Spinning the Conductors of an Indigenous Tradition

Toward a Continuity of Traditional Andean Weaving with New Electronic Technologies

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Over the last decades, there has been an unusual global interest in vindicating the knowledge and practices of indigenous communities. In Latin America one can see this particularly in numerous demands regarding anti-colonial politics, history, anthropology, and aesthetics. Based on interviews and analyses of a selection of aruma-Sandra De Berduccy's artworks, this paper explores aesthetic, material, and conceptual aspects of her work, focusing on her use of the Andean loom as a highly complex technological and social compound. It further puts her art in dialogue with nature and media archaeological debates, suggesting that her work invites us to explore a different path for media art outside hegemonic scientific and technological paradigms.

CCS Concepts: • **Applied computing** → Arts and humanities; Arts and humanities; Media arts; • **General and reference** → Experimentation.

Additional Key Words and Phrases: Andean weaving, media archeology, electronic art, Latin America, ancestral knowledge

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1 INTRODUCTION

When Europeans arrived in America, they found no equivalent to their writing system and simply thought that the native people did not have one [Ayala, 1956]. They failed to see that the iconographic system used in ceramics, monuments, tombs, and textiles throughout the continent contained a very complex communication system. They also failed to perceive the native people's mathematical knowledge, transmitted as a codified system of thought over different media [Chiapero, 2018].

Both aspects—communication and devices or media—contained a wide variety of sophisticated symbols, expressed by both visual and tactile means. The colonialist imposition of Western writing, arts, science, and religion was accompanied by the contempt and prohibition of the original people's knowledge. An example of this is documented in the National Archive of Bolivia, in handwritten ordinances issued by Viceroy Toledo [Gisbert et al., 1987, p. 10], which led to the systematic destruction of all local expression.

*This paper was written by aruma-Sandra De Berduccy and Valentina Montero based on several interviews conducted between them in 2019 and 2020.

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In spite of this, the local weaving tradition kept going but was restricted to the needs of the colonial economic system while also adopting European technologies such as the pedal loom. In European history, weaving is closely connected with technological advancement in each era. An intimate relationship between textiles, science, technology, and the arts is exemplified in the Jacquard loom that anticipated computers, the mechanical looms from the Industrial Revolution, and the construction of "motherboards" woven as ROM memories by the Apollo Guidance Computer, allowing humans to reach the moon. This point of view does not question the experiments by Anni Albers and the members of the Bauhaus group, or the latest examples of textile engineering, smart textiles, and soft circuits, multiplying and diversifying year after year. However, until recently, it was rather odd to refer to Andean weaving as "technological," since this also meant a contextualization and recognition of an Andean technological fact, which was deemed unacceptable for colonialist thought.

Only in the last few decades, the native American loom has become a subject for research. In order to name a few, from an anthropological approach, the Chilean Verónica Cereceda [Cereceda, 1978] has translated the subtleties of woven symbols and signs from the J'alqa and Tarabuco communities in southern Bolivia, illuminating their underlying language. Teresa Gisbert, Martha Cajías, and Silvia Arze [Gisbert et al., 1987] carried out a survey of textile styles and iconographies in different Bolivian territories, contextualizing their development and evolution both geographically and historically. Additionally, the research carried out by Elvira Espejo, of Cacachaca origin (Quechua-Aymara), together with Denise Arnold (English), described Andean textile processes as "women's science" [Arnold and Espejo, 2019]. It is worth noting that Espejo is the first woman from a weaving community that complements an anthropological reading of Andean textile processes with her own life experience.

Based on interviews conducted between 2019 and 2020 and analyses of a selection of artworks that employ electronical and electric technologies, this paper addresses the art-based research of aruma, who has been studying and experimenting with the Andean loom and textile processes in relation to contemporary technology. The paper describes some of her works and projects in order to comprehend the living relationship between traditional textile techniques and technologies, as well as the value of considering technology as a concept beyond modern Western logic.

