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# TECHNOLOGY, LABOR, AND LIVING BODY: TOWARD A MARXIST TURN WITHIN POSTPHENOMENOLOGY

This article argues that postphenomenology reveals certain limits in its conception of praxis as the properly historical sphere of interaction between individuals and technologies. Postphenomenology represents one of the most promising philosophical strategies for engaging the question of the technology's role in shaping our individual and collective experience. At its core, postphenomenology holds that technology becomes woven into the very modalities through which the human being – as a living, embodied subject endowed with psychomotor, kinaesthetic capacities, affective and emotional attunements, evaluative, normative, and meaning-bearing orientations – dynamically forms experience. In this view, technology is not something that is merely added externally to our engagement with the world and others; rather, it is embedded within the deep mechanism of intentionality, shaping its forms and directions. However, this article shows that postphenomenology relies on a non-historical conception of praxis and, consequently, on an abstract conception of technology. A Marxist perspective on technology, by contrast – situated within the social relations of production and reproduction, and threating technology as a structural element of the labor process – allows us to anchor the formative role of technology at the level of the social structure rather in abstract relations between 'people' and technological power. A Marxist turn within postphenomenology thus appears particularly useful for strengthening postphenomenological analyses by providing them with a more robust historical grounding.

## 1. Postphenomenology and the technological structuring of experience

Postphenomenology, as developed primarily by Don Ihde and subsequently extended (among others) by Peter-Paul Verbeek,

Robert Rosenberger, Galit Wellner, and Nicola Liberati, presents one of the most influential phenomenological approaches to the philosophy of technology. It aims to describe the ways in which technologies mediate human experience by identifying and articulating the specific modes through which technologies intervene in the intentional structures of the human subject understood as a living body situated within a worldly horizon. Its central theses revolve around three key notions: the *non-neutrality* of technologies, their *multistability*, and the characteristic *relational forms* through which they co-constitute human-world interactions. Although postphenomenology remains indebted to classical phenomenology, it departs from it by emphasizing the constitutive function of the material technological artifacts in their 'praxis-perceptual' embedding within individual and collective experience (Ihde 2009, 23ff.; Ihde 1991, 102f.; Ihde 1993, 1ff.). Throughout this reconstruction, it is essential to foreground the postphenomenological commitment to praxis: technologies shape experience insofar as, in their material interaction with living bodies, they are situated within – and actively contribute to the constitution of – forms of life, understood as structured complexes of practices, habits, skills, and social behaviors.

### 1.1. Non-neutrality

A foundational thesis of postphenomenology is that technologies are *non-neutral*. Against views that treat technologies as mere instruments at the disposal of users, Ihde argues that every technological artifact actively mediates human access to the world. More radically, technologies are said to be «transformational in that they change the quality, field, and possibility range of human experience» (Ihde 1993, 33). Accordingly, technologies do not simply intervene in already-given intentional relations; rather, they reshape the very structure of intentionality by amplifying, constraining, or redirecting the ways in which subjects relate to the make sense of their environment (Verbeek 2008; Liberati 2016; Mykhailov, Liberati 2023). A telescope not only enhances visual acuity but also reorganizes the phenomenality of the observed object; celestial bodies become magnified, manipulable visual phenomena that call for new interpretative schemas. Similarly, medical imaging technologies render internal organs experientially accessible, but only in the form of particular visualizations, thereby introducing new hermeneutic frameworks and normative

expectations concerning what a 'healthy' or a 'pathological' body looks like. Again, a smartphone affords specific modes of communication – continuous availability, rapid exchanges, multimodal representation – while discouraging slower-paced, context-rich forms of interaction. In each case, the artifact's material configuration and operational logic shape the modes of givenness of objects and thereby the intentional horizon within which they can be experienced. Accordingly, technologies positively contribute to structuring the field of possible actions, shaping perceptual and attentional orientations, and consolidating particular interpretative habits.

### 1.2. Multistability

While technologies are non-neutral, they are also characterized by what Ihde calls *multistability* (Ihde 1990, 144ff.). According to the multistability thesis, technological devices do not have a single fixed function or meaning. Rather, their use and experiential impact vary across contexts, cultures, and practices (Tollon 2021; Powys Whyte 2015; de Boer 2023). The same artifact may support different trajectories of mediation depending on the intentions, skills, or socio-material arrangements involved. Verbeek (2005, 11, 138) highlights this aspect to counter deterministic accounts of technological influence: although technologies do influence human-world relations, they do so in multiple possible ways that cannot be exhaustively predetermined by their material structure.[1] The multistability of technologies can be illustrated by the way users repurpose devices: a smartphone camera may function as a tool for artistic creation, documentation, surveillance, or social signaling; a hammer may be used to build furniture or as a weapon; medical imaging technologies can stabilize different forms of clinical practice depending on the institutional environment, regulatory constraints, and epistemic cultures. Technologies thus do not prescribe a single form of mediation but operate within a field of potentialities that become actual only within concrete practices. Crucially, multistability can also be interpreted in a philosophical-political key (Rosenberger 2017; Rosenberger 2024, 106ff.) to show that technological artifacts sediment the conflicts of

[1] Interestingly, Powys Whyte (2015, 76ff.) observes that Verbeek's conception of multistability is compatible with a strongly relativistic account of technology's identity. Ihde and Rosenberger, in contrast, seem to defend a more moderate position.

interpretations and the struggles for values that shape the process through which they are integrated into society.[2] This shows distinctly why the notion of praxis remains central. It is only within contexts of relational strategies – anchored in the interactions between individuals and institutions (in the political sense, but also in the cognitive sense, e.g., expert elites involved in the management of technological infrastructures) – that multistability acquires its concrete social and historical articulation.

### 1.3. Relational forms of technological mediation

Postphenomenology's most distinctive contribution lies in its taxonomy of technological mediations. Ihde (1990, 72ff.; 2009, 42f.) famously distinguishes four principal forms through which technologies shape human-world relations: embodiment relations, hermeneutic relations, alterity relations, and background relations. Each form captures a different way in which technologies can enter into the structure of intentionality.

#### 1.3.1. Embodiment relations

In embodiment relations, the technology becomes experientially 'transparent' (Ihde 1990, 73): it 'withdraws', in Heideggerian sense, as an object of attention and integrates into the corporeal schema of the subject. The artifact functions as a perceptual or motor extension of the I-body. Classic examples include the blind person's cane, eyeglasses, or a surgeon's scalpel. In such cases, the user does not perceive the technology *as* an object but perceives *through* it.

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[2] In a very illuminating paper, Bas de Boer (2020) follows Verbeek's argument (in Verbeek 2011, 59ff.) that moral agency is constituted not in a vacuum, but within a real space that is already technologically mediated. In this view, moral subjectivity is dynamically bound up with the formation of technological objects – that is, it is not a pre-given subjectivity that confronts the center of power (as in Andrew Feenberg's technosystem) but emerges through practices of valuation and interaction within technological mediation itself. For de Boer, the question of the constitution of moral subjectivity becomes political precisely when moral subjects understand themselves as agents interacting with a technosystem within which they can make claims for the democratization and responsibilization of the processes that shape technological objects. Crucially, this requires a critical understanding of the forms of technological rationality imposed by centers of power upon moral subjectivities that are themselves constituted through technological mediation. It is at this point that postphenomenology and critical constructivism become mutually reinforcing. However, I shall argue that the very concept of praxis implicitly at work in this view is insufficient to ground a historically sensitive account of technology.

