Phenomenology and the Cognitive Sciences
https://doi.org/10.1007/s11097-023-09905-2

Back to the technologies themselves: phenomenological turn within postphenomenology

Dmytro Mykhailov[1] · **Nicola Liberati**[2]

Accepted: 17 March 2023

Abstract

This paper revives phenomenological elements to have a better framework for addressing the implications of technologies on society. For this reason, we introduce the motto "back to the technologies themselves" to show how some phenomenological elements, which have not been highlighted in the philosophy of technology so far, can be fruitfully integrated within the postphenomenological analysis. In particular, we introduce the notion of technological intentionality in relation to the passive synthesis in Husserl's phenomenology. Although the notion of technological intentionality has already been coined in postphenomenology, it is "in tension" with the notion of technological mediation since there are still no clear differences between these two concepts and studies on how they relate one to another. The tension between mediation and intentionality arises because it seems intuitively reasonable to suggest that intentionality differs from mediation in a number of ways; however, these elements have not been clearly clarified in postphenomenology so far. To highlight what technological intentionality is and how it differs from mediation, we turn the motto "back to the things themselves" into "back to the technologies themselves," showing how the technologies have to be taken into consideration by themselves. More specifically, we use the concept of passive synthesis developed by Husserl, and we apply it to technologies to show their inner passive activity. The notion of the passive synthesis enables to demonstrate how technologies are able to connect to a wider (technological) environment without the subjects' activity. Consequently, we claim that technologies have their pole of action, and they passively act by themselves.

Keywords Phenomenology · Husserl · Passive synthesis · Postphenomenology · Technological intentionality · Technological mediation · Passivity

✉ Nicola Liberati
liberati.nicola@gmail.com

Extended author information available on the last page of the article

Published online: 12 April 2023

1 Introduction

Phenomenology has always been known for its motto "back to the things themselves."[1] These words embed the very nature of what phenomenology wanted to achieve since phenomenology aims at being closer to things because they have an essential role in the constitution of the subjects and the world. However, it is unclear how this motto has been used by postphenomenology and the philosophy of technology more in general. We want to use some of the elements of phenomenology as a resource for understanding and tackling the implication of technologies on society and, at the same time, to refresh the phenomenological foundations underlying postphenomenology. Thus, we propose a new motto that takes inspiration from the original one and focuses on the technologies: "*back to the technologies themselves*."

Husserl famously stated the original phenomenological motto in the introduction to the second volume of *Logische Untersuchungen* (Hua 19).[2] Afterward, the motto got a wide range of different philosophical interpretations (Steinbock, 1997; Brainard, 2001; Von Herrmann, 2000, pp. 101–112; Zirión, 2006). There are several discussions related to this famous quote. For example, why did Husserl put "things themselves" [*Sachen selbst*] in quotation marks? Some researchers insist that by doing this, Husserl aimed to stress the impossibility of going to the things themselves and so wanted to highlight the normative and regulative nature of the motto itself (Steinbock, 1997). The other idea in this regard is that Husserl thought this expression was frequently used before, which is why he put it in quotation marks to indicate that.[3]

However, one of the primary intentions of this motto was to show how phenomenology is different from the other approaches focusing merely on subjects as in anthropocentric and solipsistic perspectives by introducing the objects per se as a vital part of the philosophical reflection. Even though by the "things themselves," Husserl did not mean "concrete objects such as coins," he looked at objects as part of "the fundamental structure of phenomena and of the conditions of the possibility for appearance" (Zahavi, 2003, p. 94).

Undoubtedly, phenomenology and postphenomenology are well connected, but it is unclear how much connected they are. There is an expanding body of literature

[1] In the original German text, Husserl wrote: "Wir wollen auf die «Sachen selbst» zurückgehen" (Husserl et al., 1984/10).

[2] In the present paper, we will refer to Husserl's works published in Husserliana. These works will be abbreviated in text with "Hua" and, after that, are cited by volume number, with the page number(s) following a slash. The only exclusion will be Husserl's work *Erfahrung und Urteil* that has not been published in Husserliana so far. In the case of this work, we will refer to the first German edition published in 1936. When we will give a direct quote, the corresponding English page number will be provided in square brackets after the Husserliana citation. The original German text will be provided in the footnote following the quote.

[3] Another discussion is related to the usage of the word *zurückgehen* (going back). In his *Aufsätze und Vorträge* (Husserl, 1987), Husserl explains the word usage in the following way: "So war es kein glücklicher Ruf "Zurück zu Kant," der nach einer Zeit unweigerlich seine gleichlautenden Rufe "Zurück zu Fichte," "Zurück zu Hegel," zu Fries, zu Schopenhauer mit sich brachte. Der rechte Ruf lautet wieder: An die Sachen selbst als freie Geister, in rein theoretischem Interesse" (Husserl, 1987/206).

posing whether postphenomenology is phenomenological enough (Ritter, 2021b). This questions the fundamentals of postphenomenology by focussing on the link binding the two frameworks. Depending on the answer to this question, we can get significantly different pictures of postphenomenology today. Some authors raise this question because of too empirically solid elements within postphenomenology (Scharff, 2022). Others think contemporary postphenomenology provides us with a deep reinterpretation of some central phenomenological concepts (Hanff, 2022).

