Western Epistemology: a stranger in a strange land?

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Abstract

Westernization in the Pacific, as in the world, brought with it many old truths and new ideas. It brought new belief systems that were widely accepted and technologies that mostly proved useful. But it also brought something that it never fully put into words, although the brightest of students attending the best of schools may have had a glimpse of it. It's not a secret but, somehow, it's rarely discussed. When Westerners came they claimed to know an awful lot of things. But how did they know what they claimed to know? What was their way of knowing things? This paper discusses the various ways of knowing, with special reference to scientific knowledge and its epistemological basis, and to the nature of the body of knowledge it generates and protects. The objective is to provide a short history of western thought and a foundation for young scientist who need more than the successes of technology to understand how they know the things they claim to know. (PHD 2011; Vol. 16(2): p112-118).

Introduction

The handing down of tradition is a familiar way of knowing in the Pacific; but the Europeans came with their own traditions. We could imagine that each group of Pacific Islanders thought that the westerners shared a single understanding of their origins and culture, as they did themselves. The missionary, the government administrator, the doctor and the teacher were seen as being of one kind. But western society is pluralist, encompassing several quite different ways of knowing and doing things, some of which are shared, but one of which is relatively 'new' – about 400 years. So, what are the different ways of knowing and what are their relative merits? And what is special about science as a way of knowing? This area of study has its own language, so a short glossary of some of the terms used in this paper is provided as an appendix.

When did human beings begin to think about ways of knowing?

Homo sapiens (the 'knowing hominid' - us) has existed in our current form for around 150,000 – 200,000 years. That's not very long - only 6 to 8 thousand generations. The genus Homo to which we belong is thought to have its origins about 3.5 million years ago (140 thousand generations). The common Western account of the emergence of philosophical thought is that it started with the Greeks around 400-500BC. But before the Greeks the Egyptians had developed a very detailed astronomy built on careful observations of the heavens made over hundreds and possibly thousands of years. Their objective was to achieve the afterlife, so they were certainly thinking deeply. But even they were preceded by the Sumerians (1,800 BC) with hundreds of years of astronomy and who invented writing, accountancy and beer! And they, in turn, were preceded by prehistoric civilizations that we know very little or nothing about, who had been doing all sorts of interesting things for thousands of years as modern humans - including the use of sophisticated hunting methods more than 45,000 years ago.

Hunters and Farmers

Hunting is deeply embedded in our prehistory as the skill that has carried us through vast amounts of time. "The oldest act in the intellectual history of the human race: the hunter squatting on the ground, studying

the tracks of his quarry. In the course of countless chases he learned to reconstruct the shapes and movements of his invisible prey from tracks on the ground, broken branches, excrement, tufts of hair, entangled feathers and stagnating odours. He learned to sniff out, record, interpret and classify such infinitesimal traces as trails of spittle. He learned how to execute complex mental operations with lightning speed" (Ginzberg in Rudgley 1999). The hunter was an observer of the natural world and through generations of observation and hunting tradition was able to improve hunting techniques. The simple gatherer was also an observer: of the annual cycles of nature and the changing availability of natural foods.

But the farmer developed this knowledge further and made choices to select particular seeds to plant according to the cycle of the seasons, which they learned to forecast by the stars, and which also became the basis of many of their religious rituals. The Egyptian myth of Osiris and Isis, ritualized at the vernal equinox and the planting of the corn, set the core narrative for many of the world religions that have followed.

The approach to the natural world that hunters, gathers and farmers employ is quite similar to that of scientists. Like the scientist, the source of the hunters' knowledge is in careful observation, developing rules from observations and testing them in the field. But ancient hunters, gathers and farmers differ from modern scientists in the way that they interact with nature. Where the ancients thought they could manipulate nature with rituals and spells to catch their prey, or to have good harvests (and where they couldn't do it themselves their Gods could do it for them), scientists manipulate nature directly with technologies, which we will come to later.

