Principia

The Philosophical Journal of Prince Alfred College

Volume 9

Editor Mr Mark Foy

Assistant Editor Timothy Hobbs

Printer Mr Simon Ludbrook

Contents

Editorial

Timothy Hobbs

Year 11

History abounds with extraordinary philosophical figures: Confucius, Aristotle, Kant and Gandhi. Within all different kinds of religions and cultures, distinctive philosophical thoughts and ideas have been crucial in shaping the way people live their lives.These extraordinary figures, both men and women, have tried to understand the fundamental nature of knowledge, reality and existence, thinking about things beyond the realms of their immediate environment and in doing so expanded the knowledge base of mankind. Philosophers have developed various systems of beliefs about reality and created integrated views of the world. They have asked themselves questions others had not thought to ask, and in this way arrived at ideas about the nature of existence, man's role in the world and the essence of life, which has shaped our understanding of ourselves. Today philosophy can be understood as the foundation of knowledge; the standard by which ideas are integrated and understood in society.

Philosophy is an inevitable outcome of our rational mind. One of our most basic human instincts or natural tendencies is to gain knowledge of the world in which we live. In order to understand the world we are compelled to draw conclusions about its very nature. These conclusions are processed and developed in the mind to become an individual's personal outlook on the world and their own personal system of beliefs. This is the basic idea behind philosophy. It provides the basic framework through which we can understand and comprehend the world. It provides the necessary premises by which man can discover, explore and learn.

In our ever connected, globalised and modernised world sometimes we don't take the time to reflect and consider our own thoughts and opinions. At a young age this is extremely important in terms of growth and development. It is an important step in balancing different aspects of our lives - intellectual, physical and emotional - to achieve satisfactory well-being. By incorporating philosophy as a subject at school and university, time can be allocated to stop and reflect upon our thoughts and our experience in the world around us.

It has been said that "the great virtue of philosophy is that it teaches not what to think, but how to think." Through the practicing of philosophy people can cultivate ways of thinking which are valuable in all professions. Philosophy can build and sharpen analytical skills, provoke deep thought, ask you to question generally accepted theories and ideas and teaches the art of expressing things clearly. It demonstrates that problems can often have multiple solutions and trains students to approach these problems from a number of different perspectives. Over time an ability to formulate questions and follow arguments becomes more natural. The diverse range of useful and practical skills and knowledge that philosophy can impart on a person means that it is becoming more valuable, more relevant and more necessary in our society today.

Challenge yourself to think beyond and as Immanuel Kant, one of the greatest philosophers of our time, said - *sapere aude*, which literally translates to - "*dare to think."*

Is it the case that some areas of knowledge seek to describe the world whereas others seek to transform it?

William Miller

Year 12

The modern era arose with our sudden capacity to acquire vast amounts of knowledge. It was the implication of this fundamental paradigm shift, in relation to the accessibility of seemingly infinite sources of knowledge, which has transformed our political, social and cultural destinies. Undoubtedly, both mathematics and the human sciences, as areas of knowledge, have had a transformative effect. Yet, this claim encourages an analysis of the motivations of mathematics and the human sciences, regardless of a transformative or descriptive consequence, within the singular 'world'. In light of this, the question arises as to whether areas of knowledge can be considered to involve a single motivation, whether motives aiming at description and transformation are necessarily mutually exclusive and whether there is a single world or rather that reality can be divided into a multifaceted collection of separate worlds unique to each area of knowledge.

The claim alludes to the intent of each particular area of knowledge when acquiring knowledge through the inclusion of the verb 'seek'. A point of particular relevance when exploring the nature of mathematics and the human sciences is the intent behind the perpetual pursuit of knowledge in both fields of inquiry. The term 'seek' connotatively implies a fundamental motive, in this context, to describe or transform reality, regardless of whether description or transformation is achieved. Hence, the claim emphasises a motive rather than an achievement. As it would be incorrect to state that an area of knowledge can be motivated, in this sense, the claim may be interpreted as relating to the desire of the typical mathematician or human scientist at the forefront of development within their respective area of knowledge.

The assessment of the claim requires an examination of the meaning of 'world' as through defining the world as either the mathematical paradigm separate to human affairs or the political, social and cultural reality, which is intrinsic to the human sciences, differing conclusions regarding the statement may be justified. The mathematical world is a reality generated by mathematical deduction, being constrained only by fundamental axiomatic parameters and being progressed purely through logical axiomatic deduction.

While the extrapolations made from the logical manipulation of such self-apparent axioms often are innately relatable to our physical reality, supported by the use of mathematical formulas within the natural sciences, they can be viewed as being distinct from our physical reality; operating within the abstract. Perhaps a more traditional interpretation of the 'world' is the one presented within the constraints of the human sciences, which resembles to a greater extent the humanistic products of intention.

Evidently, as the human sciences deal with the examination of human beings in terms ofour fundamentally human attributes; such as those involving language, politics and economics the developments made are predicated to a large degree on human intention.

The world of our intentions, while existing to some extent with correlative patterns, in the empirical sense, is the world in which the human sciences dwell and can be seen as being distinctly removed from the logical dictation of the mathematical world. The apparent differences between the

mathematical world and the world of the human sciences challenges the notion implicit in the topic claim of a single world can been seen as relating to two worlds.

Depending on how the terms ‘describe’ or ‘transform’ are contextualised they may be used in an interchangeable sense. For instance, pure mathematics is often done primarily for the progression of the logical system generated by mathematics. In this sense, the absolutely certain nature of mathematics, within the confines of its own system, enables mathematicians to elaborate infinitely on axioms through a systematic application of deductive logic and through the use of increasingly complex equations, intrinsically transforming the world of mathematics. Mathematics can therefore be seen, after the initial establishment of self-apparent axioms, as being a system in which humans can discover a known complexity through equations that describe a logical continuation**.**

Within the confines of mathematics, it could be argued that mathematicians of the modern era transform mathematical knowledge and yet it may additionally be argued, comparatively, that mathematicians do not transform but rather further describe, through discovering an already existing ‘tree’ of theorems, the mathematical world.

Hence, the further development and manipulation of mathematical axioms can be seen as being either transformative or descriptive, or both simultaneously. Therefore, it must be queried whether an area of knowledge seeks predominantly to transform, through descriptive measures, or to describe without a particular desire to transform.

Hence, it would seem that the motive of describing the world and transforming it are not mutually exclusive, even if accepting the transformations must occur in a world outside of the one generated by the area of knowledge. While there may exist purely mathematically oriented individuals who seek to describe the logical system of mathematics without any motive to transform an alternate aspect of reality outside of the mathematical realm a mathematician may have other motivations such as to use mathematics to assist in the transformation of a technological mechanism. A similar coexistence of motives, which are represented in the claim as being conflicting, can be found within the human sciences. For instance, the use of surveying within numerous facets of the human sciences would typically be considered to have a purely descriptive purpose during the collection and analysis stage. However, as the Australian Bureau of Statistics notes the Australian census, much like any other typical surveying methodology, seeks to “[provide] a snapshot of Australia's people and their housing … [with the] information… [being] used to determine services and facilities you and your community need” (Australian Bureau of Statistics, 2014). Description for the purposes of transformation is common within the human sciences as the collection of data is largely commissioned deliberately to change the world. It would appear almost nonsensical to collect data primarily for the purpose of collecting data; there has to be a motive that exists for developmental processes.

Those who work within mathematics and the human sciences are constantly aware of the potential transformative effects of acquiring knowledge in their worlds, which inevitably plays some part in their intentions. The sheer importance placed on mathematics in educational institutions, for instance, depicts how society and governing bodies recognise the importance of mathematical progression as being essential to social change rather than just being a logical system separate from our political, social and cultural destiny. For instance, at my school, which mirrors the general hierarchy of importance placed on subjects, we study mathematics intensively over the workings of other logical systems; for example chess. As society is aware that pure mathematics has widespread implications for transformations within fields such as the natural sciences, engineering, medicine and finance it is depicted by society as fundamental to progression and as such can be determined to be inherently motivated by a promise of transformation. Perhaps paradoxically, even the most descriptive facets of

the human sciences can also be subtly motivated by a desire to transform. From the perspective of linguistics, there is a definite intent to preserve languages in order to maintain diversity in data sources, a form of transformation of the future through preservation. Nevertheless, there can exist the motive to prevent transformation as illustrated by William Labov, a sociolinguist, who coined the term “Observer’s Paradox” (Cukor-Avila, 2000, pp.253 - 254) when describing that the purpose of linguistic research in the community is to find out how people talk when not being systematically observed, and yet, they must be systematically observed for the data to be collected.

Areas of knowledge do not exist or develop separately from each other; a transformation or description of one may incite a transformation in another. Hence, the question is raised as to whether the motivation of one area of knowledge in furthering another constitutes a motivation for transformation, on behalf of the area of knowledge being transformed. The application of mathematics within the human sciences suggests that our development of mathematical knowledge can be designed for both descriptive and transformative purposes. For instance, the development of probability and statistics within mathematics can be seen as having been progressed purely for real world application. In 1564, Gerolamo Cardano, one of the earliest mathematicians to delve into probability theory did so with the intent of describing the workings of games predicated on chance for the purpose of transforming the way in which people played them and understood the risks they were undertaking (Gorroochurn, 2014, pp.13-20).

Extrapolating this use of probability theory and statistics further into the 21st Century we see the human sciences make use of mathematics for similar purposes; to describe an aspect of human nature in order to transform this aspect by manipulating a treatment of the description whether for sociological or even economic purposes. For instance, within the human science we see how the application of technology based on mathematical theorems allows for the analysis of human behaviour, which can then be catagorised and manipulated for the purposes of innovation and political policy; from educational changes to designing stadiums to regulate crowd movements.

Hence, we should be hesitant to accept this topic claim as it becomes clear from the vast diversity of each area of knowledge and from numerous contradictory interpretations that it is difficult to catagorise the entirety of either mathematics or the human sciences as desiring either to describe or transform the world, whether this means its own reality or the wider social realm in which we all operate. The motivations of mathematicians and human scientists range considerably along a describing-transforming spectrum making it evident that neither mathematics nor the human sciences can be seen as having an intrinsic desire to either describe or transform.

Bibliography

Websites

Australian Bureau of Statistics. (2014). *Census of Population and Housing*. [online]

Abs.gov.au. Available at: http://www.abs.gov.au/census [Accessed 9 July 2014].

Other Online Materials

Cukor-Avila, P. (2000). Revisiting the Observer's Paradox. *American Speech*, [online] 75(3),

pp. 253-254. Available at: http://muse.jhu.edu/journals/as/summary/v075/75.3cukoravila.

html [Accessed 11 July 2014].

Gorroochurn, P. (2014). Some Laws and Problems of Classical Probability and How Cardano Anticipated Them. *Columbia.edu*, [online] 25(4), pp.13-20. Available at: http://www.columbia.edu/~pg2113/index_files/Gorroochurn-Some%20Laws.pdf [Accessed 8 July 2014].

Is that which is accepted as knowledge today sometimes discarded tomorrow?

William Miller

Year 12

It can be seen, from a scientific perspective, that fundamental to our development of knowledge is the pursuit of a true knowledge that timelessly describes principles of reality for specified parameters. In such a pursuit it is evident, from history, that conceptual ideas are proven wrong or revised to alternate theories in order to explain reality in what appears to be a more accurate fashion. Self-evidently this process seems to be inclusive within the natural sciences, within which theories are notably based on empirical data that can be revised with the inclusion of new evidence. Comparatively, the question is raised as to whether, within a system based on alternate ways of knowing, such as the ethical one, knowledge that we accept today can be discarded as inaccurate in the future.

Although scientific method varies considerably across all scientific branches science must adhere to a general methodology in order for it to be classified as scientific knowledge, in a contemporary sense, and these characteristics of scientific study lends what we would deem to be scientific knowledge to future revision. Science is empirical; its development of theories must have a basis in evidence and therefore its assertions are hypothesised due to the application of logical inferences that extrapolate the notions supported by evidence to the general. Knowledge formulated in the wake of the analysis of evidence is subjected to dismissal if in a later instance such knowledge is contradicted by alternate evidence. An example of this is the transfer of scientific knowledge, in regards to the movement of the Earth, from a geocentric model to a heliocentric model. Hence, it is evident that if new evidence presents itself in the future current concepts of scientific knowledge may be discarded, depending on the nature of the new evidence, in favour of an alternative model which allows for the inclusion of all evidence.

In light of this, scientific claims should always be treated with some degree of doubt as science is generally accepted as containing an innate potential to be falsified. The inability of science to separate itself from the problem of induction, as it is an empirically based system, gives rise to the question as to whether science can ever really be recognised as beholding ‘true knowledge’ as outlined by notions of scientism such that an absolute truth is obtained and is accepted as never being able to be discarded. However, it must be noted that even if a scientific theory presents itself for a significant period of time as being without flaws, or with minor anomalies, this does not offer any guarantee to the truthfulness of the theory in depicting the nature of reality. The limitation of science to our perspective, founded primarily on sensory perception, is that while it may prove to be useful it does not prove to be true. A technological development may change our perspective and hence alter our understanding. However, as we are unable to view the entirety of the universe in an objective manner we must be aware that science will forever be falsifiable and hence potentially subjected to change.

Yet, what if science does not have to be innately falsifiable? Within science there are some forms of knowledge that could conceivably never be falsified due to the issues of perception and magnitude. An example of ‘scientific knowledge’ that cannot be falsified is found with string theory. String theory, was born from the purely mathematic work of Euler in which the notions of ‘strings’, minute bands of energy from which all matter was made and all forces could be explained, was developed. The inability of string theory to be empirically tested makes this piece of scientific knowledge unable to be falsified while it may be accepted within scientific circles.

In determining whether ethical knowledge can be appropriately discarded in the future the general methodology in the classification of ethical knowledge must first be analysed. Although ethical

principles are deductively developed into an ethical theory for the behaviour of an individual in any given circumstance, these ethical principles are founded upon a variety of ethical sources that gives rise to considerable conflict between the ethical theories devised. For instance, the ethical theories of conduct as depicted by religion may differ considerably to those dictated by one's own rationality. Even within each of these respective fields there is scope for deviation in their fundamental axioms and within a single religion there may exist ideals which conflict when attempting to apply them in a given situation. Hence, as sources of ethical ideals are so diverse and not of equal moral significance it is clear that in the wider sense, ethical theories are discarded and reevaluated in the present. Therefore, if there is already conflict amongst ethical beliefs in the present it would be reasonable to assume that, depending on the society or individual, an ethical belief may be discarded in some scenarios and accepted in others.

However, it is clear, by general standards, that there is the societal establishment of some form of general ethical consensus by which the wider community is governed. For instance the establishment of a legal system whereby if one who does not act in a 'moral' fashion he or she must face ramifications imposed by the legal system. However, does this more formal dictation of ethical theory as a form of knowledge upon the masses have the ability to be reformed or dismissed in the future? Throughout history legal proceedings have changed in accordance to changes in the general ethical paradigm, currently indicated by the gay marriage debate. Extrapolating this tendency in history into the future it may be deduced that similar general ethical principles may change in accordance with the societal factors.

Some scientific knowledge, which has the potential of being empirically falsified, may be discarded in the wake of future evidence as does the more ambiguous basis of ethical knowledge when faced with innately conflicting ideals.

