

Aboriginal science for the ecologically sustainable future

In the search for scientific and technological solutions to the global ecological crisis, few scientists have questioned the fundamental assumptions which underlie the Western scientific system, a system, it could be argued, which actually produced the crisis. Michael J. Christie examines some myths underlying both Western and Aboriginal modes of knowledge production, and discusses how the socially negotiated metaphor within Western science is consistently denied, leaving a dangerous pretension to absolute truth.

RECENTLY WE HAVE heard much in the media about a relatively new concept in the Western world – the ecologically sustainable future. When we look at the state of our planet and the failure or reluctance of Western science and technology to devote itself whole-heartedly towards achieving the goal of sustainability, we are led to begin a search for new paradigms in science and new ways of negotiating the scientific agenda.

Aboriginal science is a mode of knowledge production which has evolved to allow human beings to fit into, rather than outside of, the ecology. It is a science in which all human dimensions, the social, economic, religious and political, are integrated and interpreted within, and in terms of, the rest of the physical universe.

Many white Australians would agree that we need a science which allows us to discover and maintain ourselves as part of the ecology, rather than separate from it, but most would discount the potential of Aboriginal science to teach us how to do this, on the grounds that Aboriginal science has so clearly a mythological or religious basis to it. We are inclined to say that Western Science, for all its faults, is the science of the really real, and that to give up our demonstrable scientific reality in favour of a semi-religious system would be naive.

However, in their nature and structure, the Western and the Aboriginal scientific systems are, in fact, fundamentally alike. Both consist of complex webs of propositions and interpretations beaten out and finally agreed upon by groups of scientists. Both require some sort of faith, or acceptance of a particular picture of the world. Both are socially negotiated pictures of the universe which inform the ongoing life of the society. Each system bears with it certain strengths and limitations, which we need to understand fully, not the least because our Western system has been developed so that its limitations are very difficult to identify.

There are two fundamental characteristics which both the Western and

Aboriginal ontologies share. (By ontologies, I refer to the picture of the world which a scientific system develops.)

Metaphor as framework

First, all ontologies are essentially metaphor. There is no sense in which a science or ontology can be said to be *equivalent* with reality. It must, in every respect, be a picture or a model of reality. In Aboriginal science the metaphorical basis of the ontology is actually celebrated, and its truths are expressed in ways rich in metaphor. For example, the popular Aboriginal identification of two different parts of the land relating to each other as mother and child ignores the obvious physical differences between land and people. Land can not give birth to more land, yet this metaphor assumes a different connection which contributes to a total picture of the cosmos. The mother-child metaphor (in Yolngu language this is affectionately known as Yothu-Yindi, the child next to the great one) interprets and formalises and integrates scientific knowledge from all different areas of Aboriginal reality. It can be used to describe the way waters and winds or totemic animals relate to each other. Similarly, different clan groups stand in yothu-yindi relationships to each other as they depend upon each other for ceremonials, marriage bestowal, procuring food, and many other ways.

This knowledge-building through metaphor is also true of the Western scientific ontology, although less readily admitted to. Developing a metaphor involves selecting a particular picture of reality and fitting our data into that picture. The Western scientific system, like the Aboriginal system, ignores some of the obvious differences between elements and focuses upon those aspects which are found to be congruent according to the chosen metaphor. An obvious example of this metaphor building in Western science is the process of quantification. When I say that there are 200 people in this room, I am making, in some ways, a rather bizarre metaphorical leap, by assuming

that in one sense we are all identical, and therefore can be included meaningfully in a set of '200 people'. We are, in fact, all quite different, so different that it would be impossible for me to actually define what a *person* is, but my scientific system allows us to assume that in some sense we are all alike, and to that extent, counting people is a meaningful scientific process.

