

Stretching Senses

Stretching Senses through
the *Haptic Hanbok*:
Mapping the Field(s) of Inquiry

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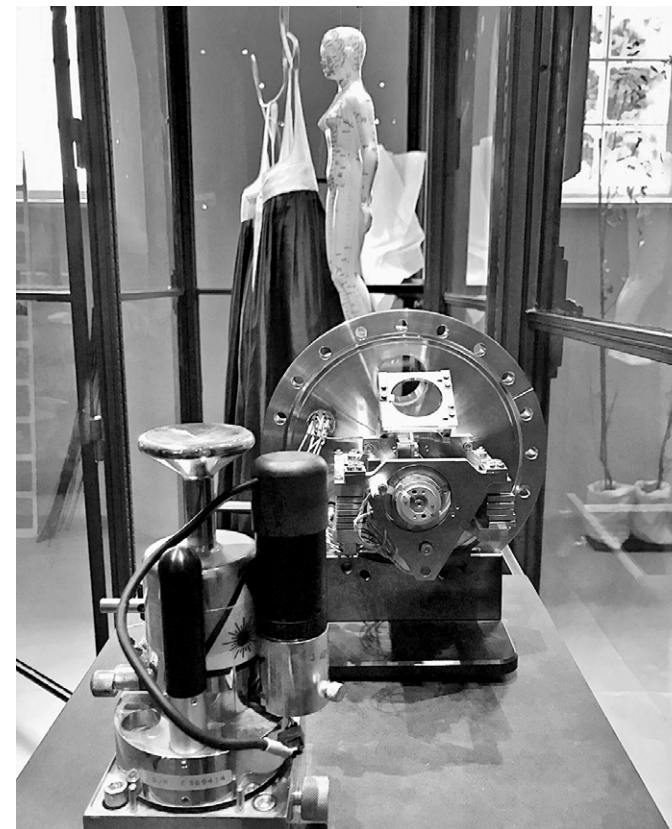


Fig. 1: Display case,
Stretching Materialities

Exhibition spaces often invite a playful departure from the ordinary, creating a kind of permission slip for visitors to try things they would rarely consider in their daily routines. Imagine stepping into a museum and not just looking at an unfamiliar garment in the display case but slipping it on—perhaps even pairing it with a VR headset! On the opening night of *Stretching Materialities* at TA T, the air was alive, filled with contagious enthusiasm. Visitors hovered around open display cases, drawn to the textures, smells, and possibilities offered by the exhibited objects. One of the displays showcased Korean sartorial heritage, *hanbok* (fig. 1). To be more specific, it was a sheer and light *myeongju* (silk) *hanbok chima* (skirt) in a deep green shade. Gently swinging, the chima was hanging next to a cream-colored acupuncture dummy. Alongside, there were two heavy metal-bodied scanning probe microscopes: a scanning tunneling microscope (STM) and a smaller atomic force microscope (AFM). Two visitors nearby were getting help with mounting light grey colored VR headsets. □ [Exhibition, fig. 25, 143](#) A long black cable plugged into the side of the headset connected



¹ *The Sensing Knife* is a project of Jürgen Rabe and Fardin Gholami. They aim to turn the sensitive probe of an atomic force microscope (AFM) into a neurosurgical tool which would »sense the brain material as it also can cut through it.« *Virtual Sensing Knife* brings this idea into the virtual realm. Wearing a VR headset and *Haptic Hanbok*, the visitor may sense an invisible boundary inside the material through the different vibrations conveyed by the *Haptic Hanbok*.

the VR device to a long vest-like garment they were wearing: a *Haptic Hanbok*, and a long purple *durumagi* (overcoat). A few minutes after they stepped into the rotunda in turns, their arms turned into a *Sensing Knife*—at least, that’s what it looked like through the VR goggles they were wearing. Parts of their clothing vibrated according to the digital brain tissue they were touching. This seemingly strange assemblage of a *hanbok*, VR, and the *Sensing Knife* brought into question how different ways of worldings meet. By using the term worlding, I emphasize that the world is not a static, pre-existing backdrop for human beings.

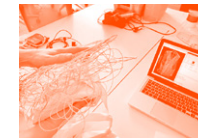
Continuing from the previous chapter by anthropologist Maxime Le Calvé, this chapter illustrates the wearable side of *Virtual Sensing Knife* and *Haptic Hanbok*.¹ While exploring the potential of wearing clothes as sensory device for the public in exhibition spaces, this chapter engages with the following questions: How does exhibition as research that uses clothing challenge knowledge-making practices? How does it stretch senses and inform public understanding and in what ways? Furthermore, what if the *Haptic Hanbok* is more than just a conveyor of vibrations generated by motors in a mixed-reality environment and becomes the stage for its wearer to perceive the world in a different way? As philosopher Yuk Hui (2018) suggests, different cosmologies enable and constrain technological development in unique ways. Cosmotechnics refers to the idea that technology is not universal but shaped by the specific cosmological frameworks that give rise to it—each culture’s worldview informs how technology is imagined and implemented. In this light, the *Haptic Hanbok* became a testing ground for such cosmotechnics, where the integration of concepts like *gi* (기, vital energy) with haptic technology offered a space to explore how different cosmological perspectives could interact with, and even reshape, our understanding of technology. The *hanbok* itself, while rooted in a specific cultural heritage, also became a conduit for VR haptic experimentation, illustrating how technology and cosmology are in continuous dialogue. Placed in between and connecting different realms, the *Haptic Hanbok* suggests the wearer to view the body and the world not just as a visible, fixed entity but as a relational flow. The wearer could consequently become more sensitive to how one’s energy flows with(in) the surrounding environment. □ [Process, fig. 18, 278](#)

As Marilyn Strathern (1992, 10) suggests, »It matters what ideas we use to think other ideas.« Rather than solely drawing inspiration from the modern dominant medicine practices or popular sources of first-person shooter games or Hollywood movies,



the project listened to what *hanbok* and *gi*-based worlding could bring into the picture.

