Education, the Interpretive Agenda of Science, and the Obligation of Scientists to Promote this Agenda

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ABSTRACT: This paper presents an argument that emphasises the following points: (1) the importance of public education; (2) the essential difficulty facing all involved in public education that is aimed at sustaining a biologically and culturally rich world; (3) the recognition of science as having both a technical agenda and an interpretive agenda; (4) the scientific interpretation of the universe: an evolutionary and ecological world-view; and (5) the importance of the interpretive agenda of science for public education and the obligation of scientists to promote this agenda.

KEYWORDS: Education, science, sustainability, world-view

1. *The importance of public education*

Many words could be and have been devoted to describing the complexities of social change. Speaking bluntly, however, there are essentially two general ways of attempting to change society in a peaceful manner: the 'top-down' approach of legislation and the 'bottom-up' approach of education, whether formal or informal. Both of these approaches influence each other in all sorts of complex ways, of course, but it is useful to distinguish them for analytical purposes.

Attempting to implement social change solely or primarily by legislative imposition smacks of a paternalism that is contrary to the spirit of democratic institutions. Democratic institutions proceed most smoothly when legislation *expresses* the will of (at least a majority of) the people. This observation therefore suggests that for peaceful, democratically mediated social change, the leading partner in the ongoing dance between public education and legislation should ideally be that of public education (*public* from Latin *poplicus*, of the people).

2. *The essential difficulty facing all involved in public education that is aimed at sustaining a biologically and culturally rich world*

The essential problem we face in educating lay people and politicians – not to mention ourselves! – about the issues that need to be addressed if we are to

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sustain a biologically and culturally rich world is that the issues involved are manifold, often exceedingly complex even when considered 'in isolation' (an approach that carries dangers of its own), and well-nigh overwhelming when considered in terms of their complex interactions.

It is simply asking too much of everyone concerned – knowledge providers and knowledge receivers – to expect them to be knowledgable about the plethora of complex issues that confront us. Although we are surrounded by a sea of information, it is all too easy to drown in this sea. The poet T.S. Eliot spoke for many people – laypeople, politicians, and experts alike – when he asked:

> Where is the wisdom we have lost in knowledge?
> Where is the knowledge we have lost in information?

We all know what it is like to suffer from 'information overload', 'infoglut', 'media saturation'. And continuous attention to the details of the plethora of complex issues that confront us can easily lead to psychological burnout, 'compassion fatigue', and despair.

What we need, then, in order to make sense of the masses of information with which we are bombarded – indeed, for our very psychic survival – are what we might call *interpretive rules of thumb*. By this I mean heuristics or rough guidelines that enable us to sort and prioritise masses of information very quickly – even in the absence of far-from-complete knowledge of any subject – and to bias our responses to these priorities in various ways. Our perceptual processes do this all the time at an unconscious level, but, in this context, we are concerned with interpretive rules of thumb that operate at higher cognitive levels – that are learned rather than 'wired in' to the nervous system – and, hence, that are, at least to some extent, consciously malleable.

Needless to say, there are many individual differences in this area: different individuals employ different interpretive rules of thumb in different ways. However, considered at the cultural level, interpretive rules of thumb are very much a function of a culture's world-view. For example, consider the rather different interpretive rules of thumb that flow from the following world-views: (i) the world consists of a Great Chain of Being, a hierarchy of creation; the purpose of life is to strive toward, or at least venerate or worship, the highest form of being – God; 'lower' forms on this hierarchy of creation exist for the sake of 'higher' forms; humans are therefore entitled to use those forms of creation that are less 'developed' – or less 'perfect' – as they see fit in pursuing their God-given purpose in life; (ii) the world is a deterministic, clockwork-like mechanism; whatever happens has to happen; the human sense of freedom and, hence, responsibility is therefore an illusion.

In the light of these remarks, it becomes vital to ask: (i) can scientists play a role in furnishing people with an ecologically oriented set of interpretive rules of thumb – with an ecologically oriented world-view?; and (ii) if so, what does this world-view look like?

I believe that the answer to the first question is an emphatic 'yes.' Scientists not only can play a role in furnishing people with an ecologically oriented world-view but are, I would argue, heavily obliged to play such a role. This particular role, however, belongs primarily to what we might call the *interpretive* agenda of science rather than the *technical* agenda of science. I will consider this point first and then come to the question of the nature of the ecologically oriented world-view provided by modern science.

