

Science: discovery or invention?

Fergus McGinley

Are atoms real or are they the creation of scientists' fertile imaginations? The answer that this paper explores is 'both!' They are real, but they are invented, not discovered; they are artefacts, not facts. On this 'objective instrumentalist' understanding, the objects of science in general are invented tools for practical action in the world, which exist in the context of whole clusters of experimental and theoretical techniques within particular scientific disciplines. This understanding stands in stark contrast to the almost universal view that science discovers things which are already there; that it discovers, so to speak, the true underlying nature of reality.

This paper first explores the objective instrumentalist interpretation of science. It then goes on to explore the significance of the historic misinterpretation of science as discovery rather than invention. It suggests that this is a vital pillar of the 'scientism' that has, to a large extent, pushed the Christian world-view to the margins of contemporary culture. We then consider an objective instrumentalist interpretation of knowledge and perception in general, and explore the grounds of our knowledge of reality in the living Word, Jesus Christ. We draw a clear distinction between the 'invented order' of our thoughts and perceptions, and the 'created order' of God. Finally, we suggest that only a thoroughgoing instrumentalist critique can really hope to displace the underlying 'scientism' of our post-Christian world.

Introduction

When it comes to technology, no one has any problems in identifying a telephone or an airplane as an invention. But what about science: is Newton's law of universal gravitation an invention? Surely not! On the almost universally accepted understanding, technology is about inventing instruments for doing things, but science is about discovering things that are *already there*.

Likewise Dalton *discovered* atoms — he didn't invent them. They were also already there! We could go on.

Evolution existed, presumably, long before Darwin discovered it. Einstein discovered photons and curved space, he didn't invent them. DNA, we assume, was wound in a double helix from the year dot; Crick and Watson didn't create this shape themselves! Everywhere we look science seemingly discovers; discovers things which already exist, things which would be there even if science had never found them. The notion that science invents rather than discovers is a nonsense! But such is the contention of this paper.

I have argued in an earlier paper that scientific objects are *instruments* of scientific experimental action, not objects that exist in the world independently of this experimental action.¹ And if they are instruments then of course they are invented, not discovered. But before we proceed to look at some more arguments in favour of this contention, let's look at what its significance might be.

If, in spite of popular perception, scientific objects are just like technological objects — namely instruments for doing things — then it follows that we have all, scientists and lay people alike, been labouring under a massive delusion for quite a few centuries. But so what? Well, this delusion is an essential part of the all-pervasive scientific *ideology* that has built up over the past three to four centuries. This 'scientism' says, among other things, that science has all the answers, that it has the final say about what's really in the world and how it works. Science has supposedly 'proved' God doesn't exist, or at the very least that He's redundant. To borrow some terminology from classical Greek philosophy, science has become the sole authoritative discoverer of 'true being'.² Scientific ideology has virtually supplanted Christianity and relegated it to a marginal role in contemporary society.

Now if science invents instruments rather than discovers true being, this ideology comes crumbling down. Such pillars of modern atheist-humanist thinking as evolution and the Big Bang, which rely totally on the notion that science discovers things that are already there, are exposed as stemming from a radical *misinterpretation* of the nature of scientific knowledge. Well that sounds pretty good for starters doesn't it? And there are further, even deeper, ramifications of this expose which we'll explore later. But let's not count our chickens yet. First we need to be convinced that science invents instruments rather than discovers pre-existing realities. So let's get on with looking at this apparently outrageous contention.

Philosophical problems

As a matter of fact, any student of the Philosophy of Science knows that the common view of science as discovery of things which have antecedent and independent existence has all sorts of problems. I have elaborated some of these in my earlier paper.³ From Hume onwards philosophy has gone up endless deadends trying to explain science — from the problem of induction, the observer paradox, the theory-ladenness

of observation, through all the way to Heisenberg's uncertainty principle and Kuhn's scientific paradigms. There are philosophical holes all over the notion of science as objective discovery of antecedent existence!

But again, so what? What relevance do technical philosophical problems have to either the everyday practice of science, or our general understanding of what science is and what it tells us about the world? From one point of view the simple answer to this question is 'not much'! These problems have had absolutely no bearing on the historical development of science, and the vast majority of scientists have been, and still are, completely oblivious to them. As for us — the 'general public' — we have grown so used to science telling us the gospel truth about what really exists that we are even more oblivious (if that is possible) to the philosophical problems lurking behind the scenes.

