Culture and Indigenous Knowledge Systems:
Emergent order and the internal regulation of shared symbolic systems

Michael Fischer
University of Kent
Canterbury, Kent, UK
m.d.fischer@kent.ac.uk

Abstract
I will briefly explore the relationship between culture, knowledge and behaviour in a context of change, in particular with respect to the relationship between explanation and practice, the relationship between scientific and cultural knowledge, and their applications. Specifically, I argue that applications (or instantiations) of scientific knowledge are not the same as science, and undergo a process that has properties not unlike those described by Ellen and Harris [2000] for ‘Indigenous Knowledge’ (IK). This process uses knowledge that is not derived from the system represented, but nevertheless is necessary for the system to operate in a contingent world even though this knowledge was not in the original subset of knowledge being applied. This consideration of knowledge about what contexts must be instantiated to enable domain knowledge to be instantiated builds on Ellen’s concept of prehension [Ellen 1986, 1993], which in part includes the anticipatory knowledge a subject brings to a situation. I suggest the operative principles in IK have similar properties. Describing or formalising this enabling knowledge permits us to more formally describe what Ellen and Harris suggest is ‘tacit, intuitive, experiential, informal, uncodified knowledge.’ [Ellen and Harris 2000: 28]. Finally, I examine the consequences of the relationship between knowledge and contexts of use to explore properties relating to culture and IK.

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1 Culture
Culture and traditional knowledge are concepts developed and advanced by anthropologists over the past century or so. In many schools of anthropology culture has developed from a useful insight, promoted by Franz Boas and others in the early period of American anthropology, into a symbolic hydra by 1960, finally mutating into the impossible chimera we confront today. These concepts have recently been appropriated and used in ways never envisioned by anthropologists, sometimes contravening the data, theory and models used by anthropologists to develop these concepts. It would be fair to say that initially most anthropologists welcomed this attention, with not a few embracing these appropriations. But there is little evidence to support many of the principal applied threads that have developed in ‘critical’ politics, economic development and conservation. Anthropologists have an opportunity - and an obligation - to clarify and refine both concepts in the context of these (mis-) appropriations, and to clarify them for what they are, anthropological inventions used to define and enhance understanding, not to define movable property or motivate new forms of race (and racism).

In 1971 G. P. Murdock presented his enigmatic Huxley Memorial Lecture to the Royal Anthropological Institute, ‘Anthropology’s Mythology’ [Murdock 1971], with a pair of dramatic claims; neither culture nor social structure can be reified to serve as an explanation. These were, to the extent they existed at all, our characterisation of patterns of interactions between individuals, not the source of these interactions. Anthropologists had to abandon subjects of a super-organic nature and deal with individuals and their productions to explain what we call social and cultural. After a half-century in anthropology, Murdock was introducing a programme for much of the next half-century - focusing ethnography, cross-cultural research, and theory on diversity of individual experience and choice, not commonality and conformance.

As an anthropologist I think it unlikely that most anthropologists will abandon, or would want to abandon, the culture concept as a central component of anthropological theory, but that does not mean our concept ‘culture’ can remain undisturbed or that applications of the culture concept emerging within and outside of anthropology be unexamined. Re-examination has been proceeding apace for well over five decades, and although we are no closer to general acceptance of a ‘core’ to the
cultural concept, nor have compelling arguments against the cultural concept emerged. In the midst of this swirl of reflection, self-reflection and contemplation, culture has actually grown more pervasive as a concept, if not a clearer one. The theme of this session is oriented in part to how the culture concept contributes to our understanding of human systems. But can it do the work we demand of it?

2 IK and Cultural Knowledge

‘Indigenous knowledge’ (IK) as a term has emerged over the two decades to describe the knowledge of a group of people local to a given situation, sometimes used interchangeably with ‘local’ knowledge [Ellen and Harris 2000:1-2], and which I am taking to be an instance of what others have called cultural knowledge. Many anthropologists have questioned the value of trying to distinguish IK as a ‘special’ kind of knowledge [ibid.: 25-6]. At the core anthropologists and those interested in applications of IK have very different goals for characterising a peoples’ knowledge. Practitioners are interested in knowledge that, regardless of source, is enactable with respect to their own practice. Anthropologists are more interested in the knowledge itself for one domain and its interconnections with other knowledge in other domains.

