MASTER LOGIC AND PHILOSOPHY OF SCIENCE

Feminist epistemology: standpoint theory

What can feminist standpoint theory say about the physical sciences?

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July 2020

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«The initial period is one of filling in gaps —correcting sexist biases and creating new topics out of women's experiences. Over time, however, feminists discovered that […] existing paradigms systematically ignore or erase the significance of women's experiences and the organization of gender. This discovery […] leads feminists to rethink the basic conceptual and theoretical frameworks of their respective fields» (Stacey and Thorne 1985, p. 302).

Abstract

In this work I provide a detailed description of Sandra Harding's feminist standpoint theory, which represents one of the three traditional approaches to feminist epistemology. I start by presenting the two main theses of the theory: the situated knowledge thesis and the thesis of epistemic privilege. In order to do that I extensively talk about the concept of partial perspectives and the concept of social location. Then, after the two main theses, I present Harding's strong objectivity proposal and, related to it, the interrelation between, on one hand, the scientific and epistemological norm of objectivity and, on the other hand, the social and political norm of diversity. In the discussion section I try to introduce some arguments regarding the importance of considering the concepts presented previously, in the context of very abstract disciplines such as the physical sciences. To that end, I consider two dimensions of the problem: firstly, the culture and social organization of science; secondly, the knowledge-producing practices of science. Both dimensions contribute to the way scientific knowledge is produced and thus to scientific knowledge itself. It is in this sense that I assert that the social location of knowers can affect the content of science.

Key words

Social location; production of knowledge; objectivity; physics.

Resumen

En este trabajo se proporciona una descripción detallada de la teoría del punto de vista de Sandra Harding, la cual representa uno de los tres enfoques tradicionales de la epistemología feminista. Empezaré introduciendo las perspectivas parciales y el concepto de la “social location”, que me servirán para presentan las dos tesis principales de la teoría: la tesis del conocimiento situado y la tesis del privilegio epistémico. Luego presentaré el programa para una objetividad fuerte de Harding, y la interrelación entre objetividad —norma científica y epistemológica— y diversidad —norma social y política—. En la discusión se introducirán argumentos a favor de la importancia de considerar los conceptos presentados anteriormente dentro del contexto de las disciplinas abstractas como la física. Con ese fin, se considerarán dos dimensiones del problema: por un lado, la organización cultural y social de la ciencia y, por otro lado, las prácticas de producción de conocimiento.

Palabras claves

“Social location”; producción de conocimiento; objetividad; física.

Contents

1. Introduction

Feminist standpoint theory is one of the three traditional approaches to feminist epistemology —the other two being feminist contextual empiricism and postmodernism—, and it was firstly introduced in the 1970s and 1980s. Among the most influential thinkers who developed feminist standpoint theory are Dorothy E. Smith, Nancy Hartsock, Sandra Harding, Patricia Hill Collins and Alison Wylie. In this essay I will mainly focus on Sandra Hardings's work.

In general, epistemology is concerned with describing and explaining how knowledge is acquired. In particular, epistemology of science is concerned with describing and explaining how *scientific* knowledge is acquired (Potter 2006, p. 14). As for feminist standpoint theory, it is a feminist epistemology of science, but it is also a type of critical theory, that is, a theory aimed at empowering oppressed groups in order to improve their situation. One of the most common characteristics of feminist theories is the claim that women have privileged access to reality. However, even if in some situations this claim cannot be properly justified, a particular feminist theory may still offer «true representations that are most useful to women than other true representations» (Anderson 2017).

A first introduction to the important concept of standpoint can be given as follows. In Harding's words, «a standpoint arises when people occupying a subordinate social location analyze the conditions of their lives and engage in political struggle to change them». This is why Harding's epistemology of science is firmly rooted in feminism, but also in anti-racism and post-colonial thought and, historically, it has important roots in Marxist epistemology (Potter 2006, p. 26). Indeed, one of Marxism's most powerful resources for feminist standpoint theories «was the insight that the material conditions of peoples' lives can actually shape their understanding of the social and natural world». It is precisely in this sense that feminist epistemologists argue that knowledge is "socially constructed" (p. 135).

According to Harding, «a feminist standpoint is fundamentally the possession not of an individual, but rather of a community that has been engaged in deeply critical discussions aimed at figuring out how to get the knowledge that will be useful to particular groups of women in their distinctive disadvantaged locations in global gender, race, class, and colonial relations» (Harding 2015, p. 173). Thus feminist standpoint theory analyzes the relationship between knowledge and politics, and set it at the center of its account. This means that its final aim is to provide a causal account, and explanation for, «the effects that different kind of politics have in the production of knowledge» (Harding 1993, pp. 55–56).

Wylie believes that the question of how power relations influence knowledge is both empirical and conceptual, and it is about «what systematic limitations are imposed by the social location of different classes or collectivities of knowers, and what potencial they have

for developing an understanding of this structured epistemic partiality» (Wylie 2003, p. 31–32).

Based on this brief introduction, and on the few elements presented so far, I believe that it is already clear why feminist standpoint theory is considered a political and social commitment, other than a philosophical position and an epistemology.

In the first part of this work I will review the two main theses of feminist standpoint theory and present Harding's strong objectivity proposal. In particular, I will analyze in great detail the concept of social position. In the second part of this work I will engage in a discussion about the possibility to apply feminist standpoint theory, and especially the concept of social location, to the physical sciences. The material I will use comes from the traditional as well as more contemporary feminist thinkers. Among them: Donna Haraway, Sandra Harding, Alison Wylie, Kristen Intemann, Elizabeth Potter, Elizabeth Anderson and Evelyn Fox Keller.

2. The two main theses of feminist standpoint theory

Feminist standpoint theory is based on two main theses: the situated knowledge thesis and the thesis of epistemic privilege (or epistemic advantage). The situated knowledge thesis asserts that our social location influences the experiences we have in a systematic and continuous way, and it can shape and limit what we know, in such a way that the knowledge we arrive at is achieved from a particular standpoint. The epistemic privilege thesis asserts that some standpoints, such that those of marginalized, discriminated or oppressed groups, are epistemically privileged.

