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## Abstract

Nancy Cartwright understands scientific explanation in terms of stable causes, which she calls “capacities” or “natures”. She has been criticized for her interpretation of Mill’s tendencies, for her stress on the individual causes, for the contrast between her empiricism and her metaphysical flavor (not always clear), and for her “local realism”. This paper will analyze those criticisms and will show that a greater reliance on Aristotle may help to answer those criticisms and to consolidate her proposals. Besides, Cartwright is more skeptical about the possibilities of causal explanation in the social realm than about its possibilities in the natural science. The explanation of this greater skepticism, however, is not clear at all. Then, the paper will also look for Aristotelian social capacities and will provide some Aristotelian arguments for Cartwright’s skepticism about their knowledge.

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Nancy Cartwright considera que la explicación científica debe realizarse en término de causas a las que denomina “capacities” o “natures”. Ha sido criticada por su interpretación de la noción de “tendencia” de John Stuart Mill, por su énfasis en las causas individuales, por el contraste entre su empiricismo y su tono metafísico (no siempre claro), y por su “realismo local”. Este trabajo analiza estas críticas y muestra que si Cartwright se apoya más en Aristóteles puede responder esas críticas y fortalecer sus argumentos. Aparte, Cartwright es más escéptica respecto a las posibilidades de la explicación causal en el ámbito social que en la ciencia natural. Una explicación a este mayor escepticismo se puede realizar acudiendo también a Aristóteles. En el trabajo se postulan “social capacities” aristotélicas y se ofrecen argumentos aristotélicos a favor del escepticismo de Cartwright.

Keywords: Nancy Cartwright, causality, epistemology of social sciences

*JEL codes:*

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## **1. Introduction**

A renewed interest concerning Aristotle's thought relevance for contemporary science can be observed. This indeed is happening on the political, moral and economic aspects of human life and society. Some Aristotelian insights have even influenced natural sciences. Aristotle's metaphysical and epistemological conceptions provide a rich frame of analysis of very different subjects. In the present day, the Aristotelian elements are often blended with other influences. Nancy Cartwright combines elements from Aristotle, with others of John Stuart Mill, and modern thinkers, as Elizabeth Anscombe, Patrick Suppes, Ian Hacking and Clark Glymour, among others.

In this paper I will address some tensions present in Cartwright's thinking, and I will propose that they might be overcome by a greater reliance on Aristotle and Anscombe's thought. These tensions, I will argue, obey in part to her reliance on Mill. Before enumerating these tensions, I will first devote some lines to Cartwright's position.

Cartwright understands scientific explanation in terms of stable causes, which she calls "capacities" or "natures" (Cartwright 1992: 71, nt. 7). Cartwright's program aims at defining what capacities are (ontology), how they are known (epistemology), and how we use them (Cartwright 2007b: 1). In this paper I will concentrate on the first two topics.

Cartwright opposes Hume's reduction of causality to regularity of mere associations: "The generic causal claims of science are not reports of regularities but rather ascriptions of capacities, capacities to make things happen, case by case" (1989: 2-3), she states. Cartwright also opposes covering-law supporters because they do not consider causes; they merely include the so-"probed" singular case within a general covering law. Otherwise, Cartwright agrees with Mill's proposal of "tendencies" which she identifies with her "capacities". She states: "I suggest that the reader take my 'capacity' and Mill's 'tendency' to be synonymous" (Cartwright 1989: 170). According to Cartwright, Mill's tendencies are not tendencies of events but tendency factors or stable real causes. These tendencies or capacities may give rise to Cartwright's so called "nomological machines", "stable configurations of components with determinate capacities properly shielded and repeatedly running" (2001: 292; see also 1999: Chapter 3, 50).

Cartwright's proposal has been criticized in different ways. Margaret Morrison (1995) highlights some tensions in Cartwright's thought. First, she notes a tension between the singular and universal aspects of capacities (1995: 163). Cartwright looks for "a concept stronger and more general" than Humean laws (1989: 145), "not just epistemological but metaphysical as well (...) much like essences" (1989: 146), but she puts singular causes first. Second, Morrison also sees in Cartwright a conflict between her empiricism and capacities. For singular capacities to be stronger than Humean general laws supposes a metaphysical commitment that makes verification unnecessary. How could a person be empiricist and metaphysic at the same time? Finally, Morrison considers that Mill's "tendencies differ in important way from Cartwright's capacities" (1995: 166). In my opinion, Cartwright's reply (1995) is satisfactory (and will be developed in the paper). Another point of criticism (i.e., Emma Ruttkamp 2002: 121; William R. Minto 1997) is her "local realism" (Cartwright 1999: 23) a disunified view of sciences. This vision owes mainly to Neurath (see Hands 2001: 78, 313), and is very well illustrated by Figure 0.2 (p. 8) of *The Dappled World* (Cartwright 1999). This figure represents a set of balloons (each balloon being a science), filled with gas and floating in the sky, but tied with threads to objects on the ground (trees, signals, lights, or another thread). (I agree with an Aristotelian interpretation of this representation that I will introduce further in the paper). The final criticism that I will consider is her skepticism about the possibility of explanation in social sciences (see Reiss 2002).

In the paper, I will first analyze the Cartwright – Mill connection, then the Cartwright – Anscombe and finally the Cartwright – Aristotle connection. I will show that both Anscombe and Aristotle, as recognized by her, have strongly influenced Cartwright. The tensions mentioned above will be solved by Cartwright's arguments, based in Anscombe and Aristotle, and by complementary Aristotelian elements. I will also argue, from an Aristotelian perspective, against those criticisms, and for the skepticism of Cartwright concerning a successful explanation in natural and (mostly) in social sciences.

The problem of her interpretation of Mill will be tackled in the next section about the Cartwright – Mill connection. The problem of the tension singularism-universalism, will appear in the section about the Cartwright – Anscombe connection. The tension empiricism-metaphysics, and the problem of her disunified view of science, in the section about the Cartwright – Aristotle connection. This last section will also include an Aristotelian account and development of the statements of Cartwright concerning social sciences. Thus, the conclusion will be that there is still much we can learn from Aristotle with respect to economics and social theory. Some topics will remain open; they could probably be defined only by Cartwright herself.

### **The Cartwright – Mill connection**

“[M]y views and arguments are essentially the same as Mill’s in modern guise” (Cartwright 1989: 8), Cartwright states. She exposes Mill proposal to deal with causes in different causal situations (1989: Section 4.5, pp. 170-9). Mill’s tendency, according to Cartwright, corresponds to “the essential behaviour of a factor” (1989: 203).

In Book III, Chapter X of his *System of Logic*, “Of the plurality of causes, and of the intermixture of effects”, Mill considers that one phenomenon could be caused by different causes: “it is not true, then, that one effect must be connected with only one cause, or assemblage of conditions” (1882: 311). One phenomenon may involve a concurrence of causes. This may happen in two different ways. In the first way, the different causes act modifying or interfering their effects, thus constituting a compounded causal action. Mill exemplifies this by the joint operation of different forces in mechanics. In the other case, “illustrated by the case of chemical action, the separate effects cease entirely, and are succeeded by phenomena altogether different, and governed by different laws” (1882: 315). In the first case, Mill expresses the action of each cause by saying that “it *tends* to move in that manner even when counteracted” (1882: 319: italics in the original). And he concludes: “All laws of causation, in consequence of their liability to be counteracted, require to be stated in words affirmative of tendencies only, and not of actual results” (1882: 319). Cartwright (1989: 179) then states: “ultimately I think Mill’s view has to be

that the fundamental laws of nature are laws that assign stable tendencies to specific causes.”

A few words on Mill’s thinking about social sciences and Political Economy should be added to understand the problem here involved.<sup>1</sup> In the Book VI of his *System of Logic*, “On the Logic of the moral sciences”, Mill describes the difficulties of knowledge in these sciences, given the complexity of their subject, the innumerable influencing circumstances and its modifiable character. It is extremely difficult to arrive at “the ultimate laws of human action”, i.e., causal laws in this realm (1882: 597).

The only thing we can do in each branch of these human sciences is to propose hypothesis or *axiomata media* (originated inductively by our general knowledge of the topic of study), in accordance with the previous highest – and also hypothetical – generalizations about human nature, that have to be verified (or not) by empirical laws. The first part (two first steps: hypothesis and deduction) of the method is called *a priori*, and the last one *a posteriori* (1882: 605). The whole method is called *Deductive* (1882: 599). This method is applicable only when the plurality of causes is of the mechanical kind, i.e., a composition of causes. When the plurality is of the other kind, the chemical-like one, the only possible method is experimental, in order to try to isolate the different influencing factors; but this is impossible given that we cannot do experiments in the required conditions specified by Mill (1882: 610-3).

