Reframing perspectives in *Studies of Science and Technology and Society*

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Defining the field

In his introduction to the field, Sismondo (2010 2nd Edition) uses the terms *Science and Technology Studies*, making a distinction from the previous name *Science, Technology and Society*, both standing for the acronym STS. According to Sismondo's review, these different names correspond to different approaches to the field, which in the long term ended up merging in one; or more accurately, the second approach was absorbed by the first:

> … the two STSs differed considerably in their approaches and subject matters: Science and Technology Studies was a philosophically radical project of understanding science and technology as discursive, social, and material activities; Science, Technology, and Society was a project of understanding social issues linked to developments in science and technology, and how those developments could be harnessed to democratic and egalitarian ideals. (P. viii)

> Parallel to this in the academy, "Science, Technology and Society" became, starting in the 1970s, the label for a diverse group united by progressive goals and an interest in science and technology as problematic social institutions. […] This is the other "STS," which has played a major role in Science and Technology Studies, the former being both an antecedent of and now a part of the latter. (P. 10)

It seems that there were two divergent approaches to the concern about the social and discursive dimensions of science and technology. One is a “philosophically radical project” that comes from the academy, and is based in figures such as Merton, Popper, Polanyi, Mumford or Heidegger (the first STS). The other was formed by a project of “understanding social issues” related to science and technology, such as social differences and decision-making processes (the second STS). In the end, these issues ended up converging in the actual STS.

In other words, one could have approached the field by thinking about knowledge and science and philosophizing about it; or alternately from the realization that scientific institutions and technology have an important effect in society that should be studied. For Sismondo, this distinction is no longer relevant as far as both paths merged, but it seems important to think further on the meaning of this unification, particularly since one of the two competing perspectives overtook the other.

In this case, the academic perspective that considers this issue from an epistemological, internal point of view (the analysis of internal dynamics) absorbs the less academic approach that is mainly concerned with social issues and is considered to have a political bias (“progressive goals”). Even though the result is “philosophically radical” and includes the analysis of the concerns of the second STS, something appears to have gotten lost along the way: the relevance of the macro-social dynamics that are the main issue of the second STS. Latour's astonishing neglect of social class differences in his analysis of Aramis, Eglash's condescending argument in favor of the intelligence of Africans,[1] Daston & Galison’s careful and deferential treatment of “the scientists”, could be some examples of the critical attitude that is lost with the dissolution of the second STS. Even Sismondo's portrait of the discipline, though comprehensive and highly illuminating, neglects major conflicts inside and outside the field: he can speak as easily about the Strong Program as Actor Network Theory, as if they were complementary perspectives in the joint venture of *Science and Technology Studies* and not strongly opposed views of what science and technology are. In a pedagogic and introductory book to STS, this is understandable

1 Whether his intentions and his point might represent a positive implication in this matter does not change the fact that he completely ignores the economic and social conditions of African Americans, as well as the history of Africa and the particular problems of indigenous populations. Were these social situations necessary to his case studies? It is difficult to say, mainly because the point he is trying to make is particularly difficult and socially sensible. But that does not change the fact that he tries to stay on the “technical” side of the issue, without engaging with social matters.

and even desirable, but it also shows the non-radical, non-controversial style that seems to characterize the discipline.

Under the rubric of *Science and Technology Studies* there is no need to address the main social issues that are mandatory in social sciences, because the discussion can run only on the technical level of knowledge and science. Popper's epistemological reflections and Heidegger's ontological analysis of technology are some examples of critical work on a purely philosophical level that are highly valuable in a general sense. However, when the matter of discussion directly addresses particular technoscientific realities that relate to social problems, there is a need for a major sociological or anthropological perspective to contextualize the social issues involved. The case studies that “are the bread and butter of STS” (Sismondo, 2010) normally have to deal with these conflictive matters: How are we supposed to study a case such as the genetic modification of organisms without giving an account of the global situation of agriculture and food commerce? Or how can we understand the story of a public transportation system without considering the political dimension of public decision-making?[2] How can we talk about an audio format without remembering its cultural and economic implications?

Case studies, as with any other kind of research, need to limit their scope and focus to a central issue, otherwise it would be impossible to write a report. However, in order to explain any phenomenon and build a scientific narrative around it that makes sense and can stand by itself, the scope has to include a minimum of necessary factors. A good example of a careful definition of the areas related to a case study is Sterne's account of the meaning of MP3; economic and industrial problems are treated, not in depth, but in the aspects that are related to the process of production and definition of an audio format. Sterne does not engage in a profuse debate on intellectual property and Internet regulation laws, but he explains the major social and economic consequences of the MP3 format to the industry and the public. In his work, there is a sufficient limitation of the matters that must be treated in order to give a coherent and self-standing explanation of “the meaning of a format”.

