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THEORETICAL / PHILOSOPHICAL PAPER

Some Suggestions to Improve Postphenomenology

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Abstract
Postphenomenology was envisaged to lay bare the black box of technology through a phenomenological approach. The vision, in this sense, was to identify how technology might mediate both the subjectivity of its immediate user and the world around her. In this paper I will argue that to cognize technology's effects fully, we need to enrich postphenomenology with further insights. In particular, SCOT and ANT may be integrated into postphenomenology. While the former can provide a historical narrative of how technology has evolved throughout time, the latter may embed technology within a network where the interplay of the technology, the first user, other individuals and the society, on the whole, can be depicted. After a preliminary theoretical discussion, I will go through some case studies to articulate how SCOT and ANT can make a contribution to a systematic investigation of technology.

Keywords Technology · Mediation · Multistability · Postphenomenology · ANT · SCOT

Introduction

Technology is intentionally created by human beings to serve a certain purpose. But soon after its development it may transcend the mere instrumentality and take on an active role influencing the creators. I use my credit card as a passive tool so long as it is used for payment. But it may also go further and start affecting me in turn. For example, it turns out that bank cards may promote consumerist behavior and invite owners to overspend (Hafalir & Loewenstein, 2009). Here the initially silent artefact has transgressed its assumed primary function and is actively affecting me.

Such an activeness of technology is associated with the notion of *mediation*. A systematic treatment of the mediation of technology found an expression within the postphenomenology movement. On the latter's account, the notion of mediation

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refers to the interconnectedness of human beings and technology. Technology is not located simply *between* users and the world, rather all three factors are entangled in an intricate way. Technology, moreover, reconfigures both human behavior and the world appearing in one's consciousness, according to mediation theory. In the presence of a technology, subject and object cannot remain untouched, rather, thanks to the technology's featuring they would undergo changes, as I will discuss in more detail.

However, postphenomenology is not the sole framework to bring mediation of technology into view. Actor-Network-Theory (ANT) took it seriously, too. Translation (the mirror image of the notion of mediation within ANT) is a central notion in ANT teachings. In ANT, though, there seems to be, among others,[1] a crucial divergence in the way technological mediation is approached. While in postphenomenology, mediation is treated in a phenomenological way, i.e., from within, in ANT, mediation is studied through a third-person point of view, i.e., taking up an 'outside-in' approach.

Even though the postphenomenological approach to mediation has proved efficient, it may fall short, I will argue, of tracking *all* dimensions of mediation. Many things may be left out with a mere phenomenological approach. In particular, although technology's impacts on individuals are quite captured by the inside-out approach, it appears that postphenomenology is not well equipped to address effects on collectives. The latter requires an outside-in approach. ANT insights may be of help accordingly. This is not, however, the only arena where postphenomenology may, or rather needs to, improve. It may also be enhanced on a different ground, namely expanding on the notion of *multistability*. The latter refers to the fact that technology may have different stabilities, that is, different meanings, in different contexts. As I will discuss, postphenomenology's obsession with the actual existing technologies may cause it to miss some subtleties about technology. The history of evolution of every technology can surface stabilities which otherwise could remain unnoticed. The so-called SCOT movement (Social Constructivism of Technology) proves effective here to provide such a historical narrative. All the foregoing shortcomings, I think, need to be remedied. To be specific, I will argue that the postphenomenological approach, (1) is unable to analyze how technologies mediate behavior on a *collective* level, (2) insufficiently recognizes the *political* and *social* dimension of technology's mediation, and (3) with its emphasis on the current configuration of technologies misses their further possible stabilities.

Drawing upon ANT and SCOT, I will try to show how such shortcomings may be rectified. While ANT seems quite relevant to meet drawbacks associated with the mediation of technology (number 1 and 2), the empirical approach of SCOT may throw light on the ways technologies receive different stabilities within society (number 3). In sum, in this paper, I will be proposing integration of ANT and SCOT into postphenomenology.

In what follows, I first provide an overview of postphenomenology ("An Overview of Postphenomenology" section). Special attention will be devoted to the notion of mediation ("Postphenomenology, Mediation and Possible Relationships

[1] I will discuss the differences between them later.

Between Human Beings and Technology" section) and postphenomenology's methodology ("Multistability and the Methodologies of Postphenomenology" section). Next, I will start supplementing postphenomenology's framework on two grounds ("How Can Postphenomenology be Supplemented?" section); firstly, drawing upon SCOT, I will suggest a further way for doing postphenomenology ("An Extension of the Variational Cross-Examination" section). Secondly, I will try to show how fruitful integrating ANT into postphenomenology may be to reveal some of the societal, political and collective dimensions of technological mediation ("Mediation Beyond Individuals; Toward a Comprehensive Account of Mediation" section). I will close the paper with a final discussion lastly ("Metaphysical Challenges" section).

An Overview of Postphenomenology

Postphenomenology is a movement to study technology in a systematic way. Drawing on classical phenomenology, postphenomenology tries to make sense of technology in its social and cultural context. Postphenomenology is inspired by three different sources (Rosenberger & Verbeek, 2015: 1); first, classical phenomenology and its forefathers, Husserl, Heidegger, and Merleau-Ponty (Ihde, 2009: 11). This is evident from Ihde's remark that 'Postphenomenology is a modified, hybrid phenomenology' (Ihde, 2009: 23). Second, the American pragmatist tradition. And third, research in the empirical field of 'science and technology studies' (STS) in the second half of the twentieth century. I will briefly go through each in turn.

While the influence of classical phenomenology on postphenomenology is undeniable, as the movement's name indicates, postphenomenology does not embrace classical phenomenology uncritically, as the prefix 'post' suggests. Phenomenology in the Husserlian vision was developed to gain access to a 'real knowledge' of the world, as its basic tenet 'back to the things themselves' implies. While science had been seeking to 'analyze' the world, phenomenology aimed to 'describe' the world. In fact, the early phenomenology of Husserl conceived of itself as a rigorous science (Husserl, 1963; Ihde, 2009: 7). The core of phenomenology was thought to be regaining access to the 'original world'. This *essentialist* perspective is where postphenomenology distances itself from classical phenomenology (Rosenberger & Verbeek, 2015: 11). According to a postphenomenological point of view, a phenomenological investigation, far from 'describing the world,' should make sense of 'the relations between human beings and their world' (Rosenberger & Verbeek, 2015: 11). Postphenomenology rejects the notion of a pre-given object and a pre-given subject altogether, where the latter intends to *know* the former. Subject and object come to take shape through the relation of the human and the world. This stress on relations, and more precisely on the 'mutual constitution' of object and subject, 'sharply demarcates the postphenomenological approach from classical phenomenology' (Rosenberger & Verbeek, 2015: 12). Postphenomenology's ontology is

a 'relational ontology,'[2,3] and here the importance of technology lies. Technology crucially features in this 'mutual constitution' of subject and object. That is to say, technology mediates both subjectivity and objectivity. Technology mediates the way the world appears to a subject, and accordingly the way the subject evolves. In contrast to the classic phenomenology which thinks in terms of'alienation,' postphenomenology thinks in terms of 'mediation' (Rosenberger & Verbeek, 2015: 11). Postphenomenology's main concern is with the way technology changes our perception, behavior, values, and generally the way we live, as well as the way the world is presented to us.[4]

Yet another doctrine of postphenomenology, in contrast to the classical phenomenology, is its experimental commitment to specific concrete technologies. The very ordinary technical objects draw postphenomenology's attention. In different contexts technologies behave differently; any particular usage of them, therefore, deserves an independent study. This is the point Ihde makes where he attends to the fact that 'how diverse [technologies are], …, how differently embedded in different cultures even the same technologies may be' (Ihde, 2008: iv). He then, referring to the traditional approach to technology, takes the issue that 'such an analysis was useless since it could not discriminate between the results of playing a musical instrument … and the process of genetic manipulation' (Ihde, 2006: 271). As Verbeek notes, postphenomenology aims to study technology not 'in terms of its conditions of possibility but in terms of concrete artifacts, and yet to continue to pose philosophical, and not merely empirical, questions' (Verbeek, 2005: 6).