Moreover, within the last several years, many researchers have questioned the role of the transcendental element in contemporary philosophy of technology and the role of the empirical turn (Bosschaert & Blok, 2022; Ritter, 2021a; Romele, 2022; Smith, 2015; Zwier et al., 2016). These aspects clearly show the need to revisit some postphenomenological ideas using part of the concepts developed within classical phenomenology. One of the milestones of the postphenomenological way of thinking is rooted in the theory of technological mediation (de Boer et al., 2018; Liberati, 2019; Verbeek, 2006).

According to the postphenomenological school of thought, technology[4] is never a neutral tool but always transforms the relation between the subject and its world. In this sense, the theory of technological mediation helps us better understand various components of human-technology relations, and, by doing so, it focuses our attention on contemporary technologies. Moreover, the theory of technological mediation has a very strong practical capacity by being able to highlight the relations connecting people, the world, and technologies. It has already been successfully applied to such domains as medicine (Kudina & de Boer, 2021; Mykhailov, 2022), education (Jubien, 2014; Adams and Turnville, 2018), instrumental design (Verbeek, 2006), AI (Wellner, 2021), intimacy (Liberati, 2019, 2020a, 2020b, 2021b, 2022), and scientific instruments (Ihde, 2009; Rosenberger, 2009).

However, even though the theory of technological mediation remains a conceptual driver within the postphenomenological inquiry, some critical positions move against mediation throughout the contemporary philosophy of technology since there are several points of concern. Firstly, technological mediation usually focuses on individual "human-technology" relations paying less attention to a broader technological context (e.g., collective intentionalities, etc.) (Osler & Zahavi, 2022; Zahavi, 2021). Secondly, it has been criticized for being too distant from political and societal questions (Coeckelbergh, 2022; Ritter, 2021a; Scharff, 2022). Thirdly, some philosophers have criticized the theory of technological mediation for being too concentrated on analyzing technologies at the concrete level (Zwier et al., 2016). Fourthly, the contemporary theory of technological mediation has many intertwinings with Bruno Latour in precise and ANT in general, which makes the link to phenomenology more complicated (Arzroomchilar, 2022). Moreover, what is more

[4] Every time when we are using the singular term technology, we are not referring to some abstract and universal "technology" as in the case of the use of "Technology" with the capital "T." On the contrary, in the present paper, we apply an empirically oriented approach to technology meaning that technology is always a set of *different technologies*. That is why terms technology and technologies in this paper are used interchangeably. For more on the difference between "Technology" and "technologies," see Ihde (2010) and Rosenberger (2021).

important for this paper is that the theory of technological mediation reduces technology either to the subjective pole (as in the case of embodiment mediation, where technology merges with the subject) or to the objective pole (as in the case of background relations, where the world completely absorbs technology).

Following this perspective, we are never thinking of the *technologies themselves* since the technologies are always *either* with the subject *or* with the object. In what follows, we will show that it is possible to look at technologies differently and that the key to this perspective is open to the notion of technological intentionality. This opening to the new idea of intentionality applied to technologies also gives us a unique perspective on the theory of technological mediation itself.

Novel technologies like deep brain stimulation (henceforth DBS) are taken into account as examples because they clearly show how we need to introduce technological intentionality to better address the implications they have.

2 Completing mediation theory with technological intentionality

2.1 A tension between mediation and intentionality

Postphenomenology has been primarily occupied by mediation within human-technology relations (Verbeek, 2005; van den Eede, 2010; de Boer et al., 2020; Mykhailov, 2023). This philosophical focus goes with several shortcomings, namely, such an approach does not provide the key to the technology itself because each time technologies are reduced either to subjective or to objective poles. Even if the theory of mediation is fertile by showing how there is no clear distinction between subjects, objects, and technologies, it does not provide technologies with their pole. The technologies seem not to have enough space and importance to have their intentionality and to be a third pole of the relations. If we take a look at the usual types of mediation introduced in postphenomenology, we can see this "reductionist's" tendency[5]:

Embodiment: (human—technology) → world.
Hermeneutic: (human) → (technology—world).
Alterity: human → technology (—world).
Background: human → (—technology—world).
Cyborg: (human/technology) → world.