Liberati (2016, 205ff.) insightfully points out that, for technologies to genuinely mold phenomenological experience, they must be both 'directionally' and 'noematically' transparent – that is, they must preserve intentional directedness toward the very object perceived (rather than generating ersatz perceptions) and must not impose a text-like, semiotic mediation on the object itself. The world appears in/through technologies because technologies become part of the subject pole of the perceptual relation. Embodiment relations exemplify most clearly postphenomenology's roots in the phenomenological notion of the body subject. Yet they simultaneously reveal postphenomenology's pragmatist dimension: the integration of technology into bodily praxis involves skill acquisition, habituation, and the incorporation of technological norms into the user's comportment. Accordingly, Ihde underscores that perception is essentially «actional» (Ihde 1990, 27; Ihde 1991, 26f.). The embodied technology thus shapes the user's possibilities for action and the salience of environmental affordances.

### 1.3.3. Alterity relations

Alterity relations arise when technologies appear as «quasi-others» (Ihde 1990, 98) – entities with which users interact as if confronting an alterity. This is most apparent in technologies that simulate agency, such as robots, AI-driven assistants, or automated customer-service systems (Wellner 2020; Liberati 2022).[3] The technology manifests not as a transparent instrument but as a counterpart with which the user negotiates or communicates. Alterity relations highlight the mode in which technological artifacts embody social expectations, scripts, and normative roles. They reveal how technologies can be construed as *social actors* – not because they possess autonomy, but because their material and functional organization solicits anthropomorphic or dialogical responses. Alterity relations thereby illuminate the social and affective dimensions of technological mediation, which are inseparable from the practices and forms of life within which such technologies operate.

### 1.3.4. Background relations

[3] Mykhailov and Liberati (2023) provide a very intriguing phenomenological and postphenomenological analysis of unsupervised learning techniques in programming languages.

Finally, background relations designate the unobtrusive presence of technologies that structure the field of experience without becoming thematically noticeable. Heating systems, electrical grids, network infrastructures, and algorithmic filtering systems exemplify this form of mediation. These technologies recede into the background of everyday life yet remain integral to the constitution of the lived world. Weiser (1993) has insightfully focused on the way enveloping computer systems «ubiquitously» mold the human experiential background (Liberati 2016). Rosenberger's urgent study of «hostile design» (2019) shows how many of the artifacts that populate our urban background horizon significantly – and often discriminatorily – shape perception and action in ways that frequently elude explicit reflection. Background technologies illustrate how mediation operates diffusely across a distributed network of artifacts that configure the temporal, spatial, and social rhythms of praxis.

### 1.4. Praxis and the material conditions of technoscience

Throughout these relational analyses, postphenomenology insists that technological mediation is always embedded in praxis. Technologies do not determine experience in isolation; they do so through their integration into historically and socially constituted forms of life. This emphasis on praxis does more than localize technological mediation in everyday life. Most importantly, it also enables postphenomenology to articulate the role of technological implementation in the development of scientific knowledge itself.

For Ihde, «technoscience» names the inseparable entanglement of modern scientific knowledge and technological devices (Ihde 1993, 58f.; Ihde 2009). His engagement with socio-constructivist and feminist science studies was motivated by a shared conviction that modern science is never a purely theoretical enterprise but is always materially and technologically mediated (Ihde 1993, 116ff.; 99f.). Scientific observation is intimately related to the instruments that make phenomena accessible, and these instruments are themselves embedded in specific configurations of praxis. The scientific image of the world is thus co-constituted by technological artifacts that do not simply 'extend' perception but reorganize the very structure of what can appear.[4]

[4] In Ihde's view, modern scientific representation is also a form of 'representational *engineering*' – not in the narrow professional sense but in the

Thus, postphenomenology's focus on praxis extends beyond ordinary experience and into the epistemic practices of scientific inquiry. It highlights how technological artifacts participate in the constitution of scientific objects, methods, and norms, revealing science itself as a mode of technologically mediated engagement with the world. It also shows that scientific practice is an irreducibly material form of praxis. This emphasis on the material mediation allows Ihde to articulate a very important point: since technoscience by essence requires complex material infrastructures, it also requires financing. Reflecting on historical cases such as da Vinci and Galileo, Ihde observes that «*their enticement for the prince was the offer to invent and develop marvelous instruments of war!*» (Ihde 1993, 59; italics in the original). He thus further characterizes technoscience as the «science that is embodied in instruments and whose infrastructure is 'military-industrially' supported» (ibid.), highlighting the structural link between scientific inquiry and the centers of wealth capable of sustaining its technological conditions. Relatedly, Ihde also notes the distinctly corporate character of contemporary technoscience, which reaches its full expression in the integrated relationships among universities, government, and industry. As he writes, «contemporary technoscience in its now technological and corporate form requires a very complex, large, and society-supported infrastructure for the production of its 'products'» (Ihde 1993, 60).[5]

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ontological sense of *manipulability*. To engineer an object is to bring it into a field of possible transformations, operations, and controlled variations. Modern science achieves understanding not only by observing but by constructing objects in such a way that they can be experimentally manipulated, recalibrated, and recomposed. His famous analysis of Leonardo da Vinci's 'exploded diagram' exemplifies this claim. By depicting a machine as an assemblage of discrete, separable, and re-combinable components, Leonardo provides not a merely visual representation but an engineering ontology: the world is presented as a system of elements that can be individually identified, isolated, and technically controlled. Significantly, this also applies to human body. For Ihde, this is not an accidental feature of scientific imaging but a structural one. Technological mediation shapes the very ontological style of modern science, orienting it toward forms of representation grounded in operationality, modularity, and reproducibility.

[5] Significantly, the way Ihde interprets the material conditionality of technologies leads him to focus primarily on the cross-cultural dynamic of their geneses. Ihde points out that technologies tend to develop more in

Ihde's analysis is particularly revealing because it identifies a crucial aspect of technoscientific praxis, namely the conditions of its material realizability. This way of framing the problem brings into view a further and unavoidable dimension: the political significance of technological artifacts themselves. Once technological mediation is understood as materially conditioned, socially situated, and structurally embedded within networks of power, the question of how technologies function politically – how they shape, enable, constrain, or distribute forms of agency and participation – cannot remain peripheral. It is precisely here, at the juncture where the material conditions of technoscientific praxis meet the political structures that sustain them, that the limitations of postphenomenology begin to show. To clarify these limits, and to grasp the sense in which technologies bear inherently political functions, we must now turn directly to the way in which postphenomenology has attempted to accommodate the politics of technology.

