Scientific knowledge not like other forms of knowledge

The argument that science possesses some inherent features not possessed by other disciplines, thus making scientific knowledge distinct from other forms of knowledge has long been debated by philosophers of science. Instinctively, when questioned, the layman may propose that what distinguishes scientific knowledge from other disciplines are the fundamental principles of scientific experimentation, hypothesis testing and theory construction and that the aim of science is ultimately to understand, explain and consequently predict the world in which we inhabit. However, can scientific knowledge really be distinguished from other forms of knowledge on the basis of these features alone? The nature of philosophy of science is to determine what constitutes a science, therefore what common feature all the disciplines purporting to fall under the umbrella of science share that makes them a distinctive form of knowledge. The purpose of this paper is to examine scientific knowledge and compare it with other forms of knowledge in terms of the methodologies they employ, and the rational behind the knowledge.

As Okasha (2002) articulated, it is implausible to argue that scientific knowledge is distinct from other forms of knowledge purely on the basis that the aim of science is to comprehend and explain worldly phenomena since this aim is surely shared by all disciplines. Intuitively, one might argue that scientific knowledge can be demarcated from other disciplines by the methodology utilised by scientists to progress scientific explanation, which predominantly resides in the implementation of empirical investigation, theory construction and hypothesis testing. However, as Haack (2003) highlighted, controlled experiments, for example, often thought of as

distinctive of the sciences, are not utilised by all scientists, nor are they only utilised by scientists. Whilst astronomers and evolutionary theorists rely on observational methods rather than empirical testing, it is arguable that people such as mechanics and plumbers do utilise methods more akin to the standard scientific means. In fact, as Haack (2003) asserted, what distinguishes science from other disciplines is not that science relies on a distinct methodology, but rather that scientists have merely extended and refined the resources utilised by ordinary people in everyday empirical inquiry, of which we all partake in. In concurrence, Sokal (2008) emphasised that the use of the term " science" should therefore not be limited to the natural sciences but should include investigations aimed at acquiring accurate knowledge of factual matters relating to any aspect of the world by using rational empirical methods analogous to those routinely employed in the natural sciences. This supports the notion proposed by Huxley that " the man of science simply uses with scrupulous exactness the method of which we all habitually and at every minute use carelessly". All empirical inquirers, whether they be molecular biologists, sociologists, historians or detectives, make informed conjectures about the possible explanation of the phenomena that concerns them, examine how well these conjectures stand up to evidence they already have and any further evidence they can obtain and then use their judgement to determine whether to continue to support their original conjecture, modify or reject it. Hence, scientific knowledge cannot be distinguished from other forms of knowledge on the basis of the methodology that it employs since science is not in possession of a special method of inquiry unavailable to historians or detectives or indeed the layman. The methods of certain scientific endeavours may be more refined

and exact than for other forms of investigations, however, as Sokal (2008) emphasised, methods of inquiry must be adapted to the subject matter at hand. The underlying principles of scientific inquiry as opposed to other rational inquiry that relies on empirical methods are ultimately the same.

What then can distinguish scientific knowledge from alternative types of knowledge? Popper (1972) made a strong case for the notion that whilst some empirical testing conducted in science or indeed in other forms of rational inquiry is genuinely empirical, some disciplines purporting to fall under the umbrella of science rely on methods that are arguably non-empirical or even irrational and pseudo-empirical and that whilst they utilise methods which appeal to observation and experimentation, nevertheless they do not meet the scientific standards. Popper (1972) highlighted cases of supposed pseudo-scientific theories, such as Freud’s psychoanalysis theory and Alders’ individual psychology theory as providing evidence for this stance, arguing that they had more in common with myths than with science whilst seemingly possessing strong explanatory powers. He argued that the fact that any behaviour observed could be explained by these theories, although used to bolster credibility for the theories, was in fact their biggest weakness since no conceivable behaviour could contradict them and therefore the theories were non-testable and ultimately non-falsifiable. He argued that it is easy to obtain confirmations for any theory if we seek confirmations and that confirming evidence should not count except when it is the result of a genuine test of the theory which means that it can be presented as a serious but unsuccessful attempt to falsify the theory. Popper emphasised that whilst the procedure of making a theory such as Freud’s

psychoanalysis theory compatible with any possible course of events is always possible, and the theory can be rescued from refutation, the price is that its scientific status is significantly reduced.