In order to correctly understand the two main theses of feminist standpoint theory, it is important to consider the following preliminary remarks. I will expand and explain these remarks later on in this work, for now, I will just mention them: first of all, the definition of a standpoint does not presuppose an *essentialist* definition of the social categories by which a standpoint is characterized; secondly, standpoint theory does not assert that the standpoint of marginalized, discriminated or oppressed groups are *automatically* epistemically privileged; finally, standpoint theory is not merely claiming that people who have different experiences will know about different things.[1]

In the following sections, I will present the situated knowledge thesis and the thesis of epistemic privilege in more detail, and I will try to underline the points that permit to understand what these theses imply within the context of scientific inquiry.

2.1. The situated knowledge thesis

The first scholar to develop the concept of situated knowledges was Donna Haraway in 1988. After Haraway's contribution, the concept of situated knowledges became one of the most important elements of feminist epistemology.

To explain her proposal Haraway employs the metaphor of vision: in order to achieve objectivity and, at the same time, taking into account the multidimensionality of the subjectivity, it is important to choose a particular point of view when starting to see. Haraway's concept of vision is not passive, rather, it is active and forces the knowing subject to critically position herself or himself with respect to the phenomena to investigate. Concerning the traditional concept of objectivity, which asks the knower to create a necessary distance between the subject and the object, Haraway explains: «The eyes have been used to

[1] Thorough discussions about these questions can be found, for example, in Kukla (2006), Rolin (2006) and Intemann (2010).

signify a perverse capacity […] to distance the knowing subject from everybody and everything in the interest of unfettered power». On the contrary, Haraway believes that what really guarantees objectivity is not the construction of the subject-object distance, but the power of *parcial perspectives* (Haraway 1988).

Partial perspectives are both limited and localized, and they represent the first step for understanding that knowledge itself is situated. According to Haraway, when we start to see —and knowing— we must ask ourself the following questions: How can we see? Where can we see from? What is limiting our vision? What do we see for? Who gets to have more than one point of view? Who gets blinded? Who interprets what we see? From these questions it follows that the positioning process implies responsibility and therefore it is not an innocent practice: «Vision is *always* a question of the power to see —and perhaps of the violence implicit in our visualizing practices. With whose blood were my eyes crafted? […] Struggles over what will count as rational accounts of the world are struggles over *how* to see» (Haraway 1988).

Currently, the situated knowledge thesis can be articulated as follows. It asserts, firstly, that knowing subjects are situated in specific locations —historically, geographically, culturally, socially, etc.— and that they have distinctive relationships with the world around them and with respect to other knowing subjects. Secondly, it asserts that the knowledge they produce depends on their locations as well as on their specific relationships with the world and with other knowing subjects (Anderson 2017).

Within the context of feminist epistemology, authors are interested, in particular, in *socially* situated knowledges. Individuals produce knowledge from their specific *social* locations, which means that social locations affect what they can know and how they can come to know. An individual's social location is determined by her or his social identity —gender, class, race/ethnicity, sexual orientation, age, national origin, and other socio-political categories— and by her or his social roles and relations —occupation, political preferences, etc.— (Anderson 2017). Therefore according to the situated knowledge thesis, the social location of the knower influences what she or he can experience, and it shapes and limits what she or he can know.

Knowledge, here, is considered to be embodied rather than abstract and universal. This means that different persons —different bodies— are subject to different environments and conditions, thus their experiences, as well as their evidence and beliefs, will be different. As said, the social location of the knower is determined by the intersection of several social dimensions, such as gender, race and class. Hence, because the knower is socially located, the knowledge produced by the knower will be socially located as well, that is, it will be a situated knowledge. The fact that the social location of the knower shapes what she or he can know, also means that the ways how social location shapes experience might not be homogeneous within people belonging to a certain social group. Nevertheless, belonging to a particular group within a specific historical, social and political context, is indeed relevant to

the kinds of experiences one has because of how the context affects material circumstances (Intemann 2010, pp. 785–786).

In Wylie's words, social structures and institutions, as well as roles and relations that are systematically structured, can be «robust enough to shape what epistemic agents can know» (Wylie 2003, p. 29) This is so because social locations are systematically defined by social structures and relations, especially relations of production and reproduction. These structures are hierarchical, constitute a system of power relations, thus creating the material conditions of people's lives and structuring people's social interactions with one another. Consequently, «the experiences and understandings of those in different social locations can differ»: they can differ in the content of their knowledge, but also —and more importantly from an epistemological point of view— «in what they take knowledge itself to be» (Potter 2006, p. 156; citing Wylie 2003, pp. 29–31).

At this point it is important to remark that feminist standpoint theory is not about merely socially located perspectives: a standpoint is not just the perspective one acquires in virtue of the experiences she or he had, rather, a standpoint must be *achieved* through critical thinking and reflection on the relationship between power structures, social locations and production of knowledge. Therefore a standpoint is not simply a socially located perspective —as the notion of situated knowledge might imply— but is defined by the collective awareness of how power structures shape and limit the production of knowledge. Standpoints do not automatically arise from occupying a specific social location; they «are achieved only when there is sufficient scrutiny and critical awareness of how power structures shape or limit knowledge in a particular context»; they do not presuppose a universally shared perspective among all members of a certain group; and, more importantly, are accomplished by communities, not individuals (Intemann 2010, pp. 785–786).

Therefore feminist standpoint theory is undoubtedly concerned with the epistemic effects of social location, but, in addition, it is also concerned with «the effects and the emancipatory potential of standpoints that are struggled for, achieved, by epistemic agents who are critically aware of the conditions under which knowledge is produced and authorized» (Wylie 2003, p. 31). And it is the existence of a differential distribution of power that makes situated knowledges and difference in interests closely related (Crasnow 2013, p. 417).

