Work and Technology

by Colin Davies

The word work has many meanings. I want to define it fairly narrowly at first, using it in the everyday sense that most people use it. For most people work is an economic resource; it is what we do to increase our wealth, both individually and collectively. Wealth is whatever can be bought: sustenance, comfort, convenience, leisure, entertainment, information, choice, independence, travel, physical health, sex, power and privilege. What cannot be bought - conviviality, mental health, happiness, love - cannot be increased by work. It might be argued that there is an exception to this rule - namely the satisfaction to be gained from work itself - but here we step outside my narrow definition. Work can be a source of personal fulfilment, but this is not an essential feature of work as an economic resource.

In the capitalist industrialised world we are encouraged to think that the harder we work, the wealthier we will become. But we know that there are quicker ways to increase our wealth. One is to exploit the work of others, by force or by negotiation. Another is to invent better ways of doing work - new tools and new technologies - and it is this aspect of work that I want to examine in this essay. Material wealth can be measured in many different ways but however we measure it, there is no doubt that in the industrialised world the total sum of material wealth is increasing. It is increasing not because we are working harder but because of technological advance. For example, successive inventions like the steam engine, the motor car and the jet aeroplane have increased the total quantity of our wealth, measured in the crude terms of speed, efficiency and an increased variety of experience. So perhaps we should distinguish between two different kinds of work: the work of invention and the work that earns us a share of the increased wealth created by inventions. Of course, it is often difficult to

separate the two. The work that we do to make a living often contributes to the work of technological advance.

Work in the modern world is inseparable from technology. We crave the wealth that technology provides and we work to gain our share of it. And yet the more technology advances, and the more its advance accelerates, the more we think of it as an alien force beyond our control. We contribute to it, we are implicated in it, and yet we fear it. We are filled with dread when we hear the news that a sheep has been cloned, that a computer has won a chess tournament against the world champion, that it is possible to choose the sex of our children, or that machines are beginning to think for themselves, just like human beings. It is often said that we live in a technological world and that the progress of technology is inevitable. But nobody is asking us if we want it. Nobody is proposing any alternative. We seem to have no choice. We may be wealthy, but we feel powerless.

So what is this thing called technology? What does the word technology mean exactly? It turns out to be a surprisingly new word. In my (admittedly ancient) Pocket Oxford Dictionary, it appears only in the Addenda. My dictionary was last revised in 1946, so we can assume that, as a word in common use meaning 'the science of the industrial arts', technology is not much more that fifty years old. Despite its newness, the word technology has nevertheless become extremely powerful, so powerful in fact that it seems to have created a whole world of its own - the technological world that we live in. And this world now threatens to overthrow the old world, whatever the world was before it became technological. If we want to understand the technological world, we must first recover an understanding of that old, forgotten world.

You might object that surely technology has always been with us. Surely there is no essential difference between a tool like a computer and a tool like an axe or a plough. Isn't the use of tools one of the defining characteristics of humanity? Haven't we always lived in a technological world? I want to argue that this is false, that the technological world is indeed a fairly recent phenomenon and that its rise has paralleled the rise of capitalism.

The word technology, in the modern sense, is closely allied to the word science. It also has a special relationship with the word nature, that relationship being one of opposition - technology versus nature. Similarly, we think of the word technology as being opposed to the word art. Technology, science, nature, art - these words are constantly changing their meanings and their relationships to one another. When words change, our view of the world changes. And since we can only view the world from inside our bodies through our senses, interpreting it with our minds through language, we might as well say that when words change, the world changes. The particular configuration of word relationships outlined above is characteristic of the modern, technological world. There was a time when these relationships were different. There was a world before the technological world. One way that we can form a picture of that pre-technological world is by seeing how these words were used in ancient Greece. Technology, after all, is basically a Greek word.

The Greek word poiesis, from which we get our word poetry, means (approximately) making, or productive activity. So, in ancient Greece poetry was seen as a productive activity, just like the making of a pot or the building of a house. But poiesis includes two kinds of making: techne, man's making, and physis, nature's making. Techne includes both art, in the modern sense of say poetry or painting, and what we would now call technology, the making of practical artefacts like pots and houses. The word physis includes both organic and inorganic nature. It might be better to think of it as meaning the forces of

nature, from the movement of the sun and the stars to the processes of growth and decay. So techne includes both art and technology, and both take their place alongside physis (nature) within the general concept of poiesis (making). All of these words are therefore co-operating, pulling in the same direction. Each is perceived as part of a unified concept of making that includes the whole world, both natural and artificial. Contrast this with the modern view that opposes technology and art, art and nature, nature and technology.

