

## From Salamander to Servomechanism: For a Distinction Between Weak and Strong Coproductivism

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Coproductivism is a complex form of constructivism. It was founded by American scholar, Sheila Jasanoff, as a concept and research program. It consists of considering science as inseparable from society in all its aspects and concludes that as science influences and models society, society influences and models science, in a co-evolutional and indissoluble process. In this paper I propose the thesis that what coproductivism scholars talk about often is a form of strong coproductivism. Contextually I will try to give a definition of what a weak coproductivism is by claiming its very existence and thus implying a universal presence of coproductivism *tout court*. My impression is that the strong form is believed to be the unique one. While I will not deny the tight relationship between human culture and its reading of nature that many STS scholars have been describing in the last decades, I will try to defend the fact that not every description or usage of nature is necessarily political, religious, moral, legal and so on. For this aim, authors of different times, disciplines and schools will be useful to ground this argument.

What is Coproductivism?

Sheila Jasanoff (2004c, 22), founder and main representative of coproductivism, identifies Bruno Latour's *We Have Never Been Modern* (1993) as the text where the concept is proposed and described for the first time. "Here, he explicitly linked constructivist themes from S&TS with themes of political philosophy, repeatedly asserting that the nature-culture divide is a creation of human (or, more specifically, Western) ingenuity" (Jasanoff, 2004c, 22). This is why it is useful to see, first, how Latour uses the term coproductivism (in French: *construction conjointe [des sciences et des sociétés]*). After having criticized "premoderns" for the confusion they used to have between knowledge and power, and "moderns" for their nature-culture dichotomy causing hybrids to be clandestine, Latour gives his proposition: in order to study fruitfully the relationship between science and society, we have to maintain the fundamental unity that premoderns had vis-à-vis nature and culture, while preserving the modern idea of separation between an objective nature and a free society. He then writes:

How can size, exploration, proliferation be maintained while the hybrids are made explicit? Yet this is precisely the amalgam I am looking for: *to retain the production of a nature and of a society that allow changes in size through the creation of an external truth and a subject of law, but without neglecting the co-production of sciences and societies* (Latour, 1993, 133-134).

This is one of the most philosophical books by Latour, whose program, despite the modest dimension of the text, is extremely complex and ambitious. Latour, along with his companion, Michel Callon, has his own language, aims and set of principles. The aim of their project and of Latour's book is twofold: first, to eliminate the Great Divide (*Grand Partage*) of the classical anthropology that separated human societies into traditional and modern, pre-rational and rational, oral and visual; second, to drop the dichotomy between nature and culture. The most important terms are "translation", "humans" and "non-humans", as well as "black box" and "networks". Through the principles of symmetry, which claim that both winners and losers must be treated the same way and that both humans and non-humans must be described with the same terms, Latour and Callon's theory, called Actor-Network Theory (ANT), tries to describe relationships between humans and non-humans in terms of translation, finalized to create bigger and stronger networks which, once stabilized, could become black boxes. So the difference between modern vision and premodern vision is just the entity or dimension of these networks. Hybrids are a product of modern technological power, but according to *We Have Never Been Modern*, there is no difference among the "primitive" civilizations regarding their relationship to nature. To complete the picture, Jasanoff synthesizes Latour as follows:

It is the mechanism by which Western societies sort the multitudes of hybrid networks that constitute their cognitive and material existence into seemingly autonomous worlds of nature and culture. So basic is the resulting duality in "modern" thought that Latour regards it as a constitutional dispensation: it underwrites all other ways of grasping the world. An appealing aspect of this view is that it genuinely is about *co-production* – that is, it does not presuppose any *a priori* demarcations of the world before that world is worked upon by human imagination and labor [...]. The analyst's task is to make visible the connections that coproduction renders invisible, so that both "natural" objects, such as the cloned sheep Dolly or the ozone hole, and "social" objects, such as experts or governments, can be seen as linked together in *actor-networks* whose heterogeneous constituents criss-cross the constitutional divide (2004c, 22).

A small introduction to ANT, which cannot nor does it want to be exhaustive, was due. In the next paragraph, I will talk again about the distinction between premoderns and moderns in terms of the dimension of their networks, since it can be a parallel to my proposition between weak and strong coproductionism.

