Narrowing the gap between the natural and the social sciences.

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Abstract: The natural and social sciences are generally considered to be completely different fields of knowledge. This paper will challenge this view in an original manner by turning the usual approach to this challenge upside down. It will argue that the natural sciences are more like the social sciences than we think, instead of trying to enforce a rationalist deductive epistemology onto the human sciences. To do this, references to authors working on each field of science separately will be made, and their views will be combined to allow a fruitful comparison. The sciences as a whole are understandable through finitism, as it is used by Barnes, Bloor and Henry. It is not the intention to formulate a comprehensive theory of science, but simply to make the idea of such a theory credible.

It is widely recognized that there are other sciences than the natural, or the empirical, referred to as the social or human sciences[1]. However, just as widely recognized is the fact that these latter sciences are not as objective and homogenous as the former. Where physics has offered us ingenious technologies that have thoroughly changed our society, political science has yet to show us one example of a perfect democracy. This difference in applicability, and therefore success, is exhibited in the more or less uniform character of the natural sciences, where all scientists agree on what has been established, for example the truth of the Second Law of Thermodynamics, contrary to the different schools and traditions in each social science who differ about fundamental elements concerning their discipline. Considerations like these have led Kuhn to coining the empirical sciences as "mature" as opposed to the "immature" social sciences (Kuhn; 1970), exemplifying the tendency amongst many thinkers to view the natural sciences as epistemologically superior to the undeveloped human sciences.

According to the tradition of the critical rationalists (with Popper as main figure) hard science uses the method of falsification, which relies on testability as its criterion for rationality. The essence of this hypothetico-deductive character depends on the possibility to make objective observation statements. These statements are recorded as *facts*, the building blocks of the empirical sciences. The whole scientific enterprise comes down to arranging all physically possible facts into abstract theories that explain and predict them, giving us a systematic view on what reality is about. In contrast, the human sciences are not interested in nature as such, but busy themselves

[1] The terms 'social sciences' and 'human sciences' often are meant to refer to different disciplines, but I will use them interchangeably throughout the text as referring to the non-empirical sciences.

with human nature, or rather with *human actions*. In this context facts have a very different form, they are not simply observation statements (or abstractions from observation statements), instead they are *interpreted* human action. The sociologist is not involved in making objective empirical reports on what people do (although that often serves as a preliminary to a sociological investigation), rather he tries to interpret their actions in order to explain them, in other words in order to grasp their *meaning*. Empirical investigation is fundamental to the human sciences as well, but it takes on a different form, in that the phenomena of interest to a natural scientist are unmediated (except for the instruments they use, which will be of importance later) whereas the social scientist relies on the use of signs. The meaning of human action can be grasped only through interpreting signs which indirectly reflect it.

To sum up, according to a great deal of thinkers the natural sciences can reach objective, certain knowledge. The social sciences, because of the intrinsic subjective component of interpretation, have to be satisfied with knowledge that is always open to revision, never certain, and less objective. In the following pages I will try to show that this image, although it may be a bit of a caricature, is wrong. A possible objection is that the social sciences can adopt similar methods and criteria of rationality as the natural sciences so that in the end the only difference between both is one in degree, since undoubtedly the empirical sciences do work better, instead of a difference in method. This approach could be taken out of an understandable motivation to prevent the social sciences from being regarded as unscientific. The approach presented here is exactly the opposite, but has the same outcome: I will argue that the methodology of the natural sciences is in essence also interpretive. To do this I will not present arguments of my own, but rather combine the views of several authors working in distinct areas to give way to an original outlook on science as a whole. The result is indeed that the social and natural sciences have a common epistemological status, with the only difference being one in degree, not in method.

Before a positive approach is built up, there is an important aspect of the social sciences which will not be dealt with. The object under study in the human sciences is mankind, in all its various facets. This object significantly differs from the object under study in the natural sciences, nature, because humans are influenced by theories about them. Man already has a (mostly implicit) view about what humans and culture are, which influences his actions, and with it the whole project of the humanities.