In general, says Aristotle, art (including technology) either imitates the works of nature or completes that which nature is unable to bring to completion. In this sentence, the word imitation is not used in the ordinary sense that a portrait imitates the form of a person's face. It is not the forms, but the processes of nature that are imitated by art. In Aristotle's world man can only imitate nature because man is inescapably a part of nature.

A simple analogy might make this clear. Nature makes oak trees, and man makes houses. In the Greek view of the world, these are both aspects of poiesis, and the making of a house imitates in some sense the making of an oak tree. Oak trees come from acorns and every acorn has within it a potential oak tree. We might say that the oak tree already exists before it is made, at least as a possibility. All sorts of things may happen to prevent the making of the oak tree, but nevertheless, we might reasonably say that it is the acorn's destiny to be an oak tree. And obviously the acorn came from an oak tree so its existence looks backwards as well as forwards. It contains both the past and the future. Now, what about the house? If the making of the house imitates nature, then it must also contain past and future. The house already in a sense exists both as raw materials as yet unassembled, and also, most importantly, as a form, however vague, in the mind of the maker. In the ancient Greek world view, that form, like the potential of the acorn, does not come from nowhere but is, in a sense, already given. It is not, as we might think of it, one of an infinite number of

possibilities, but one of a limited number of possibilities, limited by nature, by the inescapable primary conditions of existence - earth, sky, gravity, seasons, the qualities of materials, the form of the human body and so on. An important aspect of this idea of given form is that it implies a concept of time very different from our own. We think of time as flowing in one direction like a river into an unknown future of infinite possibility. Our linear view of time is a precondition of the idea of progress that we have in mind when we use a phrase like 'the inevitable progress of technology'. But if time were more like a circle or some other continuous form, more like the cycle of days and years, acorns and oak trees, then our idea of progress would be nonsensical, as it would have been to the ancient Greeks.

We study the past in order to see ourselves more clearly; to reveal afresh the things that have become so familiar we hardly see them. One of these things is technology. As soon as we realise that the word technology has not always meant what it does now, we begin to see through the technological world to another, different world. We might call it the 'given world'.

But I seem to have left out science. Science is the new factor in the equation. It is the alliance of technology with science that is the distinguishing feature of the modern technological world. In his book, The Unnatural Nature of Science, Lewis Wolpert argues that this alliance was not really cemented until the nineteenth century. Until then, technology (in the western world at least) had advanced slowly by a process of trial and error. This does not mean that pre-scientific technology was crude or primitive. The Gothic cathedrals of thirteenth century France, for example, raised the technology of masonry construction to a level of efficiency and sophistication that has never been surpassed. But it wasn't until the nineteenth century that the abstract, mathematical science of statics was

used to predict the performance of large structures before they were built. Wolpert's point is that science is a superior form of investigation, a search for generally applicable truths about the world rather than the development by trial and error of a specific technique. The home of science is not the workshop or the medieval mason's lodge but the laboratory, a place deliberately separated from the world of everyday experience.

As far as we humans are concerned, the only world that exists is the world of experience, the world that we know through our senses and interpret through our minds, the world to which we are bound irrevocably by our mortal bodies. But since the first formulations of modern science by thinkers like Galileo, Descartes, Bacon and Newton in the sixteenth and seventeenth centuries, we have come to rely on a different assumption - that it is possible for us to observe the world 'objectively', as if we could get outside our bodies and gain a vantage point on some higher plane of existence. The whole edifice of modern science was built on this assumption. In the scientific view of the world, subject and object, man and world are separated. The world has become not a unity, but a duality.

So immediately it can be argued that the world envisaged by science is, in a sense, unreal, even impossible. In this world the objective realm takes precedence over the subjective and becomes the standard for reality as a whole. Man no longer participates in nature, but stands outside it, observing it in the laboratory and manipulating it through technology informed by science. It is one thing to believe in the real existence of a world outside ourselves, but quite another to believe that we can by-pass our bodies and minds in order to establish constant, objective truths about that world. The adoption of this belief was the first step towards the creation of the modern, technological world.

