

A (Cybernetic) Musing: Certain Propositions Concerning Prepositions

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Knowing Prepositions

In this column, I explore the subtle distinction created in English by the choice of preposition. The choice of preposition can make a remarkable difference to the understanding of a word, creating great variety. Such distinctions (one example I cite is between *models_of* and *models_for*) give great power to concepts, especially in terms of associated intention. Thus, I distinguish systems with an *observer_of* from those with an *observer_in*, arguing that the first are first order cybernetic systems, the second, second order.

I then develop in more detail a new prepositional distinction, between *knowledge_of* and *knowledge_for*, exploring the differences in intentionality and world view. Although this is only a beginning, its relevance and importance is argued and an example is given.

Background

When I was an architecture student my teachers regularly invited me to make a sketch model of what I wanted to do. I couldn't understand what my teachers meant. Surely a model was made when you finished the process of designing, in order to illustrate (albeit in some somewhat abstracted and idealised way) the design you'd made? How could you have a sketch model? Was this not a contradiction in terms?

Anyone who has worked in an architecture or design school will be familiar with this response to the request to make a sketch model. I was not unique in failing to understand, though I was in a small and rather unperceptive minority.

Many years later, and still not understanding what was going on with models, I was working with Gerard de Zeeuw at the University of Amsterdam. We had a very large grant to look into aspects of social improvement: essentially a design exercise. De Zeeuw talked about two types of models: *models_of*, and *models_for*. At last, the penny dropped and I understood. Of course, a model doesn't have to be of something: it can be for the purpose of discovering. *Models_of* are models that describe the world as we have made, or find, it; *models_for*, purposive and therefore essentially cybernetic, are intended to allow us to act on that world, to find something out, to see what would happen if....

Since then, I have come across many people who work with models: sometimes as sketches, sometimes to illustrate final products, and sometimes as products

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themselves—that is, in many different ways. This difference can, I think, be captured by the sort of prepositional proposition that de Zeeuw was making use of in his distinction between models_of and models_for.²

Design Research

In design research, a frequently quoted “prepositional” distinction was made in the early 1990s by Christopher Frayling, rector of the Royal College of Arts in London. He talked of three types of design research: *research into* design; *research through* design; and *research for* design. What might these three be?

Frayling himself seems to remain vague. There has been lively debate on what he did, did not, or might have said (is verbal conditionality as potentially rich as the use of prepositions?), especially around the year 2000 on the Ph.D. by Design list, summarised and interpreted in a long response by Friedman.³ Frayling’s original paper, and several since, use different terms (or possibly develop the original ones). I will therefore simply give my interpretation here.

Research into design is precisely that: research into the activity of designing. (Remember, in contemporary English, *design* and *research* are both a noun and a verb.) What happens as we undertake design activity? Note how I place this separately from research into designed objects, such as aesthetics, history, cultural studies etc. Many would actually reverse this position.

Research through design is research in which methods of design are used. I have argued, briefly in this column (and more extensively in, e.g., Glanville, 1999) that research (with which I often bundle experiment) is a design activity. Research through design is research which explicitly takes on board the nature of design, which is to say research that recognises its source in design, and which uses the insights and understandings of design in its pursuit. These understandings are difficult to formulate: but that, I argue, is part of how design works.

Finally there is research for design. I take this to be research into the conditions for design to take place, into facilitating the successful occurrence of design activity. Under what conditions do we encourage and support design? Where can a design approach be undertaken, and how can we keep this possibility open and available. The simple choice of preposition used by Frayling radically transforms the approach to and focus of research to be undertaken.

2. I have been unable to find a clear statement in de Zeeuw’s extensive publications concerning models_of and models_for, even with his help. My reference is, therefore: de Zeeuw, personal communication, 1984.

3. Frayling’s usage both in and following this paper (Frayling, 1993) has not been entirely consistent, and many consider it to be a distraction. Friedman, in a web discussion (Friedman, 2000) claimed that Frayling was, himself, rather irritated by this distinction. My point is, however, not that the distinction is correct, but that it is an example of the use of prepositions to radically modify intentions.

