Intercorporeality with a Soft Telerobotic Incarnation.

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Abstract

This thesis is a post-phenomenological investigation into the use of soft robots as mediating bodies between humans that could unfetishise their imaginative figure of the stranger, in an event I call incarnation. Through my own encounters with Palestinians for the purpose of conflict resoluton and through readings of phenomenological and sociological studies, I determine the importance of the physical body, its fleshiness, nonlinearity and organic qualities for the construction of a meaningful and transformative dialog that can free us from stranger fetishism. Furthermore, I investigate the potential of nonhumanoid robotic avatars to liberate the interlocutors from prejudice and identity constraints. I propose the use of soft robots as a medium of reembodidemnt that could factilitate massive scale physical incarnations, creating physical encounters between people who are unable to otherwise meet in person. As a proof-of-concet, a novel method for the production of soft robotic avatars is introduced, capable of bodily haptics, language translation and animalistic emotional expression, accompanied by a web based software platform for an easy development of applications. Using this method, *Hitodama*, a first prototype for a soft robotic avatar is produced. I perform an intial evaluation of the robot in an encounter between people of different cultures, using an example app in which they examine their bias and prejudice of one another. I analyze the results by conducting interviews with the participans, following the principles of interperative phenomenological analysis. Finally the broad potential of artistic craftsmanship to assist in political transformation is debated, reaching the conclusion that a scientific perspective could be applied not only to the creation of the piece, but also to the estimation of its societal effect.

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Introduction

Manifesto

"Man has to perform an act of incarnation, for he is dis-embodied (désincarné) by his imagination. What comes to us from Satan is our imagination" (Weil, 2002, p. 54). This intuition by French philosopher and political activist Simone Weil captures the core of this thesis and the underlying motives for the production of *Hitodama* - A soft robot for a mediated incarnation. My guiding principle is, and has always been since I was discharged from my military duty, the use of cutting edge technology for social well-being. Throughout my evolution as a developer, I slowly drifted away from paths of algorithmic rationality and abstract, alienated coding and into questions of meaning and existence. Following my Bachelor's degree in Philosophy of mind and Neurobiology, I have sought ways to transcend my institutionalized role of a programmer and apply the knowledge I have gained to challenge pressing issues of our society, and in particular, my own society in Israel.

Ever since its formation, Israel has been divided between two nations, Jews and Palestinians. Due to the events of the 1967 "six day war", and until this very day, most of the Palestinians reside under Israeli military occupation. Access restrictions enforced by the Israeli government prohibit the crossing of populations between the nations and inhibit the Palestinians' mobility. A 700-kilometer-long concrete barrier surrounds the "Green line" that separates Israel from the West Bank – the area that currently holds the largest population of Palestinians within the former mandatory Palestine that lies between the Mediterranean sea and the Jordan river. While the crossing of Israelis to the other side is, at best, frowned upon, and at worst institutionalized and encouraged in the case of settlements; the Palestinians endure stricter restrictions, not only across the West Bank, but also within it. Multiple checkpoints divide different areas of the land and force the Palestinians to face military control on a daily basis.

Growing up in a middle-class, liberal Israeli family, in Tel-Aviv of the 90s is a self-conflicting experience. The discourse oscillates constantly between hope for peace and prosperity to the despondence of war and carnage. The surrounding scenery changes quickly from a decadent lifestyle of beaches and high tech offices to a life amidst a war zone of missiles and suicide bombings. Throughout these changes, people are constantly immersed in media spectacles of tragedy that provoke our sensation of social unity; a sense that is reinforced by the nation wide military conscription and the omnipresent memory of the holocaust. From an Israeli liberal point of view, the conflict is associated both with guilt and resentment for the injustices toward the Palestinians, but also with necessity and a justification of self-defense against a lethal threat to the body of our nation. As a result of this strange mesh of emotions, one develops a self-contradictory and somewhat post traumatic image of the Palestinians: They represent, on one hand, a source of danger, and on the other, a marginalized and abused population. Their behavior is both condemned and justified, they are both terrorists and freedom fighters; they are to be reconciled with, but could not be

fully trusted.

A phrase transition in my life occurred in the summer of 2012, when I landed on an opportunity to join a two-week conflict resolution workshop in Germany. The initiative, as started by an Israeli and a Palestinian who formed a relationship through mutual work, grouped young adults from both sides, carrying their hopes and doubts, to sit and talk together in one shared space. The participants in fact lived no more than a hundred kilometers away from each other, and yet, they were so infinitely apart in practical terms that the most reasonable place for them to meet was in a separate continent, 4000 kilometers away. Moreover, the two groups could not even meet during the journey to the Germany, because movement restrictions compelled the Palestinians in our group to take a detour through Jordan, rather than taking the shortest path through Israel's airport.

Since the conflict between the nations is very much situated in the land of Israel/Palestine, meeting at a relatively neutral and distant location was also constructive. As noted by Nietzsche (2001, p. 134) : "Egoism is the perspectival law of feeling according to which what is closest appears large and heavy, while in the distance everything decreases in size and weight" . Albeit Germany plays significant role in the conflict with its great effect on the historical processes that lead to the formation of Israel as the home of the Jewish people, it was, nevertheless, easier for the parties to bridge the gaps without the unnerving presence of soldiers and the affect of this blood-soaked land.

Up until then, the closest encounter I have had with a Palestinian was an occasional crossing with a nearby "Israeli-Arab". This controversial term can be accounted for an attempt to sequester the national aspirations of the Palestinians that ended up under Israeli jurisdiction during the 1948 war for its independence (Peleg & Waxman, 2011, p. 26). To this day, the 1948 war marks both a national holiday for Israelis and a monumental catastrophe, or "al-Nakbah", for Palestinians, due to hundreds of thousands of them being driven out from their homes and becoming refugees in the neighboring countries. As for 1967 Palestinians that found themselves out of Israel's borders after its formation – they are currently living under either siege in Gaza or under military occupation in the West Bank. Naturally, my encounter with them has been strictly imaginative or digital – this was about to be my first physical encounter with the *Other*.

I remember the anticipation I felt as we arrived, in pouring rain, to our host institution "Jugendakademie Walberberg", a youth center and hostel in a remote village close to Cologne. The Palestinians were already waiting for us at the rendezvous point, waving their national flags, demonstrating unity. Upon meeting the embodied strangers face to face, I experienced what could be described not only as an emotional turmoil, but also to some extent a spiritual event. A vertical motion in which transcendental forces and ideas sedimented within a body, only so that they can once more coil up within themselves, and transcend along their historical contingency to emerge a true found *Logos* – the voice and ideas of the strangers in their corporeality. The *Other* was no longer a fetishized stranger, but a verified existence - Weil's intuition of incarnation was validated. After this event, I felt grounded, more open to difficult discussions

and was able to obtain a sense of pain relief. It was as if the corporeal presence of the Palestinian in front of me had untangled and mended short-circuits that existed in my mind, and from then on, everything felt more natural.

At the end of the workshop in Germany, we were asked to think on how we can utilize what we had gained toward the upcoming future. At that moment, I felt a great sense of duty – I was to use my software engineering skills to bring about this event that I experienced to a massive scale, to enable conflict resolution for the masses until a critical point of the nonlinear system that is society is reached, and the democratic process is shifted toward peace-making. I did not consider at first that corporeity as such, is a crucial ingredient for this process. I simply aimed toward a free and expressive virtual encounter between conflicted strangers; whether through games, music, chatting or other forms of online communication. Now, however, I would like to contend that the virtual reality is insufficient for a true determination of history, and for a true transformation of the individual. Through the Merleau-Ponty's phenomenology and post-colonial theories of Sarah Ahmed, I would argue that a biomimetic embodiment is necessary for intersubjective dialectics that determine the style of our social existence. The physical flesh of our subjectivity in time and space, and our physical interaction with the other, demarcates our being in this world and form our social identity. This realization led me to pursue the technological solution for an efficient, mobile and expressive re-embodiment, a *techno-flesh*; one that can cross borders, separation barriers and facilitate events of incarnation when a physical encounter is not possible. I found the answer in the form of a soft Robotic re-embodiment, a modern-day incarnation, an Avatar for pain relief.

