Climate Change and Cultural Transformation

Part 4 The Good, the True and the Sublime

Chapter 14 **Exploring the True: Science as Consciousness 1**

> When we consider what religion is for mankind, and what science is, it is no exaggeration to say that the future course of history depends on the decision of generations as to the relations between them.
>
> Alfred North Whitehead

> All descriptions of reality are limited expressions of the world of emptiness. Yet we attach to the descriptions and think they are reality. That is a mistake.
>
> *Letters from Emptiness,* Shunryu Suzuki

Like many of my generation when I was sixteen I had to choose what to study at school for 'A' level. It was difficult because I had enjoyed all subjects up till then. What I discovered was not only had I to choose only three but these three had to be selected according to one of two kinds of classification – arts or sciences. I was being inducted into what I only half realised were two separate cultural domains. Our school fifth year was more or less cut in two. One half donned white coats and disappeared into laboratories to peer down microscopes and observe physical life in scientific detail. The other half – which included me – retired to the classroom and library to discuss the broader picture of ideas in literature, languages and history.

This was my introduction to the "two cultures" which characterised our educational system. As I was to experience, this was not just a practical arrangement but an ideological fissure which widened the further one went with one's education. Not only were we physically separated in the sixth form but there was too little communication or exchange of ideas between the two groups. Moreover we were encouraged to regard each other – sometimes with animosity - as belonging to quite different ways of thinking about life. At university it was as if we inhabited two different universes with opposing world views. The two groups became strangers to each other with different and unrelated value systems.

In a way – unknown to me at the time – we were replicating a cultural split which began in the sixteenth century when a tacit pact was made with the Church that science could continue to probe the material universe as long as it did not trespass on the religious beliefs and values of the Church. Galileo, for instance, could accept the empirical evidence of his telescope that the planets circled the sun while he showed outward respect for Cardinal Bellarmine's – and the Church's – religious and spiritual assertion that the Earth was the centre of the universe. [1] The division led eventually to the development of two fundamentalisms – the scientific belief in a material, mathematically-describable, objective truth and the dogmatic, irrational tenets of a monotheistic faith.

The myths of science

The irony is that while scientific progress led it further and further away from religious truth – until it eventually denied all existence of God – it had already unconsciously taken on some of the fundamental beliefs of the Christianity it was opposed to. In other words science itself had become an ersatz religion, a point never clearer than today. The philosopher, John Gray, for instance, has suggested that while "science is supposed to be the pursuit of truth .... in secular cultures it has become the chief vehicle for myth". [2]

The myths of science have been analysed in detail by two thinkers in particular: B. Alan Wallace, the Buddhist writer on science and mind and a principal translator for the Dalai Lama, and Rupert Sheldrake, the biologist, a past Research Fellow of the Royal Society and currently a Fellow of the Institute of Noetic Sciences in California .

In his book, *Embracing Mind,* Wallace examines the central belief of scientists that physical phenomena alone are real, something it knows through "objective scientific investigation". This is a myth, he concludes, that was "never arrived at scientifically. Rather, it resulted from a process that automatically filtered out contradictory evidence". [3] It was forced to do this on account of the political and historical circumstances which prevailed at the time of its emergence. Science was born in the largely Christian world of Renaissance Europe and could not have been free of the influence of the basic tenets of Christian theology. This influence was felt negatively rather than positively in what Wallace describes as "A Shotgun Wedding – the Marriage of Science and Christianity". [4]

Science is about the empirical attainment of knowledge but modern science often forgets there are three principal ways we arrive at knowledge:

1. through our physical senses;

2. by way of mind – “the mind behind the eyepiece"; and

3. by means of authority – the acceptance of knowledge handed down to us, but which we only accept insofar as it makes sense in our own experience.

In the sixteenth and seventeenth centuries scientists had to survive the horrors of the Inquisition – the rack or execution - and to do this they felt they had to accept the terms of the Church and confine their science - their mode of knowing – to the first, the domain of the senses, while the Church monopolised the other two – mind and authority.

From the sixteenth century on science developed its characteristic method of procedure – “consisting in systematic observation, measurement, and experiment, and the formulation, testing, and modification of hypotheses” (OED). While science rightly prides itself on the method of disproving its hypotheses – this being evidence of progress - it has never really asked how the mind formulates its hypotheses in the first place, since this raises metaphysical issues which the Church would not allow it to consider or contemplate. Consequently the human mind - or imagination - is taken for granted as an integral – but unexamined - part of the scientific method. Human and social scientists conclude that, as a result, science is unconscious of itself as observer of what it is observing.

