Om Vetenskapens gränser

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You expect from the title (and publisher) a serious book on the limits of scientific inquiry, instead you get a rather opinionated piece on the absurdity of science, especially as to its so called positivistic ambitions; a diatribe which, however, does stop short of fully endorsing radical postmodernism. The author has a Ph.D. in sociology, and thus has a rather skewed idea of what science really is, besides he shows at times a rather shocking ignorance, as well as an extensive confusion, examples of which abound. Yet, as we all know, if you go through a list of yes and no questions and respond randomly you may expect to be right on the spot half of the time and completely off the other half; and this book is no exception. I share about half of the opinions of the author, and take great exception to the other half. To his credit, the author writes fluently and engagingly, and the book becomes something of a page turner, touching on many interesting questions, if unable to discuss them competently.

The author has read a fair amount, but what he has read seems rather undigested, having never really made it his own, thus mixing the low with the high and often contradicting himself in his eagerness to cite. I have already referred to his ignorance, some of which may be considered trivial, such as attributing the seeing of the world in a grain of sand to Baudelaire, yet it shows a certain tone-deafness. He openly admits that he never took to mathematics and in particular never became 'socialized' in that discipline, whatever is really meant by that, and hence it remains to him incomprehensible and he would be totally unable to distinguish between good and bad mathematics (something I suspect many ostensible mathematicians would be as well). To openly admit your shortcomings is always sympathetic, but to be closed to mathematics constitutes a serious intellectual handicap the seriousness of which those afflicted seldom realize, just as those who are tone-deaf to music inevitably are unaware of the joys they are deprived of. One could go on picking on the shortcomings of his account, such as his superficial understanding of the conflict between science and religion, as well as his limited conception of science, understandable as he seems to have never been close to the real thing. He makes fun of Linnaeus classification as being arbitrary and signifying nothing, not realizing its purpose. Alphabetical arrangement is likewise arbitrary, not to say even more so, as well as irrelevant to the contents of what is being ordered, but it has definite advantages when it comes to searching and identifying, for which it was conceived. One could further nail him on his naive rejection of evolution, or is he just writing tongue in cheek? A rejection which comes across as a bit shocking, and one wonders whether one is dealing with a crack-pot. Incidentally Darwin did not hold off publication for fear of a religious outcry, but because he was apprehensive of the reactions of his colleagues and feared that he might have been dismissed as unscientific, just as Lamarck had been a few generations earlier, would he not present a compelling argument based on solid empirical data. But I have decided to ignore this and instead focus on what is interesting and important, regardless of the

authors understanding and treatment of the issues.

The main issue is whether Social science is science after all. My standpoint is that it is not and here I am in agreement with the author, although our perspectives and interpretations are rather different. He openly disparages the idea that science should be in accordance with the facts, because there are no facts in Social life, they are all conventions anyway[1]. Be that as it is, it makes it impossible to do science when it comes to the social world, and that is just something we need to accept. It does not mean that studying the social world is useless or worthless, only different, it develops, as far as it develops, in other ways. Science has the ambition to present truths, and as far as it can be checked independently, it has to accord. In science there is a distinction between facts and theories. Admittedly it is not easy to draw a sharp line between them, as some facts are so to speak theory-laden, but the principle remains. It is much easier to check a theory than come up with one. To check a theory you need not be an expert, to come up with one you may have to. Most people cannot understand the physics and mathematics of an atom bomb, but they sure can recognize one when they see one. It reminds the mathematician about NP-completeness. To check that a proposed solution to an equation is a solution is simple compared to coming up with one. The former can even be mechanized, not the latter. It is a common misunderstanding among the public, the politicians and also social scientists that solutions, i.e. theories are the inevitable outcome of methods. A scientist should be methodological and objective and not sin against any rules. If he (or she) is a good boy (girl) their industry and competence will eventually bear fruit. In Poppers conception of science, there is no methodology involved, which confuse people no end, the way a theory is conceived is a total mystery, its an act of true creation, just as much as that of writing a book, composing a piece of music, or painting a picture. The objective nature of science is not to be looked for in the way theories are constructed, but that t an be checked against the real world. And as to prejudices, no science is possible without prejudices to be tested. Due to testing the issue of prejudice is no longer an issue, and nothing to be removed in anticipation, if wrong it will be removed eventually anyway, The objective nature of science and its theories are thus to be measured how it holds up to reality, if it is in accordance to the facts. This accordance is objective and can be agreed on collectively. If not the facts against which it is being checked are not basic enough but too 'theory-laden'. Facts kick back, as the Swedish economist Myrdal pointed out, something the author returns to repeatedly puzzled and disapprovingly. In order to stimulate the imagination it needs to be challenged, and the challenge consists in overcoming obstacles, and in science the obstacles are facts. There is no such thing as a totally free imagination, it always has to be 'situated' to use in a slightly different sense an expression the author refers to in a different situation. The fascination of natural science lies exactly in the nature of the obstacles which it has encountered. If the author had understood this, entire chapters could have been excised out of the book. Amusing chapters I admit, in fact among the must amusing sections of the book, I am thinking of the role of the personality in creative arts (literature and jazz in particular) versus in science; but nevertheless totally