In sum, all those studies which label themselves postphenomenological share at least two basic tenets:

> First, they investigate technology far from as in an abstract sense, in terms of 'the relations between human beings and technological artifacts', to study the role of technology in shaping human. They … consider technologies … as 'mediators of human experiences and practices'. Second, they 'combine philosophical analysis with empirical investigation'. It means, rather than simply 'applying' philosophical theories to the technologies, they try to make sense of concrete individual artifacts. (Rosenberger & Verbeek, 2015: 9)[5]

[2] Elsewhere, Rosenberger speaks about 'relational strategy' to mean "the understandings and the bodily habits a user develops in order to take up a technology for a particular purpose" (2012: 289). In other words, by this term he refers to the process of learning how to relate bodily and perceptually to a specific interface, and how it is relevant to our experience and perception. 'Relational ontology' has nothing to do with 'relational strategy'.

[3] 'Relational ontology' should not be confused with a 'relativist ontology'. Postphenomenologists are not relativist.

[4] In the following sections I will have more to say about the mediating role of technology in the reconfiguration of subject and object.

[5] Jesper Aagaard and others, in their book 'Postphenomenological Methodologies' argue for similar criteria in order for a study to be qualified as postphenomenological (2018: xviii). According to them every postphenomenological inquiry should "be anchored in an anti-essentialist, relational ontology (the 'post-' part) and it must take departure in embodied experience (the 'phenomenology' part)'.

On the side of pragmatism, the second source of postphenomenology, Ihde takes it to be able to enrich phenomenology by 'avoiding the problems of subjectivism and idealism with which early phenomenology was cast' (Ihde, 2009: 11). In Ihde's words, pragmatism can improve the classical phenomenology as follow:

> The enrichment of pragmatism includes its recognition that 'consciousness' is an abstraction, that experience in its deeper and broader sense entails its embeddedness in both the physical or material world and its cultural-social dimensions. Rather than a philosophy of consciousness, pragmatism views experience in a more organism/environment model. (Ihde, 2009: 20)

And finally, the third source upon which postphenomenology builds its framework is the so-called 'empirical turn' (Achterhuis, 2001) in philosophy of technology inspired by 'science and technology studies' (STS). Turning against generalizations about technology and consequently attending to specific technologies and conducting empirical investigations of concrete technologies is the legacy of STS. More importantly, the Social Construction of Technology (SCOT) proved to be a fruitful source of inspiration for studying technology. Developed by Weibe Bijker, Trevor Pinch, and others (e.g., Bijker, 1995; Collins & Pinch, 1998; Oudshoorn & Pinch, 2003; Pinch & Bijker, 1984), SCOT investigates how a specific technology may have emerged out of intense social conflicts and disputes, rather than evolve simply through engineers' plan (Bijker, 2010: 71). In this sense, emergence of technologies has undergone a kind of 'interpretive flexibility,' rather than being the outcome of an 'internal logic' of technology. Different interpretations have been around regarding the role and meaning of a technology and along the way of its development. The road has not been as straight and smooth for it to emerge as the current form. This focus on the historical narratives and experimental inquiry has been tempting to postphenomenology.

Postphenomenology, Mediation and Possible Relationships Between Human Beings and Technology

Central to postphenomenology is the notion of mediation, as mentioned above. The idea underlying mediation consists of two pillars in conjunction; 1—technology goes beyond the mere instrumentality and takes on an active role, 2—technology shapes a relation between subject and object where they are mutually constituted. The human-world relationship, moreover, typically is a human-technology-world relation, on postphenomenology's account (Ihde, 1990). If so, to unravel the mediating role of technology, relations are of crucial importance. Nothing is sensible outside the relations. Postphenomenology's departure point is then exploring the human-technology relationship (Rosenberger & Verbeek, 2015; 13). To that purpose, Ihde has categorized different kinds of relationships between human and

technology[6]; embodied relationship, hermeneutic relationship, alterity relationship, and background relationship (1990). I attempt to lay out each of them in the following lines.

By an embodied relationship, Ihde means a user who treats a certain technology as though it was a part of her body. A cane for an elderly person, for example, is normally perceived as part of her sensorial system, except for non-standard moments, such as when it is malfunctioning. Here it is the human-cum-technology which relates to the world, not a human alone, it appears. Schematically an embodied relationship may be described as follows:

Embodiment relation: (I – technology) → world.

A hermeneutic relationship refers to a situation wherein a kind of reading or interpreting a sign is at stake. For example, an x-ray photo of an internal organ is a representation of the respective organ. For the human to make sense of the condition of the internal organ the photo has to be read first by a physician. The diagram of such a relationship may be sketched as this:

Hermeneutic relation: I → (technology – world).

An alterity relationship with a technology means taking the technology as a quasi-human existence. A vending machine, for instance, is treated as if it was an intentional agent, that is, it is being directly communicated. One may find the schematic description of such a relationship here:

Alterity relation: I → technology (– world).

And finally, a background relationship is meant to refer to kinds of technologies which do not engage the user's attention, rather in the background they are just preparing the stage. An air conditioner, for instance, is a technology to provide a pleasure environment for human beings, but it does the task in silence. That is, here users are not directly in contact with the technology. Such a relationship can be described as follows:

Background relation: I (– technology – world).

In the rest of the paper, the notion of mediation will play a major role. Now, for a moment, let me turn to another aspect of postphenomenology, namely its methodologies.

Multistability and the Methodologies of Postphenomenology

Postphenomenology, as described in the foregoing, takes the relationship of human beings and their surroundings to be often mediated by technology. Each technology, moreover, needs to be studied in its specificity to bring the respective mediation into

[6] Verbeek, later, introduced two further possible relationships, that is, fusion relationship and immersive relationship (Rosenberger & Verbeek, 2015; Verbeek, 2011).

view. Not only do we need to take every single technology into account, we must do it in different contexts. After all, a particular technology may manifest a variety of different behaviors. As noted in the introduction, technology has 'multistability' rather than 'stability' (Ihde, 2009: 16; 1999: 47). Technologies offer different characters, different meanings, in different usages, i.e., they never reduce to a single nature.

So far, we have not touched on any practical hint as to how to conduct a postphenomenological inquiry. The question then is what is the methodology of doing postphenomenology?

As Rosenberger and Verbeek note, postphenomenological research does not have a strict methodology (Rosenberger & Verbeek, 2015: 32). Yet one may come up with some general criteria all postphenomenological research needs to meet:

> First of all, they typically focus on understanding the roles that technologies play in the relations between humans and world, and on analyzing the implications of these roles. … Second, that postphenomenological studies always include empirical work as a basis for philosophical reflection. … Third, postphenomenological studies typically investigate how, in the relations that arise around a technology, a specific 'world' is constituted, as well as a specific 'subject.' … Fourth, on the basis of these three elements, postphenomenological studies typically make a conceptual analysis of the implications of technologies for one or more specific dimensions of human-world relations—which can be epistemological, political, aesthetic, ethical, metaphysical, et cetera. The central question then is how technologies help to shape knowledge, politics, aesthetic judgments, normative ideas, religious experiences, et cetera. (Rosenberger & Verbeek, 2015: 31)

A widely received method for doing a postphenomenological investigation has been thought to be *variational analysis*, a notion intimately tied with the concept of multistability (Ihde, 1993: 7). It is through a 'variational analysis' that one may recognize the 'complicated structure of multistability' of technology, or identify 'multistability as a phenomenological result of variational analyses' (Ihde, 2009: 16). The idea of studying variations comes directly from Husserl's work, as his PhD project was on a theory of variation in mathematics (Beyer, 2018), but a revised version of it was embraced by postphenomenologists. As Ihde explains, 'In Husserl's earlier use, variations were needed to determine essential structures, or 'essences'. Variations could be used to determine what was variant and what invariant' (Ihde, 2009: 12). With putting a thing in different contexts and different perspectives, the essence or the constant part of a thing surfaces, on Husserl's account. For doing so, Husserl calls on freedom from all prejudice, implemented through *bracketing* our natural attitude, or suspension of our preconceptions. The latter is what he calls *epoché*, meaning an appeal to the pre-reflective attitude toward the world. According to him, after practicing the epoché, and the application of variational analysis, one may reduce everything to its stable part, that is, its essence. But Ihde realizes that, far from an 'essence,' what emerged or 'showed itself' through application of this method was multistability (Ihde, 2009: 12). Things do not have an essence that could be considered as the residue after all contingencies have been taken away. Rather, as varying

things remain in place in different contexts, varying stabilities arise. One needs to take all stabilities into account to cognize a thing. In such a revised account, through empirical investigation, armchair brainstorming, anthropological study, or other means, possible meanings and uses for a technology are revealed (Rosenberger, 2014: 381; 2018: 176).[7]

Later Robert Rosenberger (2014, 2017, 2020a) has furthered variational analysis, proposing the supplementary step of 'variational cross-examination'. He claims that variational analysis may be conceived only as the first step of a 'larger methodological framework' (Rosenberger, 2014: 381). Through variational analysis we may come to identify that there are multiple stabilities,[8] and not only one. But that is not enough, he argues. In the second step, we should study each of these stabilities in turn, and identify the respective mediations accordingly. His method involves critically contrasting the various stabilities of a technology for the purpose of finding out how a particular stability has come to prevail (Rosenberger, 2014: 369, 2017, 2020a). This cross-examining, as he describes, involves three different endeavors (Rosenberger, 2014: 382–386): studying (1) the comportments and habits, i.e., the ways our body relates to a technology in the latter's different usages, (2) the role of a technology within different networks, meaning studying the programs and anti-programs involved, and (3) the material tailoring, to learn how different stabilities bear on certain material configurations.