3. *The recognition of science as having both a technical agenda and an interpretive agenda*

Scientists are trained primarily with an eye to what we might call the *technical* agenda of science. This is the agenda that issues in knowledge of the form: 'If this, then that.' The *practical* upshot of this theoretical knowledge is obvious: 'If you want to achieve this result, then do X.' This is 'can do' knowledge; it is 'know-how'. This knowledge has brought us many blessings but has also ushered in many unintended problems.

But this is not all there is to science. In addition to the formidable amount of technical knowledge with which science has provided us, it has also provided us with an unparalleled understanding of the universe in which we find ourselves. This cosmological understanding reflects what we might call the *interpretive* agenda of science.

It is important to realise that although the technical and interpretive agendas of science are intertwined, they are not the same thing. At the level of prediction – or 'if-then' technical knowledge – quantum theory, for example, represents the most successful physical theory that has ever been proposed. But at the level of interpretation, quantum theory represents one of the great unresolved puzzles of science. Quantum theorists agree on the mathematical formalism of the theory, but have thus far found the question of what it is that is actually going on in the world represented by this formalism to be inscrutable.

What, then, does the *interpretive* agenda of science have to say about our place in the universe?

4. *The scientific interpretation of the universe: an evolutionary and ecological world-view*

Under the interpretation provided by modern science, the most obvious general feature of the universe is the fact that it has become increasingly differentiated over time. The universe we live in is an *evolving* universe rather than a steady-state universe – a finding that applies whether we are talking at the physical level or the biological level. Moreover, the products of these evolutionary processes have, in their interactions, influenced the pathways along which these very evolutionary processes have proceeded – and, again, this finding applies whether

we are talking at the physical or the biological level. Thus, the universe we live in is an *interconnected* or *ecological* universe in the significant sense that the *interactions* between the products of evolution are central to any account of the dynamics of evolutionary development.

How can we encapsulate this world-view? If we think of the evolutionary process of increasing differentiation diagrammatically then it has to be depicted as a ramified or branching structure. It is therefore an accurate metaphorical description to speak of all general kinds as branches, and all individual entities as leaves, on the same Evolutionary Tree of Life.

A somewhat more detailed and less abstract version of this cosmology runs as follows. The universe emerged out of *nothing* some fifteen billion years ago, possibly as a runaway consequence of a *vacuum fluctuation*, a phenomenon which is consistent with established principles of quantum theory. As the universe cooled, this early 'runaway' period of unimaginably rapid inflation and high energy gave rise to a soup of freely moving charged particles; these particles, in turn, coalesced into atoms; the atoms coalesced into gargantuan gas clouds; these clouds broke up under the influence of gravity to form 'smaller' clouds the size of galaxies; and these eventually coalesced into the solar systems, and so on, that make up galactic structures. Our own sun, which, along with the Earth, formed about 4.6 billion years ago, is just one of an estimated ten billion trillion (10^{22}) stars in the universe, and one of well over 200 billion stars in our own particular galaxy. The sun's energy drove the spontaneous self-organisation of the first, primitive self-renewing and self-replicating structures (i.e., life forms) that appeared on the Earth some 3.6 billion years ago. The awesome diversity of life on Earth then evolved through the intricate interplay of geographical and ecological diffusion (i.e., organisms spreading into different geographical locations as well as different ecological niches), genetic variation (the 'raw material' of biological evolution), and natural selection (i.e., certain kinds of environments being more favourable to the survival of some organisms than others).

Essential to the scientific understanding of biological evolution is the finding that ancestral species do not change *into*, and are not in any necessary sense *superseded* by, newer species; rather, newer species radiate out (branch away) from ancestral species, which can continue to exist alongside the newer species. Moreover, this process is a highly contingent matter; things could so easily be different. For example, all the primates radiated from a small tree shrew like animal that existed during the time of the dinosaurs. If this animal had been extinguished either during the time of the dinosaurs or along with them then we and all the other primates would never have come into existence. Indeed, wind back the tape of evolution far enough and, as Stephen J. Gould explains in his aptly titled book *Wonderful Life* (p. 14), 'the chance becomes vanishingly small that anything like human intelligence would grace the replay ... the "pageant" of evolution [is] a staggeringly improbable series of events, sensible enough in

retrospect and subject to rigorous explanation, but utterly unpredictable and quite unrepeatable'.[1]