Aboriginal scientists refuse to make such a huge metaphorical leap. They know each person is an individual, from a certain family, from a certain part of the land, from a certain totem, related to each other in particular ways. It is their relatedness and their affiliations which are significant in the Aboriginal system, and to quantify people would force us to ignore those other metaphors which define our various modes

Each system develops certain dimensions of truth at the expense of others

of connectedness with the world and each other. A Yolngu gathering of 200 people say, at a funeral, would be seen by Yolngu scientists in terms of a variety of roles and dimensions specific to the context. They would see the close relatives of the deceased, people who are the managers for the totems of the deceased, people in the correct relationship to do the ceremonial singing or the painting, people whose land forms part of the dreaming track chosen to return the spirit to its home, and many others. Aboriginal science ignores, in this instance, the common humanity shared by the 200, and perceives and labels them according to different metaphors appropriate to the context. In the Aboriginal context, the fact that there are 200 people present is useless information. Western science, on the other hand, ignores the reality that all elements are given meaning by their context, and cultivates a metaphor in which they can be manipulated as

abstractions without reference to context.

Thus in all scientific systems there is the building of knowledge on a framework of metaphor, and, at the same time, a sort of censorship is involved. Some things are revealed and others obscured, in a systematic way, by the operation of a metaphor. The Aboriginal knowledge makers discount quantification as unproductive because it necessitates examining things out of context. The Western scientists censor out the intuition, the ideas and traditions of uneducated people, and the folk wisdom of the past and confine themselves to empirical data. The metaphor building at the heart of Western science lies in its refusal to admit any but hard data, and it gives rise to a hard, mechanistic model of the world in which human appetites and weaknesses are out of the picture.

Negotiation of knowledge

If we cannot see the selection processes of metaphor-making and censorship at work, we may fall victim to the myth that Western science is *discovered* not negotiated, a myth perpetuated at all levels of Western science and science education. The apparent independent unfolding of Western scientific knowledge through *discovery* is an illusion; *our* knowledge is no less socially constructed than Aboriginal knowledge.

In Aboriginal knowledge making, the negotiation process is readily admitted to. Over the ages, from the social, emotional and intellectual environment in which the Aboriginal thinker was immersed, those insights which have best reflected the socially defined situation, and those which have best contributed to socially defined goals, have been selected, pooled together, discussed and refined and progressively contributed to the evolving ontology. Mythology records many of these insights. And the mythology indicates to Western viewers that Aboriginal science is demonstrably a social construction which reflects the social structures, economies, motivations and aspirations of Aboriginal

people. As the physical and social universe changes, Aboriginal scientists constantly re-negotiate their ontology.

A different form of negotiation is taking place in Western science. When Copernicus broke with the church's science, when the economists left the marketplace for the universities, and the botanists left the farm for the laboratory, they did so in order to pursue their investigations without the restrictions imposed by religious, social, economic or environmental fluctuations. They, as it were, negotiated to limit themselves to those data which can be counted unarguably, so in effect they would be unhampered by political or ecological contingencies. The particularised knowledge of the peasant, the shopkeeper and the priest was soon left out of negotiations, and, uncontaminated by the fuzzy effects of traditional wisdom, a very clean-cut, ever expanding, powerful and impressive science blossomed.

The aspect of this science which was negotiated in the laboratories and universities was its strictly positivist dimensions. One could say that it was agreed to construct a picture of the world in which only those things which could be counted exist, and where all those things which can't be counted, don't exist. All other angles were excluded from scientific reality, and all questions posed were expressed, analysed and responded to only in terms of those things which can be measured. So while the Western ontology is rich in some sorts of truths, this is at the expense of other truths which it has chosen to ignore.

The background of each science

It is impossible to say that one system is truer than the other. Each system develops certain dimensions of truth at the expense of others. And each system has evolved to suit the needs of the scientists in the community.

From the Aboriginal point of view, the Western ontology is hopelessly impoverished by its inadequacy to account for social, psychological, spiritual, economic and political realities of day

to day life. Aboriginal science has developed in parallel with an economy which is based upon constant, ongoing, highly tuned responsiveness to the physical and social environment, a subtle and complex responsiveness which involves simultaneous reception and processing of large amounts of extremely varied and constantly fluctuating stimuli. To quantify things or examine them removed from their context in this culture is hardly adaptive.