Jasanoff's language and aims are, of course, different. Though in general she shares the same preoccupations and objectives as ANT's, her focus is mainly on power and politics. As she states from the very first sentence of the first chapter of her fundamental text, "Science and technology permeate the culture and politics of modernity" (Jasanoff, 2004b, 1). The coproductionist approach wants to illuminate the

relationship between sciences/technologies and society in all its aspects, with a special regard to political and legal powers. Jasanoff claims that, as science influences social identities, institutions, representations and discourses, it is also influenced by all these elements. The way of knowing the world has a double bind with the pragmatic interest to administrate it. The endeavor of the book edited by Jasanoff is to constitute a new vocabulary, with which to analyze the link between technosciences and social rules as well as political hierarchies. The fundamental idea of coproductionism is that the social and the natural orders coproduce each other. In other words, to represent the world and to decide how to live inside it necessarily go together:

Society cannot function without knowledge any more than knowledge can exist without appropriate social supports. Scientific knowledge, in particular, is not a transcendent mirror of reality. It both embeds and is embedded in social practices, identities, norms, conventions, discourses, instruments and institutions – in short, in all the building blocks of what we term the *social* (*Ibidem* 2-3).

This approach avoids both the natural and the social determinisms, by means of the refusal of the realism typical of those who sharply divide the two spheres. Coproductionism does not want to be a complete theory, capable of precise prediction (see Jasanoff 2004d, 280). More modestly, it intends to be a new language, with which to look at the science-society connection, in order to avoid the errors and the omissions of the preceding approaches.

To go into detail about the book in question, some of the chapters (Miller, Waterton, Wynne, & Dennis, 2004) are mainly focused on institutional issues, where the role of science is small and thus the dialogue with it is reduced. Indeed, Jasanoff (2004d, 275) claims the following:

Social histories of science and technology have become commonplace, as have [...] studies focusing on the construction of knowledge through human agency, instruments and will. The theme of co-production can be seen as a productive extension of this trend. If early sociologists of science were concerned principally with bringing the social back into knowledge-making, a new generation of S&TS scholars has acknowledged the need to explore, in a fully symmetrical move, the playing out of systems of knowledge and technology within society.

While nobody contests this, I nevertheless think that coproductionism teaches (or should teach) to consider science and society as internally, interdependently and permanently influencing each other, as Hilgartner (2004) does, but as Miller (2004) probably does not do enough. Miller, it seems, still separates the domains of science and institutions in his analysis of a global political order aimed to fight climate change, as if they were two closed, divided realms external to each other with influences that are a reciprocal causation. Coproductionist works can be more bent on the science side or on the society institutions: this depends on the matter addressed, on the knowledge of the author, and on the argumentative interests. What is important is not to consider the two worlds as impermeable, but rather, to recognize deeper and more intricate internal relations between the

two. In his analysis of the moral and legal order that underpin research on DNA, Hilgartner (2004, 131) writes that “Legal knowledge and practices do not exist in a universe that is somehow separate from scientific knowledge and practices [...] for property—and practices that shape the boundaries of ownership—are deeply embedded in laboratories and the routines of scientific life, and they shape a laboratory’s internal operations and relations with the outside world”. Without renouncing to recognize their different ontologies<sup>1</sup>, we must represent, in our minds and then in our writings, science and law (as well as other social institutions) in a more fluid dialogue: when a scientist is in her laboratory, she still thinks of laws and juridical implications of her research, because she is immersed into the sea of law which penetrates society in its entirety at every moment.

At the same time, with Latour, we consider coproductionism as a universal phenomenon in space and time. It does not only regard modernity, but all human community of any place and time. Jasanoff seems to have some reserves and shows a humble caution for the application, use and utility of coproductionism theory. She writes:

Yet, expansive though this framework is, co-production remains only one possible way to account for the relations of science, technology and society. It aims neither to be a universal grand theory, nor to be univocal in the sense of commanding all who adopt this perspective to invoke it in precisely the same ways, using the same units of analysis, and with the same interpretive or critical intent. Working in the co-productionist idiom, in short, requires not only attention to its possibilities but also modesty about its limits (Jasanoff 2004d, 275).

Coproductionism is not a localized phenomenon, but a ubiquitous and constitutional one linked to the human relationship and negotiation with nature itself. Constructivism may help us put this in light, but it does not necessarily imply coproductionism: that is why we suggest seeing constructivism as a way to show the omnipresence of coproductionism and coproductionism as a way to enrich and add complexity to constructivism. Moreover, such caution by Jasanoff is possibly due to the sentiment that there are cases where coproductionism, as she intends it, is less evident. This is precisely what we are going to call weak coproductionism.