There are numerous additional methodologies as well, having been put forward by several scholars, most of which are in a way connected to variational analysis.[9] To my purpose, however, the foregoing two cases suffice. The overview[10] provided so far sets the stage to present my suggestions to improve postphenomenology.

[7] This characteristic of technology, as being multistable, may yet serve a further function. The phenomenon of the multiple stabilities of technology, made visible by variational analyses, may also serve as an argument against overly deterministic accounts of human-technology relations (Rosenberger, 2014: 373). As Verbeek notes, 'technology is never purely determinative, for in principle other cultural relations with a given artifact are always possible. But neither is it purely instrumental, for when an artifact receives a particular definition within a cultural context—and thus becomes stable rather than multistable—it still contributes to shape that context' (Verbeek, 2005: 138).

[8] On the relation of the notion of multistability and variational analysis one may also look these Rosenberger (2020a, 2020b) and Whyte (2015)—'What is Multistabilty'.

[9] For example, Tobias Röhl (in Aagaard et al. eds., 2018) proposes four new methods for postphenomenological investigations: (1) maximally contrasting artifacts, (2) minimally contrasting artifacts, (3) contrasting contexts of use, and (4) auto-ethnographic observations. In a similar vein, Aagaard (in Aagaard et al. eds., 2018) proposes two extra methods, namely 'researcher reflexivity' and 'analytical validity'.

Hass (in Aagaard et al. eds., 2018), in a similar vein, develops an anthropological method called 'participant observation' to run a postphenomenological research while participating in an activity and taking other's anecdotes into account.

[10] Other than the notions of mediation and variational analysis, while exploring case studies in the "Mediation Beyond Individuals; Toward a Comprehensive Account of Mediation" section, I will also draw upon further postphenomenological aspects.

How Can Postphenomenology be Supplemented?

Postphenomenology provides a great ground to shed light on technology and make sense of it. Nevertheless, I argue, postphenomenology needs to be supplemented to arrive at a more inclusive framework. In this section, my contention will unfold on two grounds. Firstly, I argue that a focus merely on the current shape of an artefact might conceal part of the story. We need sometimes to place a technology in its trend of development to identify its further *stabilities* and respective mediations. On this account, a focus on the historicity of technology may be read as a *method* of doing postphenomenology. Every technology has witnessed debates, disputes and fights along the way of its evolution to ultimately result in the current version. Going over such instabilities would lay bare some of the latent dimensions of a technology. In such an exploration we may draw upon SCOT teachings, as I will elaborate.

Secondly, I argue that (1) mediation sometimes is not just the matter of a single individual, being affected by a technology. Rather, collectives are involved. In this respect some aspects of mediation would be left out of postphenomenology, and (2) social and political dimension of mediation cannot be addressed within the framework of postphenomenology. To rectify such shortcomings, ANT will be of help to me. I will then suggest to integrate ANT into postphenomenology. To make my point, I will be exploring two case studies which will be called 'collaborative or collective mediation' and 'casual chain mediation' respectively. I will deal with these two moves in the following two subsections.

An Extension of the Variational Cross-Examination

The first arena I intend to draw attention to is the stage before the genesis of a particular technology, and in particular a technology's trajectory of evolution. Postphenomenology takes the current shape of a technology for granted, starting subsequently from its relations with the user. As Verbeek points out, postphenomenolgy shifts away 'from the conditions of technology to technology itself, to the technological devices and objects that are virtually ubiquitous in our daily lives' (Verbeek, 2005: 100). In this sense, attending to the historical context out of which a technology has emerged seems irrelevant. Even though postphenomenolgy admittedly goes in the right direction when it places its focus on technology-in-use, such an approach, I argue, does not preclude the relevance of an artefact's history of development. There is a lot one may learn along the process of evolution of a particular technology. Discerning historical falls and rises of a technology, breakdowns, struggles, rivalries, and whatever it has been through along the way of its dominance, could provide a researcher with beneficial insights which would have gone unnoticed otherwise.

In this vein, the way Social Construction of Technology (SCOT) treats technology may be instructive. SCOT emerged as a movement to study the social context within which technologies come into being. Its iconic case study is the history of the bicycle. Pinch and Bijker (1984) and Bijker (1995) provide a narrative of the

evolution of contemporary bicycles. There one can find the long path contemporary bicycles have gone to become dominant in contemporary societies. According to the narrative, there were two primarily competing designs of bicycle around at first: bicycles with wheels of the same size and those with the front wheel higher than the other. While the latter was deemed to be suitable for racing, the former conforms with the transportation aims and commuting of average people. The bicycle with a larger front wheel enjoyed a higher speed with lesser stability. The same-sized wheel bicycle, in contrast, was considered safer. These two versions were in a competition to prevail for quite some time. Ultimately, safety defeated speed and excitement, and bicycles took on today's shape. In retrospect, one may imagine the evolution of a technology as linear and smooth, but the picture is naïve. The same-sized wheel bikes had to struggle to be able finally to achieve today's position. The final configuration of a technology is not just a matter of efficiency, or of mere technical factors. Rather, social and political factors are as decisive as technical ones.[11]

As mentioned above, Rosenberger notes that the notions of multistability and variational analysis are 'not the end of the story, rather the openings'. I think he is right. However one may improve his approach by going through the history of a technology. Rosenberger's case studies (e.g., his treatment of hostile design and the homeless) are quite insensitive to the prior variants of technologies, and he takes only the existing stabilities into account. I argue that SCOT's remarks would help extending such a cross-contrasting. I briefly show how Rosenberger's method may be enhanced by bringing in SCOT.

First of all, we may relate the notion of multistability in postphenomenology with that of *interpretive flexibility* within SCOT. The latter implies the under-determination of a technology (Bijker, 2010: 71), i.e., the contingency of a technology's specific stability. The meaning of a technology is fluid in the sense that a technology may only receive provisional stabilities. The temporal meaning given to a technology, moreover, is practiced by social factors. As mentioned above, both the bike-for-race and bike-as-transportation were possible in the first place.[12] Across time, however, the latter prevailed by ruling out the former. It was society that ascribed such a stability to bikes.[13]

The next point to make is that SCOT's insights may enhance all three stages of the cross-examination in the following way. Concerning habituation and bodily comportment, one can notice the different bodily gestures associated with

[11] On the subject of political dimensions of the technology development, one may find the observations of Feenberg illuminating. His ideas of technology as being the result of social and technical components, rather than merely technical, are insightful. See, for example, Feenberg (1999).

[12] In this vein, there are two further notions, within SCOT (Pinch & Bijker, 1984): *Closure Mechanism* and *Social Groups*. The closure mechanism refers to the stabilisation process of a technology, which comprises the rhetorical process of agreement on the nature of a technology, as well as the way technology functions in society. And the notion of social groups is meant to refer to those whose interpretive frameworks and negotiation determine, to a large extent, properties of a technology.

[13] There is a difference between the notion of interpretive flexibility and that of multistability. While within SCOT interpretation of a technology is predominantly social, for postphenomenology multistability is not merely social. Rather, the materiality of a technology plays a crucial role too. It means that the latter is meant to refer to the *interaction* of a technology and society.

each specific stability of bikes, namely bike-for-race on the one hand and bike-for-transportation on the other. Once bikes are designed and used for race, given the difference in size of the wheels, one needs first to be quite skilled in riding. Keeping such a bike balanced while riding requires a high degree of competence on the one hand and specific bodily comportment on the other. Riding transportation bikes, in contrast, does not take so much experience to be tamed. It requires, moreover, a different bodily posing while riding. Pinch and Bijker even mention how sometimes diverging designs were devised for women to accommodate the moral challenges associated with women sitting on a bike, e.g., wearing skirts on a bike was thought to be inappropriate (1984: 28). It shows how the specific dominant etiquette and values in a society are ultimately connected with a certain stability. The reverse also is true. Different stabilities, i.e., different bodily engagements with technology, may trigger diverse types of mediation.