For example, Western science has produced incredibly detailed knowledge of the reproductive behaviour of crocodiles along with wonderful technology for measuring time, but there is no way the Western scientists can predict, using their knowledge and technology, exactly when the crocodile eggs will be laid on the swamps. Aboriginal scientists, on the other hand, know little of the Western microscopic detail, but know that 'the moment in which crocodiles start to lay their eggs is ... entirely predictable if one pays attention to march flies'. There is a certain sort of march fly which will come and tell you the eggs are there. 'The other type of biting fly tells you that the bush plums are ready' (D. B. Rose, 'Exploring an aboriginal land ethic', *Meanjin*, 1988, p. 382).

In Aboriginal science thousands of seemingly unrelated pieces of information are organised through complex webs and levels of metaphor which are utterly alien to our Western taxonomies. Incorporated into this environmental sensitivity is historical, sociological and religious sensitivity. The scientific process works to balance a vast range of input qualities and angles in a structure from which knowledge production is an ongoing situation-specific process. An economy and life style which demands this high level of sensitivity to the whole ecology lends itself to the development of an ontology rich in successive layers of metaphor, one, in fact, which celebrates and gives life to the work of metaphor in religious practice.

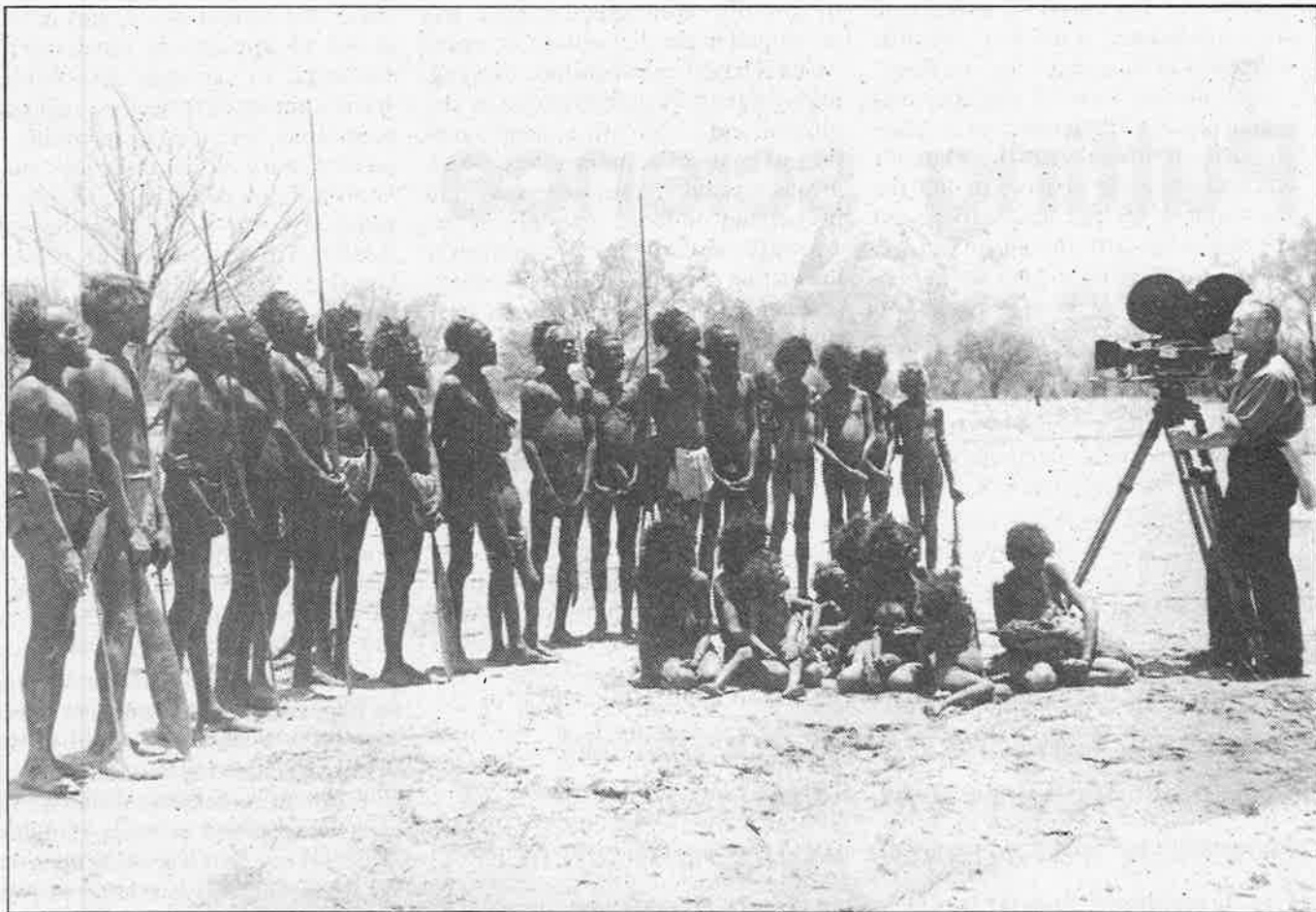
The Western scientific system on the other hand has developed in a world which placed humanity apart from and

