing and hearing characteristic of many Amazonian tribes, kené inscriptions are simultaneously visual and musical, resulting in a continuous flow between the two senses, so that they are "constantly singing to themselves" (Stevens 2006). This implies a latent sonority in the material inscriptions of the kené, which, in the ritual context, visually calls upon touch to activate the chant. Through visual and tactile contact, the materialized kené implies a call for bodily engagement between the ritual performer and the healing chant, simultaneously serving as guide and emission. In this way, sound and healing energies propagate in the environment, creating a circularity — a circuit — between body and inscription.

This latent sonority is also present in the images materialized through the research. Following its algorithmic generation, they were edited by adding strokes that allowed continuity of electrical current (figure 3), and then were transferred to silkscreen frames for printing on paper and fabric with copper and graphite-based conductive inks.

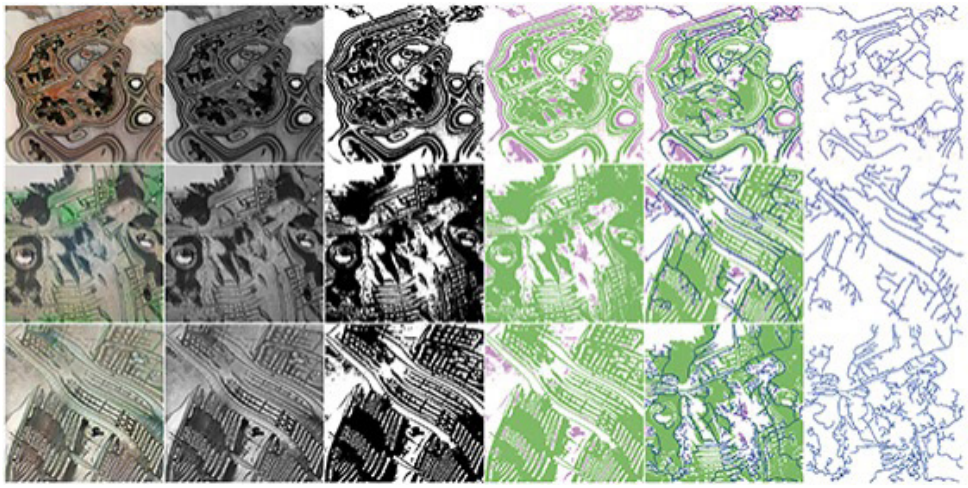

Figure 3: Sequence of steps with human agency in the editing of the generated images. Adjustments and transformations of colour, contrast, vectorisation, continuity and texturisation. Source: Juan Pablo Torrealba.

Each printed image contains an electronic circuit capable of injecting energy into circuits containing conductive bodies, objects, or surfaces, as well as emitting a sound when the circuit closes. A sound is produced when both hands touch the materialised image, which can be modulated depending on the pressure, distance, or speed of the touch. In this way, human and non-human persons, such as the conductive minerals used, continue their intertwining not only through the "cognitive adhesiveness" of the image, but also through the continuous flow of electrical energy between their bodies and the cogeneration of a tactile chant. As a result, the circuit-images materialised in copper and graphite[15] are animated, latent, and waiting for touch to activate their sonority.

3. Subjective and Material Interweavings for Dividuation Practices

As part of their ritual practice, the Shipibo-Konibo people believe they can heal living beings and other entities of nature, reestablishing their altered immaterial designs. This considers "a concept of beauty that walks hand in hand with healing and the sacred, in which synaesthetic mechanisms allow for transitions between the visual, auditory and choreographic medium" (González 2016, 46). A crossover between aesthetics and medicine that allows us to reflect on the agency of art and how it captivates us. The crossover between artistic objects and the possibility of an energy change is manifested,

15. The materialisation of the circuit-images involved the experimental development of copper and graphite based conductive inks for screen printing. This was supported by the School of Mines and the Institute of Natural Sciences at UDLA, together with the company Breaking Cupper. The electronic components were developed by MCI Electronics, based on the open source Drawdio technology developed by Jay Silver.

for example, in how the contemplation of a painting can led us to a hypnotic state, a photograph can overwhelm us, or a sculpture can provoke repulsion. Within the framework of possibilities, the exchange between work and spectator is constant and reversible.