In the laboratory, the only phenomena that can be studied are those that conform to the subject/object model of the world and that can be expressed in the abstract language of mathematics. This restriction is built into the whole institution of experimental science. We seem to be in a situation where the world of science is the only legitimate world, even though we know from our most common everyday experiences that science does not represent the whole of the reality. Dreams, for example, are a part of everybody's daily life. We might wonder about their meaning or significance, but no-one doubts that they really occur. And yet science has little or nothing to say about them. Psychology, sociology, economics - the disciplines that deal with the human mind and human behaviour - all stubbornly refuse to conform to the certainties and predictive power of pure science. And yet we feel the need to call them 'social sciences' because science is seen as the only true form of knowledge. At an everyday level, this often leads us to behave in absurd ways. When we feel cold, for example, we look at a thermometer to see how cold it 'really' is. So deep is our respect for the objective reality represented by the scientific instrument that we allow it greater importance than the reality of our own experience. Scientific reality is a disembodied reality. The only reality available to us, however, is the reality of our bodily presence in the world.

But if science gives us only a partial view of the world, how can we begin to understand the whole world, the world that includes us, our bodies, our minds, our memories and our dreams? Again, ancient Greece provides a possible model. In an essay called Myth and Education, the poet Ted Hughes points out that Plato, a philosopher whose writings are full of rigorously logical dialectical arguments, recommends that the first things a child should learn are not logic or argument or mathematics or science but the traditional stories about gods and mortals, heaven and hell, earth and underworld, monsters and heroes, life and death, dreams and magical transformations that we call myths. Plato seems to have regarded myths as some kind of essential food for the developing mind of

the child. Why? Because, according to Hughes, it is only stories that have the power or capacity to contain the world, reality and nature in all its manifestations. In this view, science, mathematics, philosophy and logic can only ever deliver a partial account of the world. To get the whole picture, we need a different kind of apparatus. We need stories. Language is stories and language makes the world. What myths do above all is unite the inner world of the mind and the outer world of objective reality.

In his book Science and the Soul of Modern Man, Bryan Appleyard tries to call into question the power of science and technology. One of his examples is the introduction of western medicine to a pre-industrial society in which many people suffer from malaria. Science and technology can solve this problem with quite simple medical procedures. But in the process, something of the indigenous culture is destroyed and, though malaria might cease to be a problem, it is soon replaced by less easily cured psychological and social ills. Science and technology can only deal with the objective and the measurable. They cannot deal with the subjective and immeasurable world of myth, which includes inner as well as outer experience, the dreams of the people as well as their material well-being. And this is why it fails.

Some scientists are themselves well aware of the limitations of science. Werner Heisenberg, who discovered the uncertainty principle in quantum physics, realised that the world as seen by science is little more than the reflection of science itself. It looks like the real world but, like a laboratory, it is only a partial representation of it. By insisting on the primacy of scientific knowledge, we are suffering from a grand delusion. 'Mankind,' says Heisenberg, 'finds itself in the situation of a ship's captain whose ship is built of such heavy steel construction that its compass points constantly at itself. The ship simply goes round and round in circles and gets nowhere.'

The rise of digital technology provides one of the clearest instances of the way that the technological world has obscured the given world. Miniature computers, first developed for the NASA moon landings in the late 1960s, have proliferated over the last thirty years and become an indispensable tool for millions of workers. Computers model aspects of the real world and present them to us in analogous forms. We have already become completely accustomed to virtual desktops, virtual files and virtual offices and now we are invited to experience nothing less than virtual reality. Increasingly, our minds inhabit the simulated world of cyberspace (a term first coined, interestingly enough, in a science-fiction story - a kind of myth). Already we seem to be forgetting that cyberspace is nothing spatial, that the space in cyberspace is only an analogy. We speak of it as if it were a real space that we could truly inhabit, with our bodies as well as our minds. Attempts are made to drag our bodies into cyberspace by means of various electromechanical attachments - helmets, gloves and joysticks. We have even begun to contemplate the possibility of cybersex. But often we experience cyberspace as a disturbing disruption of our physical and mental being. Addicts of so-called 'immersive' computer games are familiar with the sometimes dangerous disorientation caused by the transfer from the virtual world back to the real world.

Of course, virtual realities are not new. Paintings, novels, plays and films are all kinds of virtual reality. What is new is the idea that virtual reality in its digital form might not just represent the real world, but might actually replace it. A reversal has taken place. The workings of computers used to be explained by analogy with the human brain and mind - the hardware as the brain, the software as the mind. Now psychologists explain the workings of the mind by analogy with the computer. Advocates of so-called 'strong AI' (artificial intelligence) have begun to assert that computers really think, just like animals and humans. In the science of genetics, organic nature itself is explained in digital terms. The virtual is beginning to invade the real so that we find it difficult

to maintain the distinction between them. There are scientists who make complex computer viruses which behave independently, reproduce and even evolve. By all common sense criteria, they are indistinguishable from life forms. I believe that the claims for artificial intelligence and artificial life are empty. They are merely illusions, but they are only the latest extensions of a much older illusion - the illusion of a dualistic world that lies at the heart of modern science and technology. Science and technology now dominate our lives, especially our working lives, in ways that are deeper and more pervasive than we realise. Technology no longer serves work; work now serves technology.