above the natural world, and in command of apparently inexhaustible resources. In our early days Western science appeared to need no ecological constraints, and it quite naturally expanded along all the directions which improved our potential to exploit the physical world for our comfort and wealth. This expansion of Western knowledge was incredibly fast. We refer to it as an explosion of knowledge - it exploded because it was unconstrained by the social, psychological, political economic and ecological realities which constrained the development of Aboriginal science.

This has brought about the monumental dilemma of the modern world: that we now have, without any doubt, the *scientific* knowledge to solve the world's problems, but what we are lacking is the *political will* to implement the solutions. The response from an Aboriginal scientific position would be: 'What more could you expect if political realities have not been embedded in your scientific system? How can you expect science to solve your human problems if it depends upon an ontology which accords things their scientific value only after they have been abstracted from the day-to-day social and political and economic context?'

Summing up thus far, it is clear that in no sense is the Western scientific system truer than the Aboriginal one. Both have pursued and developed certain dimensions of the truth at the expense of others, in response to the economic, cultural and political demands of the cultures which produced them.

Furthermore, the Aboriginal system, in its own sphere, is impressively ecological, in a way in which ours is not. The features of Aboriginal science which give it a firm ecological grounding are the ongoing negotiation of knowledge, and the extensive use of a large range of metaphor to interpret scientific data within a social, political and economic context. The work of metaphor and negotiation in Western science is generally denied or ignored by our own scientists, and yet these take centre stage in the ecologically based science of Aborigines.



Thus from this point of view, Western science has two fundamental weaknesses. The first is that the only metaphor available or allowable in Western science is the positivist empiricist one. With access to only one metaphor, we can produce only a very limited picture of who we are and how we fit in and what we must do. No matter how empowering or exciting pure science may be, it is by definition irresponsible, and thus simply not good enough to solve our present ecological dilemma.

The second weakness is that the negotiation process in Western science-making is, in effect, all over and done with. The pure sciences are, by definition, not open to the mitigating influences of negotiation. The negotiating has been done: only empirical data are to be admissible. When physicists or mathematicians are confronted with the human problems associated with the technologies they produce, they can claim that these problems are, as it

were, outside their field. We need an ecological scientific methodology to return all our knowledge and ideas to the one unified field.

Some time in the future, if we are going to survive, we will develop an economy and a lifestyle which is sustainable. It will not be supported by a constant and unchanging view of the world, but by a mode of science production which is sensitive to the interaction of human needs, emotions and intuitions, as well as to the almost imperceptible moment by moment, year by year changes in the environment. A science like this will lead us to understand, care for, and respect the part we human beings have to play in the ongoing greater ecology of the planet.

Acknowledgements

I am indebted to the Aboriginal elders of our community and to everyone else at the school, including the children, for

the ideas expressed in this paper, also to Dr Helen Watson from the History and Philosophy of Science Department of Melbourne University who has been involved in this work. I highly recommend her book (*Singing the Land, Signing the Land*, Geelong, Deakin University Press, 1990) which explores the contrast between Aboriginal and Western knowledge production through the examination of a wide range of graphic and written material.

Michael Christie has lived and worked in Northeast Arnhem land as a teacher/linguist since 1972, first at Milingimbi and, since 1985, at the Community school at Yirkala. He has qualifications in education, linguistics and educational anthropology. This article is reprinted, with permission, from the Australian Science Teachers Journal, March 1991; the second part of the article, omitted here, deals with school science curriculum.