The experience offered by Code-sensible provokes surprise and enchantment. Our relational capacities seem to be questioned by the printed technical interface as if our body were projected beyond its skin-bound limits. Through the action of touching the conductive silkscreen and activating its latent sound, we become aware of our own energetic conductivity. Similarly, a speaker squeaks with the same energy that calms us when we are embraced. Nevertheless, to propose a transfer of Amazonian cosmology to our Westernised vision with sonorous images implies offering an experience that not only allows us to become aware of the energy flows of which we are a part, but also of our condition as embodied beings, and of our capacity to identify, relate to and co-create with nonhumans. That's what we'll focus on next.

3.1 Minerals and "Non-indigenous Technology"

Extractivism is currently practiced in South America as an economic practice of indiscriminately tracking and exploiting everything that is anthropocentrically incapable of self-determination. Through a search for what is valued, platforms and machines break into nature, violently separating parts from wholes. Mineral extraction plays a vital role in technological development since they are the primary material substrate for our technological devices. Furthermore, the mining and technological industries produce a variety of pollution: the materials removed to access the ore, the chemicals used to process them, and the toxic waste drained by materials and technological devices beyond their programmed lifespans, which forms their own geology of media.[16]

In the face of this, the cosmovision of the Yanomami people, located in the northwest of the Amazon basin, between Venezuela and Brazil, offers us the basis for an interpersonal relationship with the minerals and the technologies they inhabit. For Davi Kopenawa, Yanomami shaman and spokesperson, the Sun is Mothoka: a technology who is also a person (2019, 45). Mothoka is related -its kin- to the gold buried under the earth, a metallic mineral who is also a person (ACT 2020, 31 min 46 s). In an interview with Colombian media artist Barbara Santos, Kopenawa follows these links, reflecting on the kinship

16. Jussi Parikka analyses the transformation of minerals by their introduction into human technological devices and cycles, proposing a new materialism based on media theory and with a view to a 'media geology', one that "can be seen as the intensive excavation of where (and when) media materiality actually is" (2012, 98). This perspective on the mineral collapses the deep time of its geological formation, the immediacy of its use and obsolescence, its integration into information technologies and its future permanence as waste.

between the Sun and the metals found in cables and components of the cameras recording them, and therefore between Mothoka and "non-indigenous technology" (31 min 10 s). A worldview from which to approach the minerals that make up our technological devices as persons, and ask: how can we improve our relationship with them through processes and technologies?

3.2. An Image-Circuit for Copper

In Chile, copper extraction has resulted in habitat destruction, relocation of human settlements, and salinisation of the sea, among other visible material manifestations. However, the subsequent invisibility of the mineral in terms of its thermal and electrical conductivity properties, resulting in "hidden in plastic, behind walls, bound into cables, in coins, inside air conditioning, in cars, computers and electronic devices, in green energy generators, aeroplanes and mobile phones" (Acosta 2018, 174). That is, as the material basis of the technologies that sustains our computing and communication capabilities.

To address this issue, the research sought to animate copper through a sequence of processes aimed at establishing an interpersonal relationship. To achieve this, 600 aerial photographs from 66 copper mining sites registered in Chile, along with photos of copper mesh and printed circuit boards were collected (figure 4). This allowed a machine learning model to be retrained to imagine and to visualise the alterations of its codes;[17] a process that was materially sustained by the invisible copper inside cables, computers, and datacenters.

