II Epistemic Problems and Philosophy of Science

1 Overview

In Chapter 2 the objectives of economics as a science will be discussed. It will be stated that economics intends to derive conditional statements which tell people how they can interfere with the course of events. Economics therefore follows the positivist programme, although it does not fully take over positivist methodology.

In Chapter 3 the fundamental question of what makes a theory scientific is raised. The traditional way of answering this question consists of calling a theory true because it is well founded. This leads to the question of the ultimate justification of science.

Chapter 4 offers a brief overview of traditional attempts to solve the problem of absolute justification. For the sake of argument, criticism is presented from a radically sceptical perspective. Section 4.1 addresses the problem of the nature of reality, its relation to human beings and their consequences for human cognition. Starting from the concept of a preestablished meaning that reveals itself to human beings through rational thinking, the argument turns to another concept focusing more on the active constitution of reality by the perceiver. Yet, pursuing this argument in the sense of radical scepticism leads to fruitless solipsism. Additional assumptions about the human faculty of cognition and its commensurability with the (outside) world are needed. Reflecting the specific sources of human cognition, the controversy between empiricism and rationalism is briefly mentioned - pointing to the difficulties of both approaches. Finally, the concept of intersubjectivity is considered mentioning the tight relationship of this concept to anthropological assumptions. It is concluded that the very possibility of cognition requires assumptions that are not beyond doubt. Section 4.2 deals with strategies to derive scientific statements. If it is accepted that the human faculty of cognition depends on both sense-perception and rationality, the question is asked whether there exists a strategy that allows one to derive statements about reality which depend on simple, readily acceptable postulates. Such statements could then be regarded as being absolutely justified and intersubjectively valid. In this sense, inductivism, pragmatism and falsificationism are briefly discussed in consecutive Sub-Sections; although finally it must be said that the project of an absolute justification has so far failed.

Chapter 5 discusses the consequences of this failure. Section 5.1 addresses the argument that the impossibility of providing absolute justification leads to scepticism. However, failure to prove the existence of an absolute justification does not prove its non-existence. Therefore, scepticism is just one possible
conclusion among others which will subsequently be argued to be highly inadequate on the grounds of its absurd consequences. Yet, as is pointed out in Section 5.2, rejecting scepticism is not tantamount to embracing dogmatism, which seems to have shown itself to be equally inappropriate. This is because dogmatism can be used to immunize any arbitrarily chosen premiss or statement, and also because it is an obstacle to scientific and methodological progress. Section 5.3 proposes common sense or intuition as a basis for arguing that some statements are better than others. After all, optimism may be justified by stating that the human way of viewing the world offers man at least some of the orientation he seeks. If no mechanism is found to settle disputes, however, this approach can lead to relativism. Two parties could disagree but both would cite common sense as the basis for their statement. Section 5.4 argues that, even if the concept of absolute truth is to be abandoned, the notion of analytical truth - which guarantees truth relative to premisses - is very meaningful. It is suggested that casting scientific statements in axiomatised versions offers methodological advantages. The consequences of such an approach are to divide the scientific argument into two spheres: The sphere of analytical truth and the sphere of discussion about first principles.

Chapter 6 addresses the question of the cognitive status of such a first principle. Section 6.1 explores the consequences of relativism that follows if the decision on the first principle is made by everybody on his own, without any additional structure. It is argued that the consistency rule embodied in the axiomatised approach ensures a minimum of objectivity, but that science then loses its claim as a peaceful and impersonal arbiter if it is not possible to move beyond relativism. Overcoming relativism is therefore the objective of Section 6.2. It is argued that the notion of the validity of scientific statements is tightly associated with the idea of objectivity common to human beings. Therefore, analogous to the categorical imperative in ethics, the crucial point is that science is conducted with the intent to serve the idea of truth – although no enforceable mechanism can be devised that would overcome relativism in practice. It is argued, then, for pragmatic reasons to allow for relative anarchism in science and to only require consistency and openness for criticism as formal criteria.

Chapter 7 lays down the methodological implications of the previous discussion. It proposes to structure science into two spheres: The sphere of first principles and the sphere of analytical truth. It is argued that such an axiomatised approach facilitates communication and increases transparency.
2 The Objectives of Science

Economics, as it is understood in this thesis, ultimately has a practical purpose. Its aim is neither to provide identity nor to be a logical pastime. "It wants to know in order to predict and to predict in order to interfere." This objective is taken from the positivist programme. If nature can be harnessed for human ends, why should not the same be possible with social relations for the sake of social welfare? Theory thus serves purposeful human action. In the words of Mises,

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4 This is quite in line with the positivist programme which wanted to transfer the approach of the natural sciences to social sciences. It is based on the philosophy of Bacon (see e.g. Schülein, Reitze (2002), p. 61) and turned against Hegel. Also, Hobbes (Mader (1992a), p. 176) explicitly calls for a practical intention.

5 As is arguably the case for arts and humanities (see Mader (1992a), p. 53); The distinction between "sciences" on the one hand and "arts and humanities" on the other is relevant as it has methodological consequences. The method of the natural sciences is clearly positivist, empirical and ahistoric. The method of arts and humanities is the "historical method", also referred to as "Hermeneutics" or "Verstehen". Their objective is to study the different expressions of human existence as they are revealed in different situations and conditions during history. The only thing that remains more or less the same in this flow of events is the human being. So by studying history, literature and art in the past and present, human beings try to answer the eternal question of "who they are".