2.2. The thesis of epistemic privilege

The thesis of epistemic privilege (or epistemic advantage) asserts that some standpoints —such as those of disadvantaged, marginalized, discriminated or oppressed groups— are epistemically privileged. Classically, this implies three kinds of epistemic privilege. Namely, through the standpoint of the disadvantaged, marginalized, discriminated or oppressed groups, standpoint theories claim: i) to show the fundamental regularities of power structures

in society; ii) to represent existing social inequalities as contingent rather than natural and necessary (they appear natural and necessary to privileged and dominant groups); and iii) to offer a representation of the world in relation to universal human interests rather than to particular classes or groups (Anderson 2017).

According to Intemann, the thesis of epistemic privilege has to be understood as the claim that epistemic communities that *include* members of marginalized, discriminated or oppressed groups will have epistemic advantages, or more rigorous critical reflection, than communities that do not. Intemann also underlines the fact that this may be the case at least in *some* contexts. In scientific inquiry, members of oppressed groups may help in reaching a more rigorous critical consciousness because «their experiences will often be precisely those that are most needed in identifying problematic background assumptions and revealing limitations with research questions, models, or methodologies» (Intemann 2010, p. 787).[2]

Wylie believes that people belonging to marginalized and oppressed groups «must understand the assumptions that constitute the worldviews of dominant groups in order to successfully navigate the world»; moreover, the fact that their experiences often conflict with dominant views may lead them to create alternative views about how the world works. So the thesis of epistemic privilege is about «how reliable particular kinds of knowledge are likely to be, given the social conditions of their production», and the understanding of the limitations of particular views —the dominant ones— considering that they are partial and therefore the knowledge they produce «will fail to maximize salient epistemic virtues» (Wylie 2003, 34–35).

However, it is important to remark that the fact that an epistemic community includes a member of a marginalized group does not automatically imply epistemic advantages, because in order to achieve a standpoint —thus epistemic privilege— a rigorous critical thinking and reflection is required. This leads to another central point of feminist standpoint theory, that I anticipated before: the epistemic privilege is not reached by the individual, rather, by the epistemic community as a whole (Intemann 2010, p. 789).

In fact, in order to gain access to the standpoint of an oppressed group, it is neither necessary nor sufficient to be a member of that group. It is not sufficient because members have to become aware of their group identity and achieve a shared understanding of the power relations that cause the oppression; it is not necessary because the values and interests of the oppressed group are publicly accessible, so that anyone can theorize phenomena in relation to the values and interests of the group. On the other hand, the standpoint must be achieved through the self-knowledge of autonomous agents who actively participate in the consciousness raising process, and the epistemic privilege thus shifts to the group, that comes

[2] Notice that when considering background assumptions, Intemann has already combined some aspect of contextual empiricism with standpoint theory. Indeed, nowadays the two approaches tend to converge (see Intemann 2010).

to define itself as a collective political agent. In this sense, one would say, for example, that a privileged standpoint is not that of women, but of feminists (Anderson 2017).

With respect to the social situatedness of dominant groups, Harding argues that they fail to critically and systematically interrogate their privileged social situation, and also the effects of such privileges on their beliefs. This is why they find themselves in a scientifically and epistemologically disadvantaged social situation for generating knowledge (Harding 1993, p. 54).

3. Objectivity, strong objectivity and diversity

Feminist standpoint theory asserts that knowledge is always produced from a particular standpoint, and that certain standpoints are epistemically privileged. Therefore it challenges the traditional notion of scientific objectivity, based on neutrality and value-free science. Actually, feminist standpoint theory, as well as other approaches to feminist epistemology, rejects the view of science and objectivity as value-free.

An enormous amount of literature has been produced to criticize the traditional notion of scientific objectivity. Here I will present Harding's proposal for a "strong objectivity", an account of objectivity that does not require science to be value-free.

3.1. The strong objectivity proposal

The central point of Harding's strong objectivity is the claim that to reach more objective accounts in natural as well as social sciences, «researchers should start research from "outside" the dominant conceptual frameworks» of a given field of study (Harding 2015, p. 30). Here, a dominant conceptual framework is one that serves the values and interests of the most powerful, dominant groups.

Starting research from "outside" the dominant conceptual frameworks and from "outside" a discipline does not mean trying to reach the so-called "view from nowhere" —that is in fact not possible to reach—, rather, it means finding or creating a little but significant *distance* from prevailing values and interests: this will allow researchers to detect dominant assumptions and to enable a critical perspective capable of illuminating issues in new ways (Harding 2015, pp. 34–35).

The strong objectivity proposal develops starting from how knowledge is produced in the real world and how science is actually practiced today, not from an abstract ideal of what would make perfect science. First of all, today in the real world public institutions and private corporations can shape the ways scientific knowledge is produced: the design and management of everyday knowledge production in science depends on the financial support of these corporations; in other words, the articulation of research projects as well as their purpose may often be shaped by the values and interests of those who fund them. Secondly, scientific communities today are extremely homogeneous: they are mainly made of people belonging to the same social group, therefore they share precise and distinctive set of social values and interests, and then «train them into research practices that further advance such distinctive values and interests» (Harding 2015, pp. 30–33).

Moreover, according to Harding the procedure that scientists follow of repeating research processes, observations and experiments is useful to identify assumptions, values and interests that differ between specific individuals or between research groups. However, if social values and interests, or assumptions, are shared by the entire scientific community in a given field, then these background assumptions, values and interests cannot be detected. This is why «the perspectives that tend to prevail in research are those of already advantaged groups», in particular, those groups that can access funding. Therefore «it is their economic, political, and cultural assumptions, intended or not, that tend to shape results of research» (Harding 2015, p. 34).

The following step in the strong objectivity program is to look at how a critical distance can actually be achieved, and how this process can maximize the objectivity of research. An important way in order to do that is to create sufficient diversity in scientific communities.