2 TRANSFER OF KNOWLEDGE BETWEEN GENERATIONS

When a Quechua weaver tells her daughter "you must learn to weave," she's not only teaching her, but also transmitting resources to help her solve problems in any daily life situation and context. Thus, the process of learning to weave involves the development of a specific knowledge for the young apprentice: to give a certain order to the woven threads, picking up some of them while hiding others in order to create a firm and flexible structure that generates images that, although they may differ from her community's traditional iconography, still preserve the same technique. The loom is a tangible result of a pre-colonial way of thinking, present in the logic of these textile structures.

Nowadays, during this intergenerational transfer of knowledge, a system of thought is also being transferred, providing new generations with what could be referred to as epistemological tools that help to give order and meaning to the world by following sequences that solve "problems."

Based on her reflections and experimental practices, the artist has developed a complex work combining the traditional loom with electronic arts, tracing unusual continuities between these two. Her experiments offer a tactile, intellectual, and material approach to the concept of technology, enabling us to locate the technological and artistic development of the South American original peoples on a horizontal plane with other cultures, and thus demystifying accepted hierarchies of knowledge and craft [Montero, 2020].

Fig. 1. The local Quechua community visiting the *e-aruma* exhibition, placed at the native forest Territorio Lupaqa, Capinota, Bolivia, 2017. (©Sandra De Berduccy)

aruma undertakes her artistic work within the tradition of the Andean weavers, rejecting expressions such as "rescue" or "recovery" of knowledge. For her, weaving is a living and prevailing practice, to which she, throughout her research and practice, contributes through reflection, experimentation, and creation, and by being part of a community that has a shared interest in exploring materials [Pitman, 2020]. Presenting these processes, whether as exhibitions within the art system (galleries and museums) or through educational events (workshops and residencies for exchanging different weaving techniques) or as actions in the forest (Figure 1), has contributed to introducing the aesthetic and technological potential of these ancestral tools and processes not only to society, but also to the artisans and local communities themselves as they recognize the potential in their knowledge that has often been devalued or despised by consumer society.

3 THREADS OF TRADITION

aruma's first weaving experience happened during her childhood in Cochabamba. Before she was twelve years old, she learned how to crochet and hand knit. Over time, she observed Quechua women carrying spindles and making their own threads, which sparked her interest in the sophisticated loom work and caused her to decide to delve into textile traditions and complement them with contemporary digital technologies.

Her first attempts at weaving dealt with iconological issues, trying to "unravel this underestimated writing." In her Text Textile Code project (2002), she explored the "tocapus": geometric designs found in Inca clothing, woven with tapestry technique and framed in small squares on rows, containing