Cybernetics: the *observer_in* and the *observer_of*

In cybernetics itself there is an equally impressive and perhaps even more significant example.

From our current moment in time, we can look back over cybernetics with a new lens and a new clarity. (First order) cybernetics was concerned with circular causal and feedback mechanisms in biological and social systems (Macy conferences), or control and communication in the animal and the machine (Wiener's eponymous book).⁴ As we know, Wiener's characterisation involved feedback, a synonym for circular causality. Feedback involves an observer sending back observations of performance of the active agent to that active agent so that the active agent can adapt its behaviour to better achieve some end (goal). So, in cybernetic systems, there is necessarily an observer that is actively involved in the system. That is, there is an *observer_in* the system.

However, in first order cybernetics (as in classical science), there is another, and quite different observer. This is the *observer_of* the system, who stands outside the system. This observer "touches the system lightly", being presumed to have no noticeable effect on its behaviour. Relatively recent research, leading to Chaos Theory, shows us that even that which touches lightly may have a vast effect—the flap of a butterfly's wing producing the tidal wave the other side of the world. But we will not consider this here.

So there are two distinct observers: the *observer_in* the system, and the more traditional, older (and more scientific) *observer_of* the system. The *observer_in* the system is the cybernetic observer. The *observer_of* the system is the scientific observer.

The choice of preposition shows us the origins of second order cybernetics in a simple light, and demonstrates the need, in order to maintain logical consistency, to change the way we observe cybernetic systems from acting as an *observer_of* to acting as an *observer_in* the system. Put in more familiar terms, we should convert our cybernetics from being of observed systems to being of observing systems as per von Foerster's (1975) differentiation, distinguishing the cybernetics of the observed system (the *observer_of*) from the cybernetics of the observing system (the *observer_in*).

The *observer_in* the system is the central and critical cybernetic observer: without this observer, there would be no feedback and so no control, and no circular causal and feedback mechanism, and so no communication. The *observer_in* the system makes the system cybernetic. Given this understanding, it may seem odd that cybernetics for

4. The Macy conferences took place between 1946 and 1952 (with an initial meeting in 1942). As was the tradition with conferences funded by the Josiah Macy, Jr. Foundation, there were no proceedings. The arrival of Heinz von Foerster in 1948, judged to be of like mind but with abominable English changed this. Margaret Mead suggested he should edit proceedings (von Foerster 1948–52) in order to learn English, and von Foerster suggested adding the prefix "Cybernetics" to the original title (Circular Causal and Feedback Mechanisms in Biological and Social Systems), because von Foerster found this title incomprehensible. Wiener, whose book had just been published (Wiener, 1948) was deeply touched and there was unanimous concurrence. The Macy proceedings have recently been republished, with commentaries, under the editorship of Claus Pias.

so long acted through understandings deriving from and modelled on the *observer_of*. Under these circumstances, what we have come to call second order cybernetics can be seen to be a (self-) consistent approach, whereas the original cybernetics is built on an inconsistency in the treatment of the observer. And, although this is not quite the detailed argument of Margaret Mead's 1968 paper "Cybernetics of Cybernetics," in which she argues for cybernetics to be studied as a cybernetic system, it falls nevertheless within the spirit of her critique.

Thus, it would appear that second order cybernetics is not the next step in a sequence. Rather, it's what cybernetics is and should always have been.^{5, 6} First order cybernetics, in this light, is compromised (although it often works well enough), a tentative half-step without quite the courage of its convictions. I am perhaps as surprised at this understanding as anyone else.

The observer_in

Yet this understanding of the two observers, the *observer_of* and the *observer_in*, and particularly the *observer_in*, is not unique to cybernetics. Indeed, it has long been clear in other fields that the question of the observer's involvement is a major issue. We have argued at length over which observer should we favour. This is an inherent problem in situations where we hope to involve other humans in actions (usually to improve some situation). Indeed, it is tempting to say that in any action based area we are dealing with observers in rather than of. Perhaps no field is more action based and concerned with humans than psychotherapy, which would undermine the *observer_of* of Freud's practice and support, rather, Bateson and Ruesch's position (1951) that mental illness is a social disease into which the therapist must enter to join his/her patient. Freud's therapist is an *observer_of*, Bateson and Ruesch's an *observer_in*. Frankl's observer is even more an *observer_in*.⁷

Such fields include all the social and health sciences, welfare, philosophy, psychology, the humanities, the arts, and architecture and design. I have been known to argue, when pushed, that the *observer_in* is the general case, but I will not sideline us with that, here.