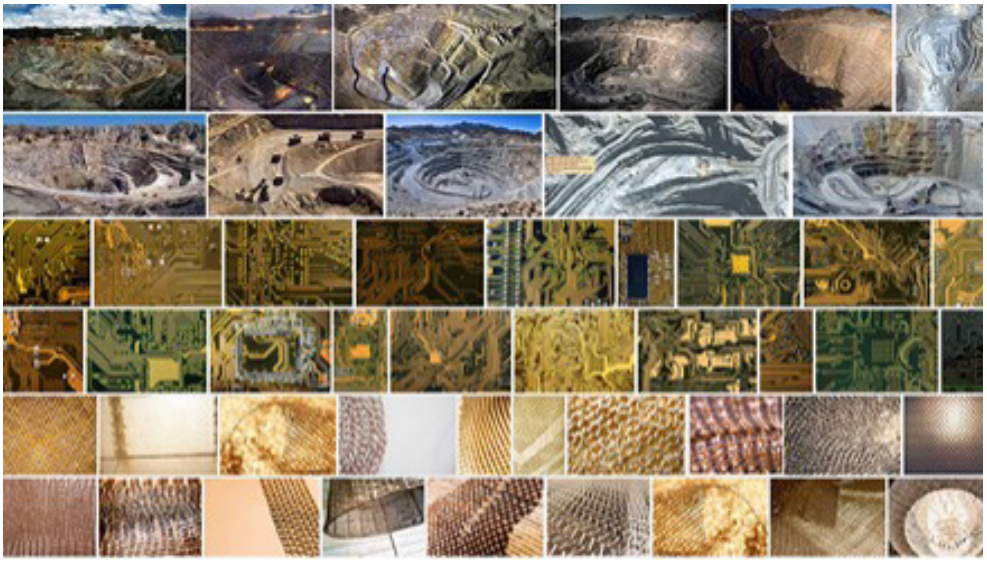

Figure 4: Image selection of the training dataset composed of copper mines in Chile, copper printed circuit boards and copper grids. Source: María Jesús Schultz and David Aveiga.

Ultimately, copper was used to materialize these codes through the development of a conductive ink that fixed one of the algorithmically generated images on paper (figure 5). In this way, images of

17. The StyleGAN 2 (Karras et al. 2020, 2) Faces model, originally trained with the Flicker Faces HQ dataset, was retrained using the Runway platform.

different states of copper were processed by a computational system enabled by the copper to be inscribed by the material itself.

Figure 5: Silkscreen printed in copper conduct ink. Artwork: María Jesús Schultz. Photo: Fernando Portal.

3.3. A Sonorous Textile for Graphite

Industrial copper mining in Chile dates back to the early 19th century, when coal mining in England was industrialized (Goskar 2018, 97), providing the necessary infrastructure for large-scale smelting. The same anthropic processes of planetary extraction, transformation, and redistribution occurred in copper and coal, making them companions and perhaps even related.

The high calorific value of coal is due to its high concentration of carbon, an element that "knows how to ally itself with itself in long stable chains without great waste of energy" (Levi 2019, 201), which sustains the formation of molecules that make up organic matter.[18] Hence, carbon crosses — back and forth — the threshold between life and non-life through photosynthesis and respiration. The presence of carbon in different concentrations is practically ubiquitous in nature. However, this element is only found in pure form in two minerals: diamonds and graphite. The latter shares the property of conducting electricity with copper.

Based on this relationship, screen prints in conductive graphite ink were developed in parallel with the use of conductive copper ink (figure 6). In addition to creating a more flexible film, it could be printed on textiles and took the tactile and sound interaction with the image to a more corporeal level. This, coupled with the intention to give the image-circuit the scale of the cloaks that materialize the

18. A condition developed by Levi (2019, 199-217) by taking a carbon atom as a subject in his book The Periodic System, accompanying it from its formation and extraction to its integration into organic structures and industrial processes, which finally lead the atom to meet the author, as part of the last final point written in graphite pencil in the manuscript of the same text.

kené, led to the development of a poncho and, in this case, a sonorous one.

