

*Floriana Ferro*

## **Meeting the Gaze of the Robot: A Phenomenological Analysis on Human-Robot Empathy**

### **Introduction**

The development of humanoid robots has become more and more sophisticated. Since the 1990s scientists have demonstrated the importance of non-verbal communication in human-robot interactions (HRI), especially eye contact. Very recent studies, carried out especially during the last five years (i.e., Liberati, Nagataki 2019; Schellen *et al.* 2021; Ciardo, Wykowska 2022), prove that the gaze of the robots affects human emotions and behaviour. This appears to be a manifestation of what phenomenologists call “empathy”, which is the fundamental phenomenon through which my subjectivity grasps the experience of the other, since the other is perceived as being like me. This phenomenon has been carefully studied by Edith Stein (Stein 1917; eng. trans. 1989) and Edmund Husserl (Husserl 1950; eng. trans. 1960) in the first decades of the 20th century. However, the two thinkers did not live during the digital revolution and the development of robotics, therefore they only referred to empathy between subjectivities in flesh and bone.

After one century, the scientific and technological landscape has consistently changed. The most recent results achieved in the domain of Artificial Intelligence, especially Robotics, present a new challenge to phenomenologists and to post-phenomenologists as well. Since all of them are currently reflecting on new technologies and their effects on human life, the gaze of a robot – of a machine – affecting the behaviour and emotions of humans inevitably raises questions. Is empathy between humans and robots possible? What happens in my subjectivity when I encounter the gaze of an artificial being? When I recognize the gaze of the robot, do I feel the same empathy as I feel for another human being?

This paper aims to problematize the question of empathy related to the robot gaze through the conceptual tools developed by phenomenology. The first section will be dedicated to the most recent studies in robotics concerning the subject under discussion, especially the effects that the robot gaze has on human feelings and behaviour. In the second part,

I will give a brief description of the phenomenon of empathy, as it is developed by Husserl and Stein, and compare this phenomenon with the human experience of a robot gaze. Analogies and differences will inevitably emerge: I will argue that, since the robot gaze comes from robot eyes, the latter are perceived as *similar* to human ones (otherwise they would not have significant effects), but not as *identical* to them. Indeed, the difference between the human and the robot gaze is due to their being embodied: human eyes are perceived as belonging to a living body, whereas robot eyes are seen as part of a machine-body. In the third section, I will use the concept of *transcorporeal analogy*, taking inspiration from the notion of *transdimensional analogy* developed in other studies (i.e., Ferro 2022). In this specific case, I will argue that there is a common empathic ground, based on an extended concept of corporeality, which was well developed by Merleau-Ponty (1964; eng. trans. 1968) and then re-interpreted, with different nuances, by Ihde (2002), Verbeek (2008), Haraway (1985, 1991 edition), Braidotti (2013), and others. I consider this extended body, called by the Merleau-Pontian term “flesh”, as a common ground between the human gaze and the robot gaze, thus allowing to widen the phenomenon of empathy itself.

## 1. The robot gaze and its effects on humans

The role of eye communication is considered very important in HRI, so much that, according to Admoni and Scassellati (2017, p. 25), the earlier research into this phenomenon started in the 1990s among the virtual agent community and then extended to robotics: humanoids with meaningful eye gaze, such as Cog (Scassellati 1996), Kismet (Breazeal, Scassellati 1999), and Infanoid (Kozima, Ito 1998), were thus developed. Admoni and Scassellati, together with other scientists in the domain of HRI, have deeply worked on the gaze of the robot and on our recognition of it: among their discoveries, it is worthy to be mentioned that the robot gaze is more frequently perceived when robots use short and frequent glances rather than long and less frequent ones (Admoni *et al.* 2013). The first important thing, in order for the human to perceive the robot gaze as such, is to become aware of it and this awareness is possible only if the stares have something similar to human ones. For instance, it is not very frequent in common conversation that a friend looks at me with a fixed stare and for a long time, especially in group conversation, since it would make me feel uncomfortable. On the contrary, short and frequent glances are more likely to happen in a social context.