The poles founding the relations are the one of the subject one and the one of the world, while the technologies are attached to them. Even if the significance and importance of the technologies in the structure of the relations are clear, they are something in between the two main elements, and this position in between gives

[5] These are just examples of possible relations since postphenomenology clearly showed how any kind of combination is possible. These different configurations help to better study the effects of technologies on us and on the other way, even to design a technology with specific aims (Hasse 2008; Adams, Catherine; Turnville 2018; de Boer 2021a, 2021b; Fried and Rosenberger 2021).

them an ancillary role, even if an important one. Clearly, technologies are fundamental in creating the relations and so to generate the two poles of interest, but, at the same time, they are dependent on these two poles, and they orient themselves in line with the force field generated by these two main elements.[6] Consequently, by seeing the technologies as "mediators," which constitute the two main elements, postphenomenology risks missing out on technologies themselves. In a way, even if the technologies generate the two poles, they do not have the same role of the two main elements. However, it is possible to think of the technologies not just as "mediators," which give meanings to the subjects and objects but as a third pole. For this reason, we introduce the term "technological intentionality" to focus the attention on the technologies themselves and provide them with their pole.[7]

It seems intuitively obvious that technological intentionality is different from technological mediation. Postphenomenology also aligns with this intuition by claiming that all technologies have intentionality and all mediate human experience (Mykhailov, 2020; Mykhailov & Liberati, 2022; Verbeek, 2008). Moreover, according to Don Ihde (Ihde, 1978, pp. 77–78, 1990, pp. 102–103), technological intentionality "indicates the directedness of technologies toward specific aspects of reality. A cassette recorder, for instance, possesses specific intentionality with respect to sound, which strongly differs from human intentionality, since it registers not only foreground but also background sound" (Verbeek, 2005, p. 114). Technological intentionality has also been developed by the second generation of postphenomenologists. For example, we can find this term in several works by Peter-Paul Verbeek (Verbeek, 2005, 2008). While Verbeek is moving in the same line of reasoning that Don Ihde started, he has supplemented the notion of technological intentionality with a new conceptual underpinning. According to Verbeek, technological intentionality is not just directedness of the technological object to some part of reality—as Don Ihde previously suggested—but also a possibility for creating new types of human-technology assemblages, namely, cyborg intentionality (especially in its type of the composite intentionality[8]) (Verbeek, 2008). Verbeek insists that two different meanings of "intentionality" are intertwined in this kind of intentionality. The first meaning relates to technological intentionality as an "intention" of the technology

[6] It is important to say that, at several places, postphenomenologists claim to adhere to relational ontology, implying that relationships are primary to the relata constituted by them. For more on this topic, see (de Boer and Verbeek 2022, p. 198; Van Den Eede 2019; Ihde 1990, p. 25; Verbeek and Rosenberger 2015, p. 19; Verbeek 2011, p. 52). However, even under this consideration, postphenomenology risks diminishing the technology to an addendum, even if important, of the two "relata," which are object and subject. The technologies still play a role in "mediating" and making the two poles emerge without being a third pole of interest.

[7] Of course, it does not mean that the technologies become completely isolated from both subject and the world, but it appreciates the variety of roles technology can have.

[8] In his work, Verbeek defines different types of cyborg intentionality such as technologically mediated intentionality, hybrid intentionality, composite intentionality, augmented intentionality, and constructive intentionality (Verbeek 2008). In this paper, we mainly refer to the composite intentionality because, in our opinion, this is one of the best attempts to grasp the technological intentionality in contemporary postphenomenology so far. However, even if composite intentionality is a seminal concept, it still does not focus on the phenomenologically based passive activity of the technology, while our paper introduces this component to the discussion.

itself. At the same time, the second meaning refers to human intentionality that has been mediated by technological intentionality.[9] However, Verbeek's analysis of cyborg intentionality still aligns with the "reductionist" tendency within the mediational theory. Even in cyborg intentionality, particular stress has still been made on human intentionality and not on the technologies themselves. For example, while describing cyborg intentionality, Verbeek writes: "When this "directedness" of technological devices is added to human intentionality, composite intentionality comes about: a form of intentionality that results from adding technological intentionality and human intentionality" (Verbeek, 2008, pp. 392–393). By doing this, technological intentionality is being "eclipsed" by the theory of mediation once again, and the path to the technologies themselves has been concealed.

As we hope it is clear, technological mediation as conceived by the postphenomenological approach is different from technological intentionality. While intentionality, according to the postphenomenological view, represents directedness of the technological object to some part of reality; mediation, on the other hand, occurs within "human-technology" relations and usually shows up as a transformative activity.[10] Said differently, intentionality provides a direction; mediation transforms the experience according to the direction provided by the intentionality. In this sense, one can suggest that intentionality exists *before* the mediation and even that *intentionality presupposes mediation*. Thus, technological intentionality is a more fundamental element of the technology itself, and so it seems impossible to grasp the nature of the technology without having understood this element.

Moreover, the notion of technological intentionality creates a conceptual tension inside postphenomenology itself. On the one hand, postphenomenology accepts that technologies have their intentions, while, on the other, it insists that technologies are already defined by their "human-technology" relations and so by their mediational activity. However, it is impossible to have both claims at the same time. We should either admit that technological intentionality is possible and technology can have intention in itself or reduce technology to its mediational activity only. Because of these different perspectives and the fact that the researchers worked mainly on the technological mediation, mediation almost eclipsed the concept of technological intentionality. Moreover, thanks to this history, it seems that the problem of the "intentionality" of the technology itself is still an open question in today's postphenomenology even if it was one of the first focal points of its research.