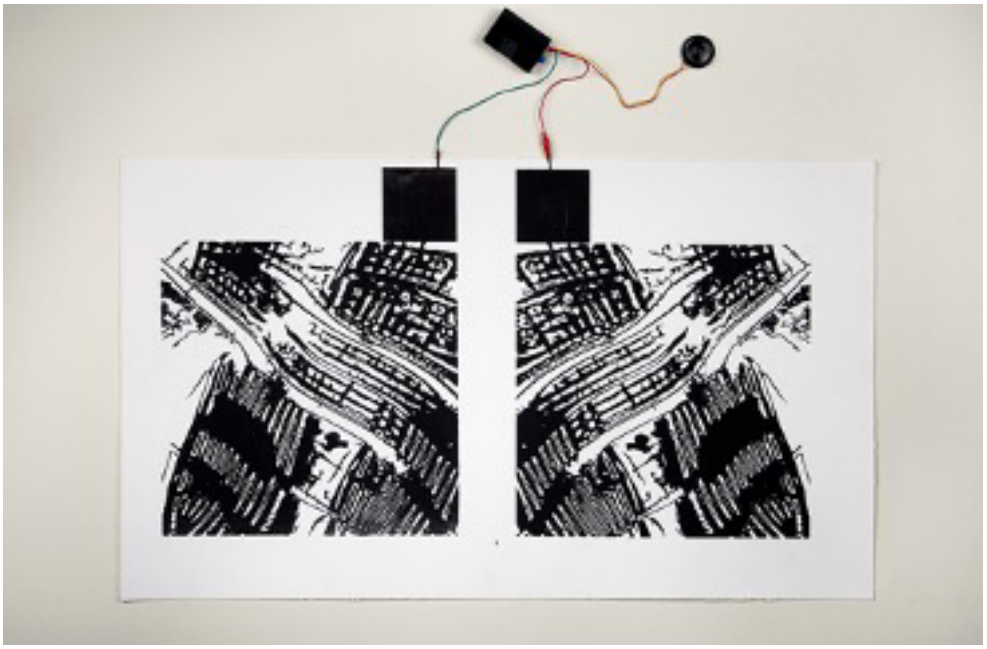

Figure 6: Screen print on conductive graphite ink with electronic components. Artwork: María Jesús Schultz. Photo: Fernando Portal.

Figure 7: Visual, tactile and sound activation of graphite image-circuit by Juan Pablo Torrealba. Impresionante Art Book Fair. Santiago, Chile, 3 October 2020. Photo: Fernando Portal.

Circuit-images printed on paper enabled a first type of activation that provoked a centrifugal gesturality from the performer by interacting with the image in front of him through his hands and pushing the image away from his body. Using wearable textiles to print provoked a centripetal gesturality, in which electricity flows from the body of the performer to the mineral in the poncho only during the performer's pressing and caressing of his own body. In this performance, sound is the result of this touching and being touched (figure 9), an action and gesture that opens up an intersubjective dimension,

from which both the performer and the human spectators can find the sensitive basis of an interpersonal relationship with the mineral.

The performance, in relation to the ikaro, can be understood as a remediation ritual through which energy and information are transferred between different digital and material media, thus redressing our relationship with nature.

