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Material Culture, Practices and Horizons of Knowledge: A Reply to Fried's "The Tragedy of the Thermometer Without Numbers"

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Although the case of the thermometer offered in our article (Parente and Mascaró 2024) was mainly intended to exemplify a modality of hermeneutic interface and its implications for other types of interface, the fact is that the example has an expressive force that exceeds this limited framework of argumentation. Samantha Fried's reply (2024) proves this tendency. In her text, Fried proposes, first of all, to interweave some post-phenomenological intuitions with pragmatist spirit. In this sense, her reply quotes Dewey and mentions some aspects that could contribute to strengthen this link between post-phenomenology and pragmatism.

Secondly, Fried seeks to underline the tragic character associated with the thermometer without numbers when it becomes a useless instrument. The disruptive aspect that Fried connects with the tragic character is reminiscent of the Heideggerian analysis of the hammer in *Sein und Zeit:* we discover the hammer as a present object only when it malfunctions, when its agential fluidity with the environment is momentarily interrupted. In the same sense, it is only when an essential aspect of the thermometer (its hermeneutic interface) is removed that the inherently communicative nature of that aspect of the artifact becomes illuminated.

Perhaps Fried's argument could be summarized this way: the efficacy of the readable object depends on its connection with worlds of knowledge and practices. In this sense, the lack of access to certain worlds is tragic since it entails an impossibility of access to knowledge, and eventually hinders the possibility of political decision making. Considering this interpretation, we will structure our comments on Freid's intuitions following the topics of her argument: 1) efficacy and access to knowledge; 2) the problem of trust; and 3) the tragic character of the interface's breakdown.

1. Efficacy and Access to Worlds of Knowledge

The problem of efficacy already has a certain history within the debate on the material agency of objects (Latour 1992; Kirchhoff 2009; Malafouris 2008; Parente 2016). In that context two major alternatives for understanding that objects have agency are usually distinguished. The first indicates that objects have agency due to their own materiality and stresses a complete symmetry between all organic and non-organic components of the phenomenon. The second indicates that agency emerges rather in assemblages between materials and agents (organisms in general), which may include different gradations of intentionality, design or planning.

Our idea, as we argue in the article, is that the agency of different artifacts or instruments (in this case, a thermometer) cannot be understood without the standardized practices of measurement that cut across a given material culture. This implies that we cannot decouple the efficacy of a singular item (mercury thermometer) from other human and non-human aspects (agents with the appropriate know-how, an artificial ecology that includes other objects that permeate the act of measurement, i.e., standards of measurement, and also the specific purposes contemplated by the act itself such as biomedical care, etc.).

Fried agrees with this idea of the primacy of practices in defining the agency of an object when she states that "there are worlds of knowledge surrounding this thermometer that give those numbers efficacy in the first place; that imbue meaning into the hermeneutic interfaces" (29). And also when she states: "no technology exists in a vacuum; readable technologies are hoisted up by vast amounts of empirical knowledge, not to mention the practices and institutions surrounding that knowledge" (30–31). Our idea of the thermometer as an artifact endowed with a hermeneutic interface capable of detecting environmental aspects is clearly anchored to practices, to a holistic notion that would include artificial measurement systems. In short, the efficacy of an artifact is tied to the dense practices in which that artifact plays a standardized role; it is not tied exclusively to its materiality, nor to the minds of its occasional users.

To ensure the success of a measurement practice, the properties of mercury are as fundamental as the pragmatic capabilities (know-how) of the users involved. Indeed, it is wrong to assume that there is only one scenario with agents on the one hand and measuring instruments on the other. Measurement practices stabilize and, in turn, exhibit a certain standardized way of combining agents, artifacts, specimens, know-how, biomedical criteria, care cultures, etc. If we were to take away the know-how that makes it possible to operate properly with a thermometer, or if we were to eliminate the medical knowledge that draws a causal connection between a certain temperature and a certain state of health of the body (fever), the practice of temperature measurement, as we understand it today, would collapse completely.

In a way, the thermometer constitutes not the starting point, but rather the point of arrival of a certain artificial ecology and measurement practice. The artifact presupposes a certain crystallization of practices and stabilization of standards that have been sedimented over time, practices that shape the possible courses of interaction of the agents who encounter these objects. The relationship between the artifact, the practices and the worlds of knowledge is related to two questions that deserve clarification: on the one hand, the question of the degree of explicitness of the knowledge associated with the object, and on the other, the specification of which types of knowledge are those from which the object can emerge or towards which it orients us.