In the light of what was just said, we could state, using the famous definition by Marcel Mauss (2010), that science is, according to coproductionists, a “total social fact”. When talking about the gift and, in particular, the potlatch, Mauss describes a total social fact as an activity with implications in all institutions of a society: religious,

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<sup>1</sup> I specify that ontologies have to be maintained because Latour, even if in his *Irréductions* (Latour, 1988) affirms that nothing is reducible, does, in fact, reduce every actor of science and society to a network where all that counts is force and power, flattening every distinction of domain and risking to unify all. Similarly, he does not care about argumentation in itself. Now, philosophically speaking, we need to maintain both argumentation and the distinctions of essence between sciences and the various institutions so that we can (1) respect the principle of irreducibility stated by Latour himself and (2) continue with the work of making complex the analysis of technosciences that ANT has rightly started, but that sometimes, as in such a case, disregards.

legal, moral, politic, familiar, economic, esthetic (*Ibidem* 66). Mentioning this renowned concept is useful to find an instrument to express the proposition of this paper, to which the next section is dedicated.

### Weak Coproductionism

The thesis which states that technosciences and society are tightly connected, co-causing and co-influencing each other, is easy to agree with in light of STS discoveries and reflections after Kuhn. Nevertheless, there are some sciences where this tight relationship between our approach to nature is less linked to our society, *albeit it is never totally separated from it*. If we share constructivism, as we do, any interpretation of the world is, by definition, created by humans, and *humans live in a society and are immersed in a culture*. What changes is the degree and the number of institutions that can take part in our several ways of reading nature. If we take certain natural sciences such as zoology, botany, mycology, and the like, the presence of, say, politics in scientists' analysis of animals, plants and mushrooms is likely more minor than in physics applied to nuclear plants or to servomechanisms. What is to be proposed here is an ideal line with two extremes. On one end is the weak coproductionism and on the other end is the strong one. It is important to emphasize that it is a distinction of degree, not of nature. When coproductionism scholars, and more generally STS researchers, talk about "science", they seem to intend only those sciences where coproductionism is at its strong extreme, that is to say with several overt implications of politics, law, society needs, and the like. By generalizing this kind of coproductionism to "science" in general, maybe we risk forgetting some other disciplines that have a reduced influence by and on societal institutions. We want to stress the fact that what we do here is making explicit something which, in some way, is already taken for granted in Jasanoff's (and other STS scholars') discourse. Recall that Jasanoff writes, "Scientific knowledge [...] both embeds and is embedded in social practices, identities, norms, conventions, discourses, instruments and institutions – in short, in all the building blocks of what we term the *social*" (Jasanoff, 2004b, 2-3). At the practical moment, most STS books and articles seem focused mainly on hard sciences with strong outcomes on society. Apart from the aforementioned founding book of coproductionism, *States of Nature* (Jasanoff, 2004a), we could use several examples: Collins (1980) takes into account the TEA-laser, detecting gravitational rotation, and some experiments in the paranormal; Callon (1986) talks about the domestication of scallops for fishery purposes; Wynne (1992) analyzes the effects of nuclear plant problems on soil in Great Britain and the interaction between farmers, scientists and authorities; Latour (1988) tells the story of the discovery of microbes by Pasteur and his networks; Gaudillière (1997) focuses on the invention of allosteric proteins; Bonneuil et al. (2008) concentrates on GM crops' opposition by farmers and NGOs in France. This is to say simultaneously that (1) "*science*" is not only physics, bioengineering, molecular biology, microbiology, psychology,

*climatology, medicine and the like, and (2) other natural sciences, with far less impact on society and less influenced by it, are coproduced, socially constructed and worth being analyzed.*

When taking into account engineering, physics, chemistry, biology, or climatology, it is generally easy to detect their link to society conditions, necessities, fears, requests and finalities. Their applications are vast, their regulation more or less strict, and sometimes they move into a direction precisely to respond to a need from “outside” their domain. In other terms, research in such fields is more and more often moved by a pragmatic, economic, military, industrial or pharmaceutical push than by the “pure” curiosity of scientists or by their sheer love for truth.