Can a machine know?

William Miller

Year 12

Machines are typically designed as a reflection of the acquisition and application of human knowledge with the purpose of completing a designated process. This mechanical replication of human ingenuity is subsequently often viewed as simply a superficial tool which obtains information despite an inherent inability to comprehend and thus know the relevance of such information within an area of knowing. And yet, the mathematical paradigm within which machines operate supplies certainty within the constraints of designated axioms; a certainty which in itself may present itself to be knowledge. Therefore, the following knowledge issues arise with response to the knowledge question '*Can a machine know?*' Primarily, variations on perception of the constraints which define an entity's ability to know, the nature of a machine and additionally whether replication of traits which enable a capacity to know constitutes a true capacity to know.

Through using humans as an example as a being with the capacity to know it would appear that the requirements of knowledge contain a complex amalgam of language, perception, reason and emotion. While language is present within mathematical systems of machinery through the application of programming and ensures the creation of fixed axioms from which reason is achieved, through logic it would initially appear that machines have the ability to comprehend direction and apply analytical procedures. Perception and emotion, while more ambiguous within mathematical entities, can be replicated artificially, in terms of human sensory perception, and can be recognised algorithmically. Consequently, it would appear that machines, within the confines of their mathematically oriented and thus logically structured paradigm, have the ability to know with absolute certainty. In such a system, human ways of knowing which do not rely on logic, such as emotion, have no place in the process of acquiring 'mechanical knowledge'. Alternatively, as this conclusion is founded on the premise that one's ability to know is fundamentally orientated by degrees of certainty within their own system, whether biological or mechanical, this conclusion can be rendered moot with an alteration to the very premise defining the nature of one's ability to know. For instance, if knowledge is perceived as a comprehension of the relevance of information within an external system (i.e. the physical world) the validity of the existence of knowledge within a machine decreases dramatically. While machines can acquire information from the external world and extrapolate data in relation to the outside world, to be made use of by humans, their actual comprehension of the relevance of the mathematical algorithms which they follow is, or at least appears to be, nonexistent. Therefore, if comprehension is fundamental to transferring information to knowledge machines are unable to know, in terms of the relevance of their information. Subsequently, it would appear that depending on the definition of knowledge in itself the extent to which one could argue in favour of the existence of mechanical knowledge could vary.

Evidently, through the previous assertions made there is an assumed differentiator between humankind, as an example of a 'knowing' society, and machines. However, depicted often through biological sciences, such as systeomics, as a 'biological machine' the human body can in many ways appear to exhibit mechanical traits. Clearly, accepting a definition of machines to encompass biological organisms would imply that have the ability to know, as demonstrated by human beings. Yet, as knowing occurs fundamentally within the mind, for purposes of analytical clarity the previously mentioned differentiation between machines and human beings on a 'mental' level must

be firmly established for a well-reasoned analysis of the ability of machines to know. Typically, a machine is perceived as a tool which uses logic for a specific purpose. Within evolutionary terms humanity has one purpose; survive to procreate. While the purposes of machines vary they still are designed, much like humans are, as suggested by notions of evolutionary progression, to fulfill their 'programming'. What appears to separate a knowing being from mechanical one is the ability to question, challenge and deviate from their designated purpose. Examining such differentiators in regards to the nature of truth encourages the inevitable questions as previously examined to arise: does certainty based on an internal system constitute knowing, or is knowing more accurately defined as an understanding of relevance, rather than application, in an external system? In terms of the definition of a machine, the circumstances in which a machine can convincingly appear to have knowledge is when the definition of knowing is inclusive of certainty within an internal system and/or when the definition of a machine can include an entity similar to that of humans, whether mechanical or biological, and if biological with the ability to deviate from a designated purpose through individual self-awareness.

As previously mentioned, deductions made from a variety of ways of knowing, enabling the existence of different conclusions based on a comprehension of relevance and application can be interpreted as an ability to know. However, does a replication of all of these attributes, including reason and uncertainty, based on mathematical axiomatically determined logic within a mechanical system which analyses the external world constitute a knowing system as real as any humans'? While machines can acquire information through artificial replications of perceptive tools, such as cameras and microphones does the replication of human thought suggest thought? Human thought, oriented around uncertainty and multi-variable analysis replicated through programming techniques such as fuzzy logic enables a mechanical computation to deal with the notion of partial truth, existing in fields such as control theory and artificial intelligence. This 'partial truth' however, is still fundamentally a reflection of mathematical conceptions rather than independent thought on the basis of the machine. The machine itself does not assign a 'truth value' to include within algorithms through its own experience or comprehension. The information gained through perception remains information; data to be processed according to mathematical formula rather than individual desire of knowledge. Thus, possibly implying that machines themselves cannot think and develop conceptual understanding; they can only act as required. The information they compute is not recognised as knowledge, but rather is recognised as data, and so the conclusions which they draw would appear not to be truly known, in terms of a more conventional approach to the concept of knowledge.

To conclude, to answer the knowledge question *'Can a machine know?'* the nature of knowledge and machines must be established. If knowledge can include certainty within an internal system machines can, in this sense, know. However, if one's ability to know requires a recognition of the value of information in acquiring knowledge machines appear not to have this function. Similarly, if a machine can incorporate biological organisms, such as human kind, or can replicate biological organisms completely it would seem that a machine can know. Yet, if machines themselves are purely mathematically oriented, with the inability to deviate from mathematical algorithms they cannot deal with information independently and obtain a notion of their results as knowledge. Whether replication of attributes which constitutes knowledge or not, machines seem at this current stage, to not have the ability to think separately to mathematical processes and can therefore not comprehend information as knowledge.

Is it so that we agree about general standards in the arts but disagree as to whether a work has artistic merit and, conversely, disagree about ethical theories but all know an unethical action when we see one?

Mitchell Porter

Year 12

At first glance, the title's assertions seem to assess artistic and ethical discourse correctly. The title suggests that artistic and ethical knowledge is somewhat shared with respect to artistic standards and ethical judgements. The title also claims that artistic standards and ethical theories are somewhat independent of their judgements, implying that these areas of knowledge are less systematic than others. If the title's assertions are true, then both of these claims require interrogation.

However, looking more closely at artistic and ethical discourse in reality shows that the title's assertions are not really accurate. Recent literary theory debates show that we do not generally agree on artistic standards. In *The Verbal Icon,* the New Critics Wimsatt and Beardsley argue that we should not refer to a reader's response to a work of literature to analyse it, because it 'ends in impressionism and relativism.' (Wimsatt and Beardsley 1954) In contrast, Stanley Fish argues in *Surprised by Sin* that a work should be judged solely by its reader's response (Shmoop Editorial Team 2008). Similarly, ethical discourse reveals that we do disagree about whether certain actions are ethical. For example, the population of Australia is roughly split between those who think late-term abortion should be wholly lawful and those who think it should depend on relevant circumstances (The Age 2010). To counter, one might argue that the word 'may' admits that the title's assertions are uncertain or difficult to apply in all cases. However, because the title highlights these particular assertions at all, it seems that the author believes their assertions to generally be true. The title's assertions, then, appear to be problematic.

However, these assertions are still relevant; they draw attention to the issue that theories about artistic and ethical judgments are often quite removed from the judgments themselves, as well as the question of the extent to which artistic and ethical knowledge is shared. Sometimes, despite holding different ethical theories, we will share ethical judgments about particular actions-for example, agreeing that random murder is wrong-and vice versa. Similarly, we will sometimes share artistic standards-for example, agreeing that meritorious works are beautiful-despite disagreeing about artistic judgements, and vice versa. However, if the arts and ethics produced systematic knowledge, this would not be the case. In deductive logic, a set of premises must lead to a single conclusion. If ethical and artistic knowledge relied only on deductive logic, artistic and ethical theories and standards would take the form of premises which would lead to conclusions in the form of judgments about a work of art or an action. Therefore, we would agree on judgements whenever they were derived from agreed upon theories and standards, so we would agree upon judgements and theories equally. This, as the title suggests, is not the case. Therefore, the arts and ethics are not exclusively systematic areas of knowledge, which may threaten their universality. If there are no ethical universals, then it seems to follow that one cannot live an absolutely ethical life, a notion damaging to our ability to conduct ourselves morally. While artistic knowledge is less crucial to our personal conduct than ethics, it leads to such odd conclusions as that which says that the work of artistic 'masters' like Shakespeare and Da

Vinci holds no claim to artistic merit because there is no absolute standard to which it can appeal. Consequently, I would not like to accept the claim that these areas of knowledge are somewhat relative because of its odious implications. It seems that, if certain ethical theories and artistic standards are shared, then, because one can deduce universal judgements from universal standards, we avoid this problematic conclusion.

To assess the extent to which shared knowledge in these areas exists, it is necessary to examine the extent to which we arrive at artistic and ethical standards and judgements through reason. Because the arts and ethics are not exclusively rational systems of knowledge and because they are not empirical, they must have a non-rational component. Non-rational knowledge might be emotional, so the arts and ethics may be founded on emotion, which suitably responds to the title's issues. The discrepancies between standards and judgements in these areas would be inevitable if emotion drove artistic and ethical discourse, because emotion is independent of deductive reason. However, the reality of artistic and ethical discourse seems to threaten this notion. While discussing aesthetics in *The Critique of Judgment*, Immanuel Kant noticed that, while 'everyone has his own taste,' (Kant 1790) we justify our artistic claims (Kant 1790). For example, to critique Shakespeare's play *Macbeth*, one would not simply say that 'it felt cathartic' but would give reasons for their subjective responses, like 'Shakespeare uses characterisation to make *Macbeth* cathartic.' This is similarly true in ethics; a lawmaker would not ban murder simply because they did not approve of it but, rather, they would give reasons for their moral assessment, like 'people have a right to live.' Even though our artistic and ethical judgements and standards are often discrepant, the fact that we attempt to mediate them through rational justification suggests that we have a sense that our artistic and ethical knowledge can be applied universally. Therefore, it seems that there must be *some* shared standard for artistic and ethical judgements. Therefore, the non-rational component of the arts and ethics must manifest itself when we follow our sentiments rather than these universal standards. Unfortunately, on closer examination, this argument seems to contain a logical blunder. Suppose I said that *Macbeth* was meritorious because its characters were complex. Why are works with complex characters meritorious? Either I respond by saying that character complexity is good because I feel that it is good or I rationally justify it, from which an infinite regress follows. We must concede that the foundations of the arts and ethics resist rational justification and are, therefore, not necessarily shared. Consequently, we may not agree on artistic and ethical standards and judgements.

However, non-rational knowledge is not necessarily relative or personal; we may still share the non-rational foundations of the arts and ethics. These areas of knowledge are stable if intuition, a non-rational but still non-emotional way of acquiring knowledge, can be shown to form a valid basis for artistic and ethical theories. As G.E. Moore elucidated in his 1903 work *Principia Ethica*, we accept that shared intuition leads to knowledge of self-evident truths. To illustrate, he discusses why reason is a way of knowing. One could not rationally justify claiming that reason leads us to knowledge, because rationally justifying this claim presupposes that reason leads to knowledge, which begs the question. However, 'we are all so fully agreed that it is a warrant of truth' (Moore 1903) because we intuit that it is self-evidently true to any reasonable person. Extending this analogy, Moore thought that, because such knowledge is based on self-evident intuition, if there are self-evidently true moral intuitions, then consistency requires that we found ethical systems on these intuitions. The same is true in the arts; if intuition leads to self-evident artistic truths, then these truths should found artistic judgement. Because self-evident ideas can form a stable foundation for artistic and ethical knowledge, it is necessary to question whether these ideas actually exist. In ethics, it seems that we share the idea that the existence of morality is self-evident. Moral systems appear to manifest themselves in practically every human culture and moral nihilism, the view that morality does not exist (Pratt 2014),

is rarely accepted with conviction. To illustrate, Bertrand Russell, who philosophically rejected morality's existence, said in 1960 that he found himself 'incapable of believing that all that is wrong with wanton cruelty is that [he does not] like it.' (Pidgen 2008) We have a powerful sense that morality exists, so much so that it seems to be self-evident and, therefore, appears to be true. However, self-evident artistic beliefs are more elusive and, consequently, the notion that artistic ideas arise from personal emotion is an attractive proposition. There appear to be a number of differences between the purposes of art across different cultures and contexts. To illustrate, Ancient Greek art was primarily designed for functional purposes-for example, pottery-as well as to commemorate historical events and represent mythological ideas (University Press Inc. 2012). In contrast, in my country of Australia, the 'Angry Penguins' participated in a modern visual art movement which sought the 'liberation of the subconscious' and free expression (ACME 2008). Ancient Greek and modern Australian artists seem to have had distinct and culturally specific views on the purpose of art. If art had a self-evident purpose, various cultures and contexts would probably recognise it, as they recognise the existence of goodness. Therefore, even though I share the views espoused by the Angry Penguins, I cannot claim them to be true on the basis of self-evidence. Consequently, while artistic knowledge seems to be emotionally based and personal because we lack the intuitive foundation on which to base artistic judgements, ethical knowledge appears to be more absolute.

While the title's assertions are problematic, they illuminate the discrepancy between standards and judgements in the arts and ethics and the issue of the extent to which artistic and ethical knowledge is shared. The idea that personal emotion founds these areas does not necessarily follow from the discrepancy between theories and judgements in the arts and ethics, but it does show that they are founded on non-rational belief. While ethics seems to be a stable area of knowledge because these non-rational beliefs often take the form of self-evidently accurate intuitions, the arts are less stable because they produce more personal knowledge. Therefore, while we generally agree on ethical theories and judgements insofar as they are based on self-evident moral values, we do not agree so frequently in the arts because they are more relative.

Bibliography

eBooks:
Kant, I 1790, *The Critique of Judgement*, University of Adelaide, Adelaide, accessed 25 June 2014, http://ebooks.adelaide.edu.au/k/kant/immanuel/k16j/section2.html#SS56.

Moore, GE 1903, *Principia Ethica*, Fair Use, accessed 27 July 2014, http://fair-use.org/g-e-moore/principia-ethica.

Wimsatt, W and Beardsley, M 1954, *The Verbal Icon: Studies in the Meaning of Poetry*, University of Kentucky Press, Kentucky, accessed 9 June 2014, http://louisville.edu/humanities/ph.d-program-in-humanities/aha/critical-theory-reading-group/selections/WimsattandBeardsley-TheIntentionalFallacy1954.pdf/at_download/file.

Websites:
ACME, 2008 *The Angry Penguins*, Australian Government, Canberra, accessed 2 August 2014, http://australia.gov.au/about-australia/australian-story/angry-penguins.

Australian Associated Press, *Call for early abortion to be lawful: poll*, 2010 The Age, accessed 24 July 2014, http://www.theage.com.au/national/call-for-early-abortion-to-be-lawful-poll-20100704-zvtt.html.

Kren, E & Marx, D 2014 *The School of Athens*, Web Gallery of Art, accessed 27 July 2014, http://www.wga.hu/frames-e.html?/html/r/raphael/4stanze/1segnatu/1/athens.html.

Nobelprize.org, 2014 *The Nobel Prize in Literature 1957*, Nobel Media AB, accessed 27 July 2014, http://www.nobelprize.org/nobel_prizes/literature/laureates/1957/.