Mill affirms that there is one branch of social science that can be studied according to the Deductive method: namely, Political Economy. This is because a main motivation of action in this field can be identified, i.e., the desire of wealth; thus, we can apply this method, explain and even predict. He recognizes, however, that “there is, perhaps, no action of a man’s life in which he is neither under the immediate nor under the remote influence of any impulse but the desire of wealth” (1882: 624). It will be “absurd” that any political economist tried to apply to a particular case his conclusions. These derive from treating the considered end as the sole end which is unrealistic (1882: 624-5; see also 1874). Mill adds: “This approximation has then to be corrected by making proper

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<sup>1</sup> For a good exposition of this topic, see Hausman 1981 and 1992, pp. 123-151, and Hands 2001, pp. 14-25.

allowance for the effects of any impulses of a different description” (1882: 625). The Deductive method of Mill resembles the Exact Method of Carl Menger (quoted by Cartwright 1989: 3 and 2002: 147) and Cartwright’s deductive-nomological machines.

As affirmed in the Introduction, however, Cartwright has been criticized for her interpretation of Mill. In addition to Morrison, Christoph Schmidt-Petri (2008) thinks that Cartwright’s capacities are significantly different from Mill tendencies which are as well problematic in the context of Mill’s whole thinking. According to Schmidt-Petri, Mill uses tendencies for methodological entirely practical reasons rather than for metaphysical reasons (2008: 2). These tendencies do not endorse the realism of Cartwright’s capacities (2008: 12). Cartwright’s reading of Mill on this point is different; but this is a difficult topic, i.e., the metaphysical (or not) character of Mill’s tendencies, that cannot be clarified in this paper. Nevertheless, there is another problem: the internal inconsistency of speaking of real causes in a Humean like context, as it is Mill’s.

This last point is considered by Cartwright (1989: 178-9). She quotes Peter Geach on this point, but she ultimately underestimates the possible inconsistency. Geach (1961: 103) opines that Mill, confronted with the facts, was obliged to affirm the existence of these real tendencies. But he complains about finding this doctrine “mixed up with an entirely incompatible Humian invariable-succession theory.”<sup>2</sup> The point about this “unofficial doctrine of tendencies” is also made by Quentin Gibson (1983: 298): it “is inconsistent with his view of laws as invariable sequences.”<sup>3</sup>

The specialists on Mill also hold the position that Mill was fundamentally a Humean about causality. The concept of cause in its basic sense, affirms Fred Wilson (2007: 12), is acquired through our experience of matter-of-fact regularity: it is one that relates phenomena to phenomena and not phenomena to *noumena*. A law is a regularity; to explain a fact is to put it under a law. “The ideas are joined to form a judgment of

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<sup>2</sup> He adds that Mill’s tendencies are very close to Aquinas doctrine of *inclinationes* or *appetites* in nature – interestingly, because these *inclinationes* are also very close to Cartwright’s capacities of nature (cf. Geach 1961: 104-5).

<sup>3</sup> Dan Hausman in a personal conversation (January 18, 2008) told me that he also considered that Mill’s theory of causality is inconsistent. Cartwright has found Mill’s notion of ‘tendency’ fitting with her views. But it is not really Mill but Cartwright.

regularity, a causal judgment” (2007: 18). According to Craig Dilworth (2006: 14), “in the spirit of Hume and in defiance of common sense, Mill (...) identifies causality with succession”. He also explains how N. R. Campbell attacked Mill for his Humean conception of causality as succession (2006: 27). John Skorupski (1989: 175) states: “He [Mill] regards causation exclusively as a relation between phenomena. Uniformities in the spatio-temporal relations among phenomena are all we can know. If there are ‘metaphysical’ causes – causes lying ‘behind’ natural phenomena – we can know nothing of them; nor need they be taken into account in the analysis of inductive reasoning”. Geoffrey Scarre (1998: 114) considers Mill’s scientific project as “metaphysically abstemious in its construal of causes as constant conjunctions, devoid of any hint of a priorism in the definition of scientific ideas, and disposed to evaluate successful science in terms of its provision of law-like generalizations to explain phenomena”. Notwithstanding, Scarre differs from Skorupski when he states that for Mill theories “were more than conceptual devices for instilling order in the observational data and for facilitating predictions of phenomena” (1998: 130). For Scarre, they had a realistic aim of representing the world as it actually is (cf. 1998: 135).

An “old” paper by Robert McRae (1948) considers a change in Mill’s conception of causality. First, we have the Mill recipient of Berkeley and Hume. Mill, who I now quote, states: “when I speak of the cause of any phenomenon, I do not mean a cause which is not itself a phenomenon; if I make no research into the ultimate or ontological cause of any thing (...) Between the phenomena, then, which exist at any instant, and the phenomena which exist at the succeeding instant, there is an invariable order of succession (...) To certain facts, certain facts always do, and, as we believe, will continue to succeed. The invariable antecedent is termed the cause; the invariable consequent, the effect” (1882: 236-7). Then, however, in the same book, “after defining the causal relation as invariable succession between phenomena, Mill introduces considerations which are incompatible with that definition” (McRae 1948: 242). Mill realizes that there are cases in which the temporal succession is not the sign of causality (e.g., day and night). Mill concludes some pages later: “Invariable sequence, therefore, is not a synonymous with causation, unless the sequence, besides being invariable, is unconditional” (Mill 1882: 245; see also 582 –Book VI). Further on we find the statements about tendencies that we have analyzed before.

I will here add some points that Cartwright might not agree with. The first one is Mill's absolutely strict methodological individualism – noted by Daniel Hausman 2001: 302, Skorupski (1989: 275 and 281) and Wilson (1998: 239-45 and 2007: 31-32, 34). The Deductive Method by considering separately each cause-effect relation supposes a denial of the social relation as another cause or factor socially relevant. Or in Hausman's words, "to speak, as Mill does, of a deductive method, is misleading because the law governing the conjoint operation of causes cannot be deduced from the laws governing the component causes separately" (2000: 302). This, I think, is another inconsistency of Mill because he then recognizes that there is a mutual interaction between effects and causes, which makes explanation even more difficult (1882: 632). Cartwright, I have affirmed, would not agree with this methodological individualism (see e.g. Cartwright 2007a: 26 and 75). However, one may wonder whether her nomological machines with stable causes acting individually and composing effects are not analogous of Mill's methodological individualism.<sup>4</sup> The nomological machine analogy is not an organic analogy (Cartwright 2001: 290). This doubt, however, does not seem to be compatible with Cartwright's following description of nomological machines: "The machines of interest here involve a relatively stable arrangement of parts which gives rise to a number of interconnected causal processes inside the machine plus some kind of skin or shield that limits access to the internal variables under a variety of common circumstances" (2007a: 18).

The second point is Mill's determinism. The word "determinate" continuously appears in Mill's *Logic*. It is a point also highlighted by scholars dedicated to Mill's thought (cf. Wilson 1998: 205, 251; 2007: 20). The spirit of Cartwright's proposals seems deeply contrary to determinism (see, e.g., 1999: 6, 110 about our "messy world").

The third point is Mill's strict Humean separation of fact and ought statement, of science and art (1882: 653-4). Art deals with ends and science with the means (a separation that Economics will inherit). In this case, the entire spirit of Cartwright's thinking makes me doubt whether she would agree with this strict separation. Besides, Wilhelm Hennis (1973: 137-8) suggests that this is also an inconsistency in Mill's thinking because, there is a firm

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<sup>4</sup> As Daniel Hausman has suggested me in a personal conversation.

contrast between his affirmations in the *Logic* and his extensive use of values and the dialectic method in his political and moral writings such as *On Liberty* and *Considerations on the Representative Government*. Schumpeter also considers that in Mill's political economy there is a difference between Mill as methodologist and Mill as dealing with economic facts.