But back to the identification of technology as invention — are there any philosophical problems for it? Certainly not! There is not even a discipline called 'philosophy of technology', let alone books or papers full of disputes about its logical foundations. Inventions — tools, instruments, devices, techniques, processes — can be seen and used; they do things, they work, they speak for themselves! They aren't things which were already there before we came along — they don't exist antecedently or independently — but they sure are objective.

Not one philosopher has doubted the objectivity of one human technological invention, while many have disputed the objectivity of scientific theories and laws. The problem with scientific theories and laws is that they can't be seen or handled. They're usually expressed symbolically — on paper, in mathematical equations, in technical journals and textbooks. Worse still, they're

often about things which themselves can't be seen (like gravity, atoms, genes, wave functions and quarks), or about things which existed long ago or happened slowly over a long period of time (the Big Bang, evolution, continental drift), or about things that are so complex, or big, or far away that they are very hard to measure (*El Nino*, Black Holes). Science has power, but it also has plenty of mystery and mystique; technology just has power!

Let us return to our original question: does science discover or does it invent? We have noted that while there are no philosophical problems about technology being invention, there sure are problems about science being discovery. The interesting point is that science and technology, like love and marriage, go hand in hand. This is true both historically and practically. The development of modern science since the 16th—17th centuries has been completely co-extensive and interdependent with the development of industry and technology. And practically speaking, science continually leads to technological development, either directly or as a 'spin-off, and is in turn completely dependent on technology to provide all sorts of instrumentation and other inventions in order to do its research. One can not and does not exist without the other.

Now, if science and technology are so continuous with each other, it seems odd that they are, supposedly, about two fundamentally different things — namely discovery and invention. It also seems odd that two things so closely connected should inspire such different responses from philosophers: one, science, leading to total confusion; the other, technology, apparently so uncontroversial as to not even warrant analysis. The assertion that science, just like technology, invents rather than discovers, provides a neat solution to this conundrum.

The idea that science invents is known in philosophical parlance as 'instrumentalism', and has had a somewhat checkered career. It began with the 'operationalism' of people like Bridgman,⁴ but received its clearest and fullest expression in the philosophical work of John Dewey, the well-known 'pragmatist' and arch-humanist.⁵ Later the waters got muddied, and, as I have discussed in my earlier paper on this subject, a highly subjective form of instrumentalism developed which completely missed the essential objectivism of Dewey's original version.⁶ This 'subjective instrumentalism' — perhaps best exemplified in the so-called

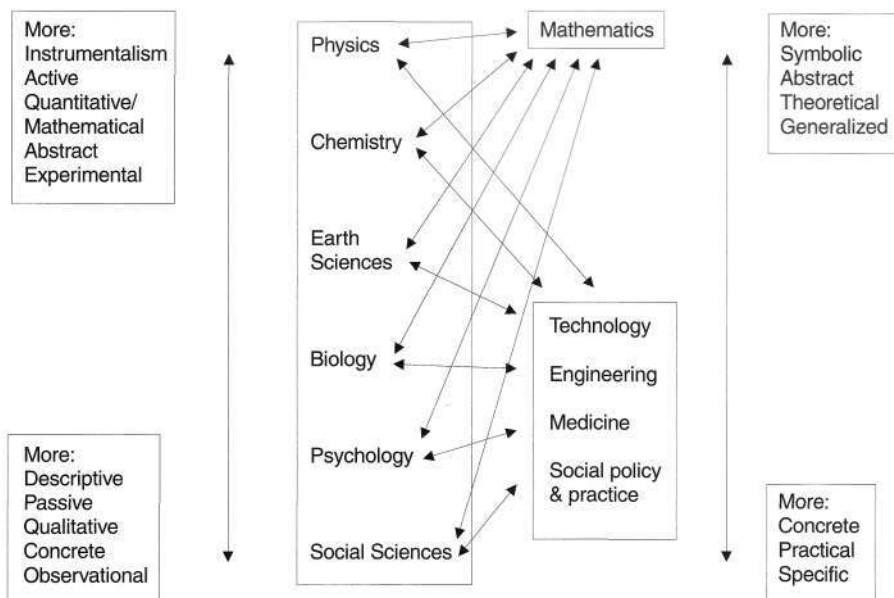


Figure 1. The continuity between Mathematics, Science and Technology.

