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# Correspondence

# A Comment on 'Measurement and the Structure of Scientific Analysis' by Warren Kinston

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THIS PAPER appears to provide an even more valuable insight into the problems of knowledge representation than is claimed by the author.

In brief, Kinston adds a fifth level of knowledge representation to those proposed by Eddington and Gregory. In addition to the levels of entity, observable, comparable and measurable, Kinston proposes 'relatable'. Only when the other representations can be connected together can this meaning become emanent and it is this representation of relations which closes the system of knowledge representation. Indeed we cannot know what anything is about until all the ideas, observations, comparisons and measurements have been connected together. Kinston considers this as a necessary condition for the representation of knowledge and tentatively suggests that it is also sufficient. Just so—but I suggest that he might have gone further; to consider how impossible would be the exchange of ideas across the boundaries of knowledge systems without such a structuring of representations.

I suggest that the new Level V in a knowledge system may well become a Level I representation in that system's meta-system of knowledge and that such a transport cannot be effective at lower levels of representation. We may assume that when packaged for the journey there is something there which is relevant to the observations being made in the meta-system and that once transported *all* the relations are considered and not just those which the meta-system observer considers important for the moment. This presents the meta-system observer with Ashby-variety on a scale which might well tax his capacity. Be that as it may; having taken the intellectual responsibility of adopting a concept for another system the onus is on him to justify discarding what is irrelevant. Hence we see qualifications such as 'other things remaining equal', the economists' classic disclaimer, not as some means of excluding what might not be relevant were it to be explicated, but as an excuse for an inadequate explanation; for a paucity of the explanatory capacity of the theory being advanced; a retreat from complexity. We should then be justified in asking what are these 'other things' which must remain stable while the interactions being described are taking place and what might happen were they not to behave themselves. Such questions challenge the significance of hypotheses in relation to particular decisions, courses of action, policies and practices. Such questions as these challenge the over-ambitious use of metaphor.

The adoption of a metaphor for explanatory purposes entails defining an interactive pattern in the metaphoric (Level V) which corresponds with that in the problem at hand. From some of these relations (Level V) in the metaphor which are not immediately accessible in the problem there may arise suggestions for its structure. These may be properly explored in an endeavour to elucidate the problem and maybe they turn out to be useful. There remain, however, the *unused* relations in the metaphoric and, I suggest, tentatively, the abandonment of these needs be explained. This may well curtail the too facile adoption of selected parts of the metaphoric and impose such a discipline that more care is taken in this technique of ideation. A simple example: let us say that in describing a system our observer decides to adopt a simple linear equation as an explanatory model. Let us say that it is a classical cybernetic system with negative feedback such as is widely used in many fields. Consider then that what has been adopted provides a credible 'explanation' of the phenomena under observation. We know however that even simple linear systems can behave in 'strange' ways when they are driven far from equilibrium (e.g. [2]). Typically, our observer will not consider such eccentricities when using his systems model in everyday situations (e.g. in an operational research project). If he is not quizzed on what might happen in situations far from equilibrium, he may well fail to observe the instabilities in the problem situation and make recommendations for action which may result in the problem situation being thrust into chaos. A similar example, so often ignored by financial analysts and those in the prediction business, is that of a system with feedback which, though signed negatively and so intended to reduce fluctuation, is so delayed that it amplifies rather than reduces it [1]. These two examples are to be seen every day where cybernetic models (metaphors) are incompletely adopted. More rigorous use of metaphor, 'warts and all', could provide cautionary warnings.

Kinston has, I believe, made in this paper a major contribution to the realisation of the objectives of your journal—the facilitation of a 'multi'-disciplinary focus for the exchange of new ideas (Level V from one discipline to Level I in another). My small contribution suggests that when that exchange takes place the whole package should be transported to be used or abandoned but with explanation.

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# Reply

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DR ROBB has commented positively and perceptively on the framework I have offered to account for knowledge production, that is to say the structuring of representations of the world [4]. I appreciate and agree with the specific points he makes and would like to add to them.

*Relations as the system of knowledge*

I must hasten to emphasize that I am not the first to insist on the extraordinary significance of relations. Many philosophers from varied traditions, e.g. Spinoza, Husserl, Wittgenstein, have noted this peculiarity of knowledge. More recently leading scientists deeply concerned with human functioning have come to a similar conclusion, e.g. systems researchers like Foerster [3], psychologists like Piaget [9], anthropologists like Bateson [1] and psychoanalysts like Matte-Blanco [7]. The discovery that objects, events, sensations, ideas are not primitive experiences but representations of relations generates an 'aha' experience. My particular contribution was to place relations within a theoretical framework in which both objective experiences, such as objects or events, and subjective experiences, such as ideas and value, could be seen as building blocks of a relation.

However a further consequence of the framework offered is that for a product at levels I–IV to be considered itself as an item of knowledge, it must be regarded as a relation in its own right ($I_V$, $II_V$, $III_V$ or $IV_V$). This is part of the inherent nature of the framework and would need to be explicitly clarified in any theory attempting to explain the framework. Robb has correctly noted this peculiar phenomenon in two particular cases: first the use of relations as building blocks of meta-systems; and second, the transfer of ideas across knowledge systems.

*Exchange of ideas across knowledge systems: Robb's cases*

From a practical point of view there are three different varieties of exchange to be considered. The easiest and usual case, described by Robb, is when a Level V relatable can be used as a Level I concept in a meta-system. This frequently applies in one's own work. However most researchers usually cover no more than two adjacent hierarchies (i.e. the system and the meta-system) and will be disinclined to study in detail the system below their system of interest or the system above their meta-system. More difficult problems arise in the second and third varieties of knowledge transfer. In the second case, also described by Robb, relatables (knowledge) might be usefully moved from one knowledge system X, to another knowledge system Y, X and Y being sharply different and with no hierarchical linkage. Moving a concept from one discipline or domain to another like this is becoming common in the social sciences, and all too often it gives the appearance but not the substance of new knowledge. Robb is correct when he emphasizes that the transport of knowledge across disciplines requires, or will be substantially benefited by, precise analysis and explanation.

*Exchange of ideas across knowledge systems: an additional variety*

There is a third variety of knowledge transfer which is not explicitly addressed by Robb, but deserves mentioning as it contributes to the theory of representation. Here, relatables are usefully moved from one knowledge system A to another knowledge system A′ *which purports to represent a similar portion of reality as A*. This case requires some brief explanation. The five-level system of representation exists with two higher hierarchical levels which complete a whole framework for the practical design of inquiry. These levels were alluded to but not developed in the original paper [4], and have been described in more detail elsewhere [6]. Level 6 is the level which indicates exactly how, in practice, the five-level system is to be worked with as a whole. In other words, this level constitutes an 'inquiring system' as defined by Churchman as it is 'the guarantor of the validity of the results of man's attempt to gain knowledge' [2, p. 274]. Churchman's inquiring systems also form a five-level hierarchy; and the practical usefulness of his analysis has been demonstrated [5, 8].

The important implication of the above is that a given real world domain when studied using different inquiring systems will produce different concepts, different data and different knowledge based on these and on different criteria for confidence in the truth or certainty of the results. Movement of knowledge between scientists using different inquiring systems is possible and highly desirable because the inquiring systems serve differing purposes, all of them important. Unfortunately, investigators working within one inquiry system often actively reject, ignore and invalidate knowledge generated from another [5, 8]: e.g. it took 50 years after Freud's discovery of ambivalence for researchers in child psychology to conclude, independently, that their bipolar questions were invalid and that it was essential to allow the child simultaneously to hate and to love someone or something.

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