As we have shown, phenomenology should not just look at subjects, but it should appreciate the importance of objects as well as its famous motto "back to the things themselves"

[9] In addition, intentionality can be addressed in terms of the "directedness" of the perceiver's action and in terms of the availability of the content (Liberati 2016a). The intentionality of the subject flows toward the external object or be redirected toward a substitute, which talks about the objects such as in the case of a subject who looks at the thermometer to know the temperature of the object. Moreover, the object can be provided by the technology following a traditional way such as an image in false color showing the temperature, or it can be provided as a text to be read and interpreted such as the graduated scale of a thermometer.

[10] This transformative activity might be related to change in perception—as in the case of the AR glasses (Liberati, 2017)—or to the change in practical dimension—as in the case of AI decision-support systems (Mykhailov 2021).

highlights. The movement toward the objects has to be intended to open the research to different aspects that cannot be fully addressed by an anthropocentric and idealistic perspective of the epoch where Husserl lived. Today, the call of phenomenology to open the horizon to different elements can be interpreted as giving importance to other elements like technologies for the same reasons. Husserl stressed how objects had not to be reduced to other poles because that would have meant having a reductionist and anthropocentric approach. Technologies also should not be reduced to other poles because that would be to follow a reductionist approach putting subjects and objects as primary.

2.2 Technological intentionality and technology itself—the passive activity of the object

It has already been touched upon above that, according to the postphenomenological school of thought, technological intentionality is related to directedness (Liberati, 2016a, 2016b; Mykhailov, 2020; Verbeek, 2008). However, in our opinion, the notion of directedness cannot describe the whole "spectrum" of technological intentionality. More importantly, it does not explain *how* technology can be active "by itself" (Liberati, 2021a; Liberati & Chen, 2022). That is why, in order to provide deeper philosophical inquiry to the problem of technological intentionality, we cannot rely only upon the postphenomenological framework, but we need to include the phenomenological notion of passivity in our discussion. Technological intentionality, as we will show in this section, is closely related to the passivity of the object. This notion is hard to "grasp" in action, and so this might also be a reason why the concept of technological intentionality has been, in some way, "eclipsed" by the idea of technological mediation so far. Moreover, the passive component of technological intentionality makes it highly resistant to non-phenomenologically embedded approaches.

The notion of passivity was first developed in Husserl's phenomenology, and, in what follows, we will focus on how Husserl developed the notion of passivity to uncover some elements that have not been addressed in the philosophy of technology and postphenomenology so far. In the work *Ding und Raum* (Husserl, 1973), Husserl describes how things are given to us if we are looking at them through a phenomenological perspective. He writes:

> In the natural attitude of spirit, an existing world stands before our eyes, a world that extends infinitely in space, that now is, previously was, and, in the future, will be. This world consists of an inexhaustible abundance of things, *which now endure and now change, combine with one another and then again separate, exercise effects on one another and then undergo them* (Hua 16/4 [2]; emphasis added).[11]

[11] "In der natürlichen Geisteshaltung steht uns eine seiende Welt vor Augen, eine Welt, die sich endlos im Raum ausbreitet, jetzt ist und vorher gewesen ist und künftig sein wird; sie besteht aus einer unerschöpflichen Fülle von Dingen, *die bald dauern und bald sich verändern, sich miteinanderverknüpfen und sich wieder trennen, aufeinander Wirkungen üben und solche voneinander leiden*" (Hua 16/4; emphasis added).

Although Husserl almost did not write about specific technological objects[12] in the quote mentioned above, Husserl formulates a strong phenomenological intuition that states that things have an ability to interact with one another by combining, separating, and affecting each other. In a later work, Husserl describes this characteristic of things through the notion of passivity.

In his later works like *Erfahrung und Urteil* (Husserl, 1939) and *Analysen zur passiven Synthesis* (Husserl, 1966), Husserl develops the concept of passivity more deeply. Originally, the concept of passivity was developed both for describing passive actions of subjective consciousness, like the synthesis of internal time and association, and for defining objective passivity. The latter, in Husserl's terms, "is not related to the absence of actions of the object itself, but, rather, it is linked to the object's activities, which are out of the ego's activity" (Liberati, 2016a, p. 5). In this sense, to be passive for the object does not necessarily mean to be inert but to be active without the concrete action of a subject (Biceaga, 2010). Moreover, within the comparison of subjective and objective passivity, it is also important to highlight that the activity of the consciousness arises from its passive elements.[13]

In this sense, Husserl's notion of passivity tries to grasp how the objects are active outside of the subject's activity and can be active "in themselves" (Biceaga, 2010). However, Husserl did not explicitly put the notion of passivity in relation to technologies, but he talked about objects more in general. In the present paper, we show how technologies can be passively active to further develop postphenomenology through a phenomenological framework.

Following this late Husserl's perspective, we can easily look at the technologies as objects with passive activities that are always hidden from the subjective view. Moreover, the activity of the technologies also emerges from their passivity.[14]

Thanks to the idea of objects that are passively active within the Husserlian framework, we can address this hybrid position of the technologies by appreciating their passive activity in the relation-binding subjects and objects. It is possible to look at the technologies as something that can be "active" by themselves, thanks to the passive element that every object possesses. Following this perspective,

[12] For an exception, see (Liberati 2016b).