Pidgen, C 2008 *Russell's Moral Philosophy*, Stanford Encyclopedia of Philosophy, accessed 27 July 2014, http://plato.stanford.edu/entries/russell-moral/.

Pratt, A 2014 *Nihilism*, Internet Encyclopedia of Philosophy, accessed 2 August 2014, http://www.iep.utm.edu/nihilism/#H3.

Shmoop Editorial Team 2008, *Stanley Fish*, accessed June 10 2014, http://www.shmoop.com/stanley-fish/.

University Press Inc., 2012 *Ancient Greek Pottery*, Ancientgreece.com, accessed 2 August 2014, http://www.ancientgreece.com/GreekPottery/.

Is the task of history is the discovering of the constant and universal principles of human nature?

Jason Anglberger

Year 12

History is an area of knowledge that is characterised by an attempt to understand the past. Distinct from the area of knowledge history, being the study of events, is 'History' which refers to the events themselves (Utilisation of the terminology 'History' will be avoided in the essay). However, history is shaped by its attempts to understand the role of humans in the past specifically. It is this that gives rise to many of the strengths as well as limitations of history, as humans themselves are often an enigma in the present let alone humans separated by the passage of time. It is questionable that history will ever be able to determine timeless principles of human nature due to its limits as an area of knowledge. The Human Sciences as an area of knowledge comparatively seems better suited to determining these constant principles, yet it will be shown that it too has difficulties. However the wording of the topic professes certain ideas about the task of an area of knowledge that must be addressed first.

The topic asserts that it is the task of history to determine constant and universal principles, which by extension asserts that history only has one task. The idea that areas of knowledge have a prescribed task is doubtful. The questions must be asked – Why should history, or any area of knowledge, only have one task? Further, how is this one task determined? The human sciences, as an area of knowledge, are also included in this dilemma. At the very basic description, an area of knowledge is a way of grouping knowledge. The way that it is grouped is based on the differences in how this knowledge comes about. As will be discussed, history and the human sciences describe very different methods of acquiring knowledge. However, there is no requirement for an area of knowledge to have an aim. Knowledge can be acquired without a particular intention to use it. It is illogical to say that knowledge has an inherent aim just as it is illogical to say an inanimate object has an aim. This can be extended to the areas of knowledge, like the knowledge they categorise they also have no inherent aim. This is illustrated by the fact that often knowledge is hard to place into one area or another, they seem to fit in more than one place. Because these boundaries often blur, it demonstrates that areas of knowledge themselves are not some underlying divide between types of knowledge but an artificial creation so humans can better understand and order types of knowledge. Determining the aim of these areas of knowledge is difficult then, but the idea that each only has one task is even harder to consider. This is because these areas of knowledge have incredibly diverse applications and it is hard to define one aim that they all conform to. An example of the use of history is the analysis of Hitler's invasion of Russia in 1941. Many historians argue over why this conquest failed, the comparison is made to Napoleon's similar attempt to conquer Russia in 1812. History attempts to determine whether this is a case for recurring similar events (Tarle, 1946). A different example however is a recent historical publication in Russia, proving Soviet leaders had knowledge of Gulags for political prisoners. This directly challenged official Soviet history, which dramatically changed the perceptions of the population on the legitimacy of the government (Crabtree, 1993). The free will of humans has defined what the application of history has tried to achieve in these cases. The topic is mistakenly definitive in its assertion that History only has one task.

Another problem with the topic is that it functions on the basis that constant underlying human principles exist, as it suggests that the areas of knowledge are at least attempting to find them. This in itself is a topic of substantial philosophical debate, as so far there is no proof that they exist. There are

significant implications for our race if they do. The idea that we are able to progress as a species is cast into doubt if there is an unchangeable aspect to our existence. How would the idea that we are unable to improve effect our societies aims today? Similarly, if they were proven to not exist, it would be the disruption of the foundations of 'morality'. If there are definitively no underlying principles to our behaviour it is difficult to formulate an axiom for right and wrong. However, it may be possible that these areas of knowledge can function adequately regardless of whether these principles exist or not. The act of trying to find them assumes that they are true, but trying to find them should cast light on whether or not they exist rather than impacting on the functioning of the areas of knowledge. These areas of knowledge frequently try to investigate theories that could prove incorrect and this is no different. In this regard the essay shall continue to examine these areas of knowledge as if there are constant and universal principles of humanity to be found.

History possesses one key limitation that means determining constant and underlying human principles is difficult using just this area of knowledge. Often history does expose what seem like recurring human principles. For example, many people hold the belief that humans have always fought wars. This is usually based on historical knowledge as indeed since physical records of events began being created, there have been frequent conflicts. History, considered individually, therefore supports the idea that conflict is an inherent human trait. However, anthropological study suggests prior to recorded history there were no wars (Cummings and Cummings, n.d.). Anthropology, a branch of the human sciences, is in this case more useful as it does not solely rely on records of past events but also current empirical information about our society and study of past societies. This exposes the advantage the human sciences possess in that they are not limited to the past.

In this regard, it is impossible for historians to describe the past without the influence of both time and previous events upon them as history is a study in time. It is impossible for history to exist separate from time for two reasons. Firstly, it is entirely concerned with the past and the significance of each event is entirely relative to its place in the past. No analysis of causality can take place without a linear progression of time, and similarly an understanding of the past cannot exist without the past. Secondly, historians are part of the course of time themselves, unable to remove themselves from time. When it comes to timeless principles this exposes clearly the problem faced by history. It is impossible to be sure that any knowledge gained from history is timeless because history is inherently linked to time. Relating back to the example, all the evidence considered by history points towards the conclusion 'humans have always fought wars', yet the reasoning for this conclusion is based on the relative frequency of wars over time. History does not allow us to claim 'humans *will always* fight wars'. The way that the human sciences operate is such that they are more likely to allow such a definitive conclusion to be reached. The test based verification of science using repeatable evidence allows the principles that it discovers to be timeless.

However, in regards to actually determining the principles of human nature, the human sciences are somewhat limited. They study only our observable behaviour, attempting to describe human nature solely based on the actions of that human. It is inadequate to describe the complexities of a human entirely these actions.

The human sciences face a similar issue here as history; never being able to be certain about the intention of a human. Many intentions are acted upon, consciously or unconsciously, but humans can have intentions that do not manifest themselves in the physical at all. Because of this it is very difficult for either area of knowledge to be certain in regards to a person's intention through the uncertainty of what is taking place in the mind. There is no observable way to determine all of the different intentions a person experiences. By extension it is difficult for them to determine why a

person made a particular decision. This is a crucial subject when trying to determine human principles.

Although the topic has incorrectly asserted certain ideas about the purpose of areas of knowledge and also the nature of constant and underlying human principles, it largely does not hinder an examination of how successful both history and the human sciences are at determining constant and universal human principles. Both areas of knowledge can be used with the aim of investigating these and in doing so could contribute to understanding whether these principles exist at all. Despite this, both areas of knowledge possess limitations. Although in some cases they may seem to support the idea of timeless human principles, the fact that they both examine only the actions of humans is a significant issue. History in particular is limited by its close relationship to time, which hinders its ability to find timeless principles. Overall it is difficult to examine the issue of whether these principles exist using only these two areas of knowledge and it is advisable to make use of other in the investigation of human nature.

References

Crabtree, D 1993, *The Importance of History*, Gutenberg College, viewed 6th of July 2014, http://msc.gutenberg.edu/2001/02/the-importance-of-history/

Cummings, M and Cummings, E n.d. *Facts Behaving Badly: Humans have always fought wars,* On Violence Blog, viewed 1st of July 2014, http://onviolence.com/?e=481

Mayell, H 2001, 'Climate Change Caused Extinction of Big Ice Age Mammals, Scientist Says', News article, National Geographic, 12th of November, viewed 12th of July 2014 online at http://news.nationalgeographic.com.au/news/2001/11/1112_overkill.html

Mombauer, A n.d. *The Debate on the Origins of World War One*, British Library Board, viewed 12th of July 2014, http://www.bl.uk/world-war-one/articles/the-debate-on-the-origins-of-world-war-one

Tarle, E 1946, *Two Invasions*, Foreign Affairs Forum, Council of Foreign Affairs, viewed 6th of July 2014, http://www.foreignaffairs.com/articles/70532/eugene-tarle/two-invasions

Can a machine know?

Jason Anglberger

Year 12

Firstly, we must establish what 'machine' means to us. The first connotations that are brought to mind are of artificial construction; something that has been made through the deliberate actions of humans. Evidently this would not be an appropriate definition as it would mean that a painting, for example, could be classified as a machine. A machine has a task that it performs actively, rather than the painting, which is inanimate. The definition does have its limitations, such as whether a bicycle is a machine if it requires human input. Most people would argue that a bicylce is a machine, if a relatively simple one. It is prudent then, to define a machine as above but with the additional requirement of having some human input. Every machine currently created has had human input in order for it to start functioning and fulfilling its purpose. Even the most complex computational programs still have limits that are defined by humans. An argument against this is the theoretical artificial brain. If a brain is exactly replicated to function as our brains do then it fulfils the requirements of the definition. In this case, would it be accurate to define the brain as a machine? Saying so would be very close to defining an actual human brain as a machine and it is difficult to argue that 'machine' is an appropriate way to describe the complexities of the brain. Therefore, another requirement must be formulated to define what a machine is. Using the above example the brain would, theoretically, think. It would have had human input to begin its function and it would be fulfilling its intention of functioning like a brain which primarily involves thinking. In this way it can be seen that there is a distinction from most machines, which do not think, and an object as complex as the brain, which can think and is conscious. This statement does raise questions about the nature of thought and consciousness, but ultimately that is out of the scope of this issue. Simply, it should be clear that there is an inherent difference to the processes of a computer and the thought that we experience.

The next issue it the establishment of what knowing consists of. Many things are capable of possessing knowledge. A book that contains writing in it could possess knowledge. There is a distinction between the relationship the book has with the knowledge and humans. The book is only a vessel for the knowledge, it does not analyse, understand, or act on the knowledge. Therefore knowing is a process that involves more than simply possessing knowledge. Knowing describes something that is done with knowledge. It is important to establish that knowledge and understanding is not the same. Although a person can be made to recite the reasons for something occurring, they might not understand or be able to describe the implications. In this case, clearly the person has knowledge of the reason despite the lack of understanding. To further the example, in a test, the person might write down an answer to a question that they don't understand, however they *know* that the question is correct, as they have been told that it is. Further illustrated by this example, knowing is not necessarily related to truth. Although something can be known to be true, the knowledge that it is based on could be false, despite the apparently definitive connotations of *knowing*. From here a line of argument could be pursued about truth and reality yet the most important point in regards to the question is related to the criteria for knowing. It is certain within a closed system (or mind) and is based on knowledge.

Now that a frame on which an argument can be based has been formulated from the question, that actual problem of whether a machine can think will be investigated. A machine can possess knowledge as has been described. The problem becomes more difficult to investigate when the claim that complex machines can act on knowledge that they possess. The example of a computer program that can analyse faces and then determines whether a given picture is of that person shows that the computer is acting on the knowledge that it has been given. It is making a decision, albeit binary, with

the input being something that we interpret as knowledge. Does this qualify as knowing though? Using the definition for knowing as established for above, an argument could be pursued that this means that a machine can know, as in a computer for example, its programming is its way of knowing, which is by nature certain within the system of the computer. Although the computer might not be correct from our perspective in a decision that it reaches, the one constant is that it will have behaved under the instructions of the programming, which it *knows.* This would seem to indicate that the response is affirmative to the question. A key component on the nature of knowledge has been overlooked though. Knowing describes a condition in which not only is the knowledge able to be acted upon, but it is able to be analysed, evaluated, and questioned. A human has the ability withdraw their mind away from emotion for example, to analyse their feelings and whether the course of action they are directing them down is the correct one. A machine is clearly not able to do this. Although it can be programmed to question knowledge that is given to it, as per the definition prescribed to a machine, it would have to be originally programmed and in addition follow this to be able to question other knowledge. This presents us with a clear distinction between a humans *knowing* and the way that a machine uses knowledge. There is one inherent limitation to this argument, and that is the nature of the mind. Because humans are the only ones who can examine the effect of the inherent construction of the mind on our thoughts and, indeed, ability to *know*, it is not possible to say whether we are limited in our ability to know like a machine or if the mind truly transcends similar limitations. It is apparent that the mind must have some limitations yet the question of whether this is due to some kind of 'programming' is unresolvable.

Is it the case that some areas of knowledge seek to describe the world, whereas others seek to transform it?

John Dongas

Year 12

The world of knowledge that we experience in our contemporary society very clearly differs in certain aspects from that which our ancestors might have once had. Yet, this raises the question, how has this change run its course? Did we intend, through knowledge, to transform our world? The connotation of 'seek to' introduces the problem of motivation, something difficult to observe with certainty. Taking an objective area of knowledge, such as mathematics, and comparing it with the human sciences seems to contrast two mutually exclusive poles, one being descriptive, and the other transformative. However, it is difficult to see how the differences are defined, and even if it is possible to distinguish between them. By examining these two areas of knowledge, I wonder how we could establish a way of knowing whether one is wholly descriptive or transformative. Therefore, to what point we can classify one of these areas of knowledge into one of these categories must be questioned if the topic claim is to have any merit.

One consideration before commencing this essay is to what the term 'world' in the topic claim refers. Is it simply the physical sense of planet Earth, or is it specifically humans, our experiences, interactions, and history? Although it is possible that the application of knowledge may always change the physical world, especially through scientific discoveries, taking the purposes of this essay into account, incorporating human history requires a more subtle philosophical analysis regarding the two types of knowledge being discussed.

The implication of 'seek to' in the essay's title implies that it may be through motivations that one can make a distinction between descriptive and transformative knowledge. Here, a difficulty in the use of language arises since seeking is not necessarily the same as doing. What this implies is that motivation or intent is what might distinguish between the two. Yet this is not as easy as it might seem. Recently, I was required to complete a survey for a company which had produced a series of lessons on goal planning and productivity. We had been told that the goal of the survey was to 'gain an understanding of the things you had learnt from the program in order to improve it for future year levels'. This statement seems to suggest that the goal of the survey was overall to transform the experience of the future year levels. However, in order to do this, what the survey does is offer an overview of the feelings of the class. Similar phenomena exist in the field of mathematics. If the mathematicians who worked on a theorem had no intention of transforming a piece of knowledge, then we can say that we have distinguished between descriptive and transformative motives.

However, the problem with accepting this as an end point is that intent is an incredibly difficult source of knowledge to identify. We look again at the field of mathematics. How it is designed in its methodology is to branch out from the known axioms, proofs, and theorems to build upon its own elaborate system. Yet in the world that we live in, there would not be much emphasis placed on mathematics, nor funds provided for its research if it was so self-centred. Mathematics must therefore have some transformative aspect to it. Even the purest of mathematicians would most likely be aware of this. It could be argued that many pure mathematicians seek no impact on the world other than the

development of the mathematical tree, despite being aware that their efforts may lead to some change. On the other hand, those in the applied field, more familiar to students such as myself, are somewhat more willing to seek transformation. Therefore, particularly considering the dual nature of a field like mathematics, it becomes challenging to distinguish between descriptive and transformative knowledge by generalising across the area of knowledge itself. Of course, the basis of this argument still relies on assumptions that the motives for doing mathematics differ for a pure mathematician to an applied one, something that cannot be entirely known due to the problems of discerning an individual's intentions. We need to be aware that in contrast to the natural sciences, the intentional dimension of human activity operates in a completely different way to that of direct cause and effect. Our actions when attempting to transform the world may have many intentions, or even unintended consequences. The investigations of an area of knowledge can be diverse, and as such, involve diverse motivations. Those who undertake these investigations are similarly diverse. Hence, the generalisations made by the topic about motivation are questionable and difficult to justify. The relationship between intentional and unintentional action is therefore highly variable and not easy to establish.