The Classical Period

The earliest Greek philosophers had put forward some astounding theories – including the idea of the world being composed of uncaused and unchangeable material atoms in random motion (Democritus 460-370 BC). It took us two thousand years to come back to that idea - atomic theory. The early Greek philosopher Pythagoras (570-495 BC) and later developed by Euclid (325- 270BC), thought that the universe could be explained by mathematical forms, harmonies, and perfect shapes, but their ideas were not developed further until another thousand years had passed. The main Greek philosophers weren't scientists in the modern sense of the word. Greek philosophy had two opposing trends – naturalism and rationalism. Naturalists thought that sensory observation was the only path to knowledge while rationalists thought that the application of rigorous logic would achieve true knowledge. (This debate then continued throughout the history of western philosophy until the late 18th century and David Hume).

The three most famous Greek philosophers (Socrates, Plato and Aristotle) unknowingly set the basis for the 3 major classifications of philosophy in use today - moral, metaphysical and natural philosophy. Socrates (469-399 BC) raised questions of moral philosophy and by challenging people's beliefs through 'socratic questioning', was eventually sentenced to commit suicide for undermining young people's confidence in their ideas, their elders and the state. He sought to know what was common to all virtuous acts, and reasoned that if we want to choose good actions over bad ones we must know what 'Good' is. He was aware that different cultures defined things differently and thought that there must be some universal reference point, or everything would be relative to culture and of no use as principles to guide human behaviour.

Socrates' student, Plato (427-347 BC), carried these ideas into metaphysical philosophy. He elevated such principles as goodness, justice, wisdom and beauty to Ideals and Universal

Forms that existed beyond our experience, but which permeated our reality and, of which, our earthly experience was a mere shadow. According to Plato, the philosopher's task was to reconnect with these essences by looking beyond the particulars of our experiences to the universal Ideals they reflected. This metaphysical approach to knowledge theorized about reality without the need of direct observation, so it was essentially rationalist.

But the thing that troubled Plato most was when he did make observations. As we now know, the planets move around the sun against a background of stars that appear fixed in position relative to each other. But the erratic movement of the visible planets (Venus, Mars and Jupiter) didn't conform to the mathematical perfection that Plato reasoned to exist. They moved about the sky as if under their own volition (and they were thought of by many as being Gods). This puzzle set in motion much of the western mathematical and intellectual effort to explain the movement of the planets until they could be found to conform to Plato's ideal of perfection. The approach was that observed facts would eventually fit the theory.

But, unfortunately, like many after him whom he influenced, Plato thought that the earth was at the centre of the universe. So despite his obsession with observing the planets, Plato thought that the true path to the knowledge of their movements was through the intellect – not through the senses. He also thought that by studying natural phenomenon one would 'remember' the underlying essences of everything; as if universal knowledge was something that we had lost but could regain. It's not hard to see how Plato's ideas contributed to the development of the religious concept of heaven and a past 'golden age'.

But where Plato had taken Socrates' moral philosophy into metaphysics, Plato's student Aristotle (384-322 BC), a biologist, brought people back to earth and to natural philosophy. Although Aristotle still held many mystical ideas, he encouraged the close observation of nature: material reality rather than 'ideal' reality. One was a substance we could experience through our senses, the other was not. Observation of nature presented our only possibility of understanding the world. Aristotle started the enduring classification systems that we use today to help us order our observations – substance, quality, quantity, relation, primary and derivative, species; and created a basis for the development of the material sciences .[1] But to our modern mind he failed as a true natural philosopher because he tried to explain things in terms of 'attractions' 'essences' and 'affiliations' rather than by natural forces. Aristotle failed to reconnect to the mathematic approach of the earlier work of Pythagoras.