[13] Husserl's phenomenology presents a perspective where objects are almost "alive" since they are characterized by a fundamental passive action, which makes them not fully determined by subjects' intentional acts. As presented by Husserl, the objects, in their hyletic data, are pre-arranged at the object level and "presented" to the subject as a pre-given entity. Thus, objects present themselves to us with a certain resistance or "thickness" since they constitute themselves prior to any relation with the subject. In order to better grasp the pre-giveness of objects in Husserl and the passive analysis involved, it is possible to refer to Bernet 2002; Biceaga 2010; Dahlstrom 2007; Ferrarin 2006; Priolo 2020; Trincia 2008.

[14] Phenomenology provides us with a conceptual vocabulary that enables us to "track" the activity technology has outside of the subjective pole, and so we can show how technologies are active "in themselves," even if they are not in immediate relation with a subject. This approach provides a parallel and different perspective on similar topics studied by Object Oriented Ontology and ANT (Harman 2008) from a perspective, which is much closer to postphenomenology since it is anchored in one of the main elements of Husserlian phenomenology. Thus, it is possible to enhance postphenomenological approach by integrating some of the key elements in phenomenology, which are still missing in it in order to highlight different aspects of the effects of technologies like its "passive activity" as technological intentionality.

technologies have their pole of action that can *interact* with both subjective and objective poles. Thus, we can consider technological intentionality as an active component of technology itself, which is deeply connected to the passive components of technologies.

The elements of the "passive activity" of the object we are interested in can be generally conceptualized in two main elements. Firstly, this passivity is "passive" only from the subject's perspective. Secondly, the object can interact autonomously with objects and subjects, and this interaction usually happens outside of the subject's consciousness. The first element applied to technologies shows how technologies act out of the subject's perspective in a hidden way, and so they are constantly more than what the subjects see. The second element shows how technological intentionality goes in contrast to the postphenomenological theory of technological mediation since technologies have their poles of action and can act autonomously without subjects[15] and objects.[16] Moreover, according to phenomenology and postphenomenology, technologies are not just objects around the other objects, but they can be active participants in both human-technology and technology-technology interactions.

In order to highlight these elements, the following section takes into account the case of Deep Brain Stimulation (DBS).[17]

3 Neurotechnologies—deep brain stimulation (DBS) and neural implants

Generally speaking, DBS system is used to stimulate particular brain regions (brain nucleus) in order to improve different cognitive functions (as in the case of Alzheimer's disease) (Laxton et al., 2010), specific mental states, or psychiatric conditions

[15] In this sense, the technologies are the ones integrating the subjects in their activities, and not vice versa. For example, many technological objects affect us before they are in use (Adams, Catherine; Turnville 2018, p. 12). A notification on my phone tugs at me to check it, a chair proposes me to sit, an apple invites me to take a bite (Geniusas 2011, 2012; Liberati 2020a, 2020b). In this way, technological objects "invite" me to do some actions before I start using technology. What is more importantly, even the mere presence of the object can shape my decisions and behaviors. For example, when my phone is (passively) laying on the table in front of me, I can be tempted to check my emails and messages. In this case, the phone is literally doing "nothing," and it is passive, but, in its passivity, it is still acting upon me by calling for specific actions of mine. In this way, a significant part of technological intentionality is played by the "passive activity" of the object.

[16] During this interaction, technology is active "by itself," which means that technology has its pole without depending on the ones of subjects and objects. A possible example here is when one technological object interacts with the other technological objects in order to accomplish its function. For instance, every computer program (even the most simple one like "Paint" or "Soliter") consists of other computer programs, which, in order to operate properly, must run on the computer's hardware (Mykhailov and Liberati 2022). These are interactions that are taking place outside subjective attention, and, so, in Husserl's terms, they might be named passive, and they form a vital part of the technological world we are living in today.

[17] This type of technology has been chosen because it makes some elements of the analysis more visible. However, we can apply our work to other technologies as well.

(for example, depression) (Mayberg et al., 2005; Rush et al., 2000; van Westen et al., 2021), and movement disorders like essential tremor or Parkinsonism (Benabid et al., 2009). Moreover, it has been scientifically proven that DBS can help repair some perceptual dysfunction and even help return some lost senses.

There are two types of DBS systems applied today: invasive and noninvasive DBS. In the case of an invasive DBS, the system is directly implanted into the patient's body, while noninvasive methods do not necessarily require surgery or other invasive mechanisms. That is why noninvasive methods are more popular nowadays, while invasive solutions are only applied in some severe cases.

Usually, the DBS system consists of three main components[18]: the implantable pulse generator (IPG), the lead (under the skin), and an electrode in the target area of a deep brain (Herrington et al., 2016). The IPG is a battery-powered neurostimulator inserted in a titanium shell, which sends high-frequency (~100 Hz) electrical impulses (~0.1 ms) to the target brain area. The electrical pulses go through the lead, a coiled wire with four electrodes placed in one or two different neuron clusters of the brain. Finally, the signal gets to the electrode that is situated in a target area of the deep brain. The target area can vary depending on the needs of the patient.