6 As is arguably the case for some ill-conceived economic models; see Hutchison (1994), p. 29

7 Comte (1852), p. 91, "Savoir pour prévoir afin de pourvoir", translated by the author.

8 For an introductory chapter on the philosophy of Comte, see e.g. Mader (1992b), pp. 142-151. In the Anglo-Saxon tradition the word "science" is used synonymous with "natural sciences". The term "social sciences" is also common, but only underscores social sciences' ambition to emulate the natural sciences. Therefore the positivist programme in philosophy which advocates the transfer of the method of natural sciences to the study of social relations (hoping to bring about progress to social relations similar to the impressive progress achieved in the realm of technology) is engraved into terminology. This is different in the German tradition. The term "Wissenschaft" is used in a much wider sense: It traditionally comprises the natural sciences ("Naturwissenschaft"), arts and humanities ("Geisteswissenschaft" or "Humanwissenschaft"), mathematics and logic ("Formalwissenschaft") and the social sciences ("Sozialwissenschaft"). In the German tradition the social sciences and especially economics methodologically stand somewhere in between arts and humanities and natural sciences. This does not matter so much for the objectives of economics, which were stated to be clearly in line with the positivist programme. But especially, when it comes to the problem of controlled experiment in economics and to the discussion of methodological individualism, the method of "Verstehen" arguably plays an important role (see: part II of the text). There is a very rich discussion of this in the German tradition, and it is interesting to see how the now dominant Anglo-Saxon tradition appears a bit uneasy when addressing this question because of its terminological self-imprisonment.

9 Of course purposeful action presupposes a human being with a free will whose needs and wants are taken as an absolute given, and who thinks in categories of teleology - taken as the only possible human way of thinking. If this is too reductionist for some readers, they are...
"The archetype of causality research was: Where and how must I interfere in order to divert the course of events [...] He searches for the regularity of the law, because he wants to interfere. Only later was this search more extensively interpreted by metaphysics as a search after the ultimate cause of being and existence"\textsuperscript{10}. The argument, that such a prediction is not possible in economics\textsuperscript{11}, is not accepted but it is acknowledged that precision and margins of error are certainly higher for economic predictions than for other sciences\textsuperscript{12}. However, "assuming that prediction [...] remains an inevitable activity in real-world economic life"\textsuperscript{13}, the question is not whether the status of economic predictions is high in an absolute sense, but rather if there is "any margin of advantage economists may or may not have over non-economists in providing less inaccurate predictions"\textsuperscript{14}. In the view of the author there is no way economics could circumvent this challenge.

Theory, in the positivist sense, can therefore be defined as the teleological element which is necessarily part of every purposeful human action. This definition allows the casting of theories as an integral part of practical life. It also allows for deriving a formal property of theory as something ultimately concerned with predictions in the form of conditional statements\textsuperscript{15}.

3 What makes Science scientific?

If the objective of science is to support purposeful human action it seems natural to assume that a scientific theory's quality should be judged by its reliability. A theory is reliable if expectations based upon it are not frustrated. This raises the question of what distinguishes a reliable or "good" theory from an unreliable or "bad" theory. This is essentially the question about the foundation of science\textsuperscript{16}. A good theory would be a "scientific" theory because of a set of properties that makes it distinct from a bad theory, which could be just any statement. These

\textsuperscript{10} Mises (1949), p. 22 (4.ed. 1996)
\textsuperscript{11} see McCloskey (1985), p. 15 cit. Hutchison (1994), p. 29
\textsuperscript{12} see Hutchison (1994), p. 29
\textsuperscript{13} Hutchison (1994), p. 32
\textsuperscript{14} Hutchison (1994), p. 32
\textsuperscript{15} Conditionals have an “if-then structure”.
\textsuperscript{16} Science is simply taken as a short-cut for: “The sum of all endeavours to create good theory.”
properties are traditionally truth in the sense of correspondence with reality\textsuperscript{17}, or at least objectivity\textsuperscript{18}.

Scientific knowledge is traditionally argued to be well-founded and therefore true\textsuperscript{19}. Well-founded knowledge is supposed to derive its truth from an underlying cause; but where does this cause derive its truth from? It can easily be seen that this approach leads to infinite regression if one does not ultimately find an absolute justification on which all further knowledge is based. This search for the absolute justification has traditionally been the task of philosophy. Once firmly established, it would ideally prescribe a method leading directly from this ultimate source of truth to scientific knowledge in any field of interest.

So, why bother about these questions in an economic monograph? Would it not be more efficient (and much easier) to stop thinking about methodology\textsuperscript{20} and just follow the method prescribed by philosophy of science? After all, every reasonable man would be forced to agree that everything one comes up with is scientific and therefore true. Unfortunately, it is not that easy. The reason is that philosophy has proven far more successful at showing the shortcomings of different approaches to the problem of the ultimate justification than it has been at solving the problem itself. Like it or not, it simply is a brute fact that at present there is no compelling solution to the problem of absolute justification. The next Chapter will take a radically sceptical perspective in order to to drive this point home.

4 Absolute Justification

4.1 Basic Concepts of Cognition

One concept of cognition is to assume that there is a preestablished objective meaning in the world. As human beings are part of this world, they also have access to its meaning. This can be thought of as a more or less passive process. The meaning is already there. It has only to be received. Often, this meaning is assumed to have a certain structure. It could, therefore, e.g. have a rational

\textsuperscript{17} This is the Aristotelian definition (see Mader (1993a), p. 126). The same concept is somewhat more weakly expressed as "approximation of reality"; see Chalmers (1994), pp. 151-159

\textsuperscript{18} Although there are different shades to the notion of objectivity, the essential element is independence from the will of the perceiving subject in one way or another.

\textsuperscript{19} see Mader (1992a), p. 13

\textsuperscript{20} especially for an economist who advocates separation of labour
structure. Then, of course, human beings only have access to it, if they engage in rational thinking as opposed to believing in irrational myth. This was arguably the programme of the early days of western philosophy. These assumptions, however, now appear very speculative.