Yet even if we were able to hypothetically identify a way to reconcile these internal conflicts, distinguishing the motivations behind describing and transforming would not be any easier. Another primary issue is how to define the terms descriptive and transformative. In its simplicity, the phrase transformative knowledge could be described as knowledge which itself transforms the experiences of human beings in some capacity. It seems difficult in this context to identify how one might be able to obtain knowledge which is by itself transformative. In what capacity would it be possible to gain knowledge which fails to describe the world, yet somehow exists to change it? This knowledge must rather be primarily descriptive in its initial development, in order to be able to be used for change. Returning to the previous example, it is evident that despite describing my class by completing the questionnaire, the overall motivation of the survey was to use this information in order to better the experiences of the future classes doing the program. Briefly ignoring the limitations of this kind of knowledge, the survey would on some level offer a description of the things that the class had learnt from the program. In a situation such as this, it is difficult to distinguish between what might be classified as descriptive and what might be transformative. The census itself is descriptive, yet the application of the results is transformative.

It is not only in the human sciences however that these two terms are difficult to distinguish. They also exist in more or less the same way in mathematics. One interesting example I came across was that of Benford's Law. It states that in many real-life sources of data, the leading digit is the number 1 about 30% of the time, with larger numbers appearing with decreasing frequency.[1] Having been discovered by accident, and then described mathematically in the form of a logarithm, this discovery had arguably no intention of transforming the world. Yet, today it is used in numerous scientific and economic situations to detect fraud and analyse statistics.[2] Although subsequent applications of the idea might be incidental to the motive of the original investigation, at least superficially, this is an example of how a simple observation describing an interesting phenomenon has been used to transform our understanding of economics.

What this more or less establishes is that the motive for knowledge related to our 'world' is not necessarily one of those two mutually exclusive poles. Overall, knowledge that transforms the world usually has had some motivation to act descriptively in some initial context. That is not to say that descriptive knowledge will always be used in a transformative way. Concepts such as infinity are known to be abstract. They exist in the field of mathematics as an interesting observation or

phenomenon. Of course, there are theoretical applications of infinity in fields such as computing and physics, black holes for instance.[3] This results from our use of equations to describe physical events. However, while we acknowledge there would be circumstances where knowledge, particularly in mathematics, only has theoretical applications for the time being, we are unable to know at the current time whether or not these concepts will ever have an application in the future which may well change our understanding of the universe as a human race, and therefore transform our 'world'. What confuses this premise even further is that a pure mathematician might develop pure mathematics with at least some conscious awareness that such development might sometimes have subsequent transformative applications. Hence it is not as easy as one might think to know for sure whether a piece of knowledge is descriptive or transformative based on its motivations, or even its applications.

In conclusion, while some areas of knowledge may in fact seek to describe the world, and others seek to transform it, it seems difficult to distinguish between the two categories. Firstly, we identify that areas of knowledge are not so easily divided based on their descriptive or transformative qualities, since they are so often an amalgamation of both. It appears as though it would be possible to distinguish the two by analysing the intent behind them, whether or not they seek to describe, or transform the world. Yet, primarily, intention is difficult to identify, let alone generalise over one or two whole areas of knowledge. If this is the case, then overall, we can try to generalise areas of knowledge into one of the two given categories by assuming the motivations behind them, but we also need to be aware of the limitations in categorising them this way.

1. Browne, M, *"Following Benford's Law, or Looking out for No. 1"*, The New York Times, published August 4, 1998, accessed 24th June, 2014 online at: http://www.nytimes.com/1998/08/04/science/following-benford-s-law-or-looking-out-for-no-one.html
2 Ibid
3 Barrow, J, *"Does Infinity Exist?"*, +Plus Magazine, published July 2, 2012, accessed 25th June, 2014 online at http://plus.maths.org/content/does-infinity-exist

Works Cited:

Barrow, J, "Does Infinity Exist?", +Plus Magazine, published July 2, 2012, accessed 25th June, 2014 online at http://plus.maths.org/content/does-infinity-exist

Browne, M, "Following Benford's Law, or Looking out for No. 1", The New York Times, published August 4, 1998, accessed 24th June, 2014 online at: http://www.nytimes.com/1998/08/04/science/following-benford-s-law-or-looking-out-for-no-1.html

Is it so that what is accepted as knowledge today sometimes discarded tomorrow?

John Dongas

Year 12

The knowledge that exists in our contemporary society very clearly differs in certain aspects from the knowledge our ancestors might have once had. The conventional view of science argues that science is the accumulation of truthful knowledge built up over time by repeated testing. However, in areas of knowledge such as history and ethics, the sources of their knowledge are sometimes diverse and not of equal significance or moral judgement. The extent to which this knowledge is therefore subject to revisionism over time is an interesting one.

One of the main issues to arise concerning ethical knowledge is whether or not the knowledge is ever really accepted in the first place. Personally, I am not always persuaded that honesty is the right cause in any given situation. When being honest might harm me in some way, my self-interest determines that I should instead abandon this ethical principle. For example, I might have said that I did do my homework, and given that not being punished for not doing it made me happier than the fact that I had lied, it would seem a perfectly ethical choice. A follower of value ethics would believe this to be an infringement on the display of excellence of character. On the other hand, taking the perspective of utilitarian, as long as no one else is harmed in the process, this would be a decision which follows the structure of ethical thought assuming that my initial ethical principle is one of eudaimonia. What results is somewhat of a convolution of claim and counterclaim as is often seen in ethical thought, based on the theory that one might subscribe to. Although contemporary ethical theorists constantly attempt to synthesise and refine these theories, situational ethics acknowledges that no single theory can be applied to any situation. When there is such ambiguity in ethical theory, it seems difficult to argue that we actually have any ethical knowledge in the first place in the sense that is a true, justified belief. If that were to be so, then ethical knowledge is never really accepted and therefore never discarded at all.

However, it is still possible to consider social behaviour that is considered to be ‘inherently right and wrong’. This kind of language is often used when discussing ethics. The problem here is that by believing that these actions are deemed to be ‘inherent’ suggests that they are beyond the varied perspectives that make up the various ethical theories. Besides this fact, it is often the case that the idea that any ethical knowledge can be inherent is disregarded itself, considering not everyone might agree on the values that should be ‘right’ or ‘wrong’. Because ethical knowledge is not necessarily empirical, ethical knowledge is generally not proven through evidence. Furthermore, accepted knowledge cannot necessarily be contradicted by new evidence if this new evidence cannot actually be presented. Although I might be able to agree on an inherently ‘right’ idea, for example ‘honesty’, I seem to have no evidence to support my decision to subscribe to this value. It is possible however, to suggest that although quantitative observations are most likely not responsible for my belief in this virtue, qualitative data concerning net happiness or a like measure may be in some way responsible. Unfortunately, this data is often subjective and since a specified unit of happiness is not universally accepted, extrapolating ethical knowledge from axioms which may or may not be universally accepted weakens the strength of ethical knowledge and revision. In this way, it seems that ethical knowledge lacks the basis upon which revision may occur.

An interesting point of comparison is to that of history, and whether or not the historical method as an area of knowledge actually needs revision. Currently, history is revised constantly, and it is one of the areas of knowledge that seems to attract the most revision, with schools of historiography and so on. One of the problems with historical knowledge is its subjectivity. Unlike ethics, it is possible to gain quantitative evidence in history, such as the number of people in the armed forces, as I, a history student, would have to do in a historical investigation. However, in the historical method, the effect of these facts has to be evaluated, and this is often done so by schools of historians who have different biases. One example that I have come across in history is concerning the Eastern Front of the Second World War. There are two main schools of thought, the revisionists and the traditionalists who describe the Soviet Union's economic superiority and the Nazi's miscalculations respectively as the reason for the ultimate Soviet victory[1]. I found that historians such as Chris Ward, who have greater expertise and bias towards the Soviet Union, often mentioned the patriotism and other strengths of the USSR and failed to acknowledge the failures of the German war effort[2]. Hence, due to the nature of historical bias, it seems reasonable to believe that historical knowledge requires constant revision. However, unlike the scientific method, this revision does not produce a clear distinction between the original, and the revised knowledge. In many cases, historians are often trying to reconcile two views. In a history essay, I would need to make reference to, for example, the traditionalist and revisionist views, and even though one is newer than the other, the traditionalist view is never fully 'discarded', in the sense of being disposed of for being useless or undesirable. There must have been evidence to suggest it in the first place, and this cannot be ignored. Therefore, although we may actually be revising the knowledge we currently have and creating new arguments based on new evidence, discoveries and so on, whether or not the previously accepted knowledge is truly discarded is debatable.

In conclusion, history and ethics are two areas of knowledge in which the acceptance and later the ridding of knowledge are difficult to evaluate. Unlike in the scientific method, one piece of contradictory evidence does not prove a theory of human science, particularly in ethics, to be incorrect. This is because these theories are often the result of many years of accumulated knowledge and evaluations of trends of social behaviour, which unlike in science, are not reproducible. In effect, outliers can exist. Even assuming that a specific piece of knowledge is accepted in the first place, whether or not ethical and historical schools of thought are ever disproved to the extent that they are discarded does not seem reasonable. While some contemporary knowledge may be revised today, others may be accepted forever. Some might lie somewhere in between the two. Overall, the revision of knowledge in these areas cannot be predicted.

1 Ward, C, 1999 Stalin's Russia, Chapter 7: Culture and Society 1927-1953, Second Edition, published by Oxford University Press, Oxford, UK

2 Ibid

Is the task of history is the discovering of the constant and universal principles of human nature?

Angus Read

Year 12

The search for knowledge leads to the discovery of many ideas, some of which are accepted as facts, but these may be subject to questioning, re-evaluation, or change in nature. Constant and universal principles, if they exist, would not be susceptible to these processes, instead being ultimately true and unchangeable. These truths may be sought through a number of areas of knowledge, particularly through history and natural science, although this may not be the sole task of these areas. In investigating the success of these areas of knowledge in this task, a number of knowledge issues arise.

The idea that these areas of knowledge only have a single task, and that this task is the discovering of constant and universal principles of human nature is a distinct knowledge issue. In the case of natural science, this is evidently untrue; science seeks to investigate the universe, looking far beyond the scope of humanity, and so seeks knowledge aside from that in the statement. In the case of history, there are many goals within this area of knowledge, but it is possible that these goals are all motivated by this search for universally constant principles of human nature. It is true that history focusses study on humanity specifically, and so if its goal is, in fact, to determine universal principles, they would be of human nature.

The issue of what is meant by a 'principle of human nature' must be addressed. This could refer to an intrinsic element of humanity or human behaviour that may not vary between people, or at least is present in some degree in everyone. Alternatively, it may be a general statement that can be applied to all demographics at all time without necessarily being true for every individual. This is critical to both the existence of these principles and how they may be determined. It is reasonable to consider them to be quite general, as human nature evidently varies even within communities.

The existence of such principles is another issue in investigating the statement. It is possible that there are no universal and constant principles of human nature. Two critical elements of this statement are the ideas of 'universal' and 'constant', each of which may be debated. A universal principle would need to apply to all humans, possibly allowing for a few exceptions: those deviating from human nature such as those with brain damage, or arguably those with psychological disorders. This would raise the issue of what constitutes a severe enough psychological disorder for one to be disregarded. 'Universal' principles may only exist if human nature is consistent throughout humanity, which may not be the case due to genetic variation, although these variations may not fundamentally alter the nature of people. Cultural and environmental factors may be disregarded, as these affect behaviour outside of nature. 'Constant' principles cannot exist unless human nature will not change over time. Whether or not this has been the case previously depends on the definition of 'human', but regardless, previous events will not necessarily dictate future events, as is a problem with the area of knowledge of history. History produces knowledge by a study of past events, which by nature are unique and unrepeatable. A consequence of this is that predictions made by this in regards to change in human nature must make the assumption that these unique past events will give us insight into the future, an assumption which is not necessarily accurate and demonstrably not perfect. As such, 'constant'

principles of human nature may be possible, as may 'universal', although clear problems are presented in their determination.

The area of knowledge of history, being the study of the past, provides an analysis of perspectives and motives, and so may be somewhat successful in determining elements of human nature. The method of history has the advantage of viewing humanity over a long period and across the world, able to compare these elements at different times. This allows for an evaluation of the differences, and may attempt to link them all to a single principle. History does however present issues as an area of knowledge, such as its subjectivity and sensitivity to review. In my studies I have recently discovered a clear point at which a great deal of historical review and change in perspectives commenced, being the opening of the Soviet archives in 1992.[3] In particular, I noticed a contrast between the views of historian David Glantz at this time and prior, as he began to use this newly revealed information.[4] By seeing this difference, I became aware of the effect of available information on conclusions drawn. As a result of the complexity of any historical event, it is necessarily true that evidential studies of them will be selective and incomplete, which may affect the conclusions drawn, greatly limiting the reliability of historical study. This leads to reduced success in reaching goals such as determining universal and constant principles, as the conclusions drawn may not be accurate. In this same study of historical information, I drew my own conclusions based on contemporary evidence and historical arguments, and realised that my conclusions varied in some way to any held by historians. This does not necessarily mean that my interpretation is wrong, indeed all current views may be wrong or all may be in some way correct. My differing view, as well as the multitude of views held by different historians, demonstrates the failure of history to draw properly objective conclusions. If history is unable to do this, either inherently or incidentally, it will be unable to properly determine constant and universal principals of human nature.

The method of natural science is advantageous in that it allows for the discovery of more demonstrably objective truths. Science has been largely successful in determining principles that appear to be universal, and are mostly constant through time. In the context of this question, it is only necessary for these principles to be necessary on the scale of the earth, which is measurable by science and so can be considered 'universal'. Issues arise of inconsistency on the quantum level however, which limits current scientific ability in determining objective principles with certainty.[5] This problem is mostly resolved with the M-theory, which is an amalgamation of five versions of string theory.[6] Science tells us that physical 'constants', such as the mass of electrons, have changed slightly over several billion years, although probably not significantly since soon after the Big Bang.[7] This raises the knowledge issue of whether or not these very minor and gradual changes will affect the fundamentals of human nature. Science does however suit finding principles such as this well in that it may find objective truths about humanity through the idea of determinism. Using the predictability that is, according to science, inherent in the universe, it may be possible to determine all aspects of human nature in a physical sense. If this is the case, it gives science the potential for very good success in discovering universal and constant principles of human nature if they exist, and if they are physical in their foundation, and otherwise has the potential to determine less permanent principles of human nature.