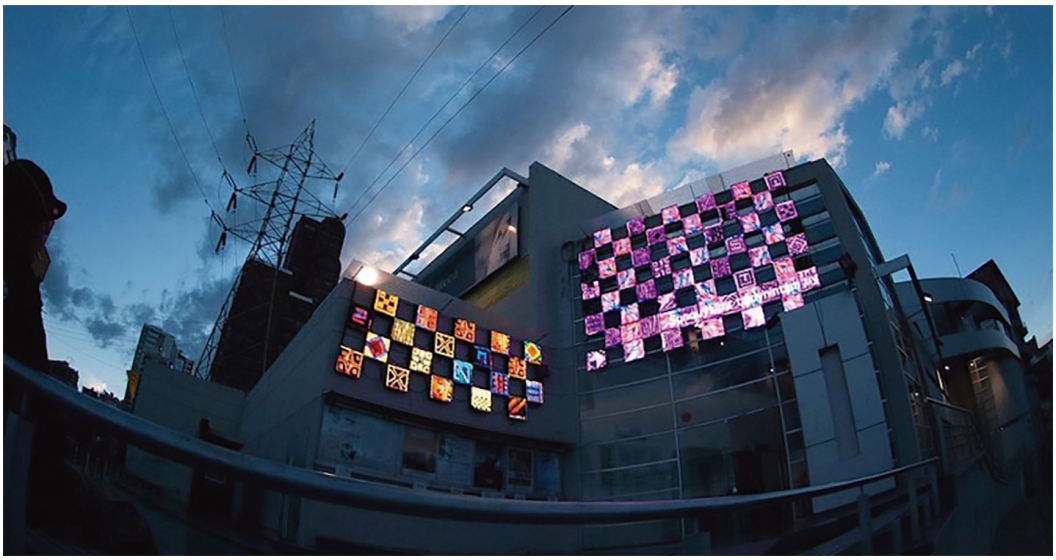

Fig. 2. Yawarniyki . . . 2011 interactive installation, La Paz, Bolivia. (©Sandra De Berduccy. Photo: INDI.)

compliments and poems in Quechua. She translated the symbols based on William Glynn Burns's decoding [Burns, 1981], which identified ten key symbols in this ideographic writing. "Yawarniyki . . ." (2011) (Figure 2) was an interactive installation on the main façade of the Bolivian Cinematheque. A sensor registered the color of the spectators' clothes and sent signals with chromatic information to hundreds of LED square panels, coloring the building and sending a compliment in Quechua, written in tocapus and translated into Spanish (De Berduccy, 2011).

4 SPINNING: ACCUMULATING ENERGY

In 2013, she focused on understanding the craft of Andean weavers and, while questioning her own artistic practice with modern means, she embraced a country life: spinning, weaving, dyeing, experimenting, and observing plants, creeks, and stars. She tested the voltage of saline waters with a voltmeter and identified the ancient hydraulic logic in gravity irrigation used by farmers, experimenting in her own home workshop with an irrigation circuit called "hydraulic chip" based on grooves. A sort of technological pantheism, where each spun fiber in the loom weft has a system with contained energy, blurred the distinction between nature and culture.

One of her first observations was the torsion in different textile techniques, which is proportional to the technique's complexity and the life span, impermeability, and even the fire resistance of a textile, determining, in turn, the final product and its specific use. aruma identified this torsion in the thread as a means for storing mechanical energy, exploring the possibilities of visualizing it by creating electrical energy using a handmade spinning wheel and a dynamo (Figure 3). Thus, aruma conceived the fabric as a technology that uses the contained and accumulated energy in each fiber. aruma also analyzed the electrochemical qualities of color in Andean textiles. She studied how chemical energy could also generate electricity. One of her first experiences with electrochemistry was in 2013 with illuminated cacti (Figure 4). She used Airampo (Opuntia cochabambensis), a native cactus used for dying wool in different purple tones, and with electrical circuits connected to LEDs she displayed the energy-generating potential of this dyeing cactus.

Fig. 3. e-landero, 2016. Visitor using a spinning wheel that generates electricity. Interactive installation, Santa Cruz, Bolivia. (©and photo Sandra De Berduccy)

Fig. 4. Airampo cacti emitting its light in the darkness of the inter-Andean dry forest, 2014. Territorio Lupaqa, Capinota, Bolivia, 2017. (©and photo Sandra De Berduccy}