Nature is indifferent to what we think about her, it will act the same anytime and anywhere.[2] Interesting as this may be, in my opinion this will not affect the view here presented. It is a complication for the humanities that it affects herself the object it investigates, but it need not alter her practices in despite of this difficulty. In fact, it can even aid scientists when looking for causes or explanations, to take into account this phenomenon, providing a resource of possibilities. In the end, social science is concerned with human action as such; however it may have come about or will evolve.

The task before us is analysing both the concept of *human action*, the basic unit of investigation in the social sciences, and the notion of *exemplar*, the fundamental unit of knowledge in the natural sciences. The idea that exemplars, or paradigms, are the basis for science, and not the instantiations of general laws, comes from Kuhn and is taken over by the sociologists of scientific knowledge Barnes, Bloor and Henry (Barnes, Bloor & Henry; 1996). It cannot be the intention in such a brief work to argue for every claim made, especially since others have already done this (except for the main theme of the text), so I will take some things for granted which others wouldn't.[3] For the present purpose an illustration of what is meant suffices.

In the postscript to his *The structure of scientific revolutions* Kuhn explains the notion of a paradigm. One meaning he gives to it is that of a shared example, or an exemplar. He illustrates this by looking at eighteenth-century mechanics. Galileo had studied the motion of a ball rolling down an incline and up again, and associated it to the movement of a point-mass pendulum. Huygens then solved the motion of a physical pendulum by imagining it to be a combination of several point-mass pendula and focussing on the movements of their centres of mass. Finally, Bernoulli used the idea to explain the flow of water from a hole in a tank. It is in a like manner that the science student learns to use scientific concepts and grasps their theories, he looks at examples. The general laws and symbolisms as such are incomprehensible without showing the situations to which they apply, indicating in each case how they relate to the problem under discussion. A theory is not a set of general statements, from which

[2] Except maybe for the field of quantum mechanics, but that is a very controversial issue. Also, the fact that nature acts the same is a metaphysical assumption, not an empirical law, it is however shared by all scientist; since without it science, and even life itself, would be impossible.

[3] It goes without saying that amongst those who wouldn't take it for granted, and even straight-out deny it, are the critical rationalists mentioned above.

we can deduce instantiations. Rather it is an unfixed set of exemplars, serving as models to approach a new problem. Whether the model is applicable or not depends on the scientific community's collective decision and cannot be predicted using prescribed rules. "To describe the growth of scientific knowledge as a movement from one problem to the next on the basis of analogy and direct modelling is to offer a finitist account of the process."(B, B & H; p.105). In order to defend the previous statement it needs to be clarified what is meant by a finitist account.

The statement: "This is a duck", together with a finger pointing to something in the water, is an act of classification. It ranks an object under a class. Two ways of doing this can be discerned. An individual can observe objects and things, and group those that are similar, or he can follow the lead of others and classify as they do. Both are aspects of classification, the one is concerned with experience, the other with tradition. Different cultures have different systems of classification, all of them based on experiencing the same world. It seems that to a certain extent, classification is a matter of social convention. On the other hand, it is tempting to think that once an individual has acquired a framework from his culture, he is capable of using concepts by himself because he has learned to follow rules of resemblance and difference that are once and for all fixed. To see why this is wrong, we can direct our attention to a simple case: an individual learning to group ducks as ducks. At first he is shown instances of a duck, by pointing to them, in other words ostensively. We assume "that the inherited system of classification of kinds is learned by ostension." (B, B & H; p.49). At first our subject is confused, and doesn't know whether we mean the pond the duck is swimming in, the outstretched finger, or the beak of the duck. But after a large amount of samples, he is just as capable as the rest of his community to use the concept of a duck. This is an example of the most that can be achieved by ostensive learning, from it we can deduce three important implications.