This proves that it is not simply sufficient that robot gaze takes place, but that it shall be directed to humans in a certain way. Moreover, it will

be easily recognized as such if it is generally *directed to me*, to my eyes: Imai *et al.* (2002) have argued that the robot gaze is fundamentally *ego-centric*, so that I perceive it when eye contact between the robot and me takes place. This is particularly important for what I aim to show in this paper, namely that the gaze of the robot gives rise to the phenomenon of empathy, notwithstanding the differences between feeling it for humans and for robots. Studies in HRI prove that this difference is maintained even in the case of humanoid robots, that are, somatically speaking, the most similar to us.

It is tempting to assume that perfectly matching robot gaze behaviors to human gaze behaviors will elicit identical responses from people, but this is not always the case. Several studies suggest that gaze from robots is interpreted differently than gaze from humans. In general, it is difficult to compare robot gaze to human gaze directly, because while robot gaze can be infinitely controlled, human gaze tends to have small, unpredictable variations (Admoni, Scassellati 2017, p. 37).

In order to stimulate the phenomenon of empathy in humans, the robots shall resemble, as much as possible, human gaze. The reason is that empathy takes place only when the human subject recognizes the other as an *alter ego*, another I. It does not imply that the other must be perceived as exactly the same: humans experience empathy also towards animals, as our everyday life with pets and scientific studies prove (Young *et al.* 2018). We recognize animals as living and sensible beings, who can feel pleasure and pain, and to whom we communicate. Their gaze is very similar to what Admoni and Scassellati write about, since they contain those “small, unpredictable variations” belonging to every living being. This is proven also by Ghiglino *et al.* (2020), according to whom humans recognize likeness with robots if their eye movements are slow but variable. Unfortunately, for what concerns the robot gaze, the possibility for every single eye movement to be under control limits our perception of the robot as a living being and thus our empathy towards it.

The development of humanoid robots has become particularly sophisticated and, in the last few years, many studies on the robot gaze have been published. Liberati and Nagataki (2019), taking inspiration from Sartre, Levinas, and Merleau-Ponty, show that a real interaction between us and the robots is possible only if the latter show us vulnerability: even if the robot’s vulnerability appears different from ours – i.e., a trash robot which does not recognize some items as garbage – it may give rise to a relationship. Liberati and Nagataki think that, if the robot is able to detect my emotions and makes me feel vulnerable, a closer link between us may be possible. However, the distance between humans and robots is still evident. Kelley *et al.* (2021) show that, when the robot gaze is perceived,

it does not involve the same parts of our brain as the human gaze does: the robot gaze does not engage the right temporoparietal junction, which is involved in the eye contact between humans.

For what concerns the specific effects of a robot gaze, Schellen *et al.* (2021) argue that it increases the possibility of honest behaviour: when the iCub robot establishes eye contact with the human participants to the study, after they have performed deceptive behaviour, they tend to be more honest. It means that moral actions are influenced not only by the gaze of other humans, but even by robot gaze: humanoid robots may be thus considered as social agents. Ciardo and Wykowska (2022) also prove that the iCub may help in the resolution of conflicts, even if not in conflict adaptations; generally, it helps modulating cognitive control.

Similar effects have been found in less recent studies. Saerbeck *et al.* (2010) show that the robot gaze has a greater impact when it is combined with other kinds of behaviours (gestures, facial expressions, etc.): if a robot tutor is able to act like this, it stimulates empathy and improves the performances of students in language learning. Finally, Andrist *et al.* (2015) have pointed out that empathy towards robots is more likely to occur when there are some traits of personality which we recognize as similar to ours. It means that the more the robot is akin to the human, the more the human feels closer to it.

All the abovementioned studies prove something that phenomenology had stated at the beginning of the 20th century: empathy takes place only when I recognize the other as an *alter ego*, as being similar to me on the basis of acts, expressions, and gestures performed. However, in order to understand if empathy as such may be really felt toward robots, and not only toward living beings (especially humans and animals), an analysis of the phenomenon of empathy between humans will first take place.