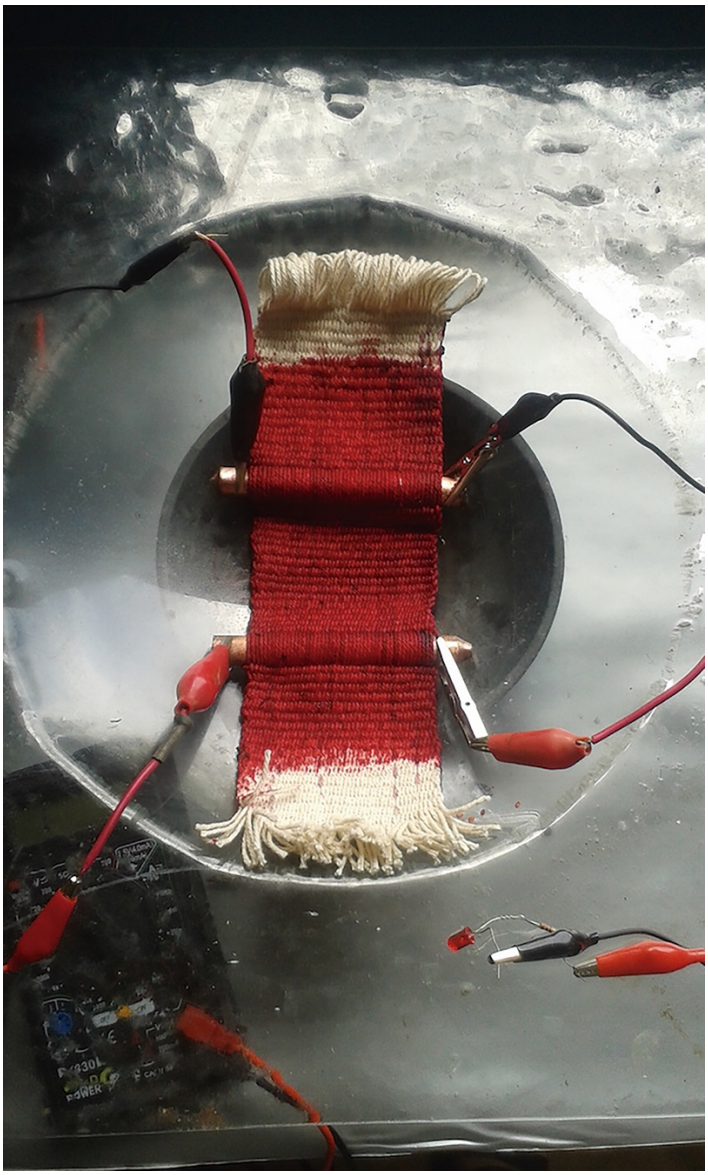

Fig. 5. *Electrochemical Variations*, 2016. Natural dyes applied on a textile surface, revealing its chromatic spectrum, by controlled electrical impulses. (©and photo Sandra De Berduccy)

The dye extracted with ancestral methods generates chromatic phenomena. The series *Electrochemical Variations* (2016) (Figure 5) dealt with experimentation between acidic and alkaline media, developing a method that affected the dyes by applying controlled electrical impulses. Through these experiences, aruma revealed the dyes' spectrum, separating the pigments contained in each one of them.

5 LOOM AS APPARATUS

aruma's approach to her work coincides with Vilem Flusser's reflections, for whom the creative act based on technical devices must go beyond a mere "functional" role [Flusser, 1990]. For the Czech thinker, artists must be able to access the hidden interior of machines. aruma has been interested in comparing traditional Andean weave to a "black box," which does not reveal at plain sight the programming it contains within. In an exercise of self-reflexivity, she is interested in unravelling the "programming" codes in the loom, a reminder of Anni Albers and her research on ancient Peruvian textile patterns by reverse engineering in order to discover how the patterns were made, recognizing their intrinsic complexity [Albers, 1974].

Continuing with machine analogies, aruma says that when we contemplate the color and iconography of Andean textiles, we only get the "input" and "output" of surface information. Not even by looking at the loom in action could we access the intrinsic complexity of the "program." That is to say, "we can't see how the information flows within." Although the logic behind most machines can be revealed by opening them up and examining their inner circuits and components, "reverse engineering" applied to Andean textiles is quite difficult, since auxiliary tools, torsions, and tensions carried out by the weaver are information that gets lost once the textile is finished (Figure 6). In short, discovering how a textile was made by undoing it or unweaving it would prove to be very difficult.

The search for understanding the construction logic of Andean textiles based on technological aspects has led aruma deeper into code and programming languages. In 2014, experimenting with QR (Quick Response) code, commonly used to store data in an image on a square structure, she saw a parallel between the QR coded image and the pre-Hispanic textile technique of visible weft, used hundreds of years ago by the Huari-Tiwanaku culture. In her QR series (Figure 7), she used alpaca fiber and the original structure of pre-Hispanic weaving by old Huari masters, creating QR codes that, once decoded with smartphones and tablets, could show encrypted information.