Another difference between Mill and Cartwright is pointed out by Wade Hands (1994: 757-764). Cartwright empiricism, says Hands, is a practical one. Given the concepts of under-determination and theory-ladenness, we "take the naturalist turn and accept the actual practice of science in determining what science is" (Hands 1994: 760). Scientists believe in and intervene with capacities (1989: 168-9, 1992: 60-1). Thus, Cartwright is willing to accept things that do not live up to strict empiricism because scientists accept such things. Mill instead is first empiricist and then naturalist. As Hands very well expresses it, for Cartwright "the final court of appeal for philosophical debates about science is the actual practice of science (...). [W]hat science is must be regulated by the practice of science, and she argues repeatedly that real practicing scientists actually do presuppose that capacities and causal powers exist in systems they study" (2001: 313 and 315). Hands attributes this to Neurath's influence (see Cartwright 2007a: 11 and 48). In this point Cartwright's thought greatly resembles Ian Hacking's (1983: 31 and Chapter 16) as she recognizes (e.g., 1999: 5, 34).

The conclusion is that Mill's ideas about the nature of causality and, consequently, about the methodology of science, are inconsistent. Within this confusion, Cartwright has taken the ideas that she shares with him. This is genuine and there is probably a coincidence between the realist Mill and Cartwright. But she has too quickly discarded the other – probably most genuine – Mill, the Humean Mill. In fact, after having relied relevantly on Mill in *Nature's Capacities and its Measurement* (1989), Cartwright quotes Mill only four times in *The Dappled World* (1999), and two times in *Hunting Causes* (2007b).<sup>5</sup>

### **The Cartwright – Anscombe Connection**

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<sup>5</sup> She quotes Mill four times in *How the Laws of Physics Lie* (1983) for the same reasons that in *Nature's Capacities*.

At the beginning of the first chapter of her last book, *Hunting Causes* (2007b: 11), Cartwright states: “The central idea behind my contribution to the project [on causality at LSE] is Elizabeth Anscombe’s”. Cartwright refers to Anscombe’s Inaugural Lecture at the chair that had been held by Wittgenstein at Cambridge, entitled “Causality and Determination” (Anscombe 1971). In this Chapter, Cartwright highlights the individual character of causality and the plurality of causes. She concluded by affirming: “I have presented the proposal that there are untold numbers of causal laws, all most directly represented using thick causal concepts, each with its peculiar truth makers” (2007b: 22).

After this, in *The Dappled World* (1999) she had dedicated Chapter 5, “Causal diversity; causal stability” “to Elizabeth Anscombe, from whom I learned” (1999: 135). The context of this chapter was also to show the topics of the particularly and multiplicity of causes: “there is a great variety of different kinds of causes and (...) even causes of the same kind can operate in different ways” (1999: 104). She had also quoted the same paper of Anscombe in *Nature’s Capacities and their Measurement* in this context: “often the operation of a cause is chancy: the cause occur but the appropriate effect does not always follow, and sometimes there is not further feature that makes the difference” (1989: 105).

Cartwright, as mentioned, also quotes Geach’s essay on Aquinas at an insightful book written by Anscombe and him, *Three Philosophers*. The other philosophers are Frege and Aristotle. Thus, it is likely that Cartwright has read Anscombe’s essay on Aristotle in this book. Anscombe studied with Wittgenstein and was one of his literary executors (she translated him and wrote *An Introduction to Wittgenstein’s Tractatus*). She was, however, an Aristotelian and her most famous book, *Intention*, inspired by Aristotle, became a philosophical classic.

In the essay quoted by Cartwright, “Causality and Determination” (Anscombe 1971), Anscombe argues two main theses. The first is that she “refuse[s] to identify causation as such with necessitation” (1971: 88). “Causality” she affirms – warning that may sound obvious –, “consists in the derivativeness of an effect from its cause” (1971: 91-2). And she reasons: “it’s not difficult to show it prima-facie wrong to associate the notion of cause

with necessity or universality (...). For it being much easier to trace effects back to causes with certainty than to predict effects from causes, we often know a cause without knowing whether there is an exceptionless generalization of the kind envisaged, or whether there is a necessity” (1971: 91).

Related to this is the possibility of observing causality in individual cases Anscombe argue in two ways. First, she writes, we actually use many causal terms in ordinary language. The idea of causality comes from an abstraction that begins with particular observations of different kinds of singular causations: “scrape, push, wet, carry, eat, burn, knock over, keep off, squash, make, hurt” (1971: 93). And this happens at such degree that if a language would not included causal verbs we would not be able to speak about the world. Second, it is the problem of induction. We cannot obtain a singular cause from a generalization. Adding the clause “if normal conditions hold” is too vague. The task of excluding all the required circumstances cannot be carried out. We do not know if we know all them.

The second thesis is an argument against determinism and for indeterminism; she also establishes a classification of the latter. She distinguishes between being determined in the sense of pre-determined and determinate. What has happened is determined once it happens and this is obvious (this is the sense in which Aristotle affirms that the past and present are necessary). What she is concerned with is pre-determination. Here is when another distinction arises: there are non-necessitating causes, “one that can fail of its effect without the intervention of anything to frustrate it” and necessitating causes, that that only can be frustrated by interference. Her definition of indeterminism is the thesis that not all physical effects are necessitated by their causes. This does not mean, however, that the indeterminate effects have no causes (1971: 101). The Aristotelian account of causes will explain this non-necessitating cause.

This Anscombe doctrine of causation seems to fit with Cartwright’s ideas. First we observe singular causality, then we look among causes those that are stable, and finally we could have a law and a set of causal laws or capacities – a nomological machine – that would hold if there were not interferences. There is a plurality of causes, and indeterminism may hold even in the physical realm (see Newman 1995: 277 on Cartwright’s denial of

ontological determinacy). Actually, Adrian Heathcote and D. M. Armstrong (1991) while maintaining that there can be a singular identity between a cause and a law but established a posteriori, and contingent, quote both Anscombe (1971) and Dupré and Cartwright (1988).

The reply of Cartwright to Morrison (1995) concerning her possible tension between singularism and universalism resounds to Anscombe. Cartwright states: “I would say that our central usage of tendency terms supposes that the association of tendencies with properties or structures (...) need not be universal; it may hold across certain regimes or domains. But within the domain in which the claim of association can be regarded as true, the tendency when appropriately triggered will always operate unless there is a good physical reason why not” (1995: 179-180). She is referring to necessitating causes in this case. Cartwright seems also to consider Anscombe’s non-necessitating causes: “But the exercise of a capacity need not occur universally upon triggering even when nothing interferes” (2007a: 20; cf. also 2, 4, 50-1).

There are two other points I would now like to make. First, Cartwright does not take into account – nor does she deny it – the relationship between human freedom and determinism. One may wonder whether in this point Cartwright follows Mill who is determinist (1882: 581 ff.). The differences between the natural and the human realm seem to be only of complexity given the plurality and the unpredictable character of the causes. Anscombe states that physical indeterminism is indispensable for human freedom – we cannot be free if we do not have some control over our own physical activity. She adds, however, “but certainly it is insufficient. The physically undetermined is not thereby “free”. For freedom at least involves the power of acting according to an idea”; this goes beyond mere un-predetermination of an in-deterministic physics (1971: 102). Here we have a reason for the greater complexity of human affairs that Cartwright states; but she does not explain it. There seems to be a lot of room for freedom in Cartwright’s thought (for example, this seems to be underlying Cartwright and Del Seta 1997). However, would she consider that freedom explains something in social sciences? I will come back to this topic in the next section.

A second point is that Anscombe's position supposes a strong metaphysical commitment regarding causes which Cartwright shares. But in some occasions she leaves aside this commitment (e.g., 1992: 47-8, reprinted in 1999: 81; 2001: 277). This is not sensible because it involves returning to what she is criticizing; instead of a kind of general nominalism we would have a singular nominalism. We cannot work with "as if natures or capacities" clauses because if in fact they are not real the whole project of Cartwright would make no sense. Doing a balance, however, Cartwright's metaphysical commitment is clear (see e.g. 1989: 136, 139, 140, 142, 146, 147, 197, 223, 226; 1992: 51; 1995: 181; 2007a: 7, 11, 28, 32; 2007b: 49, 132, 250). For example, she affirms: "we aim in science to discover the nature of things" (1999: 181): "capabilities are more than modalities; they are something in the world" (1989: 181). I share the idea about a clear metaphysical compromise of Cartwright with Andrew Newman (1995). He realizes that "Nancy Cartwright keeps her distance from the usual categories of metaphysics (...) Nevertheless, her arguments definitively favour realist metaphysical views" (1995: 274-5).