Concerning the second move of cross-examination, i.e., programs and anti-programs and in general networks involved, SCOT can offer again a lot. Regarding bicycles, there appear to have been different competing networks. On the one hand, the network of those who 'viewed [their] activity primarily as an athletic pastime,' and on the other hand, those who would have taken it as a vehicle for 'transportation' (Bijker, 1995: 37). Particularly 'professional men, clerks, schoolmasters or dons' were mainly using high-wheeled bikes for doing sport (Pinch & Bijker, 1984). Moreover, there were a variety of firms, designers and related industries involved in both of these networks. All of them were in competition to promote their own preferable stability. Pinch and Bijker even illustrate the network of 'anticyclists' whose 'actions ranged from derisive cheers to more destructive methods' (1984: 24). It seems highly informative to get to know how the network of the bike-as-transportation defeated the rivalries. Including such networks, i.e., the network of bike-as-race and the network of anticyclists, may remain hidden in Rosenberger's account. Such a historical travel may bring the interconnectedness of the networks within society and the artefact into view. Not only networks try to affect the technology, but the latter mediates the existing order of the society.

In another case study, Bijker (1995) sketches the trajectory of emerging the fluorescent lamp. As he notes, 'the introduction of the fluorescent lamp was held up because the electric utilities were more powerful than General Electric' (1995); or 'the fluorescent lamp finally appeared on the market because General Electric proved more powerful' (Bijker, 1995: 11). It appears then that a historical narrative may also reveal the political dimensions of conflicting networks, to show how a specific stability came to be dominant. Power relations seem quite relevant in the development of a technology.

And finally, one may also expand on the third stage of the cross-examination drawing upon SCOT's remarks. Here one needs to focus on the specific materiality associated with the competing stabilities. SCOT can lay bare how a change in the components of a single product may bring about diverging stabilities and mediations; changes ranging from a change in 'saddle,' 'steering bar,' to 'air tire' of bicycles (1984). As an example, it is shown how the meaning of the air tires for bicycles was gradually transformed from a 'crazy idea' to a solution to the 'vibration

problem' and ultimately to 'how to go as fast as possible'. Contrasting such historical variants may reveal aspects which would have remained latent in a mere imaginative variational analysis, or by focusing just on the *existing* variations.

I believe, SCOT's approach, as a supplementary move for the Rosenberger's method, may throw light on the multistability of every technology and the respective mediation of each stability. In particular, as I elaborated, the notion of *interpretive flexibility* could be associated with the postphenomenological concept of *multistability*. While Rosenberger's approach takes its departure point the variants of a technology at the *present* time (e.g., see Rosenberger, 2014), SCOT may bring a temporal dimension, and explore all variants across the time. In this sense, with the help of *interpretive flexibility,* we would come to know further stabilities along with the role of society in bringing them about, and at the same time the notion of *multistability* would help us to cross-examine varying stabilities as well as explore the relevant mediation of these stabilities.

Having enhanced variational analysis and the notion of multistability, now it is time to expand on the notion of mediation.

Mediation Beyond Individuals; Toward a Comprehensive Account of Mediation

In this section I ponder over another aspect of postphenomenology, namely the notion of mediation. In this part I would like to shed light on kinds of technological mediation which may cross the boundary of individuals and subsequently fall beyond an exclusively phenomenological approach. I will then propose to supplement ANT's teachings to get a comprehensive framework to scrutinize technological mediation in the fullest sense.

To that purpose, I will survey two cases of mediation. Both are brought about by technology, or at least technology has a central role to realize them, and then try to make them sensible by an integration of ANT and postphenomenology. I will examine them in turn.

An example of what I will call 'collaborative or collective mediation' is the resulting subject engendered by using the Internet in general and social networks in particular, in a certain way. Today, thanks to technological advancements, a growing number of activities are being replaced by online ones. We do not go shopping so often any more, rather, we grab whatever we need from Amazon. Amazon benefits us even more. By its 'collaborative filtering' it provides us with a collection of similar products that have been the preference for those who have behaved like we do. In picking out a product, thus, this 'filtration' may save our time by leaving aside goods that seemed irrelevant. As another shift brought about by online space, one may refer to the fact that we do not meet people face to face very often, rather we prefer to hold our meetings through Skype. We may also track news surfing the Internet. We no more need to wait for news broadcasts via cable channels. The internet has brought great opportunities that could not have been imagined before. We may even make use of its capability to customize our favourites, meaning that we can ask the internet to provide us with what fits our taste. Through the option of 'personalization' or 'customization' we may get rid of trashy or unpleasant contents in advance.

We no longer need to encounter contents that do not appeal to us. It seems great that we do not have to waste our time figuring out our preferences. They are already there, tailored for us in advance.

But technology is not innocent, it mediates the way we live. The internet, in particular, is no exception of course. Dealing with all the ways the internet affects us is beyond the purview of this article. Here I would like just to bring one important aspect to the fore: the phenomenon called 'echo chamber,' 'information cocoon,' or 'group polarization'. In his book 'republic.com 2.0,' Cass Sunstein (2007) extensively treats the phenomenon and warns about its threat for the society. Here I draw on his work to explore the way the internet may mediate behaviours to ultimately make my point.

Group polarization, in a general form, refers to the phenomenon that 'groups of like-minded people, engaged in discussion with one another, will end up thinking the same thing that they thought before—but in more extreme form' (Sunstein, 2007: 61). It is more than obvious that, for communication, people ordinarily tend to choose those who already are in the same political, ideological, or religious camp. We are usually inclined to avoid conflicts caused by opposing views, morals, and ideologies. As a consequence of this inclination, however, we may evade getting exposed to objections. Far from a critique, one's enthusiasm for holding on to one's ideology might even be escalated by the admirations by agreeing fellows, resulting ultimately in adopting more radical views. Of course, the phenomenon of 'echo chamber' was not unprecedented before emergence of the internet. But it has been augmented by the advent of the internet and social networks, given the availability of new technological tools, like filtering, customization, and censorship. As Sunstein notes 'the most striking power provided by emerging technologies [is] the growing power of consumers to *filter* what they see' (Sunstein, 2007: 5; italic mine). Internet in general, and social networks in particular, can function as a barrier in getting exposed to rival views. It deprives people of getting to know other possible worldviews. As a result, 'people are likely to move toward a more extreme point in the direction to which the group's members were originally inclined' (Sunstein, 2007: 60). This, in turn, can ultimately pose a threat to democracy and peace. According to Sunstein, a well-functioning system of free expression must meet two requirements:

> First, people should be exposed to materials that they would not have chosen in advance. Unplanned, unanticipated encounters are central to democracy itself… Second, many or most citizens should have a range of common experiences. Without shared experiences, a heterogeneous society will have a much more difficult time in addressing social problems. (Sunstein, 2007: 5–7)

By 'common experience' he means 'general-interest intermediaries'. People who rely on such intermediaries have a range of chance encounters, involving shared experiences with diverse others, and also exposure to materials and topics that they did not seek out in advance (Sunstein, 2007: 7–9). With the internet, and particularly the networks, both are in jeopardy. On the one hand, 'common experience' is reduced, and consequently 'in-group out-group' affairs increase. On the other hand, due to the ability to filter content in advance, exposure to varying worldviews diminishes. Consequently, mutual understanding grows weak.

In this vacuum of mutual understanding, fundamentalist leaders, as a result, use, or rather abuse, this social fragmentation in accordance with their goals, or, as Sunstein notes, as if they become 'polarization entrepreneur,' so to speak (Sunstein, 2007: 74). In a sense, social networks serve as mediators to drive those already-ideological-minds in more radical directions.[14] This is a brief outline of how an ideological mind could grow more ideological with the help of technology.