In dialogue with this transmission process, aruma chose to experiment with different optic fiber applications. She used optic fiber, but its rigidity, thickness, and delicacy made weaving rather difficult, so she inquired about Chancay and Chimú textile techniques from the central and northern Peruvian coast in the late intermediate period, between the twelfth and fourteenth centuries. She found an ancient technique of balanced weaving using three warp threads, joined by a fine weft line. The Chancay textile technique allows for an optic fiber to remain straight, enabling light to travel without obstacles (Figure 8). With this quasi-archaeological exercise of using an unconventional contemporary material like optic fiber, aruma updates an old and almost forgotten pre-Hispanic textile technique in order to understand how fibers operate within a highly ordered system. To this end, she carries out her research in museums and books, as well as by contacting master weavers and testing out possible solutions on small looms and prototypes. For her, the creative practice is an opportunity to carry out an archeology of knowledge, in Foucault's terms: "To reveal in all its purity the space in which discursive events are deployed is not to undertake to re-establish it in an isolation that nothing could overcome; it is not to close it upon itself; it is to leave oneself free to describe the interplay of relations within it and outside it" [Foucault, 1972].

6 TECHNOLOGY OPERATING AT THE SPEED OF YOUR BEING

As stated above, it is tempting to link the loom with the computer, since the beginning of computation was in fact related to the automated textile work of the Jacquard loom and the subsequent observations carried out by Ada Lovelace. For aruma, the stages in loom weaving are similar to the logic behind coding programs such as Processing or Arduino IDE, investigating common factors or basic correspondences between both systems, revealing their inner logic. "For example, the 'setup'

Fig. 6. Andean backstrap loom, with the set of traditional tools, 2017. (©and photo Sandra De Berduccy)

configuration and the loom assembly and then the 'loop' and the beginning of the weaving have common problems. Besides, as in a code program, when you execute, or start weaving, the first 'turns' are critical, because that is when you realize if the system actually works or not," aruma explained. (Figure 9). That's why, on her first double cloth weaving, an extremely difficult back-strap loom technique, she wrote/wove: "Hello world." This made it clear that the system was working; that is to say, she had "incorporated" the necessary algorithms and repetitions to produce a complex weave.

Shortly after learning about aruma's work and talking with her about her creation and research processes, we realized that it was not enough merely to establish or force symmetries. Traditional notions of hardware and software seemed insufficient as comparative parameters, since material

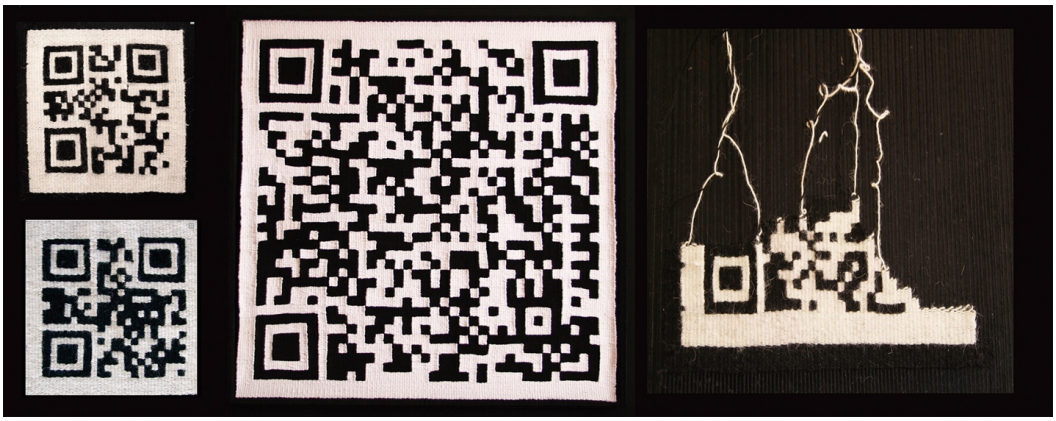

Fig. 7. QR codes, 2014–2016, made with ancient Huari-Tiwanaku tapestry technique. Could you read this textile? (©and photo Sandra De Berduccy)