### **The Cartwright – Aristotle connection**

Aristotle is an author often quoted by Cartwright. These quotations indicate she knows Aristotle's writings and thought. She cites the *Physics*, the *Metaphysics*, the *Nicomachean Ethics* and his scientific treatises. Her acknowledgment of Anscombe reflects another trait of Aristotelianism. In *How the Laws of Physics Lies* she quoted Aristotle, first "analogically", to indicate that there is a trade-off between generality and truth (quoting the *Nicomachean Ethics* -1983: 9). Then she uses a passage of *Metereologica* as example of idealization (1983: 110). Finally she cites the famous Aristotelian passage about chance – *Physics* II, 5. In *Nature Capacities* Aristotle is one of the authors most cited along with Mill, Glymour, Hume and Einstein. For example, she adopts Aristotelian abstraction (1989: 197-8), and she uses his classification of four causes (1989: 211-214 and 218-226). She also affirms that her conception of capacities has Aristotelian resonances (1992: 45-8, 69, 1999: 72; 2001: 277, 290).

In Chapter 3 of *The Dappled World*, "Nomological Machines and the laws they produce" she explains that capacities are basic, and that the laws of nature (necessary regular

associations between properties) permit on account of a system of components with stable capacities in particularly fortunate circumstances (nomological machines). This is also explained in Chapter 6 (reprinted with slight changes in 2001): “[The thesis that] I am most prepared to defend, follows Aristotle in seeing natures as primary and behaviours, even very regular behaviours, as derivative. Regular behaviour derives from the repeated triggering of determinate systems whose natures stay fixed long enough to manifest themselves in the resulting regularity” (1999: 149; 2001: 290). But, coming back to Chapter 3 of *The Dappled World*, she then answers: “What facts then are they that make our capacity claims true?” After providing some arguments (including a Max Weber’s expression), she concludes: “But so far I still think that the best worked out account that suits our needs more closely is Aristotle’s doctrine on natures, which I shall defend in the next chapter. Capacity claims, about charge, say, are made true by facts about what it is in the nature of an object to do by virtue of being charged. To take this stance of course is to make a radical departure from the usual empiricist view about what kind of facts there are” (1999: 72). Instead of the usual empiricist view she is adopting an “Aristotelian empiricist” view.

The view that most scholars hold about Aristotle’s doctrine on science originates in his account of a necessary, deductive science. Aristotle, however, only exceptionally – for example in logic and mathematics – deals with science in the way detailed in the *Posterior Analytics*. This is the book where Aristotle characterizes that kind of science. It is one of the books in the set of Logical books Aristotle called *Organon* (i.e. “instrument” of thinking). J. M. Le Blond, in his classic *Logique et Méthode chez Aristote*, maintains that “the books composing the *Organon*, are more concerned with *exposing* science in a rigorous way than with *doing* science. His scientific books, on the other hand, focus on research and they are the ones that reveal the method” (1939: 191). That is, the *Organon* contains a theory of science, while the scientific books are actual science that does not always follow the precepts of the theory. In fact, in his studies – especially biological (*On the Part of Animals*, *The History of Animals*), physical (*Meteorology*), and practical (Ethics and Politics) –, Aristotle allows plenty of room for experience and he does this in order to discover and also verify scientific principles. He says in *Generation of Animals* (concerning his observations about the generation of bees) that “credit must be given rather

to observation than to theories, and to theories only if what they affirm agrees with the observed facts” (III 10, 760b 31; cf. also *De Anima*, I, I, 639b 3 ff. and 640a 14 ff.). Causes are grasped by a sort of intellectual intuition – called abstraction – which presupposes experience but is not based on a complete enumeration of cases. Moreover, in some cases, one or a few cases suffice to abstract the universal. But they have to pass the test of verification. Le Blond shows how Aristotle uses experience in detailed observation as well as in experiment: “flux and reflux of the research going from facts to theories and from theories to facts” (1939, p. 242). This clearly explains why Aristotle states in *Nicomachean Ethics* (VI, 8) that “a boy may become a mathematician but not a philosopher or a natural scientist.” The reason, he adds, is that the philosopher and the natural scientist need experience. As he states in *On Generation and Corruption*, “[I]ack of experience diminishes our power of taking a comprehensive view of admitted fact. Hence those who dwell in intimate association with nature and its phenomena are more able to lay down principles such as to admit of a wide and coherent development” (I 2 316a 5-8). That is, experience plays a fundamental role in Aristotle’s real science, but an experience that allows us to reach real causes. This is my interpretation of what Cartwright is proposing, and answers Morrison’s concern about how to be an empiricist and a metaphysician at the same time.

Chapter 4 of *The Dappled World* (1999) is taken from Cartwright’s “Aristotelian Natures and the Modern Experimental Method” (1992). Here she persuasively shows that what science actually does by studying “the inner constitution [of things and events] is a study of an Aristotelian-style nature” (1992: 69; 1999: 102). “Still, I maintain, the use of Aristotelian-style natures is central to the modern explanatory program. We, like Aristotle, are looking for ‘a cause and principle of change and stasis in the thing in which it primarily subsists’ [*Physics* II, 1, 192b22], and we, too, assume that this principle will be ‘in this thing of itself and not *per accidens*’” (1992: 47; 1999: 81).<sup>6</sup> This argument is especially relevant for Cartwright, for, as I have quoted from Hands, “the final court of appeal for

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<sup>6</sup> She adds three differences between Aristotle and modern science: 1. the change of substances for structures; 2. the causes often do not reveal themselves directly but by experiments; 3. she comes back to 1 stressing the stability of structures (1992: 47; 1999: 81). These differences seem to be against her assimilation of Aristotle’s formal cause with structures in *Nature’s Capacities* (1989: 221) and are examples of the distance that she sometimes put with metaphysical commitments (see Newman 1995: 274-5 and the section on the Cartwright – Anscombe connection in this paper). She is right in affirming that the properties studied by modern scientists do not reveal the essence of that to which they belong (1992: 48; 1999: 82).

philosophical debates about science is the actual practice of science (...). [W]hat science is must be regulated by the practice of science, and she argues repeatedly that real practicing scientists actually do presuppose that capacities and causal powers exist in systems they study” (2001: 313 and 315). As also yet written, Hands attributes this to Neurath’s influence, but as stated above it is also highly Aristotelian. Cartwright comes back to the same idea in 2001: “I want to recall the Aristotelian idea that science aims to understand what things are, and large part of understanding what they are is to understand what they can do, regularly and as a matter of course” (2001: 277). In this point the influence of Hacking is greatly recognizable. As she states in the previous quotation, this is compatible with Aristotle’s ideas about science.

There is, finally, an interesting unpublished paper by Cartwright, “No God, No Laws”, that also makes reference to Aristotle. The thesis of this paper is that the concept of a law of Nature cannot be made sense of without God. All depends on the meaning of law of Nature. She reviews the empiricist position – “just a collection of events, one after another” (2007c: 3) –, the Platonist – relation among abstract entities – and the Instrumentalist. She then explains the problems of those positions. The empiricist is only descriptive; it cannot be taken as responsible for what happens. The Platonist offers explanations, but these have nothing to do with the empirical world. Concerning the Instrumentalist position, it is ultimately based on regularities that do not necessary hold. Finally, she explains “Aristotelianism”: “the laws of science describe the powers that systems in Nature have by virtue of certain facts about them” (2007c: 21). She concludes: “I endorse this kind of pre-Cartesian/pre-Humean empiricism and I have spent a lot of effort trying to show that notions like powers and causings are not only compatible with an empiricist view of science but that we cannot make sense of science without them” (2007c: 22). The argument of her paper is that the other positions cannot support laws on Nature without God. Instead, for Aristotelianism there is no need of God. “On the Aristotle-inspired account, there is necessity and governance in Nature: natural systems have powers and events in Nature are made to occur in the way that they do by the exercise of powers” (2007c: 23). This dispensable character of God, however, in part is not correct from an Aristotelian position. For Aristotle, God is the prime mover, part of Nature (*physis*); and no power, no event, no change would act without this prime mover (*Metaphysics*, Lambda).

But in another sense it is correct, because, for Aristotle, the causal intervention of God in the whole nature does not imply a special intervention of a sort of external divine plan or design.