Alternatively, one could give up the notion of a preestablished meaning and argue that there will never be any meaning independent of its human perceiver. So, meaning is the product of an active act of constitution in the perceiver’s mind. It follows that the world cannot be known “as such” but can only be known “for us”.

But why for us? What do I know of the meaning the world has to others? Can I be sure that there is a world? Can I be sure that there are others? The last bulwark against scepticism of this kind is my own self-consciousness\(^{21}\); but impressive as this certainty may seem, it also reveals itself as being quite useless. Nothing interesting concerning how to access reality can be derived from it. Descartes e.g. proposed rational thinking and suggested that God could not be so heartless as to bestow man with such a faculty if it was not in order to help him find orientation in the world. Once again, one has to make a leap of faith. Of course, modern thinkers would probably not refer to God but rather to biological evolution to support their optimism that the human faculty of cognition actually provides some orientation in the world.

Descartes’ obsession with rational thinking as the only source of the human faculty of cognition is also controversial. There is clearly another obvious candidate: sense perception. The controversy between empiricism\(^{22}\) and rationalism will not be thoroughly discussed. It shall only be mentioned that both approaches encounter difficulties: The rationalist approach has difficulty explaining the body-spirit relationship - a problem if an outside world is assumed. The empiricist approach, on the other hand, has difficulty explaining how cognition is possible without any preestablished notions and ideas\(^{23}\).

By saying that there is no meaning independent of the perceiver, one seems to elegantly circumvent the tricky question of whether there is an outside world.

\(^{21}\) This is Descartes’ famous cogito principle.
\(^{22}\) in its extreme form also called sensualism
\(^{23}\) By transgressing from perception to a statement of perception, a notional apparatus is needed. It could be objected that the notional apparatus itself is derived from perception. Someone could observe several objects, look for a common characteristic and give it a name; but merely the choice of different objects on the basis of a common characteristic presupposes the notion of that characteristic.
In fact, one could say that the question does not matter. For even if there was an outside world, nothing could be said about it. Still, there remains the experience that things are happening against my will. So, in the reality that my mind constructs, there is an element which I cannot control at will, which is – in a sense – objective. Whether there is an outside world or not, I must still be confident that there is a basic commensurability between my thinking and this objective element which I will call the world. This is basically an ontological assumption very close to the structural symmetry assumed above.

The world can be further differentiated thusly: There is an animated and unanimated world. The animated world is comprised of entities that I consider similar to myself and which I will call my fellow human beings. When I say that my fellow human beings are similar to myself, I am also saying that there is a set of relevant characteristics which make them and me human. This is, I make anthropologic assumptions. If there is a specifically human faculty of cognition, a specifically human way to think and to sense, then there is also a specifically human way to view the world. This means that, in so far as the construction I make is a specifically human construction, it is necessary and therefore objective in the sense of intersubjectivity.

In conclusion, it can be said that assumptions have to be made in order to allow for the possibility of cognition. These assumptions seem very subtle and it does not seem reasonable to oppose them. Strictly speaking, however, they are not beyond doubt. From arguably the only bulwark against scepticism, human self-consciousness, nothing interesting can be derived. The list of additional assumptions usually includes an ontological assumption which claims some degree of commensurability between human thinking and the world, and an anthropological assumption which states some specifically human faculty of cognition.

4.2 Strategies to derive scientific statements

4.2.1 Introduction

So far, fundamental concepts of cognition have been discussed, and it has been seen that the possibility of cognition cannot, strictly speaking, be taken for granted. However, even if it is assumed that such fundamental assumptions as those discussed above are met, nothing has been said about specific strategies to derive scientific statements.

If human cognition, as was suggested above, is divided into sense perception and rationality, and if the spontaneity of the intelligible “I” is such that
sensual perception functions in terms of space and time and rationality in terms of causality and teleology, cognition is possible\textsuperscript{24}. Perceptions in space and time would be initially subjective. In order for them to become objective they would have to be further structured\textsuperscript{25}. This would happen in terms of causality and teleology as the only categories available to the human mind. Either everybody who is exposed to the same data would come up with exactly the same answer, or - regarding cognition as a reflexive activity - can at least be convinced to agree to the same answer in an ideal discourse situation\textsuperscript{26}. Therefore, the following Subsection will explore if there exist strategies which lead to theories that every reasonable human being would be forced to accept (intersubjectivity). Once again, a radically sceptical perspective is taken when criticising the different approaches.

4.2.2 Inductivism

One approach would be to consider a statement to be scientific if it is either directly founded on observation or derived by means of deductive logic from such a statement\textsuperscript{27}. If it is accepted that deductive logic is the epitome of human structured thinking, the question is how is it possible to derive general statements from observation. For inductivism the answer is “inductive logic”. It plainly states that if it is observed that A follows B in many instances and under many different conditions, then A always follows B\textsuperscript{28}. Of course, there are two key assumptions: If such a statement is to be considered objectively valid it must be assumed that both perception and “inductive logic” are objectively valid. Accordingly, objections are raised against both “inductive logic” and the status of perception.

Russell’s example of the desolate fate of the “inductivist turkey”\textsuperscript{29} displays the argument that inductive logic cannot be proven by deductive logic: Suppose a turkey observes that he is fed regularly at a certain time. As he is scientifically minded he does not want to jump to conclusions and observes this behaviour under many different conditions and circumstances. Still, when he recognizes that

\textsuperscript{24} see Mader (1992a), p. 207. This is in the spirit of Kant.