3.2. Objectivity and diversity

Wylie asserts that «far from compromising epistemic integrity, certain kinds of diversity (cultural, racial, gender) may significantly enrich scientific inquiry» (Wylie 2003, p. 26). On the other hand, Intemann explains that different theories give different accounts about the kind of diversity that is needed for promoting and achieving objectivity: in fact, while in feminist contextual empiricism it is the diversity of values and interests that is epistemically beneficial, in feminist standpoint theory it is the diversity of social position what really counts.[3]

Contextual empiricists believe that individuals with different values and interests will «provide a system of checks and balances so as to ensure that the idiosyncratic values or interests of scientists do not inappropriately influence scientific reasoning». In contrast, defenders of feminist standpoint theory believe that knowledge is embodied, in other words, that social positions have the capability to «track power relations in ways that are epistemically significant». That is why members of oppressed groups will be able to «provide access to evidence that has implications for the plausibility of background assumptions, models, and methods. In particular, their experiences as ‘‘insider-outsiders’’ put them in a particularly strong position to reveal evidence that has been historically excluded from scientific communities» (Intemann 2010, pp. 790–791).

It is important to note, here, that feminist standpoint theory does not merely claim that research communities should include people from different social groups because people with different experiences will know different things. Indeed, as I explained earlier, some social

[3] Although the two kinds of diversity may seem alike, they are not equivalent: the diversity of social position may imply diversity of values and interests, but the diversity of values and interests may not necessarily imply diversity of social position. For example, men and women have different *embodied* knowledges —their social locations are different—, however, they may share the same feminist values and interests.

groups are epistemically privileged: «the standpoint aim is not only to be inclusive of different experiences, but particularly those that undermine hierarchical power structures and counteract the negative effects of oppression on knowledge production» (Intemann 2010, p. 791).

Some social groups are systematically excluded from participating in the design and management of our institutions, for example, they are excluded from scientific inquiry. According to Harding, in order to maximize objectivity it is fundamental to start research from the questions that arise in the lives of these excluded social groups. Not only their questions would be new and valuable, but also the procedures they would use to answer them will differ from those that occur to people belonging to privileged or dominant social groups —as they are exactly those that design and manage the institutions—. By doing so it will be possible to develop what Harding calls another "logic of scientific inquiry" (Harding 2015, p. 38).

Harding's claim about objectivity and diversity can be summarized as follows. On one hand we have the norm of diversity, which is a social justice and political norm; on the other hand we have the norm of objectivity (or of maximizing objectivity), which is an epistemic, cognitive, scientific and intellectual kind of norm. Harding's claim is that these two different kinds of norms —objectivity on one hand, and diversity on the other hand— can provide mutual support for, and bring resources to, each other (Harding 2015, p. 23, p. 173).[4]

It follows that «there should not and cannot be only one science around the globe», that is, societies are so different from one another in terms of politics, economics, history, traditions and culture, that they will naturally develop distinctive bodies of knowledge. These distinctive bodies of knowledge will «enable them to flourish in the particular parts of the natural and social world that they occupy». In particular, each scientific tradition has an effect on the ontologies and the epistemologies that they will develop. This is the reason why we should in principle live in a "world of sciences" (Harding 2015, p. 153).

[4] Notice that, in this sense, the scientific and epistemological goal of maximizing objectivity can be now considered also an ethic and political project (Harding 2015, p. 142).

4. Discussion: the problem of social location in the physical sciences

The situated knowledge thesis asserts that there is no universal knowledge, that the knowledge produced depends on the social context in which it is produced and on the social locations of those who produce it. The thesis of epistemic privilege asserts that some social groups are epistemically privileged: their marginalization and oppression make them capable of understanding better the power structures of reality and of producing knowledge that is less partial and free from the interests and values of the dominant groups.

Some questions may arise when considering the situated knowledge thesis and the thesis of epistemic privilege: Do these two theses apply to every aspect of reality? Do they apply to every aspect of knowledge production? And within the context of *scientific* knowledge production, further questions may be: Is the social location of knowers important if we consider extremely abstract disciplines, say, physics and mathematics? Is the epistemic privilege deriving from the standpoint of oppressed groups relevant if we consider the knowledge production processes of disciplines like physics and mathematics?

Before trying to answer these questions, it is instructive to see, very briefly, some consequences that the two theses have for the social sciences.

4.1. The social sciences

Wylie believes that in the world there exist important structures of social differentiation, and that these make a systematic difference to many aspects of life. For example, the type of work people choose, the social relations they create, the power they have when they enter and live in these relations, and the self-understanding about their own situations. Therefore it is important to ask whether the social location —that is determined by the structures of social differentiation— has or has not epistemic effects, and, if it has such effects, what they are. Wylie actually believes that a strategic epistemic privilege does exists when people sharing the same social location and the same experiences reach a critical and oppositional consciousness, that is, when they come to identify a distinctive standpoint. From the scientific inquiry perspective, the epistemic privilege will help them «in grasping the partiality of a dominant way of thinking, bringing a new angle of vision to bear on old questions and raising new questions for empirical investigation» (Wylie 2003, p. 38).

One of the structures of social differentiation are the relations of power. According to Kristina Rolin, relations of power can represent a real and concrete obstacle to the production of knowledge within the humanities and the social sciences. In fact, this is particularly

evident if we consider the different roles played by informants and interviewers in social science inquiry. Moreover, Rolin points out that «it makes sense to say that an object of inquiry [a person] "resists" being understood» and that «it would be naïve to assume that relevant evidence lies out there in the social world waiting for a social scientist to come by and collect it». This is so because, as she explains, evidence can be either suppressed or distorted by the pervasiveness of power relations (Rolin 2009, pp. 220–224).[5]

Rolin admits that her analysis of standpoint theory implies that its relevance is limited to scientific research in the humanities and the social sciences only, insofar as they study power relations. However, she also adds that recent work in science and technology studies indicates that power relations are an integral part of the culture and social organization of science, in life and natural sciences as much as in the humanities and social sciences (Rolin 2009, p. 225). I will come back to this point later.

4.2. The physical sciences and mathematics

As I recalled before, Intemann asserts that the thesis of epistemic privilege has to be understood as the claim that epistemic communities that include members of oppressed groups will have epistemic advantages, or more rigorous critical reflection, than communities that do not. And she insists in saying that this may be the case just in *some* epistemic contexts, not all contexts. Thus a natural question to ask at this point is: Why is it so? And what can we say about the epistemic contexts Intemann excludes?