[3] http://www.loc.gov/exhibits/archives/intro.html
[4] http://www.historynet.com/david-m-glantz.htm
[5] http://profmattstrassler.com/articles-and-posts/particle-physics-basics/quantum-fluctuations-and-their-energy/
[6] http://www.damtp.cam.ac.uk/research/gr/public/qg_ss.html
[7] http://www.space.com/18894-galaxy-alcohol-fundamental-constant.html

The use of these areas of knowledge in this context creates the knowledge issue of whether or not predictions may be made, given that history is based on information regarding past events, and science is based on present and past observation. Determining a principle would be making a prediction for most past, present, and future cases, which assumes that past trends will be continued and no unexpected changes will occur. This is particularly significant in history, which is less effective at determining fundamental elements required for predictions than science, a comparison in which human interests may be equated roughly to subatomic particles. This creates a greater limitation for history in determining such principles, remaining somewhat problematic for science. Unlike the sciences, history relates specifically to human motivation and causes, which may be used to represent generalisations about human nature. In this way, history is presently able to have a measure of success in determining principles of human nature, as it provides an analysis of what has happened and why in a human sense. This has not lead to objective or stable principles, but has at least been successful in representing many aspects of human nature through time.

The areas of knowledge of history and the natural sciences both have some level of success in determining principles of human nature, although have not yet objectively demonstrated any to be constant or universal. A number of knowledge issues arise when attempting to evaluate their success, as well as in their reaching of these principles and whether or not these principles exist. History is able to take a broad view of humanity and its nature, while science is able to determine objective elements of nature and make relatively reliable predictions based on evidence observed. Neither are fully successful, although science may have the potential to determine such principles, should they exist.

Bibliography

Library of Congress, n.d. *Revelations from the Russian Archives*, United States Government, accessed 6 August 2014, http://www.loc.gov/exhibits/archives/intro.html

Moskowitz, C 2012 *Phew! Universe's Constant Has Stayed Constant*, Space.com, accessed 7 August 2014, http://www.space.com/18894-galaxy-alcohol-fundamental-constant.html

M-theory, the theory formerly known as Strings, n.d. Cambridge Relativity, accessed 8 August 2014, http://www.damtp.cam.ac.uk/research/gr/public/qg_ss.html

Santoro, G 2010 *David M. Glantz Fights for the Truth About Stalingrad*, Weider History, accessed 6 August 2014, http://www.historynet.com/david-m-glantz.htm

Strassler, M 2013 *Quantum Fluctuations and Their Energy*, Of Particular Significance, accessed 8 August 2014, http://profmattstrassler.com/articles-and-posts/particle-physics-basics/quantum-fluctuations-and-their-energy/

In the production of knowledge, is it only because emotion works so well that reason can work at all?

Tyson Bateman

Year 12

Every day, we use emotion and reason as two ways of knowing, in order to produce knowledge. Emotion consists of various instinctive internal feelings and external forms of behaviours in reaction to certain situations, caused mostly because of a person's background and society. Whereas reason is based upon logic, rationality and judgement, used when making decisions. The relationship between these two ways of knowing is peculiar, the preposition that "in the production of knowledge, it is only because emotion works so well that reason can work at all" suggests that a fault in emotion correlates directly to a fault in reason. The 'production of knowledge' refers to the act of gaining or developing knowledge. Yet, what does it mean for emotion to 'work well'? It seems rather context specific with definitions of 'working well' differing between mathematics, regarded as objective, and the arts, considered as more subjective. Furthermore, it is important to consider to what extent emotion and reason are two opposing forces, inhibiting upon one another in the quest for knowledge or two ways of knowing that must exist concurrently in order to maximise knowledge production.

The proposition suggests the without emotion 'working well', reason cannot work at all in the production of knowledge, but what does it mean for emotion to 'work well'? Emotion, just by its nature is volatile and spontaneous, and the line between rational and irrational emotions can often be thin. As such, emotion 'working well' could be considered very differently in unlike situations, and even differing areas of knowledge, such as the arts and mathematics. Art can cover a wide variety of forms, from paintings, sculptures, dancing and music. It is defined as any creative human endeavour that expresses emotion and has a meanining beyond its simple description.[8] Mathematics is an area of knowledge concered with number, quantity and space, following a rigid structre to acquire new knowledge, from accepted axioms creating theorums and an ensuing proof.[9]

One view, perhaps clichéd, would see that art is based on emotion and that mathematics is based on reason. As such, any creative piece within art is judged by the emotive response it is either motivated by or it produces from the audience. Accordinly, mathematics is only driven by the structure of mathematics, relying on logic, reason and judgement. On face value, both of these views are very reasonable. As I sit in mathematics class trying to solve an equation, I use reason and logic to come to my answer, progessively moving from one step to the next. Emotions, whether they be stress or frustration, leave me no closer to the answer. What is required emotionally to solve the equation is that emotions do not impede upon the ability to use reason. Thus emotions 'working well' would require a sense of rationallity. Contrarily, upon painting in art, it is my emotions that spur my ideas of what to paint and how to do so. I once fealt especially infuriated and used harsh, reckless strokes of black and red to show my anger with no considertation of the overall composition or direction of the piece, only my emotions spurring my actions. There are no limits on the emotions one can represent in

[8] van de Lagematt, R 2005, *Theory of Knowledge for the IB Diploma*, Cambridge University Press, Cambridge, England, Page 330
[9] van de Lagematt, R 2005, *Theory of Knowledge for the IB Diploma*, Cambridge University Press, Cambridge, England, Page 55

art, whether they be rational or irrational. As such, any form of emotion can be seen as 'working well' in art, in regards to the production of knowledge.

However, it could also be said that emotion and reason play a role in both art and mathematics. Instead of relying solely on reason in mathematics, perhaps it is the satisfaction I will experience if I correctly arrive at an answer which motivates me to use reason in completing the question. Furthermore, depending on one's knowledge of mathematics, the level and type of emotion present when producing knowledge may alter. Someone with a high level of mathematic proficiency and fondness of mathematics will have a far different opinion of mathematics than someone whom struggles and thus dislikes mathematics. Hence, there is evidence of emotion being present within mathematics. Similarly, when creating art, some decisions, although they may largely use emotional impulses, are arrived at by using reason. While painting, one must decide what to paint, what style of painting and so on. Thus, it must be considered that emotion and reason may have roles, although small, in art and mathematics in the production of knowledge, rendering what constitutes emotion 'working well' very context specific in regards to the area of knowledge and situation.

Upon establishing what constitutes emotions 'working well,' it is important to consider why reason would need such in order to 'work at all.' Reason 'working at all' would mean reason being able to produce knowledge effectively, which as discussed before is mostly concerned with decision making. Further examination of the issue raises the question as to whether emotion inhibits or assists reason?

Often, it can be seen that emotion hinders, not only reason, but all of the ways of knowing. Due to emotion's irrepressible and largely subconscious nature, it has the ability to alter the body's other internal processes. After reading an article about an art exhibition which did not show the artist's name in order to allow viewers to appreciate the piece without any external factors[10], I investigated myself. At an art exhibition, I realised the large price disparity between the works of different artists, which I did not think accurately represented the difference in quality of the art. I was unfamiliar with the artists' reputation, but it was clear that some of the more renowned artists demanded a higher price. To me, it seemed the fame of the artist created an emotional reaction amongst the audience, altering their perception of the art. As such, they judged the notorious artist's pieces through rose-tinted glasses and unknown artist's pieces pessimistically. This emotional bias hindered the audience's ability to make a reasoned judgement on the quality of the art, and its according price.

However, it can also be said that emotion does not inhibit reason, but instead assists and enhances our ability to use reason in the production of knowledge. This can be seen when emotion comes in the form of motivation, the 'driving force the flux from desire to will in life.'[11] As such motivation can assist reason in spurring someone to make the decision to follow their desires. This is the case with mathematician Andrew Wiles.[12] As a ten year old boy, Wiles found Fermat's last theorem in a textbook, which had not been proved for over 300 years. Wiles recounts that he "knew from that

[10] Belcher, D 2013, *Paris exhibition presents the Art, not the Artist,* International New York Time; Arts, October 16th 2013, http://www.nytimes.com/2013/10/17/arts/international/paris-exhibition-presents-the-art-not-the-artist.html?_r=2&adxnnl=1&adxnnlx=1407481246-OLGayDW43ryTErX48gYHAQ Date Accessed; 15th July 2014

[11] *Motivation*, Wikipedia; The Free Encyclopaedia, http://en.wikipedia.org/wiki/Motivation Date Accessed; 16th July 2014

[12] Pieprzak, N 2008, *Fermat's Last Theorem and Andrew Wiles*, +Plus Magazine, June 1st 2008, http://plus.maths.org/content/fermats-last-theorem-and-andrew-wiles Date Accessed; 12th July 2014

moment, [he] would never let it go. [He] had to solve it."[13] Wiles' motivation carried through his studies as a mathematician until he was able to solve it in 1995, over thirty years after discovering the unsolved theorem. His discovery was hailed as the "proof of the century" and Wiles' case shows the power motivation, and in turn emotion, has in regards to his judgement to continually attempt to solve the theorem. Absent of his desire to solve the theorem as a boy, Wiles may never have done so, leaving the world without one of the greatest mathematic discoveries. Hence, emotion can be seen as assisting and enhancing reason in some cases, as well as hindering in others.

Throughout this examination of the proposition, the idea that if emotion does not 'work well,' then reason cannot 'work at all' has been explored., and the analysis would indicate that this is true. However can the same be said of the opposite, whereby if reason does not 'work well,' then emotion cannot 'work at all'? Reason, as a way of knowing relies heavily on judgement and rationality. But if this judgement was to become irrational, it would affect emotion, similar to the effect of irrational emotions. Within a mathematical setting, if a question demands the answer to "10x10", the rational application of reason is to multiply 10 by 10, achieving the correct answer of 100. Yet, if someone applies an irrational use of reason, constantly dividing instead of multiplying, and thus divides 10 by 10, then they calculate the incorrect answer. Continual application of reason not 'working well', like in this instance, would undoubtedly result in confusion and frustration as irrational emotions come to fruition. As a result, the proposition cannot be considered wholly correct, as there is also instances where it is reason not 'working well' which results in emotion not working 'at all' in the production of knowledge.

In exploring the proposition, through the relationship between emotion and reason in the production of knowledge in the regards to mathematics and the arts, I believe that the proposition is to a larger extent true. Within both areas of knowledge, the arts and mathematics there is a delicate balance between the role reason and emotion hold. For the arts, emotion is largely responsible for producing knowledge, with reason being used minutely in comparison and the opposite can be said of mathematics. Yet, a common feature of both, is indeed the fact that when emotion does not 'work well,' then reason does not 'work at all.' Just as accurate however, and opposing to the proposition, is that in some cases when reason does not 'work well', then emotion cannot 'work at all.' This paralleling relationship shows the power and influence just one way of knowing can hold over other ways of knowing in the production of knowledge. Thus, as we partake in our lives, it is important to be mindful of our emotions and our use of reason, for if they remain unchecked and irrational, the effects may be devastating.

Bibliography:

Books:
van de Lagematt, R 2005, *Theory of Knowledge for the IB Diploma*, Cambridge University Press, Cambridge, England, Page 55, 330

Web documents:
Belcher, D 2013, *Paris exhibition presents the Art, not the Artist*, International New York Time; Arts, October 16th 2013, http://www.nytimes.com/2013/10/17/arts/international/paris-exhibition-presents-

[13] Pieprzak, N 2008, *Fermat's Last Theorem and Andrew Wiles*, +Plus Magazine, June 1st 2008, http://plus.maths.org/content/fermats-last-theorem-and-andrew-wiles Date Accessed; 12th July 2014

the-art-not-the-artist.html?_r=2&adxnnl=1&adxnnlx=1407481246-OLGayDW43ryTErX48gYHAQ Date Accessed; 15th July 2014

Pieprzak, N 2008, *Fermat's Last Theorem and Andrew Wiles*, +Plus Magazine, June 1st 2008, http://plus.maths.org/content/fermats-last-theorem-and-andrew-wiles Date Accessed; 12th July 2014

Motivation, Wikipedia; The Free Encyclopaedia, http://en.wikipedia.org/wiki/Motivation Date Accessed; 16th July 2014

Is it the case that some areas of knowledge seek to describe the world whereas others seek to transform it?

Lachlan McNamara

Year 12

The continual quest for knowledge and understanding its complexities often leads a mind in an array of directions, however two key components for all areas of knowledge hold true. It is not sufficient to summarise that some areas of knowledge wish to describe the world they encompass, providing explanation to those inquiring no further, whilst others seek to transform the world, acting as a stepping stone for humanity to be altered. There is inevitable overlap between these two components, and the inherent reliance one holds on the other indicates the mutuality of this relationship. Both the individual and their own environment affects what is derived from gaining an understanding in the human sciences and mathematics, however the concept of 'seeking' presents an issue in itself, for often we begin with one goal in mind and arrive at an entirely different, often better, destination. Dr. Howard Florey and Sir Alexander Fleming are often credited with saving millions of lives through discovering penicillin in 1928, although this result was not explicitly sought by the pair; an accident involving ignored petri dishes.[14]

Furthermore, the mutually exclusivity, or lack thereof, for the two outcomes must be addressed, as often the product of knowledge is an amalgamation of describing and transforming the world. The human sciences' appear to adopt a continual revision whilst mathematics often focuses on an eternal truth; however the composition of these two areas of knowledge in regards to both describing and transforming the world can lead to convolution.

The concept of seeking too provokes discussion and contemplating in the scope of this question. Seeking describes a variety of actions, both intentional and inadvertent in regards to knowledge, that all must be evaluated. Asserting that areas of knowledge such as science and the human sciences actively 'seek to' either describe or transform the world significantly alters what role spontaneity has played throughout history and will continue to play. If something is not initially sought after, as the question stipulates, then in some standings the eventual finding would lose merit. Arguably there are no areas of knowledge that 'seek' to describe the world, for all areas of knowledge, particularly human and natural sciences, are too diverse and complex to qualify all facets. Furthermore, as knowledge itself has such a wide variety of functions in our own lives, the investigations undertaken are similarly unique. In the human sciences, actively seeking one thing yet ultimately transforming one's world differently are almost inherently inevitable. Regardless of what we seek, our interpretations will provide new insight into knowledge understood differently in the past, extrapolating this knowledge to alter our future. To transform the world is not always a motivation, however, which raises ethical question concurrently. In order to gain a true grasp of our world we describe it, yet it is innately human to challenge these notions, to question 'why'. Often this challenging can draw out the extent of this human desire; those who do 'seek' to acquire this knowledge often see an end justifying a means, often an unequivocally fallacious concept. The CIA's Project MKULTRA sought methodologies to manipulate the human mind, typically through covert

[14] Frater, J. (2014). *Top 10 Evil Human Experiments - Listverse*. [online] Listverse. Available at: http://listverse.com/2008/03/14/top-10-evil-human-experiments/ [Accessed 25 Jun. 2014].

administration of mind-altering substances like LSD[1]. This organization sought to both describe and transform the world yet clearly breached an ethical obligation of humanity, which provides another conundrum. Hence, this transformative motivation that occurred, although not actively sought by all, is indicative that all investigations may be destined to feature both motivations.