First of all, reference to ostension can never give a formally satisfactory account of classification. This is due to the indefiniteness of any act of ostension. One can always interpret such an act incorrectly, for every object is at the same time a member of various classes, a duck is a bird, but also an animal, a flying object, etc. We classify things because they are the same as each other, but just as well because they are *different* from others. It is possible to group *any* range of objects together consistently, so formally it cannot be determined how to classify the next instance that

comes under our attention. Second of all, the same problem exists with classifications based on empirical characteristics that haven't been taught ostensively. Imagine that we are *told* how to classify things by means of a definition, or that there is a *rule* to follow. The definition and the rule will be made up of terms themselves, which are either defined as well, or are learned by ostension. In the end there has to be a point where words don't refer to other words anymore, but to immediate experience. These final terms are therefore learned by ostension, so that the formal deficiency that holds against ostensively learned terms holds against any classification in general. The assumption made above was therefore not necessary to make the point. Despite these two formal arguments, in practice problems with classification seldom occur. We seem to be extremely good at it considering what was said before. This leads to the third consideration, that humans have some innate sense of sameness and induction. In no other way can we explain the fact that a three-year old can distinguish between most of the animals on a farm, than to assume that he has some instinctive ability to correctly apply terms. Therefore it is important to recognise that there are two factors involved in classifying, nature and culture.

The sketched account leads to the view of finitism. It is summarised in the following five claims. (B, B & H; p.55-59).

1. The future applications of terms are open-ended.

Since classifying is in essence a social process, it depends on conventions. These are never determinate; there is no algorithm for applying a term. This means that the "use of our terms is *open-ended*; there is no definite class of things to which they already apply. No closed domain of application the boundary of which can presently be discerned."

2. No act of classification is ever indefeasibly correct.

This follows from the fact that we don't classify on basis of identity of appearance, but on basis of analogy in appearance. People *decide* collectively on the basis of a range of intuitive possibilities whether a term may be extended to a specific instance. It is a judgement, not a description, which establishes the use of a term.

3. All acts of classification are revisable.

Any act of classification may be revised; we can conclude that the analogy was extended wrongly. A collective judgement entails not just the past and present, but also the future.

4. Successive applications of a kind term are not independent.

When new instances have been added to the set of already existing ones, we have a different term than before. They change our perspective on past cases as well, and might lead us to exclude some of them.

5. The applications of different kind terms are not independent of each other.

If we classify on basis of resemblance, it should be a maximum resemblance. So we have to compare an instance with examples of several classes in order to find the greatest analogy. Classification is a holistic activity; every term is related to others.

Now we can make sense of a finitist understanding of natural science. A class consist of its accepted instances; they serve to decide what else belongs in it. The same can be said of a theory and its exemplars, the future applications of a theory depend on the existing applications. Its users decide on basis of analogy with established examples if a problem can be interpreted and solved with it. There are no fixed rules and deductions, in the end it are scientists who judge collectively what falls under a theory's domain. This doesn't occur randomly, not anything goes, there are technical methods for grouping and modelling, but this doesn't imply "the existence of a single theoretical structure lurking behind all the various exemplars." (B, B & H; p.107). Finitism accounts for the workings of the natural sciences, its five theses can be applied to exemplars unaltered. (B, B & H; p.106).

1. The future applications of exemplars are open-ended.
2. No application/extension of an exemplar is ever indefeasibly correct.
3. The status of all existing exemplars is revisable.
4. Successive applications of the exemplars of a theory are not independent.
5. The applications of the exemplars of different theories are not independent.