In the historical case of servomechanism, to mention the title of this paper, we are in the face of a technical device utilizing physical phenomena for military and political purposes. It was indeed created during Second World War by cyberneticians at the service of the State. Since the beginning of the Industrial Revolution, another kind of “objects” have indeed started populating our world and lives. I am talking about things such as radioactive or acid rains, as well as GMOs or clones like Dolly the sheep, strange objects that authors like Beck (2001, 16) and Latour (1993, 1) have tellingly defined as “hybrids”. What is natural and what is artificial in these phenomena? Where is the delimitation between one domain and the other? Many authors, such as Descola (2011, 78) and Latour himself (1993, 1-8), have started considering these questions even philosophically inappropriate or senseless. According to these authors, anything that is a combination of human and non-human and pursuing purity is nonsense. Still, one might argue to them that if the mix of nature and culture is evident and manifest in hybrids, the rest of nature does not necessarily have our intervention in its existence. Describing hybrids as a conjoint product of artificiality and nature does not mean that volcanoes, reef barriers and worms are the same. When you interview an ornithologist or a herpetologist, they may answer that theirs is a “pure” passion and that when they study their beloved animals in the wild, they are trying consciously to escape society and its constraints. Now, if it is true that whichever description or observation they have of their birds and reptiles is somehow filtered by their culture, it is also true that they have not directly intervened in the creation or state of being of those same animals. Again, human activity on earth is changing climate, orographical structures and ecosystems, and leading to new evolutions and genetic disruptions of life. But these are secondary, indirect effects, whereas acid rains and, above all, GMOs are direct effects of human will.

We are not claiming that certain kinds of sciences are exempt from society’s reaches whatsoever. Scientists’ methods of constructing bird or reptile hierarchies, or their ways of describing and classifying them, are dependent on the human culture to which these scientists belong. For example, it has been shown that authors of university medical manuals usually describe the fertilization of woman’s eggs by man’s sperm following stereotypical male-female roles that have shaped our

society deeply for ages (Martin 1991). What we claim is something else: that from an article of *Nature* describing the last discovered salamander, institutions like politics or law are likely excluded. There, the author will be busy counting the number of vertebrae, or describing the various tonalities of the salamander's dorsal coloration, as well as taking into account all the aspects that form the set of traditional information given by a scientist to describe the holotype of a new species to science. Aesthetic dimension is probably still implicitly present in such a case, since the batrachologist studies amphibians because she likes them, but morality or law are likely not fundamental in such a context.

Using Mauss' concept, we are *not vis-à-vis* a total social fact. The degree of coproductionism, present in a given scientific discourse, is not certainly measurable in percentages or in other metrics. The goal is not to find ways of determining degrees of weak and strong coproductionism in chirurgical ways. Our interest is to give a sort of sensibility not to consider science as if it were all and just one, with no distinctions into it. "Science" is several *sciences* with different kinds of interactions with society. *What is undeniable is that in engineering the administration of proof is by definition linked to societal needs, while in limnology this is not necessarily so.* If it is true that morality can still be present, in an article on the population size of a species of frog in a pond, it is also true that there are varying degrees of such a presence. There, the batrachologist operates her size estimations after having counted frogs, by means of a toe-clipping technique that consists of cutting the first phalange of one or more fingers of an individual. This renders possible recognition in case of recapture of the same specimen. Of course, batrachologists have had the preoccupation to find solutions that do not determine the death of the frogs, nor lesser damages. But again there is a degree of such a presence, because ethics is less important in research about reproductive behaviors of that same frog population, where analytical techniques are normally not hazardous to animals. To talk about weak coproductionism in a scientific discourse is not to say that institutions are absent from it. Sometimes it is sufficient that they be silent or implicit; in other words, not implied explicitly and directly, nor treated as a central protagonist of the story.

To read this proposition with another focus still, let us consider again ANT distinction of weak and strong networks. To cite Latour and Callon again, if there is a difference between those we call premoderns and us, the moderns, it is just in terms of power, extensions of practices, accelerations in the circulation of knowledge, modifications of traditions and beliefs, extensions of societies, actors and thus networks compared to theirs (Latour, 1993, 48). Now, the distinction between a weak pole and a strong pole of coproductionism is applicable indistinctly to premoderns and moderns. If Jasanoff and the other coproductionists focus mainly on contemporary society and their way to relate to nature (that is, science), it is partly due to a matter of interest and of domain: they are Science & Technology scholars, not ethnobiologists. It is also due to the greater evidence that coproductionism has in Western societies, remarkably after the

Industrial Revolution. We do not think, on the other hand, that coproductionism is not applicable to Amazonia tribes of Indios, nor do we claim premodern societies weakly coproduced in their entirety. The point is another. In modern societies, coproductionism is more evident because the strong pole is more diffused. How can networks be stronger? Contemporary societies are differentiated from premodern ones because they have stronger networks with a higher quantity of non-humans at the service of humans (see Descola 2011, 70-71). They get power by the ever-growing associations of several actors. A certain description of nature is thus linked to a certain law, which is linked to the community of judges and policemen who derive their power from the weapons industry that produces their guns. Our societies are what they are because they constantly work on allying science with politics, societal needs, instances of morality, law, and other institutions. To sum it up, *from weak to strong coproductionism, there is an ever-growing association of different actors*. The more numerous and the more differentiated they are, the stronger the resulting networks will be.