Science and religion

The history of the relationship of Western science and Christian theology involved a changing balance of power. Today science is generally viewed as the antithesis of religion but it grew out of a highly religious society. Its pioneers such as Copernicus, Descartes, Galileo, and Newton were all Christian believers and it was St Thomas Aquinas who had introduced Aristotle into Christian thought. Only in the last two centuries has science come to replace religion as the final authority. Yet it has never freed itself completely from the Christian theology that gave birth to it. As a consequence

> the prevailing popular view of science in the West is based on the discoveries achieved by the scientific method, but infused with a hidden Christian view of nature. This view evolved from a set of metaphysical assumptions that underlie science and are believed by many scientists today – they’re collectively called *scientific materialism.* P 10

This philosophical view of scientific materialism emerged most clearly in the nineteenth century. Wallace outlines the principles, or beliefs, on which it is based:

- *Obectivism* is the belief in an objective reality - that 'the only reality of importance exists "out there" beyond our minds – the objects we perceive as the physical universe'.

- *Metaphysical realism* is the belief that the objective universe can be known by the subjective human mind.

- The *closure* principle "denies the possibility that anything other than material influences can affect any aspect of the natural world".

- *Universalism* "declares that these rules are universal – they are the same in every corner of the universe be it the centre of a cell or the centre of a star".

- *Physical reductionism "*reduces all of nature to physical entities and interactions".

Wallace concludes from these five principles: "this materialistic view was the unintended offspring of the marriage of Christianity and science". [5]

A similar argument is also developed by Rupert Sheldrake in his recent book, *The Science Delusion*, subtitled *Freeing the Spirit of Enquiry* - presumably conceived as an alternative scientific response to Richard Dawkins' popular *The God Delusion.* Also a scientist himself, Sheldrake is very pro-science. No one could deny the extraordinary achievements of science as a form of revelation as well as technology. He acknowledges how "our intellectual world has been transformed by an immense expansion of knowledge, down into the most microscopic particles of matter and out into the vastness of space, with hundreds of billions of galaxies in an ever-expanding universe". [6] Yet the spirit of free enquiry is held back by the limitations of its view - "the dogmas of modern science". Moreover, at the beginning of the twenty-first century when science and technology seem to be at the peak of their power, "unexpected problems are disrupting the sciences from within". While most scientists assume that any problems will be solved by more research on established lines, some think they are "symptoms of a deeper malaise". Sheldrake believes "science is being held back by centuries-old assumptions that have hardened into dogma. The sciences would be better off without them". [7]

The greatest delusion is that science already knows the answers. It has lost touch with the mystery of things - the fundamental questions are settled, only the details need working out. Like Wallace, Sheldrake thinks science's belief that all reality is material or physical has closed its mind to other possibilities but he also believes that, if science was

freed from these restrictive dogmas, it would be regenerated. It would be truly scientific. Sheldrake lists ten dogmas in the “scientific creed” that most scientists take for granted. They include:

- Everything is essentially mechanical.All of nature’s species are complex mechanisms, including human beings. In fact the universe itself is a vast machine.
- All matter is unconscious. It has no inner life, no subjectivity, no point of view. Even human consciousness is an illusion, an effect of the brain.
- The total amount of matter and energy is always the same and was created in the Big Bang at the beginning of the universe.
- The laws of nature are fixed and are the same today as they ever were and ever will be.
- Nature is without purpose and evolution has no goal or direction.
- All biological inheritance is material, carried in DNA and other material structures.

Neither Wallace nor Sheldrake are anti-science but wish to extend and expand the scientific method and view. Wallace’s writings remind us that science is an exercise of the mind and could benefit infinitely by becoming more aware of itself as a reflective – or contemplative – practice. It is extraordinary, for instance, that the theory of evolution - arguably science’s most important understanding of the last 150 years – excludes humankind. While nature – and the universe – evolves, we are thought not to. Sheldrake’s concept of morphic resonance implies the idea that nature itself is coherent in a way beyond our conventional understanding, an hypothesis which, of course, conventional science cannot accept, even as something to contemplate or test.