While collaboratively developing the *Haptic Hanbok*, we explored how different technological practices reflect divergent worldviews. The exhibition’s display case displayed two key objects: a microscope and an acupuncture dummy, each representing contrasting approaches to the human body. The microscope exemplifies a worldview that seeks to understand the body through its visible, structural components. Since the 17th century, pioneers like Antonie van Leeuwenhoek and Robert Hooke used microscopes to identify cells and tissues, solidifying the notion that the human body can be analyzed as an assembly of discrete parts observable under magnification. In contrast, the acupuncture dummy illustrates a holistic understanding of the body, one that emphasizes the flow of *gi*—vital energy—through invisible channels, maintaining balance and health. While these two frameworks may seem at odds, the exhibition became a space where such disparate worldviews could interact. By integrating concepts like *gi* with modern haptic technology, the *Haptic Hanbok* brought together acupuncturists, garment makers, anthropologists, physicists, and creative coders. This collaboration demonstrated how different ways of knowing the body could converge, creating new, interdisciplinary forms of embodied knowledge. □ [Process, fig. 3, 266–267](#)



Haptic garments highlight the »experiential dimension« of clothing (Entwistle 2000; Davidson 2019). Encouraging visitors to »wear« the exhibit, our collaborative project aimed to explore how one’s perceptions and movements change when donning a *hanbok* in an exhibition space, rather than considering the garment a static object hung behind a glass display. For Choe Han-gi, a 19th century scholar, who wore *hanbok*, wearing clothes was an engaged interaction with the vital force of energy, known as *gi*. He suggested that through clothing, humans can actively direct their experience in a way that overcomes the bias of *gi* (being too cold, too hot) and that nourishes this energy force. The world is not a given but constantly shaped through actions like moving, sitting, walking, touching, interacting, and breathing (Varela 1999, 8). If so, wearing clothing, which is part of, and also an element that affects these activities through facilitating movements, plays a significant role in the process of worldmaking.

→ [Stretching Practices, 35](#)

STRETCHING SENSES AS A CONCEPT

Stretching senses is experiencing the world in ways previously unimagined or unfelt. Much like how stretching the body activates muscles we rarely use, leaving us feeling refreshed or even surprised, stretching the senses awakens dormant or habituated sensory capacities. In the exhibition context, where participants engage with the *Haptic Hanbok* and VR experience, this sensory stretching not only brings new awareness to bodily perception but also acts as a kind of warm-up—like dipping your toes into water before fully diving in—transforming the very act of worlding. It provides a gentle, approachable gateway to exploring how we engage, sense, and make sense of the world. The unfamiliar sensations created by the *hanbok*'s tactile feedback and the immersive virtual environment challenge participants' embodied experience, reshaping their sense of being in and with the world. In this way, stretching the senses is not just a refreshing of perception; it may also be a reorientation that alters how one participates in the ongoing process of world-making.

Not only the *Haptic Hanbok* but the whole exhibition invites the audience to stretch the way they see, smell, walk, feel, and listen to things, ultimately aiming to challenge the way they engage with the world. Stretching senses is a recognition of how sensory experiences are culturally and materially mediated. Sensing is not a passive, brain-bound process. □ [Exhibition, fig. 15, 137](#) In the context of this exhibition, where participants wear the *Haptic Hanbok* and navigate a virtual reality environment, sensing becomes an act of doing—an ongoing interplay between body, materiality, and technology. This resonates with Erin Manning's (2013) exploration of movement as a relational process, where the body's sensory capacities are continually stretched through its interactions with other bodies and materials. The *hanbok*, as a tactile, wearable extension of the body, becomes part of this relational meshwork, helping participants to sense not only with their bodies but through the materiality of the garment, reshaping how they perceive and engage with the world. For Manning (2013), the body is always in a state of becoming through its relations with other bodies, materials, and environments. *Hanbok* in this exhibition is a material partner in the act of sensing—a garment that participates in the movement of the body, attuning it to a different flow of sensory perception. Putting on a *hanbok* with a stiff collar and flowing panels helps navigating the VR environment in a way that further stretches



the body's sensory capacities. Rather than fixed perceptions, participants experience a continuous unfolding of tactile and visual sensations, expanding their sensory horizons.

Bringing in Constance Classen (2012) and David Howes (2003), scholars of sensory studies, allows to deepen this theoretical framework by considering how senses are culturally constructed and multiple. For Classen and Howes, the senses are cultural practices shaped by history, technology, and material culture. In this exhibition, the act of stretching senses involves a multisensory reorientation—a way of engaging with the world where different sensory modalities, such as touch, vision, and proprioception, are brought into new configurations. *Hanbok*, with its association to sensing the world as a coagulation and dispersion of vital energy, plays a crucial role in this sensory reorientation, linking the body's present experience in a virtual realm with a *gi*-based understanding of worlding. □ [Exhibition, fig. 19, 139](#)



Clothing as an Active Mediator of Sensory Experience and Worlding

Clothing actively mediates our engagement with the world by involving multiple sensory modalities. When we wear clothes, we experience a range of sensations—texture, weight, temperature, tightness, and flexibility—that shape how we move, interact, and perceive our surroundings. □ [Process, fig. 2, 266](#) For instance, Constance Classen highlights the role of touch in shaping how we perceive the world, noting that the »feel« of fabrics or materials informs our sense of comfort, identity, and how we relate to others (2012, 5). A tight military vest feels different on the skin than a loose silk vest, and these tactile experiences become part of how we sense and engage with our environment. In this sense, the materiality of clothing plays a crucial role in shaping how we move through and orient ourselves in the world. Furthermore, the act of wearing clothes creates a feedback loop between the body and the world. As we move, the clothes shift, tighten, and loosen, affecting how we perceive our own body and how it occupies space. Our clothing often anticipates or accommodates movement, guiding our bodily experience even before actions fully unfold. The fabric's weight or fit, for instance, adjusts how we might turn or bend, subtly directing our embodied experience and affecting how we engage with objects and environments.