Geertz [1966] recast and broadened Wallace’s distinction [1965] as ‘knowledge for’ and ‘knowledge of’ - procedural versus declarative knowledge. I suggest there is another - more primitive - distinction we should draw: knowledge relating to a specific domain system and knowledge exterior to a domain system but necessary to instantiate that knowledge (the idea of instantiation as an integral part of cultural knowledge, broadly speaking, that links the ideational level of cultural constructs with the phenomenological level of behaviour was introduced by Read 1988 (see also Read 2001, 2003b, nd; Leaf 2001, In Press). Finkelstein and Fischer [1989] and Fischer and Finkelstein [1991] formalised the concept underlying instantiation using a tenased deontic logic). Knowledge about a domain system is knowledge, conscious or non-conscious, that addresses a domain and its functioning - both procedural and declarative knowledge that comprises the explicit and internal components of a domain system; the objects, actions and structures necessary to describe and perform within a particular human sub-system. The knowledge exterior to a domain system is basically knowledge about context of use (instantiation) for a given knowledge domain system (see Read 2003b: Table 2 for examples). In other words, knowledge relating to circumstances or contexts of use in which the knowledge of a domain is reliable (credible) or can be applied together with the processes of instantiating that knowledge.

The overall concept of separating knowledge about a domain from knowledge about contexts of use was derived from deontic logic, a logic whose modal operators denote permission and obligation rather than possibility and necessity [Fischer and Finkelstein 1989, 1991; Fischer 2002]. Instantiating knowledge relates to how the substantive domain knowledge can interact with or inhibit applications of knowledge from other domains, when to shift approaches to applications, how to create favourable circumstances for the desired results or how to proceed when information is missing. The domain knowledge cannot by itself create the conditions for its instantiation. As I will amplify in the next section, it is knowledge relating to instantiation that underlies many of the problems with applications of any kind of knowledge, IK or not.

3 Is IK Systematic?

Ellen and Harris [2000: 4-5] present a checklist of characteristics that anthropologists and others have associated with ‘indigenous knowledge’ (IK, although Ellen and Harris settle on ‘traditional knowledge’ as the best of a unsettling group of terms [ibid.: 3]). This includes attributions emphasising the empirical, practical, applied, and situated (contextual and spatial) nature of IK, together with aspects such as oral transmission, informality and fragmentary distribution. In their conclusion it is this latter group that forms the prototype:

However, we believe that IK, in the sense of tacit, intuitive, experiential, informal, uncodified knowledge, will always be necessary and will always be generated, since, however much we come to rely on literate knowledge which has authority, the validation of technical experts and is systematically available, there will always be an interface between this kind of expert knowledge and real-world situations. It will always have to be translated and adapted to local situations and will still depend on what individuals know and reconfigure culturally independently of formal and book knowledge. [ibid:28]

Although I agree with the overall sense of their conclusion, but their emphasis on IK being intuitive, informal, uncodified and oral is misplaced - confusing the consequence of a process as the criteria for the process. These are probably accurate enough as a description of most instances of what we commonly regard to be IK as they are situated, but Ellen and Harris seem to take these points further as critical to the production and use of IK.

Ellen and Harris are not separating the process of instantiating knowledge from the knowledge itself. They are fundamentally correct in making the point that IK is complex and rich in its context of application, as, I would argue, is all knowledge that can be applied. They use Richards’ [1993] account of knowledge as performance, in which Richards contests a view of knowledge as a simple list rules and decisions. Richards notes that Hausa farmers in northern Nigeria adapt to drought by making adjustments to their cropping pattern, sowing and re-sowing until a secure planting is instantiated or they exhaust their resources. However these ‘[cropping patterns] ... are not the outcome of a prior body of “indigenous technical knowledge”...’ [Richards 1993: 67], instead requiring interactive decision-making within a constantly changing historical context, idiosyncratic for each farmer and where that historical context constrains or directs the appropriate applications. Richards is clearly discussing knowledge instantiation, not knowledge. From this Ellen and Harris suggest we should ‘...recognise knowledge is grounded in multiple domains, logics and epistemologies.’ [2000:18] and continue, ‘it may be far more productive to move away from the “sterile dichotomy between indigenous and western”’ [Agrawal 1995: 5] which idealises and obscures knowledge and
practices, disempowering peoples and systems through artificially constrictive systems.’ [Ellen and Harris 2000: 18].

They continue by criticising efforts to codify IK, build IK into policies, the politics of IK and the resulting diffusion of agency from these [ibid.: 18-24]. While this is certainly descriptive - most attempts to codify IK have been inadequate, attempts to employ IK in development projects often have mixed results, and the political structures that embed and embody knowledge mirror existing status relations. But this has no bearing on our prospects relating to more formal representations of IK. A better conclusion is that these states of affairs are a result of our generally poor accounts and treatment of characterising human knowledge.