#### Examples of Weak and Strong Coproductionism: From Zoology to Benjamin Whorf

Society and culture, we have argued, are always present in any analysis of nature that any human civilization can carry on. What varies is the number of institutions and the degree to which they are present in a given discourse about nature. To illustrate these variations, let us take some examples from human knowledge of animals (“moderns” know this discipline as zoology) in order to show the possible movement from the weak pole to the strong one. We will begin with some cases of strong coproductionism.

The first cases are those in which an animal species is important for a human community for more than one reason. In China, snakes are simultaneously a kind of food, a Zodiac symbol and a medicine tool, whereas in Hungary ovines are a kind of food, a symbol of Satan and a musical instrument, a bagpipe called the Hungarian *duda*. Such examples are endless. Nevertheless, I wish to focus on a Western “modern” example: the determination of species and subspecies and the implications that taxonomy has on conservation policies by governments and organizations.

Biologists utilize several tools to tell apart species and subspecies in the five kingdoms. For animals, until recently there were just morphological, ethological, distributional and reproductive tools on which biologists could found their conclusions. Today, the most widespread tool, as well as the most reliable one, is DNA analysis (mitochondrial and nuclear). Now, the job of taxonomists in classifying living beings’ taxa is not simply an interesting topic capable of giving a certain intellectual pleasure to naturalists. Its utility does not lie uniquely in that it is only once you know what you have in front, that you can deal with it and ask questions about it. The implications of nomenclature are indeed highly political too. To discover an endemic species on an island, where it is scarce and



endangered, normally generates the mobilization of authorities, or at least of scientists and volunteers, in order to enrich conservation conventions and local protection policies, finalized to care for that “new” species. This should lead to the activation of conservation programs, such as the institution of reserves and parks, or projects of captive reproduction and then reintroduction of offspring into the wild. This is a clear case of strong coproductionism in zoology.

Another similar case of such a genre is the one about CITES and the elephant mentioned in Thompson (2004). The African elephant (*Loxodonta africana*) is now treated by CITES, according to the subpopulations in the Continent, as if it were divided into different species. Normally the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) has just one way to manage a single species, but some African countries maintained in 1997 that *L. africana* be downgraded from Appendix I to Appendix II of the Convention, which means that if at the beginning of its protection, the African elephant could not be killed and traded in any way, now it could at certain conditions. What brought this was not a purely scientific fact of statistical data on populations, nor just conservationist considerations, but also economical and political reasons, as well as national identities issues:

The position that sustainable utilization of certain elephant populations was viable kept resurfacing, and managed gradually to become the position associated with the growing demand in conservation for social justice for developing countries. [...] The argument gained ground that if environmentalists and others in the West were so keen to see elephants saved, they should help pay for them to be saved, including compensating those actually living with the elephants for their care of the elephants and for elephant-inflicted losses. Short of meeting this obligation, conservationists and animal lovers in the West had no moral authority to prevent Africans from making elephants pay their own way in a sustainable trade. This North/South equity logic gradually became irresistible, and represented a shift from a universal endangered elephant to a global one whose preservation made different geopolitical demands on different people in different places (*Ibidem* 74).

In terms of weak examples, we have already given the case in which a batrachologist describes a new species of salamander, and the same can be said for an entomologist describing a new spider, or for a primatologist describing a new lemur. This same salamander, spider or lemur, could be important for a local sympatric human tribe for religious, mythological, or economic reasons. But for the, say, German scientist who analyses it in his laboratory in Cologne, the significance of that new species can be “purely scientific”, especially if it has no apparent threat in the wild, and thus does not need any conservationist effort, nor does it have a pharmaceutical interest for the production of a new medicine. What we will do in the following part is show that any discourse about nature is filtered by a culture. Even in the case in which a certain animal or plant species has no alimentary, symbolic or political interest for a human group, the analysis that the latter does of it is nevertheless passed through some cultural lens.