How is all this connected to my concern? Group polarization, in the way pictured so far, I believe, is not traceable wholly by a solely first-person driven investigation. It needs more. Thanks to advancements in telecommunication technologies, users could increasingly customize what to see in advance and what not to see, that is, they can filter out what they want to encounter quite ahead of time. This new condition calls for a more cosmopolitan endeavour to unfold social media mediation. It demands a method capable of addressing both 'individualistic' and 'collective' behaviours. Group polarization, although grows in individuals, requires taking 'collectives' of both humans and technology into considerations. Staying at the level of individuals may cause some subtleties to be left out. We need an approach, along with the postphenomenological one, to disclose what is going on at the level of collectives.

An 'echo chamber' is brought about neither solely by technology nor by humans, rather it is grounded in a heterogeneity of human actors and non-human actors, namely a network. One cannot overlook the effect of featuring the like-minded peers when exploring the effects of the internet. Similarly, one cannot drop the influence of technology either.

The way I have articulated the issue is reminiscent of the Actor-Network-Theory. It is a framework originally developed by scholars such as Michel Callon (e.g., 1986), John Law (e.g., 1987) and, above all, Bruno Latour (e.g., 1987). ANT has its origins in an attempt to understand the evolution of science and technology. Science and technology involve similar processes of emergence, according to this view, that is to say, they both are constructed (Latour, 1987). While SCOT considers technology to be entirely a construction of society, ANT agrees in part with SCOT on the social aspects of technology but stresses also the influence of technology on society. Not only technology is the result of society, but also society in part takes a new shape by technology. According to ANT (Latour, 1992, 1999, 2005), mediation should not be thought of as either purely social or technical, rather as a collective of both, a network. Latour even goes beyond this to deny any kind of an inherent distinction between humans and non-humans, that is to say, there is no difference between a social affair and a technical one. Both humans and non-humans establish *associations*, linking to other actors to shape networks or collectives. The network, in turn, exercises its power by bringing about certain effects. This attention to collectives, or the accumulative force, may be ANT's contribution to the envisioned postphenomenology. While postphenomenology tends to study the mediation of particular technologies on individuals, ANT investigates mediation as a phenomenon emerging out of collectives of technology and humans.

[14] For a more extensive treatment of the relationship between communication technologies (CT) and terrorism, see, for instance, Mahmood and Jetter (2019). There they provide a model as to how the level of free flow of information through CT is tightly linked with the level of terrorism in different countries.

Nothing outside the context of networks is sensible, that is, every entity *emerges* from a network out of a heterogeneity of relations, and at the same time *is* a network itself. According to Latour's 'symmetrical' approach, no actor has a priority or primacy over others, meaning that both humans and nonhumans should be treated on a par. According to Fenwick and Edwards, all 'distinctions, such as those between the social and natural, between the material and cultural, the human and non-human, and between the technical and social, are taken to be effects rather than foundational assumptions' (Fenwick & Edwards, 2010: 3). All these classifications should be explained in terms of the networks themselves, rather than being explanatory. The force of heterogeneous collectives is irreducible to merely individuals, it is distributed upon factors, irrespective of them being human or non-human.

Central to ANT is the notion of *program of action*. Latour (1994: 38) investigates his paradigmatic example of speed bumps. In a campus, the demand for a driver to slow down his car could be implemented by a police officer standing with his power to issue traffic citation. But it also could be done in a different manner, for example, by installing a speed bump on the road. In this way the program of action of the network comprising the driver and the car encounters an *antiprogram*, meaning a program of action confronting the driver's program of action. The network of officials, policymakers and the police which has produced the effect, namely the speed bump, confronts the network of driver and her car, and ultimately could change the latter's program of action by forcing the driver to slow down. Here the program of action of police and regulators, it seems, has materialized on the way.[15] According to Latour, even the word of road bumper in French, translated as 'laid policeman' in English (Latour, 1992: 166), allude to this *delegation* of police's task to the artefact. *Delegation* is another pivotal term in ANT. In fact, delegation seems to be the ability to act at a distance through things (Fenwick & Edwards, 2010: 19). Officials and police are not present at the campus, but still they are able to manage the scene, with a relic manifested in the shape of a speed bump. We may sometimes delegate a part of our job to nonhumans, as the example of speed bumps suggests. As another example, Latour takes up the case of hydraulic door closers (Latour, 1992: 155–158). In a public place, say a hotel, the duty of closing doors after entering may be delegated to laypeople. In this case, we would have to educate or urge people to close the door upon their entrance. Or, similarly, we can educate a doorkeeper instead and delegate the responsibility of closing the door to her. In this case, Latour argues, he will probably miss his job sometimes. Moreover, it would be costly to recruit a full-time doorkeeper. Instead, we may come up with a more efficient plan and *inscribe* the job to an artefact, by installing a hydraulic door closer on the door. In such a scenario we have delegated a part of our program of action to a nonhuman. Engineers can inscribe morality into technology so that artefacts take over a part of humans' obligations. In this perspective it is not just humans that may take responsibility, rather

[15] Providing a complete overview of ANT is beyond the scope of my aims here. For more about Latour's ideas, one may find Latour (1992, 1993, 1994, 1999) interesting.

'responsibility for action must be shared among the various actants'[16] (Latour, 1994: 34). *Black box* is yet another notion in ANT's vocabulary by which one may refer to the rigidity or fixity of a network. Latour (1987) takes the example of a camera to show the meaning of a black box: it is made up of many elements but is taken to be a *single* entity with some properties, and with some acts in a certain way. Being a camera then means being the effect of a variety of things which have been joined together in order to build a durable, stable and naturalized assemblage, one whose uniformity is taken for granted. A black box, therefore, is a network which seems to hide its elements.

But how does a network grow? Callon (1986) has illustrated that networks assemble and extend themselves through 'moments' of *translation*. In the example of the hydraulic doors, the programs of actions of both the passers-by and the hydraulic door should be translated for a connection to be held. The passers-by have to push the door to open it. They have to put energy into it to be able to enter the building. The door should also be translated. It cannot remain untouched. It should stand there and, rather than being in itself, should be waiting at the service of the passers-by. It has to accept some changes if it wants to stay in a network. If it is not ready to be translated, it will be dead, namely, it will be replaced with another object. Moreover, a hydraulic door behaves in a different way than a normal door does. The hydraulic door needs more energy to be opened. But this energy is exactly that which is going to be saved within the hydraulic system to later help the door close automatically without any extra energy from the passers-by. This can be conceived as a delegation from non-human to human. Not only humans may use non-humans to get things done, but non-humans, too, can delegate something to humans. This should not come as a surprise, though, given the symmetrical method of ANT.

Callon proposed that networks, or at least some types of networks, entail *problematization*. An actor needs to feel a problem to start negotiating with new networks. Along the way of making a network, some actor intends to establish itself as an *obligatory passage point* which may frame related entities in particular ways. Obligatory passage point is the key actor through which all other relations should flow. Other entities which are attracted or invited to this framing have to detach themselves from their prior networks to start negotiating their connection and role in the new emerging network. Callon called this moment of *interessement*. In moments of interessement, the obligatory passage point not only selects the entities which are to be included but also those to be excluded. The entities which are included experience enrolment in the new network relations, a process where they become engaged in new identities and behaviours. In contrast, those actors that cannot properly be translated will not find their way into the new network. The moment of *mobilization* comes when the network becomes sufficiently durable and stable to behave as a black box. Black boxes may be transported. I may carry my book to wherever I need since it is a black box. The book is an effect generated after a lot of works have gone

[16] Actant is a substitution for the word actor. The reason for introducing the term is that Latour is reluctant to give humans priority over technology in generating outcomes. The term 'actant' is indifferent to being human or nonhuman, whereas actor connotes a humanistic meaning.

into it. But it can behave as a mobile, as a black box, as though it has long stayed in isolation. The obligatory passage point seems to be the first mover, one might think. However, it is an effect itself too. Nothing has a fixed and a priori essence. Everything is given shape through negotiations and translations within networks. Therefore being an obligatory passage point does not imply any intrinsic characteristic of an entity.

ANT brings a new opportunity to account for cases like 'group polarization'. A preliminary schema of the process of generating a polarized community with its extremist individuals could be outlined as follows.