I have highlighted the main points of the Cartwright – Aristotle connection. I will now essay the exercise of going beyond these points trying make more precise some Cartwright’s concepts and argue of some Cartwright’s thesis in an Aristotelian way. I organized the rest of this section in the following way. First, I will analyze the ontology of Cartwright’s capacities from an Aristotelian perspective. Then I will tackle the topic of the knowledge of capacities and her disunified view of science. Finally I will look for Aristotelian arguments for Cartwright’s skepticism about scientific explanation.<sup>7</sup> Cartwright is more skeptical about the possibilities of causal explanation in the social realm than about its possibilities in natural science<sup>8</sup>. Given Cartwright’s Aristotelian roots, I will present some Aristotelian arguments also for this difference.

### 1. The ontology of capacities

According to Cartwright, capacities, natures, or “powers to do” are real causes (cf., e.g., 1989: 182). They have three elements: 1. potentiality: what a factor can or tends to do in abstract; 2. causality: they are not mere claims about co-association; 3. stability (Cartwright 1998: 45). She calls them “natures” (1992) and quotes – as already mentioned – Aristotle’s definition of nature as “the cause and principle of change and stasis in which it primarily subsists in virtue of itself” (*Physics* II 1 192b 22-3). She then clarified that this is what he want to mean by capacity (1992: 71, nt. 7). Capacities, then, are internal forces, ‘inner causes’.

According to Aristotle, capacities or *dynameis* are “powers to do”. His definition in the *Metaphysics* is similar to the definition of nature: “a source of movement or change, which is in another thing than the thing moved or in the same thing *qua* other” (V, 12, 1019a 15-

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<sup>7</sup> For a discussion of Cartwright’s skepticism see Boumans 2005: 102, Hoover 2002: 157-8, 173 or Reiss 2002.

<sup>8</sup> I consider that the opposition between natural and social is not correct. The human being is part of nature, and society is a natural institution. However, I will adopt this usual terminology.

6). *Dynamis* is an “urge of nature to grow to maturity, to realize form, and to perform the due function” (Guthrie 1967: 140).<sup>9</sup> Within causes, Aristotle uses the idea of potentiality in reference to the material cause. However, for Cartwright (and also for Aristotle), the causal structure of a nature (formal cause) is the most relevant in the scientific explanation of a concrete phenomenon. Causes, however, are the four causes considered by Aristotle, material and formal, efficient and final.

A capacity, for Aristotle, may also be a habit or disposition (*Categories* VIII) and action or passion (*Categories* IX) – physical as well as human – i.e., kinds of accidents that admit variations of degree (a way of measuring).<sup>10</sup>

In a metaphysical commitment through which she refers to capacities’ stability and applicability (1989: 146; see also 1992: 51), Cartwright states that “capacities are much like essences”. In this regard, she affirms that her conception of capacities has Aristotelian resonances (1992: 45-8, 69, 1999: 72; 2001: 277, 290). Among the Aristotelian causes, she assigns priority to the *form*, which is similar to the causal structure (1989: 223).

According to Cartwright, there are different kinds of causes: “causation is not one monolithic concept” (2007b: 44). This is also maintained by Aristotle (*Physics* II, 3). However, Cartwright maintains that there is a common characteristic of the plurality of causes: “the idea that causes allow us to affect the world” (2007b: 46). I leave for section 4.2 another ontological aspect of capacities: the ontological explanation of uncertainty in the natural and social realms.

## 2. The epistemology of capacities

How do we know capacities? This is not an easy task. Cartwright maintains that stable causes or capacities are known by intellectual abstraction (1989: 8, Chapter 5). Under

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<sup>9</sup> According to the Greek-English Lexicon of Lydell – Scott (Oxford, Clarendon Press, 1900), *dynamis* is a power, might, strength; an ability to do something, a faculty, capacity.

<sup>10</sup> This meaning of capacity may be interesting because it could be compared with Sen’s concept of capabilities or with McCloskey’s developments about virtues. On Cartwright’s notion of disposition, see 2007a: III.

specific (and difficult to achieve) conditions, Cartwright also shows that capacities can be deduced from probabilities, and that they can be measured (1989: 1.4 and 2.4). However, this proceeding always supposes that we have some causes at the beginning of it: “no causes in, no causes out” (1989: Chapter 2).

Measuring is not itself the knowledge of capacities. We may measure some effects, or some things that cause, but not the very causation. We measure “indirectly” (Cartwright 2007a: 25 see also 42). However, in order to have a first experimental contact with the events that manifest the cause and the effect (and also with the strength of the former) that allows their intellectual knowledge, measure appears as crucial. As the classic dictum states, “nihil est in intellectus quod prius non fuerit in sensu”; this first experimental contact is necessary. Perception and abstraction are closely related and are rather indistinguishable. In actual knowledge, the senses and the intellect intervene together. Causes are perceived by senses and intellectually understood.<sup>11</sup> This can also be applied to experiments. The cause may be assimilated to what Aristotle calls “common sensible”: “objects which we perceive incidentally through this or that special sense, e.g. movement, rest, figure, magnitude, number, unity” (*De Anima* III, 1, 425a 16-7). This perception is the basis of intellectual knowledge of the concrete causes and is complemented by it. Measures induce or allow inferring an abstractive knowledge of causation (Cartwright 2007b: 178). This is a process of subtracting the concrete circumstances and the material in which the cause is embedded and all that follows from that (1989: 187).

We have a pending topic. The “dappled world” of Cartwright seems to be “merely a very complicated and diverse place” (Newman 1995: 276) where, consequently, sciences are disunified. It seems to be an epistemic situation caused by an ontological view. Nevertheless, we should remember that the referent of Cartwright while sustaining this dappled world is a foundationalist view of a Unified Science, which holds a univocal concept of science. Her enemy is fundamentalism (Cartwright 1999: 23). Aristotle would take Cartwright’s side. He would agree with Cartwright’s figure of the balloons floating on the sky, because it includes threads that tied them ultimately to the ground. Cartwright expresses this saying that “the sciences are each tied, both in application and confirmation,

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<sup>11</sup> On the knowledge of causality see Minto 1997: 36 ff..

to the same material world” (1999: 6). For Aristotle this ground is the being that all possible subject matters share, and two other common characteristics of science, first, that science makes knowledge claims (“when a man believes in a certain way [*pisteue*] and the starting points [*archai*] are known to him (...) he has scientific knowledge [*epistatai*]”, *NE* VI, 3, 1139b 33-4) and, second, that all sciences are demonstrative by deduction and/or induction (science is “a state of capacity to demonstrate” [*hexis apodeitike*]” (*NE* VI, 3, 1139b 31). Aristotle uses extensively the concept of analogy homonymy *pròs hén*. For Aristotle, causes and science are analogous concepts, because the ground, i.e., the being, is also analogous. Thanks to these common characteristics, practical science (an inexact science about a contingent subject-matter) is science by “similarity” [*omoiotésin*] (*NE* VI, 3, 1139b 19).

Homonymous *pròs hén* concepts have different but related meanings, one of which is the “focal” or primary meaning to which the other, derivative, meanings refer and are connected. An example posed by Aristotle is ‘healthy’: the focal meaning of healthy relates to a healthy human body; derivative meanings refer to healthy foods, sports, medicines, and so on (cf. *Metaphysics*, IV, 2, 1003a 32 and ff.).

Homonymy *pròs hén* also applies to being. Being means a concrete thing, a substance, what a thing is (an essence), and an accident such as quality or quantity. All these realities are beings of a major or minor degree. Beings or entities present themselves, according to Aristotle, in about ten categories or predicates. Aristotle explained and developed this idea in the book of *Categories*.<sup>12</sup> There are as many predicates as manners of existence. The category “substance” is the focal meaning or “starting point” (1003b 6) of beings. Substances are, by definition, ontologically primary items: their existence can be affirmed without invoking the existence of anything else.<sup>13</sup> Substance is individual (a *tode ti* – a this –) and separable. We have criteria of identity of each substance that make it identifiable

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<sup>12</sup> Aristotle is cautious concerning the number and definition of categories. The indeterminate condition of being and the richness of reality advise us to leave this number open: cf. Aubenque (1974, pp. 179-83). For Aristotle’s enumeration of the categories cf., e.g., *Categories* 4, 1b25 - 2a 4, *Topics*, I, 9, 103b 20-5.