\textsuperscript{25} see Mader (1992a), p. 207

\textsuperscript{26} The requirement of honest dialogue is posed by Kant in “Was ist Aufklärung” (1784) for the “Public use of reason” and taken up by Apel, Habermas and Schnädelbach in their efforts to transform transcendental philosophy to “Universalpragmatik”. See Mader (1993), p. 220-220

\textsuperscript{27} This is the methodological programme of neo-positivism of the “Wiener Kreis”; see Mader (1992b), p. 154; Chalmers (1994), p. 38

\textsuperscript{28} see Chalmers (1994), p. 19

\textsuperscript{29} see Bertrand Russell cit. Chalmers (1994), p. 20
he is fed at the same time independent of weather conditions on all days and during all seasons, he finally acknowledges this as a scientific regularity. The following day, he is slaughtered. Attempts to save the inductivist approach by taking recourse to the notion of probability\textsuperscript{30} will not help. If it is acknowledged that there is an unlimited potential set of possible perceptions, this probability will always tend toward zero. If a limited set of perceptions is assumed, this is an additional assumption. A possible reason why this should be the case is that nature is assumed to be stable and structurally simple, so that as more and more observations are available, statistical inferences can be made with ever smaller marginal error.

Also the status of perception in inductivism is subject to criticism. On the one hand, perception is in doubt as a sure source of scientific knowledge\textsuperscript{31}. On the other hand, perception is shown to be theory-laden\textsuperscript{32}. Perceptions are therefore subject to the same distortions as theory. In the first case it is maintained that there are different experiences of perception, because these are the product of physical and psychological factors which can both differ among individuals. In the second case - the argument that perception is theory-laden - it is pointed out that by transgressing from perception to a statement of perception\textsuperscript{33} a notional apparatus is used which is itself based on theory\textsuperscript{34}. Induction does not create a direct link between perception and statement, but only a link between a statement of perception and a more general statement\textsuperscript{35}. In addition, perceptions are always guided by theory as for the necessary choice between relevant and irrelevant\textsuperscript{36}.

\textit{Inductivism as a practical approach to conducting science depends on the assumption that perception and “inductive logic” are objectively valid. These

\textsuperscript{30} see Chalmers (1994), p. 24
\textsuperscript{31} see Chalmers (1994), p. 28f
\textsuperscript{32} see Chalmers (1994), p. 32f
\textsuperscript{33} see Chalmers (1994), p. 33f: Every statement presupposes to be communicated by language or by some other means.
\textsuperscript{34} see Section II4.1
\textsuperscript{35} Insofar as it is structurally close to deduction also linking different kinds of statements.
\textsuperscript{36} see Chalmers (1994), p. 36f: Observations and experiments are always guided by theory, or at least should be. Otherwise, only lists of aimless observations would be drawn up. It is, however, the objective of science to test, extend and improve theories. There is always a hypothesis that is tested. Observations which are considered to be unequivocally irrelevant will therefore be excluded. Yet in order to distinguish between relevant and irrelevant observations, a guiding theory is needed. If the theory from which the guidelines to conduct the experiment were derived is false, relevant factors could be mistakenly excluded.
assumptions are not beyond doubt. They therefore do not ensure that the construction of the world obtained by using inductivist methodology is intersubjectively valid: It is possible for reasonable people to disagree.

4.2.3 Pragmatism - Foundation by Method

Another way to justify a scientific statement is to argue that it was derived by a successful method. This argument could be used to support inductivism or any other method claimed to have been successful.

This argument has no problem in accepting the idea that both sensual perception and thinking are fallible; but it assumes that these errors can be corrected by observing methodological prescriptions. Bacon e.g. distinguishes the following common sources of distortion of human cognition: The prejudice of subjectivity (idola specus), of language (idola fori), of tradition (idola theatri) and a certain degree of incommensurability of the human faculty of cognition and the structure of reality (idola tribus). The scientific method makes sure that sensual perception, which is the basis for induction and is thus the ultimate source of knowledge, is “supported” by controlled experiment. In addition, it provides rules to “guide” thinking. By prescribing a common method for everybody, subjectivity of cognition is reduced. Language is reformed in order to fit the necessity of exactness in science. History and tradition are explicitly excluded as an obstacle to cognition.

The quality of a scientific statement therefore depends on the method that was used to derive it, more specifically on the suitability of this method to correct the sources of distortion in thinking and perception; but why should one method be better than another in this respect? One possible justification could be that theories, derived using a specific method, are generally successful in explaining and predicting things. But can past success be used as an appraisal criterion? Essentially, it is claimed that something that was successful in many different cases will be successful in all or at least in most cases. But this is exactly what is claimed by “inductive logic”.

Ultimately, foundation by method is shown to be based on “inductive logic” which can be justified neither by deductive logic nor by experience. Therefore, it is either circular or makes an additional assumption.

37 see Mader (1992a), p. 197
38 see Mader (1993), pp. 168-171; Schülein, Reitze (2002), pp. 60-64
39 see David Humes proof of circularity: in e.g. Chalmers (1994), S. 20
4.2.4 Falsificationism

Attempts to provide an ultimate justification for scientific statements can be credited rather for prematurely cutting off the argument by referring to some "metaphysical insight" which cannot be proven than for pushing it to a point where no further criticism is possible. Ironically, this is also true for the inductivist and pragmatic foundation of science, the very attempt that was meant to fight back metaphysics.