In this thesis, I establish a theorem regarding the importance of embodiment in social transformation; I then ask the question of whether a remote re-embodiment, a techno-flesh, could exhibit the same power for social dialectics as a direct encounter, and if not, how can we bring it as close as possible to the actual thing. I will outline my journey for constructing a telepresent soft robot that can serve as a mediator between subjects in conflict, knowing that I will first and foremost test it in the land of Israel and Palestine, but hoping that it can be applicable to any situation of conflict or other situations of social and physical gaps. The implementation is put to preliminary testing and is evaluated for future work. I invite the reader to join me on this journey of transcendent hope and corporeal suffering.

Thesis goals and method

The core question of this thesis is that of technological mediation. Despite the famous saying by post-phenomenoligst Don Ihde that "human activity from immemorial time and across the diversity of cultures has always been technologically embedded" (1990, p. 20), there is a vast spectrum of experiences that branch out of different technologies and different use cases of mediation. The saying is perhaps true in the broad sense of mediation, since we are always perceiving the world through matter, but it is not only the presence of the medium

that matters, but also its style.

In any mediated interaction that is not a direct encounter in a shared physical space, a symmetry break occurs. The two conversing subjects are no longer sharing the same medium of communication as they would be if they were simply standing in front of each other; an experience gap is opened. The conditions of the two interlocutors could be quite similar, for example when two people are having a Skype call through their laptops, but in many other cases the situation can greatly vary, for example when one person is controlling a robot using their phone while the other is physically interacting with that robot. Thusly, if we want to consider the right medium for particular use case, we must look at the experience from three different perspectives: 1) In regards to the *receivers* communication at any given moment, How do they experience the presence of the *transmitter* with them in the same space? How much of the other side's corporeality is being perceived through the medium? For our use case, we would like the transmitter be incarnated, such that it could free the receiver of its fetish, prejudices and bias regarding the transmitter's body and identity. This aspect is discussed in the chapter titled **"Phenomenology of Incarnation"**. 2) In regards to *transmitters* of communication at a given moment, how much do they feel present in the remote location in their flesh? Do they have a sense of agency and ownership of their actions and do they feel freedom to express their core values? For our use case, the transmitter should feel comfortable discussing more intimate and even conflicted subjects as to generate empathy and obtain relief. This aspect is discussed in the chapter **"Phenomenology of re-embodiment"**. 3) In regard to mutual perspective of intercorporeality and multimodal communication, are there sufficient ways of expression for a meaningful encounter? Are there mechanisms of interaction and dialog that allow the interlocutors to bypass the hurdles of the medium and flow freely into conversation? This aspect is discussed in the chapter **"Mutlimodal intercorporeality"**.

Once those aspects are determined, several choices of mediums are stacked up one against the other in a comparison chart, listing their advantages and disadvantages for the task from each of the research perspectives, finally explaining the selection of soft robotic telepresence as the medium of choice. In addition to the phenomenological analysis, more practical aspects such as accessibility and feasibility will be taken into account. With the chosen medium, the soft robotics research for *Hitodama* is presented, outlining the design choices and the production method for head, face, neck and arms along with phenomenological reflections. Finally, the user test is analyzed and the aesthetic implications are discussed.

Phenomenology of Incarnation

Stranger Fetishism and the Circulation of Emotions

We begin with a further investigation of the conditions that led to the above event of incarnation. As noted, prior to the encounter, I had nothing but an image of a Palestinian; the so called *Other*. An image that was fed by media, by conversations, by my own internal processes, none of which originated directly by a Palestinian, co-inhabiting my own time and space. I have developed a milieu of emotions toward this image that were by definition generalized and prejudiced, since they were oriented toward an abstract entity, a generalized identity. Moreover, these emotions tended to be posited on more extreme ends of the emotional spectrum, either being strongly negative or strongly positive.

This phenomenon is symptomatic to what is described by Sara Ahmed as "Stranger Fetishism". In her book *Strange encounters* she defines it as "a fetishism of figures: it invests the figure of the stranger with a life of its own insofar as it cuts 'the stranger' off from the histories of its determination." (Ahmed, 2000, p. 5). The epistemological gap of the stranger in its corporeality leaves an opening for an over-representation; a figure of our imagination that we endow with deep emotional value. Ahmed borrows the term "fetishism", both from a Marxist perspective of "commodity fetishism" and from a Freudian perspective of a phantasmic substitution.

Let us first examine the Marxist perspective. In *Capital: Vol I*, Marx explains his notion of commodity fetishism (Marx, 2015, p. 47). The fetishism lies in the Bourgeois's inability to discriminate between the commodity item's inherent and physical history - such as labor time, materiality and use, and its abstract value that is determined by the social relations of exchange: "A commodity is therefore a mysterious thing, simply because in it the social character of men's labour appears to them as an objective character stamped upon the product of that labour" (Marx, 2015, p. 47). When we assign a monetary value to a certain item, we in fact conceal the fact that this value is a result of a social and historical process, and it appears as if the value is an objective property of that item. Ahmed equates this process to the fetishization of the figure of the stranger. So in this case, the 'commodity object' that is tied to a material basis would be a corporeal person of some social identity, while the value that we assign to it is the abstract figure of the stranger. Much in the same way, we are prone to assign our prejudices, that are a product of social exchange, as actual qualities of a person. (TODO: Something about reification)

The Marxist analogy becomes even more interesting when we examine the economical circulation of emotions that are associated with the stranger. In her later book, *Cultural Politics of Emotion*, Ahmed identifies a relation between the circulation of abstract monetary value during commerce and the circulation of affect involving strangers in society (Ahmed, 2014, p. 45). In his discussion about the general formula of capital (Marx, 2015, p. 104), Marx explains the importance of the transition from the more simple form of trade: Commodity-Money-Commodity (C-M-C), to the more modern form of Money-Commodity-

Money (M-C-M). In the former, more simple form, money is used only as an abstract mediator between two objects that are grounded in their materiality and use-value. For example one would sell their produced crop of corn to obtain money, which would then be used to buy cloths. However, in the latter form of M-C-M, the accumulation of abstract value is the end goal of the transaction, and since the only use of the money is to further accrue it, the process is endless. Thus, value, or circulated capital "suddenly presents itself as an independent substance, endowed with a motion of its own, passing through a life-substance of its own, in which money and commodities are mere forms forms which it assumes and casts off in turn" (Marx, 2015, p. 107). The same effect, Ahmed suggests, occurs when the imaginative figure of the stranger, and its associated emotions are circulated throughout society. Ahmed provides as an example the discourse surrounding asylum seekers in the UK. Leaders of the conservative party have created a frightening image of the asylum seeker, one that is not only "flooding" and "swamping" the nation, but is also disingenuous in their intention; faking the need for asylum in order to be able to reside in the country. This discourse is passed around, from speech to speech, from media report to office conversations, all while breathing life into the imaginative figure and accumulating affect, intensifying the associated negative emotions. The reason for this intensification is exactly that which enables the accumulation of capital; its disassociation with anything physical that can set its bounds. According to Ahmed "The impossibility of reducing hate to a particular body allows hate to circulate in an economic sense, working to differentiate some others from other others, a differentiation that is never 'over', as it awaits others who have not yet arrived. Such a discourse of 'waiting for the bogus' is what justifies the repetition of violence against the bodies of others in the name of protecting the nation" (Ahmed, 2014, p. 47). She notes that her analogy to Marx is limited, since her "argument does not respect the important Marxian distinction between use value and exchange value" (Ahmed, 2014, p. 45)", yet it is imperative to recognize the metaphysical similarity between the two notions of circulation. In both, a lack of access to the worldly *flesh* of things, whether they are a stranger or a commodity, drives the emergence of an abstract image. The circulation of the image in society only intensifies its perceived reality, and the powers the projection of strong emotions toward that image.Once an individual of the targeted group, let us say a Muslim asylum seeker, is encountered, whether through media or in person, an event occurs which Ahmed refers to as"the 'sticking' of signs to bodies" (Ahmed, 2014, p. 13). The accumulated imaginary value that was intensified by circulation *sticks* to the body of the stranger and appears as if it is an inherent quality of that body.