Twentieth century physics

What is beyond controversy are the questions that twentieth century physics still poses to orthodox science. That the theories of relativity and quantum mechanics offer a challenge to classical Newtonian physics is well-known, even if the challenge has not really been met. What perhaps is less well-known is that many of the main figures of the new physics - including Heisenberg, Bohr, Schroedinger, Einstein, De Broglie and Eddington - were themselves, if not religious in the sense of conventional believers in God, sympathetic to a mystical worldview, which accepted that the universe was essentially

mysterious and not accessible only to positive, common human reasoning. In their view we can formulate relative hypotheses and theories about the nature of the universe but we could not by these have absolute knowledge of it.

They were clear about the limits of understanding that physics can offer. There was a whole realm of understanding beyond physics - the domain of metaphysics - which physics cannot penetrate and about which it can make no authoritative assertions. Physics uses the symbolic and beautiful language of mathematics to describe the world but it does not go beyond symbols. As Sir Arthur Eddington wrote: "We should suspect an intention to reduce God to a system of differential equations……. We have learnt that the exploration of the external world by the methods of physical science leads not to a concrete reality but to a shadow world of symbols, beneath which those methods are unadapted for penetrating" (KW p 6)

As Ken Wilber comments in his introduction to the philosophical and mystical writings of the new physicists he edited: "the great difference between the old and new physics is not that the latter is relativistic, nondeterministic, four-dimensional, or any of those sorts of things…… both the old and new physics were dealing with shadow symbols, *but the new physics was forced to be aware of that fact".* [8] And Eddington spoke for the new physics when he declared that this awareness was "one of the most significant of recent advances". Schroedinger agrees even more strongly: "Please note that the very recent advance (of quantum and relativistic physics) does not lie in the world of physics itself having acquired this shadowy character; it had ever since Democritus of Abdera and even before, *but we were not aware of it; we thought we were dealing with the world itself".* [9]

Science and Plato's cave

This cannot be emphasised too much. It was as if physics had realised that it was still looking at the back wall of Plato's famous cave and to see the true light of the sun would require looking from a quite different view. Sir James Jeans sums it up:

> The essential fact is simply that all the pictures which science now draws of nature, and which alone seem capable of according with observational fact are mathematical pictures…..they are nothing more than pictures - fictions, if you like….Many would hold that, from the broad philosophical standpoint, the outstanding achievement of twentieth century physics is not the theory of relativity with its welding together of space and time, or the theory of quanta with its present apparent negation of the laws

> of causation, or the dissection of the atom with the resultant discovery that things are not what they seem; it is the general recognition that we are not yet in contact with reality. We are still imprisoned in our cave with our backs to the light, and can watch only the shadows on the wall. [10]

Heisenberg wrote an account of a conversation he had with Wolfgang Pauli and Niels Bohr in Copenhagen in 1952 about the mystery of things - Bohr had referred to Schiller's words, "truth dwells in the deeps" (KW pp 33-40) For all their clarity in their mathematical and analytic thinking these scientists were anti-positivist in believing that human knowledge amounted to nothing when compared to the "wider" perspective of metaphysics. The positivists used the word "metaphysics" as a term of abuse and consigned it to earlier, primitive cultures from which, they think, we had presumably moved on, despite the fact that Aristotle, revered throughout the Middle Ages, wrote a major work on the subject of what comes "after" physics. The new physicists of the twentieth century understood that creative and imaginative work always comes from contact with the "deeps".

Heisenberg understood how the scientific challenges that faced the ancient Greeks were still those the modern world grappled with. In the nineteenth century there was a revival of materialism in general cultural as well as scientific terms. "Dialectical materialism" changed world politics. And in science the concept of the atom made a big difference in the explanation of chemical bonding and in the physical behaviour of gases. But there were difficulties in the material theory of the atom, particularly whether atoms can be thought of as physical objects in the way stones, plants or other objects are. Quantum theory had shown that we cannot apply our ordinary intuitive concepts unambiguously to the smallest particles since they do not conform to our normal ideas of position, velocity, colour, size and so on. For Heisenberg it raised the debate of classical Greece between the atomistic materialism of Democritus and the idealism of Plato and he was clear which side he came down on:

> For the smallest units of matter are, in fact, not physical objects in the ordinary sense of the word; they are forms, structures or - in Plato's sense - Ideas, which can be spoken of unambiguously in the language of mathematics. Democritus and Plato both had hoped that in the smallest units of matter they would be approaching the "One", the unitary principle that governs the course of the world.