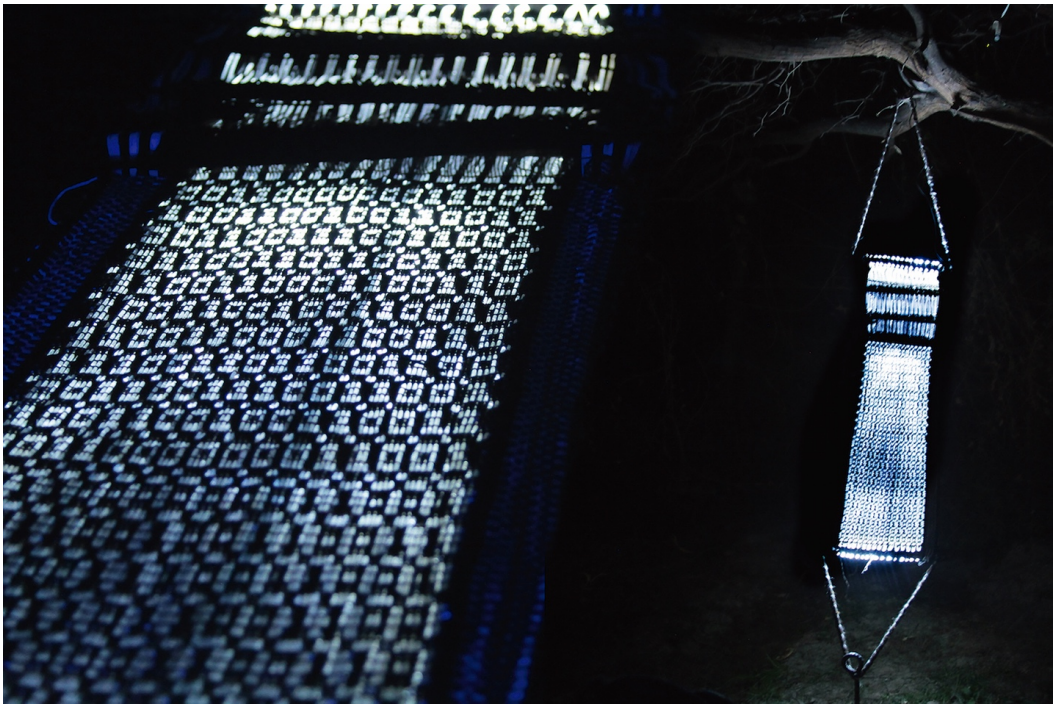

Fig. 8. e-chimu, 2016. Balanced weave found in Chimu and Chankay cultures, allows fiber optics to remain straight into a textile structure. (©and photo Sandra De Berduccy)

elements or hardware (wool, dyes, needles, spindle), and languages or codes of the process (structures, torsions, frames, icons) seem to be indivisible due to the complexity and sophistication, as well as the closeness, that this practice and knowledge have within a community.

"When I weave, I form a complex system with everything that surrounds me. I use complex technology that works at the speed of being," says aruma. She continues, "I follow a sequence of