The discussion on projection and stickiness leads us to the Freudian view of fetishism. Ahmed suggests that the "process of fetishisation involves, not only the displacement of social relations onto an object, but the transformation of fantasies into figures" (Ahmed, 2000, p. 5), she slightly backtracks in the corresponding footnote (Ahmed, 2000, p. 182), arguing that the Freudian model is less suitable, since it privileges the phallus (or lack thereof in women), as that which is being concealed and substituted by the fetishized object. It is

however important to note that in Freud's account for fetishism, it is described as "habitually present in normal love, especially in those stages of it in which the normal sexual aim seems unattainable or its fulfilment prevented" (Freud, 1953, p. 154). Once more is the tendency to ascribe emotional value to an object, as a substitution for a physical state that is non-accessible. We can observe a similar notion at the other end of the emotional spectrum when dealing with the "uncanny". The term was first explored psychologically by Ernst Jentsch (1997), defined as an uneasy feeling of "psychical uncertainty" (Jentsch, 1997, p. 5) that arises when something unknown and foreign is encountered in correlation to something old and familiar, for example when we are uncertain if a certain character is a human person or an automaton. Freud expanded on that notion, claiming that the "uncanny is in reality nothing new or alien, but something which is familiar and old-established in the mind and which has become alienated from it only through the process of repression", citing examples of repressed phenomena such as "animism, magic and sorcery, the omnipotence of thoughts, man's attitude to death, involuntary repetition and the castration complex" (Freud, 1955, pp. 241–242). Nevertheless, there is a resemblance between the uncanny and fetishism. In both cases, a certain inaccessibility to the true nature of an object, a certain gap, serves as an incubator for repressed desires or fears toward that object. The conviction that positive and negative emotions are in many occasions interchangeable is also supported by Ahmed (2014, p. 50). She defines hate as a form of intimacy that is in fact predicated by love, citing Gordon W. Allport's classic account *The Nature of Prejudice*: "a symbiosis and a loving relation always precede hate. There can, in fact, be no hatred until there has been long-continued frustration and disappointment" (Allport, 1954, p. 215). This is all the more supported by neuropsychological studies such as one performed by Zeki and Romaya (2008), showing that hate and love share overlapping neuropsychological mechanisms.

Whether it is fear, love, hate or any other emotion, the impossibility of truly knowing a subject may lead to figure abstraction and ultimately to fetishisation: an emotionally attached relation between us and an imaginative figure. Such a relation, as any highly emotional attachment, is prone to addiction and obsessiveness. Moreover, as we've seen, the figure can gain a life of its own and intensify once it takes part in social circulation. Surly, this effect is not simply triggered on any subject that is only partially known; it requires a starting point, an initial value, a birth of a figure. It could be a reported incident involving an asylum seeker, or a mysterious encounter with an attractive individual. If out relation to the abstract figure would remain in the transcendent realm, it wouldn't have been a major cause for concern, but the relation is naturally cast back into a living subject, resulting in peculiar behavior at best and violence at worst. It remains to be asked, how does one "truly" know a subject? How do we "unfetishise" the stranger? As Marx's example suggests, there may exist a pivotal role to physicality, to corporeality. Thinking about today's virtual and digital methods of social interaction, how does a typical WhatsApp conversation contribute to social relations? It is well agreed upon (TODO: **REF**), that indications of the users' status such as "typing" or "seen message", cre-

ate mystery and thus only incubate the fetishized figure, not to mention more enigmatic ways of knowing individuals such as through their social feeds. Yet it seems that even a direct Skype conversation is somewhat lacking (TODO: REF?). The exact cause is elusive, and perhaps only manifests unconsciously, but a virtual encounter always leaves some room for interpretations regarding individuals and our relation to them. Is it body language that we are missing? Some nuance of speech that is not transmitted accurately over the fiber optic cables? Or is it something even more fundamental? To illuminate the significance of the intercorporeal interaction, we turn to the phenomenology of Maurice Merleau-Ponty.

Flesh and Intercorporeality

How is the physical different from the virtual? How is the real different from the imaginary? These kind of questions quickly evolve into the most fundamental questions of *being* and Consciousness. Queries that have troubled man-kind in both east and west since the beginning of history. However, we are not simply looking for any perspective on the meaning of life and existence; we are looking for one that bestows special status to the physicality and embodiment of the human connection. One that investigates into the corporeality of the *Other* as a medium and a foundation of affect and knowledge, that incorporates the *Other* into *Being*. There is no better place to look than the phenomenology of Maurice Merleau-Ponty.

Phenomenology is a discipline of philosophy that is firstly attributed to Edmund Husserl, but spans a wide range of thinkers and methods (Smith, 2018). Husserl defines it as a "science of essence", pertaining to the a priori intuitions of consciousness and experience (Husserl, 1982, p. XXII). The discipline of phenomenology can be seen as a historical development which stems from the intuitions of the greatest thinkers of western philosophy such as Descartes and Kant; the intuition that if we are to know anything about the world, it has to start with our conscious experience and its intuitive structures. Merleau-Ponty joins this project with his most widely acclaimed work *Phenomenology of Perception* (Merleau-Ponty, 2013). In this work he reminds us that any pure conscious experience is nevertheless an act of the body, that perception is a bi-directional interaction of our body with the world, inhabiting time and space. This implies that "learning", and even "thinking" are all intentional bodily actions upon the world, and should be investigated as such. According to Merleau-Ponty, insofar as we develop as a body, the range of possibilities is gradually "sedimented" into our physiology, and we become habituated, adjusted to the world that surrounds us. This is not a solipsistic act, since we always co-develop our social identity in concordance with other inhabitants of the world. Despite being written in the 1940s, this approach is relevant today even in regards to modern neuroscience, especially to researchers that inspect the brain as a self-organized non-linear dynamic system that dissipates into the open environment. One of those researches was Walter J. Freeman, a scientist of *Neurodynamics*. In his book *How Brains Make Up their Mind*, Freeman argued

that the brain operates as a self-organized complex system of nerve cells, that is arranging its "attractor landscape" in concordance with the outside world. Input from the outside environment triggers this dynamic system into a trajectory of patterns that determines our behavior. Freeman cites Merleau-Ponty numerous times, asserting his intuition of bodily perception and assimilation of the world's structures. (Freeman, 2000, pp. 125–127). An even more radical scientific manifestation of Merleau-Ponty's theories can be found in theories of *Quantum Neurodynamics*, that portray the brain as a dissipative quantum field that melds with the external world. Quantum neuroscience researcher Giuseppe Vitiello refers to the "openness of the brain to the external world" as dissipation (Vitiello, 2007); Merleau-Ponty uses very similar phrasings in his theories, maintaining his focus on the entire body, rather than just the brain. Such thought is linked to even more modern theories, for example regarding the roles that gut microbes play in shaping our behavior (Dinan, Stilling, Stanton, & Cryan, 2015). The intuitive investigations of Merleau-Ponty are proven to be scientifically sound even decades after they were written. (TODO: Write about Enactivism).

In final published works of Merleau-Ponty: *The visible and the Invisible* (1968), a work that is incomplete due to his untimely death at the age of 53 and was published posthumously, and *Eye and Mind* (1964, p. 159), an essay about aesthetics and metaphysics, Merleau-Ponty starts laying down his own ontology - the ontology of *flesh*. He critiques previous ontological interrogations of existence and begins to divulges his own theory, placing a great emphasis on how our relationship with the *Other* is crucial to our understanding of metaphysics; after-all, it is the basis for our existence as social beings. The underlying question, however, is still one of *knowing*. What exists? What is true? How do we make the logical leap from being immersed in a vivid experience of life, to devising positive facts about our world, ourselves and others? Merleau is critical of "philosophies of reflection", primarily referring to those of Descartes and Kant that could be considered as forms of Idealism. The proverbial *Cogito* - "I think there for I am", intuitively shifts our attention to the world of *thought*. We cannot directly know and access the world outside of our body, except through the mediator of thought. Through reflection and logical analysis, we deduce whether our experience is that of perceiving the real outside world, or that of imagining. By examining the consistency of change in our inner world, in relation to our actions and our body, we assert the geometrical rules of the world. Our interaction with the world is passive; we consume light that is coming from things, and organize it according to our logical structures. What does that suggest regarding our relation to others? "If then the others are thoughts, as such they are not behind their body which I see — they are, like myself, nowhere; they are, like myself, coextensive with being, and there is no problem of incarnation". Reflection is thus "the simple transposition of the incarnate subject into a transcendental subject and of the reality of the world into an ideality" (Merleau-Ponty et al., 1968, p. 31). Hence, intuitively we disregard the others in their physicality: "there is no intermundane space, there is only a signification 'world' " (Merleau-Ponty et al., 1968, p. 53). In *Eye and Mind* Merleau-Ponty

argues that painting is the ultimate manifestation of *Being* in all its depth. A Cartesian view of vision however, is insufficient in its understanding of the world around us: "A Cartesian does not see himself in the mirror; he sees a dummy, an 'outside,' which, he has every reason to believe, other people see in the very same way but which, no more for himself than for others, is not a body in the flesh." (1964, p. 170). From these writings it is clear that this form of idealism is perilous, because it encourages the reduction of individuals to thoughts, of actions to signs and of bodies to images. Such a view may lead Sarah Ahmed's notion of fetishisation of the *Other*.