For example, pain in terminal cancer can be relieved by DBS in the cortex, in the central gray of the brain, or the sensory thalamus (Owen et al., 2006). Electrodes in the hypothalamus's posterior section might help cluster headaches (Leone et al., 2004). Furthermore, DBS can facilitate solving several psychiatric issues (van Westen et al., 2021). For instance, obsessive–compulsive disorder (OCD) can be treated by DBS of the nucleus accumbens. DBS in the subgenual cingulate white matter can improve mood during depression (Perlmutter & Mink, 2006), and DBS of the posterior hypothalamus might improve disruptive behavior (Franzini et al., 2005). As a result, DBS has contributed to circuit theories of brain dysfunction by showing how localized dysfunction and interference can strongly influence brain-wide networks (Lozano et al., 2019, p. 2).

Some of today's DBS systems can stimulate and record patients' brain activity (Rao, 2019; Stanslaski et al., 2018). As we have already mentioned, during the stimulation, DBS system sends high-frequency electrical impulses to the target brain area. The high-frequency electrical impulses can both stimulate a target area and block some originally "broken" signals that the brain generates (as in the case of various motor disorders like essential tremors). The recording activity, in turn, can help register the patient's treatment dynamics, and it might provide some valuable insights into the changes in the patient's condition and sometimes even predict various changes in the patient's health. In this way, the DBS system can monitor and modulate the patient's neural activity.

More than 35,000 patients have been treated with DBS (Swaab, 2010, p. 22). Although this technology looks very prominent and the number of people ready to use it increases yearly, it is worth remembering that the DBS system still has several

[18] A good schematic illustration can be found via the link: https://www.healthplexus.net/iTherapies/VisualAids

undesirable side effects.[19] For example, during the electrode implantation, seizures and infections might occur after the surgery. Moreover, various unwanted psychiatric symptoms may also occur, such as changes in character,[20] manic, or depressive states, etc. (Dings & de Bruin, 2015; Zawadzki, 2020).

3.1 Technological intentionality in DBS

The notion of technological intentionality can be applied to the DBS systems, thanks to its relation to the "passive" component of the object. Although technological intentionality is a fundamental component that all technologies have, we are focusing on DBS as this technology is a very illustrative case, which makes the passive components of the technological intentionality more visible. DBS can serve as a good illustration how the notion of technological intentionality developed in this paper may nuance the notion of cyborg intentionality.[21]

In the case of invasive DBS, the whole system has been directly integrated into the patient's body to, for instance, deliver stimulation to targeted areas responsible for body movements. This blocks the abnormal brain signals that might cause symptoms like tremors in Parkinson's disease (Benabid et al., 2009). Moreover, as we have shown, the new-generation DBS systems[22] are able not just to block abnormal brain signals but also permanently monitor brain activity. Thus, when an abnormal signal appears, the DBS can detect it and reduce it (Stanslaski et al., 2018, p. 3). To reduce the abnormal signals and to make symptoms of the patient disappear, the DBS stimulates targeted brain areas when the abnormality starts. In this sense, the DBS is designed to act only in presence of abnormal signals, leaving the patient in a "natural" state for the rest of the time. It is possible to have DBS, which adapts and "predicts" the occurrences of abnormal signals, merging their activities fluidly and hiddenly from the patient.

[19] This double-edged sword can be understood in relation to the idea of magnification and reduction exposed by postphenomenology. According to postphenomenology, technologies do not "improve" human beings, but they provide magnifications of some aspects and consequential reductions of others (Ihde 1990; Kudina 2021; Rosenberger 2008; Wellner 2011).

[20] There are several cases that are widely discussed in the scientific literature when the usage of DBS caused to strong changes in the character of the patient (Gilbert et al., 2017). One of the most famous cases is the case of Charles Garrison. According to Mathews et al.: "Following implantation of the DBS, Mr. Garrison had significant improvement in his motor symptoms. More dramatic, however, was the change in his personality and demeanor […]. Mr. Garrison now became extremely outgoing and gregarious […]. Mr. Garrison went on to develop not only a new demeanor but also a new outlook on the world. Previously, a loyal Republican, he switched his affiliation to the Democratic Party. He became an ardent environmentalist, traveling to numerous conferences and insisting (over his wife's objection) on giving all of their charity donations to environmental causes" (2009, pp. 58–59).

[21] The case of DBS is also important for the contemporary philosophy of technology for several reasons since DBS is a novel medical brain technology that can change our understanding of the human body in general. For example, according to Pateraki (2019), DBS has a crucial impact on the patient's life experience by transforming the experience of the temporality of the patient, which can lead to a number of philosophical consequences.

[22] New-generation DBS systems are using an additional implanted electrode to detect some undesired abnormal signals from other parts of the brain.

In this case, the patient lives the result of a technological byproduct where the technology intentionality of the DBS system plays a major role. For example, if the purpose of DBS surgery was to reduce the essential tremor, then, after DBS is active, the patient will experience the "stillness" in his or her body. The movements will become less distracted; actions will receive the contingency. The patient will be able to "use" his or her body for accomplishing tasks that s/he was not able to do earlier, like writing with a pen, holding a cup, and using a mobile phone.