Intemann explains that it is not very easy to see how marginalized social groups would have an epistemic privilege in every context, because «there are some areas of knowledge (for example, theoretical physics) where the experiences one has in virtue of one's social position appear to be irrelevant to the content of the theories or evidence at stake» (Intemann 2010, p. 784). In addition, Intemann says that it is possible to yield epistemic advantages only if the experiences of the knowing subjects are relevant to the *content* of the research context. For example, subjects living in sub-Saharan Africa may have epistemic benefits in scientific research on HIV or climate change, however, they will have none in evaluating background assumptions in theoretical physics (p. 789).

A similar position is shared by Alessandra Tanesini. According to Tanesini, the justification offered by Wylie to explain the epistemic privilege of subordinate groups —for example, the "insider-outsider" argument— is effective, but it does not have universal application. Namely, while it is probable that individuals belonging to different social groups

[5] Notice that here Rolin considers standpoint theory just as a methodology, whereas to Harding, thanks to the "strong objectivity" project, it simultaneously represents a methodology, an epistemology, a philosophy of science, and a sociology of knowledge (Harding 2015, p. 31).

develop different bodies of knowledge, the fact that this phenomenon be found in disciplines like physics or astronomy is less convincing (Tanesini 2015).

However, Harding herself believes that the feminist standpoint theory approach can and must be used for the analysis of both social and natural worlds. Although some aspects of the theory might seem to apply only to the humanities and the social sciences —especially because the objects of study of the humanities and social sciences are often knowing subjects —, the most abstract fields too can and must be analyzed, and deeply criticized, through the lens of standpoint theory. In her arguments Harding even includes mathematics and logics: these abstract disciplines, she says, «simply "looks at" aspects of the world that are less distorted by formal description than does anthropology or history», indeed, they are «less distorted, but not entirely free of distortion» (Harding 1986, p. 52).

4.3. The problem has at least two dimensions

It is indeed difficult to see how the situated knowledge thesis and the thesis of epistemic privilege might apply to very abstract disciplines such as, for example, the physical sciences. Nevertheless, it is worth trying to develop some arguments in favor of the claim that these theses actually do apply to the physical sciences too. In order to do that, it is important to distinguish the different dimensions that characterize the problem in question. As I see it, there are at least two dimensions of the problem that must be taken into account.

Within feminist epistemologies, gender is commonly considered a category of analysis to study the production of knowledge, and the progress and development of the sciences. It is common belief that it has three ways of manifestation: firstly, the principles and ideas that researchers follow to produce knowledge; secondly, the structure of science as an organization; thirdly, how people behave individually and to one another (the sociological point of view). As Harding puts the point: «gender could be understood as a part of science's conceptual schemes, as a way of organizing the social labor of science, or as an aspect of the individual identity of scientists» (Harding 1986, p. 35).

Gender is only one of the several categories —race/ethnicity, class, sexual orientation, national origin, age, and so on— that can characterize a given social location, and the previous observation holds true for any of these categories. Thus it makes sense to formulate the point not only for gender, or individual categories, but for social locations in general.

In what follows I will not consider the third aspect of the problem —the sociological point of view— and for the rest of my analysis I will just focus on the first and second aspects. That is, we have a first dimension of the problem, namely, how the social location of the knower influences knowledge-producing practices and processes: the choice of metaphysical assumptions, methods and standards; and the use of "discursive resources" such as models, narratives and metaphors. Then, we have a second dimension of the problem, related to the

culture and social organization of science. Both dimensions contribute to the way scientific knowledge is produced and thus to scientific knowledge itself. It is in this sense that I assert that the social location of knowers can affect the *content* of science.

I will now analyze these two aspects separately, starting from the cultural and social organization of science. For the sake of clarity, I must say that in the following sections I will talk about “social location” and “background assumptions/interests and values/beliefs” almost indistinctly. A more detailed analysis should consider the similarities and differences that might characterize these concepts, but for the arguments I am going to present —whose aim is to provide an initial, and partial, approach to the problem of social location in the physical sciences— they can be considered interchangeable.

4.4. Science as an organization

Harding asserts that in societies that are stratified and hierarchically structured by social categories such as gender, class, race/ethnicity and sexuality, «the *activities* of those at the top both organize and set limits on what persons who perform such activities can understand about themselves and the world around them». Moreover, as explained above, according to the situated knowledge thesis, one’s social location both enables and set limits on what one can know. Now, there are some social locations, namely, the critically unexamined dominant ones, that «are more limiting than others in this respect, and what makes these situations [locations] more limiting is their inability to generate the most critical questions about received beliefs» (Harding 1993, pp. 54–55).

If we consider the organization of scientific work, the fact that dominant interests and values set limits on what kind of, and how, knowledge is produced, means that these interests and values characterize the very foundations of the scientific enterprise, in other words, the structure of scientific institutions and the way they work. Some examples of scientific activities and mechanisms that might indeed be affected by those “at the top” are: the peer review mechanism; funding mechanisms; the negotiations within science communities which lead to consensus; the presence of prestige hierarchies among sciences and specialties; the internal politics of each discipline; the recruitment processes; career advancement mechanisms; the education and training of new scientists.

It is obvious then that the design and management of everyday knowledge production in science, and the purpose of scientific research, are shaped by dominant interests and values through all the activities and mechanisms I have just listed.

It is important to note that these observations are true for any scientific discipline, including the more abstract ones such as physics and mathematics.

4.5. Knowledge-producing practices

In a variety of disciplines it has been showed that unexamined background assumptions and beliefs affected the scientific theories and the results produced by research. Indeed, «interests shape the research programs scientists undertake and the questions they ask of nature. […] In this way, different interests shape the results the knowledge science produces» (Potter 2006, p. 142). How does this happen in practice?