'Copenhagen Interpretation' of Quantum Mechanics⁷ — is a negative thesis which contends that science is confined to merely correlating readings on measuring instruments, reality itself being ever opaque to our understanding. On this view, science is a sort of subjective game, the search for theories that work without ever being able to know whether they have any objective relationship to true reality.

Dewey's objective instrumentalism, by contrast, is an entirely positive thesis which recognizes that scientific theories in fact only work when they have a definite, objective relationship with reality. This relationship, however, is active and instrumental, not passive and descriptive. Science, moreover, from this viewpoint, is no more a subjective game than is research and development in technology or engineering.

Now in exactly what way are the objects of science, like those of technology, instruments rather than antecedent realities? Let's look at a series of examples.

Did Newton invent gravity?

Consider Newton's Law of Universal Gravitation. The popular conception is that Newton discovered gravity, that somehow he saw and described mathematically something no-one had seen clearly, or perhaps at all, before. It is felt that his law *explains* gravitational phenomena, that it reveals the underlying *cause* of objects falling or satellites orbiting. But none of these interpretations is correct.

What Newton actually observed was the same range of phenomena that was already well-known. Later his law contributed to the discovery of various new astronomical objects (e.g. Pluto), but he did not discover some 'thing' called gravity. What Newton did do that was different was to relate together a range of already observed phenomena in a new and pre-eminently useful way. Primarily, this was by characterizing planetary and satellite motion in terms of a force, measured and related in exactly the same way to motion, as forces easily observable in phenomena closer to home — objects falling towards the earth, projectiles, objects influenced by elastic forces, and so on. Having defined such motions in terms of a force, the specific form of the Law followed as a matter of empirical measurement — it was 'discovered', so to speak. But what was discovered was an interrelationship between quantities defined and measured instrumentally.⁸ This is not to say that the law was 'pure invention', but rather that it expressed a relationship between certain instrumental actions and antecedent reality, not a property of that reality by itself. The law primarily is an instrument for bringing gravitational phenomena into the overall structure of Classical Mechanics.

So in the terms in which I have described it, Newton's Law is an invention not a discovery. It is an invention

which, like many or even most other inventions, is built out of bits and pieces of other inventions. When we write it we see just an algebraic equation, and when we think about it we imagine a force acting at a distance like the one we can feel when two magnets come close together. But in fact it is built out of bits of mathematics and measuring instruments. It isn't an antecedent reality, nor does it merely describe one. It enables us to do certain ultimately very practical things to antecedent realities, such as send probes to Mars or Venus. It certainly tells us *something* about antecedent reality, but only in an indirect and limited sense. Specifically, it tells us that gravitational phenomena can be used and acted upon in various ways derived from the law, but it does not explain or somehow describe the 'true inner nature' of these phenomena.

We have become so used to thinking that Newton's law *explains* gravity, that we rarely notice the fact that characterizing it in terms of a force acting at a distance actually makes it more mysterious than it had been previously. The law enhances our ability to deal with gravity in a practical way, but it only brings us closer to understanding its 'inner reality' in an indirect way. Anyone who thinks that the notion of a force acting at a distance explains gravity should try giving this explanation to a non-scientist — a teenager for example — and then watch for the open mouth! Worse still, try using Einstein's later concept of curved space as an 'explanation' of gravity — you'll soon regret you even started.

Who invented the atom?

Let's try another example. What about atoms? Surely they exist antecedently; surely they were discovered, not invented? Interestingly enough, if you think that all areas of science use an atomic model for matter, you're wrong. Some do and some don't. Fluid dynamics and thermodynamics for example happily consider matter to be a smooth continuum; electromagnetism and quantum field theory deal with continuous fields, the latter in a partly imaginary space⁹! Chemistry and atomic physics on the other hand tend to use particle models. Of course, the usual understanding is that atomic models are fundamental, and that we really could do fluid dynamics, for example, with a particle model if we wanted to, it's only that it would get too messy and complex if we did. But is this 'reductionist' view warranted? Only, I would contend, on the assumption that atoms actually exist. If they don't, then it's a nonsense.

So the question is (at least as far as its use in Chemistry is concerned): did Dalton and his contemporaries discover the atom, or did they invent it? Let's look at how the atomic model in Chemistry developed. First there was the notion of pure substances — substances which couldn't be reduced to any other

substances using a certain range of common techniques (techniques which we would now call *physical* — filtration, distillation, evaporation, and so on). From there developed the notion of elements — pure substances that couldn't be reduced to any other pure substances by a different range of techniques (which we would now call *chemical* techniques). Finally the notion of the atom of an element came in as a model to explain why even presumably the smallest quantities of an element have the particular unique chemical properties of that element. And when the periodic table was developed it seemed natural to explain or understand the interrelationships it embodied also in terms of atoms.