We are getting a mixed message from Ellen and Harris. On the one hand they want to take a view that somehow IK is shared knowledge to some extent (that is, cultural knowledge), and on the other that it cannot be described in systematic or even definite terms. If we are to improve our understanding of IK, we cannot adopt Chomsky’s [1965] approach, and just look towards a ‘deep structure’ of IK. If, IK is in fact a combination of domain knowledge and the knowledge needed to instantiate that knowledge, then a ‘deep structure’ would describe the components of the domain knowledge and perhaps the final form of instantiation, but not the process of instantiation. Nor can we accept Richards’ [1993] approach of simply accepting that each application of IK is an improvisational performance which is wholly created anew with each instantiation. This approach, in fact requires the existence of a separate body of knowledge which I suggest is knowledge relating to instantiation, but fails to acknowledge this knowledge. We certainly should not leave the study of IK and cultural knowledge in general to succumb to an intellectually ‘tacit, intuitive, experiential, informal, uncodified’ anthropological IK tradition.

Although an ‘intuitive’ approach might seem attractive to some (whatever that constitutes), we should not follow it for two reasons. Firstly, given that we are mainly interested in knowledge that is shared to a considerable degree, IK is in some manner ‘codifiable’. Following Murdock [1971], it is a mistake to imagine that there is some refined version of ‘the knowledge’. It is likewise a mistake to imagine that this knowledge is ‘magic’, only existing in the ether, or that we cannot make better efforts to avoid some of the issues that emerge from current interpretations of IK. If we can generate ‘instances’ of such knowledge that produce results similar to indigenous agents in similar contexts, we establish that this knowledge is codifiable.

It was demonstrated over twenty-five years ago [Shortliffe 1976] that restricted domains of knowledge could be represented in an expert system and enacted interactively in new contexts, in Shortliffe’s case diagnosis of diseases of the blood. This work has been expanded and refined (including a number of projects by anthropologists including Benefer [1989], Furbee [1989], Behrens and Read [1989] and Fischer [1985]- see also Fischer [1994b, Ch. 8 for a review and discussion), and producing expert systems for very narrow domains has been a undergraduate-level project in computer science, and at least one anthropology course, for well over a decade. The expert system approach has a number of drawbacks [Fischer 1994b: ch 8], not least is that the semantics of expert systems (or production systems) are not well understood. Expert systems tend to be existence proofs. However, the stimulus for this paper emerged from attempting to develop a more formal understanding of production systems [Fischer and Finkelstein 1991; Fischer 1994a], which involved the separation of domain knowledge from the principles of instantiation. And in any case, expert systems demonstrate that it is possible in principle to address in part most of the observations of Ellen and Harris with respect to IK.

Secondly, arguments related to aggregated vs. individual authority have been taking place in most disciplines concerned with people over the past two decades. Substantial advances in agent-oriented representation and modelling in computer science are beginning to be applied to the social sciences to create ‘artificial societies’ with which the properties of knowledge and its distribution can be investigated [Read 1998, 2001, 2003a, Lyon 2002, Fischer 2002, Bharwani et. al 2002, Bharwani 2004]. This work is relatively new, but provides a formidable method for those who are not willing to represent and analyse their data in terms of aggregates or norms [Hobart 1993:19]. Although unfamiliar to most anthropologists, within a few years the technology necessary to work in these terms will be accessible to most anthropologists [Fischer and Read 2001] as the requirements for computational and computer-based skills decreases.

What is needed is an extension from the conclusions of Ellen and Harris to human knowledge and its uses, not abandonment of this study to our ‘intuition’. In particular we need to re-examine the relationship between IK, applications of IK, scientific knowledge and applications based on scientific knowledge.

4 Scientific knowledge, applied knowledge and IK

Consider the relationship between scientific knowledge, technical applications of scientific knowledge and IK. Scientific knowledge is derived from two gross kinds of activities. The first is the conscious examination of observed physical phenomena. This itself is comprised of establishing i) a class of phenomena - a classification sufficiently broad such that examples of a class appear more than once - ii) a description of the circumstances or context under which a class of phenomena can be observed, and iii) an account of how aspects of the context interact to create or influence the phenomena. The second activity is more or less the converse of the first; consciously creating and manipulating a context in order to precipitate an instance consistent with a phenomena class in a replicable manner. Technical applications are derived from this second activity. But they are not science. Whereas doing science requires, in principle at least, a conscious and reflexive knowledge of the relationship between the context and the phenomena
class, technical applications do not. These have different goals. Scientific application is oriented towards understanding, technical application towards doing. Penicillin of a given dosage and frequency works equally well in the same circumstance for allopathic practitioners and unani tib practitioners in Lahore, regardless of their basis of understanding or explanation for how it works [Lyon 1991]. At the same time, scientific knowledge is important to the ‘engineer’ as a legitimating device. ‘Knowing’ there is a good reason for the technology to work is apparently comforting to many practitioners, and much of engineering is involved in advancing the ‘ritual’ and ‘religion’ of the explanatory knowledge that underlies practical knowledge [Bourdieu 1990].