## 2. The limits of postphenomenology: technology, history, labor

Postphenomenology recognizes that technologies possess an irreducibly material dimension that conditions their very possibility of realization. The concrete forms taken by technologies are not accidental but depend on the one hand, on their intrinsic entanglement with scientific practice and on the other, on the fact that they require complex material infrastructures for their production, maintenance, and deployment. In this sense, postphenomenology appears well equipped to clarify how relations of power and technology are intertwined, insofar as the concrete realizability of technological artifacts is shaped by the material configurations through which power manifests itself. In postphenomenology, this also substantially bears on the way the very subjectivity of human beings is constituted. In a very telling passage from his *Moralizing technology*, Verbeek argues that «human beings derive their subjectivity from their interplay with the structures of power of society […] The needed relation [toward

correspondence with «*high periods of crosscultural trade and exchange than* [with] *high periods of philosophical or scientific theory*» (Ihde 1993, 62; italics in the original). Ihde further notes (1990, 164ff.) that postmodernism represents the culmination of this structural-genetic dynamic, marked by the dominance of image and information technologies – which are thus not merely tools but genuine conditions for cross-culturality.

power] does not merely *oppose* power but recognizes that subjectivity is shaped in interaction with power» (Verbeek 2011, 72).[6] This conception has inspired a substantial body of postphenomenological work on the philosophical-political implications of technological mediation, directing attention to the constitutive role that the interaction among individuals, technologies, and the social space plays in the formation of moral agency. This is precisely where studies such as Rosenberger's (2017; 2019; 2024) postphenomenological analysis of hostile design locate their critical leverage. Of particular interest for the present work, however, is Verbeek's foundational article for this line of thought, which deals explicitly with the problem of *Politicizing postphenomenology* (Verbeek 2020).

I take Verbeek's contribution to be particularly groundbreaking for the explicitly political-hermeneutic turn within postphenomenology. Building on the analyses of Ihde and Rosenberger, Verbeek argues that the microscale perceptual mediations enacted by technologies disclose «a political dimension of technology at the macrolevel of society» (Verbeek 2020, 144). This move enables him to address the question of how technologies «inevitably help to shape people's behavior and frameworks of interpretation» (ibid.).[7] From this vantage point, Verbeek raises what he takes to be the central problem for a political hermeneutics of technology, i.e., «the democratic quality of technological societies» (ibid.). More concretely, he asks: «to what extent can the organization of technological societies take place in democratic ways?» (ibid.).

Verbeek identifies three domains in which technological mediation manifests its political-hermeneutic character. The first concerns 'power', that is, the ways in which people interact with technological power. Here the central issue is specifically the material design of technologies, which impose prescriptive structures upon social life. These structures function as 'normative frameworks' within which individuals are tasked with assuming moral responsibility. This entails, as Verbeek argues, «accepting the idea that individual freedom is inevitably mediated and conditioned by technology, and also accepting the responsibility to

[6] Verbeek explicitly takes his postphenomenological-hermeneutic account to be in sharp contrast with a dialectical view.

[7] The conflict of interpretations is central in Rosenberger's account of how multistability is socially manifested.

deal with these mediations in a democratic way» (Verbeek 2020, 146). Postphenomenology thus emerges as a theoretical approach capable of grasping, in a proleptic manner, the multistable or interpretatively flexible ways in which material technologies can shape people's experience of the world.

The second – and, in my view, most important – domain identified by Verbeek concerns specifically 'political interaction'. Here, Verbeek significantly draws on Hannah Arendt's distinction between action, labor, and work. Put broadly, action belongs to humans as *zoon politikon*, labor to humans as biological entities, and work to humans as creators of a «material world that gives a context of stability and endurance to the cyclic processes of life» (Verbeek 2020, 147) – that is, forms of culture. Verbeek critiques Arendt by noting that «in her urge to highlight the specific character of *zoon politikon*, […] [she] almost overlooks the fact that the public realm actually requires a material space to exist: a public space, necessarily the product of the work of *homo faber*» (Verbeek 2020, 148). From this, it follows that the political space in which action unfolds is already a material space – technologically mediated – and that the «character of public spaces helps to shape the character of political action and interaction, including the ways in which the private sphere is demarcated from the public sphere, and the ways in which plurality and interaction can take shape» (ibid.). In this sense, Verbeek argues, the development of smart cities and social media platforms serves as a clear illustration of the role of technological mediation in materially constituting the political space. Verbeek's conclusion is that technologies «organize the process of polis-making, in the Arendtian sense of the plural interaction between people who are *different* but together also form a *common* polis» (Verbeek 2020, 149).

The third and final domain identified by Verbeek concerns the social formation and circulation of what he terms 'concerns' – that is, the collectively determined topics, aspects of life, and issues deemed most relevant for the organization of social life, both in public and private spheres. Here, the role of technologies in shaping how we represent and materially interpret the world becomes most visible. It is in this domain that the significance of technologies extends beyond the microlevel processes, demonstrating their constitutive impact on the «macro-dimension, where social practices and cultural frameworks of interpretation are formed» (Verbeek 2020, 152).

Verbeek offers a highly articulated and programmatic account of how postphenomenology can address the political-hermeneutic dimension of technology – that is, the mechanisms of social constitution that depend on the production and circulation of specific technologies, as well as on the ways in which these technologies are politically managed. Yet I think this position tends to remain somewhat abstract – namely, insufficiently attuned to the historical conditions under which technological insertion into sociality takes place – because it treats the interaction between 'people'[8] and technologies as a given, without examining the more fundamental social and economic structures within which technological artifacts are produced, reproduced, distributed, and managed. Thus, although Ihde already recognized the need to situate technoscientific development within military-industrial structures – highlighting that technological realization requires large-scale infrastructural and financial support – postphenomenology as a whole does not seem capable of clarifying the properly social and economic nature of this fundamental relation. Indeed, the social distribution of technologies are always embedded within already established social relations of production and reproduction, relations that, while of course making use of existing technologies through processes of re-functionalization and re-semantization, selectively adopt and develop those technologies that are 1) maximally efficient in sustaining the dominant regime of socio-economic productivity and reproductivity, 2) maximally 'crisis-responsive', that is, functionally flexible in responding to structural instabilities, and 3) maximally interiorizable by living bodies, which are socially arranged and mobilized in accordance with the structural mechanisms underpinning the prevailing mode of production and reproduction.

To clarify this point, consider the case of digital communication technologies, which occupy a central place in Verbeek's analysis. The fact that a given digital communication technology is materially designed, for instance, to maximize a user's time on a platform – and thereby to orient their relational habits, their

[8] Notice that this lexeme occurs 61 times in Verbeek's article, and I believe it is no coincidence that he repeatedly relies on this indeterminate category: 'people' presupposes a collectivity without internal determinations, as if individuals were not situated by a specific systemic function within the overall organization of productive and reproductive social labor. Yet there is no such thing as 'people' in history.

economic behaviors, and even their political opinions – tells us very little about the way that user interacts with others and with the collectivity at large. The crucial point is neither the design intention nor the way a given technology is accessed and managed by its users. What is decisive, rather, is the ensemble of relations of production and reproduction that constitute the society into which that technology is implanted, and through which it is subsequently mobilized to consolidate the dominant mode of production and reproduction in the face of its structural crises. This becomes especially evident with communication technologies, where even the most sophisticated strategies of public-opinion manipulation and the apparent political conflicts or divergent worldviews that surface in/on/through these media remain logically subordinated to the same underlying mode of production and reproduction of the society. As such, they do not possess a genuinely structural character; they belong instead to the ideology of the dominant mode of production.