2 “We just lack of love for technology!”

In summary, the first STS (Sismondo's STS) is concerned with how social and economic dynamics affect the production of science and technology; therefore its focus might keep social issues out of its scope. The second STS focuses on “society” as another relevant object of study in itself and in relation with S&T. The social effects and the social arena around technoscientific advances and outside the academy are a major matter of concern from this perspective, which could have been lost in the absorption of the second STS by the first.

The role of the social

The name *Social Studies of Science and Technology* (SSST) seem to be a good way to solve this loss of the “social” dimension. There, “social” stands for the perspective that we use to study S&T, implicitly excluding approaches that do not account for the social dynamics involved in techno-scientific processes. However, this is still not the same as: [Studies of] Science, Technology and Society, since these three objects of research or three realms of knowledge that would be confronted in this inter-disciplinary field should not be encountered at the same level. It could be argued that the SSST solution gives a prominent role to social or sociological approaches, or that it is a way of putting S&T under the scope of sociological examination, but that would be delusive, because in that case we would be talking about Sociology of Science and Technology. In this sense, “social studies” could work as a euphemism for sociology stripped from its scientific status, reconsidering it just a “study,” a non-scientific way to approach the understanding of social realities. This implies the idea that there are no specific epistemological or methodological rules for social research, which can instead be portrayed as a messy activity. This attitude, of course, explains Latour's disrespect for the role of the sociologist in his study of Aramis, where the expert informants are made responsible for leading the research's line of inquiry, just because it related to technology and they were engineers[3].

3 They are not all engineers by profession, as some are politicians or bureaucrats. However, due to the particularities of the French public and academic system, almost all of these professions are occupied by engineering graduates. In other words, almost all the informants had their degree in a Polytechnic School. This validation of the engineering carreer is also very common in other countries, where it is usual to find engineers as CEOs or General Directors. Even though the specific tasks of their position have nothing to do with technical knowledge, these degrees are more valuable on the assumption that engineers are intelligent people that have obtained a complex degree and therefore are prepare to solve the complex problems of a (social) organization. This trend is also portrayed in specific disciplines as organizational engineering or process engineering, an organizational management discipline that was very popular in the 90s.

All this reflection on the names of the field might look superficial, but naming is the first step in the process of framing what we think about the world, and this analysis of the name of a discipline is representative of the beliefs and attitudes behind it. This preliminary reflection on names has taken us to a major theoretical point about the "nature" of the discipline: how is the "social perspective" included in the S&T research? *S&T Studies*, undermines the relevance of a sociological or social perspective. *Social Studies of S&T*, introduces a social perspective but in an ambiguous way, also neglecting the fact that there is a science of society. On the other hand, *Sociology of S&T* represents a pure approach from the social sciences that leaves physical scientists and technologists in a secondary place, avoiding the possibility of a common space of encounter between epistemologies from the social and the physical sciences that could also integrate the practical knowledge of technicians.

Whether Sociology is at the same "scientific" level as physical sciences, whether it is below them because of some lack of their methodological accountability or if it is above them because of its higher scope (society as the basis for human existence and knowledge) can be a matter of bitter discussion. In practice, physical and social sciences have taken their own paths, avoiding theoretical confrontation and speaking to their own audiences. If we are going to take STS as a discipline of confrontation and conversation between these two spaces of science (and technology), we should try to build it in a way that this exchange can be made inside a neutral theoretical environment.

To such an end, the definition of the field as Studies of *Science, Technology and Society* seems to represent a good option. This name allows a perspective of study that does not come from a specific discipline, they are just "studies," which also makes a reference to the relevance of "case studies" in STS. In other words, we are talking about case studies involving science, technology and society. Society here does not stand for "sociology" or "social studies", but for an object of study at the same level as science and technology. Sociology, understood as "study of society," is included as far as society is considered an object of study, and at the same time we are accepting any perspective we need to use in the study of STS, be it a technical considerations, the knowledge of the physical sciences, philosophical perspectives or a theoretical approach from humanities.

The three realms of knowledge

This field stands in the joining point of three different realms: the social sciences, the physical sciences[4] and the study of technology. In this sense, the most interesting aspect of STS is its inter-disciplinary dimension, articulating knowledge from different sources in order to explain the social, technical and scientific implications of certain phenomena. We can also say that the whole field is aims to work as a negotiating point for these three realms of knowledge.