This is not to suggest that producing a technical application is simple - anything but. Applications are rarely single magic bullets. Instead, applications are created using some combination of techniques that work together for a desired result. The gross combination and sequence is often known for an application type, but detailed implementation usually requires some considerable adjustment in configuring the technology to the specific conditions of the implementation, especially in the early stages of a technology. For example, in microelectronics it takes one to two decades for a new technical development to make the transition from first implementation to wide application [Fischer 1994b]. Part of this delay simply reflects the development and diffusion of knowledge relating to a new technology, but perhaps more important, it is over this time that the technology itself is refined to make it more adapted to a wider range of contexts of application by practitioners who possess less and less knowledge by incorporating accumulated knowledge of these contexts of use into the technology itself. This is similar to the pattern of development of scientific innovations, where initial demonstration of an effect often appears in a very restricted and difficult to produce context, but as the context becomes better understood, so is the effect easier to demonstrate. This process in engineering is a result of gradually describing the many contingencies that make applications difficult, and adapting the technology so that the materials, tools and techniques incorporate knowledge relating to these contingencies and thus tend to work better across the contingent range.

Technology is often a blend of knowledge about how to interact with material systems, knowledge about the interaction and knowledge about what can and can’t be done in different circumstances and how to adapt to different circumstances (deontic or instantiating knowledge, usually referred to as ‘contextual’ knowledge, although the latter usage is descriptive rather than analytic). Circumstantial adaptations are more often in need of revision as the kinds of circumstances that can arise change often in contrast to underlying principles, which may not change at all during the period of adaptation. Instantiating knowledge is necessary to produce results from the former two, and thus must be kept dynamically in ‘tune’ with contemporary circumstances. But perhaps more significantly, without incorporation of instantiating knowledge, we are in fact not importing useful knowledge at all because the powerful things that the knowledge enacts in its origin context are not present.

Economic development project contexts are often presented as if we are exporting techniques that are based simply on ‘true’ scientific knowledge. An industry has been made of pointing out that we often do not do so. Most of this discussion has related to not exporting the context within which the knowledge must be embedded to be effective, thus not actually exporting effective knowledge. More specifically, we are not exporting useful, enactable knowledge because important contextual components the exported knowledge interacts with in its origin context are not present.

Some knowledge is seen as being powerful because it is true. Scientific knowledge is often used as a case in point (though science, by definition, is contingent.) But, in fact, much of our knowledge is powerful because it provides access to powerful processes and structures, not because it is, in fact true. The confusion with truth comes from associating too closely philosophical truth with knowledge. For example, a knowledge of spirits cannot be show to be true based on most empirical knowledge of the world. But a knowledge of spirits can be operative and powerful if it provides access to powerful things, powerful people or powerful social institutions.

5 Emergent order and the internal regulation of shared symbol systems

I have argued that knowledge about instantiation is critical to applying a domain knowledge system, and that the development of a technology is a partially encapsulated amalgam of one or more domain knowledge systems together with knowledge relating to instantiating these in specific ways, which will result in the techniques embedded in appropriate contexts for the intended results. This is, of course a function of how much control we can take of the contexts of use, and how specific an effect we expect of the technology. In general turnkey technologies generally require a great deal of contextual control, and a very specific set of outcomes.

What Ellen and Harris [2000], Richards [1993] and others seem to be addressing is not Indigenous Knowledge, but Indigenous Technology. If this contextual instantiating knowledge is so unstable and variable, how does it come to be shared? So far I have been emphasising the separation of domain knowledge systems and knowledge about instantiation. However, we must not lose sight of the domain knowledge!

Although domain knowledge is not sufficient to account for its instantiation, there is nothing to instantiate without domain knowledge. That is, domain knowledge creates possibilities for applications that would not exist otherwise. Domain knowledge is powerful knowledge, powerful because, when instantiated, it creates all that is around us. This is as true of knowledge about spiders in Somié, Cameroon, as it is of knowledge about computers in Vienna, even if these create different possibilities (in Somié a species of spider is used in divination, a speciality one must be inducted into. Spider divination (see Zeitlyn and Fischer 1998 for an animated example) directly
impacts on most important decisions taken by the Mambila residents of Somi." 