## 2. Empathy toward humans and toward robots

Among the most known phenomenological studies on empathy, Edith Stein's *On the Problem of Empathy* and Edmund Husserl's *Cartesian Meditations* may be regarded as fundamental. The two authors show both similarities and differences in their way to conceive empathy in relation to human subjectivity. Husserl thinks that ipseity or selfness (the hard core of the I) is first constituted in self-experience, within the so-called "primordial sphere", from which subsequently springs the experience of the other person (Husserl 1950; eng. trans. 1960, § 47, pp. 104-105). We first perceive ourselves as subjects, who are aware of the other only during the encounter. The recognition of the other is possible because of the "pairing" (or "coupling", in different translations). In Husserl's words:

Pairing is a primal form of that passive synthesis which we designate as “association”, in contrast to passive synthesis of “identification”. In a pairing association the characteristic feature is that, in the most primitive case, two data are given intuitionally, and with prominence, in the unity of a consciousness and that, on this basis essentially, already in pure passivity (regardless therefore of whether they are noticed or unnoticed), as data appearing with mutual distinctness, they found phenomenologically a unity of similarity and thus are always constituted precisely as a pair (Husserl 1950; eng. trans. 1960, § 51, p. 112).

The pairing association stays at the level of pure passivity, since it precedes the intentional activity of being directed at the other. “Passivity” here means that, at the transcendental level, I originally tend to recognize who is similar to me and associate them to myself: in this way I recognize the other as another ego. Neuroscientists have found something recalling Husserl’s pairing association in the functioning of the so-called “mirror neurons” (Gallese *et al.* 1996), which activate when another subject performs certain actions (i.e., grasping, manipulating, and placing). Without going into details about the differences between Gallese’s and Husserl’s ideas and frameworks, it is noteworthy that our brain tends to recognize the other *qua* other and to reproduce their feelings and actions. Transcendentally speaking, Husserl thinks that intersubjectivity is not secondary in relation to solipsism: on the contrary, even if, from the experiential point of view, we meet the other “after” we are aware of ourselves, we are already “set up” to recognize the other as an *alter ego*. From the transcendental point of view, intersubjectivity precedes and founds subjectivity: “a transcendental solipsism is only a subordinate stage philosophically” (Husserl 1950; eng. trans. 1960, § 13, p. 30).

Stein’s view is more radical, since it tries from the beginning to avoid solipsism as such. Stein thinks that the constitution of the I is intersubjective not only from a transcendental, but also from the experiential point of view.

This “selfness” is experienced and is the basis of all that is “mine.” Naturally, it is first brought into relief in contrast with another when another is given. This other is at first not qualitatively distinguished from it, since both are qualityless, but only distinguished as simply an “other.” This otherness is apparent in the type of givenness: it is other than “I” because it is given to me in another way than “I.” Therefore it is “you.” But, since it experiences itself as I experience myself, the “you” is another “I.” Thus the “I” does not become individualized because another faces it, but its individuality, or as we would rather say [...] its selfness is brought into relief in contrast with the otherness of the other (Stein 1917; eng. trans. 1989, Chap. III, p. 38).

The I is constituted in the moment when the encounter with the other takes place. Before this encounter the difference between “me” and “you” is not experienced, since both are qualityless. Lived experience as such is not enough to feel myself as an individual: only when I meet the other, who experiences themselves the way I experience myself, I am aware of my singularity. The other is an *alter ego* (another I), who experiences their own subjectivity analogously (not identically) to how I experience my own subjectivity. The encounter with the other is crucial in the constitution of my I, since it allows me to experience myself not as a general and undifferentiated subjectivity, but as a unique subjectivity, as myself. My identification therefore occurs as a process of differentiation from the other, which takes place through the phenomenon of empathy (*Einfühlung*).