1.a Worlds of Knowledge and Degrees of Explicitness

Regarding the explicitness of knowledge, we believe it is important to clarify that the worlds of emergence have an extremely implicit character, to the point that they are almost undetectable in the experience of use. No one who uses a thermometer makes a foreground consideration of the knowledge or method that gave rise to it. One just "trusts" that this object has emerged from a history of discovery, stabilization and verified practices. This is how sedimentation works (Husserl 1976, 24), it is not necessary to repeat the acquisition of meaning. If this is so, the question would be: how tragic could the disconnection with a world of knowledge that no longer had an explicit actual influence on practice really be? In fact, if we consider Fried's example more closely, it will become apparent that a thermometer without numbers is simply discarded; no attempt is made to reconstruct previous worlds. Those worlds are unnecessary in factual experience of use.

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1.b. Types of Knowledge

Regarding the type of knowledge associated with the use of artifacts, Fried's review focuses mainly on theoretical knowledge. This may be due to the fact that the author develops her argument around the object we presented, the thermometer. In this sense, we believe it is important to clarify some points:

> a) Although we used the thermometer as an example, and it was presented as a paradigmatic case of hermeneutic interfaces, we want to highlight the fact that not every hermeneutic relationship takes place with a measuring instrument and not every hermeneutic interface arises from a scientific background, for example a weather vane, a whistling kettle, a shopkeeper's doorbell or the beeping of a microwave oven.
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> b) In addition, there are other backgrounds that do not consist of theoretical knowledge, for instance, the hermeneutic relationship one has with a Ouija board is not based on a world of scientific understaning; however, this object operates as a hermeneutic interface between the material world and the supernatural world.

Many different arrangements are possible. Indeed, objects with which a reading relationship is established may come, for example, from a refuted scientific background (such as the psychograph, or a Michelson interferometer, aimed at the detection of luminiferous ether); or from a consolidated scientific background but applied in a non-scientific way (such as a chakra aligner, or an EMF detector applied to ghost hunting), or they might come from a pseudo-scientific background (such as a Hyeronimus machine, rooted in the practice called "radionics", or the E-Meter of scientology), or from a non-scientific background, which does not claim scientificity either (such as a Ouija board or a Buddhist prayer wheel). It is also possible that, far from emerging from a horizon of theoretical knowledge, the readable object constitutes the foundation for the emergence of that knowledge, as it happens in cases where an object appears before science is able to explain its functioning, e.g. the relationship between the rise of the steam engine (with its associated temperature and pressure gauges) and thermodynamics.

2. Efficacy and Trust

According to Fried, the object's efficacy is based on the trust that we can place in it. This trust is characterized by having emerged from a historically solidified theoretical world and within the framework of a consecrated method, as well as practices and institutions. All these horizons of origin are manifested in the marks and numbers of the thermometer. Thus, the disappearance of the thermometer's marks would prevent us from accessing its foundational worlds, and correlatively, the aspects of the present world about which we seek to obtain information. The fall of trustworthiness and the loss of access to previous worlds constitutes the "tragic" character of the deletion of the interface, since ultimately this suspension of access prevents us from making common decisions in a political dimension.

Now, it is important to emphasize, in connection with what was discussed in point 1.b, that not all confidence is grounded in verified worlds, practices, and methods. Therefore, the presence of numbers in an object does not guarantee the correlative presence of a valid method, or of a method in any sense whatsoever. To illustrate these assertions let us consider the example of an object applied to a refuted background of knowledge: the craniometer applied to the 19th century practice called "cranioscopy", which later came to be known as "phrenology". In that context, this device functioned as an instrument for measuring the dimensions of the human skull as a means of detecting personality characteristics. At the time, this object was installed on a background of knowledge and practices, and allowed access to worlds of knowledge, institutions and procedures. The object was effective to the extent that the method that gave rise to it and its ability to provide information about the world were relatively well established. This example seeks to confirm that the efficacy of an item within a given material culture must be judged within a contextual dimension.