In a recent article, Tailer G. Ransom and Shaun Gallagher (2023) have shown that postphenomenology must resist liberal-bourgeois conceptions of individuality and its relation to technology. In particular, the authors employ, from a social-philosophical perspective, the notion of 'cognitive institution' to identify the ways in which the constellation of practices condensed in technological artifacts becomes embedded in individuals' bodily and behavioral schemes. From this, they argue that «the meaning of individuality, as well as the phenomenological character of concrete immediate experience, is structured by its position within a sociomaterial ensemble» (Ransom, Gallagher 2023, 2192). This anti-liberal and anti-metaphysical conception of the individual is instrumental in understanding both the historically situated character of phenomenological subjectivity and the mechanisms through which technology shapes the structuring of experience. No longer conceived solipsistically, the individual is itself the dynamic process of social, economic, and political relations, embodied in the living corporeality that interacts with other living corporealities. The authors thus appropriately observe that, if the 'sociomaterial' basis is not taken into account, «the individual viewpoint remains abstract in its concreteness» (ibid.).[9]

[9] Accordingly, the real objection to postphenomenology is not the one advanced by Feenberg – namely, that it risks committing to «methodological

My argument is that the postphenomenological position fails precisely insofar as it does not consider, in its analysis of the processes through which society is technologically constituted, those structurally foundational elements of social relations – namely, the overall structure of society in the ways it organizes the actualization of labor power through the distribution of the productive and reproductive socio-economic functions of living bodies. However, Ransom and Gallagher do not note that, just as they seek to highlight the positive role of postphenomenology in overcoming the abstract conception of the relationship between technology and the individual, they fall into the very same abstract discourse by referring to the postphenomenological analyses of Ihde, Verbeek, and Rosenberger. What the authors do is merely observe the 'critical' potential of postphenomenology (Ihde 2020; Botin et al. 2020),[10] which, however, unfolds entirely within a public discourse that is already oriented and structured by the dominant mode of production and reproduction, and has no capacity to reveal its structural elements – except by occasionally conflating them with others or treating them on the same level as non-structural elements. What postphenomenology treats as the *real* substance of the interaction between technology and the socially situated individual (and society as a whole) is therefore not the real substance at all, but only the *apparent* substance, since it conflates the essential logic of interaction with the apparent one, remaining on the ideological plane. It is no coincidence that, in summarizing their theoretical findings, Ransom and Gallagher again employ the abstract concept of «people» (Ransom, Gallagher 2023, 2195).

It is therefore important to stress that the postphenomenological appeal to technological artifacts as material entities is not sufficient to secure the materiality of its philosophical discourse. In their programmatic article, Ihde and Lambros Malafouris (2019), by interweaving the theoretical trajectories of postphenomenology and Material Engagement Theory, aim to

individualism» and thus becoming «reductionist» (Feenberg 2020, 28), as if the remedy were simply to replace the individual level with a more explicitly social perspective. The problem runs deeper: even when a social standpoint is adopted, without an adequate theory of praxis that includes its structural determinants, postphenomenology is bound to remain abstract.

[10] In my view, this marks the limit of Rosenberger's (2024) otherwise excellent account of postphenomenology's significance for political activism.

highlight the remarkable contributions that the conjunction of these two perspectives can deliver: on the one hand, the 'enactive' and 'transactional' approach to human evolution and adaptation, understood as creative processes of material interaction between the natural world and human civilizations; on the other, the intrinsically sociomaterial dimension of intelligence and human action in relation to technological artifacts, which also yields an anti-mentalist and materially engaged ontological conception of the human.

It is, however, rather striking – and theoretically telling – that in the very same paragraph the authors can assert, on the one hand, that this combined framework focuses on the «analysis of mundane things and material practices, as well as different historical manifestations of the constitutive and largely inescapable or natural intertwining of people [*!*] and things», and, on the other, that «there is nothing inherently good or bad about a new technological development» - assuming that for the authors 'good' and 'bad' should not be taken in their ethical sense but precisely in relation to the sociomaterial effects these technologies may produce. Once again, then, the creative material engagement of *homo faber* is rendered abstract and de-situated, despite its self-proclaimed materiality. For it lies in the very historical essence of technology that it appears socially as a 'good' or a 'bad' artifact – where the terms are meant non-ethically, but simply in relation to the function a given technology fulfills in preserving the material (social) conditions of its own production and of society at large.[11] The way in which a technology is socially absorbed, thereby shaping the concrete practices of individuals, ultimately depends on the socio-economic position from which those individuals encounter it: machinery is 'good' for the capitalist and 'bad' for the proletarian (MECW 29, 82ff.; MECW 35, 241); satellite is likewise

[11] One could say that, for this framework, the same critique applies that Lukács levels against Engels's interpretation of science and industry as dialectical forms of praxis that overcome the Kantian concept of the thing-in-itself (Lukács 1971, 131ff.). Lukács argues that Engels errs in treating both science and industry as non-reified modes of forming objects according to the laws of nature. In reality, scientific experiment is «contemplation at its purest» (Lukács 1971, 132), insofar as its object is already pre-structured so as to be measurable and mathematically manipulable. Industry, for its part, generates its objects within the horizon of the dominant mode of production – namely, capitalism – which is never conscious of the totality of the laws it sets into motion; its consciousness is, by definition, a reified one.

'good' both for the U.S. military operative, for the travel blogger, and for the disoriented chauffeur, while being 'bad' for the Pakistani and Palestinian civilian (Chow 2006, 25ff.; Coyne and Hall 2018). Both examples, however, must ultimately be referred back to the broader system of conditions and relations that collectively determine the material organization of society in its productive and reproductive functions: in the case of the machinery, one may remain within the framework of national capitalist economies; in the case of the satellite, the analysis must already presuppose the plane of a globalized economy.[12]

This brings us back to what appears to be a structural inversion at the heart of Verbeek's position. For Verbeek, technology actively mediates the ways in which 'people' (a term that is itself problematically abstract) interact politically. Yet individuals interact politically only insofar as they stand in determinate relations that structurally derive from the way the society in which they live organizes the totality of its productive and reproductive social labor time – that is, from the ways in which it socially arranges the use of living bodies endowed with productive and reproductive labor power. The way 'people' politically interact thus does not depend for its essence on the way technology mediates

[12] It should be noted that the institution of the category of the 'civilian' as a targetable body (on this theme, see Chow's reflections) has a specific character in the context of capitalist conflict. Clearly, the 'civilian' also exists in non-capitalist forms of warfare (Cavarero 2007); yet interpretative categories are flexible – or, in marxist terms, dialectical – in the sense that they functionally mutate with the historical (economic and social) conditions within which they are applied. The Pakistani civilian who is subjected to an indiscriminate attack carried out through remotely operated drones – guided through highly sophisticated optical and positioning systems to which that civilian has no access – is a socio-economic category within the framework of global-scale capitalist economy. That this civilian also occupies a specific position in their own national economy is secondary. We should also observe that what is distinctive of capitalist warfare is the introduction of generalizing (i.e., abstract) interpretative operations that institute, for example, the concept of the people-nation (not unlike the postphenomenological people), a category that does not exist as such and that plays an ideological function in the formation of war rhetoric. (It is hardly accidental that the newspaper founded in 1914 by Benito Mussolini bore the name 'The People of Italy' [*Il Popolo d'Italia*].) Marxism must resist such abstractions and insist on a concrete (historical-materialist) analysis of the material conditions in which subjects appear on the historical stage. A phenomenology of technology cannot ignore this dimension if it is to avoid falling into abstract modes of analysis when dealing with inherently historical objects such as technologies.