How does empathy occur? Stein describes this process into three stages. “These are (1) the emergence of the experience, (2) the fulfilling explication, and (3) the comprehensive objectification of the explained experience” (Stein 1917; eng. trans. 1989, Chap. II, p. 10). First the lived experience of the other (i.e., sadness on their face) emerges and presents itself to me as an object to which my intentionality is directed: the other is not considered as a thing among things, but as a psychophysical and spiritual unit that is similar to mine. In the second phase, I try to clarify and feel the experience of the other as given: I leave aside the objectifying glance and try to identify with the other’s subjectivity, taking their place, and feel as they feel. This is the stage where empathy actually occurs, when I restructure my identity through the attempt to reproduce the experience of the other: I catch the sadness on the other’s face and feel it as my sadness. However, Stein does not think at my experience of the other as perfectly coinciding with the other’s experience of themselves, since I am not the other and my personal history will never be the same. In the third stage, I catch the experience of the other as an object again: I am back to myself and lucidly understand the feeling of the other, thus putting a distance between our experiences. Synthetically speaking, I perceive the expression of the other’s feeling, then I go out from myself in order to experience it, and finally I come back to myself and perceive the other’s feeling as different from mine.

According to Stein, I never catch the experience of the other as I would do with mine, since it is originally inaccessible to me. “This other subject is primordial although I do not experience it as primordial. In my non-primordial experience I feel, as it were, led by a primordial one not experienced by me but still there, manifesting itself in my non-primordial experience” (Stein 1917; eng. trans. 1989, Chap. II, p. 11). The experience of the other is not primordial for me as it is for them, so empathy is the non-primordial givenness of a primordial experience: I feel the

other's experience recognizing it as *their experience, not mine*. This modality of perceiving the other is not a specific form of approaching them, but as the foundation of every singular approach to alterity: empathy is "the experience of foreign consciousness in general" (Stein 1917; eng. trans. 1989, Chap. II, p. 11). Empathy lies at the heart of transcendental intersubjectivity.

What happens when I meet the gaze of the robot? Does empathy actually take place? First of all, it must be pointed out that the phenomenon of empathy is characterized by two distinct movements: a) a recognition of the other subjectivity, which is perceived as analogous to mine (Husserl), b) an awareness of the difference between the other's experience and mine (Stein). Similarity and difference are both necessary in order for empathy to occur: if I perceive something as radically different from me (e.g., a stone), I will not feel anything towards it; on the contrary, if I perceive total identity, I will not feel the experience of someone or something else, but my own experience.

In the case of the robot, both movements take place. a) As the above-mentioned studies in HRI prove, I feel the effects of the robot gaze, which also affects my behaviour: this happens because of a somewhat similarity that I perceive between the robot and me. b) At the same time, I am fully aware that the robot is not me and is neither a human or a living being. What are these two movements based on, in the case of robots, in order for empathy to occur? Let us start from seeing the effects on us, that is how we experience the robot gaze. I am interacting with a humanoid machine. In order to establish eye contact, and thus experiment the gaze of this machine, I need to recognize something recalling the eyes of a living being. I have already mentioned the iCub (2008), which is very similar to a child: it has a round white head, two eyes, and a nose; moreover, it has a mechanical body through which it crawls, grasps objects, and interact with people. The Kismet, which is ten years older (1998), is less similar to a real human being, however, its eyes, with big round bulbs and pupils, surmounted by eyebrows and above a red mouth, clearly recall us a face. There are many other examples (Nao, TIAGo, AILA, RoboThespian, etc.), which are quite different from each other, but have in common "a face with two eyes surmounting a body". The colour of the body, the presence of square or round shapes, height, weight, etc. are less important features to our purpose. In order for us to feel watched by a robot, we need to recognize the shape and movements of two eyes on a face, which is part of a whole body.