[1] He makes a point of natural science being concerned with constructions of the first order, and social science with constructions of the second order, meaning, I guess, that in social science you are concerned with how people relate to constructions of the first order

irrelevant. And it is simply not true that little is known about the personalities of natural scientists, in this regard the author shows not only a deep ignorance, but far worse, a lack of curiosity.

Social science exhibits a definite penis-envy in regard to natural science. The spectacular success of Newtonian physics became an ideal for all scientific endeavors, i.e. attempts at systematic study of all possible disciplines. But when the methods of natural science are applied to social ones the results become somewhat risible. The social scientists behave autistically, mistaking the formalism of natural science as its essence. Thus this emphasis on a specific methodology to achieve legitimacy, something that is not required in, what I am tempted to refer to as real science. One need only to refer to the remarks above, concerning the inscrutability of coming up with theories and explanations, as emphasized by Popper. No wonder that the social scientist eventually throws up his hands and wonders whether there is anything more to science than adherence to language conventions, social games according to Wittgenstein. Yes there is more to science than playing games, it is about finding truth, and here all methods are permissible, just as in war. But just as in war you are constrained by reality (and only reality, not any human conventions). Defeats are real not just linguistic conventions. People really die. In physics quantitative considerations are crucial and numbers come up. Galileo was in fact the first physicist to really appreciate the significance of numbers and manipulations of numbers in physics, of course in astronomy they had been ubiquitous from the beginning. Numbers come into natural science naturally, in social science only artificially. In fact what is more artificial than to quantify various experiences and degrees of convictions, love or distaste? Among laymen there seems to be the idea that just by introducing numbers things are made objective and scientific. To a mathematician numbers need to have meaning. Sven-Eric Liedman speaks about pseudo-quantities as opposed to real quantities, the latter can unlike the former be manipulated in meaningful ways. Thus in social science much effort and time is wasted on pure formalia, on consciously becoming real scientists, while in natural sciences this becomes an inevitable consequence of real, disinterested curiosity. The author refer to this emulation of the natural sciences as 'postivistic' and refers to the Vienna Circle and their ambition to lie a true scientific basis for everything. As Popper sarcastically remarked, they did not realize that their ambition of abolishing metaphysics entirely from not only science but also philosophy, was by itself a metaphysical project. The author rightly remarks that as 'positivism' has generally acquired a negative connotation, most scientists deny that they are positivists, while they of course are. After all it is inherent in the very nature of the scientific project. One needs to provide results and to be able to predict. But if there are no hard facts in social sciences, just as there are no hard fact in social intercourse, everything is in a flux; any such ambitions are bound to come to grief[2].