Idealism has another fundamental flaw in its logic, and that is its circularity - the fact that the rules of perception and the relation between subject and object, are defined using the same logical constructs that they induce. How could we formulate the relation between ideas and things, when all we have is our pure experience that has no inherent logic of subject and object? What is the primal a priori basis for the notion of space? Who is the circumscribed "I" that thinks therefore it exists? These logical loops sprouted other philosophies of experience, such as *Being and Nothingness*, the title of Jean Paul Sartre's essay on ontology (Sartre, 2012). Sartre recognizes that our subjective experience is in fact all there is, this *Being* that we endure encompasses everything and leaves no room for a subject or object. What then remains to our subjectivity is merely a vessel for *Being* - a *Nothing*, a negation of everything. We are solely a "a fissure that deepens in the exact measure that it is filled" (Merleau-Ponty et al., 1968, p. 53). Sartre states that "man is the being through whom nothingness comes to the world" (Sartre, 2012, p. 24), referring in fact to our freedom of choice. The ability of the human consciousness to create a distance from the totality of *Being*, to "secrete a nothingness which isolates it" (Sartre, 2012, p. 24) and to act for itself, is Sartre's idea of freedom. Nevertheless, Merleau-Ponty reminds us that our concrete body, our thoughts, our subjectiveness, those are all still parts of a *Being* that lies at a close distance to the nullified self. Where, then, is the place of the *Other* in such *Being*? It is clear that if *Being* is everything, then my body and situation share the same *Being* as the *Other*'s body and situation, an intermundane space is emerging. But more than a cooperation, the interaction with the *Other* is a vortex that drains into my nothingness: "The experience of the other's gaze upon me only prolongs my inward conviction of being nothing, of living only as a parasite on the world, of inhabiting a body and situation". (Merleau-Ponty et al., 1968, p. 62). The *Other* is there, reaching me, touching me, but I cannot reach its essence, it is transcendent. For me, there is only one nothingness and that is my own, my own freedom. I can only view the *Other* as a superficial clone of myself. This type of analysis, Merleau-Ponty states, "makes of the other an anonymous, faceless obsession, an other in general" (Merleau-Ponty et al., 1968, p. 72). As explained by Jack Reynolds (2014, p. 134), Sartre is accused of ignoring "the way in which otherness is always intertwined with subjectivity". This inscrutable gap between the *Other*'s will and the flesh of the world pushes us once again into the chasm of fetishism. In one of the footnotes in *The Visible and the Invisible* (Merleau-Ponty et al., 1968, p. 81), Merleau-Ponty notes a more general problem in what he names "philosophies of the

negative", such as the one posed by Sartre: they tend to refer to to the problem of *the* other and not *an* other; "a non-I in general". This generality is exactly the type of abstraction that Sarah Ahmed is problematizing in her work. The connecting thread between *Stranger Fetishism* and the philosophical critique of Merleau-Ponty is our ability to view the *Other* as a subjectivity in the flesh, as a body whose consciousness is interconnected to our body, perhaps only then we can truly respect the other's alterity, inspect its nuances and perceive our interactions without prejudice. Merleau-Ponty defines this as *intercorporeality"*.

The final chapter in *The Visible and the Invisible*, titled *The Intertwining-The Chiasm*, is Merleau-Ponty's last and only attempt to devise a positive ontology of the world, the ontology of *flesh*. Albeit the thoughts end abruptly, this chapter and its surrounding notes and essays lay a foundation to a vast array of contemporary philosophy. Ironically, as a prerequisite to the ontology Merleau-Ponty asks us to give away our primal need for absolute logical truth, for a *thesis*. To retreat the Bird's eye view of idealized logic, to live in the moment. Any attempt for logical truth would be sucked into an enveloping *Being*, leaving only a void *Nothingness* at the core. Instead, he proposes a dialectic that is an endless interrogation, void of significations "We are not asking ourselves if the world exists; we are asking what it is for it to exist" (Merleau-Ponty et al., 1968, p. 96). It is futile to try and freeze the notion of *Being*, because we are an inseparable part of it. The world that we are trying to resolve is perceived only by us, a body that is part of that world. "The effective, present, ultimate and primary being...offer themselves therefore only to someone who wishes not to have them but to see them, not to hold them as with forceps, or to immobilize them as under the objective of a microscope, but to let them be and to witness their continued being" (1968, p. 101).

Our recognition of the world stems from the fact that we are of it, the seer is also visible. Our body perceives under the same rules that the universe operates, all made of the same *flesh*. Of course, we maintain our *invisible* state, our private experience of colors, sounds and feelings, but that experience is directly attached to the same flesh, and is a direct result of our body's openness to the world. Then, every action we take or idea we conceive is a physical response of our body to the world. The conception of an idea is nothing but "coiling up or redoubling" (1968, p. 114) of the bodily experience. It is out body sensing, then modifying itself, learning something new, only to once again open up and interact with the physical world, whether it is by speaking out or any other act. This is a somewhat of a general abstraction to John Dewey's "Learning by Doing" (1923): According to the theory of *flesh*, even reading a book would be an active physical movement upon the world in which our eyes touch the pages of the book as we sense reactive force with our entire body: "between my body looked at and my body looking, my body touched and my body touching, there is overlapping or encroachment, so that we must say that the things pass into us as well we into the things" (Merleau-Ponty et al., 1968, p. 123). Could an increased exertion of the body lead to an increased capacity of learning? A 2012 study by the Finnish national board of education reviewed the recent research on the subject and concluded that this is indeed the case,

noting that "motor and cognitive skills would appear to develop hand in hand, because the same mechanisms of the central nervous system are responsible for controlling both motor and cognitive skills in parallel" (Syväoja et al., 2012). We are interested, however, not only in the learning and assimilation of simple facts such as Newton's law of mechanics, but also in the internalization of social meanings such as the image of the stranger or the acquisition of new behavioral patterns in society.

For Merleau-Ponty, our interaction with another human being is what validates our existence in this world, in the *flesh*. It provides us the recognition that we are visible as much as we are seeing. This recognition is based, according to Merleau-Ponty on a primordial intuition that we all all of the same *flesh* in the same universe, that our actions are undeniably seen by another as much they are seen by us. He makes the bold statement that the subjective experience of another is not completely hidden from us, because it is physically manifested in our shared space: "it suffices that I look at a landscape, that I speak of it with someone. Then, through the concordant operation of his body and my own, what I see passes into him, this individual green of the meadow under my eyes invades his vision without quitting my own, I recognize in my green his green" (Merleau-Ponty et al., 1968, p. 142). This recognition opens before us the entire universe of intersubjective being, since by transitivity we are all seen and touched by one another: "What is open to us, therefore, with the reversibility of the visible and the tangible, is— if not yet the incorporeal— at least an intercorporeal being, a presumptive domain of the visible and the tangible, which extends further than the things I touch and see at present." (Merleau-Ponty et al., 1968, p. 143).

This conviction could be interpreted in a weaker or a stronger sense. In the weaker sense, it lays the foundation to social aspects of contemporary cognitive science disciplines such as enactivism and embodied cognition, as well as philosophical concepts as Performativity. Research in those fields asserts that we define and express our social identity through bodily interactions with others - Through acting, reenacting and resonating to the physical actions of others. For example, the phenomenon of *mirror neurons*, although much more complex than the popularized interpretation of its name, is still being researched today and is exemplifying models of how the perception of bodily actions by another resonates within the correlating areas of our own motor cortex (Craighero, 2014). Another notable example comes from a phenomenon known as social rhythmic entrainment - It describes how people bond through synchronized movements, whether they are dancing together to the rhythm of music or or even walking at the same pace (Stupacher, Wood, & Witte, 2017). In the stronger sense, however, intercorporeality is not only our social, epistemic backbone, but our metaphysical one as well. It is constitutive to our sense of existence and our faculty of perceiving reality. This notion might explain why losing our social meaning may feel like a violation of our own existence. It also deepens role of physicality in our own subject of matter, the encounter with the fetishized stranger. If the bodily interaction with another is so significant that it reaches into the core of our being, it must be necessary for any kind of transforma-

tion to occur in our belief systems. In an interview with Dr. Yael Berda, an Israeli sociologist and political activist who focuses her work on the intrinsic social mechanisms of the West Bank occupation, she described her experience of crossing the separation barrier (Litman, 2018). According to Dr Berda, in order to relieve ourselves from our instinctive fear of the Palestinians, we must undergo a physical experience of crossing to the other side, because the fear is in the body. This sentiment is affirmed by Sarah Ahmed, who analyzes fear as dynamics of shrinkage and expansion of bodies: "fear works to restrict some bodies through the movement or expansion of others." (Ahmed, 2014, p. 69). For Ahmed, fear has an element of demarcation, effectively determining which bodies pose a threat and which bodies are under threat. It is then no surprise that Dr Berda, and myself included experienced such a transformation and relief simply through physical movement. The movement in itself was an act of liberation.