Of course, at no stage did the early chemists actually *observe* atoms, nor has anyone since. What was observed and studied was a whole cluster of experimental techniques and processes. The notion that atoms actually existed was a hangover from the old Greek philosophical theory of Democritus and his followers, who hypothesized the existence of atoms from purely philosophical considerations. Chemistry can be done perfectly well without believing atoms exist. The atomic model is nothing more (nor less!) than a heuristic tool for relating the outcomes of the various physical and chemical techniques that are employed in chemistry. We might say that *atomicity*, matter's apparent property of behaving as if it were made of atoms, is not a property of matter *per se*, but of its *response* to these techniques.

The apparent existence of the atom is one of the enduring fictions of scientific mythology. From an early

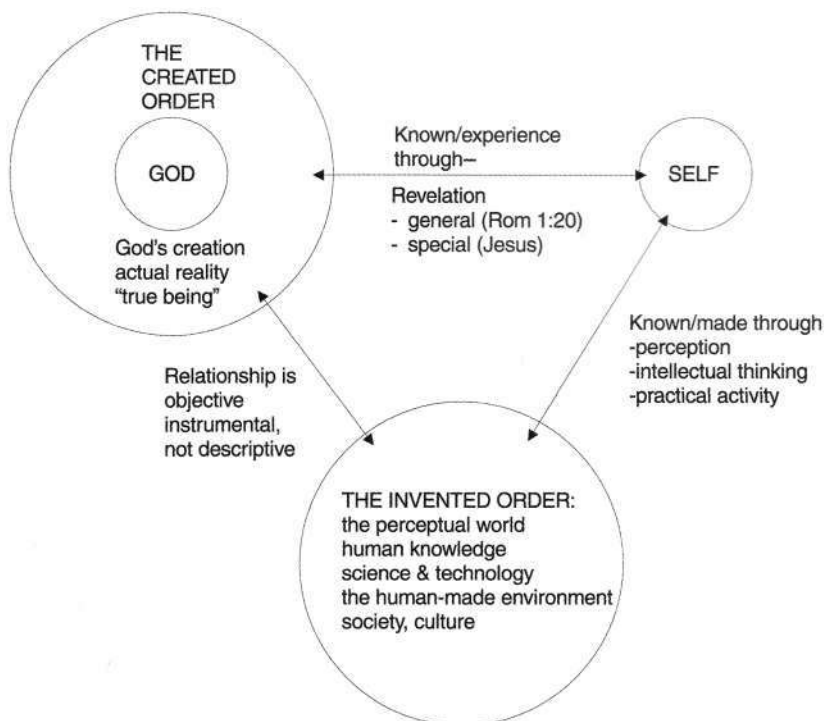
age school students are fed the supposed gospel truth that 'all matter is made up of atoms'. It operates as a sort of scientific explain -- all, used to initiate and intimidate young people into swallowing scientific ideology whole, softening them up for later indoctrination with evolution, the 'big bang' and the like. But in fact atoms do not exist at all, in a physical sense. What exists is a theoretical model, a higher level symbolic tool which operates to inform and guide a whole lot of lower level tools, including of course the experimental techniques, processes and instrumentation of chemistry and other related disciplines.

Did Crick and Watson invent the double helix?

What about the double helix of the DNA molecule — in what sense is this an *artefact* rather than a fact? Easy! Can any molecular biologist, Crick and Watson included, claim to have actually seen the double helix? No way! In fact the helical structure is a theoretical interpretation of a whole lot of indirect evidence from X-ray crystallography. In between the fact — the biochemical substance known as DNA — and the artefact — its supposed double helix structure — there is a whole batch of theories and experimental techniques. There are theories about X-rays and about the interpretation of X-ray photographs in terms of crystal and molecular structure, and then there are of course the sophisticated techniques of X-ray production and X-ray crystallography.