In addition to deploring the positivistic nature of social science, the author is contemptuous of natural science as he sees as the embodiment of Western man's ambition to dominate and exploit nature. The Old Greek did not have such ambitions, and most human cultures have indeed looked upon nature as sacred. With this sentiment I am in total sentimental agreement, and what is wrong with being sentimental? After all I am a pure

[2] The issue of self reference makes predictability in social contexts very problematic. If you could predict the stock-market this very prediction would effect it and so on, an issue well-known to logicians.

mathematician, and from early childhood I had an abhorrence of the accelerated technological development which characterizes our civilization and by choosing pure mathematics I believed I could stay aloof. Now over the years I have realized that the issue of applied versus pure science is more complicated and subtle, but this is not the place to elaborate on it. Let me only add that the Hellenistic period differs from the Classical Greek as far as mathematics is concerned as it was in some sense more 'applied'. While in Classical Greek geometry, as expounded by Euclid, who nevertheless belonged to the Hellenistic period, numbers did not enter, but only more abstract proportionality, thus Archimedes broke with tradition when he got involved in computing π numerically, traditionally they had been content with expressing that the circumferences of circles are proportional to their diameters and their areas proportional to the squares of the same. But this excursion into more practical domains enriched mathematics by posing different questions. Thus I look upon applied natural science as introducing new challenges and ideas for its pure form, not as a supplier of goods, as those do who have more of a consumer attitude towards science. As an example one can mention the genome project, big industrialized science *par excellence*, whose medical fruits have not been forthcoming, but instead has provided a fascinating window into humanity's past, as DNA sequences have as abstract strings provided much more to do with forensic investigations, of which archaeology is an example, than to the elucidations of actual traits and treatment of diseases. Medicine is applied natural science and in fact most of the resources that come to science are funneled into it. The public is eager for the benefits those endeavors can provide which seem to promise anything short of immortality, even if such an impossible striving is not rejected out of hand. But does medicine deliver? Yes and no. There are definite achievements to be pointed at, achievements which have no counterpart in pedagogy, which otherwise sees itself as a kind of medicine; on the other hand it produces much what is at best fuzzy and indeterminate and at worst self-contradictory, the reason being, in my opinion, that so much of medical research is based on statistically discovered correlations without any underlying understanding. Unfortunately what goes for science in the public mind is just such inconsequential results of studies giving them a skewed idea of what is science.

What the author suggests as an alternative to positivistic social science is a much more hermeneutical approach focused on meaning. And who can oppose this? In hermeneutics we are concerned with the individual case in all its intricacies, and, as the author points out, it totally disregards all general methods, because if it would not do so, it would no longer be a case of hermeneutics but positivism[3]. The classical distinction between natural science and the humanities is traditionally expressed as science being concerned with explanation, while the humanities with understanding. In this suggestion there is more than a tacit hint

[3] It is noteworthy that when we come to psychiatric treatments of patients based on the personality and intuition of the therapist, those treatments cannot be replicated as you cannot formalize them. Thus when adopted by others it just become a faded rigid copy. The same thing holds of course for mathematicians and natural scientists, the way they think is a mystery and cannot be taught and learned. The rigid methodology of which the author directs his diatribe is mainly a case with social scientists who try to mechanically emulate the successful practices of the natural making the methodology an end in itself and constituting the essence of what is meant by scientific'. The natural sciences have no need to prove themselves scientific, they are interesting on their own.