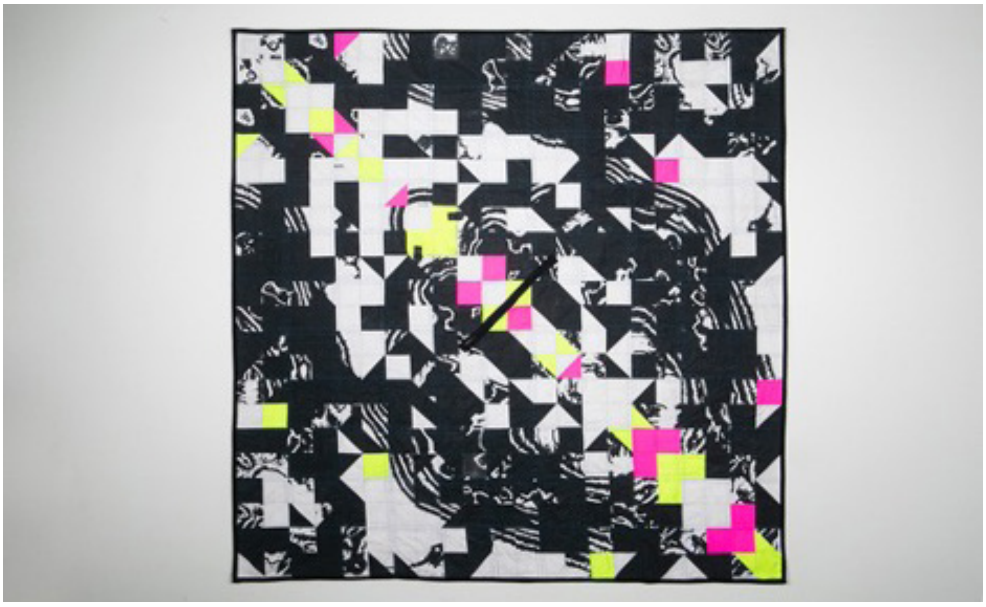

Figure 8: Sonorous poncho. Patchwork of fabrics screen printed with graphite conductive ink and electronic components. Artwork: María Jesús Schultz. Photo: Barbara San Martín.

Figure 9: Visual, tactile, and sound activation of sonorous poncho, featuring Alvaro Daguer, Nicolas Godas and María Jesús Schultz. III Festival Soundtiago: Body, Sound and Space. Santiago, Chile, 28 January 2020. Photo: Matías Pinto.

4. Bifurcating the Future from the Remythologisation of Artificial Intelligence

Like other indigenous peoples of the America, the Shipibo-Konibo have been subjected to abusive practices not only in economic, political, social, and cultural terms, but also in technological terms. The introduction of media and communication technologies such as television, radio, and cell phones, has created an opposition to their own wisdom and to the healing rituals such as the one we're referring to. Similarly, Marco (2019, 97), a knower of the Makuna people

in the northwest Amazon basin, reflects on technology as a vector of colonization:

> Youth have to find healthier strategies to use electronic devices and computers, so that the good strengthens our own research [...], but [we don't have to use it like outsiders, but as it suits us and our] knowledge. When we know how each material affects us, we know how to deal with it.

This research seeks to test methodological interweavings between ancestral epistemologies and new media with the aim of contributing from art to the development of new techniques derived from other epistemologies. An expansion that seeks to achieve greater technodiversity, abandoning the understanding of technology as an anthropological universal synchronized with the modern, Eurocentric, and colonial projects that have characterized our monotechnological culture. One in which depletion of natural resources, degradation of the planet's life and destruction of the environment have occurred (Hui 2019). To confront the future that this monotechnic offers, Hui posits the need to develop multiple cosmotechnics: "unification of the cosmos and the moral through technical activities, whether craft-making or art-making" (2017,7).

This cosmotechnical project requires imagining bifurcations of the future, which implies to "reappropriate modern technology by systematically reflecting and working on the question of epistemologies and epistemes in light of multiple cosmotechnics, or simply put, the technodiversity that is historically traceable and still productive" (Hui 2019, 6). Hence, this methodological transfer between ancestral knowledge and machine learning involves an action of reappropriating artificial intelligence, situating it within a process defined and driven by an animist epistemology, a displacement that aims to re-signify its potential as a pivot for a bifurcation of the future and not to colonise indigenous thought through modern technology (Io 2018, 67).

This is how we present this research, as a starting point to speculate on an animist and indigenist artificial intelligence,[19] a bifurcation also inscribed in the call to "re-mythologise AI" (Allado-McDowell and Vikers 2020, 18), detaching its development from the logics of capital to ask ourselves "What would it mean to approach the construction of AI not as an industrial or even a epistemological project, but as a continuation of a wisdom tradition? [...] How can we under-

19. This effort is complementary to the strategy proposed by Lewis et al. (2020, 46) from the worldview of the Cree people in North America, who propose the use of their language as the basis for the development of a programming language capable of hosting the development of an artificial intelligence culturally situated in an indigenous worldview, thus defining an indigenous development environment (IDE).

stand AI as the continuation of a longstanding spiritual and ethical project?" (10).