Now that we have determined the importance of corporeity for a transformative and meaningful social encounter, we must ask the question of whether an event of incarnation, i.e the physical grounding of an encounter with a body that previously existed only as a fetishized image of the stranger, can be mediated using technology. Such a mediation would clearly cause attenuation - A reduction and an abstraction of the subject's corporeality into a different set of signals. On the flip side, it would allow us to increase the accessibility of encounters, to perform them on larger scales and perhaps even to grant more freedom to the interlocutors as a result of the mediating layer serving as a protective shield. In essence, we wish to try and replicate as much as possible of Merleau-Ponty's concept of *flesh* when it is mediated by technology. The term *techno-flesh* was coined by Peter-Paul Verbeek, one of the pioneers of postphenomenology, as part a keynote he presented at Tel Aviv university (Verbeek, 2016). Postphenomenology, a discipline originally founded by American philosopher Don Ihde, seeks to explore the relations between humans and technology from a phenomenological perspective. We would turn our focus now to research in this field that may help in our quest for achieving techno-flesh.

Postphenomenology and techno flesh

In a work by Aud Sissel Hoel and Annamaria Carusi Merleau-Ponty's writings are analyzed in an attempt to extract his views on technology in relation to his ontology of flesh (Rosenberger & Verbeek, 2015, p. 73). According to Hoel and Carusi, the basis for Merleau-Ponty's view on technology lies within his general critique of what he refers to as an operationalist view on science, as outlined in "Eye and Mind" (Merleau-Ponty, 1964). Merleau-Ponty denotes the mistake in viewing the products of science as a representational reality, external to the things themselves and isolated from the bodily perceptive processes that conceived them. He compares that to painting, which he asserts is a direct manifestation of our intertwined experience of perception. The incorrect view on science is traced back to Descartes "whose theory of vision fails to recognize the internal complicity between vision and world" (Rosenberger & Verbeek, 2015, p.

78). However, Merleau-Ponty does not criticize Descartes' theory of a virtual mathematical space in itself, but only the operational way of thinking about that space as an ontological truth. His solution through flesh, according to Hoel and Carusi, is what differentiates the theory postulated in *Phenomenology of Perception* and his later writings. In *Phenomenology of Perception* Merleau-Ponty articulated the role of the body in raw sensory perception, but was unable to account for the creation of conceptual meanings, leaving us with a withstanding dualism of body and thought. With flesh, however, ideas, concepts, perception and matter are all of acting under the same fleshy medium. For this, Hoel and Carusi have "coined the term the "measuring body" to emphasize the "in-each-otherness" (Ineinander) of the material and ideational aspects of mediation" (Rosenberger & Verbeek, 2015, p. 79). A measuring body is anything that participates in a system of interaction in the common space of our universe. Since it operates within the same flesh, it exhibits what Merleau-Ponty refers to as a general style of being (Merleau-Ponty et al., 1968, p. 109) that can be recognized by any and intertwined with any fleshy agency. This includes both perception and ideation, but it is accentuated that in accordance with Jakob von Uexküll's notion of *Umwelt* (Von Uexküll, 1982), one that was also favored my Merleau-Ponty, each measuring body exists operates and transforms under its own world of meaning while still participating as a part of a bigger whole *interworld* (Hoel & Carusi, 2018, p. 16). The metaphor of *circuit* is also used to describe the "space of mutual and co-constitutive interactions" (Hoel & Carusi, 2018, p. 11).

How do tools and technologies participate in this fleshy circuit? Hoel and Carusi refer us to Merleau-Ponty's discussion on 'technical objects' in *Eye and Mind* (Hoel & Carusi, 2018, p. 20). While Merleau-Ponty's discussion focuses on the mediating and reflexive properties of paintings, he mentions them to be at the same category of tools and other techniques of the body that "outline and amplify the metaphysical structure of our flesh" (Merleau-Ponty, 1964, p. 168). For Merleau-Ponty, a painting is unlike a thing of all things that is observed passively by a viewer. A painting contains the embedded carnality of the painter and is constantly enacting the private experience of its creator in a dialog with the viewer. Nevertheless, we cannot overlook the fact the creator's body is seen as a point of origin, albeit being an ever-changing body schema that is in dialog with its environment, it is still recognized is the agency of the painting. It is there where Sissel and Carusi wish to take it further: "We further develop his idea of the body as a 'measure' of things by granting symbolisms and tools the status of 'measures' in their own right, that is, as 'agencies' with their own relative autonomy" (Hoel & Carusi, 2018, p. 23). Technology is seen as a "generative mediator" operating within and producing its own contingent dimensions: "For each modification new dimensions of the world open up, new ranges of possible modes of measuring and being measured" (Hoel & Carusi, 2018, p. 21). Thus, this goes beyond the decentralization of agency and into the decentralization of observation; the tools and technologies we create manipulate a shared space of perception. Sissel and Carusi recognize this approach resonates with contemporary posthumanist and new materialist ap-

proaches such as those of Karen Barad (2007) and Rosi Braidotti (2017). Such approaches open up the possibility of a mediated flesh, insofar as they recognize the interconnectedness of bodies and thoughts and the capacity for corporeality, and thus also intercorporeality, to be manifested remotely. However, they also risk the flattening of any experience to one variation in flesh, losing the meaning of a difference in form and function. We require a deeper investigation into mediation to determine its nature in social interactions.

Let us take a step back from the expanded conclusion regarding measuring bodies and focus on our scenario of mediated encounters between people. Clearly, not all mediations are one and the same and not all technological tools are utilized in a similar fashion. We are looking for a solution to a re-embodiment of the fetishized stranger; an incarnation that could carry the fleshy nature of the subject's body, along with its own mediating measures, and facilitate a relief from prejudice through communication. It would be worthwhile to return to Merleau-Ponty's analysis of painting in *Eye and Mind*, since this would be his most highly regarded example of mediated corporeality. Merleau-Ponty refers to an epitomizing discussion with French artist Auguste Rodin (Auguste Rodin, 2012, p. 34), analyzing the movement of a galloping horse in a painting by Théodore Géricault (see Figure 1).

Figure 1: "The 1821 Derby at Epsom" by Théodore Géricault, 1982. Retreived from Wikipedia (https://en.wikipedia.org/wiki/The_1821_Derby_at_Epsom). In the public domain.

Merleau-Ponty asks the following question: "When a horse is photographed

at that instant when he is completely off the ground, with his legs almost folded under him—an instant, therefore, when he must be moving—why does he look as if he were leaping in place? Then why do Géricault's horses really run on canvas, in a posture impossible for a real horse at the gallop?" (Merleau-Ponty, 1964, p. 185). The answer if provided by Rodin: "It is the artist who is truthful, while the photograph is mendacious; for, in reality, time never stops cold". Even though the horse is painted in a position that is illogical, the movement is well transmitted from the artist's expression into the painting. Not only the movement, but the also the intention of the artist; Merleau-Ponty concludes: "Painting searches not for the outside of movement but for its secret ciphers, of which there are some still more subtle than those of which Rodin spoke. All flesh, and even that of the world, radiates beyond itself" (Merleau-Ponty, 1964, p. 186). It becomes clearer that an accurate mediation of flesh should embody not only the source's movements, but also their inner intentions, their creation and experience of the world. For example, compare a Skype call to a collaborative music jam. The Skype video transmission undeniably incorporates communicative features of the transmitter such as their voice and facial expressions, but it also loses part of the flesh. One difference between a digitally sensed representation and a painting or a musical composition is the passivity of the medium. With a camera, the transmitters are not actively involved in the creation of the resulting image, they are sensed by it, but the image forms on its own. It does not emerge from their flesh. Indeed, from a perspective of new materialism and measuring bodies, the camera sensor is very much intertwined with the source's flesh and should capture all of its qualities, but the difference lies in what Hoel and Carusi ascribe to flesh as "its formative role as productive negativity", alluding to Sartre's notion of secreted nothingness. Productive negativity is the reversible quality of flesh - the power to shift between phases as when one hand is touching the other and we shift between the perception of touching and the perception of being touched. The gestalt effect of our consciousness as a willful phase shift occurs and makes Noboyuki Kayahara's spinning dancer change direction (Parker-Pope, 2008). In short, it is the emergence of meaning that is actively created by a subject.