Once I recognize the robot eyes as eyes, my empathy towards the robot can take place: I may perceive that it pays attention to what I say, is interested in my words, in my behaviour, in my interaction with it. If it is a collaborative robot, a *cobot* (Colgate *et al.* 1996), this kind of empa-

thy will help us work together, whereas, if it is a social robot, a *sobot*<sup>1</sup>, it will assist and help me fulfil my needs. Eye contact is very important in this process, especially if, as I showed in the first part of this paper, it is accompanied by other facial expressions, gestures, etc. However, the effects of the robot gaze on humans are not the same of the human gaze. The robot gaze comes from robot eyes, which are *similar*, but not *identical* to human eyes. The difference between robot and human gaze shall not be considered as located in the eyes only: if I look at a human face with one or two prosthetic eyes and perceive the latter as watching me, I perceive a human being looking at me, not a robot. However, if I am watched by a pair of metal and/or plastic eyes within a metal/plastic face as part of a metal/plastic body, then I will feel a robot gaze, not a human one. The difference between human gaze and robot gaze is not due to the different texture of the eyes only, but to their being embodied: whereas we perceive human eyes as belonging to a living body, we see robot eyes within a machine-body.

### 3. Transcorporeal analogy

I have just shown that humans are capable of feeling empathy toward robots, however, this phenomenon does not occur in exactly the same way as empathy toward humans. The difference lies in the bodies of the subjects to whom empathy is directed: humans have living bodies, made of flesh, bones, skin, muscles, organs, and directed by a nervous system, whereas robots have machine-bodies, mainly made of plastic and metal, and guided by an electronic system or software. The texture of human and robot bodies appears to be very different at first sight. However, there are also similarities between these two sets of bodies, which lie not only in their common shape. Even statues depicting humans resemble human faces and bodies, however, we do not feel particular empathy towards them. It happens because statues stand still and do not move, whereas humanoid robots make facial expressions and gestures, emit sounds and words, walk, manipulate objects, etc. They behave like human beings.

It is time to show what lies under this similarity, what is in common between us and the robots, in order to formulate my interpretation: empathy toward robots is based on analogy between human and robot bodies, on *transcorporeal analogy*. I am taking inspiration from the idea of *transdimensional analogy*, recently coined to indicate analogy between different dimensions of reality (Ferro 2022). In this case,

<sup>1</sup> I am referring here to the most recent use of the abbreviation “sobot” (Cusano 2022), not to the older one indicating “software robots”.



the analogy regarding the phenomenon of empathy applies to different kinds of bodies, to the corporeality of both human beings and robots. My intention is to show *how* and *why* differences and similarities between robot and human bodies may be conceived: at the basis of our experience of the world, of ourselves, and of the others there is a common experience of the body. This extended corporeality is what Merleau-Ponty defines as “flesh”.

What we are calling flesh, this interiorly worked-over mass, has no name in any philosophy. As the formative medium of the object and the subject, it is not the atom of being, the hard in itself that resides in a unique place and moment [...]. We must not think the flesh starting from substances, from body and spirit – for then it would be the union of contradictories – but we must think it, as we said, as an element, as the concrete emblem of a general manner of being (Merleau-Ponty 1964; eng. trans. 1968, p. 147).

Merleau-Ponty detaches from both the substantialist view of Aristotle and the classic phenomenological perspective. The flesh is not considered as “the atom of being”, the hard core of what exists, its *hypokeimenon*: it is not body *or* spirit, matter *or* form, or their compound, a “synolus” (*Metaph.* VII, 1029a1-3), but rather it is matter *and* form, body *and* spirit, which are intertwined and related in a dialectical movement. This does not imply either dualism or pluralism of substances, but an ontological monism, since the flesh is a common element, “the concrete emblem of a general manner of being” in which the polarities are not opposites, but revert the one into the other. Polarities, whose reciprocal relation is chiasmatic (Merleau-Ponty 1964; eng. trans. 1968, p. 262), move the one toward the other in a hyperdialectic movement (Merleau-Ponty 1964; eng. trans. 1968, p. 94): the word “hyperdialectic” means a refuse of the Hegelian triadic movement and its synthesis, which is the position of a new element overcoming the thesis and the antithesis. Merleau-Ponty seems to prefer a circular concept of dialectic (Vanzago 2012, pp. 194-195), in which the poles are in a position of divergence (*écart*), but not of extraneousness or opposition, since the movement of their common medium (the flesh) implies reciprocal reversibility. Merleau-Ponty’s view in *The Visible and the Invisible* is clearly anti-substantialist, thus giving way to an open idea of the body, which may include also non-living parts or elements.