Clothing does not only shape our experience; it is also shaped by the world. *Hanbok*, for instance, reflects the socio-political, technical, and cosmological dimensions of the era in which it is crafted and worn. In a different environment—like a VR setting—*hanbok* is subject to new forms of sensory engagement, reshaping its significance in relation to haptic technology. Clothes, as worn objects, are central to this embodied perception—they both mediate how we perceive the world and become part of how the world perceives us. This dual role of clothing as shaper and being shaped in the process of worlding suggests that the act of wearing is not static; it is an ongoing, evolving relationship between body, material, and environment. By considering these entanglements, we can begin to see clothing as not just a passive element but an active force in the creation and re-creation of the worlds we inhabit. → [Stretching Practices, 25](#)

Before unravelling the making and wearing experiences of the *Haptic Hanbok* and *Virtual Sensing Knife*, let us travel 8,000 km from Berlin to Seoul to delve into how *hanbok* serves as a sensory framework. This ethnographic vignette is a fragment from long-term fieldwork (2021–2023).² While different experts have their own opinions on the worldings of *hanbok*, my understandings of *hanbok* are based on spending time with Lee Ki-Yeon. She is an activist who led a movement in the 1980s reviving Korean sartorial heritage, connecting the flow of vital energy and the structure of clothing.

KOREAN SARTORIAL HERITAGE AS SENSORY FRAMEWORK

You Cannot Make Clothes Without Understanding the Body

Entering Ki-Yeon's atelier, I noticed a big meridian poster hanging on the wall (fig. 2). The poster depicted a female body from the front, side, and back with an overlaid description of the energy pathways. In the office room next door, where I usually worked on archiving, there was a diagram of the phases of *gi*—음양오행 *eum-yang-oh-haeng* (Yin, Yang, and the Five Phases theory, also known by the Chinese term, *YinYang Wuxing*) printed on an A4 sheet of paper and pinned to the wall. The sheet further described the relations between the five phases and five organs of the body. I read these wall decorations as an apparent sign that the theory of *gi* is significant in Ki-Yeon's clothes-making process.

3 The nine-head model is a figure whose length is nine times its own head length. This stylized approach tends to elongate the legs compared to the range of proportions found in most human bodies.



Fig. 2: 360° camera view of Ki-Yeon's atelier with a meridian poster

Ki-Yeon talked about acupuncture points frequently during our conversations, saying »You cannot make clothes without understanding the body.« The statement sounds reasonable, knowing that clothes are mostly made for human bodies to wear. What she meant by »understanding the body,« however, was not just about knowing the positions of bones and muscles but the flow of vital energy—*gi*. During my earlier education in fashion, where I followed global fashion design principles, I learned about the human body through sketching nudes. I then had to stylize these sketches into nine-head croquis, which are popular in fashion for their exaggerated proportions.³ However, this design approach did not account for the body's movement and internal energy dynamics. The concept of a body animated by *gi* is vividly illustrated in the *동의보감 Donguibogam (Principles and Practice of Eastern Medicine)*, authored in the 17th century by Heo Jun (fig. 3). Its illustrations, with an open mouth and vibrantly moving belly, capture the liveliness of the body, circulating *gi*. This portrayal diverges significantly from the elongated figures of fashion illustrations and the Renaissance anatomical representations, such as the ones by Andreas Vesalius from the 16th century (fig. 4), which emphasize the body's external, visible parts—elements that persist beyond life (Kim Taewoo 2021, 25; Kuriyama 2011, 9). Rather than relying on philosophers' definition of *gi*, Ki-Yeon preferred to understand and use the term through its colloquial usage and practical, bodily understanding of it. According to Korean philosophy scholar So Jeong Park (2019), the term *gi*, in Korean, denotes a fundamental life force which is interwoven in the daily life of Koreans through Korean language. Colloquial phrases such as »기가 살다 *gi-ga*

salda« (gi springs up, to get a second wind), »기를 쓰다 *gi-reul sseuda*« (using gi, giving it one's all), »기가 막히다 *gi-ga makhida*« (gi is blocked, expressing astonishment or disbelief), »기를 돋우다 *gireul doduda*« (to encourage one's gi, to cheer up) reflects how in Korea, »gi is deemed to be stimulated, roused, revived and encouraged« (Park 2019, 157). Through these common Korean expressions, Ki-Yeon's words such as »옷으로 기를 살리다 *ot-euro gi-reul salida*« (spring gi up through clothing) felt comprehensible to me. Her words would mean the wearer's life force is enlivened through the structure of the clothing. For example, Ki-Yeon told me that sharing of a garment is considered as an act of passing energy. When a child is born, the baby's first clothing, (배냇저고리) is made of used clothes from an elderly in the same village. It is because the good energy in the elderly's clothes will be transmitted to the baby's clothes and the newborn will live a long life. Ki-Yeon who practices acupuncture herself translates the flow of energy through clothing. The clothes should make paths for the air and the energy to flow. The loose structure of *hanbok* is only tightened in acupuncture spots that promotes the energy flow. For example, the spot where one ties one's pants is called 복류 *bokryu* (to restore the flow). It is a point that strengthens the kidney, and the point of the socks' pressures 용천혈 *yongchunhyul* (gushing spring) works like a battery charger, recharging one's energy.

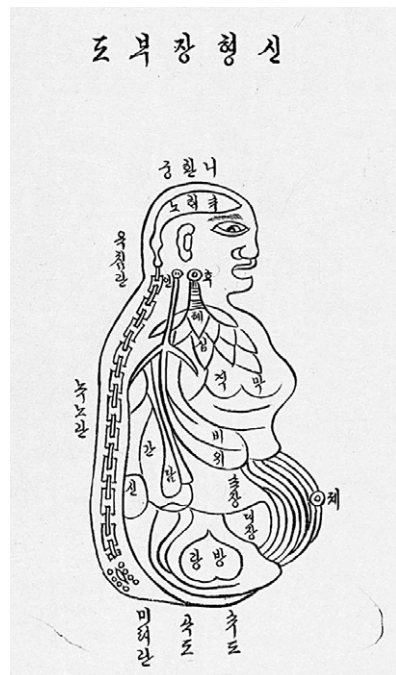


Fig. 3: Shinhyungjangbudo (chart of the overall body, viscera, and bowels) in the opening of the NaeGyeong chapter in Heo Jun's *Donguibogam* (Principles and Practices of Eastern Medicine) from 1613



Fig. 4: An illustration plate from Andreas Vesalius's *De Humanis Corporis Fabrica* (On the fabric of the human body) from 1543

4 The Korean term 다스려라 (*daseuryeora*) can carry meanings such as »to govern« or »to discipline,« but in this context it implies bringing one's mind into a state of balance or harmony.