of superiority of understanding versus mere explanation. But is there no understanding in mathematics say, only explanations? People who do not understand mathematics, and they seem to be in a majority, may think so. To those mathematics is about following incomprehensible rules. To a mathematician there is a difference. An explanation is a logically impeccable proof which is not understood but can only be verified. Understanding is as much a case in natural science as in the humanities. Could it be that in the humanities there is only understanding never any explanations? That an explanation is something objective, while understanding is subjective?. But with such a hermeneutical approach, how does it differ from literature? Meaning being concerned with poetic truth rather than mundane factual? Incidentally I use to refer to philosophy as the poetry of science, but this is not appreciated by my academic friends in philosophy. One writer the author ignores, maybe because of simple ignorance, is the British philosopher of history R.G. Collingwood, who makes a clear distinction between human history and natural science. In the former it is the reconstruction of human thought which plays the central role, and history only becomes understandable when you take into consideration the motivations for the actions taken by its actors. This does of course presume that human nature has not really changed, and that the thoughts and motivations of the ancients are comprehensible to us and hence reconstructable. Collingwood manages to present a strong case that the study of history can be scientific without involving statistics. To him history is essentially a forensic exercise where anything can serve as documents to be interpreted, it does not have to be written. But every document, especially a verbal one, be it written or spoken, has to be interpreted and can never be taken for face value, just as in a criminal investigation, every testimony could be mendacious. And just as the reconstruction of motive is central to any crime investigation, the same holds for history. In fact by placing yourself in the shoes of someone else you begin to understand what questions to ask and what observations to make. Taking the human perspective, which if anything characterizes humanism, means that issues such as values, not only moral, inevitably enters. If you take a pure postivistic approach with strict demands on verifiability, you are only left with trivialities. On the other hand if you relax those standards you may come up with interesting things although not necessarily true. This leads us to the realm of ideas. Ideas are never true or false, they are fruitful or sterile, as they are concerned with basic facts. However, the issue of fruitfulness leads of course to question whether they are fruitful, yes or no, but this is on a higher meta level of facts. Take one example. The author claims that higher education is barred to people from the working classes, as they lack social capital, and knowledge of secret codes. Taken on face value this is patently wrong. Gauss, who arguably was the foremost mathematician of all times came from a laboring background with a mother who was illiterate. His genius was recognized early on in spite of having no social capital whatsoever and as to social codes, he had no use of them either. But the statement contains an idea, the idea of resentment, to look upon things from a certain angle, in short a provocation, which you may choose to pursue or to oppose. In the end something unexpected may arise from it, and the issue of its eventual fruitfulness will only be resolved in due time.

When it comes to physics social scientists resent the mechanical approach which has so far been so successful in its original discipline. It is different with quantum mechanics, it

is looked upon with delight and catches their imagination especially the confusion it seems to introduce into the sterile deterministic world of mechanics, through self references, ambiguity of the status of the observer and a series of paradoxes which leave the physicists puzzled and at a loss. A sociologist such as the Swede Joachim Israel even claims, not without some glee I suspect, that physicists may have a lot of learn from the sociologists. I doubt it. An incredible amount of nonsense has been propagated out of pure ignorance and unguided imagination diffusing into thin air, The very name relativity theory caught the fascination of the lay pubic when first introduced. The theory is basically about invariance, the invariance of the speed of light[4], and the relativity that ensues is of course no more startling than the usual laws of spatial perspective. Just because some things appear larger to certain observers than others does not mean that size per se is a relative concept. As observers we can only see two-dimensional projections of a 3-dimensional object. The projections depend on the observers, but the object per se is invariant, and if anything gives the perfect metaphor of Plato's theory of forms. The object being the real thing, its projections just being appearances depending on the positions of the observers. We can never fathom the real thing directly as an appearance, but that does not mean it does not exist[5]. The 4-dimensional space-time continuum constructed by the mathematician Minkowski is such a Platonic entity. Relativity theory is if anything static[6], and what does it really mean to present a sociological theory based on Einstein's relativity theory? [7] No, Einstein is not the man to represent quantum mechanics, although he belonged along with Max Planck as one of its pioneers, this distinction should be given to names such as Heisenberg, Schrdinger, Dirac etc, Einstein himself was temperamentally opposed to the idea ("God does not play dice") [8]. And no one does understand quantum theory. Nature has forced us to go beyond our human limitations, all one can say is that quantum theory supply explanations, in particular incredibly precise predictions.

Science as little as language provides us with a picture of reality, the author points out. This was Wittgenstein's original idea in his *Tractatus* which he then abandoned for his more mature view that all we have are language games, an idea that greatly disgusted someone like Bertrand Russell. Thus we should never think of science as representing reality, this is naive, but just to produce narratives, and should be judged as such. Some narratives are good and engaging, others are boring. Now let us stop and ask ourselves what does this mean? For one thing to speak abut pictures (or maps or whatever) is clearly a case of being in a metaphorical mode. Metaphors are neither true nor false but are presented to make concepts more vivid and hence more accessible to the imaginations and thus in the

[4] Einstein supposedly wanted to call it invariant theory at first but was persuaded that the 'sexier' name of relativity would bring about more of a splash. And it certainly dd.