> Plato was convinced that this principle can be expressed and understood only in mathematical form. [11]

It is interesting that Heisenberg mentions both Democritus and Plato in respect of their hope that they were approaching "the unitary principle that governs the course of the world", each from opposing views - Democritus the materialist, proponent of the atomic view, Plato the idealist, believer in the absolute reality of his Forms. The origins of modern science in ancient Greece is taken up by Arthur Koestler in his classic, *The Sleepwalkers, A History of Man's Changing Vision of the Universe.*

Koestler and Kepler

The book started out as a biography of his scientific hero, Johannes Kepler, the seventeenth century astronomer, but makes the link between Kepler and the Pre-Socratics. Koestler's other hero is Pythagoras whose philosophical way was both empirical and mystical. His theory of numbers was applied both to human life and the harmony of the spheres. Pythagoras' vision, as Koestler writes, was a unifying vision:

> The essence and power of that vision lies in its all-embracing, unifying character; it cites religion and science, mathematics and music, medicine and cosmology, body, mind and spirit in an inspired and luminous synthesis. In the Pythagorean philosophy all component parts interlock; it presents a homogeneous, surface, like a sphere so that it is difficult to decide from which side to cut into it. But the simplest approach is through music. [12]

Today we may regard number and measurement as without mystery but to the Pythagoreans the mathematisation of experience was magical. Numbers were sacred to them. They were the purest of ideas, immaterial and divine. The marriage of music to numbers could only make it more noble: "The religious and emotional *ekstasis* derived from music was canalised by the adept into intellectual *ekstasis,* the contemplation of the divine dance of numbers". [13]

For the Pythagoreans numbers were eternal while everything else was transient. Mathematics was immaterial in the sense of non-material. It had the nature of mind and raised human experience beyond the senses to a level of celestial delight, the realm of the divine mind. For them the contemplation of geometrical forms and mathematical laws we're a means of purging the soul of earthly passion and therefore a path to knowledge of the divine.

Unlike the materialist philosophers of the Ionian school Pythagoras emphasised form, proportion and pattern, the relation between things, not the things themselves. There is an axis between numbers and music extending from the stars and the universe on one side to the human individual - body and soul - on the other. Koestler identified two bearings on which this axis turns - the basic concepts of *armonia:* harmony and *katharsis:* purge, purification.

The correspondence between the harmony of the spheres and man was fundamental. The Pythagoreans regarded the human body itself as a musical instrument and each of its "strings" must have the right tension and correct balance between the opposites in life. It must have good tone and be well-tempered - hence the purging and purification effected by *katharsis*. *Armonia* was not the same as our harmony in the sense of something pleasing to the ear. It was more austere, the tuning of the strings to the pattern in the musical scale. Balance and order were more important than sweet sounds:

> Sweetness does not enter the Pythagorean universe. But it contains one of the most powerful tonics ever administered to the human brain. It lies in the Pythagorean tenets that "philosophy is the highest music", and that the highest form of philosophy is concerned with numbers: for ultimately "all things are numbers". [14]

Shakespeare caught this correspondence when in *The Merchant of Venice* Lorenzo explains to Jessica:

> …… soft stillness and the night
> become the touches of sweet harmony …..
> Look how the floor of heaven
> Is thick inlaid with patens of bright gold.
> There's not the slightest orb which thou beholdest
> But in his motion like an angel sings …..
> Such harmony is in immortal souls. (Act V, scene 1)

Theoria as contemplation

For the Pythagoreans philosophy was not just a theoretical pursuit. The Greek *theoria* was derived from *theorio* meaning to "behold" or to "contemplate" so *theoria* implied a state of fervent religious contemplation. The Pythagorean community took the form of a

religious, mystical brotherhood. *Katharsis* was also important to other Greek movements such as Bacchism and Orphism but Pythagoras introduced the idea of a scale. At the bottom are simple taboos or rituals while at the top the catharsis of the soul is achieved by contemplating the essence of all reality in the harmony of forms and the understanding of numbers as underlying all forms. Plutarch explained that for the Pythagoreans "the function of geometry is to draw us away from the world of the senses and of corruption, to the world of the intellect and the eternal. For the contemplation of the eternal is the end of philosophy as the contemplation of the mysteries is the end of religion".[15] For the Pythagoreans philosophy, religion and science are united in the contemplation of the eternal.