This view is reinforced by the refusal of the classical phenomenological idea of the body, which is rooted in both Husserl’s writings and Merleau-Ponty’s earlier works. In both the second volume of the *Ideas* (Husserl 1952; eng. trans. 1989, § 41, p. 166) and the *Phenomenology of Perception* (Merleau-Ponty 1945; eng. trans. 2012, pp. 351-352), the subjective body is described as having an orientation through which I position

myself *here*, whereas other bodies are perceived as being *somewhere else*. Even if Merleau-Ponty already speaks about ambiguity and third-person processes in the *Phenomenology of Perception* (Merleau-Ponty 1945; eng. trans. 2012, pp. 106, 230), he develops the idea of an extended body only in *The Visible and the Invisible*. Here the flesh is considered as “the formative medium of the object and the subject” (Merleau-Ponty 1964; eng. trans. 1968, p. 147), so there is neither a clear distinction between them, nor the adoption of a privileged subjective perspective. The flesh may be considered as an extended element, a mind intertwined with a body, which is the body of my ego, of other egos, of the objects, and of the world.

This concept has been re-interpreted, more or less explicitly, in a post-phenomenological and posthuman sense. According to Don Ihde, whose thought gives rise to the post-phenomenological movement, new realities, which are formed with the technological and digital development, may emerge from the “foldings of the flesh” (Ihde 2002, p. 86). Peter-Paul Verbeek interprets this position through the theory of hybridization, according to which technology assumes a crucial role in our relationship with the objects: there is not only a *technologically mediated intentionality*, which is human intentionality directed toward objects through a technological device, but even a *hybrid intentionality*, which takes shape through the mediation of technology merging with the human body (Verbeek 2008). Even if post-phenomenology does not share the extended theories of the relationship between humans and technology (Verbeek 2015), it takes an interesting posthuman turn.

Among other posthuman philosophers, Donna Haraway and Rosi Braidotti (Haraway 1985, 1991 edition; Braidotti 2013) develop in a critical sense the idea of the cyborg: the latter helps us conceive the new possibilities of the flesh, without opposing it to an assumed concept of nature that excludes technology. In this paper I consider the concept of cyborg – defined as being both “cybernetic” and “organic” – as the meeting point between humans and robots. Through a posthuman interpretation of the concept of flesh (Ferro 2021), robots and humans may be considered as two poles which revert the one into the other, though maintaining their differences. The cyborg may be considered as the moment of the process of the flesh where the human becomes machine and the machine becomes human. If such a process is possible, then the robot is not something which we feel as completely extraneous, but the pole toward which we are moving; at the same time, the robot is moving toward us, it is trying to become human. If the phenomenon of empathy occurs before cyborgs (e.g., we feel it toward people with a pacemaker), nothing hinders it to occur also before robots, even if in a different way, because of their body-machine. If robots and humans are two poles of

a dynamic and hyperdialectic element – the flesh – then the relation between their bodies can be ontologically configured as implying empathy. When I meet the gaze of the robot, I meet the gaze of the flesh, and the gaze of the flesh is somehow my gaze as well.

## Conclusion

According to the analysis performed in this paper, the phenomenon of empathy between humans and robots definitely takes place. I do not state with certainty that robots also feel empathy towards humans: this issue needs an extended and foundational discourse which cannot be developed here. However, I have argued that humans may feel empathy for robots, since they recognize them as *alter egos*. The pairing association described by Husserl (1950; eng. trans. 1960, § 51), belonging to the processes grounded in our passive synthesis, activates when we meet the gaze of the robot. This does not erase the differences between the living body and the machine-body, which exclude the coincidence or identity between humans and humanoid robots. The concept of *transcorporeal analogy* allows us to conceive this essential similarity, which is evident in the effects that the robot gaze has on humans, but even the divergence of these effects between human-human and human-robot empathy. Both factors have been brought out by the abovementioned studies on HRI.