How Is the Flow of Gi Supposed to Feel?

In August 2021, I was back at Ki-Yeon's atelier, sitting across the table from her. She stretched her arms towards me to show her hands with traces of acupuncture and moxibustion (therapy which involves burning dried mugwort on particular points on the body). I asked Ki-Yeon if there is a »magic spot« that invigorates energy in all kinds of bodies when pressed. In Berlin, I had been collaboratively working on a garment with vibrating motor insertions and thought if the motors were placed in this magic spot, it could have the stimulating effect of acupressure. □ [Process, fig. 22, 283](#) She instantly replied, »The human body constantly changes, so fixing the motors in one spot won't work.« As cells are constantly reproduced, acupuncture points are also slightly different today from tomorrow. »Using acupressure magnets will be better, because you can attach them to the wearer directly,« she suggested. We climbed the staircase to the third floor, dedicated to acupuncture practice. The room was around the size of her atelier. A male acupuncture dummy, shining in the color of copper, was standing tall in the corner next to a coffee machine. There were also several books on acupuncture in Korean, Japanese, and Chinese, further nachos, a kettle, an electric fan, a small bed, three plastic chairs, and a long table.

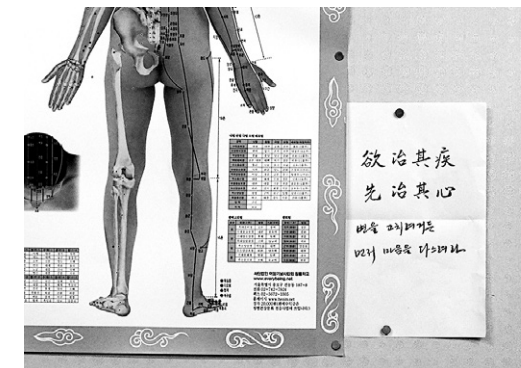


Fig. 5: Poster and handwritten sign in the acupuncture room

There was an acupuncture poster hanging on the wall, similar to the one in Ki-Yeon's office, with a handwritten sign in both Chinese and Korean (fig. 5). It read: »병을 고치려거든 먼저 마음을 다스려라« which translates as »If you wish to heal the illness, first balance the mind.«⁴ The sign highlighted the principle of East Asian medicine's holistic approach to health, which considers the emotional, spiritual, and physical symptoms together. Rummaging through a cabinet in the corner, Ki-Yeon found

small magnets. Her firm hands gently touched my elbow and went further to reach my inner arm. Ki-Yeon struggled for a moment to pull the magnets apart. Then she attached one with a medical paper tape in between my elbow and the inner crease where the arm folds. »The magnets will attract energy to gather on that point, which is related to the large intestine,« she explained. The magnet felt cold on my skin. I felt somewhat nervous, perhaps because I did not know how I was supposed to feel. Listening to Ki-Yeon's stories, I also wanted to be an advocate of acupressure. However, enthusiastically nodding to her explanation on acupuncture is one thing; bodily understanding is quite another. Do I have the sensibility to feel the flow of *gi*? My grandmother told me that my great-great grandfather was an acupuncturist. Should I have that sensibility as a family trait? Maybe scrolling the glossy surface of my smartphone had numbed my sensory organs and overwritten how I was supposed to feel when receiving acupressure. If senses and perception are related to immersing oneself into a particular sensory framework or cosmology, the disconnection from the sensory model of my grandparent's generation seems to have led to my sensory impoverishment. Unsure of how to feel, I honestly responded to Ki-Yeon that I did not feel anything. Unaware of my internal monologues, she said maybe it is because I did not have any problems with my intestines.

When I asked Ki-Yeon how she understands *gi*, she replied, »It is difficult to put into words... Try shaking your wrist.« Following her rhythm, I shook my wrist. »Can you feel something 몽글몽글 *mongle mongle*?« she asked. Indeed, after repeating it for a while, I felt as though I could touch an invisible force that was rounded, soft, and fluffy—or *mongle mongle* in Korean, an onomatopoeic expression. What I felt might not have been exactly related to *gi*, yet the bodily experience gave me an idea of how this invisible energy could be understood in a sensorial realm. Similarly, Kim Taewoo (2021, 52), an anthropologist of East Asian medicine, demonstrates the varying manifestations of *gi* not through verbal description but through the physical act of punching the air. He exemplifies this by alternating between a languid, drooping fist moving slowly from left to right and a rapid, forceful thrust of the fist upwards. *Gi*, while elusive and intangible, can thus be interpreted and perceived through embodied experiences. Understanding the concept of *gi* also involves honing one's sensory awareness to understand the body in a different manner.⁵

5 David Howes (2022) also underscores the importance of exploring the »sensory world« as culturally mediated, thereby challenging the Euro-Western focus on ocularcentrism.

For most Koreans, acupuncture is not a foreign subject; self-administrated treatment of acupressure, acupuncture, and herbal medicine is popular among the general population (Baek et al. 2013). Even when I was in middle school, fourteen-year-olds knew that pressing in between the base of the thumb and index finger would help when food is sitting heavy on the stomach.⁶ Coming home from school, I used to see my grandmother practicing acupuncture and moxibustion, or *chim-tteum*, as Koreans call the two practices together.⁷ Despite my limited exposure to Korean medicine, which consisted of knowing only two acupressure points for digestion and receiving acupuncture for a foot injury once, I understood the flow of *gi* not as basic units of reality but as something that only became effective when discussing unexplainable muscle pain or colloquial situations involving *gi*.

As Ki-Yeon's explanation of *gi* and *hanbok* entailed vocabularies of Korean medicine, such as the names of acupoints, it seemed to be a suitable way to understand her view of *gi*. When I expressed my interest in learning the basic principles of acupuncture, Ki-Yeon pointed me in the direction of her acquaintance, Son Joongyang, who teaches the fundamentals of Korean medicine to those without a medical background. Although my time in the field was limited, and I could only attend the introductory classes, I found myself constantly reflecting on how this new way of engaging with the world might influence the *Virtual Sensing Knife* and *Haptic Hanbok* project. The transformative potential of these insights lingered as I navigated both the academic and sensory dimensions of the research.