<sup>13</sup> That is, they are basic entities, not properties, from an Aristotelian point of view. For a general introduction to Aristotle’s philosophy and metaphysics, see for example the classic book by Sir David Ross (1968; first edition, 1923). For a specialized current exposition of the Aristotelian view about substance, cf. Wiggins (2001) and Loux (2002, p. 123-37).

(cf. *Metaphysics* V, 8, 1017b 23-5). The other entities fall under the rubric of accidents (*symbekós, accidens* – latin -, what happens to).

Aristotle, distinguishes two kinds of accidents, contingent and necessary:

“We call an accident that which attaches to something and can be truly asserted, but neither of necessity nor usually, e.g., if one in digging for a hole for a plant found treasure (...) ‘Accident’ has also another meaning, i.e., what attaches to each thing in virtue of itself but is not in its substance, as having its angles equal to two right angles attaches to the triangle. And accidents of this sort may be eternal, but no accident of the other sort is.”(*Metaphysics* V, 30, 1025a 30-4).

The first class is what is contingent, not necessary. The second class is what necessarily pertains to the substance in which it inheres: for man (substance) to be social (accident), for material bodies (substances) to have an extension (accident), for an economic good (substance or accident) to have a price (accident).

Accident is what happens to a substance either immediately (an economic good is bought) or in a mediated way (through another accident/s: an economic good suffers depreciation). Accidents *are* in substances (a price of an economic good) or in other accidents thanks to substance (expectations about prices of assets). According to Aristotle, accidents are quantity, quality, relation, location, time, position, possession, doing (or action), undergoing (or passion) (*Categories* 4, 1b 25 – 2a 4).

The accidental character of the subject-matter does not rule out science. There are many sciences about accidents: from mechanics to politics, from medicine, to sociology. An Aristotelian could also adopt Cartwright’s balloon metaphor.<sup>14</sup> The neo-positivist project is a reductivist project that leaves out some subjects of science and forces other them to enter into a stretched orthopaedic dress. Another possible interpretation of the figure would be the post-modern. I think that this would be alien to Cartwright’s spirit. As Hands suggests, “Cartwright is antifoundationalist, and extremely sensitive to both theory-ladenness and underdetermination, while staying safely away from the slippery slope of relativism. There is objective knowledge; it is just local, disunified, and quite different from what was proffered by the Received View” (2001: 313). It could be analogical. To such subject we have such science (cf. Le Blond 1937: 196ff on the varieties of methods). On this topic the

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<sup>14</sup> Which was designed by Rachel Haking.

influence of Hacking on Cartwright seems also clear. Hacking exemplifies with the story of Babel Library of my compatriot J. L. Borges (1983: 219). One may wonder, however, whether Borges' Babel Library would fit with Aristotle and Cartwright.

### 3. Capacities within the social realm

In *Nature Capacities*, Cartwright maintains that both the natural and social sciences belong to a world that is governed by capacities and that cannot be made sense of without them (1989: 2). She has recently stated:

Social science is hard, but not impossible. Nor should that be surprising; natural science is exceedingly hard and it does not confront so many problems as social science – problems of complexity, of reflexivity, of lack of control. Moreover the natural sciences more or less choose the problems they will solve but the social sciences are asked to solve the problems that policy throws up (2007b: 42).

She is especially skeptical concerning Economics:

“The natural thought about the difference between the most fundamental capacities studied in physics and the capacities studied in economics is that the economic capacities are derived whereas those of fundamental physics are basic. Economic features have the capacities they do because of some underlying social, institutional, legal and psychological arrangements that give rise to them. So the strengths of economic capacities can be changed, unlike many in physics, because the underlying structures from which they derive can be altered” (2007a: 54).

Economic models need to do a lot of unrealistic assumptions in a wrong way given the paucity of economic principles with serious empirical content. As a result, their conclusions are not applicable to real situations (2007a: V, *passim*). She finally suggests that we should try to understand how structure affects the outcomes (2007a: 79).

These difficulties that social science has to confront do not necessarily imply that social capacities do not exist. At least, I did not find Cartwright denying social capacities, as Julian Reiss is inclined to think (“to be consistent she cannot believe that the social world is actually governed by capacities”, Reiss 2002:1). She speaks of them in the former quotation. They are probably fewer and more difficult to detect than natural capacities. She

seems to agree with Mill in thinking that social capacities are real but abstract: “no amount of theory will ever allow us to complete the process of concretization” (1989: 211). We could arrive at abstract laws about capacities but not concrete laws about phenomena. Then, two questions arise. First, do social capacities exist? And second, if they exist, why are they more difficult to know than natural capacities? I will answer these questions through an “Aristotelian” lens.

#### 4. Aristotelian Social Capacities

##### 4.1. On the existence of Aristotelian Social Capacities

Social capacities are first, capacities of human beings inasmuch as they constitute society, and second, capacities of the very society. To Aristotle, society (*polis*) is a unity of order of human beings. For Aristotle, unities of things may be substantial, merely accidental, or unities of order. We have a substantial unity when, for example, we fuse copper and iron and as a result, we get bronze: each previous substance loses its proper substantiality and a new substance appears. We have a merely accidental unity when for example, we put one paper over others, and so on, and finally, as a result we get a pile of papers. Each paper preserves its substantiality; the unity only adds an accidental property: being over or under another paper. Finally, we have a unity of order when, for example, we assemble the parts of a machine in a way that it performs a function. Each part preserves its substantiality but the order also allows each part to contribute to the common goal of the whole machine.

Aristotle denies that the *polis* is a substantial unity against Plato’s monistic conception of society (*Politics* II, 2). He also denies that the *polis* is a merely accidental unity, as Babylon was, for example (*Politics* III, 3).

Ontologically, then, the Aristotelian *polis* is an order – a quality – of relationships – actions of people –: an ordered relation (*a prós ti*). The order is given by the fact that these actions aim at a common goal that is a shared thought and intention of those people. The foundation of this order of relations between families that constitutes a *polis* is the orientation of their actions towards an end:

It is clear, therefore, that a polis is not an association for residence on a common site, or for the sake of preventing mutual injustice and easing exchange. These are indeed conditions which must be present before a polis can exist; but the existence of all these conditions is not enough, in itself, to constitute a polis. What constitutes a polis is an association of households and clans in a good life (*eû zên*), for the sake of attaining a perfect and self-sufficing existence (*autárkous*) (...). The end (*télos*) and purpose of a polis is the good life, and the institutions of social life are means to that end. A polis is constituted by the association of families and villages in a perfect and self-sufficing existence; and such an existence, on our definition, consists in a life of true felicity and goodness. It is therefore for the sake of good actions (*kalôn práxeon*), and not for the sake of social life, that political associations must be considered to exist (*Politics* III, IX, 1280b 29-35 and 1280b 39- 1281a 4).

According to Aristotle the quest for the good life and for good actions in the *polis* corresponds to a natural urge of human beings. Let us hear again from Aristotle:

The reason why man is a being meant for political association, in a higher degree than bees or other gregarious animals can ever associate, is evident. Nature, according to our theory, makes nothing in vain; and man alone of the animals is furnished with the faculty of language. The mere making of sounds serves to indicate pleasure and pain, and is thus a faculty that belongs to animals in general: their nature enables them to attain the point at which they have perceptions of pleasure and pain, and can signify those perceptions to one another. But language serves to declare what is advantageous and what is the reverse, and it therefore serves to declare what is just and what is unjust. It is the peculiarity of man, in comparison with the rest of the animal world, that he alone possesses a perception of good and evil, of the just and the unjust, and of other similar qualities; and it is association in [a common perception of] these things which makes a family and a polis (...) there is therefore an immanent impulse in all the men towards an association of this order (*Politics* I, 2, 1253a 14-20 and 29-30).

Some social stable causes may be extracted from the former passages. There is “an immanent impulse towards association”, some kind of instinct oriented toward association; thanks to language humans declare and reach a consensus about common values; individual human beings, families, villages, social institutions and *poleis* look for the good life and good actions through mutual communication, which enable them to establish or discover the common goals they will look for. These powers and activities enables me to identify at least the following capacities (*dynaméis*):<sup>15</sup>

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<sup>15</sup> This list may help to study the very much discussed topic of the list of capabilities of Sen.