Now, to be sure, these theories and techniques provide a powerfully objective 'fingerprint' for identifying DNA, and for distinguishing different samples of the substance. As well they fulfill a vital role as part of the larger suite of theories and experimental techniques in the wider field known as 'genetic engineering'. But in the final analysis, what they apparently reveal as 'the double helical structure of DNA', is in fact, as the word *engineering* clearly expresses, an instrument for controlling and modifying genetic hereditary processes in biological organisms, not some antecedent reality.

Molecular biology's claim to have discovered the true 'inner reality' of the hereditary process is a typical example of science's massive delusion about its own nature and role, and a vital pillar of perhaps its greatest God-denying project — the great fantasy of evolution. To be sure, evolution was concocted before molecular biology or genetics were even invented. But once science thought it had found the key to phylogenesis on the



The Created vs the Invented Order.

macroscopic level, in the guise of random mutation and natural selection, it seemed only natural to then look for the key on the *microscopic* scale. The usual reductionist bent of science — that smaller is more fundamental — eventually led to the molecular level. But in fact, instead of discovering a 'deeper reality', what was really developed was an ever increasing capacity to *control and modify* the hereditary process through genetic engineering. Ironically, it is precisely this capacity of control, not the ideological delusion about true reality, that actually underwrites the great evolutionary dream in the twentieth century.

The continuity between technology, science and mathematics

We could well go on citing and analyzing examples from all the different areas of science. In a letter to this journal I have already outlined how the objective instrumental interpretation of science applies equally well to mathematics, the sole difference being that the objects of mathematics are more purely symbolic and abstract than those of science.¹⁰

There is a seamless continuity between technology, science and mathematics (see Figure 1). As we move through the spectrum from technology to science, we move from instruments which are overtly physical and tied to particular physical operations, to instruments of an ever-increasing level of generality, which are tied to higher and higher levels in hierarchies of physical operations. As such they become increasingly abstract, theoretical and symbolic. Eventually in mathematics, such a high level of abstraction is achieved that the instruments appear to be completely detached from any actual operations. But the concept of mathematics as being concerned with some pure, higher realm, having an ideal existence of its own, separate to that of the concrete physical world, is an illusion, swallowed whole by some, and generated by the very process of abstraction and generalization which gives science and mathematics their extraordinary power *in relation to* technological application. It wasn't until science began to become abstract and mathematical, in the 16th-17th centuries, that it was able to provide the theoretical framework for technology to develop in the way it did in the industrial revolution and beyond. Prior to that, science wasn't much help for technology, precisely because it *was* descriptive and particular rather than instrumental.

Of course, it has to be said that in mathematics, science and technology, all sorts of things are, in a sense, discovered. In mathematics, for example, it was discovered that the ratio of the circumference to the diameter for all circles was equal to 3.14159. . . . But this is a discovery about an invention! The mathematical circle, about which the discovery of pi was made, is a symbolic, invented entity. It is defined mathematically

Science: discovery or invention? — McGinley as the locus of all points equi-distant from a given point, but this an abstraction or idealization from real circles, for which the pi ratio is only approximate.

What about the 'discovery' in physics of a new element, or a new elementary particle? Or the 'discovery' in molecular biology of a defective gene which causes a particular hereditary disorder? In these cases as well, the so-called discoveries are about inventions — all sorts of new technologies, processes and theories in nuclear chemistry and physics, and in molecular biology, biochemistry and genetic engineering — and the way they interact with pre-existing reality. What is discovered in each case is a new way of using the instrumentation and processes involved to transform reality, not a feature of that reality *per se*.

Christianity, scientific ideology and materialism

We could go on in this train of thought, but the important point we want to get to, foreshadowed earlier, is the question of the wider significance of the historic misinterpretation of science in terms of discovery rather than invention. My contention is that this misunderstanding is the foundation stone of the scientific ideology that has swept all before it since the 1600's, pushing Christian revelation to the fringes of Western culture. How else, for example, can we explain why the scientific and secular worlds alike have swallowed whole the delusion of evolution, when there is barely a speck of evidence for such an absurd proposition? How else can we explain the absolute veneration of science as the ultimate provider of truth in contemporary society, when the vast majority have little or no real understanding of it at all?

Ironically, what in fact drives this scientism is not science's fictional monopoly on truth-provision, but its extraordinary payoff in technology. In turn, technology is revered for the obvious reason that it has, particularly since the industrial revolution, totally transformed our material, social and cultural lives. Where in the past humanity seemed to be at the mercy of the elements (or of fickle deities or spirits), developments in industry and technology have given us increasing control over the material conditions of life. We have become a people for whom God is redundant even if He does happen to exist. For most of us, technology, not Jesus Christ, is the 'hope of ages', and scientism is the cult through which we, mostly unwittingly, worship the great god of materialism.