The story of the universe as modeled by modern science is therefore one of *spontaneous self-organisation* as opposed to *transcendental creation*, *evolution* as opposed to a *steady-state*, *contingency* as opposed to *necessity*, and *increasing differentiation* as opposed to *linear progress*. This cosmology suggests that we should think of ourselves and other entities neither as links in some cosmically necessary Great Chain of Being, nor as cogs in some gigantic, deterministic clockwork, but rather as leaves on the same, luxuriously branching Evolutionary Tree of Life, which grows of its own accord.

5. *The importance of the interpretive agenda of science for public education and the obligation that scientists have to promote this agenda*

Even though world-views are 'big' things, they can be and typically are encapsulated in a simple image (or images) that can be easily conveyed and thus become widely shared. For example, the image of the ladder or Great Chain of Being for the theocentric, hierarchy of creation world-view; the image of the clock for the mechanistic, deterministic world-view. Similarly, the evolutionary and ecological world-view provided by the interpretive agenda of modern science can also be encapsulated in a simple image that can be easily conveyed and thus become widely shared, namely, the image of all general kinds as branches, and all individual entities as leaves, on the same Evolutionary Tree of Life.

Although the technical agenda of science is absolutely crucial in addressing the problems involved in attempting to sustain a biologically and culturally rich world, so is the too-often-overlooked interpretive agenda of science. This is because the evolutionary and ecological world-view provided by the interpretive agenda of modern science provides a framework of understanding within which people can see that they are not isolated from each other or from the rest of nature, and that their own fate is therefore intertwined with the fate of the larger physical, biological, and social systems which brought them into being and of which they form a part. Moreover, considered in terms of its psychological upshot, the world-view provided by the interpretive agenda of modern science – and encapsulated in the image of all entities as leaves on the same Evolutionary Tree of Life – is conducive to a more expansive sense of *identification* with the world around us than are the other world-views that have dominated (at least) Western culture over the last several hundred years.[2] (Compare the *psychological* upshot of the evolutionary and ecological world-view of modern science with that of the hierarchy of creation, or 'higher' and 'lower' states of being, world-view, encapsulated in the image of the ladder or Great Chain of Being; or with the atomistic, mechanistic, and deterministic world-view, encapsulated in the image of the clock.)

What, then, is the central message of these considerations? I have argued that it is asking too much of everyone concerned – knowledge providers and knowledge receivers – to expect them to be knowledgable about the plethora of complex issues that confront us. If people in general are to have any hope of sorting and prioritising the masses of information with which they are bombarded in such a way that they will give a high priority to ecologically relevant information, and in such a way that they will make prudent decisions even in the absence of far-from-complete knowledge on these issues, then it is imperative that they be able to filter this information through an appropriate general framework of understanding, that is to say, through an ecologically oriented world-view. Since the promotion of this world-view is crucial to the task of public education for the purpose of sustaining a biologically and culturally rich world, and since scientists are uniqely placed to promote this world-view, it follows that scientists have a significant obligation to do just this.

This recommendation may seem to represent a somewhat 'oblique strategy' to our enveloping ecological problems, since it does not emphasise a *direct* focus on this or that particular ecological issue. However, I have argued that this strategy will be extremely significant in the general task of *enabling* people to address the sheer number, variety, and complexity *of* particular issues with which they are confronted. Some sort of credible (hence, scientifically informed), ecologically oriented world-view has to be offered to and embraced by a great many people in a relatively short time if we are to have any real hope of turning around from our present crash course with ecological reality. Or expressed in more positive terms: some sort of credible, ecologically oriented world-view has to be offered to and embraced by a great many people in a relatively short time if we are to establish a meaningful, global, publicly supported (hence, democratically mediated) commitment to the sustaining of a biologically and culturally rich world.

NOTES

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[1] Gould, S. J. 1991. *Wonderful Life: The Burgess Shale and the Nature of History*. Penguin Books, London.

[2] Fox, W. 1990. *Toward a Transpersonal Ecology: Developing New Foundations for Environmentalism*. Shambhala Publications, Boston and London.