TRANSLATING *GI* AND FLOW

Back in Berlin, I faced the challenge of conveying what I had learned in Korea to my colleagues working on the project. *Gi* is an expansive concept—one that countless philosophers have spent lifetimes studying. How could I possibly encapsulate this deeply philosophical idea? I soon realized that striving for a precise definition of *gi* was not necessary for the goals of our project. Instead, our focus was on stretching the senses—provoking participants to experience new ways of relating to entities. By interacting with a virtual environment while wearing a vibrating *hanbok*, we aimed to offer a tangible sense of a flow

6 This acupoint is called 합곡 hapgok (合谷 HéGū in Chinese) which translates as »union valley.«

7 Chim, which directly translates as »needles,« refers to acupuncture. Tteum refers to the curing practice of burning mugwort on particular parts of the body.

of energy that differs from, say, the experience of wearing a heavy rigid haptic vest resembling body armor. Throughout the collaborative exhibition making process, I encountered various interpretations of *gi* among my colleagues, each shaped by their repertoire of experiences. Here, I will explore how the practice of translation—across international and disciplinary lines—both illuminates and obscures meaning, showing how material works like a boundary object during the process. → [Stretching Practices, 25](#)

In *Matters of Activity* (MoA), where researchers from diverse backgrounds shared the studio space, exchanging ideas often emerged contingently. In the MoA cluster, some researchers worked by writing, while others engaged their bodies with materials like rattan, interacting with the entire space. Architect Natalija Miodragović was one of them. Under the title *Structural Textile*, Natalija with design researcher Nelli Singer and architect Daniel Suárez explored the activity of rattan and willow branches—the cellulose microfibrils in cell walls of the wood that swell with humidity. Long, outstretched rattan branches would sometimes reach over to the next table, greeting the cut pieces of fabric to be made into *hanbok*. Stemming from Nelli Singer's *Living Beings*, the *Structural Textile* project welcomed willows' and rattan's bendable and formable material characteristics and made knitted structures using such material activity.

→ [Stretching Spaces, 170](#)



Fig. 6: Natalija looking at *Deung Deung Geo Ri* on the screen

While observing the woven willows piled up on the table next to where I sat, I realized how they mirrored the form of 등등거리 *Deung Deung Geo Ri*, a type of vest-like *hanbok* made from rattan. This garment, worn under the outer *hanbok* layer during hot summers, creates a gap between fabric and skin, allowing airflow to regulate body temperature. When Natalija saw a picture of it, she exclaimed, »This is a personal cooling device! It is a climate device!« Her architectural perspective offered

another way of translating *Deung Deung Geo Ri* as a facilitator for airflow, much like how architecture manages climate in buildings (fig. 6). Preparing for the exhibition together, working on different projects in the same space facilitated cross-cultural and cross-disciplinary exchanges, allowing different frameworks to coexist and interact.

Deung Deung Geo Ri exemplifies how the flow of *gi* parallels the movement of air, acting as a material embodiment of balance. It recalls an insight shared by Ki-Yeon during my fieldwork: »In the past, we believed that if your clothes were too tight, there wouldn't be space for luck to enter.« This wisdom points to an understanding of allowing *gi* to circulate freely, supporting health and harmony. In East Asian cosmology, the *gi* of the greater cosmos, known as *yuk-gi* (six *gi*), arises from the interplay of the five phases. It conjures memories of Son Joong-yang's teachings, where six energies—wind, cold, heat, humidity, dryness, and fire—correspond with conditions like temperature, humidity, and atmospheric pressure. → [Stretching Practices, 46](#) These forces must be in balance; warmth is necessary in the cold, but too much heat becomes harmful energy. Similarly, by creating a buffer between the body and the outer layer, the *Deung Deung Geo Ri* embodies the principle of regulating *gi*, harmonizing disparate energies. This perspective views the world not as a collection of isolated entities but as a connected flow. The way we experience these connections matter—especially in times of ecological crisis—as they determine our sensitivity to the meshwork of life. Cultivating this ecological sensitivity means attuning ourselves to the rhythmic exchanges of energy within our surroundings. In contrast to extractivist approaches, *gi*-based worldings call for reciprocity and balance, recognizing that thriving depends on maintaining these flows. Clothing, seen through this lens, becomes not just something we wear but something that allows us to feel the interconnectivity of *gi*-based worlding, offering a sensory rather than purely intellectual understanding of our place within the flow of life.

Deung Deung Geo Ri, when worn by Natalija, functioned as an in-between object, offering a sensory connection to the concept of *gi*. □ [Process, fig. 2, 266](#) Natalija's experience with the vest, first as an object to be observed and later as one to be worn, opened up another way of understanding the flow of *gi*. By understanding *Deung Deung Geo Ri* as an architectural element,



8 However, despite the richness of these insights, the project raises critical questions about their capacity to challenge entrenched global systems. Can shifting perspectives on *gi* and ecological sensitivity truly disrupt the deep-rooted forces of industrial capitalism? Without structural changes in politics, economics, and social behavior, even the most heightened awareness of energy flow might struggle to alter the trajectory of environmental destruction. The *gi* framework enriches our understanding and engagement with the world, yet it must be paired with systemic efforts to transform the structures that drive environmental exploitation.

Natalija framed it within her own repertoire: as a device that regulates airflow and acts as an »extended protective membrane of the human body.« This interpretation mirrors the meta-physical circulation of *gi*, where air and energy both need to flow freely around the body to maintain balance. For her, the concept of *gi* became more comprehensible when viewed through this architectural lens, which meant that the concept *gi* can be translated into material practices.

Later, I brought an actual rattan *Deung Deung Geo Ri* from Korea, and hung it within the *Stretching Materialities* exhibition, attached to the ceiling with an elastic nylon strap. Visitors could pull it down, adjusting it to their height, and experience it for themselves. By trying on *Deung Deung Geo Ri* alongside other *hanbok* pieces such as *durumagi* or *qweja*, visitors physically engaged with a tangible metaphor for the flow of *gi*, experiencing firsthand how these objects create space between the body and its environment, allowing airflow and energy to circulate freely. *Deung Deung Geo Ri* became an accessible material as a wearable exhibit that makes one physically sense how concepts like *gi* might integrate with contemporary approaches to climate regulation and design.⁸ Natalija's interpretation of clothing as a climate device also influenced the design of the *Haptic Hanbok*—decisions around fabric and structure aimed to evoke similar principles of temperature regulation, energy flow, and balance.