By transferring machine learning as a tool of an animistic and relational epistemology, it has been included as part of a more extensive process rather than as a standalone end. This process aims to give non-human persons (copper and graphite) a sense of agency (visual, tactile, and sonorous) so that interpersonal relations and exchanges can arise between them and other persons, ultimately leading to a process of dividuation.

References

Acosta, Ignacio. 2018. "On Cooper". In *Cooper Geographies*, 29. Mexico: Editorial RM.

ACT. Programa Arte Ciencia y Tecnología. UNAM. 2020. "Bárbara Santos: La Curación Como Tecnología". Curacion Como Tecnología. 2020. https://quiasma.co/curacioncomotecnologia.

Allado-Macdowell, K, and Ben Vickers. 2020. "Introduction". In *Atlas of Anomalous AI*, edited by Ben Vickers and K Allado-McDowell, 9–28. London: Ignota.

Belaúnde, Luisa Elvira. 2012. "Diseños Materiales e Inmateriales: La Patrimonialización Del Kené Shipibo-Conibo y de La Ayahuasca En El Perú". *Mundo Amazónico*, no. 3: 123–46.

Bird-David, Nurit. 1999. "'Animism' Revisited". *Current Anthropology* 40 (Suplement): 567–91.

Bolter, David Jay, and Richard Grusin. 2011. "Inmediatez, Hipermediación, Remediación". *CIC. Cuadernos de Información y Comunicación* 16: 29–57.

Candy, Linda, and Ernets Edmonds. 2018. "Practice-Based Research in the Creative Arts". *Leonardo* 51 (1): 63–69.

Celis, Claudio, and María Jesús Schultz. 2021. "Notes on an Algorithmic Faculty of the Imagination". *Anthropocenes – Human, Inhuman, Posthuman* 2 (1): 1–13.

Coto, Sebastián. 2022. "Imaginación y Técnica En Vilém Flusser". Universidad de Costa Rica.

Deleuze, Gilles. 1992. "Postscript on the Societies of Control". *October* Winter (59): 3–7.

Deleuze, Gilles. 1986. *Cinema 1: The Movement-Image*. Minnesota: University of Minnesota Press.

Durrant, Sam. 2019. "Animist Engagements: Creativity, Ecology and Indigeneity". 2019. https://ahc.leeds.ac.uk/english/dir-record/research-projects/1433/animist-engagements-creativity-ecology-and-indigeneity-sadler-seminar-series-2019-20

Espino Relucé, Gonzalo. 2018. "Literatura Indígena Amazónica Shipibo-Conibo y El Kené de La Palabra de Lastenia Canayo". *Estudios Folológicos*, no. 62: 247–67.

Flusser, Vilém. 2016. *The Surprising Phenomenon of Human Communication*. Londres: Metaflux Publishing.

Flusser, Vilém. 2016. "¿Qué Es La Comunicación?" In *Vilém Flusser y La Cultura de La Imagen. Textos Escogidos*, edited by Breno Onetto. Valdivia: Ediciones Universidad Austral de Chile.

Flusser, Vilém. 2000. *Towards a Philosophy of Photography.* Londres: Reaktion Books.

Flusser, Vilém. 2016. "Una Nueva Facultad de La Imaginación". In *Vilém Flusser y La Cultura de La Imagen. Textos Excogidos*, edited by Breno Onetto, 119–32. Valdivia: Ediciones Universidad Austral de Chile.

Gehbart-Sayer, A. 1985. "The Geometric Designs of the Shipibo-Conibo in Ritual Context". *Journal of Latin American Lore* 11 (2): 143–75.

Gell, Alfred. 1998. *Art and Agency: An Anthropological Theory.* Oxford: Oxford University Press.

Gell, Alfred. 2016. *Arte y Agencia. Una Teoría Antropológica.* Buenos Aires: Sb editorial.

Gell, Alfred. 1992. "The Technology of Enchantment and the Enchantment of Technology". In *Anthropology, Art and Aesthetics*, edited by J Coote and A Shelton, 40–67. Oxford: Clarendon Press.