- i. Language: man is the only animal furnished with this capacity. Language does not develop independently of society.
- ii. Rationality: the word that Aristotle uses to express language is *logos*. *Logos* also means reason, which is the source of language. In fact, this is the Aristotelian passage from which the classical definition of man as rational animal stems. Social interaction is crucial for the development of rationality.
- iii. Communication, enabled by rationality and language.
- iv. Moral sense: “It is the peculiarity of man (...) that he alone possesses a perception of good and evil, of the just and the unjust, and of other similar qualities.”
- v. Sociability: “there is therefore an immanent impulse in all the men towards an association.”
- vi. Capacity to look for common aims.

We may also think about some “economic capacities”. According to the first quotation of Aristotle, exchange and the possibility of possessing the goods are necessary when looking for a Good Life, and they are consequently a condition of a *polis*. Ontologically, the market is also a net or order of relations – of buyers and sellers, people who exchange: the order or unity comes from the coincidence of wills keen to buy or sell in order to satisfy their needs, and this coincidence is usually achieved thanks to prices. This last web of relations belongs to the broader web of society.

According to Aristotle, both society and exchange are natural in the sense that they are institutions demanded by human nature in order to achieve its natural fulfilment. Man is *zoôn politikòn* (e.g. *Politics* I, 2, 1253a 3-4) and *zoôn oikonomikòn* (*Eudemian Ethics* VII, 10, 1242a 22-3). However, for Aristotle “natural” in the human realm does not mean ‘spontaneous’ or ‘automatic’. *Polis* and exchange are tasks that need to be performed with effort. They are not mere givens. This does not mean that there cannot arise some institutions that facilitate this performance and work quite automatically. As Finnis asserts, “now such relationships in part are, and in part are not, the outcome of human intelligence, practical reasonableness, and effort” (1980: 136). The task of politics and economics, precisely, is to find out and to shape these institutions which foster the suitable habits dealing with economic coordination. In any case, as stated before, provided that one goal

of these institutions is to shape habits, the very institutions alone are like empty structures needing to be filled.

That is, we may consider also an economic capacity (*oikonomiké* as *dynamis*: cf. Crespo 2006: 777): the capacity to look for the goods that we need for the good life.

Last but not least, Aristotle's *Nicomachean Ethics* is an exposition of the notion of the different virtues – good habits – that human beings should develop in order to achieve the good life in the *polis*. Aristotle considers two kinds of virtues, intellectual and moral. According to Aristotle the intellectual virtues are five: intuitive reason, philosophical wisdom, scientific knowledge, practical wisdom, and art; while the most important moral virtues are practical wisdom (i.e., prudence, which is both intellectual and moral virtue), justice, temperance, and fortitude.

Aristotle believes individuals are equipped by nature with the ability to acquire virtues, and habits bring this capacity to completion and fulfilment (*Nicomachean Ethics* I, 2, 1103a 24-6). We said that virtues are good habits and these are firmly fixed dispositions. It is by the repetition of actions that habits become fixed in the human person. What are the main means to foster these action and thus virtues? According to Aristotle, these means are education and law.

In sum, virtues originate in natural capacities and are developed by habits within the context of human interaction. However, humans not only have virtues; they are free and they may also act against virtue. Moreover, they also have passions that often incline to act against virtues. Although individuals habitually intend to act rightly, they may be incontinent (*akrates*) and fail (*Nicomachean Ethics* VII). Human events are a compound of different capacities interacting, converging or diverging, very difficult to be known.

In conclusion, there are multiple social capacities. The problem with these great varieties of different human social capacities is that they interact in a system which has such a complexity that makes the design of social nomological machines extremely difficult. We

can only identify some singular causes acting in particular situations where, under strict constraints, we can infer probable predictions. This leads us to the second question.

#### 4.2. Why are social capacities more difficult to know than natural capacities?

As quoted, Cartwright refers to “problems of complexity, of reflexivity, of lack of control” in this respect (2007b: 42). Natural science explains with difficulty; but social science has, additional problems. Uncertainty reigns in both realms. But, what are the different sources of uncertainty that make things more difficult in the social one? The answer to this question implies an ontological reflection remaining from Section 1.

Let us begin with nature. Capacities, we have concluded, are aligned with formal cause (and consequently, final cause), with structure and function. But in nature, Aristotle holds, the necessity is not absolute, but hypothetical. The necessity of, for example, a specific matter is conditional upon those formal and final causes (*Physics* II, 9; see also Sorabji 1980: Chapter 9).

For instance, why is a saw such as it is? To effect so-and-so and for the sake of so-and-so. This end, however, cannot be realized unless the saw is made of iron. It is, therefore, necessary for it to be of iron, if we are to have a saw and perform the operation of sawing. What is necessary then, is necessary on a hypothesis; it is not a result necessarily determined by antecedents (*Physics* II, 9, 200a 10-15).

That is, in nature, events are generated by a conditional convergence of causes that do not always happen. Thus, “some cases, moreover, we find that, at least, for the most part and commonly, tend in a certain direction, and yet they may issue at times in the other or rarer direction” (*On Interpretation* IX, 19a 20-3). What is material is contingent. This is an ontological subject. The constitution of material natural things is such as to imply a convergence of principles to produce the very thing and its activities. “Those things that are not uninterruptedly actual exhibit a potentiality, that is, a may be or may not be’. If such things may be or may not be, events may take place or not” (*On Interpretation* IX, 19a 10-3). One of those principles is matter “which is capable of being otherwise than as it usually is” (*Metaphysics* VI, 2, 1027a 14). Hence, the Aristotelian conception of causality is closely related to the so-called “hylomorphic” character of natural things. This case

corresponds to the no-necessitating category of Anscombe, “one that can fail of its effect without the intervention of anything to frustrate it” (1971: 101).<sup>16</sup>

Additionally, Aristotle states “things come into being either by art or by nature or by luck (*týche*) or by spontaneity (*automáto*)” (*Metaphysics* XII, 3, 1070a 6-7; cf. also VII, 7, 1032a 12-3). Obviously, both luck and spontaneity are additional sources of uncertainty. Both terms express an event that results by coincidence (*apo symptômatôn*: *Physics* II, 8, 199a 1-5). But, does coincidence rule out causality? Aristotle’s answer is “no”; lucky or spontaneous events have causes; but they are indefinite: “that is why chance is supposed to belong to the class of the indefinite and to be inscrutable to man” (*Physics* II, 5, 197a 9-10). Chance is an accidental cause that results from the incidental conjunction of some indefinite causes. Although accidental causes are ‘accidental’, they still remain causes. The cause frustrated may be a non-necessitating cause as well as a necessitating cause. If we relate *On Interpretation* 9 with *Posterior Analytics* II, 12 we conclude that for him causality is determined from the present to the past, but not from the present to the future (see Vigo 2006: 112, nt. 6).

A lot of events are “infected” by accidental often unknown causes that make them somewhat hazardous. This is why when chance enters there is no regularity (*Physics* II, 8, 198b 35). However, as Ackrill (1981: 40) notes in reference to *Physics* II 7 198a 5-12, “luck and chance, he [Aristotle] is claiming, presuppose patterns of normal, regular, goal directed action”. Thus, luck and chance do not impede the tendency of capacities towards their ends. Let us hear Aristotle again:

Those things are natural which, by continuous movement originated from an internal principle, arrive at some completion: the same completion is not reached from every principle [each one has its own], and it is not by chance; but always the tendency in each is towards the same end, if there is no impediment (*Physics* II, 8, 199b 15-19).

In addition, Aristotle also considers the possibility of defects, both in arts (technique) and nature (*Physics* II, 8, 199a 33 – 199b 6).

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<sup>16</sup> This explanation fits with Heineberg’s indeterminism.

All these former caveats indeed make natural science “exceedingly hard” (Cartwright 2007b: 42). What difficulties are there added in the social realm?

Returning to chance, we have seen that Aristotle mentions luck (*týche*) and spontaneity (*autómaton*). What is the criterion of this distinction? Luck pertains to the human and social realm, being a specific difference of spontaneity, the genus:

They differ in that ‘spontaneity’ is the wider term (...) Chance [luck] and what results from chance are appropriate to agents that are capable of good fortune and of moral action generally. Therefore necessarily chance is in the sphere of moral actions (*Physics* II, 6, 197a 36 – 197b 2).