→ [Stretching Space, 171](#)

Still, trying to convey my understanding of *gi* to my colleagues in Germany felt like a clumsy translation of the Korean words of my interlocutors and their actions. I recall the moment I had a conversation with Fardin. Introduced earlier as a macromolecular physicist, → [Stretching Senses, 305](#) Fardin is a research associate at Humboldt University who studied polymer engineering in Iran and India. In his doctoral studies, Fardin deals with carbon based 2D membranes using scanning probe microscopy. I was on the phone with him trying to verbally convey what Ki-Yeon told me or what I experienced in my field site regarding how a *hanbok* connects the body with the universe, and how it holds and transmits *gi*, which I translated into English as »energy.« The conversation was not easy, nor was finding the right words to convey the loaded terms used in my field site. After listening to my sweaty attempts of mumbling, repeating, and lots of silence in between, Fardin said, »Talking about energy, I get it. Excess energy to no energy, transmission from one state to another, energy flows.« Somehow the space between two evolving entities was

intra-acting through *gi* theory and the logic of physics in terms of »energy,« where one was more elevated than the other. Inter-cultural assemblage contains underlying power structures, where certain terms such as »energy« were intentionally adopted in the Korean language to explain European-Western institutional structures and concepts but not the other way around. Alongside I questioned if I was trying to validate Korean cosmology by relying on physicists' acknowledgement. However, I realized that the point was not validation but to be in conversation. The worldings of my interlocutors did not require external authorities to examine whether they were reasonable and worthy. And yet it was the power imbalance that led me to think ever so slightly about such questions. The worldings of my interlocutors make connections across different scales. Here things exist in correlation, whether collaborative or antagonistic. To demonstrate such relationality in an accessible way to natural scientists was in itself an achievement. Borrowing words from Josh Evans (2023), who works with fermentation practitioners and microbiologists, »the concept of holobiome is not new, yet the idea of getting accepted in technoscience opens a different way of relating scientism to the world.« Social science and humanities talk about relationality frequently, yet it doesn't travel far enough to natural science disciplines. To change how science works and impacts the technosphere, such interdisciplinary conversations are crucial.

EMBODIED DIGITAL TECHNOLOGIES: CRAFTING THE *HAPTIC HANBOK*



This section explores the creation of the *Haptic Hanbok*, emphasizing how the process reflects not distinct worldviews but rather overlapping and evolving possibilities. □ [Process, fig. 22, 283](#) The making of the *Haptic Hanbok* required careful deliberation over two primary components: the long, vest-like garment and the integration of vibrational motors. Decisions were made regarding the shape and materials of the *hanbok*, alongside the precise size, placement, and intensity of the vibrational feedback. This crafting process was not just technical; it was a performative act that simultaneously shaped and was shaped by differing perceptions of embodiment, materiality, and technological interaction.

Preparing a garment for visitors of a public exhibition requires a certain form of generosity. To ensure the clothing fits different body forms in various sizes, the *hanbok's* spacious and open structured design was favored over tight-fitted clothing. Still, this was a contradictory choice when making a haptic garment. Most haptic suits aim to adhere closer to the body to maximize the impact of vibrations. *Qweja*, a long, vest-like *hanbok*, was chosen for the *Haptic Hanbok* due to its versatile and open design, allowing for a comfortable fit across diverse body shapes. Its sleeveless form, fastened by a single front ribbon, accommodates varying arm lengths and physiques, making it inclusive while enhancing interaction between the wearer and the integrated haptic technology.

In terms of clothes making techniques, *hanbok* is a flat garment that only comes to life when draped onto the body, creating its distinctive shape. Because of this, we needed someone with a strong understanding of flat pattern construction. Daniel Otto, highly skilled at interpreting flat patterns, joined our team to work on the *Haptic Hanbok* in Germany. Despite his lack of prior experience with *hanbok*, his keen eye for pattern making allowed him to grasp *hanbok's* flat structure intuitively.

The fabric for the *qweja* and *durumagi* was carefully chosen from Hamchang Myeongju, a silk weaving site in the Southern part of Korea, where I conducted fieldwork. Weaver Hu Ho takes part in rituals honoring the silkworm's spirit and develops mechanical looms that allow to continue Hamchang's wet weaving heritage. Daniel remarked, »This *myeongju* (silk) has a fascinating weight—it feels heavy and light at the same time, with a certain density to it.« Daniel's observation reminded me how aesthetics and sensory qualities can communicate more than just function, even evoking emotional or intuitive responses.

When selecting the fabric for the inner garment to be crafted in Germany, we sought something soft against the skin yet durable enough to withstand the demands of a participatory exhibition. We had to ensure that we could re-stitch, tailor, and adapt the garment as the design evolved throughout the research process. It also had to be breathable and regulate temperature well.

The *qweja* and *durumagi* were crafted by artisans at Saemi Hanbok in Korea, based on the recommendation of the master weaver Hu Ho. To provide flexibility for a variety of museum visitors, we offered three sizes—large, medium, and small—so participants could choose the one that fit them best. The emphasis was on ensuring that the garment didn't restrict movement, aligning with the idea that energy (*gi*) needs space

to flow. Although the two layers were constructed separately, we kept in mind that *hanbok* is itself a form of technology—one that influences how we engage with the world. In this sense, the *Haptic Hanbok* was a dialogue between two different technologies: the open structuring, *gi*-based worlding embodied in *hanbok's* material and form, and the vibrational motors programmed to vibrate according to the sound generated through the VR experience. Together, they shaped a new way of engaging both with the physical world and virtual experiences.