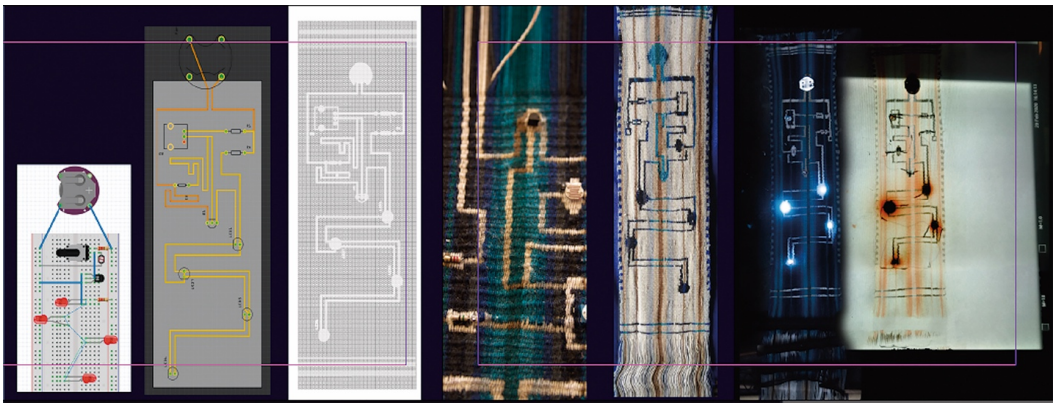

Fig. 9. Crux, 2016. Process of construction of a dark-sensitive circuit, inside two interwoven fabrics, woven with an Andean technique called kurti. (©and photo Sandra De Berduccy)

algorithms and commands, difference and repetition, merging body and mind, eye and hand in a mathematical mantra." Living in the countryside for more than seven years, she has completely imbued herself in her experimental work, having the privilege of "understanding the weavers time." Her artistic research is based on learning certain techniques, but above all on a material and existential connection with an epistemic system threatened to be destroyed by the globalizing pretensions of hegemonic colonial thought and its constitutive characteristics: racism, extractivism, and misogyny, among others. Her option of living in the Bolivian countryside incorporating traditional knowledge has been guided by, as aruma says, "understanding time and the technology within that time, which coincides with the time of plants; both take time to grow. Weaves, like plants, are not created, they are bred."

Beyond conventional dichotomies structuring modern Western thought, references to "nature" in aruma's work do not articulate it as an entity separated from humans, nor is it idealized by a modern romanticism. In coincidence with Donna Haraway, for indigenous communities, nature would be "problematic, ethno-specific, long-lived, and mobile concept something we cannot do without, but can never 'have.' [. . .] It is not the 'other' who offers origin, replenishment, and service. Neither mother, nurse, nor slave, nature is not matrix, resource, or tool for the reproduction of man. Nature is, however, a *topos*, a place, in the sense of a rhetorician's place [. . . .] [N]ature is, strictly, a commonplace" [Haraway, 1999]. We can add that nature is, at the same time, a *tropos*, characterized by change and the collaboration between human and non-human agents. For aruma, forests, trees, animals grazing, wool production, plants to obtain dyes from, weavers, microscopic processes, electrochemical reactions, the knowledge of these phenomena, etc., are all part of an organic system where distinctions between nature and culture seem indiscernible, but also useless, making traditional taxonomies separating art, technology, and science blurry as well.

The path of hegemonic technological development has led us to a tense and even violent relationship with our body and the environment. Our contemporary technological devices are hard, cold, and in most cases force us to be rigid, almost immobile. They dazzle us with their light, while they overshadow other senses, stunning us like streetlights do with nocturnal butterflies. aruma wraps her wool around her loom, puts it on her back, and moves her work space anywhere there is a tree. Her machine is portable, malleable, and soft. Hardware and code can be touched and smelled, and can also make a person warm.

Fig. 10. Backstrap loom ready to weave. (©and photo Sandra De Berduccy)

aruma's artistic work invites us to speculate on the paths taken by technology, to mutter "what would have happened if . . .": What would've happened if hegemonic technologies had taken another path? From her work we can appreciate media archeology, understood as an approach that gives visibility and value to technological experiences that have been displaced from historical accounts due to cultural, ideological, or geopolitical reasons [Burbano, 2013] and also from an eco-systemic perspective. For her, media archeology is not only carried out within the academic sphere as documentary analysis cataloging and interpreting past objects and clues, but it can also be activated in a critical, poetic, philosophical, and vitalist way of artistic research-creation within media arts. Her invitation is to address the past and the future in the connection between objects, symbols, and the body itself, actualizing an ancestral choreography of the weaver and her loom in a vital space and time.

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