In the first step some like-minded individuals get together using a technological tool like a telecommunication technology, giving rise to a collective of both human and non-human (say a particular end-to-end encrypted social network like Whats app). The course of recruitment continues to invite new possible like-minded people through technical manners. Members may *negotiate* out-groups urging them to join the group for a consolidation in order to overcome a certain problem in the society which according to them needs effort. For example, according to religious fundamentalists this alleged problem which needs effort may be infidels in the society. They might feel obliged to dissolve this problem. This is tantamount to the state of *problematization* and *interessement* in which people with some visibly potential extremist inclinations are encouraged to associate with the community. For doing this, members may go through similar forums, channels, groups in virtual space[17] to find potential individuals. In the next step, leaders or ideologues might begin to train members by certain teachings, by the application of some technical tools like podcasts, online courses and the like. Meanwhile, the leaders might have banned members from joining other groups with different views, calling *others* infidels or unbelievers. But that would most likely not be enough. Many will not follow the leaders' message with full loyalty. It means that senior members need to impose some technical approach to prevent members from exposing themselves to unbelief. This may be executed by tools such as censorship. In this sense, leaders delegate a part of their *program of action* to technology, i.e., inscribing the rule 'don't listen to others' into technology. Along the way of all trains or discussions, members gradually come to adopt more fanatic views. Seen from this perspective one may recognize how both humans and non-humans take new shape. Individuals get exposed to extremist views and are encouraged to take more radical stances toward outgroups. They may have been told about religious duties which are given by God. Along this line they already started to be *translated*; their *interests* are upgraded through *negotiations*. After *enrolment* in a new network, they are taking on a new identity. Across time, and through such a process of consolidation, the links between actors become more solid and less likely to disintegrate. In this way the network is gradually transforming into a *black box*, to become durable and sustainable.

In describing the phenomenon of radicalism, postphenomenology, too, has already proven competent. It can provide a phenomenological narrative as to

[17] According to studies, ISIS has recruited from around 85 countries across the world through such endeavours. See, e.g., Benmelech and Klor (2018).

how the online world appearing within individuals' consciousness is technologically mediated. One prerequisite of such a reconfiguration of both subject and object, however, is a certain level of familiarity with technologies involved; both smartphones (as the devices on which social media applications are installed or browsed) and the social media app itself. They both require *transparency*, that is, the interface of the technology should not draw the attention of the users. An alternative way to put this is to say that one needs to have already embodied the social media. The stronger the *embodiment relationship* with social media one has built, the more real the resultant online world would seem. If not embodied yet (say in cases like elderlies unfamiliar with the interface), mediation of cyberspace would not occur thoroughly.

Next, the emergence of the mediated online world is indebted, in part, to the features of social media apps, ranging from the ability of 'filtration,' 'customisation' and 'anonymity' to possessing a 'multitude' of accounts and 'trolls'. 'Filtration,' for instance, invites users to cut off the rival views in advance, as discussed above, to live within an unchallenged world. It leads social media to deliver an *inverted* world, where the majority of people seems as minority, and minority grows into majority. In this sense, due to leaving out divergent views, radicals can immerse themselves in a world comprising merely of like-minded individuals, and then, after a while, take it to be the reality. Such an inverted world assists leaders to maintain individuals' self-confidence and secures the community against disintegration. This might accord with the postphenomenology's teaching that the mediation of technology often comes with a certain structure, namely the structure of *amplification/reduction* (Ihde, 1990: 78). Social media augment aspect of the world (the number of people with the same mentality) while weakening the rest (others), creating a misrepresented world accordingly.

One can also recall the postphenomenological insight that mediation of technology usually may be distinguished on the account that whether it affects one's perception or one's behaviour. The former refers to what typically is called *hermeneutic* aspect of mediation, and the latter is associated with *existential* facet of mediation (Verbeek, 2005). In the light of such a classification, one may demarcate the hermeneutic mediation of social media on extremists from existential ones. The misperception of an inverted world then, is the hermeneutic aspect of the mediation, whereas the subsequent radical behaviour of them, is the existential aspect of the social media's mediation.

Moreover, we can also observe how social media, like any other technology, are multistable. Here one may identify how social media, even though might accelerate empathy, coherently may be stabilized also as a weapon to promote hate discourse. Social media platforms are weaponized in the hand of radicals to consolidate power and fight against what they call 'infidelity'. Ayman al-Zawahiri (2nd General Emir of Al-Qaeda) for instance, openly declared media to be an inclusive part of the battlefield (Carter et al., 2014). This means once again that stabilization of a technology depends heavily on the context. One particular technology cannot play out in the same manner across all cultures.

As it is clear now, it is necessary to account for the process of growing fundamentalism drawing in both the individualistic aspects and the collective ones

concomitantly. Sometimes technological mediation comes through a network; a network that cannot be *collapsed* into individuals. Put succinctly, in accounting for such a phenomenon we need to take the subtleties of both the 'individual-technology relationship' and the 'collective-technology relationship' into account. While the former is the specialty area of postphenomenology, for the latter ANT seems to be best fit.[18]

I would like to continue and complete my sketch with pointing to yet another type of technological mediation where ANT may again come in helpful; I will call it 'casual chain mediation'. My contention here is that on some occasions the mediation of technology affects initially the first user, but soon after, it passes through the direct user to get to and affect *non-users* of that technology. Moreover, the effect of mediation circulating among non-users may take on different shapes than the first user's. I appeal to a historical story to make my point; Galileo's telescope. Galileo's discovery made by means of his telescope was a seminal breakthrough in modern history; one whose aftermath went far beyond astronomy. Here I focus on the role of his telescope to find out how deep its influences have proven to be. Again, I try to provide my analysis along two different, albeit supplementary, paths; drawing on postphenomenology and ANT respectively.

Let me first dwell on a phenomenological approach toward Galileo's telescope, to see how it might have transformed his experience of the world. Here Ihde's insights, laid down in his work (specifically Ihde, 2011), may be of great help.[19]

A scientific achievement, according to Ihde, would not be fully apprehended through a 'formalistic,' 'abstract,' 'generalized and virtually non-empirical' investigation, rather it requires taking into account the scientist's embodied practice (Ihde, 2011; 71). Galileo, after all, was not only a theoretical physicist but, more importantly, a 'lens grinder, the user of telescopes, the fiddler with inclined planes, the dropper of weights from the Pisa Tower' (Ihde, 2011, 78). A scientist is always situated in a certain body posture, utilizing specific instruments and constrained within certain conditions. A scientific discovery then, including Galileo's, is always

[18] For an extensive treatment of the application of postphenomenology and ANT insights on radicalism and fundamentalism studies see Arzroomchilar (forthcoming).

[19] Despite (Ihde, 2011) is meant to put forth an objection toward Husserlian treatment of Galileo and in this sense its primary vision diverges from mine, the work may provide a frame to explore Galileo's discovery from a postphenomenological point of view.

Husserl, in the 'crisis of European sciences and transcendental phenomenology,' pretends to have discerned a notorious turning point in the history of physical science by the Galileo's work. According to him the crisis of modern science lies in the gap between 'Lifeworld' and 'world of science' initiated by Galileo (Ihde, 2011: 69–82). While the latter is the world of 'mathematical idealization' the former is filled with imprecision and vagueness. Importantly, the Lifeworld is always presupposed as the 'fundament' according to Husserl in every scientific endeavor. If so, we cannot accept concomitantly both the realistic scientific description of the world and the description of the Lifeworld where the latter, unlike to former, is directly and non-inferentially perceived by us, as the inhabitants.

Having said this though, Ihde takes an issue that not only Husserl portraits a 'reductionist version of Galileo' but he 'got science itself wrong' (Ihde, 2011: 75). Ihde, takes the Husserl's formulation to be 'self-fabricated pseudo-problem' that arises from a reduced and distorted depiction of Galileo. The mistake lies in the fact that, according to Ihde, Husserl did not adequately pay attention to the role of the Galileo's telescope. The telescope links the 'Lifeworld' and 'world of science'.

embodied through her instruments, as Ihde writes: 'science is … essentially … embodied technologically in its instrumentation' (Ihde, 1990, 1991: 103, 2011: 77). This implies that the instrument of a scientist, such as Galileo's telescope, is like the 'extension' to his perceptual and bodily activity (Ihde, 1991: 75; 1979: 15). This might be reminiscent of Merleau-Ponty's blind person who uses a stick to find her way (2012). The stick here is not simply a thing, among other things, for her. Rather it is, as though, the extension of her body, i.e., it is incorporated into her sensorial system. She feels the surroundings, through the cane, in a direct and non-inferential way, as if she is really perceiving the environment. The telescope of Galileo enjoys exactly the same role; it is the extension of Galileo's body where it modifies bodily modalities and expands the domain of what can be immediately perceived. Putting in the terminology developed by Ihde, Galileo's relationship with his telescope is an *embodiment relationship*. In this sense, Galileo, with his mediating tool, managed to bring the until then unattainable things, e.g., 'mountains in the moon' or 'the spots of the sun,' to his experiential reach. Once the telescope made the moon perceptually available to Galileo, 'spots on the sun' were no less part of his Lifeworld than the 'Tower of Pisa' (Ihde, 2011: 80). There is no longer any gap between the 'lifeworld' and the 'world of science,' since 'Galileo with a telescope is also a perceiver and a practitioner within a now technologically mediated, enhanced world' (Ihde, 2011: 80).