among them. This interaction is instead already rooted in historically specific configurations of productive and reproductive social labor. To overlook this is to mistake an effect for a cause, and to treat technology as if it structured political life in a vacuum, rather than as something itself shaped by, and inserted into, a determinate mode of organizing social labor.[13]

## 3. Marx on technology: instrument, mode of production, body of labor

In his highly influential work on the intersections between phenomenology and Marxism, Ian H. Angus offers an extended analysis of Marx's ontology of labor. Drawing on the first volume of *Capital*, Angus argues that Marx's ontology can indeed be understood as a «phenomenology of the role of human activity in nature» (Angus 2021, 180). For Marx, this activity takes the form of the «labour process», in which «man's activity, with the help of the instruments of labour, effects an alteration, designed from the commencement, in the material worked upon» (MECW 35, 190). From this, we can understand that what Marx can tell us about technology is essentially tied to the labor-contextual use of technology – that is, the technological apparatus as it functions within the labor process.[14] Already in the passage just cited, we find the fundamental structure of this process, which comprises three basic elements.

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[13] Reading Verbeek's article – but, more generally, the broader postphenomenological literature – one gains the impression that there is a peculiar and somewhat curious form of Prometheanism at play: not in the sense that human beings assert ontological primacy through the possession and deployment of technology, but rather in the sense that technology itself appears in a quasi-theophanic manner before a generic people. This quasi-theophanic quality stems from the fact that the very individuals or groups who are ostensibly positioned as interested in the production of certain kinds of artifacts rather than others seem to exist in a socio-economically – therefore historically – indeterminate vacuum. Within this empty space, technologies simply appear as if they were gifts from the heavens, without any serious consideration of their actual socio-economic constitution.

[14] As we shall see, Marx operates with a non-restricted concept of labor – one that differs markedly from our regulated and monetized understanding of work as a "working day". More generally, marxism, including non-orthodox strands such as feminist marxism, has repeatedly sought to generalize the concept of labor in relation to its grounding in the human capacity to labor (labor power). This line of inquiry extends the notion of labor to those spheres of social existence that are not directly (or explicitly) involved in production and are therefore not socially posited as productive labor. On this topic see Federici 2017; Fortunati 1995; Holmstrom 2024.

The first element is the «*material* of labour» (MECW 29, 81), which in the *Economic Manuscripts of 1861-1863* Marx broadly defines as the «object which is worked on», or the «object to be appropriated by means of labour for a specific need» (MECW 30, 56). It is important to note that, for Marx, the material of labor «appears as the inorganic nature of labour» (MECW 30, 58). Here it should be emphasized that 'inorganic' does not mean lacking life: inorganicity is rather a relational category, functionally defined on the basis of the labor process exercised upon the material (Fracchia 2008, 58 ft.; Butler 2019). Marx even goes so far as to describe nature itself, when involved in the labor process, as the human being's «inorganic body» (MECW 03, 275). Once labor is completed, the material of labor is actively transformed into a use value – namely, «the utility of a thing» (MECW 35, 46).[15] Marx underscores this point because it is as use value that the material of labor «confront[s] real living labour», insofar as it (the material) constitutes one of the conditions for labor's realization, determined by «the nature of labour itself» (ibid.).

The second necessary condition for the realization of labor is the «*means* of labour», (MECW 29, 81) defined by Marx as the «organ of the appropriating activity itself» (MECW 30, 58). The means of labor, too, is for Marx a use value, and it appears to the living labor as one of its essential moments (MECW 30, 62f.). Marx broadly defines the instrument of labor as «a thing, or a complex of things, which the labourer interposes between himself and the subject of his labour, and which serves as the conductor of his activity» (MECW 35, 189).[16] Following Hegel, Marx emphasizes that the instrument is the «first thing of which the labourer possesses himself» (ibid.). This is true not only in the sense that the human body provides the most immediate means through which labor activity is carried out – Marx is explicit that human labor is, first and foremost, a «productive expenditure of human brains, nerves, and muscles» (MECW 35, 54) – but also, and importantly, in the sense that nature furnishes the most elementary means for

[15] Recall that, for Marx, 1) use value is tied to the materiality of the object, and 2) it is realized only "in use and consumption," that is, within determinate social relations.

[16] It is also important to note that Marx understands the means of labor «not only as *instruments of production*» – such as spades, hammers, wrenches, machineries, or computers – «but also the *objective conditions* without which the labour process cannot occur at all» (MECW 30, 56), including buildings, fields, offices, but also oil, coal, chlorine, and so on.

exercising labor capacity. Marx thus famously remarks that «the earth is […] [man's] original tool house» (MECW 35, 189). Yet we should note that Marx does not mean that human beings simply encounter ready-made instruments in nature. Indeed, he writes elsewhere that the instrument «is the first product produced by man» (MECW 30, 65). Here, 'production' must be understood broadly, referring to the functionalization (whether transformative or not) of the material structure of the objects and their insertion into the labor process.[17] On this basis, Marx can claim – in a non-naturalistic and non-reductive manner – that the «use and fabrication of instruments of labor is specifically characteristic of human labour process» (MECW 35, 189).

Yet neither the material nor the means of labor could fulfill their function if they were not situated within a labor process, which in its actualization, requires what Marx calls «living labour» (MECW 29, 81). Broadly speaking, living labor – the third element of the labor process – is the «realisation, the actual use, of labour capacity» (MECW 30, 54), such that the labor process is understood as a «process in which the worker performs a particular purposive activity, a movement which is both the exertion of his labour capacity, his mental and physical powers, and their expenditure and using-up» (MECW 30, 58f.).[18] The labor process thus unfolds fundamentally (in logical and causal sense) from the infusion of teleological intentionality into matter – whether organic or inorganic. This intentionality becomes concrete in the bodily and psychic functions that are mobilized and deployed in the execution of labor. Marx insists that 'capacity' must be understood in the sense of «potency, δύναμις» (MECW 30, 37) – that is, an innate power of the human being to act transformatively upon reality in accordance with a projected plan of action, a productive design. Marx strongly emphasizes that this capacity «exists only as an ability in the living body of the worker» (MECW 30, 42). In his view, the human capacity for labour is defined as «the aggregate of those mental and physical capabilities existing in a human being, which he exercises whenever he produces a use value of any description» (MECW 35, 177). It becomes clear, then, that Marx understands the

[17] It should be noted that, as Engels observed in *Dialectics of Nature*, that the human hand itself is «not only the organ of labour, it is also *the product of human labor*» (MECW 25, 453).

[18] For a detailed reconstruction of Marx's theory of living labor see Baronian 2013.

labor process as a «form-giving activity [which] consumes the object and itself; it forms the object and materializes itself; it consumes itself in its subjective form as activity and consumes the objective character of the object, i.e. it abolishes the object's indifference towards the purpose of the labour» (MECW 30, 59).