The cathartic and religious precepts and practices were essential in the pursuit of knowledge because the Pythagoreans understood the potential *hybris* of science, that it could lead both to man's liberation or destruction. There was nothing "pure" about a science which didn't acknowledge or have experience of the mysteries and this was a principle that was to survive the end of the School. But the fact that all knowledge systems are flawed was no exception even to Pythagorism.

What the Pythagoreans realised but kept secret is that their mathematics and worship of numbers could never be absolutely pure. They discovered that there were "irrational" numbers which didn't fit into their system. Mathematical rationality could never be perfect. Nor could a secret brotherhood with equalitarian principles and communistic practices, including the emancipation of women and a monotheistic doctrine, survive persecution. But it did survive in another essential sense. As Koestler observed: "The Pythagorean concept of harnessing science to the contemplation of the eternal, entered via Plato and Aristotle into the spirit of Christianity and became a decisive factor in the making of the Western world". [16]

This 'survival' was not a complete blessing for science or eternity at the time, in Koestler's view. Science was very much alive in the sixth century BCE. The Pythagoreans accepted that orthodox - dogmatic - authority should be questioned and new hypotheses tested. They knew and accepted that the sun was the centre of our solar system and that the Earth, like the rest of the planets went round it. Benjamin Farrington, in his book, *Greek Science,* also pointed out that the Pre-Socratics were philosopher-scientists who put as much emphasis on the understanding and development of human technical science as on cosmology and philosophy: "The specific originality of the Ionian

thinkers was that they applied to the interpretation of the motions of the heavenly bodies and all the major phenomena of nature modes of thought derived from their control of techniques". [17]

The practical techniques and arts were as much a means to knowledge as pure philosophising. For the Pre-Socratics the contemplative life could be experienced in activity as much as in silent meditation. Science was as contemplative as any other philosophising. Farrington also quoted passages from the Greek tragedians of that time to illustrate how art takes pride in man's technical progress. He cites Aeschylus' *Prometheus Unbound* where Prometheus celebrates the human technical advances of the age and where, in a chorus of *Antigone,* Sophocles takes up the theme of man's inventiveness. [18] Art and science were not separate.

End of the spirit of Greek science

But the heroic period of Greek science was over by the end of the third century. From Plato and Aristotle onward natural science "lost its nerve". It "began to fall into disrepute and decay" and the achievements of the Greeks were only rediscovered some fifteen hundred years later.

The question is why the Greeks turned their backs on Pythagorean science and particularly the truth that the Earth goes round the Sun rather than vice versa, consigning astronomy to a millennia and a half of darkness and delusion. The reasons are complex. Philosophy and science are not independent of the social and political conditions of their time. The fourth century was a period of political, economic and moral bankruptcy. There was constant war and civil strife, corruption in public life and hordes of exiles and vagrant adventurers roaming the countryside.

These were the context in which Plato would have written *The Republic* with its fixed theory of Forms, its totalitarian politics and its separation of the world of ordinary experience from the eternal reality which supposedly underlies it. And from which teachings his student, Aristotle, for all his scientific observations could never escape. Plato and Aristotle were the twin-stars who established the cultural, scientific and philosophical context for the next millennia and a half and still perhaps cast their shadow over modern times.

Koestler identifies the fear of change as the general mood underlying the thought of both. They "yearned for stability and permanence in a crumbling world where change can only be change for the worse". "Progress" leads to disaster:

> "Change" for Plato is virtually synonymous with degeneration; his history of creation is a story of the successive emergence of ever lower and less worthy forms of life - from God who is pure self-contained Goodness to the World of Reality which consists only of perfect Forms or Ideas, to the World of Appearance, which is a shadow and copy of the former; and so down to man. [19]

Plato's fear of change and his resistance to the concepts of mutability and evolution reverberated throughout the Middle Ages, along with the yearning for eternal changeless perfection.

Plato and Aristotle and European thought

One of the reasons the works of Plato and Aristotle have had such an influence on subsequent European and world civilisation, apart from the fact that so much of their writing has survived intact, is that they were great and creative philosophers whose works have hypnotised us, as it were, along with the poets and tragedians of Greek culture. Yet Plato was responsible for the "rise of the circular dogma" - Koestler's phrase - which allowed Ptolemy's *Almagest* with its confusion of endless epicycles to confound the scientific and philosophical mind until Copernicus. Likewise Aristotle's Great Chain of Being, with its nest of concentric spheres, fixed a dynamic and fluid world, with an external God as the "unmoved mover" and creator once and for all of the universe and which eventually provided the Christian Church with a lasting spiritual ideology.