Now that we have an understanding of the workings of the natural sciences, it must be examined how they relate to the practices of the human sciences. The first thesis of finitism can easily be applied to human action. Ricoeur compares the interpretation and validation of human action with the practice of literary criticism (Ricoeur; 1981). A human action in many ways resembles a text, both have been produced by humans, in a certain context with a specific intention or goal, and both are liable to various often incompatible interpretations. The open-endedness of action is reflected in the fact that "… the meaning of human action is also [like a text] something which is *addressed* to an indefinite range of possible 'readers'. The judges are not the

contemporaries, but, as Hegel said, history itself. …That means that, like a text, human action is an open work, the meaning of which is 'in suspense'." (p. 208).

The analogy between texts and actions leads to an interesting suggestion, although no more than that, which is worthwhile mentioning: the hermeneutic circle implicit in all interpretation, in texts and human actions alike, is a variant (or the other way around) of the empirical scientist's experimenter's regress. Simply put, the hermeneutic circle is the paradox that the meaning of a text is construed by the meaning of its constituents, while the meaning of the constituents is accessed and assessed in relation to the meaning of the whole text. An interpreter in a sense makes a 'guess' at the meaning of the whole, under this hypothesis he interprets the parts and will come to the conclusion that the pieces of the puzzle fit together. Hirsch calls this the problem of the self-confirmability of interpretation. "The word patterns and stylistic effects which support one interpretation can become different patterns and effects under a disparate interpretation. The same text can sponsor quite different data (though some of the data remain constant), and each set of data will very powerfully support the interpreter's theory which sponsored it in the first place….After all, since the text is largely constituted by the hypothesis, how could the hypothesis fail to seem inevitable and certain?" (Hirsch; 1967; p. 166)

The notion of experimenter's regress was introduced by Collins, one of the leading figures in the sociology of scientific knowledge, and it is a central theme in his work. The best example of it can be found in the experiment to detect gravitational radiation by Weber in 1969. Before the experiment scientists were divided on the subject. Most of them predicted that a small amount of gravitational radiation should exist. Weber's results indicated a significantly larger amount than to be expected from standard theories. Others duplicated the experiment and found negative results compared to Weber. At first scientists remained sceptical, but at a certain point a consensus had been formed that there were no high amounts of gravitational radiation. Different reasons and criticisms were given for the outcome of Weber's experiment, none of them decisive and many completely unscientific. Amongst the criteria commonly used for evaluating an experiment Collins mentions the scientist's nationality and the prestige of the scientist's university of origin. The reason why science itself could not settle the debate is because of the regress: "Thus, what the correct outcome is, depends upon whether there are, or are not, gravity waves hitting the earth in detectable fluxes. To find this out we must build a good gravity wave

detector and have a look. But we won't know if we have built a good detector until we have tried it and obtained the correct outcome. But we don't know what the correct outcome is until…and so on *ad infinitum*."(Collins & Pinch, 1998; p.98). As with the hermeneutic circle, the initial hypothesis (in this case the established theories of physics) determines the perspective through which the outcome is evaluated. An experiment will count as a good one if it confirms prior beliefs, otherwise it will be criticised. At the same time experiments are what we do in order to *find* the correct hypothesis. The situation depicted here is admittedly not the common one, the regress only occurs in scientific controversies, in most cases of normal science scientist aren't as divided on the interpretation of experiments. Nevertheless controversial science is what usually interests us; since it is there that it has to prove its merits. Collins compares the resolving of such a debate with listening to forensic evidence as a member of a jury, as we will see now this analogy with a law court opens up possibilities (p. 107).

The second and third claims of finitism, the defeasibility of classification and its revisable nature, have a lot in common with the indefiniteness of legal concepts. These, in turn, can shed some light on the concept of human action. Hart's article *The ascription of responsibility and rights*, does just this. In a court of law a judge is presented with facts, some disputable, which he evaluates in the framework of justice. "…a judgement is therefore a compound or blend of facts and law…It looks as if the legal concepts are well-defined, and the judge simply has to say: "Do the facts come within the scope of the formula defining the necessary and sufficient conditions of 'contract', 'trespass', etc." But this sort of language is not suitable for legal concepts, since there's a vagueness about them that prevents us from establishing universal, infallible, 'necessary and sufficient conditions'. A judge decides by reference to past cases and specific circumstances, he has the freedom to decide whether the concept is applicable or not. When he states that it is, than the judgement makes it so, the classification of the concept has been altered because a new example has been added to its extension. However, a judgement can be withdrawn or corrected, it is possible to call it into question and review the matter entirely. Precisely this characteristic Hart calls the defeasibility of legal concepts (p. 175).