Some of the case studies of the discipline include: technological projects (Aramis, MP3), features or concepts of knowledge (fractals, objectivity, quantification of knowledge), and historical accounts of knowledge (cybernetics, information). The relevance of technology is pervasive in STS case studies, as it represents the interaction between the scientific and the social worlds: technology is the application of scientific ideas and developments in society. And this effect does not always receive the proper reflection from technicians and physical scientists, who most of the time limit themselves to follow the inclinations of funding agencies, corporations or governments.

In this context, the introduction of the social dimension as a variable that needs to be properly considered is a highly interesting feature of the field. In this respect, the participation of the social sciences to help understand the social (economic, cultural, and so on) repercussions of technical and scientific developments is crucial. And from the point of view of the social sciences, this joint venture in the understanding of STS represents a valuable opportunity to find new ways of studying *the content* of science with help provided by other fields.

However, given that materialism is the philosophical base for the scientific representation of reality, the ontological status of the social sciences is difficult, because their subjects of study – society, mind, culture and so on – do not have a material existence. That is why the social sciences had to develop ways of capturing the essence of their matters of study. In sociology, for example, Durkheim's research managed to capture the existence of society by representing the effect of social conditions on individual behavior through statistics. To such an end, he did not rely on a psychological representation of the

4 Sometimes, these are just called “sciences,” a sense that is implicit in the name of the discipline

individual – on how his thoughts are formed by social representations of reality – but of the external study of behavior and social situations. The relevance of that account is not only the development of a sociological method, but also the proof of the existence of an object of study – society – from a philosophically materialistic point of view. In psychology we can find similar approaches, for example showing the existence of personality and types of personality through the use of tests and statistical analysis of the results. Once the objects of study have been identified, more complex methods can be developed to capture their essence and their dynamics. This brief reflection is relevant because without recognizing the role and the place of the social sciences in the study of STS, we are taking the risk of confusing it with philosophy or humanities, undermining the real capacities of scientific knowledge.

Philosophy of science

Philosophy is the rational reflection from which the theoretical bases for science are built, but it is not science itself. Epistemology, the reflection on the nature of knowledge, of what it is, what its conditions of possibility are and how can we get it, is the branch of philosophy from which science is born. Popper's epistemology and philosophy of science occupy a central place in modern science, stating a set of principles and ideas that are considered standards that should guide the design of scientific research. The criteria of falsefiability, for example, is one of the results of his philosophical speculation on epistemology[5].

Philosophy of science is different from other philosophical approaches that are not usually accepted as a theoretical foundation for scientific knowledge. Briefly speaking, philosophy of science is formed by modern skepticism based on rationalism and by empirical materialism.[6] In other words, scientific accounts of the word have to be based in rational explanations of the observable relations between empirical (existing) objects. This is the epistemological basis for science, and from there methodologies can be built to give a reliable account of reality.

5 In his intellectual autobiography Popper defines himself as a thinker mostly interested in speculative philosophy and particularly in the problem of knowledge and epistemology. Popper, Karl. *Unended Quest.* 1974

6 There might be other possible ways to approach the production of knowledge, but the recent history of Western thought has reached the conclusion that this is the way that knowledge should be pursued. It has been the result of centuries of philosophical evolution: Rationalism, Empiricism, Materialism, Positivism, modern Skepticism and so on.

The “philosophically radical” approach proposed by STS implies an eventual revision of the epistemological and methodological accounts of science, via the exposition of their “social, discursive and material”[7] implications. Therefore, the “studies” of STS can be based on new philosophical perspectives of science that do not need to stick to “the rules of science,” but can take an outsider view to reshape the accepted beliefs about what scientists are doing. In this sense, STS can work as a secret door we enter to leave our common assumptions and conduct case studies from an open viewpoint, or as it is sometimes said: “to think outside the box”.

However, this philosophical approach to reflecting on S&T should not be confused with the sociological or anthropological account of the social effects of technoscientific developments. There is a difference between a philosophically radical critique of S&T and a sociological account of S&T dynamics and effects, and this distinction is the main point of this paper. Philosophy stands where a major reflection about what is knowledge and what is real have to be made, while sociological analysis is required when a social feature needs to be explained.

7 It is interesting how Sismondo chooses these three elements that are taken from Latour as the three possible objects of knowledge, thus indirectly stating the influence of ANT in his own account of STS.

CASE STUDIES

Following the discipline's custom, we are going to go through several cases explaining the difference between technical, scientific, social and philosophical accounts of the phenomena studied in STS:

Aramis: This account is the story of a political and technical project, therefore what is needed is both a sociological account of the interests and motivations driving the project and a technical evaluation of its viability, taking account of the original objectives and the necessary resources to make it work. As exposed in the critique of the book, Latour's review neglects the relevance of the political motivations and interests involved, as well as the social implications of the project, reaching an obscure conclusion about the nature of technology and "our" attitude towards it. "Our" stands for the abstract subject (the "we" of the book) that does not love technology enough. In this case, a specific type of philosophy (ANT based on Leibniz's metaphysics) is used as a substitute for social science.