An entire discipline, ethnobiology, can be utilized as an example. If we take the essential of American linguist Benjamin Whorf’s thesis,

according to which language, socially and historically formed, changes the way people understand reality, and if we leave aside the controversial aspects of such an idea, we could best understand what coproductionism is at its most fundamental level, and thus at its weakest pole. Whorf (1979, 207) asserts that every person, lay or expert, has a set of opinions about the way language functions. Whorf calls this set of opinions “natural logic” or “common sense”. Its defect is the incapability to show background, underpinning philosophy of grammars. Only the linguist, when finally comparing different languages (especially if from different families), is able to gain consciousness of deep grammar characteristics, invisible hitherto. Common sense believes thought to be universally independent from language. But the linguist, according to Whorf, recognizes that “each language is not merely a reproducing instrument for voicing ideas but rather is itself the shaper of ideas” (*Ibidem* 212). What Whorf says right after, which is the core of his thesis, resembles Descola, who will say the same thing years later and about whom we will talk about in conclusion of this third section:

We dissect nature along lines laid down by our native languages. The categories and types that we isolate from the world of phenomena we do not find there because they stare every observer in the face; on the contrary, the world is presented in a kaleidoscopic flux of impressions which has to be organized by our minds – and this means largely by the linguistic systems in our minds. We cut nature up, organize it into concepts, and ascribe significances as we do, largely because we are parties to an agreement to organize it in this way – an agreement that holds throughout our speech community and is codified in the patterns of our language (*Ibidem* 213).

What else is this but an affirmation of coproductionism *ante litteram*? In another article-chapter of the aforementioned book, Whorf states that, if asked about his conceptions of natural events without having any scientific knowledge, a man would answer that his beliefs of a flat earth and of stars “coming out” at night as rabbits are obvious, commonsensical beliefs. Whorf’s interpretation of such an answer is that “[his beliefs] satisfy him because they are completely adequate as a *system of communication* between him and his fellow men. That is, they are adequate *linguistically* to his social needs” (*Ibidem* 251). Even more, “his explanation of why he should have such and such thoughts before he came to utter them again turns out to be merely the story of his social needs at that moment” (*Ibidem*). Now, Whorf also gives much importance to science, affirming that such a consciousness from linguistics has remarkable implications for scientists, “for it means that no individual is free to describe nature with absolute impartiality but is constrained to certain modes of interpretation” (*Ibidem* 214). He then claims, “What surprises most is to find that various grand generalizations of the Western world, such as time, velocity, and matter, are not essential to the construction of a consistent picture of the universe” (*Ibidem* 216). Analyzing Hopi language, he explains it is a sort of timeless language, which varies with the observer and has zero dimensions. And in a famous example, later rejected, he conducts

a mental experiment to imagine a physics based on this different conception of time (*Ibidem* 217).

Even being aware of the successive critics moved to Whorf, among which the refusal of his famous example of the many names that Eskimos would have for snow (Pullum, 1991, Martin, 1986), the refusal of the timeless conception of physical world by Hopis (Malotki, 1983), as well as the lack of empirical proofs to his hypothesis, grounded only through anecdotal cases (Brown & Lenneberg, 1956), I propose to see Whorf's hypothesis, not literally, but for its suggestive power, as another way to express coproductionism, and *a fortiori* constructivism. In spite of his insufficient or incorrect enunciations, and notwithstanding the probably legitimate confutations of his particular examples, the general idea of a relation between the language as a socio-historical product of a human community and the influences that it can have on the interpretation of nature can still be considered heuristically valuable in STS field and to the serious researchers who are conducting empirical and rigorous investigations in the direction of Whorf's original relativism in psycholinguistic and other domains, a few of whom will be cited briefly below.

We can ask how Whorf sees language, whether chronologically and logically *anterior* in the development of an individual and of a society or not. At this regard, he writes:

Which was first: the language patterns or the cultural norms? In main they have grown up together, constantly influencing each other. But in this partnership the nature of the language is the factor that limits free plasticity and rigidifies channels of development in the more autocratic way. [...] Language thus represents the mass mind; it is affected by inventions and innovations, but affected little and slowly, whereas *to* inventors and innovators it legislates with the decree immediate (*Ibidem* 156).

Even if he seems to avoid the logical contradiction of a language anterior to society, he clearly considers it so for the individual. Recent researches show an initial period of one year during which babies have no language barriers that impede their way of seeing reality in one way or another. Only later, what will be their mother tongue will influence their interpretation favoring one reading of phenomena at the expense of another (Cromie, 2004).