On a cosmetic value Mathematics can easily appear as a stalwart of truth amidst vastly complex ways of knowing and the inherent problems the follow, however as we have established before mathematics acts to describe and transform the world concurrently. The difficultly in neatly classifying mathematics into one of these categories presents itself from the challenges that arise in asserting one's view and description of the world. The nature of mathematics may be viewed as 'the science of rigorous proof', founded with axioms allowing derivation into theorems and subsequent proofs yet to state that these proofs universally describe the world for all ignores the role that deductive reasoning plays[2]. To simply assert a theorem as a proof is to restrict mathematics to the interpretations of those deemed most intelligent and superior, neglecting the view of the world others may adopt. I study mathematics at a standard level, with our course requiring integral calculus of basic functions; in my perspective I can find an area under a curve through this mathematical process and hence my description of the world acknowledges this. Conversely, a fellow peer who undertakes maths at a studies level does not require knowledge of integral calculus, and would thus deem a problem involving such as unsolvable. The variance in mathematical comprehension throughout the globe indicates a different description of the world each individual, yet through a developed understanding this view of the world can be transformed; my friend could learn integral calculus and hence comprehend the question, transforming their own world. This is indicative of the manner of for mathematics, often appearing as simply descriptive yet advertently (or inadvertently) transforming the world. This presents a further conundrum when analysing this specific question; whether it is possible to simply describe the world without transforming it. This idea relies heavily on the idea as to whether mathematics was discovered or invented; if the former, transformation appears unavoidable as discovery of new information produces a transformed view. The latter, however, alludes to individual description of one's world, with the invention of mathematics existing only mentally and therefore any sharing leads to transformation. Stating mathematics is discovered mirrors Plato's dogma, arguing that the world is comprised of mathematical objects which hence are seen as more real than their true appearance in nature. This discovery acts to describe a natural phenomenon through logic; for example, as a young child I viewed the rings a tree as a formation of nature, whilst Platonism may identify the carbon dating the rings signify. However, upon learning of this particular description of the world, my own world is transformed despite Platonism's initial stipulations. Therefore it is evident that through mathematics as an area of knowledge the world is both described and transformed to varying degrees.

The human sciences superficially appear a means of human creation to transform the world, opposing the initial perception of mathematics. Human sciences such as psychology and economics attempt to pattern and rationalise human behaviour, which is fundamentally random yet base studies and investigations on empirical methods. This attempt to utilise the scientific method in order to predict and influence human behaviour immediately indicates this area of knowledge similarly describes the world also, as empiricism dictates observation and subsequent translation into describing the event. Nonetheless, issues with the scientific method can present themselves particularly in regards to the human sciences; the unpredictability of human behaviour, the subject matter of this area of

[2] Lagemaat, R. (2005). *Theory of knowledge for the IB Diploma*. 1st ed. Cambridge: Cambridge University Press.

knowledge, ensures that attempting to describe the world on this foundation can be flawed and inaccurate. Inaccuracy is a subjective term in this instance, for it implies that some forms of observation of human behaviour are more accurate and valid than others, which is fallacious. This in turn also limits the ability of any human science to transform the world in a similar manner; if there is a continual unpredictability then attempts to rationalise and predict future behaviour in subjects such as economics or political science is similarly moot. This is evident clearly in basic economic principles; lowering interest rates is a simple monetary policy that encourages taking out loans and therefore should create economic growth. Yet this does not always occur, for a myriad of reasons, as humans may simply have no desire to consume or increase imports, restricting growth[3]. Contrarily, the argument can be made that if there is no certainty to accurately transform the world then psychology, economics and political science should cease to exist. This pertains once again to the concept of seeking however, with humans actively seeking understanding of the complexities of our own behaviour with an eye towards altering it, effectively meeting both movements the questions addresses. This poses one final issue in the scope of human sciences in relation to the notion of human free will. Humanity's belief in free will appears to openly contradict any potential transformations of the world that human sciences can provide, with the concept that regularities occur in human behaviour indicating that humans hold a pre-determined fate. Determinism may also limit these transformations, yet despite this we continue to make judgments and alter our own actions based on what we predict others will do. At school I understand that different teachers have different strategies for checking homework; some ask for only one volunteer whilst others look for evidence from each student. Hence, when busy I tailor my completion of homework based on these predictions I have made for each teacher subconsciously, such is the indoctrination of basic determinism in our daily lives. Therefore whilst the human sciences both seek to describe and transform the world, the reality may involve uncertainty in both.

Mathematics and the Human Sciences initially appear to seek different things; the former to describe and the latter to transform. Yet the inherent nature of these areas of knowledge involves an amalgamation of the two, resulting in a view of the world that is constantly adapting. The notion of seeking is ultimately a moot point, as whether advertent or accidental all humans acquire knowledge. Mathematics and the human sciences are two constants in my daily life, with this developed understanding allowing a greater depth of questioning and ultimately understanding.

Bibliography:

Amoah, R., Amoah, R. and profile, V. (2013). *EconomicsMate: Does Reducing Interest Rates always stimulate short term EconomicGrowth?* Economicsmate.blogspot.com.au. Available at: http://economicsmate.blogspot.com.au/2013/01/does-reducing-interest-rates-always.html Accessed 7 Aug. 2014.

Borowski, S. (2014). *Scientific breakthroughs that were 'accidents' | AAAS MemberCentral*. Membercentral.aaas.org. Available at: http://membercentral.aaas.org/blogs/scientia/scientific-breakthroughs-were-accidents Accessed 25 Jun. 201.

Frater, J. (2014). *Top 10 Evil Human Experiments - Listverse*. Available at: http://listverse.com/2008/03/14/top-10-evil-human-experiments/ Accessed 25 Jun. 2014.

[3] http://economicsmate.blogspot.com.au/2013/01/does-reducing-interest-rates-always.html

Lagemaat, R. (2005). *Theory of knowledge for the IB Diploma*. 1st ed. Cambridge: Cambridge University Press.

Theoryofknowledge.net, (2014). *November 2014 TOK essay titles - theoryofknowledge.net*. Available at: http://www.theoryofknowledge.net/tok-essay/november-2014-tok-essay-titles/ Accessed 7 Aug. 2014.

Does knowledge take the form of a combination of stories and facts?

Rhys Columbus

Year 12

It is significant and necessary to investigate the extent to which stories and facts contribute to different knowledge areas. Such investigation allows an understanding of the elements of a knowledge area; ranging from the process of the knowledge to the product. A specific focus will be placed upon two generally contrasting knowledge areas in science and history. Firstly, analysis regarding the terms 'stories' and 'facts' is important initially in order to understand the extent of the terms' application. The extent of the application of the terms 'stories' and 'facts' differs between the two areas; with history offering some accuracy regarding the initial statement, whilst science highlights wider limitation and inaccuracy in the idea It is significant and necessary to investigate the extent to which stories and facts contribute to different knowledge areas. Such investigation allows an understanding of the elements of a knowledge area; of a combination. This application can then be examined both in terms of the results of the knowledge areas and the methods of investigation within the knowledge areas. The focus on these issues allows a judgement regarding the initial claim.

By definition, a story is an account or a report of an event or series of events typically from a single viewpoint, whilst at times accommodating additional views. Such an account must not necessarily be factual; as fiction comprises a large component of the idea of a story. A story holds a narrative structure and is therefore more than a simple compilation of facts. This structure involves a before and after; therefore requiring a display of comparison which represents advancement and progression. As a result, a focus upon time is a major component of a story. This suggests that stories, especially factual, are typically anecdotal when commenting upon a particular event. However, the application of the term depends on the form of knowledge within specific areas. Whilst a British soldier's recollection of a specific day during World War I may take the form of a story, the different processes of historical investigation are quite varied in their valuation of anecdotes. The term story offers even less certainty in terms of the scientific knowledge area. The term could perhaps be applied in the sense of a scientific theory; however this is likely pushing the term to the edge of its relevance and definition. The succinct definition of a story therefore for the knowledge investigation will be the recollection of events from a point of view with a visible structure; particularly with respect to the dimension of time. The same process of clarifying definitions must be employed for the second term of the investigation; 'facts'. A fact is knowledge which is considered 'true' in a specific area, based upon the appropriate testing and evidence associated with that area. These facts are often the foundation of many further developments of knowledge and thus facts allow the development of further knowledge. It is important to note that different evidence based areas of knowledge produce factual knowledge in contrasting ways. Put differently, the production of a historical fact involves a widely different process than the establishment of a scientific fact. Specifically, a comparison of sources is involved for a historical fact as opposed to repeatable experiments or observations for the knowledge area of science. It is also important to understand the role of a fact in different areas of knowledge. Historically, a fact often represents a starting point and serves as an opportunity for interpretation. In contrast, in the area of science a fact is often the desired end point; as scientific method serves to verify a theory. Therefore, for the knowledge investigation a fact will be considered a piece of information which has been proven true through the appropriate methods of evaluation

relevant to the specific knowledge area. Ultimately, a combination relies upon elements of both stories and facts and a lack of either disproves the knowledge claim.

The results of both historical knowledge and scientific knowledge do not typically take the form of a combination of stories and facts; despite elements of one such ideas existing in different knowledge areas. In history, my use of stories and facts may potentially provide knowledge in terms of 'what'; specifically these elements can reflect upon an event and therefore answer an historical knowledge question of 'what' occurred. These elements however cannot be used to respond to a typically deeper historical question: 'why'. This question relating why events occurred is a large component of the result of historical knowledge. In history, my purpose is often to evaluate and explain the rationale behind historical events and therefore these evaluations are the subject of debate and controversy. An example of this is my History Internal Assessment, which according to the IBO should result in "an answer to the question based on the evidence"[4]. This suggests that different answers exist as a result of different evidence. Considering the existence of controversy, the result of historical knowledge cannot be considered a fact, as questioning the validity of the explanation suggests the knowledge is not considered 'true'. Further, the result of historical knowledge could on occasion be conveyed in a narrative manner: timelines of events are often used to convey historical explanations. Despite this however, for specific explanations it is frequent for historical justifications and results to lack the necessary components of a story. The result of science relates to the intention to verify a scientific theory. This result therefore ultimately contains proof or evidence regarding the initial hypothesis. Such evidence can create facts; evident through the nature of scientific report. The result of a scientific investigation exists to 'provide the reader with a factual account of findings'[5]. This account is typically in the form of a processing of the data; allowing the investigator to comment upon the scientific findings and draw a conclusion[6]. However, as this sense of discovery does not indicate a change in circumstances or events, and especially lacks the organised structure of a narrative, the result of the scientific area of knowledge cannot be considered to take the form of a story. To summarise the different knowledge areas, historical result can take the form of a story on occasion, however could not be defined as providing factual information. Alternatively, scientific result can often contain a factual reflection of the scientific process, often with relation to the original hypothesis. However, the result does not contain the elements necessary to fit the definition of a story. Therefore, the result of neither historical knowledge nor scientific knowledge can be considered a combination of stories and facts.

The process of the two knowledge areas contains entirely different elements from their aforementioned result. When I undertake the process of historical investigation, three main activities of identifying, interpreting and comparing evidence are pivotal. Dividing this process into these three activities shows the different role of stories and facts within historical investigation. The identification of evidence takes the form of neither a story nor a fact; it lacks the narrative structure to be considered a story as such and it is a search for truth, rather than an individual truth, and therefore is not a fact. Interpretations of knowledge generally take the form of stories; however the variance in the views of historical events suggests that this component of historical investigation cannot be considered factual. The comparing of evidence in historical investigation does not hold a narrative structure, and the fact that evidence is being compared and often contradicted eliminates the notion of historical comparison

[4] http://xmltwo.ibo.org/publications/DP/Group3/d_3_histx_tsm_1108_1/html/production-app3.ibo.org/publication/272/part/1/chapter/3.html
[5] Hay, 1996
[6] http://unilearning.uow.edu.au/report/2bv.html

as a knowledge process being factual. Therefore, whilst there are minor elements of the two ideas within the different stages of historical investigation, no single element contains a combination of both stories and facts and it is therefore possible to conclude that the process of historical knowledge does not remain consistent with the claim. In science, I participate in the process known as scientific method, focusing on the creation of a theory: an interpretation of a fact. A theory is verified by facts and is repeatedly confirmed through observation and experimentation. The process of scientific method therefore does heavily involve the use of facts to support its basis. It could potentially be suggested that the identification of a scientific theorem, an interpretation of 'facts' in the area, contains a story regarding its development. This would provide a narrative structure for the process and therefore satisfy the aforementioned criteria of a 'story'. However, this would serve mostly as a modification of the reality; changing the scientific method into a narrative for the sake of considering it a story. Considering this, the process of scientific method involves facts but cannot be considered to involve stories; ultimately lacking a combination. Conclusively, neither process within the two knowledge areas consists of a combination of stories and facts and therefore the process component of knowledge does not verify the knowledge claim.

The initial knowledge claim is not accurate with respect to the two knowledge areas of history and science. A focus on the result of knowledge for both areas suggests that a combination of both stories and facts does not exist. Historical result can take the form of a story but certainly does not take the form of a fact. The opposite is typically the case with scientific result; facts are the desired endpoint however there is no structure to suggest a story is relevant. Additionally, a focus upon the process of the knowledge areas further dismisses the claim. Elements of stories and facts appear on occasion within both historical investigation and scientific method; however a combination is not involved. The existence of either stories or facts within the two knowledge areas is independent from the other; ultimately dismissing the initial knowledge claim.[7]

References

Hay, I. (1996) Communicating in geography and the environmental sciences. Melbourne: Oxford University Press.

Guidance for Students, History Internal Assessment, International Baccalaureate Organisation [ONLINE] Available at: http://xmltwo.ibo.org/publications/DP/Group3/d_3_histx_tsm_1108_1/html/production-app3.ibo.org/publication/272/part/1/chapter/3.html

Results. Scientific Report. [ONLINE] Available at: http://unilearning.uow.edu.au/report/2bv.html

Is it the case that some areas of knowledge seek to describe the world, whereas others seek to transform it?

James Whisson

Year 12

"What transforms this world is — knowledge.... Knowledge alone is capable of transforming the world."[8] Knowledge provides us with descriptions of the world as detached, indifferent observations, and of how things relate, allowing development of explanations and theories of cause and effect and understanding. Knowledge can then be used to change natural and anthropogenic phenomena, usually seeking to improve our environment. Galileo saw "[the universe] written in mathematical language."[9] Mathematics mainly relies on deductive reasoning to describe real and abstract structures and relationships. In contrast, knowledge of the world comes particularly from Natural Sciences, which depend more on inductive reasoning. Both methods provide descriptions and explanations and both areas have transformed many aspects of the world. Does a more deductive, "top-down" reflective approach infer a motivation to describe, while inductive "bottom-up" predictive reasoning inherently lends itself more to considering transforming things? Are the aims of describing and transforming mutually exclusive? In considering this topic consideration is required on the ways these areas acquire knowledge as well as the goals of the scientists and mathematicians. Research requires funding and is thus also motivated by funding bodies, interest groups and governments. The same research may simultaneously have different aims depending on the viewpoints.