In this moment we are faced with a crossroads - We need to choose one of two strategies. Do we a) Focus on producing better and greater sensors, that are able to not only catch the most intrinsic and subtle fleshy qualities of the subject, but also represent them in an authentic manner, or b) Create more expressive tools that allow the subject to consciously and willfully express their own flesh, as artists do with painting. Granted, option (b) requires more effort from the interlocutors to be in touch with their inner qualities and to learn new and creative forms of expression, while option (a) defers the work to the technology, allowing the users to be more passive in communication. *Mindfulness* is a form of inner-self connection that could be used to improve self-expression. Numerous researchers have shown that mindfulness could have health and social benefits such as stress reduction (Grossman, Niemann, Schmidt, & Walach, 2004), greater empathy (Walker & Mann, 2016) and success in education (Leland, 2015). It is then apparent that opting for (b) could be beneficial for society

while option (a) has a risk of doing the opposite. Moreover, in (b) the expressing subjects have a direct and controlled connection to the communication medium, allowing them learn and adapt to it, while in (a) there is an inherent barrier between the productive negativity of the subject and the medium, making adaptation harder and more reliant on the technology. With this in mind we can move forward to considerations of the materiality and form for the medium of incarnation.

Materiality of Flesh

Merleau-Ponty describes flesh as "a certain manner of being" (1968, p. 115), as well as an essence or style of existence in time and space. This does not refer to some objective science of the universe such as the laws of quantum physics and general relativity. Instead, it is the essence of nature as it appears through our bodies; the laws of the universe as they are experienced, only later to be abstracted and induced through the ideation of math and physics, a pronounced physical act on its own right. In the previous chapter we have determined that an optimal medium for the transfer of a corporeality has to be expressive, but what about the materiality of that medium? While a painting may be best for capturing the visual corporeity of a subject, it is clear that Merleau-Ponty's concept of flesh encapsulates other senses as well, and in fact he sees vision and all other senses as a particular type of touching: "We must habituate ourselves to think that every visible is cut out in the tangible, every tactile being in some manner promised to visibility, and that there is encroachment, infringement, not only between the touched and the touching, but also between the tangible and the visible" (1968, p. 134). Nevertheless, in his description of flesh, and in particular the description of intercorporeality, Merleau-Ponty assigns a special status to tactile sensing. When describing the reversibility of flesh, the power to shift our attention from touching and being touched, and when describing our body's relation to things that exists beyond it. Merleau-Ponty articulates the difference between touching a thing, experiencing it from the standpoint of our body, and touching another, which we pre-reflectively recognize to be another sensing body: "For the first time also, my movements no longer proceed unto the things to be seen, to be touched, or unto my own body occupied in seeing and touching them, but they address themselves to the body in general and for itself (whether it be my own or that of another)…the body no longer couples itself up with the world, it clasps another body, applying [itself to it] carefully with its whole extension, forming tirelessly with its hands the strange statue which in its turn gives everything it receives" (1968, p. 144).

There is a special and immediate reciprocity that is associated with touch and bodily gestures; it is when our actions and intentions toward another are met with a direct response, when are physical presence and its affect on other bodies is most accentuated. Numerous researches have shown great correlation between physical contact and the cognitive development of sociality. It was shown that maternal-newborn contact has a long-term effect over a child's physiological organization and cognition (Feldman, Rosenthal, & Eidelman, 2014) and that

tactile interactions are constitutive to all of our social bonds (Goodwin, 2017). However, before going deeper into the intercorporeality of touch, let us consider its materiality. In our context, the term *materiality* is in accordance with N. Katherine Hayle's definition of "the physical qualities that present themselves to us" [TODO: ref]. We cam regard materiality as phenomenological, rather than a scientific, analysis on the properties of matter. Archaeologist Lambros Malafouris follows the footsteps of phenomenology and new materialism, and with his vocational perspective, introduces a comprehensive framework for a body and matter based cognition dubbed the "Material Engagement Theory" or MET (Malafouris, 2013). While Malafouris does not directly address notions such as telepresence and re-embodiment, he does refer to the essential role of material properties in the emergence of meaning when using tools, focusing on activities such as clay making and knapping: "form is not imposed from the outside; it is, rather, brought forth or revealed from the inside. What we call"form" exists as a surface property rather than a static mental event. It exists where the projective mind meets the material at hand (stone, clay, or metal). More important, "form" is always "informed" by the properties of the material to which it gives shape." (2013, p. 177). This view on tools and technology bodes well with postphenomenology, and indeed Malafouris and Don Ihde have produced a joint publication discussing the role of material cognition in creative processes (Ihde & Malafouris, 2018).

Despite the intuitive interface between MET and postphenomenology, a scant amount of research in those disciplines was dedicated to the understanding of how different material properties in modern technologies affect our cognition and modes of engagement. Perhaps this is due to the fact that the vast majority of our engagement with contemporary technologies of mediation involves gazing on flat display and interacting with them using limited touch gestures. One study by Blazquez Cano et al (2017) found increased user engagement on a touch display when shopping for fashion, but there have not been extensive inquiries into the dialectics between the human body and our devices for daily use. However, when seeking a technologically mediated experience that is more physical, and involves ample material engagement, it is apparent that the field of robotics could provide an answer. Robots come in different shapes, forms and materials, and our interaction with them has more physical depth. When considering the difference between the Cartesian view on reality and the richer, more corporeal notion of flesh, it is clear that interactive display fall in the former category while robotics have the potential to deliver a flesh experience of mediation. It is left to inquire about the various materialities of robots and their efficacy for a medium of incarnation.

While in industrial roots, the only consideration for material properties has been the capacity of the material to perform a desired function, three emerging technological fields are placing more emphasis on materiality. Firstly, the field of *wearable electronics*, consisting of functional garments, clothes and accessories that blend textile-based materials with electronic circuits, secondly, the field of *social robots*, that aspires to conduct intimate and harmonious interaction between humans and robots, and thirdly, the field of *bio robotics* that

uses robotic actuators to perform medical operations on the human or animal body. As emphasized by Fortunati (2003) and Katz (2017), the underlying thread between these two trends is an attempt to unify the human body with information and communication technologies, or ICTs; to bring them closer and closer until the borderlines between the artificial and the organic vanish completely. As an umbrella term for robotics that use soft materials, the term *soft robotics* is now widely accepted [TODO: ref]. Elda Danese studies the cultural implications of the appearance of such "soft machines" [TODO: ref]. She notes how the elasticity of wearable electronics allows them to conform and adjust to underlying structures, granting the capability of the machines to adapt to the environment and the human body. She also notes how the use of soft materials in android robots is "altering their metallic and geometric qualities to achieve more empathetic, naturalistic form" (2015, p. 130). Interestingly, soft material technologies are being used not only to produce devices that try to mimic biological mechanisms and appear organic, but they are also producing futuristic forms, that while exhibiting flexible properties, still carry a post-human or non-human form. This is apparent not only in fashion-tech as noted by Danese (Danese, 2015, p. 137), but also in media art, as exemplified by Jonas Jørgensen, who both studies and utilizes soft robotic technology for artistic purposes. He notes that "soft robots are more often bio-inspired than biomimetic. That is, rather than being copies or technical remediations of biological mechanisms aimed at exact replication they extrapolate these,following their virtual lines of flight" (2017, p. 5).