Of course, scientific ideology is not totally monolithic. In recent times it has come under attack from fringe groups such as environmentalists, proponents of natural medicine, and New-Agers. But apart from the Creationist movement, Christianity has been either silent (evangelicalism), or involved in wholesale accom-

modation (liberalism). Yet, as I am contending, scientific ideology is the chief enemy of the Gospel in contemporary culture. The problem with Creationism is that it doesn't go far enough. In fact the secular world is completely unable to see or even seriously contemplate the notion of divine creation, because it is blinded by scientific ideology. Creationists can jump up and down all they want, but until they attack the ideology that underpins evolution, they'll continue to fight a losing battle.

Knowledge, perception and revelation

As mentioned earlier, the idea that science is instrumental was first clearly espoused by John Dewey in the early part of this century. Oddly, despite his great and perhaps infamous influence on education, political and social theory,¹¹ his views on instrumentalism were either ignored or simply misunderstood by the philosophical mainstream. Dewey went beyond just Science, and asserted that *all* human knowledge and thinking is primarily instrumental. He attacked what he called 'the spectator theory of knowledge', which saw thinking as a passive activity, separated and aloof from practice, having some special and exclusive hold on apprehending 'true being'. In Dewey's eyes, thinking was really just an extension of practice, a tool for refining, planning, organizing and transforming it.

We could take Dewey's thesis further and assert that our very perception of the world is primarily instrumental. Our capacities of sense perception — sight, hearing, touch and smell — don't develop in some neutral vacuum, but in response to the urgent practical necessities of life. Anyone who has watched infants develop knows this. The abilities to discern colour, shape and distance in the visual field, are driven by the child's physical exploration of objects in his environment, and the urgent needs associated with successful interactions with these objects. Similarly, the development of the other senses is driven by the practical imperatives of day-to-day living. What we see, feel, touch and smell is *not* the world as it antecedently is, but the world as instrumentally analyzed by our sense perceptions; cut up, shaped and discriminated according to our practical needs.

The consequence of course is highly successful practical accommodation, but along with this goes — potentially — aesthetic, moral and spiritual alienation of absolutely monumental proportions. This is the Fall itself — humanity a practical genius, but aesthetically, morally and spiritually blinded. We are surrounded by an all-powerful and all-loving God, but as we have historically developed our instrumental capacities — perceptually, intellectually and technologically — we have become ever more unable to see, sense or experience Him in any way. As we have surrounded

ourselves ever more successfully with the works of our own hands, we see not the real Creator but ourselves — our ideas, our practical capacities, our own power — reflected in the lines and forms of 'reality'.

Does this mean that reality 'as it really is' is closed off to us, forever inaccessible to our instrumentally conditioned perception and knowledge?¹² Are we caught in a sort of Kantian shadow world of *phenomena*, the elusive *noumena* out there somewhere, but forever beyond our grasp? Is this the illusory *maya* of the Hindus, our worst virtual reality, post-modernist, relativistic nightmare? The answer is yes and no!

On one hand our alienation from reality is, I would assert, an objective quality of the Fall. On the other hand there is, as we all know, a very good solution to the problem — Jesus. When he tells us he is 'the way, the truth and the life', we need to take 'the truth' bit very seriously. What does it mean to say that Jesus is the truth? It means that there is *divine revelation*, first through the written Word (the Scriptures), and then through the living Word (Jesus), which anchors us in reality, and provides an absolute objective referent for both our thinking about, and perception of, the world. Epistemologically speaking, Jesus provides both the conditions on which objective knowledge of the world is possible, and the foundations of that knowledge. Where historically philosophy oscillated between raw sense impressions (realism, empiricism) and pure ideas or mind (idealism) as the foundation of knowledge, in a Christian world-view Jesus is the foundation.

The created order and the invented order

What does this mean in relation to science? Firstly revelation in the Scriptures specifies that the universe in which we live is a *created order*. The universe therefore has meaning and purpose and within it humans, created in God's image with stewardship over all creation, are empowered to not merely experience the world but to change it for the better through practical action. The Fall, of course, ensured that our stewardship became distorted through sin, but the empowerment to change the world remains in place. This empowerment is the basis for our knowledge of the world, for it is by and through knowledge that our practical action upon the world is guided, organized, evaluated and developed. Without knowledge, practice is haphazard, limited and unreliable.