The current landscape of haptic wearable technology encompasses various strategies for delivering sensory stimuli. These systems are designed to engage the sense of touch in more immersive ways, employing a variety of techniques such as vibrations (e.g., vibrational motors embedded in gloves or clothing), force feedback (mechanical resistance or pressure applied to the skin), pin-array stimulation (arrays of pins or tacks that create pressure points on the skin), and electrocutaneous feedback (using small electrical currents to stimulate nerves). Each of these methods targets specific tactile receptors, and the technology is deployed on different body locations depending on the application context. The choice of body location for applying these stimuli varies, depending on the desired effect and application. For example, the arm is a common site for general-purpose wearables that need to deliver broad or low-fidelity feedback (Yao & Schaal 2015), while the finger is often targeted in designs that require high sensitivity and fine motor feedback (Pacchierotti et al. 2017).

The technical integration with VR was handled by Fardin. He guided the rest of the team to build a device that drives vibration motors using Arduino, a small programmable microcontroller often used for interactive projects and prototyping. Together with the *Virtual Sensing Knife* and *Haptic Hanbok* team, introduced in Le Calvé's chapter and part of this duograph, we explored different types and intensities of vibrational motors (fig. 7). → [Stretching Senses, 305](#) We first tried different commercial haptic wearables such as a Woojer vest for gaming and a low frequency massager attached to one's neck. We then experimented using a small breadboard (a construction base used for prototyping electronic circuits) leading to an Arduino board, audio analyzer, 21 vibration motors, bass shaker, amplifier for bass shaker, jack connector that connects the audio input from VR, micro-USB connector, and a USB power bank. The weight of



Fig. 7: The *Haptic Hanbok* making table

the motors mattered as they directly influenced the strength of vibrations. Heavier shakers were placed inside a pocket with straps, positioned around the lower chest area. This placement was an experiment to test vibrations that travel around the whole body, less focusing on direct contact with a precise location. If our aim was to amplify the vibrations we should have gone for the comparatively big and heavy bass shaker. Instead, we decided to opt for the smallest and lightest motors we could find, which are similar to the ones inside smartphones. Rather than shaking the body, we thought a gentle vibration would better suit our attempt to cultivate sensitivity and differentiate our approach from commercial haptic vests for video games.

The integration of VR technology into the *hanbok* introduced a novel embodied experience, reshaping both the sensory dynamics of the virtual system and the garment's structure. Through experimentation, we discovered that the placement of bass shakers and vibrational motors on specific parts of the body was crucial for enhancing the tactile experience. → [Stretching Virtuality, 92](#) However, acknowledging that everyone's body is unique, we needed a design that allowed the motors to be adjustable and easily accessible. Sealing the motors between layers of fabric proved impractical, as it would hinder flexibility and accessibility. Instead, we opted for an open design, enabling the motors to be repositioned or adjusted according to the wearer's needs.

Drawing on research about the impact of vibrations on various body regions (Zeagler 2017) and considering which areas of the loose *hanbok* fabric maintain constant contact with the body, we selected key points for motor placement: the neck, shoulders, and upper center back. Daniel led the pattern-making process, designing the *hanbok* so that the motors could be easily attached and removed during the exhibition.

Various experiments were conducted to determine the best pocket design for holding the motors. These pockets were not just functional; their materials and structure affected how the vibrations were felt. Some prototypes included filling the pocket with rice to dampen the vibration, others were inspired by the traditional *bokjumeoni* drawstring pouch from Korea. The final design opted for a slit pocket for easy insertion and removal of the battery and boards, while the motors were secured with modular square patches that could be hand-stitched onto the

garment. Additional pockets were created under the fabric to guide the wires, keeping them organized.

When everything finally came together—the sound, visuals, and vibrating motors integrated into the completed *Haptic Hanbok*—what had once been a series of experiments became a cohesive sensory experience. Over time, we became accustomed to this combination of stimuli, the way the *hanbok's* movement and vibrations complemented the immersive environment. Yet, I often found myself questioning whether the vibrational motors were truly necessary or convincing enough. Were they adding something essential or simply a novelty? I also nurtured a deeper question throughout the project: Can wearing something truly stretch the senses so profoundly that it transports the wearer into an entirely different way of engaging with the world? → [Stretching Practices, 31](#) This unresolved question would only be answered through the experiences of the exhibition's visitors. □ [Process, fig. 24, 286](#)



VISITORS AS CO-PERFORMERS: SENSORY RECEPTION AND ITERATION

After the lively buzz of the opening night, the exhibition settled into a rhythm of quieter days mixed with moments bustling with groups of visitors. These shifts allowed for more intimate encounters, where the exhibition mediators and I had the chance to introduce people to the *Haptic Hanbok*. Even before putting on the VR goggles, people start the sensory experience of *Virtual Sensing Knife* and *Haptic Hanbok* while wearing the clothing. Before it becomes a haptic device that connects the virtual world with the physical body, the *Haptic Hanbok* is something people wear, and in doing so they also become part of creating the scenery of the exhibition for other visitors. The *enclothed cognition* framework of social psychologists Hajo Adam and Adam D. Galinsky (2012) has been helpful in understanding the impact of wearing *hanbok* on the wearer's behavior and perception. They posit that clothing affects the wearer's behavior only when physically worn (not just imagining wearing it), and when the symbolic meaning is clear. The embodied research presented here suggests an alternative understanding where the world is a coagulation and dispersion of *gi*, with *hanbok* facilitating this vital energy flow.

The symbolic meaning of *hanbok* was conveyed through the words of mediators while helping the visitors to get dressed. The exhibition mediators were mindful of the meanings ascribed by various *hanbok* wearers and makers I have encountered during fieldwork. They played a key role in explaining the context of *hanbok* creation and assisting visitors in dressing, transforming their experience from mere observation to direct engagement. For the mediators to be more confident in guiding the audience, we prepared a document with some basic explanations of the *hanbok*, and a step-by-step video guide that showed how to wear the *Haptic Hanbok* and plug it to the VR device.



Fig. 8: 360° camera view of exhibition audiences wearing *Haptic Hanbok* and VR headset at TA T

More than other types of participatory activities within an exhibition space, inviting visitors to wear a certain garment highlights the aspect of transformation and performativity. → [Intermezzo 5, 351](#) By considering the audience as co-performers, the exhibition became a dialogical space, where visitor responses—whether physical, verbal, or emotional—add layers of meaning to the research (fig. 8). This perspective encourages a reflexive approach to research, where the researcher is not only studying an object or concept but is also studying the interaction between the object and the participant. By maintaining this reflexive, adaptive stance, the researcher can harness the exhibition as an evolving research space, constantly shaped by the interactions between participants, guides, and the exhibited materials.