We have mentioned before that a significant part of technological intentionality relates to integrating both subjective and objective poles. In the case of the DBS, technological intentionality also possesses this feature. Since the main focus of the DBS system is on the human brain, and the human brain regulates almost every organ of the human body, technological intentionality integrates every part of the human body. In the case of the DBS system, the integration process becomes possible because of the neuroplasticity of the human brain. Suppose the surgery and the further adaptation have been successful after the system has been integrated into the human. In that case, body signals from the implant will be "interpreted" by the brain like an effector channel or natural sensor (Levine et al., 2000). In this sense, even the patient's body (after the adaptation) *cannot recognize* the "artifactuality" of the signal, and it starts considering the signal as generated by the brain itself.[23] The entire DBS system becomes integrated into the patient's body, and the brain interprets the signal caused by the implant as an original part of the brain's activity.

This can strongly affect the patient's behavior. For example, Gilbert et al. (2017) describe an interesting shift in patients' behavior after DBS. Authors write:

> In a similar way, Patient 09 was so confident in her newfound strength and physical capabilities that she was nearly permanently disabled when she attempted to lift and move a large pool table. In this way, DBS may be construed as so effective in relieving symptoms that it actually causes people to have a distorted view of their own capabilities. These distorted perceptions appear to induce the belief that patients have (some) enhanced capacities far in excess of their actual abilities (p. 99).

The present quote clearly illustrates the radical shift in body perception that might happen to some patients after the DBS system has been integrated. Now, when the patient's body is integrated into the technological intentionality of the DBS system, *the whole body* is being experienced as transformed. This fact provides a wider perspective on the role of technology more in general and on the role of technological intentionality in particular. For example, postphenomenological embodiment mediation always focuses on *some* perceptual transformations in the human body (like in the famous example of the glasses or hearing aid). Even in the case of the cyborg mediation (together with hybrid intentionality) proposed by Verbeek, they show the

[23] This idea stands in a close relation to the notion of the body schema that has grown in popularity within phenomenological research during the last decades (de Preester 2011; Gallagher 1995). According to this notion, the subject acts through a series of schemas, which are part of the body, in how it moves and performs the actions.

transformative effect of some parts of the body. However, in the case of technological intentionality applied to the DBS system, we can witness a more radical transformation in action.

This transformation integrates the whole body of the patient. More importantly, this integration is, phenomenologically speaking, of a passive nature since the technology is "passively active." The technology creates new relations with other entities in the world *before* the subject becomes aware of it. In the case of DBS, these entities are human organs and medical equipment needed for collecting data from the DBS system.[24]

We can see a significant shift in understanding human-technology relations more in general. Postphenomenology considered technological intentionality as something integrated into human intentionality. However, we can see that human intentionality is integrated into technological intentionality. In this sense, through the notion of technological intentionality, we can get access to a deeper layer of technology itself where technology is not reduced to subjective or objective poles.

Moreover, technological intentionality can integrate the object's pole as well. Even if the actions of DBS technology are out of the scope of the subjects' perception, the DBS technology is very active by connecting other objects around it. As we have already mentioned in the previous section, the DBS system is able not only to stimulate a patient's brain activity but can also record it. The recording procedure results in data collection, and data collection needs to connect the implant to a wider technical environment.

On the technical level, data collection becomes possible because of the system's software. For example, the software of the DBS system called the Summit™ RC + S enables the system to permanently collect and analyze the data from the implant and share it with external devices such as a PC afterward (Stanslaski et al., 2018, pp. 12–13). This system's ability enables adjustments of the stimulation parameters, allowing DBS to adapt to the patient's needs automatically. Moreover, the system's software allows downloading updated firmware with new features and improved design solutions. In this sense, the DBS system remains permanently connected to a wider technical environment where the system is able to receive, process, and share medical data without the user's awareness (Rao, 2019). This connection creates a strong impact on brain research as the medical data can be directly acquired from the patient's body, while the research can be performed in different places such as the patient's home and the clinical environment.

Furthermore, the DBS can be connected to computers or different software and collaborate with other medical equipment like electroencephalography (EEG) and magnetoencephalography (MEG) devices. The latter often provide supplementary data from other brain areas, which are used to analyze brain networks targeted with DBS (Litvak et al., 2021). That is why both EEG and MEG are often used to treat patients with DBS. For example, one possible medical approach in this respect is

[24] The fact that technologies can create relations with other objects can be applied not only to DBS but to all technologies in general. In this sense, the phenomenological framework developed throughout this paper is universal and goes out of the scope of medical technologies only.

to map DBS-target areas by recording EEG/MEG responses within the stimulation (Harmsen et al., 2018). This approach may contribute to the optimization of stimulation parameters of the DBS system in the future. In this sense, DBS, EEG, and MEG create a technological network that can give us a wider perspective on brain functioning. For this reason, it seems important for DBS to be connected to other scientific instruments within the medical environment in order to provide a better view of the specificity of the patient's brain.