Likewise, Levinson (1996, 353) showed “that systems of spatial reckoning and description can, in fact, be quite divergent across cultures, linguistic differences correlating with distinct cognitive tendencies”. He detected three ways of space categorization, which some cultures combine and others do not. For example, “in the Australian language Guugu Yimithirr the vertical dimension is a major axis that has no topological, contact-only expression: ABOVE and ON are not distinguished and IN is expressed by metaphor” (*Ibidem* 364). This tribe has only a “north”, “south”, “east”, “west” system of categorizing positions. This absolute or cardinal directions system brings the members of this population to localize better than a European speaker in the open, vast spaces, but they have some difficulty in small spaces where a direction system based on the observer would work better. “For us, a cup to the left of a bottle

becomes a cup to the right of a bottle when we walk around to the other side of the table, but in an absolute system the cup remains, say, north of the bottle from any viewpoint” (*Ibidem* 373).

Whorf’s successors have identified in his texts passages where the linguistic determinism or relativism is strong and passages in which it is more weakly stated. The strong form, according to which language *determines* thought, has been almost unanimously rejected by posterior linguists. A form of weak relativism, in which language *influences* thought, has been instead proven to be plausible, as by the work of Levinson. What is interesting for us to note here is that Whorf’s relativism and its legacy could be supported by coproductionism authors, for they can furnish to the latter ones an ulterior and more basic argument to found their theory.

In conclusion, for a wide philosophical reading of such a matter, as Descola (2011, 76-77) says, it is not time anymore to follow traditional epistemology who used to oppose a unique, true world to the several different ways in which everyone of us represents it:

It is more plausible to admit that what exists outside our body and interfacing it, presents itself under the tokens of a finite whole of qualities and relations that can or cannot be actualized by humans, according to circumstances as well as to the ontological options that guide them. This to abandon the idea of a complete and autonomous totality, waiting for being represented and explained according to different points of view. Material and immaterial objects of our environment are to be considered neither Platonic prototypes ready to be captured more or less completely by our faculties, nor pure social constructions that would give meaning and shape to a rough material. Rather they are packages of qualities, some of which are detected and others are not (*Ibidem*).

Whorf’s determinism attributed to language is very likely excessive, i.e., when Whorf claims that “A change in language can transform our appreciation of the Cosmos” (Whorf 1979, 263). Nevertheless, Descola’s position is not that different from Whorf’s when the latter author states that “Each language performs this artificial chopping up of the continuous spread and flow of existence in a different way” (*Ibidem* 253). The present discussion was to defend the existence of something like a “weakest form” of coproductionism, proving at the same time its ever, unavoidable and constitutional presence in any of our relations to nature. With this, we wanted to agree with constructivism in general and with the omnipresence of coproductionism of sciences and society, by simultaneously showing that the main STS interests are generally focused on knowledge whose tight relation to society is evident, plural, and strong.

## Conclusion

Kuhn (1962) wrote that scientists working with different paradigms live in different worlds. This means that if intellectual tools of scientists change for some reason, such a fact alone leads to see the world differently. And scientific tools do not change without any relationship with the external world. They do it for some reason that is also related to something outside science, that is, societal sphere. Kuhn’s affirmation sheds light on how science is always related in

some way to society in its vast aspects. This, we believe, is the meaning of coproductionism and, more generally, of constructivism.

Now, what we have proposed in this paper is a degree of distinction between two ideal poles of coproductionism, a weak and a strong one. First, we have the case of some natural sciences with a minor connection to society and its institutions. Second, we have disciplines such as biochemistry, bioengineering, informatics, or nuclear physics, with all their implications for society and all its institutions. Such a distinction, implicit in most coproductionism and STS discourse in general, was to do justice to the sciences with a less evident relationship with societal institutions and that are a bit too neglected. We have proposed to ground the argumentation with other tools, particularly Mauss' definition of total social fact and ANT's notion of network strength. Through this very difference between a weak and a strong pole of coproductionism, we have intended it to be a universal phenomenon, both in time (premoderns and moderns) and in space (Europe, Amazonia or Australia). Finally, in coherence with coproductionist and constructivist bibliographical and theoretical overtures, we have suggested possible support to them from the legacy of Whorf's linguistic relativity, an alliance yet to be deepened and explored.