African Fractals: This text shows the existence of advance mathematic concepts in indigenous cultures in Africa. Ethnomathematics represent the use of a method of research from Anthropology (ethnography) to study pure science concepts as mathematics. Social sciences provide the method used to give an account of mathematical concepts: interviewing the subjects, interpreting the information provide by them, selecting samples and artifacts where fractals could be found, etc. Eglash also uses mathematical modeling (a pure science method) to help make the fractals more understandable. And lastly, he turns to philosophical and social thought when explaining the implications and results of his discoveries; although he cite several social science works to support his claims, he himself does not articulate a sociological argument to support his conclusions.

Big Science: This work explains the beginning of bibliometrics as a system to value scientific production and represent scientific progress. In this case, de Solla Price uses social science methods and techniques (statistics) to give an account of scientific progress as a social phenomena. Even his analysis of invisible colleges is intended as a sociological account of what science is and how it works in the world. The philosophy expressed here is the value that Price gives to science as the major value of human progress and excellence.

MP3: This is the story of "the meaning of a format". It is a historical account of the production of an audio format and includes technical analysis (the characteristics of the format), as well as a critique of scientific methods of research (the research protocol of the MPEG) and a sociological analysis of the implications of the format for the industry and the distribution of music. It is a simple project because it is only focused on a single technological feature (the MP3), but it is developed in a comprehensive way, articulating all the dimensions of the field. The philosophical or epistemological point in this case study is simply a demonstration of how different perspectives can be articulated to give a more complex account of technological developments.

Objectivity: Through the review of scientific atlases, Daston & Galison give an epistemological account of how knowledge is represented, including the influence of technical developments (photography as mechanical objectivity) and the social conditions involved (the relationship between draftsmen and scientists, the costs of production, etc.), in order to offer a broader representation of the foundations of science. In this sense, this work reaches a high level of complexity. It is a deconstruction of the concept of objective knowledge through an historical account of its evolution, using social analysis to make an epistemological claim. In contrasts with the move made by Latour, who uses "philosophy" to make a sociological point, Daston & Galison use historical analysis (that, in the way they use it, can be considered part of the social sciences) to make a philosophical point about the nature of scientific knowledge, a point that is aimed to affect the sensibility of scientists from the pure and physical fields towards the ways and relevance of sociological/historical disciplines.

The information: In contrast to the historical account provided by Daston & Galison, which is rich in sociological and technological analysis, Gleick's account of the history of information is more narrative and less *historical*. In this sense, we can turn to history as a social science[8] that portrays the past by establishing necessary relations between events and situations, or we can use history as a narrative resource to tell a story giving a particular account of what happened – without necessarily worrying

8 The status of history as a social science is probably the most problematic of all, but when historians use the research and discursive methods of the social sciences to build their descriptions of the succession of past events, their work can be included in the realm of social science. There lies the difference between modern historians and the historians of other times that used mythological discourses (for example) to describe history.

about the complexities of human agency and systemic interrelations. If we think of history as the real succession of past events that we try to capture through the study of documents, then we can consider it as a science; but if we consider history as a subjective narrative – representation – of something that has no existence (under the idea that the past is gone and we only have subjective representations of it), then it is not scientific, as in this case.

Conclusion:

The aim of this paper is to represent the problems and epistemological complexities of the STS discipline, as well as the need for further reflection on its foundational beliefs. The ad-hoc format of STS's case studies offers an open field for spurious representations of Science, Technology and their relation to Society, which can be misleading and worsen the epistemological problems that the discipline is trying to solve.

If we do not have a coherent representation of the essence, meaning and nature of the concepts (the realms of knowledge, i.e.) that we are using, it can be easy to present erratic philosophic accounts of reality as part of the scientific corpus, or to misrepresent the social meaning of technological developments, or to confuse political and moral claims with science. One example of misleading ideas is the confusion between human and machines as social agents, a claim that has no ontological or epistemological base, and that is subtly introduced by some theoretical currents (Latour's ANT and cybernetics) under the smokescreen of technological complexity.

This general review of the discipline and of the components that are part of it is also aimed to find ways to easily distinguish between good scholarship in STS that can offer useful and valuable insights to scientists, technicians and the general public, and weak scholarship that generates confusion and spreads misleading ideas. In conclusion, the discipline whose main objectives are offering a critical perspective on Science, Technology and Society, and serving as a space of negotiation between social and physical sciences and engineering needs to come with a strong interdisciplinary and epistemological background in order to accomplish these important aims.

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