...it is the relationships per person, 999,000 altogether. There is a population of 1000, there are a minimum of 999. Kinship seems pretty simple on the surface; 2 to 30 terms than arbitrary rules. This leads to the conjecture that formal rules will be correspondingly easier to learn than more arbitrary principles have some degree of internal consistency they in a manner that is in agreement with others. If the derived order in the data. In cultural 'data' the order must be consistent with the organisational principles.

Implicit in this argument is the proposition that for knowledge to be shareable it must maintain some level of stability, thus it must have strong organisational principles. These principles must include some basis for identifying what is, and what is not, relevant knowledge, for making inductive and abductive inferences, and domain knowledge must extensible if necessary while remaining consistent with the organisational principles.

Specific data is generally transient and idiosyncratic to
individuals. What is culturally pervasive is what is done with specific data. Instantiation is a bridge between cultural knowledge domains and cultural behaviour [Read 1988]. Instantiation is, simplistically, a kind of interpreter for cultural 'programs' in specific contexts. Instantiation itself is not necessarily a part of culture ... each individual has a lot of license. They must produce comprehensible results to others, and in consonance with physical conditions. To be pervasive cultural knowledge domains must be mostly logically equivalent between individuals. In learning physical data, pattern matching works because there is order in the data. In cultural 'data' the order must be provided by other cultural agents. If they (their judgements, actions or other feedback) do not provide ordered relationships, the patterns will be difficult to learn in a manner that is in agreement with others. If the derived principles have some degree of internal consistency they will be correspondingly easier to learn than more arbitrary rules. This leads to the conjecture that formal rules will be distributed with fidelity across a population more easily than arbitrary rules. For example, kinship is a pervasive human cultural activity that is built on a set of symbolic relationships. Kinship seems pretty simple on the surface; 2 to 30 terms are used to describe anyone in a population. But in a population of 1000, there are a minimum of 999 relationships per person, 999,000 altogether. There is a high level of predictability in what people will call others, although the data is different for everyone, so it is the principle of prediction that is cultural in conjunction with a small, well-ordered set of terms. Dwight Read [2001] has found an algebraic basis for four quite different kinship terminologies. We conjecture that all kinship terminologies have an underlying algebraic basis [Fischer and Read 2001].

We still must account for how culture can serve as a means for both stability and change. Part of the answer lies in the production of 'existential technology', which acts in the continuing definition of culture in terms of itself. But part of the answer will have to come from the cultural agents and knowledge of instantiation. The need for a 'strong' base for cultural rules that resists change but permits change under a constrained path such that it remains possible for large numbers of agents to develop in the same direction by limiting the amount of entropy that can enter the system under change. One means of doing this is to have little entropy in the specific principles underlying the organisation of different knowledge domains, while adapting to high entropy in the process of instantiation when interpreting this knowledge.

6 Conclusion
Much knowledge that we value is not either Geertz/Wallace’s for or of, but is valued because it is enabling. Knowledge of this sort can include knowledge that others hold and relate to - how this exterior knowledge can be enacted or how we can avoid its consequences, how to get knowledge that is suitable for a situation, and even how to simply survive until other knowledge that falls more within our conventional categories can be enacted. Much of what we deal with in the world is contingent, either because it is truly contingent, or simply because it is beyond our power to know and thus we must guess. Enabling contextual knowledge can have many parts that unfold in layers.

I characterise IK (in the universal sense of Ellen and Harris, not just that of 'indigenous' peoples) as incomplete knowledge. Much of IK relates to accessing powerful processes ('natural' and human influenced), structures and people, including processes for exploitation of environmental resources. Part of this access is due to conventional views of knowledge - 'facts', classificatory systems, relationships and knowledge of processes and contexts. Another part is related to what Ellen [1993:229-234] refers to as prehension, '... those processes which ... give rise to particular classifications, designations and representations.' [Ibid:229]. In other words those processes that Richards [1993] concludes are situational performance or improvisation. The serious study of this aspect of IK is required to understand how to enable a given body of 'substantive' knowledge for applications. The value of 'substantive' IK should not be underestimated as an export in its own right. But nor should be confused with enabling knowledge of instantiation, nor should we be surprised if we ignore this component and face difficulties in application. And we can face problems when enabling knowledge is exported if it is inappropriate to the new contingencies within which application is desired, as Dove [2000] suggests. In either case, it is important to be able to identify enabling
knowledge, both to understand how IK works in its original context, and how it might be modified in its new context.

References


Read, Dwight nd. Emergent Properties in Small-Scale Societies. Artificial Life 9:419-434