Historically, the rise of technology and the rise of capitalism were parallel processes. One way to illustrate the link between them is to examine a technical development in a field not usually associated with either capitalism or technology, namely painting. The completely consistent mathematical system for the representation of space that we call perspective was invented in the fifteenth century by the Florentine architect, Filipo Brunelleschi. Art historians and philosophers have seen in this invention the beginnings of a new, technological world view. In medieval, pre-perspective painting, the world is usually represented symbolically. Any resemblance between the world depicted in the medieval painting and the world as perceived by 'pure' vision is secondary to the symbolic meaning of the painting - the human story it tells. Objects in the painting are therefore organised according to their importance in the story, resulting in multiple points of view and abrupt shifts of scale. Of course, Renaissance perspective paintings tell stories too, sometimes of marvellous depth and subtlety, but they tell them in a new way. The structure of the painting is no longer governed by symbolism. The onlooker, instead of actively participating in the painted scene by reading its meaning, has become more like a disinterested observer, more like a scientist. The perspective painting is a kind of laboratory. In it, the relationship between subject and object is governed by a simplified, abstract system which simulates only a small part of human

experience - static, monocular vision. The world 'out there', beyond the window of the painting, is made into an object of contemplation - framed, rationalised, 'subjected' to the analytical gaze of the observer and by implication made available for control and manipulation.

Perspective can be seen as a kind of model of the preconditions of capitalism. The patrons of those Renaissance perspective painters were the first true capitalists - bankers and entrepreneurs (popes as well as princes) who set themselves apart from the world, seeing it as an objective reality to be explored and exploited. The abstract systems of money and the market were the economic counterparts of perspective representation. Like the world of science and technology that perspective inaugurated, the world of money now governs our lives. Those who can work the system benefit materially from it; those who can't are condemned to suffer its inhuman machinations. Perhaps both are kinds of slavery. In the industrial revolution, science, technology and the market, all born in the age of 'humanism', came together to form a vast machine for the exploitation of the earth's resources, including its 'human resources'. The machine produces material wealth for the industrialised world, but at the cost of the physical suffering of the majority of the world's people and a possibly catastrophic despoiling of nature. But the abstract, artificial system of science, technology and the market, like the abstract system of perspective painting, merely creates an illusion. Subject and object, man and nature cannot be separated. Man is nature, and to destroy nature is to destroy man.

I began by narrowly defining work as an economic resource. My argument is that this partial view of work, a view that excludes what cannot be measured or bought, is a consequence of the hegemony of science, technology and capitalism. So what is to be done? Is modern technology intrinsically evil? Does it have no positive aspects? Must we reject it entirely in order to recover the dignity of work? (Must I, for example, throwaway my computer, which gives me

much pleasure and creative satisfaction?) Can our technological tools be disinvented? Can we go back to a pre-technological world? Of course not. The idea that we might go back in time is as nonsensical as the idea of inevitable progress. Both ideas share the same linear view of time that is characteristic of the technological world. To destroy the machinery of technology in some cataclysmic global frenzy of Luddism would be madness. We have no choice but to 'start from' (the language of progress is hard to escape) where we are now. There is no need to go back in order to recover the given world, the world that includes our dreams and our inner experience, because it is still with us, just below the surface of our lives, overlaid only by a thin crust of technologically conditioned thinking. The computers and communication networks, the aeroplanes and space ships, the drugs and medical procedures, the global markets and multinational corporations were not invented by an alien species, they are the products of humanity and their roots reach deep into the sub-soil of myth.

Then how can the cruel exploitation of the earth and its people by technology and capitalism be ended? One way might be to start seeing technology clearly for what it is. To perceive its limits. To cut it down to size. To stop talking about its inevitable progress and the 'dictates' of the market. To stop pretending that it is some kind of omnipotent god. To recognise its human origins. To make it work for us again. Above all, to uncover and find expression for the truths of human experience that technology conceals. And we can do this by paying attention to language, myth and poetry. The poet speaks not from any partial scientific or technological perspective, but from the fullness of being. Poetry, like myth, is all inclusive. Whether its themes are private or public, personal or political it is always limitless because it draws on the totality of human experience embodied in the shared, living medium of language. The work of the poet can never be reduced to an economic resource because poetry serves the whole world, not just the technological world.