This connectivity of the DBS to a wider technological environment represents a significant element of technological intentionality in relation to the passivity of the object. A technology is never "alone" by being actively connected to the environment around us. However, this connectivity is hard to grasp and conceptualize because it happens outside the subject's consciousness.[25]

As we have shown in the present paper, the phenomenological approach enables us to see the underlying activities performed by the technologies that are out of subjects' perception. Thus, just as the phenomenological motto "back to the thing themselves" wanted to show how much things cannot be reduced to the subject's pole because they play an independent role in the constitution of who we are and the world where we live, by looking "back at technologies themselves," we want to show how technologies cannot be reduced to the subject and object poles because they play an independent role as well.[26]

4 Conclusion

Phenomenology claims that "going back to the things themselves" is a philosophically meaningful endeavor. In this sense, phenomenology directed its interest toward "things" in order to appreciate the role of objects in how we relate to the world in an effort to escape a reductivist approach to how subjects are constituted. Said differently, the things had to be "freed" from their dependency upon subjects. Postphenomenology and philosophy of technology, in general, seem to be entangled with the same struggle. It wants to provide a role to technologies, but, at the same time, it still looks at them in terms of "subject-world" relations, making them directly dependent on these two elements.

However, we cannot limit ourselves to analyzing technologies as dependent upon subjects and the world. For the same reason, phenomenology had to "free"

[25] It is important to mention that we do not deny that postphenomenology can work on technologies like DBS, which connect to a broader technological environment, and that it already introduces technological transparent act of which the subjects are not aware of. However, the postphenomenological vocabulary should be better conceptualized to highlight the details in such technological relations since postphenomenology does not use one of the fundamental ideas in phenomenology like the passive, which has been used by phenomenology to address the "life" of objects. For this reason, we are introducing the notion of technological intentionality in relation to the passivity of the object.

[26] It might be relevant to note that this idea has been criticized within contemporary philosophical debates. One of the prominent examples of such critics might be the position developed by Bruno Latour. Unfortunately, the limits of this paper restrict us from going in-depth on this topic. For more detail of these relations, see de Boer (2021a, pp. 110–112) and Latour (2008).

the objects from their dependency upon subjects. We need to strive to appreciate their actions in the world. Going "back to the technologies themselves" revives the main aim of phenomenology by placing the technologies at the center of the analysis. In the present paper, we aimed to provide such a phenomenological change in perspective through some phenomenological elements usually underestimated in postphenomenology. We have shown how technology's passive element is related to technological intentionality. Moreover, our paper clearly indicates how the previous analysis in postphenomenology cannot address such passivity embedded in technologies (especially in its relation to technological intentionality). According to the view provided in our paper, technological intentionality is more fundamental than the elements commonly used in postphenomenology, like "mediation." While technological mediation appears as a result of "human-technology" relations, technological intentionality exists *before* or *outside* the mediation.

More specifically, in the first part of the article, we analyzed the phenomenological role of an object's "passivity." We especially focused on Husserl's intuitions on passivity developed in his later writings, such as *Erfahrung und Urteil* and *Analysen zur passiven Synthesis*. We showed how Husserl defines an object's passivity as the ability of the object to be active outside of the subject. Although the term "passivity" refers to the passive nature of the object, this passivity is "passive" only from the subjective perspective. In our paper, we call it the "passive activity" of the object. Such activity represents a significant element of the "technologies themselves." In this sense, technologies have their poles of action, and, as such, they are able to incorporate both subjective and objective poles.

In the second part of the paper, we have focused on the DBS system in order to grasp technological intentionality in action. We have shown that contemporary DBS systems are able, on the one hand, to stimulate the targeted brain zone, while, on the other, they can record and analyze a patient's brain activity. In this sense, DBS systems show clearly how they are much more than "mere" mediators between the subject and the world. They act on their own, just as the passive synthesis within phenomenology suggested. The technologies might seem "inert," but, within this passive condition, they are active. DBS systems can moderate a patient's brain signal (e.g., integrate the subjective pole) and interact with the technological environment (e.g., integrate the objective pole). All these activities occur within the object and are not related to the subejcts' and world's activities.

Technologies, in their passivity, are active. We can grasp this activity, thanks to the phenomenological idea of going "*back to the technologies themselves*" and introducing the idea of "*technological intentionality*" to acknowledge this passive activity.

Funding The work on this paper for Dr. Mykhailov has been supported financially by the Major Project of the National Social Science Fund of China: "The philosophy of technological innovations and the practical logic of Chinese independent innovation" (技术创新哲学与中国 自主创新的实践逻辑研究), grant number: 19ZDA040. Both authors contributed equally to the realization of the paper.

Declarations

Conflict of interest The authors declare no competing interests.

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Authors and Affiliations

Dmytro Mykhailov[1] · **Nicola Liberati**[2]

Dmytro Mykhailov
101300137@seu.edu.cn

[1] School of Humanities, Southeast University, Nanjing 211189, China

[2] Department of Philosopy, Shanghai Jiao Tong University, Shanghai, China