[5] One may view the fad of cubism as a rather inept attempt at trying to do the impossible, by naively interposing many different perspectives.

[6] The author claim that Einstein's theory was rejected by the Nazi as it did not fit into their static worldview. They understood it as little as the general public.

[7] One obvious interpretation would be that just as in the case of cubism present a multitude of different perspectives which somehow would make up a transcendent unity of a meta-sociological nature. The reference is to Mead and his book *The Philosophy of the Present'*

[8] So indeed individual quirks do play a role among scientists, also those in natural science.

end to stimulate thought. They should never be taken literally, when done so they only turn silly. This is what the author seems to do and in the purpose turning more things than one silly. To liken science with a narrative on the other hand seems not intended as a metaphor, in fact science is presented as narratives and it should be taken for its face value. The ultimate implication is that there exists no outside external material world, a well-known philosophical stand known as idealism and represented foremost by Bishop Berkeley of the 18th century. It is a radical point of view which has much to commend itself (its incompatibility with modern science being only one of its virtues?), for one thing it is very logical and economical doing away with much confusion and contradictions.

But to return to narratives. What makes some narratives good, others indifferent? It has of course nothing to do with factual veracity, which in the case of pure idealism does not make sense anyway. But when it comes to scientific narratives, there are two aspects of it. One the narrative itself, which normally is the only one that the public gets into contact with; the second the basis for the narrative, which is the most fascinating part. One may liken the latter to a sold three-dimensional body, and the former to its surface. If you are just presented with surfaces you have little to go upon, one narrative may be as nice as another. It all becomes nothing but revelations. The author of the book prefers the narrative of the Bible as being much more congenial than the narrative of natural evolution with its hairy apes. One cannot fault him, given as a narrative Darwin's vision may seem a bit contrived. More distinguished people than the author have taken exception, such as the German philosopher Jaspers. As to the Big Bang it was derided by the eminent astronomer Fred Hoyle, in fact he showed his derision by coining the term 'The Big Bang' which has stuck. Later on in life Hoyle jettisoned his own alternative narrative (one involving the spontaneous creation of matter) for the by then established theory, only to renounce it before his death resuming his initial opposition (being in dotage?). In order to appreciate those narratives you need to know the background. The seed for the Big Bang theory was the observed expansion of the universe which had also been theoretically derived from Einstein's equations[9]. But how can you observe the universe expanding? This is not something you can do directly and as a fact it is not basic but 'theory-laden'. When it comes to measuring distances in the universe you will resort to a ladder. Provisional conclusions at one level serving as indisputable facts on the next. It stands to reason that the more steps to the ladder, the shakier the climb. But why be timid? The timid boy never gets to kiss any girls. Who said that natural science proceeds invariably along the rigid tracks of truth, everything is provisional, which Popper never tires of reminding us of. The first step is based on the phenomenon of celestial parallax[10] which would be an observable consequence of the heliocentric theory propounded by Copernicus, but which would not be observed for almost three hundred years due to the immense distances to the stars, something Copernicus predicted and offered as an argument against falsification of his theory (narrative?). To compute distances by parallax you need to make assumptions

[9] In fact to prevent it Einstein had more or less *ad hoc* added a term, the so called cosmological constant. This, according to him, was his greatest mistake in life. Einstein known for the spectacular confirmations of the implications of his theories, would otherwise have had an even more spectacular case to his credit.