After the Greeks the Romans developed sciences in a more applied way – and built an empire. They were more religious but less philosophical than the Greeks and were more concerned with law, trade, politics, engineering and administration. Some say that the lack of a philosophical orientation led to the decadence that triggered the fall of the Roman Empire, which collapsed in Western Europe around 400AD after hundreds of years of decline. Interestingly, the Roman Empire actually became Christian and moved east to Byzantia – and became a Greek speaking empire that lasted until 1453; and which attempted to understand the pre-Christians Plato and Aristotle as being forecasters of Christian cosmology. But the legacy of the Romans in Western Europe was mostly in the engineering sciences- the roads, bridges, irrigation, water wheels, wind-mills and metallurgy that would later form the base for the industrial revolution.

[1] It is of historical interest that Aristotle was a tutor to the young Alexander the Great in Macedonia to the north of Greece. Thus we have an unbroken line of teacher – student; from Socrates to Plato to Aristotle to Alexander. When Alexander's father Philip of Macedon conquered the Greeks he destroyed their state, but through Alexander, Greek culture and philosophy spread across central Asia to India.

The Middle Ages

During the 1,000 year period from the 5th – 15th century most of Europe's intellectual and scholastic effort was directed to the metaphysical philosophy of Christianity. Formal learning took place in monasteries and church schools, and observations of nature were explained in the terms of Christian cosmology, just as Plato, and Ptolemy (90-168 AD) after him, had tried to fit erratic planetary movements into ideals of circular planetary motion around the earth. But in the mid thirteenth century Thomas Aquinas (1225-1274), echoing Aristotle, affirmed the natural world's significance in reality and the value of empirical knowledge in the unfolding of God's creation. Almost concurrently in 1247, Roger Bacon laid the early foundations of experimental methodology at Oxford.

William of Ockham (1288-1348), an English monk, unintentionally shook Catholic faith by putting forward the logical propositions that concrete experience was the only valid basis of knowledge, and that 'universals' (Plato's Ideals) only existed as names or mental concepts and did not have an existence outside the mind. 'Ockham's Razor' has now become one of the tools of science. It essentially states that we should not multiply hypotheses (explanations) unnecessarily, but its intent is that we shouldn't test a secondary (derivative) hypothesis without first establishing the validity of the primary hypothesis. It was therefore not reasonable to hypothesise about the nature of God without first proving God's existence! This was intended by Ockham to demonstrate that man was incapable of knowing anything about God at all, other than by revelation and faith, but it has become one of the foundation principles of modern scientific method!

The period called the Renaissance roughly spanning the 14th – 17th century is thought of as the rebirth of the intellectual and creative spirit of the Classical period. Scholars began to question the previously unchallengeable wisdom of the classical philosophers – Aristotle was found to be a poor observer, Galen's (131-201) rationalist medical theories were questioned, Ptolemy's astronomy, based on the earth being at the centre of the universe, was challenged by a new explanation.

But interestingly, the landmark theory of Nicholas Copernicus (1473-1543) – that the earth and planets revolve around the sun – came about through rationalism rather than observation. Copernicus had come up with an explanation of the observed planetary movements that was 'more elegant' than Ptolemy's, at a time when elegance was a good criterion for an idea's acceptance. But Copernicus' theory contradicted the accepted world view that the earth was the centre of God's creation. Tension again emerged between a rationalism that attempts to make nature conform to a preconceived idea, and the empiricism of observation. It could only be resolved in one way – by improved observation. By looking more carefully at nature and by making better measurements of it we have a more secure basis for developing explanatory theories. And this is what happened next: the technological developments to improve observation.

Science

As might be expected, the science of optics played an important part in improving both observation and measurement. Galileo (1564-1642) is regarded as the first true scientist. Much of his contribution depended on the telescope (which he made for himself in 24 hours after hearing about the concept). Galileo's observations supported Copernican theory that the earth moves around the sun. Through his telescope he was able to see that objects in space were physically similar to the earth – the moon had a rough surface and not the perfect smoothness that was expected. But Galileo was sanctioned by the Church for supporting Copernicus' theory 'contrary to the teaching of the scriptures'.