Mathematical knowledge has transformed our lives in ways that impact us daily, yet is this the aim of mathematical research? Mathematical knowledge is an *a priori* form of knowledge because it can be determined without any particular experience.[10] Such knowledge is largely based on deductive reasoning where axioms (self-evident truths) are used to prove a theorem: General rules are applied within a closed domain to reductively reach conclusion.[11,12] This approach to knowledge acquisition carries a reflective aim, seeking to describe and define mathematical concepts and relationships. Its *a priori* nature detaches it from the real world so any application of mathematics to the world becomes a secondary goal. Prime numbers and calculus are both examples of logical, deductive mathematical knowledge that describe abstract mathematical structures. Archimedes (3rd Century BC) and Newton some 2000 years later extensively researched calculus in relation to areas and volumes of abstract geometric shapes.[13] The literature focuses on their deductive development of theories and formulae with descriptions of mathematical concepts and discussion of theory. Regarding his research, Newton saw himself "as a boy playing on the sea-shore.... finding a smoother pebble or prettier shell than ordinary"[14] further supporting that he felt motivated as an observer- and not focused on what to do with the "pebble". In line with structuralism,[15] calculus has been further abstracted to provide objective, quantitative methodology for describing the physical world. Even this application, however, remains primarily descriptive. An example comes from my High-Level Mathematics Exploration in

[8] Mishima, 2014
[9] du Sautoy, 2014
[10] Shapiro, 2005
[11] Shapiro, 2005
[12] Horsten,2007
[13] Rosenthal, 1951
[14] Brewster,1965
[15] Lehrer Dive, 2003

which I used mathematical methods encompassing calculus; area-under-curves and revolution-of-solids, and integral geometry[16] for volume and surface-area determination for a loaf of Ciabatta bread and human lungs.[17] My aim was to use mathematics to describe the physical characteristics of these objects.

There are some areas of mathematics, however, that differ from this deductive approach and provide a counter-claim in this discussion. The development and use of binary numbers perhaps closer resembles an invention than deductive logic. Binary systems were developed to meet a need– mostly for communication. Thus binary systems were utilised by the Chinese (9th Century BC) for text,[18] and for codes (including Morse-Code). Leibniz, in 1679 was first to use 0 and 1 with his aim to refine arithmetic calculators.[19] Mathematicians working with binary systems sought to transform.

Mathematics thus presents a varied field of knowledge. Many areas appear largely as *a priori* systems based on deductive logic, with mathematicians focused on describing concepts and theories without application to the world. Inclusively however, some areas can be identified that use different methodology and appear to be motivated to provide solutions to problems. Regardless of its primarily deductive reasoning, mathematics has provided much knowledge transferrable to practical applications and as such its primary motivation is not a reason to devalue its role in transforming our world.

In contrast to Mathematics, Natural Sciences knowledge is more overtly linked to our world and research appears to relate to finding ways to transform our environment or how we interact with it. Science collects data from observations and experimentation, analysis of this allows development of explanations, theories and models that predict events, change understanding and advance society. Science relies particularly on (conservative) inductivism and also on hypothetico-deductive methods, with observation, the coherence of laws, precision and deductive truth considered necessary for science to be robust.[20] Do the Natural Sciences then seek to describe, or transform the world or perhaps both? The methodology employed offers scope for both these goals, and there are different areas where one or both motives are identified.

Some areas of Natural Science have begun as descriptive and in the process have identified problems facing humanity at which point the aim has changed to solve the problem. I found an example of this when writing my extended-essay on Climate Science. Initially the science was descriptive, collecting observational data and developing an understanding of climate with scientists arriving at consensus for anthropogenic climate-change. Through development of models they went on to predict potential effects of continued global-warming. The connection of this research to the real world encouraged further research to seek mitigating actions. The motivating role of funding is demonstrated here, where governments boosted research by directing funding to climate-change research. There followed a massive growth in research, publications of journal articles, observational data-bases, and multi-model data-sets with over 30TB of data stored.[21] The research aimed to describe climate and anthropogenic factors, their relationships, provide an understanding of anthropogenic

[16] Baddeley et al, 1986
[17] This was stimulated by my contemplations in an "out of breath" state, lying, exhausted on a tennis court – that I had been told had the same surface area as my lungs.

[18] Hacker et al, 2002
[19] Leibniz, 1879
[20] Phelan, 2005
[21] Meehl et al, 2007

climate-change and predict future effects. Research is now aimed to develop policy and actions to slow, prevent or adapt to continued global-warming.

The relative importance of aims to "describe" or "transform" differs in different areas of science. In Medicine researchers aim to find ways to treat or cure disease and alleviate human suffering. This is also clearly the aim of governments who fund and direct research towards specific health goals, such as in indigenous health with the aim to "close the gap".[22] Supporting this claim is the research by Fleming, who, on observing that unwanted mold on a culture plate killed surrounding bacteria, realised the implications and put aside some of this mold.[23] Subsequent research identified penicillin, which proved life-changing in the fight against infection. Medical researchers seek to transform and identify applications for their discoveries to this aim. Their "describing" is seen as a step towards understanding, so that the knowledge can be applied to promote health or fight disease.By contrast, astronomy appears to have descriptive aims. This science studies celestial objects.

Rosenburg, an astronomer, considers that "astronomy seeks to satisfy our fundamental curiosity about the world we live in, and answer the 'big questions'. How was the universe created? Where did we come from? Are there other intelligent life forms?"[24] While spin-offs have clearly benefited the world from this research, including CCD camera technology, the Forth computer language, and satellites for defense and navigation,[25] the primary aim has been to describe the universe. Research publications are focused on observational data, analysis methods and astrophysical interpretations.[26] Although astronomical research appears aimed to describe, partly necessitated by remoteness of the subjects studied, it is difficult to predict what its future impact may be and whether researchers' aims may change.

The Natural Sciences thus display variation in how knowledge is acquired and in apparent aims with these aims also able to vary in time, and with respect to viewpoints. The topic claim in this area is thus restrictive. With respect to Natural Sciences there are fields, exemplified by Astronomy, where description seems to be the primary motivation and other areas, including Medicine, which aim to transform. The goals to describe and transform are not mutually exclusive and often form a progression as knowledge develops, thus observations and descriptions first, then theories, explanations and deeper understanding, followed by models and predictions that allow identification of transforming potential, as demonstrated by climate research. How quickly this occurs can depend on funding opportunities, particularly determined by governments.

Natural Sciences and Mathematics are two areas of knowledge that portray interesting contrasts and similarities. The deductive reasoning that underlies much of the knowledge area of mathematics necessitates a "top-down," reflective approach with application of the knowledge generally a secondary goal. Its *a priori* nature detaches it from experience, as it describes mathematical structures and relationships. It can be argued that mathematics is foremost aimed at describing both the real and abstract and seeking less to transform the world. Nevertheless, the fact that some mathematics has been developed for a purpose and that much mathematical knowledge has ultimately transformed many areas of our world, would motivate some mathematicians. The research in many fields of Natural Sciences, although variable, draws particularly on inductive logic and is more visibly connected to the physical world. Opportunities to use the knowledge to manipulate our environment

[22] Dss.gov.au, 2013
[23] Radetsky,1966
[24] Dr Rosenberg, in Hall, 2013
[25] Hall, 2013
[26] Aas.org,2014

are more easily identified, also making them more likely to attract funding. Different areas of sciences vary in their aims to describe or transform, with aims seen to change over time. Thus the aims to describe or transform are not rigid nor mutually exclusive. Only a few weeks ago, Australia's chief scientist, Professor Chubb, stated that he saw "science, technology, engineering and mathematics [as]... central to our destiny."[27] His aim for all these knowledge areas is that they will transform and shape the future, as they have in the past.

References:

1. Aas.org, (2014). AJ Aim and Scope | American Astronomical Society. Available at: http://aas.org/authors/aj-aim-and-scope Accessed 3 Jul. 2014.
2. Australianmuseum.net.au, (2012). Cicadas: Superfamily Cicadoidea - Australian Museum. [online] Available at: http://australianmuseum.net.au/Cicadas -Superfamily-Cicadoidea Accessed 2 Jul. 2014.
3. Anderegg, W. Prall, J. Harold, J. and Schneider, S. (2010). Expert credibility in climate-change. Proceedings of the National Academy of Sciences, 107(27), pp.12107--12109.
4. Andersen, H. and Hepburn, B. (2013). Scientific Change. *Internet Encyclopedia of Philosophy*. Available at: http://www.iep.utm.edu/s-change Accessed 6 Jun. 2014.
5. Andersen, H. (2013). *New challenges to philosophy of science*. 1st ed. Dordrecht: Springer.
6. Baddeley, A., Gundersen, H. and Cruz-Orive, L. (1986). Estimation of surface area from vertical sections. Journal of Microscopy, 142(3), pp.259--276.
7. Balashov, Y. and Rosenberg, A. (2002). *Philosophy of science*. 1st ed. London: Routledge.
8. Boyer, C. and Merzbach, U. (1989). A history of mathematics. 1st ed. New York: Wiley.
9. Bueno, O., (2000). Empiricism, Scientific Change and Mathematical Change. Brewster, D. (1965). Memoirs of the life, writings and discoveries of Sir Isaac Newton. 1st ed. New York: Johnson Reprint Corp.
10. Carlisle, R. (2004). Scientific American inventions and discoveries. 1st ed. Hoboken, N.J.: John Wiley & Sons.
11. Chubb, I. (2014). SPEECH: CRANLANA PROGRAMME | Chief Scientist of Australia. [online] Chiefscientist.gov.au. Available at: http://www.chiefscientist.gov.au/2014/05/speech - cranlana-programme/ Accessed 2 Jul. 2014.
12. Dss.gov.au, (2013). *Closing the Gap | Australian Government Department of Social Services*. [online] Available at: http://www.dss.gov.au/our-responsibilities/indigenous-australians/programs-services/closing-the-gap Accessed 3 Aug. 2014.
13. Eltham, B. (2014). Mixed bag for science in Joe Hockey's first budget. [online] the Guardian. Available at: http://www.theguardian.com/world/australia-news blog/2014/may/13/mixed-bag-for-science-in-joe-hockeys-first-budget Accessed 3 Jul. 2014.
14. Ferguson, N. and Schneier, B. (2003). Practical cryptography. 1st ed. New York: Wiley.
15. Edward Hacker; Steve Moore; Lorraine Patsco (2002). I Ching: An Annotated Bibliography. Routledge.
16. Hall, S. (2013). How Astronomy Benefits Society and Humankind. [online] Universe Today. Available at: http://www.universetoday.com/106302/how-astronomy-benefits-society- and-humankind/ Accessed 3 Jul. 2014.

[27] Chubb, 2014

17. Hoffman, A. (2011). Talking past each other? Cultural framing of skeptical and convinced logics in the climate-change debate. Organisation \& Environment, 24(1), pp.3--33.
18. Horsten, L. (2007). Philosophy of Mathematics. [online] Plato.stanford.edu. Available at: http://plato.stanford.edu/entries/philosophy-mathematics/ Accessed 7 Jul. 2014.
19. Industry.gov.au, (2014). Strategic Research Priorities. [online] Available at: http://www.industry.gov.au/research/Pages/StrategicResearchPriorities.aspx Accessed 2 Jul. 2014.
20. Lehrer Dive, L. (2003). An epistemic structuralist account of mathematical knowldege.. PhD. Department of Philosophy, University of Sydney, NSW.
21. Leibniz G., Explication de l'Arithmétique Binaire, Die Mathematische Schriften, ed. C. Gerhardt, Berlin 1879, (7), English Translation.
22. Meehl, G., Covey, C., Taylor, K., Delworth, T., Stouffer, R., Latif, M., McAvaney, B. and Mitchell, J. (2007). The WCRP CMIP3 multimodel dataset: A new era in climate change research. Bulletin of the American Meteorological Society, 88(9), pp.1383--1394.
23. Mishima, Y. (2014). Yukio Mishima. [online] Goodreads. Available at: http://www.goodreads.com/author/show/35258.Yukio_Mishima Accessed 2 Jul. 2014.
24. Okasha, S. (2002). *Philosophy of science*. 1st ed. Oxford: Oxford University Press.
25. Oreskes, N. (2004). The scientific consensus on climate-change. Science, 306(5702), pp.1686--1686.
26. Phelan, J. (2005). Philosophy. 1st ed. Cambridge: Cambridge University Press.
27. Radetsky, M. (1996). The discovery of penicillin. The Pediatric infectious disease journal, 15(9), pp.811--818.
28. Rosenthal, A. (1951). The history of calculus. American Mathematical Monthly, pp.75--86.
29. du Sautoy, M. (2014). A Brief History of Mathematics. BBC-Podcasts and Downloads - A Brief History of Mathematics. Available at: http://www.bbc.co.uk/podcasts/series/maths Accessed 4 Jul. 2014.
30. Shapere, D. (1982). The concept of observation in science and philosophy. *Philosophy of Science*, pp.485--525.
31. Shapiro, S. (2005). The Oxford handbook of philosophy of mathematics and logic. 1st ed. Oxford: Oxford University Press.
32. Stein, H. (1988). Nineteenth-Century Transformation of Mathematics. *History and philosophy of modern mathematics*, 11, pp.238.
33. Tymoczko, T. (1986). *New directions in the philosophy of mathematics*. 1st ed. Boston: Birkhäuser.

To what extent is the use of logical reasoning limited?

Andy Nguyen

Year 11

Recently, my fellow TOK classmates and I embarked on the exploration of ethics as an area of knowledge. Having just finished the study of mathematics – which is primarily a logic based area of knowledge – I felt a sense of contentment thinking that I would finally be able to discard this (in my opinion) dreary and overused form of thinking. At an age of 13, I had been convinced by a particularly persistent history teacher that I am primarily a logical thinker and have used logic exhaustively in my everyday life. Having realised my obsession with logical thinking, I was eager to finally embark on a new way of knowing which ethics would supposedly provide. This joy lasted to no avail for the study of ethics also involves the strenuous use of logic.

Undoubtedly the use of logic has various strengths, which I had become accustomed with in the recent TOK study of mathematics. However despite its strengths I have come to realise its inevitable limitations – limitations with which I am uncomfortable. Essentially, through these recent studies I have come to ask myself: to what extent is the use of logical reasoning limited?

Logical reasoning typically revolves around the use of reason and common sense – it is used frequently in everyday life to make decisions. The advantage of logical reasoning is how it functions using a systematic approach in which there are premises to ultimately develop a conclusion. This systematic approach enhances clarity as the conclusions are derived from premises that one believes to be self-evident. As the conclusions are derived from plausible premises, the conclusions themselves become plausible. Typically, when logical thinking is used in everyday life, the premises are assumed and excluded – however logical reasoning can be represented in a systematic approach:

Premise 1: You should not waste time

Premise 2: Having to explain assumed premises in order to justify a rational decision wastes time

Conclusion: Therefore, you should not explain assumed premises

Despite the hypocritical nature of the example, it illustrates how rational decisions are formed and how the conclusion is based upon self-evident beliefs. With the conclusion being a reflection of self-evident beliefs, the use of logic is capable of further developing additional reasonable thoughts indefinitely. As a result, a particularly beneficial aspect of logical reasoning is its ability to be applied continuously. Upon producing various conclusions from premises, logical thinking can then be applied to a combination of conclusions to further produce additional conclusions.

From a realistic perspective, the concept of continuously applying logical reasoning can be observed in various areas of knowledge – particularly mathematics. Mathematics is based upon axioms which can then be used to produce theorems which then ultimately produce more theorems – this is a clear reflection of how logic is applied realistically.