Through varied interactions, I observed a spectrum of responses—some visitors were reluctant, while others embraced the experience fully, wearing the *hanbok* even after disconnecting from the VR headset. The tactile qualities of the *hanbok* and its interplay with movement provoked diverse reactions. Some participants, unfamiliar with the cultural context, hesitated to try it on, while others reported feeling a sense of integration, as if wearing the *hanbok* allowed them to become part of the larger narrative of the exhibition.

One visitor expressed how wearing the *hanbok* offered an opportunity to »bodily think and feel,« describing it as both stiff and flowing at the same time. The mediators played a crucial role in highlighting the *hanbok*'s design to encourage movement, which many visitors embraced by stretching their legs or walking around more freely. One participant even remarked that the act of wearing the *hanbok* felt akin to a ritual, likening the experience to a tea ceremony. The exhibition space also hosted events like the *XenoFauna Ceremony* in 2022, which further heightened the ritualistic and sensory exploration of the *hanbok*. This ceremony, led by Korean herbal alchemist Dambi Kim, combined tea, incense, and the history of the TA T space to create modern rituals that intertwined the *hanbok* with the spirits of sacrificed animals. These ceremonial events, although brief, added a layer of spiritual reflection, emphasizing the *hanbok*'s role in connecting visitors to more-than-human experiences.

Despite the immersive nature of the experience, technical issues were inevitable. Visitors wearing the *Haptic Hanbok* occasionally encountered difficulties—whether the VR headset's volume was too low to activate the vibrations or the battery of the *hanbok* was depleted. These interruptions, however, served as opportunities for iteration and learning. → [Stretching Virtuality, 98](#) The guides and I adapted to these glitches, refining the visitor experience in real-time. Each technical issue became a moment of discovery, shaping new understandings of the delicate interaction between the body, garment, and technology. Interestingly, the fact that only one hand of each visitor turned into a knife in the VR world created a choreography of movement. Visitors reported feeling more at ease after completing the cutting sequence, moving more freely as they explored the virtual tissues. Others, however, expressed discomfort with the virtual knife, some feeling disturbed by the harsh, crispy metallic sound it produced. A few visitors even recoiled in the elevator after discovering their hand had transformed into a giant knife, unsettled by the virtual-physical boundary blurring too strongly.

The *Haptic Hanbok* consistently encouraged deeper reflection on how our bodies engage with the environment. Many visitors shifted from passive observation to active participation, transitioning from intellectual to bodily engagement. Over time, the *hanbok* and VR headset became a familiar pairing, with visitors almost intuitively understanding how they worked

together. Lara Ladik, a frequent presence in the exhibition space as she worked on her master's thesis, commented, »I can't think of a VR headset without the *hanbok* anymore,« underscoring how the exhibition transformed these two distinct objects into a singular sensory experience. → [Stretching Virtuality, 85](#)

Toward the end of the exhibition, I spent time with Daniel, repairing parts of the *Haptic Hanbok* that had worn down, particularly the loosely stitched pockets holding the vibrational motors. Daniel reflected that the *hanbok* itself, even without the motors, felt »alive« in a strange way. He remarked that the vibrations added a layer of magic, like giving the garment a heartbeat, but wondered if the *hanbok* might already possess a sense of vitality without the need for electronic augmentation. Despite the *Haptic Hanbok's* technical complexity, some visitors found the vibrational feedback less distinct than expected. When asked if they could differentiate between the vibrations in different locations, several participants reported feeling a vague, unified sensation rather than discrete vibrations. This ambiguity led to ongoing reflection about whether the haptic feedback successfully conveyed its intended meaning—whether it enhanced the perception of *gi* flow and helped the wearer sensorially distinguish between different parts of brain tissue, or whether it simply resulted in a sensory overload, blurring the experience into indistinct noise.

Crucially, the visitors were not just passive observers but co-performers, shaping the exhibition as much as it shaped them. The interaction between body, fabric, and technology fostered a new level of sensory engagement, as each visitor's movements, responses, and reflections became integral to the evolving research on the *Haptic Hanbok*. The exhibition space became a site of embodied discovery, where the lines between subject and object, participant and researcher blurred and reformed with each interaction.

CONCLUSION: IMPLICATIONS FOR PLURAL TECHNO-FUTURES

The exhibition itself functioned as a space for research, where the act of making and wearing the *Haptic Hanbok* became a method of inquiry. By stretching sensory boundaries, the exhibition invited visitors to explore alternative modes of being, enabling them to step beyond the familiar. The act of donning a *hanbok*—an unfamiliar garment for many—alongside the

immersive VR technology allowed participants to engage with a relational cosmology, where the body, materiality, and digital environments interact in new ways. This sensory engagement highlights the role of exhibitions in creating safe, non-judgmental zones for experimentation, where individuals can challenge the limited material and sensory experiences typically encountered in their daily lives.

The fusion of Korean sartorial heritage, embodied through the *Haptic Hanbok*, with VR technology presents a powerful example of how pluralistic futures might be shaped by reimagining sensory experiences. This blending of »traditional« garments with immersive digital environments points to a future where technology does not exist in isolation but rather evolves in dialogue with diverse cosmologies. By engaging with this intersection, we open up possibilities for enabling sensory experiences that challenge the limited frameworks of everyday life.

The entanglement between heritage and technology deepens our understanding of both. Through the exhibition, participants stretched their sensory capacities, not only learning about Korean heritage but also experiencing new modes of interaction via haptic and virtual technologies. This created fertile ground for future transdisciplinary and transcultural research, where collaborations between fields such as heritage studies, technology, and design can lead to more diverse modes of how we engage with material and digital worlds.

Ultimately, the sensory experiences of the exhibition, rooted in the tactile and visual realms, open up broader conversations about alternative worldmaking. *Stretching senses* in this context is not merely an individual act; it becomes a collective exploration of how heritage and technology can co-create new ways of perceiving and engaging with the world. This exhibition acts as a reminder that future technologies do not have to be uniform but can be shaped by the richness of diverse cosmotechnical strands, leading to more vibrant, pluralistic techno-futures.

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