These three elements thus constitute the structural dynamic of the labor process. Marx insists that this structure possesses a certain generality – namely, it remains invariant even as the concrete conditions of its realization change. The passage in which Marx articulates this point is crucial for the present discussion, and it is worth quoting in full:

> In so far as the actual labour creates use values, is appropriation of the natural world for human needs, whether these needs are needs of production or individual consumption, it is the universal condition for the metabolic interaction between nature and man, and as such a natural condition of human life it is independent of, equally common to, all particular forms of human life. The same is true of the labour process in its general forms; it is after all nothing but living labour, split up into its specific elements, whose unity is the labour process itself, the impact of labour on the material of labour working through the means of labour. The labour process itself appears in its general form, hence still in *no* specific *economic determinateness*. This form does not express any particular historical (social) *relation of production* entered into by human beings in the production of their social life; it is rather the general form, and the general elements, into which labour must be uniformly divided in all social modes of production in order to function as labour. (MECW 30, 63)

This passage seems to clarify that Marx's thought involves the search for structurally constant elements across the historical transitions that shape the various forms of society's overall organization of labor. These elements are rooted in the labor process understood first and foremost as the activity of an individual endowed with a living body capable of laboring. As Angus has already emphasized, it is noteworthy that, for Marx, there exist «transhistorical characteristics» (Angus 2021, 182; *et passim*) grounded in the essentially interactive (metabolic) dynamic between human beings and the world – a dynamic that is constitutively mediated by technological instruments. Yet this 'transhistorical ontology' is anything but naturalistic: it is not to be understood in terms of natural-scientific determinations. Rather, it is grounded precisely in the irreducibly phenomenological dimension of human activity – rooted in the individual's own living

body – through which reality is metabolized. However, as Moishe Postone has rightly emphasized – and as later taken up by others, such as Laurent Baronian, Michael Heinrich, and Werner Bonefeld – the labor process, insofar as it manifests itself concretely, is also a «*social* category» (Postone 1993, 145). That is, it posits a determinate relation between the dynamics of individual labor and the overall social composition within which such dynamics are enacted.

Yet I do not take these two positions – around which Marxist debates have long revolved, particularly concerning the ambivalence of Marx's concept of abstract labor (a topic I cannot address here) – to stand in real opposition.[19] Angus, in fact, provides us with adequate conceptual tools, drawn from Husserl's analysis of the *Origin of Geometry* in *Crisis* (Husserl 1970), to clarify the relation between what he takes to be the transcendental grounding of historicity of labor power – rooted in the living body of the individual – and the contingent forms that this labor power may assume within the historically constituted (cultural-civilizational) lifeworld. On the one hand, Angus maintains that «the specific character of the living body of human body gives each lifeworld its internal structure that persists throughout changes in empirical content» (Angus 2021, 173); on the other hand, for Angus, «the transcendental essence of labor is the social-material organization of the living body as a necessity for embodied spirit that determines that this essence must have incurred into empirical history as the transformation of the lifeworld by human action» (Angus 2021, 173). From this perspective, the universal historical significance of capitalism becomes intelligible: capitalism appears precisely as that 'event' through which the universalization of human labor as a determining structure of history is accomplished. This is, of course, a «retrospective» judgment (Angus 2021, 52) about the epochal significance of the capitalist organization of social labor in the historically contingent and factual formation of relations of force and production.

We can thus gain a clearer understanding of the passage cited above. First, it is important to emphasize that, for Marx, once the labor process is conceived in a determinate manner, this means that it is *economically* determined. Moreover, this economic determination is conceived on the basis of the presence of

[19] This debate over the concept of abstract labor, and its relation to value, has at times taken on radical tones, see, e.g., Bonefeld 2010; Kicillof and Starosta 2011.

historically specific social relations of production. What these social relations of production connect, for Marx, are the «social productive forces» (MECW 28, 234; MECW 29, 92). It is important to clarify that, by productive forces, Marx refers to all the elements of a society – labor power, means of subsistence and reproduction, instruments of labor, objects of labor – which dynamically combine to generate and sustain social life.[20] The relations of production are the ways in which these productive forces relate to each other in the course of production.[21] In this sense, Marx states that a mode of production is the system of corresponding social relations that determines the «economic structure of society» (MECW 35, 93 ft.). It is also clear why, as Christian Fuchs observes, Marx considers history itself to be a «succession and sublation of modes of production» (Fuchs 2014, 162). This, of course, is not to be understood in a reductionist sense, as if the economy were to exhaust the historical character of human affairs. Rather, it points more fundamentally to the fact that the way in which social productive forces interact with one another – that is, the dynamic configuration of labor, instrument, and object within historically specific relations of production – determines the concrete course of human history.[22] Accordingly, the way in which social productive forces intersect is what characterizes the specific mode of realization of the cultural-civilizational lifeworld.[23] Capitalism, for

[20] In *The Poverty of Philosophy*, Marx significantly writes that «social relations […] are not relations between individual and individual, but between worker and capitalist, between farmer and landlord, etc. Wipe out these relations and you annihilate all society» (MECW 06, 159).

[21] Fuchs (2014) provides a detailed analytical reconstruction of the relations of production, which he argues encompass modes of ownership, coercion, allocation/distribution, and the division of labor.

[22] In *The German Ideology*, Marx notes that even the most elementary mode of production – the one determined by the natural character of objects as means of subsistence – is not merely a «reproduction of the physical existence of the individuals», but also «a definite form of activity of these individuals, a definite form of expressing their life, a definite mode of life on their part» (MECW 05, 31).

[23] It should be noted, as feminist marxism has long emphasized (Federici 2017; Fortunati 1995; Holmstrom 2024), that the dominant mode of production exerts structural effects on the social formation as a whole, including in those spheres of reproduction that are not directly tied to productivity in the strict sense. Engels's analysis of the family already makes this dynamic evident. Moreover, although Marx has often been accused of naturalizing reproductive process, at least on one occasion he shows an awareness of the thoroughly social – and therefore economic and historical – character of reproductive forms (MECW 03, 274f.).

instance, is that mode of production in which abstract labor is universally established as the substance of value. Abstract labor, as a quantifiable unit of socially necessary labor time – which no longer stands in a structural relation to its means or object of labor – serves primarily to generate exchange value, which is then increasingly augmented through the capitalist extraction of surplus value.

This theoretical framework is essential for grasping the role that technology plays in the constitution of the economic system. Technology is the mediating element that, according to Marx, enables the metabolic and appropriative dynamic between humans and nature (the surrounding world). As Marx significantly writes in *Capital*, technology «discloses man's mode of dealing with Nature, the process of production by which he sustains his life, and thereby also lays bare the mode of formation of his social relations, and of the mental conceptions that follow from them» (MECW 35, 375 ft.). Angus has thus rightly observed that, for Marx, technology is «*constitutive* of the human relation to nature such that there is no simple nature unchanged by humans nor a human being apart from technical extension and development of human capacities» (Angus 2021, 297). The degree of this constitutivity is at times emphasized quite strongly by Marx himself. Technology, as the instrument of labor, not only 'lays bare' modes of production and the corresponding mental conceptions, but at times seems even to 'determine' them. In *The Poverty of Philosophy*, for instance, Marx makes the following reasoning: «Social relations are closely bound up with productive forces. In acquiring new productive forces men change their mode of production; and in changing their mode of production […] they change all of their social relations» (MECW 06, 166). Then he famously remarks that, «The hand-mill gives you a society with the feudal lord; the steam-mill, a society with the industrial capitalist» (MECW 06, 166).