This specific meaning of chance has a reason. The moral sphere is also called by Aristotle the “practical” sphere. According to Aristotle, this practical realm is more contingent than the natural realm. Aristotle recognizes this ‘weaker’ character of the practical. He asserts in the *Nicomachean Ethics*:

Our treatment discussion will be adequate if it has as much clearness as the subject-matter admits of; for precision is not to be sought for alike in all discussions, any more than in all the products of the crafts. Now fine and just actions, which political science investigates, exhibit much *variety and fluctuation* (...). We must be content, then, in speaking of such subjects and with such premises to indicate the truth *roughly and in outline* (*Nicomachean Ethics* I, 3, 1094b 11-27, emphasis added).

Aristotle identifies two reasons for this ‘inexactness’ of practical sciences: “variety and fluctuation” (*diaphoran kai planen*) of actions<sup>17</sup>. That is, there are many possible situations and the human being may change his decisions. This is why, for Aristotle, human action is always singular. He says:

We must, however, not only make this *general statement*, but also apply it to the individual facts. For among statements about conduct those which are general apply more widely, but those *which are particular are more true*, since conduct has to do with *individual* cases, and our statements must harmonize with the facts in these cases (*Nicomachean Ethics*, II, 7, 1107a 31-3, emphasis added).

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<sup>17</sup> The adjective *Diaphóros* means “different” and the verb *planáo* means “to make to wander”, “to lead astray, mislead, deceive”, “to do a thing irregularly or at random” (*Greek-English Lexikon*, Liddell and Scott).

And also,

(...) actions are in the class of *particulars*, and the particular acts here are voluntary. What sort of things are to be chosen, and in return for what, it is not easy to state; for there are many differences in the *particular cases* (*Nicomachean Ethics*, III, 1, 1110b 6-8, emphasis added).

In the “practical syllogism”, the secondary premise always refers to a particular situation. Hence, in practical sciences conclusions (actions) cannot be achieved without passing through the singular. Properties of actions are variable. An action may be just or unjust according to the situation; and the concrete determination or content of a just situation is also variable (cf., e.g. *Nicomachean Ethics*, V 10, 1137b 28-30 on equity: “... about some things it is impossible to lay down a law (...) For when the thing is indefinite the rule is also indefinite” ). Aristotle also affirms this with regard to wealth, beauty, and courage, among others. This is why he says, for example, that “a young man is not a proper hearer of lectures on political science; for he is inexperienced in the actions that occur in life, but its discussions start from these and are about these”( *Nicomachean Ethics* I, 3, 1095a 2-4). He often compares politics with medicine in this respect, as in the next quotation. In sum,

Matters concerned with conduct and questions about what is good for us have no fixity, any more than matters of health. The general account being of this nature, the account of particular cases is yet more lacking in exactness; for they do not fall under any art or set of precept, but the agents themselves must in each case consider what is appropriate to the occasion, as happens also in the art of medicine or of navigation (*Nicomachean Ethics* II, 2, 1104a 4-9).

Let us remember that practical science, as conceived by Aristotle, ends in action. However, the more “practical” practical sciences are, the less general they become. By leaving generality behind to move towards concrete reality, science limits its scope. That is something that ought to be kept in mind; we should look for a balanced position: if we try to include all relevant factors in a concrete situation we lose generality and, thus, explanatory power for different situations in the conclusions we reach. But as we try to gain generality, we lose contact with reality as it actually is, and thus explanatory, predictive and normative ‘efficiency’. Moreover, could we speak about prediction in the above described conditions? Only if we remain restricted to stable situations that are fully specified (social nomological machines).

In this regard, let us refer to Cartwright again:

Social science is hard, but not impossible. Nor should that be surprising; natural science is exceedingly hard and it does not confront so many problems as social science – problems of complexity, of reflexivity, of lack of control. Moreover the natural sciences more or less choose the problems they will solve but the social sciences are asked to solve the problems that policy throws up (2007b: 42).

Complexity and reflexivity imply “variety and fluctuation”, and rule out general analysis of social matters. These “problems” are related to human interpretations and freedom, which paradoxically are some of the most valuable human characteristics. In the social realm, these “limitations” imply well-delimited subjects if we really want to explain this. The perspectives of prediction are even more limited because the conditions are always prone to change. However, all these difficulties do not rule out capacities. Although the content will surely change, the power of thinking, talking, valuing and socializing remain untouched. We could manage them by formalization. However, as Cartwright also wonders (2007b: 171), what is the connection between formal concepts and the practical use of them within empirical reality?

But there also remains another more fundamental question. Does Cartwright’s proposal leave room for the practical realm, a realm where freedom explains the greater difficulty for explanation? Or is Cartwright a naturalist as Mill and the difference between the natural and social realm is only one of a greater complexity?<sup>18</sup> What does complexity mean for Cartwright?

## 5. Conclusion

I think that, ultimately, much of the criticism of Nancy Cartwright owes to a misunderstanding of her proposals which is due to a strong influence of the “Received View” mentality (as Hands call it). From Hume’s time to modern times we have not heard about real causes. Thus, it is not easy to affirm that science is about these causes and that

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<sup>18</sup> On Cartwright as naturalist, see Hands 2001: 313. On Mill as naturalist, see Skorupski: 1998. In 1999: 151 (2001: 292) she seems to sustain this position.

this is what scientists actually look for, as Cartwright does, and to be understood. The received view entails that if a philosopher is an empiricist he/she can not be a metaphysician. This view supports a ‘monolithic’ conception of science. If you maintain that there are real causes they must be necessary and universal. The only possible alternative seems to be one that is post-modern, relativistic and agnostic. Nancy Cartwright is one of those unusual cases of a philosopher who tries to escape from this dichotomy.

Nevertheless, Mill is not a good colleague for Cartwright’s project. We can find in him interesting insights but they are blended with inconsistent positions. His theory of causality seems to be inconsistent and he is determinist. Besides, relying on Mill’s naturalism, Cartwright does not seem to distinguish the physical and social realms more than by complexity (more causes acting and at a deeper level) and she is not clear about the definition of social capacities.

Otherwise we find in Aristotle and in Anscombe’s interpretations of causality more adequate companions to sustain an alternative doctrine of explanation by real causes in sciences, about their singularity and about indeterminism. The “trade-off” of this proposal is the acceptance of metaphysics, i.e., that causes are ontologically real, not mere products of the senses or the mind. In this perspective causality is a process of actualization of the power of an entity that may or may not occur due to internal or external factors. Matter, as conceived by Aristotle, is open to different actualizations. “What desires the form is matter, as the female desires the male” (*Physics* I 9 192a 22-3); but the adequate form is not always present. And that may be because either there is not an agent, or the agent is not capable, or it does not have the proportionate end to produce the effect.<sup>19</sup> We could ask: how many children have not been born because there was not a sexual act, and how many because either the act, or the process of generation were artificially interrupted, or because there was a biological or psychological defect in the male or the female? How many storms have failed to happen? How many units of a particular product have not been sold due to shortages in the production or to a wrong marketing campaign? We may know some of them but the richness of reality is such that it is impossible to be contained in our limited

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<sup>19</sup> For the Aristotelian doctrine of the four causes see, e.g., Anscombe and Geach 1961, 44-54, Henry Veatch 1974, 41-55 or William Wallace 1996, 3-34.

minds. We are not gods. Our limited knowledge, however, is enough to manage our lives in an appropriate way.

Nancy Cartwright finds a relatively greater difficulty in achieving causal explanations in the social realm than in the natural one. Given that the similarity of her conceptual framework for causal explanation to that of Aristotle and Anscombe, I have suggested that they could offer good philosophical arguments also to justify this difference. The greater complexity, the reflexivity and the lack of control have to do with human singular situations and with human freedom. Would Cartwright agree with this diagnosis?

The specific limitations of the social realm pointed out by Cartwright and justified by Aristotle have led economists to design specific formalized models. They are socio-economic nomological machines that apply and explain the events under well-defined constraints (see Cartwright 2001 and 2002). But Cartwright proposes a warning. The social scientist must be careful about considering real capacities in his/her models, or his blueprints of nomological machines. This care entails a careful observation and verification. Let us hear again from Aristotle: “credit must be given rather to observation than to theories, and to theories only if what they affirm agrees with the observed facts” (*Generation of Animals* III 10, 760b 31).

Meanwhile, theories are often too general and do not achieve real explanations. However, although those models need “hyper-fine tuning,” they leave the doors opened to hope: “social science is hard, but not impossible.” This hope would probably stem from the stability or regularity produced by institutions, habits or routines (Cartwright 1999: 138). It seems then that the correct way of doing social science should start by studying the underlying structure of social capacities and events (Cartwright 2007a: 79).

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