Significantly, however, Popper was not saying that non-falsifiable theories and therefore knowledge based on non-falsifiable claims do not have significance or their place. Rather, that many of the non-testable theories such as the psychoanalytical or individual psychology approaches to human understanding are analogous with myths, and historically nearly all scientific theories have been borne out of myths therefore a myth may contain important anticipations of science theories. Thus, if a theory is found to be non-scientific or metaphysical as it cannot be falsified it cannot be labelled as insignificant in terms of its value to knowledge but it cannot claim to be supported by empirical evidence in a scientific sense. Therefore, religion, whilst not falsifiable since it is not possible to prove whether God exists, is still a valuable discipline.

One caveat to Popper’s (1972) criterion of demarcation however, expressed by Okasha (2002) is that whilst Popper criticised, for example, Marxists for explaining away data that appeared to conflict with their theories, rather than accepting that the theories had been refuted, it would seem that this procedure may be routinely used in the field of science. For example, Adams and Leverrier in 1846, determined the existence and location of the planet Neptune by utilising Newton’s theory of gravity despite the fact that it had made an incorrect prediction about the orbit of Uranus and had therefore been falsified. Rather than concluding that Newton’s theory was completely inaccurate, they continued to advocate the theory and attempted to explain

away the conflicting observations regarding Uranus by postulating a new planet, thus demonstrating that even falsified theories can lead to important scientific discoveries. Hence, whilst Popper’s argument is initially strong it is somewhat flawed. It is still essential for scientific knowledge to be based on evidence that has been stringently tested against a clearly defined set of principles, which arguably makes scientific knowledge distinct from other knowledge such as theological knowledge that is not based on such stringent evidence, however scientific knowledge and other forms of knowledge cannot be distinguished purely on the bases of whether the theories they originate from are falsifiable or not since some scientific theories when falsified are still utilised to progress knowledge. Therefore, in terms of science and religion, it is possible to distinguish between the two in terms of the methods of study and how knowledge is acquired, i. e. knowledge derived from empirical testing as opposed to personal beliefs, however it is not possible to distinguish between these two knowledge bases on the fact that scientific knowledge can be falsified whereas religious beliefs cannot since not all scientific knowledge can be.

The process of reasoning on which scientific knowledge is based can also be compared with the reasoning behind other forms of knowledge. As Okaska (2002) articulated, scientific knowledge is largely based upon the process of inductive reasoning whereby scientists move from premisses about objects they have examined to conclusions about objects they have not examined. An example of this would be found in the study of Down’s Syndrome, in which geneticists have established that sufferers have 47 chromosomes instead of the normal 46. In order to determine this, a large number of

sufferers have been examined and in each case the additional chromosome has been found. Therefore, it has been concluded that having this additional chromosome causes Down’s Syndrome. However, this is an inductive inference as not all Down’s Syndrome sufferers have been tested for the chromosome and therefore the geneticists have moved from the premises about the sufferers they have examined to conclusions about sufferers they have not examined. It is possible that another explanation could be equally plausible. Scientists heavily rely on inductive reasoning wherever they move from limited data to a more general conclusion.