Background assumptions and beliefs can shape every stage of research practices and processes. For example: the selection of what counts as interesting or important scientific problems; the selection of what counts as relevant concepts to use for analysis; the formation of hypothesis; the design and aim of research; what can count as evidence; the collection, selection, sorting and interpretation of data; the decisions about when to stop research; the conclusions drawn; the way results of research are reported (Harding 2015, p. 30; Harding 1993, p. 69).

Examples of well accepted scientific theories based on biased assumptions or values can be found in the history of life science, biology, sociobiology, endocrinology, medicine, psychiatry, archaeology, anthropology, primatology, and so on, as well as in the social sciences.[6] However, to say something about how the partial perspective of the knower —her/his social location— can affect the knowledge-producing practices of science in abstract disciplines like physics, we need to take a step back and start to reflect on the vary basic elements and principles that enable scientific inquiry in the first place. For this reason we need to analyze, first of all, the role played by language in science, and then the use of discursive resources —narratives, analogies, metaphors— that help scientists formulate their hypothesis and theories, thus producing scientific knowledge.

Language

Language is the most basic and fundamental element that enables us to describe and analyze the phenomena we observe in the social and natural worlds. It allows us to name and identify the physical objects that constitute reality and the abstract concepts that we use to analyze them. The existence of a common language, and the fact that it is shared by a scientific community, is therefore essential for the knowing-seeking practices of science.

One may ask: Can language contribute not only to the description of social and natural phenomena, but also to the way these phenomena are interpreted? According to some scholars, like Evelyn Fox Keller, it can. On one hand, language makes possible the communication and the exchange of information among people. On the other hand, it plays an active role in the production of knowledge, in particular, of scientific knowledge: sharing a language means knowing how to name things around us, but also, in science, learning how to

[6] For an overview of how sex/gender bias affected scientific theories in some of these disciplines, see García Dauder and Pérez Sedeño (2017).

correctly formulate questions as well as possible answers. In other words, language shapes and limits what questions can be asked and what answers can be given that will count as acceptable.

"How science names nature" is one of the central questions of Fox Keller's work. She asserts that in order for the phenomena to be interpreted, the use of a common language is required. However, language itself may actively contribute to such interpretations. Indeed, most scientific communities wrongly believe that the universe is directly accessible, namely, that the physical objects of the world and the abstract concepts used to describe them are determined uniquely and exclusively by observation, experiments and logics. According to this view, scientists observe nature and explain the regularities they find by means of a language that is thought to be both objective and neutral. Not so surprisingly, this traditional and quite naïve conception of language, that strongly characterized the origin and first development of modern science, proved wrong. During the last decades numerous scholars showed that the language of science is *not* objective and neutral. In fact, it is the result of the complex interaction between theory, practice and ideology (Fox Keller 1996).

Another aspect of the determinant role played by language in the production of scientific knowledge is the fact that in order to become part of a scientific community —to be accepted in it—, a researcher must learn the language of that particular community, and use it correctly. This means knowing the limits that the language imposes, and be familiar with the scientific tradition it comes from.

The continuous and necessary interaction between the individual scientist and the scientific community she or he belongs to, and the fact that the individual scientist and her/his scientific community are both immersed in specific cultural and social structures, are therefore key to understand: i) why the objects of knowledge are socially constituted, and ii) how the discursive resources used to describe them presuppose social and cultural assumptions and values. I now turn to these two questions.

Both social and natural objects are socially constituted

According to Harding, the natural objects named and studied by scientists —rocks, trees, electrons, planetary orbits, etc.—, are all socially constituted. She explains this point giving two arguments. Firstly, one can assert that natural objects are social objects, as they have general cultural meanings for both common people and scientific communities. Secondly, natural objects are socially constituted because of the specific meanings given by scientists. In other words, scientific communities understand the objects they study thanks to the concepts and principles that earlier generations of scientists used to understand them. Indeed, contemporary scientists observe and understand natural phenomena within specific scientific traditions: «they could not do science if they did not borrow some past understandings of the objects and processes they study», and the assumptions about the objects and processes they

study «are always shaped by “conversations” they carry on with scientists of the past». It is in this sense that Harding asserts that the same kind of social forces that shape agents of knowledge —knowers— also shape their objects of knowledge (Potter 2006, pp. 137–138; citing Harding 1993, pp. 64–65).

Discursive resources

“Discursive resources” include, but are not limited to, metaphors, models and narrative structures. They give scientists the conceptual and theoretical framework within which to pursue knowledge of nature. They provide analogies between, on one hand, the objects, phenomena and processes under investigation and, on the other hand, more familiar objects and processes. Discursive resources are useful because «they can suggest new ways of looking at phenomena, new ways to extend theories and ways to revise them in the face of recalcitrant or surprising observations». However, one must take into account that they include cultural presuppositions: «[t]hey can be drawn from the culture within which a science is practiced as well as from cultures with which the science interacts, from other disciplines, etc.» (Potter 2006, p. 143; citing Harding 1998, pp. 68–69 and pp. 99–100).

Metaphors are one of the several discursive discourses employed by scientists. For example, there are basic metaphors that conceptualize parts of reality, like “the world is a machine”, and then there are explicit metaphors in the formulation of scientific principles, like “the struggle for existence” in Darwin’s evolution theory (Pérez Sedeño 2011). As said, metaphors play a determinant role in scientific reasoning and, in particular, the choice of some metaphors over others have relevant consequences for the kind of theories produced. It is important, in this sense, to ask about the criteria how some metaphors are easily accepted and others are not, because this leads us to focus on the cultural values that presuppose both the introduction of certain metaphors and the mechanisms underlying their acceptance or refusal.[7]

Within the physical sciences, and relative to the foundational principles of modern science and the scientific method, Harding writes: «the severe testing of hypothesis through controlled manipulations of nature, and the necessity of such controlled manipulations if experiments are to be repeatable, [have been] formulated by the father of scientific method in clearly sexist metaphors. Both nature and inquiry appear conceptualized in ways modeled on rape and torture —on men’s most violent and misogynous relationships to women— and this modeling is advanced as a reason to value science» (Harding 1986, p. 116). Here, Harding refers to Francis Bacon and the sexist metaphors that characterized his writings. Other scholars too analyzed this aspect of Bacon’s thought, for example Fox Keller (1996).