Even if no unassailable justification can be given for any scientific statement, however, it does not mean that all theories are equal; but why should any particular theory be better than any other, if both are not proven true? One reason why this might be the case was put forward by Popper who stressed the "logical asymmetry between falsification and verification"\(^{42}\). If a general statement is claimed to be universally true in space and time, while at the same time it has already failed in the past to explain and predict reality, it cannot be true. If, however, something has worked in the past, while it cannot be said that it is true, there is still a possibility for it to be true\(^{43}\). Of course, this presupposes a world functioning according to rules which are stable over time - but even if stability is admitted, only the problems of "inductivist logic" are circumvented. The problem of the status of perception remains. Therefore, falsificationism does not solve the epistemological problems, but - as will be argued below (III6.9) - rather has a different emphasis compared to verificationism as an approach to practical research.

\[\text{Falsificationism as an attempt to establish an absolute criterion to distinguish between good and bad theory depends on the metaphysical assumption of stability and the objectivity of perception. Therefore, epistemological problems are not completely solved.}\]

4.2.5 Conclusion

It has been shown that there is no possibility to absolutely justify a theory. The argument was only cursorily sketched, but seen logically, any attempt to justify a theory can be shown to reside on a metaphysical assumption, fall prey to

\(^{40}\) see Russell’s story of the inductivist turkey, in e.g. Chalmers (1994), S. 20

\(^{41}\) In the case of inductivism such an additional assumption, neither based on deductive logic nor on experience, violates the very standards inductivism proclaims.

\(^{42}\) see Blaug (1994), p. 111

\(^{43}\) see Chalmers (1994), p. 41
circularity or lead to infinite regression. This is an important result, because it dispels the widespread prejudice among scientists and the layman alike that science always depended on simple postulates of reason like deductive logic. Kant calls this the dialectic of reason: Reason demands a firm ground but seems unable to provide it.

5 Beyond Absolute Justification

5.1 Against Scepticism

It should be acknowledged here that, at present, one cannot distinguish between good and bad theory by means of simple commonly accepted postulates of reason. This result is relevant in so far as it can and was indeed argued that in the absence of absolute justification it could not be proven that science was any more than a mere habit or psychological illusion. Consequently, suspending judgement would be the best thing for a wise man to do. This is the position of a radical sceptic.

In order to avoid misunderstandings: The result that no logical foundation of science has been found does not prove that it does not exist, neither does it prove that even if there is no logical foundation of science there might not be an objective foundation in other-than-logical terms. Therefore, it is a fallacy to argue that scepticism necessarily follows from the failure to find a convincing argument for a logical foundation of science. The sceptical position is just one possible hypothesis among others, regarding the fact that no logical foundation of science has been found. So, the question is: Why should it be an adequate hypothesis? It will be seen that the adequacy of scepticism is highly questionable.

First of all, the sceptical position is self-contradicting. If nothing can be known, how can it be known that nothing can be known? Of course, this problem can be solved by arguing that this is an exception to the rule. Yet, this seems rather arbitrary. Moreover, withholding judgement seems to be inadequate in the

44 see Albert, H. (1968), p. 13
45 see Mader (1993a), p. 209-213
46 In Aristotelian terminology: There seem to be no a priori synthetic truths.
47 see Hume cit. Schüllein, Reitze (2002), p. 77
48 It must be stressed that this is not the opinion of Hume but of the Pyrrhonians. Hume is a pragmatic confining his scepticism to theory.
light of the inevitability of action in practical life. By taking purposeful action, people implicitly or explicitly choose a theory. It could be argued from the sceptical point of view that there is no benefit to consciously taking this decision. Indeed, the big merit of philosophy could be to free people from the psychological illusion that science is superior to anything else. Yet, it could be argued that even a psychological illusion has its merit. People demand theories that best calm the mental unease they experience concerning the uncertainty of the outcomes of their actions. Conscious decision-making would provide the individual with self-transparency, continuity and identity. It is ultimately preferences which decide which theory somebody chooses. By choosing a theory, people reveal preferences. If it is assumed that there is some stability in their preferences, scientists could engage in tailoring scientific statements to these preferences. By doing so, scientists are delivering utility to people. Is this not enough of a justification to pursue science? But then, the ultimate criterion for science would be subjective appeal. If this is actually all that science ultimately boils down to, one might be tempted to agree with the sceptical prescription of withholding judgement.

But consider the following thought experiment: If the radical sceptic is taken by his word he should be willing to withhold judgement if asked whether he wants to swallow a cyanide capsule or not and agree to toss coins instead. Yet, it is difficult to imagine many people exhibiting the extent of fatalism implied by the sceptical position in a similar situation. Anything else, however, would lead to a divorce of philosophical conviction and practical decisions.

The radical sceptical (pyrrhonic) position - if immunized against the self-contradiction argument - can be neither proven nor disproved. Yet, its prescription of withholding judgement appears utterly inadequate in the light of the inevitability of theory choice in practical decision making. It leads either (improbably) to fatalism or to a divorce of philosophical conviction and practical decision making.

5.2 Dogmatism

As already implied by the above thought experiment, most people would expect that swallowing a cyanide capsule is not advisable. Similarly, people would distrust a theory based on the statement that stones rise upwards instead of falling

49 see Hume cit. Mader (1992a), S. 201
50 In this case it is difficult to judge where scepticism ends and relativism starts.
51 Hume the foremost proponent of theoretical scepticism advocated pragmatism in real life.
down when "dropped"; but when trying to find a principle of truth they are confronted with the whole range of sceptical arguments.

Taking a dogmatic stance, it could simply be stated that some theories are better than others. After all, this is what motivated the search for the ultimate justification in the first place. Only later did epistemology try to find its principle. If it has not succeed thus far, it should try a little harder. Curiously, it is quite common to continue to think about science as if it was based on something that could ultimately be traced back to simple postulates of reason which are self-evident. Once again, technically speaking, all which has been said does not mean that this is impossible. It just says that all attempts to do so up to now have failed. Still, the question once more is if the dogmatic position is adequate.