Knowing Knowledge

The essential cybernetic distinction between the *observer_of* and the *observer_in* can be seen to affect our notion of the product of our learning. As has been noted, the

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5. People from other fields come to me nowadays and say that (second order) cybernetics is the only way they can see that might get us out of the imploding morass left as post-modernism disintegrates. Maybe the disappearance, commented on by many, of (first order) cybernetics in the late 1960s could be seen as the cleansing that was needed for the new and more consistent view to take to the field.
 6. According to Gordon Pask (as told to me and as reported in "Dark Hero of the Information Age" (Conway & Siegelman, 2004), Wiener always understood that there was another step to be taken in the forming of cybernetics. However, Wiener recognised that he could not see what this step was.
 7. I have in mind that most moving of all accounts of life in the concentration camps, where Frankl (2004) discusses how the inmates managed in spite of having no material basis to continue living, to live, through his own rationalisation of his own experience as an *observer_in* these camps (he was held in concentration camps for 3 years).

observer_in is involved, whereas the observer_of touches lightly, so that the connection, the involvement, is minimal. This mitigates, in the case that the observer is an observer_in, against the concept of knowledge—in the sense that we understand knowledge to be something that exists apart and independent from us (in some MIR, or Mind Independent Reality). Where the observer is involved (or the knower does the knowing), the appropriate term is not knowledge. It is knowing. In second order cybernetics, we do not produce knowledge, but rather knowing, that is, there is always an agent who knows. Knowledge, having an existence separate from the knower, is not part of the currency of second order cybernetics. Knowing is, and normally I would prefer to use that word. Translating observer to knower, this is the consequence when we have a knower in (who might have knowing), rather than a knower of (who might have knowledge).

knowledge_of and knowledge_for

This leads us into another prepositional distinction: that between *knowledge_of* and *knowledge_for*. Clearly, this distinction is based on de Zeeuw's distinction between models_of and models_for.

This distinction was developed during the last year (the first public airing was in a keynote address at the conference “The Unthinkable Doctorate” held in Brussels, April 14 to 17, 2005) in order to clarify different types of research that lead to different types of knowledge (or, more accurately in light of the above, knowing), specially in connection with design.

The point of the distinction is this. Research, as generally conceived, has become an activity concerned with the status quo. In general, it is focussed on increasing our knowledge_of what is. Research is taken, in this understanding, to reveal hidden truths about a world that exists independently of us (a MIR) as we act as observers touching the world lightly; which we come to see clearly as constituted (ideally) of a number of laws of nature. This is at the centre of our science. There are many variants on the wording I have used, but I believe this description is recognisable as being in the right the ball park.

As we discover the nature of this world, we look to use our knowledge to shape it more to our taste: we act to change the world. However, the knowledge we have so carefully gained is not designed to facilitate such change: it tells us what is, not how to change it. For that we have a different approach, which we frequently call technology. Technology is science's doing arm, converting knowledge_of what is into actions for change: it is transfer knowledge. We act as though knowing what is helps us to change, and the more knowledge we have the better we are at creating change: but it's not at all sure that its this straightforward.⁸

8. This view, that there is no necessary connection between knowing and acting, is well enough known. In my case, I first heard it from a fellow student, John Frazer, who has since become the father of generative and evolutionary architecture.

Summarising, we make knowledge_of the world which we assume exists independently of us (as a MIR) and, having acquired this knowledge, we attempt to use it to create the changes we desire through the technologies we make: that is, to improve the world.

This sort of knowledge (knowledge_of) is not intended to facilitate action. As we in the West have developed it, there is no cognisant, purposive agent that participates in the creation of this knowledge.⁹ knowledge_of is, therefore, quite naturally often very difficult to use. It is not intended for action, is without intention and does not accommodate the presence of an actor to effect whatever action is intended.