Yet Nathan Rosenberg (1982, 34ff.) has already offered strong arguments against a technological-determinist interpretation of Marx. Rosenberg accurately argues that, «To regard Marx as a technological determinist […] is tantamount to ignoring his dialectical analysis of the nature of historical change» (Rosenberg 1982, 38). It must be emphasized that this dialectical analysis entails considering the structure of the labor process as a whole, including the centrality of living labor as the space in which social relations are formed on the basis of the corporeality of the

individuals. More specifically, the determining function of the technological object within the labor process does not depend on the technical anatomy of the object itself, but on a specific way of organizing the relation of production between labor power, as it is embodied in the living individual, and the means of labor. Put more plainly: a technological instrument 'determines' the economic structure of society only insofar as it is functionally transformed into an instrument of labor – that is, only once it is positioned within a more complex and dialectically articulated chain of productive functions. This becomes especially clear in Rosenberg's analysis of the use of science in capitalist machinery.

This theoretical framework allows us to clarify the following fundamental passage:

> It is not the articles made, but how they are made, and by what instruments, that enables us to distinguish different economic epochs. Instruments of labour not only supply a standard of the degree of development to which human labour has attained, but they are also indicators of the social conditions under which that labour is carried on. (MECW 35, 190)

Now, the first point to note is that the technological instrument – inasmuch as it is a functionally *produced* object – is certainly an object that presupposes socially organized forms of productive forces; that is, it requires a mode of production. In this sense, technology is a *thematic* object, insofar as productive forces have already been exercised upon it within determinate relations of production. But technology, Marx is telling us here, is also a *reflective* object in the deeper sense that in its very interiority is sedimented the mode in which the productive forces interact according to those relations of production that constitute the economic structure. As already indicated, this is not to be understood in the sense of technological determinism – an anti-dialectical, and therefore anti-historical, conception that Marxism cannot possibly endorse. Rather, it means that the technological instrument of labor *symbolizes* the mode of production insofar as its materiality is absorbed into the labor process, a process that presupposes a differentiation of functions (both among the productive forces and within the relations of production).[24] These

[24] Rosenberg has insightfully noted that the technological instrument 'determines' society in much the same way that "a thermometer *determines* body

functions relate to the technological instrument in distinct ways depending on their respective roles within the productive system.

This point emerges with particular force in the stunning – and at times painful – pages of the *Grundrisse* known as 'Fragment on machines'.[25] Here Marx reflects intensely on the constitutive role of the characteristically capitalist means of labor, namely machinery – or, more precisely, the «*automatic system of machinery*» (MECW 29, 82). In these pages, Marx emphasizes that the development of machinery as a means of labor (productive force) marks the specifically capitalist order of production by placing the elements of the labor process into a distinctive relation of production (Wendling 2009, 55ff.). This amounts, in fact, to what Marx identifies as the capitalist structural inversion of the relation between worker and means of labor: «in no respect does the machine appear as the means of labour of the individual worker […] On the contrary, the worker's activity is posited rather as merely mediating the labour of the machine, its action upon the raw material» (ibid.). This is all the more significant insofar as – beyond signifying a relation between objectified labor and living labor, in which the former appropriates the latter in the very production process (thus constituting a form of «real subsumption»; Feenberg 2017, 120) – it determines a specific way in which the functions of the I-body as an individual endowed with labor power (and thus capable of entering determinate productive relations and becoming a social and historical subject) are arranged throughout the labor process, that is, expressed upon objects through the technical instruments of labor. Marx returns repeatedly to this point in later works (especially in *Capital*), in order to show the various ways in which the living, labor-capable body interacts with the machine tool. Not only does machinery entail a reorganization of the psycho-motor functions of the living body – through 1) the separation of knowledge from labor praxis (MECW 29, 83) and 2) the monotonization of labor activity – so that the worker is turned into a «living appendage» (MECW 35, 425 and 487) of the mechanically automated system of production. Machinery also imposes a different structuring of the society in which it is embedded as the privileged instrument of capitalist production. Among the most evident effects are 1) the expansion of the

temperature or a barometer *determines* atmospheric pressure" (Rosenberg 1982, 40).

[25] For insightful comments on these pages see Wendling 2009, 141ff.

potential labor force, now including women and children (MECW 35, 420), and 2) a radical devaluation of labor power (MECW 35, 398) – effects that signal a profound transformation of society as a whole, not merely of the productive system.[26]

It is neither possible nor necessary, for present purposes, to pursue a more detailed examination of Marx's conception of technological instrument, nor of its implication for the productive and reproductive spheres. What matters in this context is that, from Marx's perspective, it becomes evident that the technological instrument situated within the labor process imposes 1) a specific mode of bodily disposition for the living, labor-capable body within that process; 2) a structural relation between the position the living body occupies in the productive system as a whole and the manner in which it interacts with the technical object; 3) a structural nexus between the productive function of the living body in the technologically mediated labor process and its positioning within social relations of reproduction – extending even to the determination of the value of its own labor power.

We must now, in conclusion, show how this historical-materialist conception of technology – importantly confined to its role within the labor process – can inform postphenomenological and phenomenological analyses of the politics of technological artifacts.

## 5. Back to living body: history, praxis, and technology

Marx's analysis has shown that the relationship between technology and the individual is mediated by the mode of production and by the specific position that the individual occupies within the productive system. Of course, not all technologies present themselves as instruments of labor, and hence the Marxist analysis might appear limited to those domains in which an artifact emerges as an element of the labor process. It is clear that there exist technical entities that play no role in production, and consequently have no role in how we organize society. Glasses are glasses for the capitalist, the proletarian, or the petty-bourgeois, even if they may be inaccessible to a lumpen-proletarian (assuming a society without basic welfare services). However, it is legitimate to claim that if a technological object appears historically as a social

[26] The relationship between the capitalist mode of production and the development of reproductive technologies has been emphasized recently by Leopoldina Fortunati (2003).

form – that is, as a modality for organizing the relations among individuals who, based on their socio-economic positions, interact with one another in the productive and reproductive dynamics of social life – then it cannot be accounted for simply by observing how the 'individual' or the 'people' relate to it. One must also consider the ways in which individuals exist socially and, consequently, internalize the technological object within their intentional and consciential structures. Machinery is undoubtedly a way of expressing one's labor power, but precisely for this reason, it is also a way of experiencing space, time, my body, the object of labor, and social relations.