Of course Plato and Aristotle were great thinkers who attempted to understand both the physical and metaphysical worlds. While Plato's imagination and literary ability focused our attention on the eternal realities, Aristotle tried to marry direct observation of the natural world with the metaphysical "substance" or substrate which underlay it. Perhaps in their politically turbulent times and with the slave culture Greek society rested on, it was just too difficult to stay true to the unifying vision of Pythagoras and the potential non-duality of the worlds of appearance and reality.

Johannes Kepler

Kepler did most of his work before the worst years of the Thirty Years War. Like the Pythagoreans he was both a mystic and an empirical scientist. He believed in the eternal and ultimate truths of “divine Geometry” - or “celestial physics” - as the unifying vision between the mind of God and the mind of man:

> Geometry existed before the Creation, is co-eternal with the mind of God, *is God himself* (what exists in God that is not God himself?); geometry provided God with a model for the Creation and was implanted into man, together with God’s own likeness - and not merely conveyed to his mind through the eyes. [20]

It followed for Kepler that if geometry formed the bridge between man and God then it was possible to deduce the whole blueprint of the universe by pure *a priori* reasoning - to actually read the mind of the Creator. Astronomers are “the priests of God, called to read the book of Nature”.

This was Kepler the mystical or metaphysical scientist. Metaphysics is also known as “speculation” and Kepler speculated all his life, sometimes to the point of reckless insanity. But he was also a painstaking researcher and was capable of pedantic caution. There were these two sides to his mind, which can be seen as naivety and philosophical depth and which led him to ask questions no-one else dared to ask, even if it meant he might look foolish at the time. Some of his questions may appear meaningless to the modern mind but in his attempted reconciliation of physics and astronomy he set the scene for modern cosmology. In Koestler’s view, that some of his own answers were wrong does not matter. Like the Ionian philosophers of the heroic age, the philosophers of the Renaissance were perhaps more remarkable for the nature of the questions they asked than for the answers they proposed:

> Some of his questions were inspired by a medieval brand of mysticism, and yet proved to be amazingly fertile. The shifting of the First Mover from the periphery of the universe (Aristotle’s conception) into the physical body of the sun, symbol of the Godhead , prepared the way to the concept of gravitational force, symbol of the Holy Ghost, which controls the planets. Thus a purely mystical inspiration was the root out of which the first rational theory of the dynamics of the universe developed, based on the secular trinity of Kepler's laws. [21]

Kepler is an example of the importance of both the speculative imagination and the empirical mind for science. His Three Laws of planetary motion were inconceivable without his faith: the Sun as God, a spiritual as well as physical force, the heliocentric solar system - his first law; this enabled the scientist in him to create a formula in which a planet's rate of motion is inversely proportional to the distance from the Sun, which he conceived as the Holy Ghost, the Sun's force driving the motions of the planets - his second law; then after focusing on the orbits of Mars, after forty failed attempts he finally settled on the idea of an ellipse rather than a circular orbit, which he had previously assumed was too simple for earlier astronomers to have missed, and then assumed that all the planets moved in ellipses - his third law, thus completing his Trinity. [22]

Kepler continued the tradition of Pythagoras, but also Aristotle in combining metaphysics and physics, both necessary to true science. Science can be hubristic and believe in its knowledge as objective, if not absolute, truth. Metaphysics deals with ultimate reality but ultimate reality is elusive and cannot be known in any conceptual sense. From a metaphysical perspective, positive, conventional knowledge is a form of ignorance, as, in truth, is scientific knowledge. This is why Koestler characterises the most original and insightful science as a form of "sleepwalking", a fumbling in the dark, an idea which Newton himself may have agreed with.