However, such a technological instrumentation is not without cost, as noted earlier. Technology has transformative power as to impede as well as to promote certain dimensions. Galileo's telescope was to magnify the heavenly objects to grow observable, and this would have required, among other things, bringing things out of the context:

> the magnification of the Moon such that for the first time details of mountains, seas, and craters immediately are visible …. The Moon thus made visible now ceases to be placed in its normal, expansive location within the vault of the heavens (Ihde, 2011: 80).

One implication of such displacement then was that Galileo had access only to a *distorted and mediated* image of the celestial objects; a picture that was, in part, *technologically constructed*. Galileo's telescope was not simply a neutral and innocent tool. By a postphenomenological perspective one may get acquainted how the Galileo's telescope provided a new universe for him; an 'enhanced lifeworld' that was 'not available to Aristotle, the Church Fathers or the Biblical editors' (Ihde, 2011).

Postphenomenology may still keep up describing the Galileo's breakthrough, but for my purpose this much suffices.[20]

Now does such a postphenomnological account, however rich, cover all the telescope's mediation? I don't think so. There should be also mediation occurring at the societal level. yet postphenomenology tends to be silent when it comes to what is going on beyond the immediate user. Here, I propose, ANT may come as a help again. It may take over hereafter and nurture the postphenomenology's tale. Here is a preliminary schema.

Latour, like Ihde, is appealed to the mediating role of the Galileo's telescope on a similar ground, namely, the impact of the telescope on the expansion of people's world. There is a point of divergence however here. While Ihde was predominantly concerned with the impacts of the telescope on Galileo himself, Latour is mainly curious about its social and political consequences. As Latour points out in an interview,[21] Galileo's telescope has contributed to forming our outlook as 'the earth is part of an infinite universe' (2020). Galileo's telescope came to present the universe to us as 'infinite' thereafter. In this sense, not only did the mediation of Galileo's telescope go beyond its first user, namely Galileo, but it lasted for a long time, far more than Galileo's life span. Crucially, it also affected unexpected realms like politics, as Latour argues (Latour, 2020). Today one may trace its influence within environmental problems where it is increasingly threatening human life. Here Latour asks 'what does it mean for politics if we are locked in and not in the infinite cosmology opened by Galileo?' and answers himself that 'it means we cannot behave in the same way. It means we cannot just endlessly extract resources and discard our waste' (Latour, 2020).

It looks, then, that the mediational effects of an artefact may not be confined only to those having a *direct* experience of it, rather its effects may sustain for a long time

[20] To continue the postphenomenological analysis, one may also notice for example that both the interpretation of the pictures Galileo was receiving through the telescope, and using the telescope itself, would have needed developing some skills and familiarity in prior. As with the latter Ihde notes that 'users hand holding ancient telescopes have to learn how to 'fix' the Moon, and that is part of Galileo's instruction. A tripod helps, but that magnifies the apparent speed of Moon motion and one has to constantly adjust the telescope to the moving location of the Moon (Ihde, 2011: 80)'. As with the former on the other hand one may appeal to the notions such as 'visual hermeneutic' or 'hermeneutic strategy' within the postphenomenology tradition (see, e.g., Ihde, 1998; Rosenberger, 2008, 2009, 2011a, 2011b, 2013). Images provided by imaging technologies are coherently open to a multitude of interpretations, that is, they are multistable. Each interpretation, moreover, depends on a specific hermeneutic strategy, that is, 'a specific framework for interpreting the content of the images'. Here one can explore how Galileo saw the thing he saw, rather than otherwise which could have been coherently said to be seen.

[21] In his book 'Politics of Nature—How to Bring the Sciences into Democracy' Latour explicitly calls for a new politics for dealing with ecological problems. There he develops a new framework for politics within which one needs to reconceptualise how 'nature, science, and politics have to do with one another' (Latour, 2004: 6). The new politics should not consider nature distinct from society, value from fact, he argues. That is to say, we need a cosmopolitics, a politics comprising a heterogeneity of entities rather than sole humans and their affairs. He even explicitly proposes that 'the question of democracy be extended to nonhumans' (Latour, 2004: 223). For more, see the abovementioned book and also his 'We have never been modern'. In the latter, Latour speaks of 'a Parliament of Things' in this respect, to stress taking non-humans into our political considerations. The reader may find the ideas in his book interesting.

within different time and space. Thus pictured, the mediation of our outlook on the universe as deeming it 'infinite' might be said to have been *causally* dependent on Galileo's telescope. The spread of the mediation across the chain of audiences, after all, started from Galileo's observation. If this is the case, a direct experience of a technology, therefore, is not a *necessary* condition to being mediated by it. It seems to be a sufficient condition though. Mediation of a technology hence, by passing through the first user, may take on a social and political dimension.

The way mediation may travel through time and space may be accounted for by the notion of different networks. I try to draw a picture so as to describe how technology's mediation may reach areas distant from direct users. Analog to the case of 'echo chamber' phenomenon, ANT's arsenal is fairly rich to address cases like Galileo's telescope. Latour (see Latour, 1983, 1988) is an instructive example here. In his extensive study Latour represents Pasteur's laboratory and the role of both human and non-human components in Pasteur's success. When doctors, hygienists, regulators, microscopes, papers, and others were put in place and the alignment was tight enough, on his account, it came to be a taken-for-granted *truth* that microbes were the real causes of diseases. Consequently, Pasteur was considered to have made a revolution in medicine and public health. The reality, however, is that it was not Pasteur alone, Latour argues, who caused the revolution, rather a network of heterogeneous entities did so. This network with its allied actors was sustainable enough to later come to be considered a *fact*. This transformation of the health system could never have happened if any single actor of the alleged network had not performed correctly.

Galileo's telescope plays a similar role as Pasteur's laboratory. Galileo is supposed to have established a network by enrolling both humans and non-humans to establish his discovery as a fact; ranging from the telescope and colleagues to newspapers spreading news. He seems to have succeeded to ally all actors through *negotiation* and *translation* of their interests, ultimately making what later came to be seen as a *fact*. The alleged fact since then came to travel across different times and spaces as a *black box*, hiding all works that had gone into it by that network. It was sustained for a long time and at present the effect of Galileo's network is still mediating the behaviour of many, politicians among others, as Latour notes. A clue in working at a distance—all the way from Galileo's telescope to twentieth-century politicians' mentality—is the notion of *immutable mobiles*. An immutable mobile is the actor which can remain stable throughout different networks. It is highly transportable, meaning that it is able to travel from one collective to another without losing its meaning. All these constituents, according to Latour (1987), are the effects of a precedent network and are only made visible within a particular network of relations. Immutable mobiles can be silent, ignored, or overridden by other elements. However, they have developed enough solidity to be able to move around and yet hold their relations in place. They perform their task as delegates of other remotely working networks, extending their power by working to translate entities to behave in certain ways. In the case of Galileo's telescope, a textbook could be deemed as an immutable mobile which is sustained from the network within which Galileo's telescope featured up to its work within networks out of which politicians and decision-makers grow. In this way, one may imagine how it is possible for an effect of

a network to travel a long way to impact distinct networks in a different time and space. All these networks become mediated if the immutable mobile can circulate through networks properly and thus causally relate all networks in this chain.