The practical consequence of dogmatism is to immunize arbitrarily chosen methodological prescriptions against criticism. If they are not chosen arbitrarily, but because of some specific criterion (e.g. because they are "obviously true"), the question is why no attempt is made to convince others of the quality of this criterion. As a prescription for conducting science, dogmatism leads to a self-contradiction given the fact that science and philosophy of science evolved over time. Dogmatism is dogmatic about things that would never have evolved if dogmatism had been the scientific strategy. Of course, it could unconvincingly be argued that an ahistoric state has now been reached.

Dogmatism is immunizing arbitrarily-chosen methodological prescriptions against criticism. Moreover, it somewhat arbitrarily assumes that an ahistorical state has been reached.

5.3 Common Sense

Discussing the merit of methodological prescriptions, it could be argued that, as common sense has it, some theories are better than others. So, why not name "common sense" the basis of science? The argument could go something like this: Common sense suggests that a theory that has been successful in the past which is plausibly constructed and logically consistent is better than a theory for which all of this does not apply. If this is supplemented by the claim that there exists a specifically human intuition, a new basis for intersubjectivity of scientific statements could be found. In addition, it could be argued that it is justified to be optimistic that a common-sense judgement is not too far off the mark because
there is no way how mankind should have survived without a minimum of orientation in the world.\textsuperscript{52}

Yet, the problem remains: How should conflicts between two parties be settled? Experience shows this supposedly common human feature to lead people almost anywhere. There was a time when people considered empirical evidence to be intuitively unimportant and then the dernier cri.

Still, the convenience of the rational approach and its confidence that anything could be ultimately traced back to basic postulates of reason was based on its claim that anybody, when exposed to the same data, either comes up with the same conclusion or can be convinced to do so; any other option would be called irrational. In truth, however, if human intuitive sensitivity – the whole of human rationality, emotions, senses – is the criterion, two parties could very well disagree with both citing common sense as the basis for their statement.

\textit{If two parties could disagree and still cite common sense as the basis for their statement, this approach practically leads to relativism.}

\subsection*{5.4 An Axiomatic Approach}

If an absolute justification for scientific statements could have been given, such statements could have been labelled “absolutely true”. Although such an absolute justification was not found, it was said that some statements could still be better than others. However, the common way to think about truth is that something is either true or false. There is no place for a middle ground. To say that something is more true or less flawed than something else and therefore an approximation of absolute truth amounts to a masquerade upholding the word, devoid of its idea; but as the notion of absolute truth thus defined is an idea without any practical relevance, it should be abandoned. Note that the author is quite pedantic about his insistence on abandoning this notion and not redefining it. This is because the notion of analytical truth, which can be thought of as truth \textit{relative} to stated premises, is very meaningful. There is truth in the sense that everybody is forced to agree in the formal sciences. This very important concept should not become blurred by association with some newly defined “absolute truth” capturing elusive concepts like “superior intuitive appeal”. It is therefore suggested to abandon the notion of absolute truth in order to preserve the notion of analytical truth.

\footnote{\textsuperscript{52} see II4.1}
In the previous Section it was deplored that if everybody could cite his intuition as the basis for valid scientific statements, science would ultimately be based on subjective choice. This relativist position has been summed up by Feyerabend in the catchy phrase “Anything goes!”\textsuperscript{53} But this does not necessarily mean that any form of objectivity\textsuperscript{54} must be abandoned. It could be formally required that a scientific statement is consistent with self-proclaimed criteria. Therefore, even if the criteria for theory appraisal were ultimately subjective, one would actually restrain arbitrariness. Any potential critic could axiomatize the proposed argument and then check for consistency. If the consistency rule is violated, the proposed statement can be rejected. By axiomatising an argument, the critic is actually creating an explicit set of axioms which constitute the first principle of the argument. Anything else can be derived analytically.

Alternatively, one could imagine a group of people explicitly setting a number of basic assumptions. They could fix the criteria that they consider to be necessary for accepting a statement to be valid. They could engage in discussions. Each party could try to persuade others that a given criterion was vital. Yet, in the end, if they agree on a set of axioms, a possible conflict about whether a specific statement is valid or not can be analytically settled. This is extremely convenient.

Therefore, it is proposed for reasons of methodological convenience that a scientific argument should be divided into two spheres: The sphere of first principles, where discussions can be held in terms of persuasion, and a second sphere where statements can be discussed analytically and categories of true and false reapply in the sense that any reasonable man can be forced to agree. This increases transparency of the argument and thereby invites criticism. It also facilitates communication about scientific statements as it allows locating any possible source of disagreement. If people disagree about first principles, they can try to persuade each other. They might eventually decide to refuse entering further discussion, but if people disagree on the implications of first principles they can be confident in resolving the disagreement by means of logic.

\textit{In order to facilitate criticism of and communication on theory, it is proposed that theories be presented in an axiomatized form.}

\textsuperscript{53} see Chalmers (1994), p. 135

\textsuperscript{54} Recall that objectivity was defined as anything independent of the will, restraining arbitrariness.
6 The First Principle\textsuperscript{55}: Its Cognitive Status

6.1 Consequences of Relativism

The consistency requirement allows for criticism relative to self-proclaimed criteria. However, if relativism is not overcome, science loses its role as a peaceful arbiter. The question is, therefore, whether or not it is possible to move beyond relativism. The consistency requirement which is embodied by the axiomatic approach helped to preserve a minimum of objective validity by forcing people to live up to explicitly or implicitly self-stated criteria; but what can be said about the first principle itself?

