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Priya Khanna, Lauriston Girls' School

Theory of Knowledge Essay

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In today's society, comprehensive explanations for natural phenomena are sought after. The area which specialises in gathering this body of knowledge is science and it is justified by experimental evidence. This experimental evidence is in the form of empirical facts which are ascertained through accurate procedure and observation. Henry Poincare states that science is more than just a collaboration of facts, but maintains that facts are the fundamental building blocks which hold the area of knowledge together. He uses the analogy of a house to describe the dynamics of scientific knowledge and bricks to represent the tangible nature of facts. But is it always necessary for facts to support a scientific theory for that theory to be considered knowledge? Or are facts merely interpretations which are not certain? I am going to examine the role of facts in different areas of knowledge in addition to the way they are used in conjunction with reason and emotion.

Science as an area of knowledge is a systemic structure of complex relationships and connections between hypotheses and theories. These connections are created by empirical facts which serve two purposes; they either support hypotheses and function as building blocks which reinforce the framework of scientific theories or they falsify and eliminate incorrect conclusions. Therefore it can be said that scientific theories are dependent upon facts in the same way a house is supported by bricks. However, it is the way in which empirical facts are combined with other ideas, concepts and laws which allows the body of scientific knowledge to function. This can be understood metaphorically by viewing a house as a "machine for living in" (Le Corbusier 2008 p.5) which can only serve its purpose of providing shelter and a receptacle for light and personal life if it is systemically constructed of materials which are independent. This is a reflected in Buckminster Fuller's theory of *synergy* which states that the "behaviour of whole systems is unpredicted by the behaviour of their parts taken separately." (Fuller 1997 p101-120, date accessed 10 August 2008). When this theory is applied to the role of facts in science, it is made evident that the multifaceted

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relationships between scientific facts and theories create a complex entity which is far greater than the accumulation of basic statements or facts. This is evident in chemistry when one examines the interaction of atoms in a compound. For example sodium and chlorine combine to form an ionic compound which has an extremely high boiling point and can conduct electricity in an aqueous solution. But when separated into individual elements, they do not have complete valences or stability. Correspondingly, this idea is reflected in the area of music in the structure and dynamics of both a woodwind instrument and the music it plays. As a clarinettist I must assemble the different sections of my instrument before I can play music. The independent sections of the instrument must be organised in a specific way in order for the relationships between the keys to function and enable the instrument to provide a sensorial experience. Furthermore, the music which I play is held together by the relationship between rhythm and melody and is supported by musical notes. The complex connections which are created when the music is played are much greater than the individual musical notes or the capacities of the component parts of the instrument. In the same way, the scientific body of knowledge is a multifaceted system which is not simply built on the facts that support it.

Although it may appear that science is a concrete body of theories based on facts and reasoning, a theory can only be categorized as scientific if it is public, replicable and open to falsification (Popper 1963, date of access 8 August 2008). Therefore, the entire body of scientific knowledge is based on foundations which can be modified, resulting in the alterations of the structure built upon them. Science is an open study which is continually evolving as theories are refined and as a result, the facts that support them are subject to change. The changes which are made to the structure of science have been named "paradigm shifts" by Thomas Kuhn. According to Kuhn's theory, paradigms are modified as science evolves, and empirical facts are accumulated so as to enable the assimilation of theories (Kuhn 1962). However, the rejection of a paradigm can only take place in accordance with the emergence of new empirical facts and the rearrangement of the facts into new relationships. An example of this process can be seen within the human sciences in the discipline of physical geography when plate tectonics were accepted to be the cause of considerable movement in the Earth's crust. The development of this theory resulted in the rejection of the previously believed geosyncline theory of vertical crustal movement

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and a refinement of the idea of continental drift. Therefore within this paradigm shift, the unjustified basis of the geosyncline theory were rejected and replaced with the geographical theory of tectonic plates. This theory is supported by the same empirical facts which were used to support continental drift, for example, the discovery of fossils from the same species of freshwater crocodile on the coastlines of Brazil and South Africa. Although these facts have continued to support the contemporary theory, its structure has been altered; metaphorically the facts have been rearranged in the same way a houses bricks can be repositioned in the course of renovations. Based on Popper and Kuhn's philosophies, no scientific theory is exempt from the possibility of being falsified. This is coherent with the statement that facts support science in the same way that bricks reinforce a house because even the best built houses are susceptible to change due to unpredictable disasters.

A fact may be interpreted in different ways by different individuals, but this does not change the meaning or value of the fact itself. Facts are interpreted in different ways as a direct result of presuppositions in the role of reasoning. In the same way a pile of bricks has possible structural uses at the discretion of an engineer; an accumulation of facts has the potential to falsify or support a theory once a scientist has connected it to a hypothesis. This is evident in the human sciences in climatology as the facts regarding temperature rises are interpreted in different ways. In the past 90 years, the temperature of the Earth's surface has increased by 0.8 degrees Celsius (CSIRO 2000 p.2). This fact has been interpreted in two different ways, by two different scientific bodies. On one hand, it has been used to support the anthropogenic theory of global warming which states that human activity has significantly contributed to the global temperature increase. On the other hand, this same fact has been used to reinforce the argument that rising temperatures are a direct result of natural phenomena. In this situation the fact has been interpreted in different ways, but the fact itself has not changed. Therefore, even though the fact has remained concrete, the way in which it has been assembled with other facts and concepts has changed.

Although scientific knowledge is supported by facts, other areas of knowledge are not. For example, within the area of ethics one is faced with situations where ethical facts cannot be defined because there is no empirical evidence for goodness or evil, rightness or wrongness (Harman 2008, p.1). Consequently emotion becomes the

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dominant way of knowing and replaces reason applied to the assembly of empirical facts. I experience this when I see women who have undergone extensive plastic surgery to attain 'perfect' bodies and are subsequently photographed to feature in men's magazines. Initially, I am offended and emotionally in opposition to what I consider lack of dignity, but when I look at the situation using reason, I accept that these women are adults who are altering their own bodies and fundamentally making their own decisions. Regardless, I resort to my initial belief because of the strength of my original emotions and the influence of my own moral beliefs. My moral beliefs are supported by my life experience, the views of my society and my own conscience, not empirical facts. Although ethical theories are applied to ethical dilemmas, there are no facts which can be used to support these theories and consequently, the application of ethics to knowledge is limited by the lack of building blocks available. As a result the structure is not substantiated.

Even though there are no facts within the area of ethics, it can be concluded that, in most areas of knowledge, facts support the body of knowledge in the same way bricks support a house. However, this is not a simple process of accumulation. The complex relationships between hypotheses and theories that make up science are reinforced by and can only exist with the presence of empirical facts. Therefore, science is dependent on facts, but the overall dynamics of science as a body of knowledge is much greater than an accumulation of facts. Additionally, as scientific theories are modified, the facts which support them remain concrete in the same way a house can undergo alterations. Moreover, facts are definite. Those which are not already attached to hypotheses are open to reinterpretation and reassociation and can be used to support or falsify new hypotheses, in the same way bricks can be used for different purposes at the will of a designer. These general principles apply across diverse areas of knowledge, from music to physical geography. Facts are essential, but the knowledge is more than just an accumulation of them, as Poincare stated.

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