Among these studies, Liberati and Nagataki's one (2019), taking inspiration from Sartre and Levinas, offer us a phenomenological perspective on what happens when we encounter the robot gaze. I think that their research, which is crucial in understanding human-robot relations, needs to be brought forward and integrated by more general considerations on the phenomenon of empathy as such. In this paper I have tried to do the latter, hoping to contribute to the philosophical debate about the relation between us and humanoid machines, which draw ever closer to us.

## Bibliography

- Admoni, H., Hayes, B., Feil-Seifer, D., Ullman, D., Scassellati, B.  
2013 “Are you looking at me? Perception of robot attention is mediated by gaze type and group size”, in *Proceedings of the ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, Tokyo, pp. 389–396.
- Admoni, H., Scassellati, B.  
2017 “Social Eye Gaze in Human-Robot Interaction: A Review”, in *Journal of Human-Robot Interaction*, vol. 6, n. 1, pp. 25–63.

Andrist, S., Mutlu, B., Tapus, A.

2015 “Look Like Me: Matching Robot Personality via Gaze to Increase Motivation”, in *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, Seoul, pp. 3603-3612.

Braidotti, R.

2013 *The Posthuman*, Polity, Cambridge.

Breazeal, C., Scassellati, B.

1999 “How to build robots that make friends and influence people”, in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Kyongju, vol. 2, pp. 858–863.

Ciardo, F., Wykowska, A.

2022 “Robot’s Social Gaze Affects Conflict Resolution but not Conflict Adaptations”, in *Journal of Cognition*”, vol. 5, n. 1, p. 2.

Colgate, J.E., Wannasuphprasit, W., Peshkin, M.A.

1996 “Cobots: Robots for Collaboration with Human Operators”, in *Proceedings of the International Mechanical Engineering Congress and Exhibition*, Atlanta, vol. 58, pp. 433-439.

Cusano, N.

2022 “Cobot and Sobot: For a new Ontology of Collaborative and Social Robots”, in *Foundations of science*, published on 22 October 2022. DOI: <https://doi.org/10.1007/s10699-022-09860-2>

Ferro, F.

2022 “Perceptual Relations in Digital Environments”, in *Foundations of Science*, published on 24 June 2022. DOI: <https://doi.org/10.1007/s10699-022-09853-1>

2021 “Merleau-Ponty and the Digital Era: Flesh, Hybridization, and Posthuman”, in *Scenari*, vol. 15, pp. 189-205.

Gallese, V., Fadiga, L., Fogassi, L., Rizzolatti, G.

1996 “Action recognition in the premotor cortex”, in *Brain*, vol. 119, n. 2, pp. 593-609.

Ghiglinò D., Willemse, C., Tommaso, D., Bossi, F., Wykowska, A.

2020 At first sight: robots’ subtle eye movement parameters affect human attentional engagement, spontaneous attunement and perceived human-likeness, in *Paladyn, Journal of Behavioral Robotics*, vol. 11, n. 1, pp. 31-39.

Haraway, D.

1985 “A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century”, in *Simians, Cyborg, and Women: The Reinvention of Nature*, Routledge, London-New York 1991, pp. 149-181.

Husserl, E.

1950 *Cartesianische Meditationen und Parisier Vorträge*, in *Husserliana*, vol. 1 (HUA I), M. Nijhoff, The Hague; eng. trans. *Cartesian Meditations: An Introduction to Phenomenology*, M. Nijhoff, The Hague, 1960.

1952 *Ideen zu einer Reinen Phänomenologie und Phänomenologischen Philosophie. Zweites Buch: Phänomenologische Untersuchungen zur Konstitution*, M. Nijhoff, The Hague; eng. trans. *Ideas Pertaining to a Pure Phenomenology and to a Phenomenological Philosophy, Second Book: Studies in the Phenomenology of Constitution*, Kluwer, Boston 1989.

Ihde, D.