From the remaining discrepancies still apparent in planetary motions, and with the use of improved planetary charts compiled by Tycho de Brahe (1546-1601) (who was burnt at the stake), Johannes Kepler (1571-1630) calculated mathematically that the planets moved in an elliptic path around the sun, rather than in a perfect circle, finally ending the notion of a perfectly ordered universe in which everything revolved around the earth – although it took until 2008 for the Catholic Church to announce its mistake in its treatment of Galileo and its belated acceptance of Copernican theory.

Although others contributed, Isaac Newton (1643-1727) in his Principles of Natural Philosophy demonstrated that the movement of the planets and gravity could be explained mathematically: bodies attract each other with a force directly proportional to their masses and inversely proportional to their distance apart. Eventually, secular mathematical explanations emerged from centuries of a dominant Christian world view, so when Halley's Comet returned as predicted mathematically, it visually confirmed that Newton's mathematical physics applied to everything in the universe. Natural philosophy had finally reunited with the mathematical empiricism of the pre-Plato Greek philosophers.

Modern Epistemology

Rene Descartes (1596-1650) set out to discover the basis for certain knowledge. Only from certainty could one progress to build knowledge. As a mathematician, human reason was the supreme authority in matters of knowledge, as the senses could be deceived and the imagination uncontrolled. His famous statement of 'I think therefore I am' set the only certainty: that rational man is only certain of his own awareness, as distinct from the external world of material substance, which is less certain. Descartes thought that disciplined critical rationality would overcome the untrustworthy information about the world given by the senses, so by drawing conclusions from the only thing of which he could be certain, he consolidated the position of the predictive role of deductive logic in modern science.

In the struggle between rationalism and empiricism John Locke (1632-1704) took a different view to Descartes, as he was the ultimate empiricist who thought that 'there is nothing in the intellect that was not previously in the senses'. Locke's position was that reason depended on information that had been gathered by the senses – those faculties that Descartes had so distrusted. But David Hume (1711-1776) challenged the ideas of causality that underpin our knowledge obtained through the senses. We observe certain actions (B follows A) through our senses but we don't actually sense that A caused B. Causation is a logical construct of the human mind. Hume thought the mind was a jumble of disconnected perceptions that were only brought into order by instinctual need and psychological habit, and projected onto nature. Order was not inherent in nature but in the mind's own tendencies to create order. Experience could never give rise to certain knowledge because the apparent order of all past events could not guarantee the order of any future experience. All that could be perceived by the senses were the events, not the causal linkages.

Immanuel Kant (1724-1804) agreed with Hume but thought that there still must be some basis for certainty. He reasoned that Euclid's geometry, which Newton had employed, could not have been perceived in nature by the senses but was rationally constructed within the human mind and was confirmed by nature. Kant believed that the mind does not passively receive data but that it actively structures them. The mind does not conform to nature, but nature to the mind. Sense impressions alone, without 'a priori' (already existing) constructs in the mind could never lead to knowledge. Certain knowledge

is only possible because the human mind lends to the universe its own absolute order. Neither pure empiricism (without a priori structures) nor pure rationalism (without sensory evidence) constituted a viable way of knowing. Man could only know things as they appeared to him, not as they were in themselves. Science could only claim certain knowledge of appearances, not of all reality. The findings of Albert Einstein (1879-1955) in the theory of relativity supported Kant's view (and that of Socrates) that there was more than one set of appearances. So, even Kant's 'a priori' constructs were relative.

Relativity has become the foundation of post-modernism; the reaction to the objective certainty of modernism, which is leading us to view the universe in new ways. Discoveries by the Hubble Space Telescope suggest that our Milky Way Galaxy is only one of a hundred million galaxies in the universe – and that the universe may actually be misnamed – there may be more than one.