The first principle could be set by everybody individually, but what happens if people disagree? A traditional claim of Enlightenment was that every disagreement can be rationally solved. So, even if disagreements will not always be solved peacefully, peaceful settlement is possible in principle without one party dominating the other. There is order, but at the same time perfect freedom. The only law that has to be followed is the natural law\textsuperscript{56} of reason which is impersonal. Of course, people could try to reach an agreement based on the first principle, but as soon as agreement is not unanimous there is domination\textsuperscript{57}. Another traditional claim of Enlightenment was that it is not important that people agree, but rather why. One person could be right while everybody else is wrong, just because the position of this one person derives its truth from the absolute source of truth. This position must also be given up if it is accepted that there is no absolute justification of science. These are very painful implications.

If objectivity is restricted to the sphere of analytical truth\textsuperscript{58}, disputes relative to but not about first principle can be settled. There would be no way to overcome the fundamental relativism of the first principle. This raises the question of whether or not it is possible to move beyond relative truth.

\textit{The consistency requirement allows for criticism relative to self-proclaimed criteria. But if relativism is not overcome, science loses its role as a peaceful arbiter. Therefore, the question is whether it is possible to move beyond relativism.}

\textsuperscript{55} This can also be a set of first principles, but in the following the term will be used in its singular. The mathematically-minded reader can think of it as a vector.

\textsuperscript{56} see Mader (1992a), p. 102

\textsuperscript{57} "Was gemeinsam akzeptiert wird, das ist wahr, wenn und solange es akzeptiert wird" see Platon Theaitetos cit. Mader (1993a), p. 102. = "What is commonly accepted is true, if and as long as it is accepted." (translation by the author)

\textsuperscript{58} Confining law to the sphere of analytical truth is at the heart of Kelsen's “Pure Theory of Law”.
6.2 Overcoming Relativism

At least the possibility to move beyond relativism cannot be excluded. Even if it is not possible to logically distinguish between good and bad theories, this does not mean that such a distinction does not exist. The point is in the spirit of Kant: The existence of absolute truth cannot be proven, but also the non-existence of absolute truth cannot be proven. This opens the way for metaphysical speculation. In the following, it shall be attempted to describe what appears to be part of a common human idea of truth.

Every attempt to capture what seems to be the essence of truth takes recourse to parables and a form of "reasoning" which is characterized by an increased level of vagueness. In any case it is distinct from logical reasoning. This is the reason why it was suggested to keep the two spheres separated. Interpreted in this way they would correspond to Kant's distinction of "Vernunftwissen" and "Verstandeswissen".

The starting point is expressed by a paradox of Pascal describing men as "incapable of absolute ignorance and of certain knowledge"59. The line parable60 of Plato defines the relationship between synthetic truth and analytical truth as equivalent to the relationship between a true opinion and an appearance. Popper uses the metaphor that several piles in a swamp can carry a construction, although they do not reach firm ground61. Is it possible to further specify this "knowledge" which appears to be a phenomenon between scepticism and dogmatism?

It appears that a central idea is objectivity in the sense of something which limits arbitrariness. This becomes obvious in the habit to think from first principle, but also in the reluctance to accept any first principle to be the same. Logical consistency, empirical evidence and plausibility62 appear to be tightly associated to the idea of objectivity.

59 Pascal (1993), Pensée 434 : "incapables d'ignorer absolument et de savoir certainement"
60 Plato (1993), Poleteia VI, pp. 194-198
61 Science does not rest upon rock-bottom. The bold structure of its theories rises, as it were, above a swamp. It is like a building erected on piles. The piles are driven down from above into the swamp, but not down to any natural or 'given' base; and when we cease our attempts to drive our piles into a deeper layer, it is not because we have reached firm ground. We simply stop when we are satisfied that they are firm enough to carry the structure, at least for the time being. (Popper (1959), p. 111)
62 It can be argued that plausibility is a category of introspection.
A major argument against favouring one first principle over the other was that the danger exists to only formalize some form of psychological illusion based on emotionally satisfying fiction. It seems, however, that the idea of objectivity is not based on direct intuitive appeal or attractiveness. Quite to the contrary, there rather seems to be a suspicion of what looks true at first glance and a willingness to accept indirect arguments.

Consider the following example: If somebody promises to make sure that the “farmer would receive more for his grain, the worker pay less for his bread, and the baker and grocer have a higher wholesale and retail margin,” a scientist will reject this promise because it is logically inconsistent although it appeals to wishful thinking. Or consider the classic argument of Hayek concerning collectivism: It could be argued that collectivism just needs a benevolent dictator to make just decisions. Of course, given the justness of the decision, central planning should be implemented. Thus the seemingly uncoordinated activities of people can be rationally coordinated. The wealth of nations can be maximized by avoiding the inefficiencies of the market mechanism. However, it can be argued that it is very difficult to get all the relevant information in time. On the other hand, the market mechanism as a decentralized mechanism can be argued to be more efficient under many circumstances in processing information because decisions are made by persons holding the relevant information (e.g. consumers knowing their preferences or entrepreneurs knowing their cost structure). The case for central planning is another example of an argument which is very attractive at first sight: First of all, one must only flatter oneself into believing that oneself is an example of a benevolent dictator. Then, one would certainly find many instances where the market system produces unjust and inefficient results. Finally, rational planning is very attractive because it suits very well the human mind — especially the mind of the intellectual — which prefers putting things in order. Still, for all its first-hand attractiveness, even socialist scientists like Lange are said to have acknowledged the problem of information, although they thought it could be solved.