Unless the universe is a created, purposeful order then, science is simply not possible. It is not surprising therefore that historically modern science first developed in predominantly Christian cultures. In all other religious world-views — Islamic, Hindu, Buddhist, Animist — the universe is either fundamentally disordered — in that it is controlled by beings (Allah, deities, spirits) whose action on the world is capricious, unpredictable

and mostly beyond human influence — or it is illusory. Within such world-views there is plenty of motivation for the development of religious ritual, but not much for the development of science and technology!

It is interesting to note, in this context, the number of scientists who in recent times have once again started to acknowledge that the incredible order that science seems to 'discover' everywhere, is evidence of design in the universe — what, for example, Paul Davies refers to as 'the mind of God'. Of course from an instrumentalist point of view, these contemporary 'deists' have got it precisely backwards. This order is actually, I have asserted, invented not discovered. So God isn't being 're-discovered'; his existence and that of His created order have all along provided the pre-condition for science to exist. But the *invented order* that science 'discovers' is not the same as the created order (see Figure 2), although the former is indirect evidence of the latter.

This realization turns the interpretation of what science tells us about the world exactly upside down. For example, the success of the atomic model of matter does not, as is usually asserted, indicate that all matter is made up of discrete, disconnected, inanimate bits. In fact, it indicates quite the reverse. The atoms into which the model theoretically cuts matter up are not amorphous, anonymous lumps. Rather, they exhibit an amazing complexity of structure which sets them in a definite relationship to other atoms and to the whole range of physical and chemical techniques in the context of which the atomic model actually operates.

The situation becomes even more complex when science goes further to the sub-atomic level — the world of so-called 'elementary particles'. In order to characterize the increasing complexity and order that is found at this level, scientists have been forced to invent more and more properties — spin, charm, colour and so on — with which to describe the particles. Instead of getting simpler, nature gets more complex. The parts conceal and reveal the properties of the whole. The same thing is discovered in microbiology and biochemistry. The 'atoms' of life — genes — contain, in their mind-bogglingly complex structure, all the order or 'information' to generate the whole organism of which they are parts.

Atomicity therefore, instrumentally interpreted, tells us that the world is continuous, connected and animate. There is a sort of reverse reductionism at work here. But before we get too excited, what it leads to is not some 'holistic', 'process', new-age world view¹³ — some new human invention in other words — rather back to where it all started, namely God's revelation to us of His created order. We cannot get beyond this, but we don't need to anyway. In the final analysis we need to know God, not in the sense of intellectual definition, but in the sense of actual personal relationship. Knowing

in the former sense may be a vital tool of knowing in the latter sense, but it should not be, and cannot be, an end in itself.

Instrumentalism and Scripture

Before we finish it might be instructive to ask what the Scriptures have to say explicitly about science, and in particular whether they support an objective instrumental interpretation of it. Unfortunately the development of modern experimental science post-dates the New Testament by about 1500 years! True knowledge, as it is referred to in the Old Testament, means primarily revealed knowledge of the created order, not the instrumental knowledge that modern science encompasses. Witness, for example, the debates in the book of Job. Job and his contemporaries come up with all sorts of arguments to interpret the disastrous events that had occurred, attempting to justify either Job or God, but in the end God himself appears and declares '*who is this that darkens my counsel with words without knowledge?*' (Job 38:2). He then proceeds to reveal himself to Job explicitly as the Creator and Sustainer of all things. In the face of this overwhelming revelation, Job sheepishly concedes '*surely I spoke of things I did not understand, things too wonderful for me to know*' (Job 42:3). Clearly, human attempts to understand the universe are limited, but that is only a problem if we think, like Job and his friends, that intellectual understanding is ultimately important, an end in itself. In fact, the latter is only a tool of greater or lesser effectiveness. The ultimate end is experience of God's created order, which can only come in the final analysis through revelation.

While modern science did not exist in New Testament times, its precursor — the philosophy, science and mathematics of ancient Greece — certainly did. John Dewey contended that it was precisely because Greek natural philosophy was merely descriptive at the empirical level that it had little use practically or technologically.¹⁴ Its attempts to understand the universe and discover 'true being' lead it on the exercise in futility that the Apostle Paul describes in chapter one of First Corinthians. He declares:

'Where is the wise man? Where is the scholar? Where is the philosopher of this age? Has not God made foolish the wisdom of this world? ... Jews demand miraculous signs and Greeks look for wisdom, but we preach Christ crucified ...' (1 Cor. 1:20-22).