In the same vein, in a globalized informational society such as our own (see Castells 2010), satellites can assume a diverse function depending on the subjects with whom they interact. Kirk Besmer (2014) has offers a very compelling postphenomenological reading of the global navigation satellite system (GNSS) – in particular, the Global Positioning System (GPS) – and the ways in which it reshapes the phenomenological structure of our spatial experience, beginning with a reorganization of orientation and directionality as characteristic forms of spatial representation. This form of spatial disposition, which bears some affinity with cartography, is still very peculiar because it "urges its user to remain in the symbolic order of representation" (Besmer 2014, 137). The shift from an intra-worldly experience to a purely symbolic one produces a 'displacement' of the situated subject, who no longer experiences space situationally but only 'locationally': «Every GPS device, thus, is a material manifestation of a view of space and place that has become so common to Westerns that it is unrecognized, almost unrecognizable» (Besmer 2014, 139). It is already clear here that the process identified by Husserl in the *Crisis* – the formalization of phenomenological experience – assumes an additional determinacy in the case of GPS, insofar as space is experienced quantitatively as 'location'. rather than as a horizon of 'places', that is, as a set of spatial segments identified in relation to subjective and intersubjective processes of meaning-making.[27]

[27] This view can be fruitfully connected to Angus's interpretation (2021, 112ff.) of digital culture through the Husserlian concept of formal abstraction as the formal-mathematical determination of worldly experience – an experience thereby emptied of meaning and rendered experimentally controllable. On this

However, this reading of the GNSS, while evidently significant for our spatial experience, implies a generalization that must be highlighted and problematized. Indeed, the same system that in one part of the globalized world is 'experienced' as a navigational tool – thereby imposing a certain cognitive-phenomenological structuring of spatial experience – manifests very differently in other regions. In fact, the satellite system, operating on different frequencies, is employed in military contexts to orient, track, locate, and target unmanned aerial vehicles (drones) equipped with missile systems. It thus functions as a tool that enables more efficient targeting of living bodies in specific regions of the world, allowing for greater military control and increased capacity to kill. From a subjective-phenomenological perspective, however, this constitutes also an alternative structuring of spatial experience. Whereas, as noted by Besmer, the GNSS provides a top-down, quantitative vision of space (rendering it controllable, discretizable, measurable, and symbolic), in the case of drones over civilian populations, it entails, among other things, a bottom-up experience of space as the domain of being-targeted, being-aimed at, being-struck. The overhead space becomes an indiscreet and violent eye, whose gaze is unpredictable but potentially lethal, capable of striking at any moment.[28] Moreover, as has been recently highlighted in several articles on the genocide perpetrated by Israeli military forces in Gaza, 'drone-ized' space is also sonically marked: the sound of drones reverberates at all times and in all places, being experienced primarily as the sound of horror, terror, and threat – a vibration that unsettles and deprives the inhabitants of Gaza of sleep.[29]

The fact that the satellite system technologically shapes the experience of Palestinian civilians in a radically different way than it does for Israelis or Western populations is fundamentally linked to the fact that Palestinians are subjected to a settler-colonial war

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reading, digital culture, whose representational form is numerical, would constitute the very culmination of this abstracting modeling of the lifeworld.

[28] This spatial vision is powerfully captured in Moshab Abu Toha's poem *Mothers and Mulberry Tree*, which describes the birth of a litter of puppies beneath a mulberry tree. The poem ends, significantly, with a single, isolated, and commanding final line: "And the drone watches over all" (Toha 2024, 21).

[29] For a remote, vague, and wholly inadequate – but still very useful – sense of the situation, I refer to the article in *The Guardian* "I hate the night life in Gaza": https://www.theguardian.com/world/ng-interactive/2024/oct/17/i-hate-the-night-life-in-gaza-amid-the-incessant-sounds-of-war.

(Veracini 2018; Gutwein 2006; Busbridge 2017) aimed at expropriating their land, resources, and existential space, thereby carrying out a structural process of «primitive accumulation» (MECW 35, 704ff.) characteristic of capitalism (Coulthard 2014, 6ff.; Alazzeh and Uddin 2025).[30] One cannot disregard that Palestinians occupy a specific position within Israeli capitalist economy, which decisively determines how the satellite system technologically informs the spatial experience of Palestinian civilians.

A similar line of reasoning can be applied even within the internal socio-economic contexts of advanced capitalist societies. Consider, for instance, the use of GNSS for the systematic and fine-grained monitoring of gig-economy workers (Newlands 2023; Möhlmann, Zalmanson 2017; Bérastégui 2021; Griesbach et al. 2019). In this case, GNSS becomes embedded within an ecology of surveillance technologies that enables real-time location tracking and continuous productivity control within the framework of platform capitalism. The gig-economy worker – typically possessing minimal contractual and legal protections, limited union representation, and low pay – experiences direct oversight of their labor activity, which is subjected to a quasi-panoptic scrutiny that quantitatively evaluates their productive behavior (Bérastégui 2021, 33ff.; Griesbach et al. 2019). Thus, the worker's spatial experience as shaped by the satellite system is always fundamentally bottom-up: the phenomenological establishment of the employer's gaze observing them as commodified labor capacity. This issue becomes even more interesting when we consider that the same worker simultaneously uses the GPS to navigate space efficiently during work. Furthermore, the worker may also employ the GPS in non-work contexts, where a top-down perspective predominates. This apparent contradiction is only superficial, though. It simply requires situating appropriately the different levels of technological constitution of phenomenological

[30] Recently, the settler-colonial reading of the Israeli-Palestinian conflict has been revisited and critically reassessed. Amir Locker-Biletzki (2018; 2025) provides a notably compelling analysis, identifying in the conflict key elements of imperialism in Lenin's sense – that is, imperialism understood fundamentally as the mobilization of financial capital. This does not necessarily undermine the validity of the settler-colonial paradigm, but it does widen the analytical frame to expand toward the global dynamics of capitalism, and thereby enables a properly marxist perspective on the phenomena internal to Israel and its western advocates as well (Nir, Wainwright 2018).

experience, in order to distinguish structural from non-structural elements. Moreover, it is reasonable to suppose that, within work as a socially formalized space for the expression of labor power, the worker experiences more acutely the effects of technological interference, which shapes and orients such expression. In this, we find the key to Marx's concept of alienation as an objective – not merely psychological – form of the experience of labor under capitalism (MECW 03, 299, 317f.; *pace* Ihde 2020, 21f.).

We can therefore conclude that the ways in which technologies are instantiated on the living body – shaping the structures of intentionality and the bodily and evaluative schemas of the individual – depend significantly on how technologies are socially distributed, and on the fact that this distribution is structurally determined by the socio-economic position that the individual occupies within the relevant productive system. The technologized praxis that shapes the forms of the lifeworld experience is thus always also a praxis grounded in relations of production among productive forces, among which emerge individuals endowed with labor power and technological apparatuses. Naturally, there may exist, so to speak, 'neutral' spaces not directly involved in social productivity; yet even in such cases, one must seek a structural link to the organization of society as determined by the dominant mode of production. This certainly applies to reproductive technologies in the domestic sphere but can reasonably be extended to contemporary information and communication technologies. Technology thus manifests as inherently historical, insofar as it is tied to praxis, itself grounded in the ways individuals interact within spaces of social productivity and reproductivity. Considering the living body as a laboring body, and labor as already a technological form of mediation with the surrounding world, represents the most philosophically accurate way to illuminate the multiple functions that postphenomenology identifies as technology's role in our experience of the world. If not a radical shift, this at least suggests the potential usefulness of a Marxist turn within postphenomenology.

## 6. Conclusion

In this article, I have highlighted the central role that the concept of praxis plays within the postphenomenological framework. I have then examined several limitations inherent to this concept once postphenomenology engages with philosophical-political themes –

particularly, I have sought to show that non-historical character of the postphenomenological concept of praxis. I have subsequently revisited some fundamental aspects of Marx's interpretation of the instrument, showing that, for Marx, the instrument is first and foremost a site of social interactions grounded in the dominant mode of production. I have also indicated the usefulness of this perspective for guiding postphenomenological research on how technology mediates the constitution of experience. A Marxist turn in postphenomenology thus appears not only desirable, but potentially indispensable.

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