The messiness of science

This is in contrast to the idea of "pure science", a concept with a growing body of critiques. Kepler, himself, had acknowledged: "The roads by which men arrive at their insights into celestial matters seem to me almost as worthy of wonder as the insights themselves", [23] while John Gray, in his introduction to the 2014 edition of *The Sleepwalkers,* pointed out that, in Koestler's view, "far from being a step-by-step process of rational advance, scientific progress is erratic and often accidental - a messy, disjointed affair in which unreason plays a vital role. It is not science that Koestler is attacking, but the prevailing 'science-mythography'". [24]

The historian and sociologist of science, Steven Shapin, wrote a witty, entertaining but thoughtful essay in a recent book collection, entitled *Never Pure,* with a long subtitle: *Historical Studies of Science as if It Was Produced by People with Bodies, Situated in Time, Space, Culture, and Society, and Struggling for Credibility and Authority.* The opening introductory essay drew attention to the contradictions involved in writing seriously about modern science: "Lowering the Tone in the History of Science: A Noble Calling"! In

the late nineteenth and early twentieth centuries while it was a commonplace, Shapin states, to say that science was the new religion and that it had supplanted Christianity in offering a bright and hopeful material future, most modern advocates of science would not themselves say this. Faith and reason were thought to be juxtaposed. "What one *could* say was that cultural authority had passed from religious to secular institutions ..... and that much of the moral authority of the priest had similarly passed to the scientist". [25] This was the opinion of George Sarton, follower of Auguste Comte and founder of Shapin's discipline of the sociology of science.

According to Sarton science was humanity's highest achievement, so it should be celebrated, especially the heroic men of genius who were responsible for its progress. This historian of science was a hagiographer. Great scientists represent human nature at its highest stage of development: "truth itself is a goal comparable with sanctity .... the disinterested and fearless search of truth is the noblest human vocation". Science is "the very anchor of our philosophy, of our morality, of our faith" and the calling of the historian was to document and bear witness to this.

For Shapin there were problems with the view that science replaced religion, in respect of which he counts himself a heretic, intent on "lowering the tone", though he maintains that the proponents of science as a moral force had already done that themselves. In his list of "heresies" he insists that all science is historically and socially conditioned, as are its "truths", and that the men - and the fewer women - who practice it are as fallible and flawed as anyone else. Nor is science "pure thought" but a form of practice, where the hand is as important as the head.

In short:

> You could say that the making and warranting of scientific knowledge are *performances,* that those producing scientific knowledge can and do use a full range of cultural resources to produce these performances, and that these include displaying the marks of integrity and entitlement: expertise to be sure but also the signs of dedication and selflessness. The very idea of disembodied knowledge thus becomes a bodily performance, and Newton's, as well as Nietzsche's, diet assumes pertinence, food for thought. [26]

That science can be seen as both a humble and inspirational, as well as empirical, human art is clear from the early twentieth century scientific revolutions to its original thinking and practices today and it is in the next chapter that I turn to considering these.

Notes

[1] The conciliatory understanding of the mystics - that the centre of the universe, far from having a single location (and circumference), could be said to be everywhere - was ignored.

[2] John Gray, "Science as a vehicle for myth" in *Heresies: against progress and other illusions,* London: Granta, 2004, p 65.

[3] B. Alan Wallace and Brian Hodel, *Embracing Mind: The Common Ground of Science and Spirituality,* Boston: Shambhala, p vii.

[4] Ibid. See first chapter.

[5] Ibid. pp10-11

[6] Rupert Sheldrake, *The Science Delusion: Freeing the Spirit of Enquiry,* London: Coronet, 2012, p 6.

[7] Ibid. p 12

[8] Ken Wilber, *Quantum Questions: Mystical Writings of the World's Greatest Physicists,* Boston: Shambhala, 2001, 1984, p 7.

[9] Ibid. p 7.

[10] Ibid. p 135

[11] Ibid. p 52

[12] Arthur Koestler, *The Sleepwalkers: A History of Man's Changing Vision of the Universe,* with an introduction by John Gray, London: Penguin, 2014, 1959, p 11.

[13] Ibid. p 12

[14] Ibid. p 13.

[15] Ibid. p 20

[16] Ibid.p 20

[17] Benjamin Farrington, *Greek Science: Its Meaning for Us,* Harmondsworth: Penguin, 1961 (first part 1944, second 1949) p 135.

[18] Ibid. pp 136-37

[19] Koestler 2014, p 39.

[20] From *Harmonice Mundi,* quoted in Koestler, 2014, p 234.

[21] Ibid. p 235

[22] Ibid. See Part Four: "The Watershed", particularly chapter 6, "The Giving of the Laws", pp 285-314.

[23] Michael Scammell, *Koestler: the Indispensable Intellectual,* New York: Random House, 2009, p 460.

[24] Koestler, 2014 p ix.

[25] Steve Shapin, N*ever Pure,* Baltimore: John Ho[kins University, 2010, p 3.

[26] Ibid. p 5.