For such purposes, another type of knowledge seems necessary—a knowledge_for (action).¹⁰ This is knowledge that has purpose (action, usually meaning we hope to introduce a change that leads to some improvement); and allows an actor to carry out this action. The intentions in making this knowledge are quite different from those involved in making the more traditionally scientific knowledge_of.

Knowledge_for, is the knowledge needed by those whose function is to act rather than to describe. These include architects and designers, social workers, researchers, psychotherapists, military strategists and so on. It necessarily performs in a manner quite distinct from traditional scientific knowledge. Our failure to acknowledge this has led us, it would seem, to carry out a lot of knowledge-making activities that are actually structured in such a manner as to prevent the knowledge thus made from helping us in acting. This has led to the creation of a special type of knowledge that translates knowledge_of into action. What I am proposing here is a type of knowledge that does not need two steps as in knowledge_of transformed by transfer knowledge, but is so constructed that it simply supports action: knowledge_for. This is the knowledge that action takers acquire, often almost unconsciously and subliminally, and which constitutes a significant and central element of their expertise. It is closely related to other forms of knowledge that I mention below.

An Example

In order to make my point less abstractly, let me cite (with agreement) a case.

Dominique Hes, a doctoral student I worked with, had been awarded a scholarship in the Centre for Design at the Royal Melbourne Institute of Technology University (RMIT). Dr. Hes's knowledge when she started her Ph.D. was constructed as what I now call knowledge_of, whereas what she needed was knowledge_for. Arriving with privileged access to a life cycle assessment software package, her project was to encourage architects to design with this package. Finding major barriers in accessing

9. Purpose (teleology) is at the heart of cybernetics. In their early proto-cybernetic paper, Rosenblueth, Wiener and Bigelow (1943) indicate the importance of purpose and intention—which had been ruled out of scientific discourse for some centuries. In many ways, the bravest of the conceptual steps that were taken in the progress towards cybernetics was to include intention and, therefore, the observer.

10. I am aware that this change in preposition works in English but not necessarily in other languages. For instance, in Dutch and Flemish, the translation of both prepositions, of and for, can be the same word: *voor*.

designers just to discuss the project, she determined that it was her lack of understanding of design that was the major problem. We proposed she attend a one week introductory landscape architecture course run by RMIT for potential undergraduates considering applying for a place, to get at least a beginner's feel for design. She reported it was the best week she had ever had, and began to understand that you couldn't just force architects to use assessment software because not only was the whole style of the package totally alien to the way that designers think and work, but also it was unhelpful in that the resulting assessment gave scarcely a hint of how to improve the life cycle performance of the architectural design project.¹¹

Recognising this shortcoming, we decided to lease Dr. Hes to architects' offices that had shown a concern for environmental considerations in a current design. Over a period of time she began to speak the language of architects and architecture, even adding to drawings. The result was that she was able to re-form what has previously been her *knowledge_of* into *knowledge_for*. This was not, I argue, a (technological) translation using transform knowledge from *knowledge_of* to *knowledge_for*: it was far too fluent and unitary for that. What Dr. Hes did was to make *knowledge_for* in place of *knowledge_of*. And the proprietary software package was not mentioned again, for, being *knowledge_of*, it was unusable.

An eventual outcome of this tactic was a building that was both decent architecture and uses 73kwh/m² rather than the (Australian) normal of 250kwh/m², while also saving 72% of water used by standard buildings in the same organisation.

What has been called *knowledge_for* is not without precedent. When I first named it I was aware of subjects that are solidly based in approaches that are at least close, including (as well as design) Andragology and Praxiology. But there are also ways of trying to deal with a division in knowledge that somehow reflects this division, including (from design) Donald Schön's reflective practice (1983) and Michael Polyani's tacit knowledge (1967). It is clearly the sort of the knowledge that is at the heart of what the Masters students my colleagues Leon van Schaik, Sand Hessel, and I have been working with at RMIT, which has recently been given a more general account in van Schaik (2005). There are developments in other fields: Gibbon et al's (1994), mode 1 and mode 2 learning from management for instance. I am collecting further suggestions from the Ph.D. in Design list (one example is declarative versus procedural knowledge), where *knowledge_of* and *knowledge_for* is at the time of writing a hot topic.