What has been said of legal concepts can be extended to human actions. Traditionally actions have been explained in terms of an individual's psychological

state in combination with descriptions of physical events. Let us take the example of a man named Smith, whom we have observed hitting a woman. If we reply to the question: "Who hit her?" with "Smith hit her", we are not referring to any mental event such as an intention or so. On the facts observed we have justified reasons, in the absence of some defence, to ascribe liability to Smith. Human actions are blends as well, this time of facts on the one hand, and on the other social conventions and customs. Accordingly, their meaning can be challenged by the means of defences similar to those in a law court. This includes the possibility of revealing previous unknown facts, such as "Smith and the woman were rehearsing a play", showing that the descriptive aspect is of importance as well, in the same way that new observations function in the natural sciences. Hart gives in total seven reasons why "…our concept of action, like our concept of property, is a social concept and logically dependent on accepted rules of conduct. It is fundamentally not descriptive, but ascriptive in character." The example illustrates that the flaw of the traditional view is "…its mistake in identifying the meaning of a non-descriptive utterance ascribing responsibility…, with the factual circumstances which support or are good reasons for the ascriptions."

It is not too difficult after the foregoing to adapt the fourth and fifth claims of the finitist approach to the analysis of human action. When Freud[4] invented the notion of a neurosis and discovered its implications on the human mental life, all previously known cases of insanity gained a new interpretation. Of course psychologists before Freud did not classify some instances of insanity under neurosis, since the term was unfamiliar to them. Thus the existing class of instances of insanity changed drastically. Accompanying this change within a class, was the change in the whole spectrum of human behaviour. By noting that everyone suffered to a certain extent of minor neuroses and that the case of the psychotic is simply an extreme form of the normal pattern, a completely original perspective of looking at every aspect of human behaviour was born. This short example can do no more than give a glimpse of a more general exposition, but hopefully it is successful at bringing across the intention.

[4] Everything said about Freud comes from personal recollection, and it is therefore not possible to cite references.

What has been offered in this paper is an attempt to give a uniform harmonious understanding of the underlying epistemology in both the natural and the social sciences. Whether I have succeeded in this depends for a great deal on the authors cited (and of course on my representation of them), since it are their arguments and insights upon which I have drawn. The essential argument brought forward is that there no fundamental epistemological difference between both fields of science, they can both be interpreted with reference to finitism. This does not mean that there is *no* difference, it is clear that the natural sciences are a lot more successful, in application as well as in their contribution to human knowledge. In my opinion there are three main reasons that account for this difference. One is the age of the empirical sciences that exceeds that of the human sciences by several centuries. This is undoubtedly an advantage to any time-consuming activity, which science certainly is. The second, connected, reason is that unlike its social counterpart, the natural sciences in general have a uniform paradigm to work in, in periods of normal science all scientists are on speaking terms with one and other, they use the same methods and background knowledge to explore their field allowing to communicate their findings unproblematically. There are no such paradigms in the human sciences; instead there are conflicting perspectives that lead to other ways of doing research. This brings us to the third reason. It is only in periods of controversy that the social influences really leave their mark on the science itself. The empirical sciences are still *empirical*, meaning that the impact of interpretation involved in problem-solving is a lot smaller than in the social sciences. So the conclusion to be reached is the following: although there is no qualitative difference between the two fields of science, there is a big quantitative difference, due to the varying extent that conventions and contingencies obstruct the proceeding of otherwise purely empirical matters.

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