3. The Tragic Character

Finally, there are many ways to make the relationship between measurement technologies and users tragic. A couple of examples might illustrate this idea. The first: faced with the problem of climate change, one might well think of the denialist responses of certain heads of state who do not object to the measurement methods themselves, but reject their causes or ignore the political responsibility that a country or a corporation should have for the effects of this phenomenon.

In a close line, a second example of the tragic dimension of the relationship between measurement technologies and human life would be the paradox of detection of the phenomenon of climate change itself. As Bratton (2019) accurately points out, the same planetary-scale computing technologies that are capable of detecting climate change contribute, by their extraordinary carbon emissions, to the growth and stabilization of the very phenomenon they purport to "measure." There is a kind of tragic circularity in this relationship that has important political implications for the environmental crisis and should not be overlooked.

In what sense is a thermometer without numbers "tragic"? The erasure of the thermometer's communicative interface is not the only conceivable option for us to describe an interaction as tragic. Strictly speaking any measuring artifact that is not properly integrated with the necessary know-how is "tragic" to the extent that it does not actualize the ability to measure even if all the material aspects of its interface are available and functioning properly. It is not necessary here to imagine an alien approaching a measuring instrument such as a mercury thermometer, but more straightforwardly a child accustomed to using digital thermometers. Using a mercury thermometer here implies not only observing the interface and knowing which temperature indicates a fever and which does not, but also knowing in which part of the body should the thermometer be placed, for how long should it be left there for it to measure temperature correctly, which temperature would indicate fever that requires medical attention and which wouldn't, and so forth. Without this artificial ecology around the artifact, the thermometer momentarily becomes a piece of glass that does nothing, or says nothing.

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The tragic character is also dependent on the horizon of emergence and applicability of knowledge and practices. Could we consider the loss of the indicative marks of the craniometer mentioned above "tragic"? Here again, access to certain worlds of knowledge and practices would be eliminated, but in this case, those worlds consist of theoretical knowledge that has been refuted and abandoned. A 19th century phrenologist would experience such a loss as tragic, but not us from our 21st century standpoint. Something similar could be said of the disappearance of the letters and numbers on a Ouija board or the EMF detector of a ghost hunter. Respectively, the spiritualist and the ghost hunter would consider the functioning of their devices effective and reliable, and the loss of the markings that allow readings to be made, tragic. What these examples intend to show is that efficacy, trust and belonging to worlds of knowledge depend on the historical horizon of understanding where the apparatus appears, therefore also the attribution of a tragic character to a certain transformation in an artifact (for example, the loss of the marks in a thermometer) depends on the artificial ecology to which the object belongs or belonged. In view of the above, the question arises: is any loss of connection with horizons of understanding truly tragic? Or only those that break the link with worlds of scientific knowledge already established as such?

In this sense we would like to suggest an alternative: perhaps instead of a tragedy, the suppression of the link with enabling worlds represents an opportunity to reconstruct access to those worlds, an access that has become highly implicit and unclear with the passage of time. If this is the case, maybe the disconnection with horizons (via the disappearance of the indicative marks of the object) will allow us to critically review those very horizons and perhaps recognize the pseudo-scientific, refuted scientific, misapplied scientific, or simply religious, symbolic or ideological nature of each background. Naturally, several of these worlds can overlap and be found at the same time in the object´s background. Certainly there are precedents to the notion that the breakdown of an artifact's linkage with the world in which it is installed and from which it has emerged constitutes an opportunity to reconstruct the structure of that world. We need go no further than the Heideggerian analysis of the deficient modes of taking care [*Besorgen*] (Heidegger 1996:69).

Final Remarks

To conclude, we agree with Fried on the importance of material culture and the standardized practices that constitute it in order to understand the effectiveness of a thermometer or any other artifact as such. And, in turn, we believe that, beyond the ontological issues, it is also important to encourage a political reading of measurement strategies that contributes to become aware of some not so visible links between measurement technologies and environmental problems. All things considered, in view of Fried's insightful reading of our paper, we deemed it worthwhile to highlight a few notions that may not have been explicitly addressed; namely, the fact that there are different types of knowledge that set the ground for both the appearance of an artifact and our praxical involvement with it; the highly implicit character of these types of knowledge; the contextual structure of the tragic nature of the loss of interfaces and, lastly, the fact that not every hermeneutic relation takes place with a measuring device.

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