What I am proposing in distinguishing these two types of knowledge is a considerable Research Programme that would, incidentally, justify a research more

11. Essentially, such packages calculate how much environmental impact a proposed building will have over its entire life—from the production of the materials, their transport, the use of the building (energy, water, paper, waste, etc.) and its disposal or refurbishment at the end of life. This allows the architect to play with the results to try to minimise the environmental impact of a design, but gives little direction as to the nature of these changes. Although experience improves things, in general all the help being given the designer is to be told "You are using too much." (Using the right amount, or less, is rare!) In effect, the architect goes back to rework a scheme, being told time and again that they are wrong, (their proposed building makes too great an impact). The *knowledge_of* used in the creation of the package tells us what will be, not what to do about it.

relevant to areas such as design. It would need to look at strategies for creating knowledge_for. At the moment the distinction between these two (complementary) types of knowledge is not properly explored. Such exploration will include considerations of the inevitable Greek contribution (e.g., Aristotle's *Episteme*, *Techne* and *Phronesis*; those cybernetic staples, Piaget's learning principles, von Glasersfeld's constructivist learning, Maturana and Varela's views on knowledge, and, of course, Pask's learning systems; as well as some relative recent philosophical considerations such as Dewey's and Heidegger's.) I am, naturally, interested in all suggestions, and hope to return to this topic to explore the difference at a later date. For the moment, at least it seems like a framework within which we can better enquire—and build understandings of this distinction.

Conclusion

The change in preposition has allowed a new distinction of some power. For me as a professional teacher of design, the difference, under-explored and uninformed as it may currently be, has been valuable and opens up a new way of looking at design (and the relation of design knowledge to second order cybernetics), as well as other areas, developing a completely new area of investigation and delight. A prepositional distinction can help us better understand the difference between (and connectedness of) second and first order cybernetics. I have tried particularly to show the power of prepositional shifts and to explore one example, most close to areas of professional concern at the moment, design.

I end with a quote. In 1953, Susanne Langer wrote about different kinds of knowledge, using prepositions to distinguish between knowledge_of and knowledge_about, thus:

We have two kinds of knowledge, which may be called respectively knowledge of things, and knowledge about them. The former is that direct intimacy which our senses give us, the look and smell and feel of a thing – the sort of knowledge a baby has of its own bed, its mother's breast, its usual view of ceiling and window and wall. It knows these objects just as it knows hunger or toothache; it has what Bertrand Russell has called 'knowledge by acquaintance' of certain things, a most direct and sensuous knowledge. Yet the baby cannot be said to know anything about beds, food, houses, or toothaches. To know anything about an object is to know how it is related to its surroundings, how it is made up, how it functions, etc., in short, to know what sort of thing it is. To have knowledge about it we must know more than the direct sensuous quality of 'this stuff'; we must know what particular shape the stuff is taking in the case of this thing. A child may know the taste and feeling of a scrambled egg, without knowing that it is an egg which has been scrambled; in that case, he will not associate it with a boiled egg or an omelette. He does not know that these are different forms of the same thing. Neither does he know that in its raw, fresh, natural state the egg is a pristine form of chicken, and by more distant relationship an incipient chicken-dinner. (Langer, 1967, pp. 22-23)

I cite this quote not only to show that distinctions made through the use of different prepositions is an old tradition: after all, it's something we learn about in grammar. But also to highlight the appropriateness of this sort of distinction in relation to

knowledge in a manner rather different to that which I argued above. I don't see these as competition, but as complements. All that I have written above shows the power of the preposition, in English, in forming intentions in language use. We need both to be careful and visionary—visionary because a change in preposition can lead to a radical change in understandings of how we might construct our worlds, perhaps in a manner that will surprise and even shock us into new insights. This is a potentially very powerful device.

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