Thinking about soft robots through the perspective of flesh, it is evident that soft materials have a better capacity to interact and synchronize with the human body and the environment. They are ontologically closer to the material properties of the human body and are more receptive of its intentionality and expression. Further more, there is another important quality of soft materials that should not be overlooked, especially in the context of flesh, and that is their style of movement. In a paper by Guy Hoffman of the Media Innovation Lab at IDC, Israel (2014), a convincing argument is outlined as to why we should pay more attention to movement, rather than just form, where designing robots, citing a body of research concerning non verbal acts and gestures in humans. From the point of view of phenomenology, this argument appears natural, as movement of the body is at the core of perception and in some cases even consciousness [TODO: Ref?]. We would dedicate more thought to matters of body language in the chapter about intercorporeality, but let us consider the role of materiality in movement.

Why is it that some materials seem to move in a style that appears more organic and more lifelike than others? We might think that an organic substance simply has more degrees of freedom, more plausible conformations and states of movement. But yet, some machines have an astoundingly complex inner mechanism with countless degrees of freedom [TODO: ref some clockwork thing?], yet on our view they do not portray the same materiality as organic entities. The answer may present itself when we consider the *linearity* of movement. If there is one repeating quality in natural processes, it is the self-organization of

fractal-like patterns that emerge out of a complex dynamic of inter-connections [TODO: ref, strogatz!]. If there is one quality that defines those patterns, it is their nonlinearity. Organic substances and systems move in a style that is at the same time deterministic and predictable, but also non linear [TODO: examples]. As for animal movement, the neuromuscular system itself exhibits nonlinear properties [TODO: Ref]. In the world of robots, even if an anroid's arm is covered with a soft material, when the android moves its joints, the linearity of the underlying servo motor is apparent. The software could even try to imitate nonlinearity by shifting the speed of the motor between steps, but the underlying discrete and linear materiality would uncover itself from beneath the flesh. That is not the case with soft robots made of silicone rubbers, textiles and other stretchable materials. Those materials have an inherent nonlinear dynamic style of movement. Even the most basic form of soft movement, a pneumatic system controlling the inflation of a party balloon, the movement seems more organic than that of the most expensive android robot. We have determined the importance of soft materials for an engagement with the flesh of a perceiving body, we can now summarize the logos of incarnation.

TODO: Can organic material be not uncanny.

The Logos of Incarnation

TODO: Positive incarnation VS negative reification / fetishim - Tulpa? TODO: Ranciere logos TODO: Form and fetish for robot TODO: The logic of incarnation

Phenomenology of Re-embodiment

Agency and Ownership

The term *re-embodiment* is used by postphenomenoligists such as Besmer (Rosenberger & Verbeek, 2015, p. 55) and Dolezal (2009) to denote a mediated experience in which a subject assumes another body, physical or virtual, in a remote location. A previous term used for similar experiences was *telepresence*, first coined by in 1980 by Marvin Minsky, who applied it to remote object manipulation applications and their teleoperation systems (Campanella, 2000). However, as Dolezal notes, telepresence is normally used to describe a functional scenario in which the remotely manipulated environment is real and does not apply to virtual environments. Insofar as the experiences of virtual reality, avatar gaming and robotic telepresence have a common phenomenological nature of assuming control over another body, they can be grouped together under the term of re-embodiment. How about a Skype conversation? We would be inclined to assume that this is not a form of re-embodiment, since although the users assume a form in a remote location (on somebody else's computer screen), they have no control over that environment and cannot manipulate it; they have no *agency*. But is that true? Imagine I was to shout so loudly

during a Skype call that my voice broke a wine glass in a remote location, or that time the creators of South Park had trolled everyone's Alexa devices using remove TV screens (Lockett, 2017). A sense of agency could be achieved even with a minimal effect on the remote environment. A more clear example of a Skype call that adds agency would be wheel based telepresence robots such as the ones produced by Beam (Patel, n.d.). In a virtual reality game, despite the fact that the environment I am manipulating is completely virtual, I still have sense of agency in that environment which contains my remote body.

The nuances of re-embodiment become more apparent when considering not only the notion of agency, but also that of *ownership*. Galagher (Gallagher, 2000, p. 15) distinguishes between agency and ownership such that agency is the "sense that I am one who is causing or generating an action, for example, the sense that I am the one who is causing something to move", while ownership is "sense that I am the one who is undergoing an experience". A lack of ownership could have moral implications on re-embodiment. According to Dolezal "Dissociation from ownership, induced by a lack of presence, has many ethical and epistemological implications and, furthermore, has phenomenological consequences in which the subject feels alienated from the actions he or she is performing" (2009, p. 218). Dolezal denotes an artwork titles "Legeal Tender" (Paulos, 1996) as the "first publicly accessible telerobotic website, where users, after agreeing to take full responsibility for their actions, could destroy or deface two allegedly real 100USD notes." (2009, p. 210). This action is criminal act in the United States, yet In a study done by Dreyfus it was found that "most participants in the experiment responded that they did not believe that the notes and the experiment were real, and hence did not feel as though they were placing themselves under any risk" (Dreyfus, 2000). This poses major concerns for more serious telepresence applications such as telesurgery, where a doctor uses a remotely controlled robot to operate on a patient's body. If a doctor does not feel present during the operation, their sense of accountability could be hindered, risking the patient's health (Dolezal, 2009, p. 211). An even more terrifying example comes from the world of remotely operated war drones. One study of drone killing in Pakistan between the years 2004 and 2009 found an usual amount of civilians that were killed by drones, citing the emotional and physical distance as one cause: "A 20-something Christian Air Force pilot living with her two children in suburban Las Vegas who views a monitor to locate her targets would seem to be as distant as a one can be from targets in rural, Muslim Pakistan. Television and YouTube video of drone pilots on the job reveal a set-up that looks very much like video game. These factors and others likely contribute to the high death rate among unintended targets" (O'Connell, 2009, p. 9).

According to Dolezal, the key factor that enables a sense of ownership is *proprioception*: the "kinesthetic and somatic sensations that permeate the body and give information regarding position, posture and movement" (2009, p. 219). Proprioception constitutes our *body schema*, a pre-reflective subconscious mapping of our body that allows us to act in the environment without explicitly thinking of each step and being aware of every movement. An emblematic high-

lighting the significance of proprioception is the case of IW, a man who has lost his of proprioceptive feedback due to injury (Gallagher & Cole, 1995). Despite the loss of this inner sense of the body, IW was not paralyzed and was able to re-learn how to operate in the world, however this learning was in a painstaking process in which IW had to forcefully map his intentions to the changes in his body; he had "lost the experience of body invisibility, which characterizes the normal and healthy experience of movement" (Dolezal, 2009, p. 219). Such an experience naturally entails a sense of detachment and alienation from ones own actions.

Phenomenoligists have shown how in the normal situation when the proprioceptive system intact, tools and technology could also be incorporated directly into our body schema. Merleau-Ponty's famous example of the blind man's stick defines the stick as "an extension of the bodily synthesis" (Merleau-Ponty, 2013, p. 176) and Don Ihde provides the examples of the eyeglasses - a relation in which "the technology becomes maximally 'transparent.' It is, as it were, taken into my own perceptual-bodily self experience thus: (I-glasses)-world" (Ihde, 1990, p. 73). However, as enunciated by postphenomenoligists, the experiences of telerobotics, avatar-based gaming and virtual reality are notably different from closely integrated tools and technologies such as the blind man's stick and eyeglasses. Firstly, it is a matter of feedback - in order for the tools to be integrated into our body schema, there needs to be an immediate and consistent sensory feedback between the actions of our 'original' body and the mediated environment. Dolezal argues that the "coincidence of proprioceptive sensations to visual feedback of motion is the mechanism that induces a sense of ownership of action" (2009, p. 219), citing research by Martin (1995) and an experiment by Cole, Sacks and Waterman (2000). In the latter experiment, participants were controlling a robot from the driver's seat in a mixed reality environment at the Johnson Space Center in Texas, experiencing immersive visual feedback to their actions from the robot's camera. At one point the sense of ownership was sufficiently high to make participants worry when a heavy object was about to fall on the robot's leg (Cole et al., 2000, p. 167).