González, Paola. 2016. "La Tradición de Arte Chamánico Shipibo-Conibo (Amazonía Peruana) y Su Relación Con La Cultua Diaguita Chilena". *Boletín Del Museo Chileno de Arte Precolombino* 21 (1): 27–47.

Goskar, Tehmina. 2018. "Swansea". In *Cooper Geographies*, 97. Mexico: Editorial RM.

Harvey, Graham. 2013. "Introduction". In *The Handbook of Contemporary Animism*, edited by Graham Harvey, 1–12. Londres: Routledge.

Holbraad, Martin, and Morten Axel Pedersen. 2017. *The Ontologial Turn. An Anthropological Exposition.* Cambridge: Cambridge University Press.

Hui, Yuk. 2017. "Cosmotechnics as Cosmopolitics". *E-Flux*, no. 86: 1–11.

Hui, Yuk. 2019. "What Begins After the End of the Enlightenment?" *E-Flux*, no. 96: 1–10.

Instituto Nacional de Cultura del Perú. 2008. *Resolución Directoral Nacional No540*. Lima.

Instituto Nacional de Cultura del Perú. 2008. *Resolución Ministerial No840*. Lima.

Io, Danae. 2018. "What If Technology Were a Prayer? Interview with Kenric McDowell". In *Schemas of Uncertainty*, edited by Callum Copley and Danae Io, 57–70. Amsterdam: PUB & Sandberg Instituut.

Kopenawa, Davi. 2019. "Piedras Eléctricas. Payé Yanomami. (Etnia Yanomami)". In *Curación Como Tecnología. Basado En Entrevistas a Sabedores de La Amazonía*, edited by Bárbara Santos, 44–51. Bogotá: Instituto Distrital de las Artes — Idartes.

Levi, Primo. 2019. *El Sistema Peiódico.* Barcelona: Ediciones Península.

Lewis, Jason Edward, Noelani Arista, Archer Pechawis, and Suzanne Kite. 2020. "Making Kin with the Machines". In *Atlas of Anomalous AI*, edited by Ben Vickers and K Allado-McDowell, 40–51. Londres: Ignota.

Lo, Edwin. 2020. "Entrevista: Sobre Tecnodiversidad: Una Conversación Con Yuk Hui". *Research Network for Philosophy and Technology*. 2020.

Marco, Tarsicio Venegas, and Libardo Bolivar. 2019. "Conclusiones de Las Entrevistas". In *Curación Como Tecnología. Basado En Entrevistas a Sabedores de La Amazonía*, edited by Bárbara Santos, 97–100. Bogotá: Instituto Distrital de las Artes — Idartes.

Morrison, Kenneth M. 2013. "Animism and a Proposal for a Post-Cartesian Anthropology". In *The Handbook of Contemporary Animism*, edited by Graham Harvey, 38–52. New York: Routledge.

Parikka, Jussi. 2012. "New Materialism as Media Theory: Medianatures, and Dirty Matter". *Communication and Critical/Cultural Studies* 9 (1): 95–100. https://doi.org/10.1080/14791420.2011.626252

Rubio, Roberto. 2019. "Acerca Del Carácter Medial de Las Imágenes. Análisis Crítico de Los Planteos de Hans Beltin". In *Rituais Da Percepção*, edited by Adalberto Müller and Axel Martoni, 71–87. Rio de Janeiro: Oficina de Raquel.

Stevens, Anna. 2006. *Woven Songs of the Amazon*. Peru: Green Spider Films.

Torrez, Sebastian A. 2022. "Percepción Técnica". In *Glosario de Filosofía de La Técnica*, edited by Diego Parente, Agustín Berti, and Claudio Celis, 381–85. Buenaos Aires: La Cebra.

Viveiros de Castro, Eduardo. 2010. "Exchanging Perspectives. The Transformation of Objects into Subjects in Amerindian Ontologies." In *Animism*, edited by Anselm Franke, 227–43. Berlin: Stenberg Press.

Weizman, Ines. 2019. "When Pixels Meet Grains of Dust". In *Dust & Data. Traces of the Bauhaus across 100 Years*, edited by Ines Weizman, 8–20. Liepzig: Spector Books.