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#### References

- Beck, U. (2001). *La société du risque. Sur la voie d'une autre modernité*. Paris : Éditions Flammarion.
- Bonneuil, C., Joly, P. B., & Marris, C. (2008). Disentrenching experiment? The construction of GM-crop field trials as a social problem. *Science, Technology and Human Values*, 33. (pp. 201-229).
- Brown, R. & Lennenberg, E. H. (1954). A study in language and cognition. *Journal of abnormal and social psychology* 49: 454-462 <<http://www.jstor.org/stable/675777>>.
- Callon, M. (1986) Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay. In Law, J., *Power, Action and Belief: A New Sociology of Knowledge* (pp. 196-233). London: Routledge & Kegan Paul.
- Collins, H. M. (1980). *Changing Order: Replication and Induction in Scientific Practice*. Chicago: University of Chicago Press.
- Cromie, W. J. (2004) Which come first, language or thought? Babies think first. *Harvard University Gazette*: <<http://www.news.harvard.edu/gazette/2004/07.22/21-think.html>>.

- Dennis, M. A. (2004) Reconstructing sociotechnical order. Vannevar Bush and US science policy. In Jasanoff, S., *States of Knowledge. The co-production of science and social order* (pp. 225-253). London & New York: Routledge.
- Descola, P. (2011) *L'écologie des autres. L'anthropologie et la question de la nature*. Versailles: Éditions Quæ.
- Gaudillière, J. P. (1997). The living Scientist Syndrome: Memory and History of Molecular Biology. In Soderqvist, T., *The Historiography of Contemporary Science and Technology* (pp. 109-128). Amsteldijk: Harwood Academic Publishers.
- Hilgartner, S. (2004). Mapping systems and moral order. Constituting property in genome laboratories. In Jasanoff, S., *States of Knowledge. The co-production of science and social order* (pp. 131-141). London & New York: Routledge.
- Jasanoff, S. (2004a) *States of Knowledge. The co-production of science and social order*. London & New York: Routledge.
- Jasanoff, S. (2004b). The idiom of co-production. In Jasanoff, S., *States of Knowledge. The co-production of science and social order* (pp. 1-12). London & New York: Routledge.
- Jasanoff, S. (2004c). Ordering knowledge, ordering society. In Jasanoff, S., *States of Knowledge. The co-production of science and social order* (pp. 13-45). London & New York: Routledge.
- Jasanoff, S. (2004d). Afterword. In Jasanoff, S., *States of Knowledge. The co-production of science and social order* (pp. 275-282). London & New York: Routledge.
- Kuhn, T. S. (1962). *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press.
- Latour, B. (1988). *The Pasteurization of France*. Cambridge: Harvard University Press.
- Latour, B. (1993). *We Have Never Been Modern*. Cambridge: Harvard University Press.
- Levinson, S. C. (1996). Language and Space, *Annual Review of Anthropology* 25: 353-382  
<<http://www.jstor.org/stable/2155831>>.
- Malotki, E. (1983). *Hopi Time: A Linguistic Analysis of the Temporal Concepts in the Hopi Language*. Amsterdam: Mouton De Gruyter Publishers.
- Martin, L. "Eskimo Words for Snow": A Case Study in the Genesis and Decay of an Anthropological Example, *American Anthropologist* 2: 418-423 <<http://www.jstor.org/stable/677570>>.
- Martin, E. (1991). The Egg and the Sperm: How Science Has Constructed a Romance Based on Stereotypical Male-Female Roles, *Signs* 16: 485-501 <<http://www.jstor.org/stable/3174586>>.
- Mauss, M., *Essai sur le don*, PUF, Paris, 2010.
- Miller, C. A. (2004). Climate science and the making of a global political order. In Jasanoff, S., *States of Knowledge. The co-production of science and social order* (pp. 46-66). London & New York: Routledge.

- Pullum, G. (1991). *The Great Eskimo Vocabulary Hoax and other Irreverent Essays on the Study of Language*, Chicago: Chicago University Press.
- Thompson, C. (2004). Co-producing CITES and the African elephant. In Jasanoff, S., *States of Knowledge. The co-production of science and social order* (pp. 67-86). London & New York: Routledge.
- Waterton, C. & Wynne, B. (2004). Knowledge and political order in the European Environment Agency. In Jasanoff, S., *States of Knowledge. The co-production of science and social order* (pp.87-108). London & New York: Routledge.
- Whorf, B. L. (1979). *Language, Thought, and Reality*. Cambridge: The MIT Press.
- Wynne, B. (1992). Misunderstood Misunderstanding: Social Identities and Public Uptake of Science, *Public Understanding of Science* 1: 281-304.