[7] For an extensive treatise about the role of metaphors in everyday language, and the way metaphors structure our thought and affect —and are affected by— our perception of reality, see Lakoff and Johnson (1986).

More in general, metaphors and narratives promoting and encouraging control, dominion and power of humans over nature were characteristic of seventeenth- and eighteenth-century physics. They were tied to strong mechanistic assumptions about the nature of reality, and they became guidelines not only for the advancement of natural sciences from then on, but also for decision making in other fields such as technology, industry and government policies —at the expense of a more organicistic, holistic and ecological philosophy of the relation between humans and nature— (Merchant 1980).

The arguments and examples presented so far try to show how cultural assumptions and ideological frameworks, imbedded in discursive structures like metaphors, can influence the development of science, and how the production of scientific knowledge can be shaped by the geographical, historical, social and cultural context in which knowledge is produced, that is, by the social location of knowers. Emily Martin argues: «Waking up such metaphors, by becoming aware of when we are projecting cultural imagery onto what we study, will improve our ability to investigate and understand nature» (Martin 1991, p. 501). And, in terms of a feminist standpoint theory, it will improve our ability to make representations of the world that are less partial.

4.6. Open questions and the importance of diversity

In the last sections I have tried to show that the content of science can be shaped by the social location of knowers. As I explained, this can be deduced from the study of two different but complementary aspects of the problem: the organization of science, on one hand, and the knowledge-producing practices of science, on the other hand. In both cases, social and cultural presuppositions as well as geographical and historical contexts, play a big role in defining categories, enabling analysis and processes, promoting or evaluating research projects, and structuring scientific activities in general.

The questions with which I started this discussion were: Is the social location of knowers important when we consider very abstract fields of study? Is the epistemic privilege deriving from the standpoint of marginalized or oppressed groups relevant in the knowledge production processes of abstract disciplines like the physical sciences?

I believe I gave a clear answer to the first question, asserting that the social location of knowers is indeed important, even when we consider abstract disciplines like physics. Of course, a more detailed analysis should provide additional examples of how, for instance, specific principles in nowadays physics are modeled on cultural assumptions and how the metaphors used reveal the partiality of the dominant view in the field. Therefore some aspects related to this point are still open and need further investigation.

As for the second question, I did not address it directly. I have not given any explanation or justification why marginalized and oppressed groups would be able to provide a different,

and less partial, insight on the kind of research conducted in the physical sciences. However, I would like to present now some elements that show how *diversity* of social locations can represent an inestimable resource in scientific research. This will not be an answer to the question asked, but it will at least represent a starting point for further advancements on this matter. Moreover, the example I am going to exhibit will reinforce the first argument, namely, the claim that social positions play an important role in the production of scientific knowledge, including in physics.

In an interview I conducted in 2018, a woman physicist explained to me that the different national origins of three researchers in the field of quantum gravity played a determinant role in the development of a new theory. In the interview she explicitly talked about the importance of diversity, and in the following extract she gave me an example why it is so:

> *"I always give the example of the field where I come from, loop quantum gravity, in which there were three male different scientists, there were three persons coming from very different backgrounds: so one was an Italian, with a very wide vision, a bit of historical vision but especially wideness and ability to connect things; then there was also an Indian, who had a very analytical mind, trained in the Indian tradition; and then there was a Jewish person, that was the one making crazy new ideas and so on. So only the combination of the three of them could lead to a new theory, each single person couldn't be able to construct such a thing".*[8]

In the extract she explains how the different background of the three researchers made it possible to produce a new theory. The fact that they had different backgrounds and different "ways of thinking" depend, in this case, on their different national origins: the first one she mentions is Italian, the second one is Indian and the third one is Jewish. The central point, here, is that they belong to different scientific traditions, hence the way they do science is different. The Italian physicist has wide vision and ability to connect things, the Indian physicist has a more analytical mind and the Jewish physicist is able to make new "crazy" ideas. The diversity in terms of scientific education can be considered here as diversity in terms of culture and social origin, hence social locations.

One might object that the case shows how diversity of research *styles* —not of social locations— is important in scientific inquiry. In other words, that the different "ways of thinking" cannot be related to social and cultural diversity. I disagree. According to me, research styles —as well as, more in general, cognitive styles— can and must be considered as part of the situated knowledge of individuals.[9] For example, the fact that it is possible to associate an "analytical style" to the Indian physics tradition shows that this kind of style

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[8] Personal interview, 10th December 2018.

[9] For cognitive styles and situated knowledge, and for *gendered* cognitive styles and gendered knowledge, see Anderson (2017) and references therein.

developed in conjunction with specific social and cultural factors belonging to the Indian context. Therefore I would say that research —and cognitive— styles are indeed related to the social location of knowers. Nevertheless, I recognize that this thesis needs more adequate and complete justification.

5. Conclusions

I started this work by recalling the two main theses of feminist standpoint theory: the situated knowledge thesis and the thesis of epistemic privilege. The situated knowledge thesis asserts that the knower is socially situated and therefore the knowledge she or he produces is socially situated too. Key elements for this thesis are the concept of partial perspectives and that of social location. The thesis of epistemic privilege, on the other hand, asserts that there exist some social groups that have epistemic privilege, namely, a privileged access to, and privileged understanding of, the structures of reality and the mechanisms that undergo the phenomena we observe in the social as well as natural worlds. According to feminist standpoint theory the social groups that have epistemic privilege are those that are oppressed, disadvantaged, marginalized and discriminated against.

It is worth noting here that the central claim given by the thesis of epistemic privilege can be split in three different arguments. As I have already recalled, the thesis of epistemic privilege asserts that the standpoint of marginalized and oppressed social groups give a better understanding of the natural and social worlds. Thus it says that: i) «social relations, human interactions with nature, and the meanings of both give rise to standpoints on nature»; ii) there are distinctive oppressed groups' standpoints on nature —from which follows that oppressed groups' standpoints on nature differ from those of dominant and privileged groups —; iii) oppressed groups' standpoints serve as resources for the sciences (Potter 2006).[10]

After recalling the two main theses of feminist standpoint theory I presented Harding's strong objectivity proposal and, related to it, the interrelation between, on one hand, the scientific and epistemological norm of objectivity and, on the other hand, the social and political norm of diversity.