2002 *Bodies in Technology*, University of Minnesota Press, Minneapolis-London.

Imai, M., Kanda, T., Ono, T., Ishiguro, H., Mase, K.

2002 “Robot mediated round table: Analysis of the effect of robot’s gaze”, in *Proceedings of the IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)*, pp. 411-416.

Kelley, M.S., Noah, J.A., Zhang, X., Scassellati, B., Hirsch, J.

2021 “Comparison of Human Social Brain Activity During Eye-Contact With Another Human and a Humanoid Robot”, in *Frontiers in Robotics and AI*, vol. 29. DOI: <https://doi.org/10.3389/frobt.2020.599581>

Kozima, H., Ito, A.

1998 “Towards language acquisition by an attention-sharing robot”, in D. Powers (edited by), *Proceedings of the International Conference on New Methods in Language Processing and Computational Natural Language Learning (CoNLL)*, Sydney, pp. 245-246.

Liberati, N., Nagataki, S.

2019 “Vulnerability under the gaze of robots: relations among humans and robots”, in *AI & Society*, vol. 34, n. 2, pp. 333-342.

Merleau-Ponty, M.

1945 *Phénoménologie de la perception*, Gallimard, Paris; eng. trans. *Phenomenology of Perception*, Routledge, London-New York 2012.

1964 *Le visible et l’invisible, suivi de notes de travail*, edited by C. Lefort, Gallimard, Paris; eng. trans. *The Visible and the Invisible*, Northwestern University Press, Evanston 1968.

Saerbeck, M., Schut, T., Bartneck, C., Janse, M.D.

2010 “Expressive robots in education: varying the degree of social supportive behavior of a robotic tutor”, in *Proceedings of the International Conference on Human Factors in Computing Systems (CHI)*, Atlanta, pp. 1613-1622.

Scassellati, B.

1996 “Mechanisms of shared attention for a humanoid robot”, in *Proceedings*

of the AAAI Fall Symposium on Embodied Cognition and Action, Cambridge (MA) 1996, vol. 4, p. 21.

Schellen, E., Bossi, F., Wykowska, A.

2021 “Robot Gaze Behavior Affects Honesty in Human-Robot Interaction”, in *Frontiers in Artificial Intelligence*, vol. 4. DOI: <https://doi.org/10.3389/frai.2021.663190>

Stein, E.

1917 *Zum Problem der Einfühlung*, Waisenhaus, Halle; eng. trans. *On The Problem of Empathy*, ICS, Washington 1989.

Vanzago, L.

2012 *Merleau-Ponty*, Carocci, Roma.

Verbeek, P.-P.

2008 “Cyborg Intentionality: Rethinking the Phenomenology of Human-Technology Relations”, in *Phenomenology and the Cognitive Sciences*, vol. 7, pp. 387-395.

2015 “Beyond Interaction: A Short Introduction to Mediation Theory”, in *Interactions*, vol. 22, n. 3, pp. 26–31.

Young, A.A., Khalil, K., Wharton, J.

2018 “Empathy for Animals: A Review of the Existing Literature”, in *Curator: The Museum Journal*, vol. 61, n. 2, pp. 327-343.

## Meeting the Gaze of the Robot: A Phenomenological Analysis on Human-Robot Empathy

This paper discusses the possibility of the phenomenon of empathy between humans and robots, starting from what happens during their eye contact. First, it is shown, through the most relevant results of HRI studies on this matter, what are the most important effects of the robot gaze on human emotions and behaviour. Secondly, these effects are compared to what happens during the phenomenon of empathy between humans, taking inspiration from the studies of Edmund Husserl and Edith Stein. Finally, similarities and differences between human-human and human-robot empathy are conceptualized through Merleau-Ponty's idea of flesh, which is the extended bodily element of the world. If there is a common concept of body, including both machine-bodies and living bodies, then a *transcorporeal analogy* takes place, thus explaining why the phenomenon of empathy occurs both in human-human and human-robot interactions.

KEYWORDS: gaze, human-robot interaction, phenomenology, empathy, Merleau-Ponty