It seems again that ANT proves promising in cases like 'casual chain mediation' to bring socio-political dimensions of mediation into the fore. We do not have to, therefore, limit ourselves to merely first-perspective phenomenal experience. Technological mediation crosses the boundaries between first user and the subsequent non-users. In some cases, such as the case of Galileo, non-users may be mediated by a technology if they have been in touch with the first user in a certain way. It means that while we need phenomenological vocabulary to make sense of mediated subjects, we may also integrate an *outside-in* perspective to identify the societal consequences of mediation.[22]

Metaphysical Challenges

Before closing my tale I need to deal a bit with an issue which I have not so far talked about; metaphysical challenges. The assumed challenges lay in the fact that each of ANT, SCOT and postphenomenology suggests its own specific ontology; an ontology which is not necessary coherent with others. Based on such divergences my proposal articulated in this writing might seem subject to objection. The most urgent conflict arises between the ontology underlying ANT and that of postphenomenology. While within postphenomenology framework, technology and human beings are thought to be in different ontological stances, in ANT there is a symmetry as to no entity has any privilege over others, as noted before. The principle of symmetry in ANT demands that researchers need to analyse in the same way—using common analytic tools—the disparate elements that make up a network. This entails the use of an abstract, neutral terminology that grasps the roles played by all elements without any prejudice or privileging human over non-human. In other words, within ANT, all beings enjoy the same ontological status, at least in the beginning of every inquiry. As Latour points out 'a network-like ontology [is]… an irreductionist and relationist ontology' (1996: 370). By this, Latour means rejecting all sociological concepts which are taken for granted in explaining the society; concepts like class, gender and the like. Such a *flat* ontology might seem a serious barrier in the way of integrating ANT into postphenomenology, given the latter's hierarchical ontology.

[22] My work is in line with several authors' works suggesting an amalgamation of STS (SCOT and ANT) and postphenomenology. Among others, one may look up Verbeek (2005) and Rosenberger (2018). Mine is different, I think, on two grounds. First, I am suggesting an integration of STS (both SCOT and ANT) into postphenomenology rather than exclusively ANT, as has been proposed by the foregoing authors. Second, my work is more systematic than the others, I believe. By this I mean, I am drawing on a larger portion of ANT teachings than others. While for Verbeek, as an example, there are just a few relevant terms like translation, network, black box and … for me there are more concepts to draw in.

Concerning the SCOT ontology, however, there is no requirement of symmetry, at least anything similar to ANT.[23] Within SCOT framework, at least as far as the early stage of the tradition is concerned, there is a separateness between humans and non-humans, where humans' agency is privileged in social and technological interactions (Brey, 2004). However, this does not imply by itself a full-blown coherence between postphenomenology and SCOT. In the latter, technology is predominantly, if not exclusively, a product of power relations in the society where it emerges out of varying interpretive frameworks. There is barely any emphasis on the materiality of technology and consequently its impacts on society are usually marginalized.[24] In other words, mediation of technology is not a primary concern within SCOT literature. In contrast, as extensively discussed in the preceding sections, for postphenomenology mediation is the first and foremost concern. Put simply, unlike postphenomenology, SCOT does not take seriously the interconnectedness of human and technology. Rather technology is considered to be the slave of human agency. How such conflicts then, which seem problematic at first glance, should be overcome?

In spite of such difficulties, I argue, my schema of integration is not susceptible to be threatened. As Verbeek underlies 'the difference between [postphenomenology and ANT] approaches and vocabularies, … should not be overestimated' (2005: 162). The main justification here for the legitimacy of such an integration is the domain I am drawing on ANT teachings. The contribution of ANT is supposed to just be pinpointing effects of technology, namely further mediation of a technology which is not addressed through a postphenomenological approach. If so, we don't need to commit wholeheartedly to ANT with all its demanding metaphysics. We just need to adopt its methodology, which is 'following the actors' from an 'externalist' standpoint, to see how things play out within a web of relations. The working definition of mediation which was presented in the foregoing is evidence here. By mediation of technology in this context, I referred to the interconnectedness and interaction of human and technology, and subsequently their mutual constitution, which all are recognized within both postphenomenology and ANT frameworks. The aim of my article is not to provide a systematic treatment of technology as such, which requires delving deeply into metaphysical difficulties. Rather, as I said, detecting the mediation of technology in the fullest sense is my primary aim. In this vein, I agree with Verbeek who despite diverging ontologies still believes one can 'bring the two "languages" [of postphenomenology and ANT] in close connection with one another' because of their 'common point of departure' (i.e., overcoming the radical

[23] The truth is that there is actually some sort of symmetry in SCOT too. The specific symmetry common within Social Constructivism is a principle of methodological symmetry or methodological relativism, which implies that the analyst remains impartial as to the real properties of the objects of analysis.

There is also another meaning for the notion of symmetry in the literature according to which when analysing a particular case of scientific controversy, one should apply symmetrically the same form of social explanation to all sides of the dispute (Bloor, 1976). Neither of these two conception is relevant here.

[24] In the more recent writings, there seems to be a shift in some respects within SCOT teachings. In particular, Bijker (2010) discusses the need for the development of a unit of analysis to explore the force of technology to reshape human activities and their meanings.

dichotomy of subject and object by emphasizing on mutual engagement) (Verbeek, 2005: 148). I think Verbeek misses the point however when he expects ANT to be helping just as a 'complementary to the *hermeneutic* dimension' of mediation (Verbeek, 2005: 161; italic mine). Not only existential dimension of mediation may be completed by the help of ANT, but also hermeneutic side, too, can be improved, as I showed by my case studies.

What about SCOT's divergences? Even though provided the non-flat ontology of SCOT difficulties are far less here, yet to counter the objections, the same justification may apply here. We are not going to take technology to be entirely a social phenomenon. We may still stick with our postphenomenological perspective, i.e., an ontology of intertwinement or put simply a relational ontology, while absorbing relevant pieces of SCOT. All we need from SCOT is the insight into tracing the history of evolution of a technology to track further mediations.

In sum, while both ANT and SCOT develop their own ontologies which are divergent from that of postphenomenology, one should not be worried about it as far as an integration of the two former into the latter is the matter.

Conclusion

Technology is a multifaceted phenomenon whose effects are too diverse to be captured by a monolithic approach. To unravel the black box of technology, postphenomenology places its emphasis primarily on (1) the current configuration of a technology, (2) the immediate user of it, and (3) an inside-out approach toward its mediation. All three aspects, I argued, may, or rather need to, be strengthened. The first defect, to begin with, might be covered by including a historical survey of a technology's trajectory of evolution. In this sense, the tradition of SCOT may serve as a basis, as I argued. While there have been some attempts to improve postphenomenology on the ground of 2 and 3, the evolutionary trend of a technology hardly has been touched upon within postphenomenology literature. Crucial here, as I showed, is linking two central notions, namely, *interpretive flexibility* within SCOT and *multistability* in postphenomenology. Technology's varying stabilities may be expanded on through SCOT's teachings. Not only the current variants need to be accounted for, stabilities which have emerged in the past, too, need to be explored.

SCOT may unfold, moreover, the impacts of the societal arrangement on the configuration of a technology. This is also underdeveloped in postphenomenology literature. A SCOT-oriented inquiry can illustrate, for example, how reactions of different societies to the privacy policies of WhatsApp have triggered different stabilities to appear.[25] Among others, WhatsApp postponed the implementation of the privacy policy, after facing a pushback about Facebook data sharing and lack of

[25] For example see; (https://en.wikipedia.org/wiki/Reception_and_criticism_of_WhatsApp_security_and_privacy_features, https://theconversation.com/whatsapps-controversial-privacy-update-may-be-banned-in-the-eu-but-the-apps-sight or https://time.com/5893114/signal-app-privacy/) to get a glimpse of it.

clarity (Kharpal, 2021). SCOT may also analyse how various societies may influence WhatsApp's policies differently. Some certain privacy policies, for instance, are not applied within EU, because of rules like GDPR within European countries.[26] Along the way of such an investigation, furthermore, one may compare the dominant networks as well as relations of power in European countries with what is going on within other societies. In this way, SCOT's approach may read as a sort of enhancing variational analysis in general, and cross-examination in particular.

To enrich postphenomenology on the ground of the second and third points mentioned above, ANT may come as a great candidate. Given the divergence of the third-person approach of ANT from that of postphenomenology, integration of the former into the latter might seem tempting. By bringing up some case studies I tried to show how fertile such an integration would be. Postphenomenology can assimilate the third-person perspective of ANT to bring the blind spots into view. With this, a set of vocabularies would come in to describe the ANT-oriented inquiry. Above all, the notion of *network* proved quite helpful to account for the collective dimensions of mediation. As my case studies purported to show ANT's terminology, ranging from notions such as network, black box, translation, negotiation and association to immutable mobiles and such, all helped to provide an in-depth analysis of the mediation of technology.

In sum, while postphenomenology is primarily concerned with the impact of technology on individual users, ANT deals with constellations, and SCOT may track technology's trajectory of evolution. By integration of the two latter into the former, I believe, one can explore the interplay of society, technology and the individuals, across time and space, in a systematic way.

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