First of all, Harding's strong objectivity proposal shows that feminist standpoint theory not only represents an epistemology and sociology of knowledge, but also a methodology. The proposal starts by considering, firstly, how the design and management of everyday knowledge production is carried out in science and, secondly, the mechanisms that lie behind decisions about the shape and purpose of scientific research. The strong objectivity program asserts that scientists must start their research "outside" dominant conceptual frameworks, namely, they need to create a little but significant distance from prevailing values and interests. This will allow them to reach a critical perspective and to produce theories that do not benefit or maintain, but rather challenge, the privileged points of view, enabling new ways of thinking about the world. In Harding's words: «Most natural and social scientists (and philosophers!) are themselves members of these dominant groups, whether by birth or

[10] These arguments have been presented by Potter, but she refers specifically to the standpoint of women. Here, I extend her arguments in order to consider oppressed groups in general. (See Potter 2006, pp. 141—151.)

through upward mobility into scientific and professional/managerial careers. Those who are paid to teach and conduct research receive a disproportionate share of the benefits of that very nature and social order that they are trying to explain. Thinking from marginal lives leads one to question the adequacy of the conceptual frameworks that the natural and social sciences have designed to explain (for themselves) themselves and the world around them» (Harding 1993, pp. 62–63).

An important way to create distance from dominant interests and values is by promoting diversity in research communities. Moreover, diversity is perhaps one of the most powerful tools in order to achieve strong objectivity —to maximize objectivity—. Diversity of social positions, especially, can guarantee that dominant frameworks will be criticized and challenged. A relevant consequence of this approach may be the co-existence of diverse and multiple standpoints in a given research context. From the strong objectivity proposal perspective this is not at all a problem: «rather than being an impediment to knowledge — Harding argues—, multiple and competing standpoints are a resource for feminist epistemology» (Crasnow 2014, p. 151). Moreover, «multiple and conflicted subjectivities offer possibilities for progressive transformation that are less available to the unified, perfectly coherent, and autonomous subjects (should any actually exist) to which we have all been supposed to aspire» (Harding 2015, p. 164). What is more important, this process based on the recognition of diversity as a necessary value in science, together with the proposal of starting research “outside” dominant conceptual frameworks, will finally make possible «redistributing intellectual control over the agenda and processes of research» (p. 167).

In the discussion section I have tried to introduce some arguments regarding the importance of considering the concepts presented in the previous sections —the social location of knowers, the situated knowledge thesis, the thesis of epistemic privilege, the interrelation between objectivity and diversity— in the context of very abstract disciplines such as the physical sciences. The arguments I introduced are preliminary, somehow partial, and not sufficient to fully respond to the two questions I asked: Is the social location of knowers important if we consider the knowledge production processes of extremely abstract disciplines? Can we say that the epistemic privilege deriving from the standpoint of oppressed groups is indeed relevant in fields like physics and mathematics? Although the arguments I presented to answer these questions are not complete, I believe that they might represent a first step in order to build a theory of the production of knowledge as social and situated, in the specific context of physics.

To approach the problem, I firstly started by describing, very briefly, how the two main theses of feminist standpoint theory can be elaborated and developed within the context of the social sciences, and what they can serve for in terms of scientific inquiry. Then I presented the positions of some feminist scholars who believe that the experiences of the knowers —hence their social locations— are not likely to be relevant if the subject matter under study is too abstract. In particular, they mention the case of theoretical physics and

astronomy. On the other hand, Harding strongly believes that both social and natural worlds must be analyzed through the lens of standpoint theory, and that the content of the more abstract disciplines is, probably, less distorted than the content of the humanities or the social sciences, but, in any case, that it is not entirely free of distortion.

Then I decided to clarify the different dimensions that, I believe, characterize the problem of the social location in abstract fields like physics. In this respect, I assert that there are at least two aspects of the problem that are relevant for the questions we intend to answer. These two aspects, although complementary, must be treated separately.

The first dimension of the problem concerns the culture and social organization of science. Financing institutes, peer review mechanisms, recruitment processes: these are just three of many examples through which one can show how dominant interests and values shape the purpose of scientific research and the way research is done. The second dimension of the problem concerns the knowledge-producing practices of science. These include, but are not limited to, the choice of assumptions and methods, and the use of discursive resources such as narratives and metaphors. From this point of view, if we are interested in the knowledge-producing practices of abstract disciplines like physics, we must consider the role played by language: the construction of models —for the description of natural phenomena— and the definition of principles and methods —as guide lines for scientific inquiry—, are rooted in what meanings we assign to natural objects and abstract concepts, that is, they are rooted in language. After a brief digression on language, I explored the concept of discursive resources, paying special attention to the role played by metaphors in scientific reasoning and practices.

The arguments presented and concerning knowledge-producing practices —particularly the role of metaphors— do not want to be exhaustive. To me, they represent the starting point for a larger project, that would include a more extensive literature review and further original investigation. There are indeed many aspects that have been left out, and more specific examples are needed for the context of the physical sciences.

In the last part of the discussion section I exhibited the extract of an interview I conducted in 2018. The interviewee, who is a woman physicist, explicitly talked about the importance of diversity in research communities and gave me a concrete example of how diversity of social locations made it possible to produce a new theory in the field of quantum gravity. I believe that this significant case reinforces Harding’s claim that difference and displacement is a source of creativity and power (Harding 2015, p. 163), and that knowers are not fundamentally autonomous, self-creating and culture-free individuals. After all, researchers inevitably and necessarily interact and collaborate with networks and communities in the production of knowledge, whether or not they are aware of it (p. 169). Another interesting way of putting the point is: sciences and their societies co-produce and co-constitute each other (p. 140).

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