The Greeks were on a Tower of Babel-like intellectual wild goose chase, concocting an intellectual notion of God as the ultimate 'idea' or 'form', the 'unknown God' of Acts 17:23. In fact the Greeks, like everyone else, could only truly find God through the revelation of Jesus Christ, the 'foolishness' of the cross

(I Cor. 1:18).

It seems then that while the Scriptures do not express an explicit view about the nature of science, they do imply that ultimate knowledge of reality (as opposed to day-to-day practical knowledge) can only be found through revelation. The writer of Hebrews states that:

'By faith we understand that the universe was formed at God's command, so that what is seen was not made out of what was visible' (11:3).

Again, Paul writes in Romans:

'For since the creation of the world God's invisible qualities — his eternal power and divine nature — have been clearly seen, being understood from what has been made ...' (1:20).

Both these passages imply that ultimate reality is invisible to our ordinary perception of the world, and can only be seen through the eyes of faith. Note that the use of the words 'seen' and 'understood' in the second passage implies the sort of seeing that comes through understanding inspired by revelation, not ordinary seeing or understanding.

The bottom line

It's clear here finally that we are getting to a much wider thesis than the one we started with. Suffice to say that as soon as we start to acknowledge the instrumental nature of Science, we open up a real can of worms! But we started with the contention that science invents rather than discovers, and that's where we'd better end.

The bottom line is that Christians are just as much devotees of scientific ideology as the next person, when they think that Newton's law of gravity, atoms and the double helix of DNA are pre-existing realities rather than invented instruments. The rest — a heartless mechanical world described by mathematical equations, and a distant God rendered redundant and irrelevant — follow with a depressing inevitability. Creationists might balk at evolution, but the cat's probably already out of the bag. Until we begin to attack the problem at its roots, we'll continue to occupy what to the world's eyes is the lunatic fringe. So let's stop indulging in what, after all, is simply pure idolatry, and acknowledge that science is a practical tool of our own invention (and that inventiveness itself a gift of God), not some ultimate insight into eternal truth.

References

1. McGinley, F., An instrumentalist critique of evolution, *CEN Tech. J.* 12(1):121-6, 1998.
2. 'True being' - the ultimate nature of reality, mind etc., which was to be discovered, so Plato, Aristotle and their contemporaries believed, through pure contemplation - the eternal 'essences', 'forms' or 'ideas', of which God, the 'unmoved mover', was the highest and most

fundamental.

3. McGinley, Ref. 1, pp 121-3.
4. Bridgman, P., *The Logic of Modern Physics*, New York, 1927.
5. Dewey, J., *The Quest for Certainty: a Study of the Relation of Knowledge and Action*, Allen & Unwin, London, 1930, provides its clearest statement.
6. McGinley, Ref. 1, p123.
7. d'Espagnat, B., *Reality and the Physicist*, Cambridge University Press, 1989.
8. That is, force, mass and distance, all of which are defined in terms of instrumental operations on objects (see Ref. 1, p124).
9. Quantum mechanics considers electrons, for example, to be 'wave packets' in a complex space (complex numbers are of the form $a+bi$, where a and b are real numbers, and i is the so-called 'imaginary number', -1).
10. McGinley F., Letters to the editor, *CEN Tech J.* 13(1):64-66, 1999.
11. He played a leading role in devising *The Humanist Manifesto* in 1933.
12. Cf the 'subjective instrumentalism' discussed above (p. 20).
13. See for example the work of Alfred North Whitehead (*Science and the Modern World*, 1925) and the whole genre of 'process' philosophy/theology that grew out of his writings, or more recently, work based on supposed connections between modern physics and eastern mysticism (e.g. David Bohm, *Wholeness and the Implicate Order*, 1982, or Fritjof Capra, *The Tao of Physics*, 1977)
14. Dewey, Ref. 5, chapter 2.

Fergus McGinley has a B.Sc.(Hons) in theoretical physics, with several years of post-graduate research in the philosophy of science at the University of Melbourne. He is currently Senior School Co-ordinator and a maths/physics teacher at the Torrens Valley Christian School in Adelaide, and a part-time theological student at the Adelaide College of Divinity.