It could be argued that there is a difference between a merely subjective decision and a subjective decision, which is made in intellectual honesty against the backdrop of the idea of truth. So, the point is not the fact that people decide

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63 see Drucker (1939), p. 18 citing a speech of Goebbels in 1932
64 The problem of aggregation of preferences is ignored here
65 The idea is taken from Kant, who considered “ideas” not to be constitutive but regulative of scientific knowledge. See Mader (1993a), p. 211. This distinction is also what Rousseau had in mind when opposing the “volonté de tous” and the “volonté générale” (see: Rousseau (1762), pp. 30ff).
but that they do it with an “opinio veritatis” following a kind of “categorical imperative”\textsuperscript{66}. It is suggested that this common idea of truth allows a certain communication context. Honest dialogue could be a means to expose objective criteria analogous to rational discourse. Yet, this time it is more comprehensive and not just limited to the categories of reason.

\textit{James} suggests that an acting individual should show a “will to belief”\textsuperscript{67} for the premisses that he establishes. If he does not, the theories will do nothing to calm the mental unease of acting. In practice, this will often lead to dogmatism. It is suggested here that the premiss should indeed reflect a belief. One cannot take for granted that others will always share this belief, but one has experienced that by exchanging views with others one is persuading and is being persuaded. So, it should be an open belief drawing not only from personal experience but also from the experiences of others by means of dialogue against the backdrop of the common idea of truth. Still, this dialogue should not be a modus toward achieving a convention that is automatically binding for everybody. It is more a chance to learn from others.

This last point is problematic and requires judgement. It addresses the problem of whether there is a bridge, which the author thinks exists, between the idea of truth and the practical possibility of overcoming relativism by a set of enforceable rules. One can either solve the problem by accepting that the ultimate yardstick is set by convention of the relevant community, or one preserves the anarchist quality of science by providing no such ultimate yardstick. If people could credibly commit\textsuperscript{68} to always deciding in good faith, mechanisms as majority rule or a broad consensus within the relevant community could indeed be viable, helping to filter out individual distortions due to error. But there is no way to credibly commit to this\textsuperscript{69}. Any mechanism designed to state rules which are binding for everybody therefore balances the need for order against the potential blindness or corruption of power. In scientific practice, it is argued that a strong dose of anarchism should be accepted as long as the individual scientist offers a consistent argument and is open for criticism. This is because of the pragmatic

\textsuperscript{66} Kant (1786), Was heißt: Sich im Denken orientieren. See Mader (1993a), p. 218
\textsuperscript{67} This is the title of a famous essay by James (1896).
\textsuperscript{68} The problem of commitment is the fundamental problem of contract theory that will be treated in this thesis.
\textsuperscript{69} Indeed, the religious concept of a world hereafter and divine justice can be seen as an “institution” dealing with this problem.
consideration that, in science, more than anywhere else, too much order does more harm than too little\textsuperscript{70}.

The impossibility to either prove or disprove the existence of an absolute justification opens the way for metaphysical speculation. This is distinctly different from logical reasoning. The notion of scientific validity, however, appears to be tightly associated with the idea of objectivity which is different from direct emotional appeal. Therefore, it is argued, it is possible to distinguish between merely subjective decisions and decisions made against the backdrop of the common idea of truth. This common idea offers a basis for communication. Yet, the willingness to engage in honest dialogue is merely a moral imperative and cannot be taken for granted. Hence, no set of enforceable rules can expose "truth"\textsuperscript{71}. Any mechanism that is designed to state rules which are binding for everybody therefore balances the need for order against the potential blindness or corruption of power. In scientific practice, it is argued that a strong dose of anarchism should be accepted, as long as the individual scientist offers a consistent argument and is open for criticism.

7 Methodological Implications

The author was careful to choose phrases like "sharing thoughts" or "inviting others to join" when referring to the discussions about first principle. This might look unnecessarily contrived. The intention, however, is clear: having shown that an absolute basis for science in the strictest sense of the word cannot be proven, some ground shall be regained beyond the notion of relative truth.

The suggested approach of dividing science into two spheres has the following properties: A scientist is willing to name his premisses and thereby invites criticism. This provides at least some objectivity in the sense that he accepts principles which might ultimately become effective against his will. His premisses are nothing else than the criteria relative to which he is willing to have his theories accepted and refuted\textsuperscript{72}.

\textsuperscript{70} The need for order is arguably higher in society as a whole, yet the concept of classical liberalism can be viewed as arguing for restraint.

\textsuperscript{71} The quotation marks are set, in relation to the earlier argument that the notion of absolute truth should be abandoned.

\textsuperscript{72} Of course in many cases, these premisses will be shared by the scientific community.
In order to facilitate theory choice of the individual, it is good to be transparent about the methodological principles underlying the theory that is developed. It is then possible for an individual to easily find out if a theory corresponds to his standards. A scientist does not claim to possess absolute truth. He is not dogmatic. Still he may cling to his principles and refuse to engage into discussion with someone, who does not share the same principles if he cannot be persuaded to adopt them.

By structuring science into two spheres, it is possible to locate where people differ in their views. If it is in the sphere of first principle, one will refuse to quarrel in terms of logic. One can only persuade. However, if one is in agreement with first principle one can be confident in resolving the disagreement by means of impersonal rules. This is the merit of keeping the two spheres separated. It is a structured approach to facilitate communication about theories.

By replacing the ultimate justification with a first principle, it is possible to give the idea of the critical role of science at least some room. The scientific undertaking will be based on certain principles. Relative to these principles, there is a meaning to “true” and “false”. These principles are made transparent. This facilitates the decision process of whether or not to accept a given theory, but it also provides a structured approach for locating the area of dissent. By explicitly referring to the foundation of science as a first principle, one is also taking a firm stand against dogmatism. Discussion of principles can only be led in terms of persuasion and not in terms of logic. It is proposed here that only these formal criteria be used to distinguish science from non-science.

73 In the sense of Pascal's "The art of persuasion" see e.g. Mader (1993a), pp. 190f

74 It is always possible to set axioms such that no problem of underdetermination arises.