While visual feedback that is concomitant to bodily proprioception is important for a sense of ownership, it may not be enough. Besmer argues the following regarding the transparent withdrawal of the controlling interface in robotic re-embodiment: "this second withdrawal is distantly different from the way in which bodily co-located tools and equipment—such as the blind man's cane—recede from focal awareness to become integrated into the body schema. There is a decisive difference here, for bodily co-located tools become integrated into the body schema by offering robust tactile feedback and thereby participating in somatic proprioception. This is often not the case with remote robotic machinery" (Rosenberger & Verbeek, 2015, p. 61). Besmer suggests that the experience of robotic re-embodiment is more similar to IW's case of a lack of proprioception than to the usage of blind man's stick. Besmer argues that the same problem applies for virtual avatars in a simulated game - While the controlling technology may become transparent, especially in immersive environments, without proper haptic feedback that sufficiently transmits the sense of tactile

nature of the remote environment, the avatar would always be at an infinite distance from the body.

Let us assume that mixed reality and telerobotics technology would eventually advance to a degree that they could transmit a high resolution experience to all senses of the controller. Dolezal's intuition is that "even the most seamless experience of high-fidelity telepresence will remain qualitatively different from that of engagement with one's immediate surroundings" (2009, p. 221). However, delving deeper into the difference between mediums, it is apparent that there is still a fundamental gap between a completely virtual reality experience and a telepresence in a remote environment. If we consider the possibility of techno flesh, there is an incommensurable difference in the dialog between the remote body and the environment. In the case of of a virtual environment, the environment is entirely simulated by software, while in the case of remote presence the environment is of this world. Notwithstanding the fact that the effect of the environment is eventually sensed and transmitted by an apparatus, a sensor that is placed in the world is still more far immersed in the flesh than a simulation. Having said that, there have been arguments, most notably the one by Bostrom (Bostrom, 2003), that we are likely to already be living in a universe that is simulated, but insofar as scientists are still struggling to grapple with the question in light of infinite micro and macro scale of the universe (Beane, Davoudi, & J. Savage, 2014), and insofar as we might not even be capable of dealing with that question because we are subjected to our own cognition of the world, the gap between the universe and our current knowledge of simulation holds firmly. A virtual reality experience takes us one step closer to the dualistic Cartesian-Lockian model of representational knowledge that is separated from our body, and such a model would have a greater risk of reifying our contrived images of one another, turning them into reality.

TODO: Materiality paragraph

Re-embodied imagery

In Donna Haraway's seminal work *A manifesto for cyborgs, science and technology* (2006), she depicts a utopic techno-feminist vision of cyborgs - machine/organism hybrids that are freed not only of their military-capitalist creators, but also from sociological and biological constraints such as gender, race, sex and a need for reproduction. She wants us to transition from *body imagery* - An embodied conceptual cage that determines our world view and our political language, into *cyborg imagery* - A reconstitution of bodies and discourse "on the basis of seizing the tools to mark the world that marked them as other" (2006, p. 33). Nowadays, one might say that this vision is slowly realizing, with the advent of of social media as the *def facto* form of communication, virtual realities as a standard space for gatherings and technological modifications for the body becoming more and more prevalent. However, as Haraway noted, the confusion of boundaries with the help of technology calls for a skillful responsibility in their reconstitution: "is it not just that science and technology are possible means of great human satisfaction, as well as a matrix of complex dominations

(2006, p. 39). Phenomenons such as cyber-bullying, public-shaming and virtual sexual harassment [TODO: ref?] prove that point exactly. We can now start to think not only about body imagery, but on *re-embodied* imagery: The effect that re-embodiment has on our world view and dispositions. This effect could be divided into two main categories: a) The effect on our social cognition that is due to the disassociation of agency and ownership. b) The effect of avatar's nature on our image of self and in turn our cognition.

As the previous chapter suggests, and as most likely any one of us has experienced, a reduced ownership in re-embodiment allows us to not feel as accountable for our actions as in face-to-face communication. This leads to two outcomes, a positive and a negative: a) responsible

TODO: My cognitive science presentation. TODO: Also about the visual appearance in VR anecdote in Dolezal.

Intercorporeality

Multimodality and Social Semiotics

We would not be doing justice to phenomenology if we analyzed the experience of technological mediation between humans merely from the fixed perspectives of each side. While it may be true that every communication act ultimately funnels into the individual, subjective experience of the interlocutors, some aspects of the experience cannot be defined by a simple one-directional relation between the environment and the subject. Instead, it is a dialectical process in which the final experience emerges from the modes of dyadic interaction. In face to face communication, the majority of meanings are created using common language and through bodily gestures. When using a technological medium, however, some modes are of communication are no longer available, some morph into different styles, while other completely new modes of interaction appear. An analytical framework that is useful for investigating various modes of communication and their role in social meaning-making is the framework of *multimodality*, particularly in the light of social semiotics. As defined by Gunther Kress (2009), multimodality analyzes the different modes of interaction that are in play, while social semiotics deals with the specific meanings that emerge in specific situations. In-line with phenomenology, Kress suggests that we move away from more virtual definitions of communication such as language and grammar and focus on the materiality of meaning making - the specific modes and affordances of our body and senses: "the focus on on materiality offers the possibility of seeing meaning making as embodied - as in our bodies: a means of getting beyond separations of those other abstractions, mind and body, or affect and cognition" (2009, p. 83).

However, the robustness of mediated and re-embodied intercorporeal relations and their potential to exist through technology has been doubted by researches such as Dolezal (2009, p. 222), Dreyfus (2000) and Stone (1991). Insofar as the experience one feels when communicating with a remote or incarnated

medium is that of disassociation and alienation, that feeling becomes two-fold when applied to the most delicate and significant aspects of intercorporeality. Dolezal argues that "Physical contact and proximity between human subjects constitutes an important qualitative aspect of intersubjective relations that may never be obviated by technological mediums" (2009, p. 222). Dreyfus makes an even stronger argument, declaring "tele-intimacy" as an oxymoron - "because any sense of intimacy must draw on the sense of security and well being each of us presumably experienced as babies in our caretaker's arms. If so, even the most sophisticated forms of telepresence may well seem remote and abstract if they are not in some way connected with our sense of the warm, embodied nearness of a flesh-and-blood human being" (2000, p. 16). Both Dreyfus and Stone (1991, p. 13) refer to fact that a re-embodied body does not withstand physical risk to its composition, and therefore loses depth in the mediated interaction.

There indeed is no denying the potency of an immediate and imminent physical interaction, but we should also try to avoid romanticism, and without forgetting the Cartesian risk of losing our bodies in virtual flatness, consider the multimodalities of mediated intercorporeality and the affordances of various mediums.

Language and Feedback

Elizabeth Keating has studied various groups that are using different forms of telepresence as their daily means of communication [TODO: REF]. She met with engineers who had to cooperate with people living in different locations around the world to achieve a single task, and also with gamers who were actually sitting together in one physical space, but were operating in a separate virtual environment where the avatars only shared an inter-virtual space, as opposed to the intermundane.

One key aspect in communication is that of language its own modalities of verbal content, tone of voice and bodily movement. In a seminal research by Albert Mehrabian in 1971 [TODO: REF], it was stated that in determining the credibility of a particular person during verbal interaction, only 5% of the impression is accounted to the actual content that is uttered by that person; 55 percent is accounted to body language and 38 percent is accounted to the tone of voice. While this paradigm has since been challenged by researches such as Phillip Yaffe [TODO: REF], the important role of bodily signals during verbal communication is unquestionable. As Keating notes, in situations where interlocutors are mediated by a technology "no shared metalanguage exists for them to talk about the role of bodies and how they mean in interaction (the engineers use the short hand descriptor "face-face" to mean the whole body). The movement and contrastive properties of eyes, the flexibility of the face to convey attitudes and emotions, the mobility of the hands to organize talk and manipulate objects, the sense of touch, the seemingly "natural" attitudinal displays of the limbs, and the body's relation to others' bodies" (Goodwin, 2017, p. 305) (TODO: Correct REF). However, technology also opens up new modalities and possibilities of communication, some of which may be used to

mediate over the gaps that were initially opened in exchange for the increased range and mobility.

TODO: From the end of Dolezal TODO: Recap Meyer / Keating TODO: Dialogism? TODO: Laban style TODO: Hapticl sociality TODO: Ruth Feldman

Mediation chart

The following chart blah

Medium	Incarnation	Re-embodiment	Accesbility	Feasibility
Bananas	2.0	4.0	2.0	5.0
Apples	3.0	1.0	3.0	5.0
Oranges	3.0	1.0	3.0	5.0
Melons	3.0	1.0	3.0	5.0
Plumes	3.0	1.0	3.0	5.0

Caveats

Technological bias

HITODAMA - Design

TODO: Harraway talks about salamanders

Orthogonal Aesthetics

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