Summary

This short review of the history of western philosophy has revealed several essential features in the rise to a scientific way of knowing the world. Early hunters and gatherers made simple observations of animal tracks and times of vegetative ripening. Hunters and farmers went further to make more complex observations and to test them out, and to predict the best times for hunting and planting, although they didn't always reap the benefits, so they employed magic and ritual to assist their hunting and planting, and when their magic and rituals failed them they thought that someone, similar to themselves but with far greater powers, could bring about their desired outcomes. Rationalism went hand-in-hand with ritual. If we could imagine the universe as attaining some ideals of perfection in which the greater powers had control, we could direct our rituals towards them.

Table 1. 3 Ways of Knowing

	Priest	Hunter/Farmer	Scientist
Source of knowledge	Divine Revelation	Tradition	Theory
Way of acquiring knowledge	Studying religious texts	Observation	Controlled Observation
Method of testing knowledge	Correlation of events with prayer	Trial and error	Hypothesis testing
Logic used	Belief	Induction	Induction & Deduction
Method of validation	Personal experience	Production	Replication

But as observation improved through technology it challenged the rationalist ideals of the perfection of creation. Their improving observations required better explanations, which eventually were found in the mathematics of a physics that applied to all nature. Galileo and Newton's contributions led to an awareness of the vast size of the universe, while the observations of geologists and biologist hinted at an enormous span of time.

But science has added 3 things to the hunter's repertoire. Control: when observing something in particular all else that impacts on it needed to be controlled, so that the explanation of variation would only attach to the observed phenomenon. Operational definition: what we observe needs to be precisely defined in terms of the characteristics that allow inclusion or exclusion from the study. Replication: that whatever we have observed by experiment

needs to be replicated to ensure that the same results will be obtained from the same process each time: before an explanation of the results can be inferred and predictions made.

Conclusion

When Europeans arrived in the Pacific they didn't have an integrated epistemology, and they were not an integrated society as they first appeared. Among them were some whose knowledge was based on the faith that what was revealed to them in holy texts was real and required no other explanation. There were rationalists, who thought the nature and society should conform to certain ideals that they considered absolute and 'best' from their own relative position. There were those who thought that the observation of nature would provide all that we needed to know. And there were those who were scientists – who only claimed to know what they could reason to be true on the basis of systematic and careful observation employing methods of control, operational definition and replication.

Annex 1. Glossary

Philosophy: *the study, or science, of the truths or principles underlying all knowledge and being. Divided into 'natural philosophy' (the sciences), 'moral philosophy' (arts, society and humanities) and 'metaphysical philosophy' (religion and mysticism).*
Metaphysics: *the branch of philosophy that deals with first principles such as the sciences of being (ontology) and of the origins and structure of the universe (cosmology).*
Epistemology: *the branch of philosophy that investigates the origins, nature, methods and limitations of human knowledge.*
Rationalism: *the theory that reason is, in itself, a source of knowledge independent of the senses.*
Empiricism: *the theory that all knowledge is derived from experience. We use the term 'empirically tested' when we test our ideas in the real world of experience. Empiricism is related to 'naturalism' in philosophy, which proposes that knowledge is only obtained by observation of nature.*
Revelation: *God's disclosure of himself and His will to His creatures. Believers have a sense of knowing the origins and structure of the universe and God's will for the world through religious texts, the conjunction of events and the corroboration of their beliefs by others.*
Science: *the systematic study of man and his environment based on the deductions and inferences which can be made, and the general laws which can be formulated from reproducible observations and measurements of events and parameters within the universe. Science relies on deductive logic and the acceptance or rejection of a hypothesis, either empirically or theoretically (statistically).*
Technology: *The branch of knowledge that deals with science and engineering, or its practice, as applied to industry; applied science. Technology relies on inductive logic and probabilism: if it works more often than not - use it.*

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Last week came news that: 1) the Central Medical School has increased its students to 76, including eight dental students; 2) there are 100 native nurses in training; 3) the Fijian Government now proposes an overall health plan for all the islands, with a base hospital at Suva served by air ambulances from the other islands.