The issues arise when a logical approach is applied to the concept of logical thinking. As demonstrated by Gödel and his Incompleteness Theorem, it becomes evident that logical systems will

inevitably succumb to paradoxes – where two logically valid ideas contradict each other. This concept can be seen in mathematics through a variety of problems however it is important to consider that these paradoxes are relatively infrequent and as a result do not prevent mathematics from functioning.

Nevertheless, the presence of paradoxes cause significant issues – both theoretically and practically – even despite their relatively low frequency. As stated above, I tend to use logic on a daily basis in order to solve various issues however occasionally; I am confronted with a dilemma which appears to be paradoxical. For the purpose of this example, let's assume that the probability of a paradox occurring is 1/1000 – i.e. within 1000 problems that I am confronted with, there will be 1 paradox. In everyday life, I am confronted with numerous issues – whether they are significant or insignificant – which I tend to use logic to solve: over time the number of problems requiring logic increases. With a sufficient amount of time, the number of problems will become excessive: hypothetically, the number of problems I have will be approaching infinity. From the prior statistic, every 1/1000 problems will be paradoxical – applying the same logic, over time the number of paradoxes will also increase. Similarly to the number of problems I have, a hypothetical approach would suggest the number of paradoxes I encounter also approaches infinity($\frac{1}{1000} \times \infty = \infty$). As a result, I have infinite problems which can be solved logically, yet I also have infinite paradoxes which cannot be solved logically. Although logic would suggest that I have more problems that can be solved logically than cannot be solved logically, logical reasoning also dictates that I have an equal number of problems and paradoxes. Depending on the perspective adopted when thinking about this issue, either:

- The number of paradoxes I have are relatively insignificant to the number of problems I have, since there are 1000 times more problems that can be solved logically than cannot be solved logically
- The number of paradoxes I have are equal to the number of problems I have and hence, I cannot solve a large proportion of problems as they cannot be logically solved

Clearly, this example in itself is a logical paradox and hence supports Gödel's Incompleteness Theorem. What is more disastrous however is that I am thinking about how my problems can be solved rather than actually attempting to solve any of my problems, and hence I am producing more problems – and consequently, adding more paradoxes to my ever expanding list…

Obviously, there are many flaws in this example – such as the convenient probability of a paradox occurring – however what it attempts to suggest are the limitations of logical reasoning. Although realistically the probability of a paradox is most likely significantly lower than 1/1000, regardless, the logical reasoning appears to be the same: the number of paradoxes approaches infinity as the number of problems tends to infinity. The example itself portrays the significant limitations of logic: although paradoxes appear to be an unlikely and improbable segment of logical reasoning, they are capable of becoming increasingly large issues that envelop half of the issues that can be solved logically. What was initially a relatively reliable way of knowing has now personally become somewhat undependable and questionable.

However, disregarding the use of logical reasoning for its inevitable flaws would also be unrealistic. From a logical approach – adopting a way of thinking that does not use logic would be illogical by definition: ways of knowing which are not logical are illogical. This would suggest how other ways of knowing somewhat limited as it would be difficult to justify illogical decisions. So essentially – against my will – I am forced to succumb to logic, despite realising the substantial limitations. And it is for this reason for which I am uncomfortable – essentially being limited to logical reasoning and having to embrace potentially infinite paradoxes simply because logical reasoning dictates this.

Despite the clarity logical reasoning provides, it is heavily limited simply due to the way in which it functions and as a result: logical reasoning is paradoxical by nature. Indisputably, logical thinking is beneficial under many circumstances and continues to function as part of our everyday society – however it is important to consider its limitations as it enables us to make better informed decisions about our everyday life. Even despite the limitations of reason – it remains to be an advantageous and useful way of knowing which should continue to be used… with caution.

In future, I wholeheartedly hope that there will be another form of knowledge which exceeds logic and surpasses these inevitable limitations. However until that time comes, I am still trying to figure this out. Logically that is.

To what extent does logic and emotion affect our ability to make decisions?

Andy Nguyen

Year 11

Humans make decisions everyday: whether it is for mundane tasks or whether it is a life changing judgment – decision making is paramount to human life. Making decisions however is a very inflated term which entitles a multitude of different aspects – often decisions are based on the context of a situation however from a highly general perspective, two main approaches can be used: logical thinking or emotive appeal. Both interpretations are capable of shaping how a conclusion will be determined: however logical thinking and emotive appeal can be considered contradicting forms of thinking – people often favour one form of thinking over another. It is important to consider the benefits and limitations of each form of thinking in order to better understand the ways in which decisions are made and how these forms of thinking are capable of influencing decisions.

Logical thinking is primarily based around reason and common sense: people often rely on logic in order to make everyday decisions. The use of logical thinking uses reason in a systematic form to generate a sequence of events which appears to be rational. An example of this logical thinking would be:

Premise 1: You want to succeed in school

Premise 2: Doing your homework can help you succeed in school

Conclusion: Therefore you do your homework

Through this basic sequence of events, it becomes clear that logical thinking follows a systematic order in which a conclusion is generated – clearly, there are more complex forms of logical reasoning which require more premises to be considered in order to generate a proper conclusion. The value of logical reasoning is how the systematic approach – although it is not expressed as such in everyday life – can be understood by multiple people as logical reasoning is inherent in most people. However, a significant limitation in a logical argument is how it relies on premises: an argument only remains persuasive if the premises are accepted. Different people will naturally have different thoughts in how they perceive life therefore it is possible that people may disagree with the premises. In relation to the above example: there are some people that who do not place great significance on succeeding in school and there are other people who would consider other forms of education as far more beneficial than doing homework. Clearly, if either of the premises were disregarded than the conclusion of doing homework would become seem irrational. The example depicts how logical thinking relies heavily on the basic premises – because of human ambiguity, there is no guarantee that logical thinking can be applied to all people, and therefore logical thinking cannot be applied under all circumstances.

As logical thinking cannot be applied to all circumstances, there will always remain an element of doubt whenever it is used in making decisions: although a concept may seem rational to an individual – it is far less likely to be accepted by everyone from a more global perspective. If a concept cannot be accepted by everyone than it then poses the question: how many people will not accept the concept? As each human is different, it would be expected for each human to think differently – if everyone is thinking differently, than how can it be expected for people to accept the same premises? This idea reflects the magnitude of doubt which can be placed on logical thinking: as logical thinking

relies heavily on premises to generate conclusions – the idea that premises could potentially be rejected by different people limits the applications in which logical thinking can be applied. Essentially, logical thinking is not universal – it relies heavily on people's opinions and their willingness to accept premises: as a result, although logical thinking can be applied simply to an individual who accepts the premises – logical thinking is far more difficult to apply to a larger audience due to the conflicting opinions.

Emotion is also a significant form of decision making as it places a greater importance on human characteristics. While logic relies on rationality and reason, emotion is far more concerned with sentiment and consideration of others. An example of emotional thinking could be applied to the previous homework conundrum:

Premise 1: You want to succeed in school

Premise 2: Doing your homework can help you succeed in school

Conclusion: Therefore you do your homework

Although there may be people who accept the premises and understand the conclusion – people (particularly teenagers) are still inclined to procrastination and laziness despite the rationality of the thinking. This is because of how the concept of doing homework can be associated with feelings of boredom and dreariness – although the argument is logically acceptable, it is still disregarded. This is due to both the strength and weakness of emotional thinking: it can be considered irrational under certain circumstances.

This irrational thinking associated with emotion can be considered a negative as it could become difficult for people to understand a decision: since emotion is often generated from individual experience and events, different people can have different emotions towards different events. If emotional thinking is applied by different people to the same event, different conclusions will be generated – clearly there is a significant level of ambiguity in relation to decision making with emotional thinking. The ambiguity could be associated with irrationality and therefore emotional thinking is not ultimately reliable for generating the same results amongst a large audience – since the results from emotional thinking cannot be replicated it could be considered a limitation.

However, the strength of emotional thinking is also how it can be considered irrational – irrational ideas which cannot be explained through logical thinking can often be explained through emotional thinking. As an example:

Premise 1: We want to end poverty

Premise 2: Donating money to charity helps end poverty

Conclusion: We should donate money to charity

Although the premises of this argument could be questioned – the basic idea of the argument makes logical sense. Despite this, poverty is still prevalent with very little improvement – although this could be traced to the inefficiency of charitable systems, the main idea would be how people simply are not giving to charity despite the logical thinking involved. From a logical perspective, this phenomenon would be difficult to explain – but from an emotive perspective: emotions of greed, spite and self-indulgence can help to explain the irrationality. Essentially, the example acts as a way to reflect how people are comprised by many different attributes aside from logical thinking and therefore show how

these illogical attributes are capable of developing irrational decisions – emotive thinking is able to explain irrational decisions.

Overall – there are two main ways in which people make decisions: logically and emotionally. Both attributes have values and limitations and ultimately, they are both required to function as part of society. As a result, both forms of thinking are equally valuable as the rejection of one form of thinking could lead to becoming ostracized – the combination of these 2 forms of thinking enable people to function as part of society and ultimately make decisions.

When is it appropriate to employ military intervention?

Timothy Hobbs

Year 11

In an increasingly volatile geopolitical landscape, the question of whether it is appropriate to intervene in a crisis with the use of military force is something that is being asked more often. Military intervention is defined by the United Nations as 'the deliberate act of a nation or a group of nations to introduce its military forces into the course of an existing controversy.' Historically, states have used military intervention as a way of achieving their geopolitical goals of protecting and/or enhancing their territory, populations or other critical resources. However, more recently it has been used for humanitarian purposes and to resolve foreign conflicts. As new realities and challenges have emerged over time, so too have new expectations for action and new standards of conduct in national and international affairs. In 2014 the use of military intervention has been discussed and in some cases employed in relation to the conflicts in Syria, Israel and Gaza, Iraq and Ukraine. There are a number of points of view in relation to the appropriate use of military intervention. I would argue in accordance with the United Nations, that military intervention should only be employed as a last resort when all other diplomatic avenues have failed. Others would have you believe that military intervention should be our first point of call or that it is never appropriate. One thing that they all have in common is long-lasting ramifications for everybody involved. In any case the decision to intervene should be well-considered.

The United Nations (UN), most Western nations, international humanitarian organisations and myself adopt the view that military intervention should be a last resort. When all diplomatic channels have failed to resolve a conflict and minimise civilian casualties, then and only then is military intervention appropriate. Diplomatic avenues offer a peaceful way to attain conflict resolution, protection of civilians and ultimately sustainable international peace and security. They apply pressure on multiple levels of a government without using force and inhibit a government's capacity to interact with the outside world. These coercive measures short of military intervention, aim to persuade the appropriate authorities to take or not take particular actions. Diplomatic avenues to conflict resolution come in the forms of economic sanctions, trade embargoes, suspending/ending military and political cooperation, restricting diplomatic representation or travel, restricting access to petroleum products, suspension of membership from international or regional bodies etc. Obviously some of these avenues would be more successful than others.

An example of successful economic sanctions in the real world is in Myanmar. Myanmar has been engrossed in one of the world's longest-running unresolved civil wars and as a result the military has been able to maintain control of the entire country for decades. In 2008 the people of Myanmar rebelled by holding peaceful anti-government protests. This act of defiance lead to a crackdown by the ruling military junta which included barricades at places of worship and the murder of vocal members of the community, including a group of regionally respected monks. The international community responded with harsh sanctions on the Myanmar government. Since then, Myanmar has introduced some historic democratic reforms which have increased the ability to speak and worship freely and as a result some sanctions have been lifted. Australia has led efforts to encourage reforms but says "there is still a lot of work to be done." [Former Foreign Minister Bob Carr].

This example highlights the success of diplomatic channels in conflict resolution and protecting civilians and supports the idea that it should be tried before use of military intervention. Had military intervention been used in Myanmar straight away, it would have only inflamed the situation and resulted in a greater number of casualties. The same could be said about military intervention in general. If we resort to military intervention at the first signs of conflict, the result could be catastrophic. Nevertheless, if diplomatic channels should fail, what can the international community do to protect the rights of people, solve the conflict and restore international peace and security? We need to have an alternative solution. As a last resort we must consider a military intervention. It has the potential to save hundreds or even thousands of lives, stop a government or terrorist organisation inflicting pain and death upon civilians, stop social, economic and environmental damage and force corrupt foreign governments to disband and step down. If these positive outcomes can be achieved through the use of a military intervention then it is only logical to try and use it as a way of deescalating a crisis. The UN has publicly endorsed, but not ratified, a policy,outlined in a report from the International Commission on Intervention and State Sovereignty, called 'the Responsibility to Protect.' The policy details the principles for military intervention including when and how it should take place. There are five criteria outlined that must be fulfilled before making the decision to intervene and absolute rules that apply when intervening. If these rules were strictly adhered to, the criteria to intervene was fulfilled and all diplomatic channels had been tried and tested to negotiate a resolution to the conflict or controversy, military intervention would be appropriate to use as a last resort.

An opposing view is that it is never appropriate to employ military intervention. People who adopt this point of view believe that if there is potential for things to go wrong, as there is in a military intervention, then it shouldn't even be considered as it could end up inflaming the situation. The ways in which military interventions play out are quite diverse as every situation has a different set of circumstances. Some argue that military interventions are aggressive, violent and drastic measures of resolving conflict that may well result in further death, damage and destruction. More military personnel and more military might fighting in designated conflict zones means more targets and therefore a higher death toll. They say that violence cannot be resolved using more means of violence - that is hypocrisy.

These people also call attention to the fact that there is no set international framework for a military intervention. They argue that without international framework decisions and responsibilities are often not well-considered and mistakes are more likely to happen. Having no framework also suggests that military interventions cannot be legally sanctioned. Rules and guidance are needed to assist in making the right and legal decisions and as no such universally accepted rules or framework exist regarding a military intervention, the right and legal decisions cannot be made. Therefore military intervention will fail because it is 'illegal' and not well considered. People adopting this view suggest to the international community that they should persist with peaceful measures and diplomatic channels to try and resolve conflicts.

Nevertheless, if diplomatic channels have been cut and peaceful measures have failed, what more can the international community do to resolve the conflict and stop the blood-shed? Can they really just sit back and watch the deaths of human beings? Do we not have a responsibility to protect our common humanity? If we adopt the view that employing military intervention is never appropriate and that it may inflame the situation, causing further death and destruction but ignore the fact that military intervention has the potential to achieve a positive outcome, conflicts may never be resolved and

people may continue to be put through the horrors of pain and death of war. The implications of doing nothing must be weighed up against the ramifications of doing something. This is a very complex thought process which should not be done in haste. However, in most cases doing nothing will only result in further death and destruction. Something must be done, which is why military intervention should be considered as a last resort, after all diplomatic channels have failed.

After careful and thorough analysis of the opposing opinions on the question of "*when is it appropriate to employ military intervention?*" I believe the original argument should be retained. The view that military intervention should be used as a last resort when all diplomatic avenues have been exhausted is the answer to the question. Ultimately, it means that should peaceful diplomatic channels be unsuccessful in their aim to persuade authorities to take or not to take certain actions, the international community can do something to save lives, resolve conflict and restore international peace and security. However, the opposing argument has identified the need for an internationally agreed upon, universally accepted and ratified framework for a military intervention. If this becomes a reality military interventions may have more success in the future. Finishing on a quote from Samantha Power, the current US Ambassador to the United Nations, who supports the original argument; "My basic feeling about any military intervention is that it should be a last resort, undertaken only to stave off large-scale bloodshed."