It is arguable that other forms of knowledge as well as scientific forms of knowledge are largely based on inductive reasoning. In fact, we use inductive reasoning in everyday life and our common sense is built on inductive reasoning as highlighted by Haack (2003). However, there are forms of knowledge which do not rely on inductive reasoning, namely religion and theology. According to Haack (2003), unlike religion, science is not primarily a body of belief, but rather a federation of kinds of inquiry. Scientific inquiry relies on experience and reasoning and the sciences have developed many ways to extend the senses and enhance our powers of reasoning but they require no additional kinds of evidential resource beyond these, which are also the resources on which everyday empirical inquiry depends. Religion, on the other hand, is not primarily a kind of inquiry but a body of belief based on personal commitment. Unlike religion, theology is a form of inquiry. Unlike scientific inquiry however theology welcomes and indeed seeks supernatural explanations, explanations in terms of God’s making things so. Furthermore theology usually calls on evidential resources

beyond sensory experience and reasoning and most importantly on religious experience and the authority of revealed texts. As Sokal (2008) highlighted, unlike scientific reasoning that is based on facts, theological reasoning stems from the notion that the holy scriptures provide the answers to life and when asked how it can be known that this evidence is accurate, the answer given is because the holy scriptures say it is. Thus theology is subject to circular reasoning and so unlike scientific inquiry; according to Haack (2003) theological inquiry is discontinuous with everyday empirical inquiry both in the kinds of explanations in which is traffics and in the kinds of evidential resource or method on which it calls.

However, debate looms large over the nature of inductive reasoning, and whether in fact it is merely a form of circular reasoning itself. Hume (1739) argued that induction cannot be rationally justified at all since it invokes the “ uniformity of nature” which is the assumption that unexamined objects will be similar to examined objects. According to this we cannot assume that past experiences will be a reliable guide to the future and to argue that induction is trustworthy because it has worked up until now is to reason in an inductive manner. The uniformity of nature cannot be tested empirically either since this would require inductive reasoning. Hume emphasised that our inductive inferences rest on an assumption about the world for which we have no good grounds and therefore postulated that our confidence in induction is just blind faith. Therefore, arguably if this were the case then science is like religion and theology after all in that it is based on reasoning that can never be proved. However, there are many caveats to Hume’s theory. As Strawson emphasised, induction is so fundamental to how we

think and reason that it is no the sort of thing that should and could be justified as induction is one of the standards we use to decide whether claims about the world are justified. Furthermore, the notion of probability would suggest that there is weight in our inductive reasoning, and therefore since scientific knowledge is founded on objective empirical evidence, it is arguable that the reasoning behind science is more trustworthy that that of religion which is subjective in nature.

In conclusion, intuitively scientific knowledge is a distinctive form of knowledge; however, under closer examination it is evident that similarities do exist. The reasoning behind predominantly all scientific knowledge, like the majority of other disciplines and our everyday inquiry, is inductive in nature, which raises the question as to whether any scientific knowledge can ever be proven. Furthermore, whilst science depends on the scientific method of experimentation, theory construction and hypothesis testing, as Haack (2003) emphasised, these methods are by no means exclusive to science. Rather, scientific inquiry should be seen as continuous with everyday inquiry, although somewhat more refined and other disciplines should be equally able to utilise the scientific method. Whilst methodology may differ between disciplines, the underlying concept that the inquiry must be rational for the knowledge obtained to be credible is inherent in most disciplines akin with science. As Chalmers (1999) argued, there is a false assumption that there is a universal scientific method to which all forms of knowledge should conform however as Feyerabend (1975) argued, defenders of science typically judge it to be superior to other forms of knowledge without adequately investigating these other forms. He

postulated that there can never be a decisive argument in favour or science over other forms of knowledge that are incommensurable with it and that if scientific knowledge is to be compared with other forms of knowledge then it will be necessary to investigate the nature, aims and methods of science and those other forms of knowledge by utilising methods such as by studying historical texts, records, original papers, letters, private conversations and so on, rather than simply by utilising scientific methods. In concurrence with Haack (2003) and Sokal (2008), Chalmers (1999) also emphasised that other forms of knowledge should not conform to the rules of logic stipulated by science and therefore pseudo-science and disciplines such as Marxism should not be rejected as implausible on the grounds that they do not conform to the preconceived notion of the scientific method.

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