[10] Everyone is familiar with terrestrial parallax, it is but a component of general perspective

about global geometry, the natural assumption was that it was Euclidean[11] if it would be positively curved, distances would be exaggerated. This direct method fails for but the closest stars, but there are other more sophisticated geometrical methods but all based on certain assumptions, and it would lead to far astray to discuss them here. Then we had the real spectacular discovery when Henrietta Levitte observed at the beginning of the 20th century the relationship between periods of certain variable stars, so called Cepheids, and their absolute luminosities. Periods are easy to determine, but what about absolute luminosity? The punch line is that they all where in the sight line of one of the Magellan clouds and hence could be assumed to lie in it[12] and hence be basically equally distant and thus absolute luminosity being proportional to apparent (which in Euclidean space is like the force of gravitation inversely proportional to the square of the distance). Then one only needs to identify a nearby Cepheid whose distance happens to be known to us to effect a calibration. In this way, modulo some basic daring assumptions, one may determine the distance to nearby galaxies. Now due to the well-known Doppler effect one can determine the absolute velocity with which a luminous object is moving away from or towards us and one discovered the so called red-shift which was proportional to the distances to the objects in this case galaxies, and hence that they were moving away from us. From this one could easily calculate the rate of expansion. Now this may seem like a house of cards and in many ways it was, but Hoyle believed in it. Taking this expansion literally would mean that at one time in the distant past (which could be computed given assumptions as always) all of the universe was concentrated at a singe point which then had exploded, with a big bang, as Hoyle sarcastically observed. To avoid this scenario which did not appeal to him he came up wit the *ad hoc* idea of spontaneous creation of matter. But now came the real punch-line which transformed the highly speculative theory to uncontroversial fact of life, because according to this theory the Big Bang should have left a residual radiation of a certain temperature and in the mid-sixties this was actually observed! A totally independent confirmation (but of course still the theory can as any theory be contradicted (falsified) in the future). Even Hoyle at the time gave in. This is cosmology, it has no practical consequences, but relates to deep existential questions as to why something is instead of not. It is a curious coincidence that this modern creation myth so much resembles the Biblical one. 'Let it be light!' And in fact one of the early proponents of the Big Bang theory Georges-Henri Lemaître was actually not only an astronomer and professor of physics but also a Catholic priest[13].

When it comes to Evolution and Darwin's theory of natural selection (as opposed to human engineered breeding) the narrative is even more extensive and as noted Darwin spent decades amassing arguments for it before he dared to confront his colleagues with it[14]. Unlike the cosmology of Big Bang the theory of evolution plays a central role in

[11] In fact space is non-euclidean, massive bodies curve it according to Einstein's general relativity, but the effects are local and can be disregarded

[12] or at least most of them, and if some did not adhere to the simple rule it would be tempting to dismiss it as an impostor, its position therein only being an optical illusion

[13] He actually predicted back in 1927 the expansion of the universe before Hubble empirically observed it.

[14] Had it not been for his mentor - the geologist Lyell - who strongly urged him to come forward in

biology, without it nothing makes sense. There are no rival narratives that can even compete with it.

Only to be presented with the cream of a theory is like stealing without earning the insight by some hard work. In fact rather than as it is normally done in popular science one should present the observations and the struggles to interpret them, just as in a detective story where mysteries are eventually resolved. This is a genre which people seem actually to enjoy[15]. This may be why Freud's case stories are such a delight to read. The author claims in fact that what characterize good narratives is the transcending of genres, as in the case of Wittgenstein's 'Tractatus' of Freud's case studies which apart from a 'scientific' approach is also literature. However, I find this a trivialization of narrative playing down the actual contents, which when all is said and done, constitute their cores.

A radical post-modernist stand is not sustainable. For one thing it is logically contradictory, rejecting all narratives as false, yet providing one of its own as true. In fact one is reminded of Collingwood's quip: 'Those who reject metaphysics make thereby a metaphysical stand'. Furthermore once you relativize all knowledge, it is only logical to relativize all morality as well. But to dismiss the Holocaust as yet another narrative or legitimize political mass murder as yet another approach to political problems, you surely sin against (current) political correctness, and this is something the postmodernists definitely do not want to do lacking the courage of their convictions. In short they cannot be taken seriously and for all their anti-authoritative stands, they are at their core deeply authoritarian, preferring to be told what they are to believe.

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view of Wallace as noted above, he might have procrastinated the rest of his life

[15] The first detective story was not the one by Poe but by the German writer E.T.A. Hoffman who wrote 'Das Fräulein von Scuderi' which appeared around 1820