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An Observing Science

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"Nothing is real beyond imaginative patterns men make of reality"—William Blake

Abstract

In this paper I make the arguments that I see supporting a view of how we can come to know the world we live in.

I start from a position in second order cybernetics which turns out to be a Radical Constructivist position. This position is essentially epistemological, and much of this paper is concerned with the act of knowing, crucial when we try to develop an understanding of what we mean when we discuss a field of knowing (knowledge), which is at the root of science.

The argument follows a path in which I discuss the essential role of the observer in observing, the creation of constancies between different observings and their exteriorisation as objects which are then represented and used in communication with and between other observers, each unique (and therefore each observing in its own way). This leads to the assertion that the qualities we associate with the objects of our universes are attributions, rather than properties inherent in the objects themselves.

At each step in the argument I explore consequences for how we understand the world, in particular through science. I show limitations, new insights and understandings, and re-evaluate what we can expect to gain from science. One change is the shift from noun to verb in the consideration of processes—for instance, the study of living rather than life.

In this way, I intend to show not only that Radical Constructivism is sensible, but that it does not preclude us having a science. In contrast, it can enrich science by taking on board the sensible.

In the process, which science is seen to be the more basic is challenged.

Keywords:

Second-order cybernetics, observing (observed, observed), circularity, (individual) experience, science, construct, constancy/pattern, attribute/qualities

-1 Prelude

There is a composer who lives in New York called LaMonte Young. He is recognised to be the father of minimalism. On a recent visit I joined in a piece of his (and his partner Marian Zazeela), “Dream House”, that has been being played continuously for over seven years. The musical element consists of a complex chord made of frequencies that are defined by prime numbers. This extraordinary chord is generated on a computer, and has, it is claimed, not been changed in all the time the piece has been playing.

The piece is played in an apartment on the third floor of a building in TriBeCa. As you walk around the space, the sound you hear changes, although the generated sound is said not to. The explanation science gives us is that this is due to standing waves, and also to the effect we have on the sound environment as both reflectors and absorbers. It is also due to the interaction of the sound waves, producing beat frequencies—that is, pitches that are not generated by the computer acting as a sound source, but rather at each particular point in space.

However, I found that, even when I lay on the floor, as still as could be, without breathing, and with no one else present to change the sound, what I heard kept changing. I discovered I could even adjust what I heard by focusing my concentration and listening the pitches up or down.

Yet all the time, I was told, the computer was (at least assumed to be) giving out the same instructions leading to the production of the same frequencies of air pressure waves (which I choose to call sound).

The question that inescapably persisted in my mind was what did I hear? What is the basis for believing that the sound was unchanging? How can I know the computer did not change the sound?ⁱⁱ What was I hearing? What was it when it changed?

In this paper I argue that, in effect, what I call the pressures which made sounds was all my construction. There was nothing I experienced that was not my experience for which I was responsible.

It is in that quandary and understanding that LaMonte Young’s and Marian Zazuela’s “Dream House” is so extraordinary, so remarkable, so life changing.ⁱⁱⁱ

0 Introduction

There are several reasons given for developing theories (or hypotheses).

Conventional wisdom tells us that theory both explains and predicts. It gains some value (some truth) from its ability to predict, because it demonstrates through prediction a concurrence and congruence with reality. Science, in this view, provides us with a good match. It is testable. The vocation and task of the scientist is to propose explanations of observations that provide good predictions because they can be presumed to make a good

match with reality—and then to test these to failure (Popper 1969). Testing is what converts a hypothesis to a theory.

Nor does science shrink from examining, and testing to (a presumed eventual) destruction, some at least of the assumptions it makes. Such assumptions as concurrence and congruence with reality may thus come in for examination, as may the current (although admittedly changing) understandings of observation and knowledge, and the question of whether we predict or shape our futures. It is these notions—observation, prediction and reality—that I examine in this paper from a position that turns out, having come from the understandings of second order cybernetics, to be that of the Radical Constructivist.

There is, however, another reason for our wish to build theories, less often considered, but I believe of equal importance especially to us as creators of theory. This reason belongs to World 3 of Popper's taxonomy (Popper 1972), which gives it—in Popper's terms—the status of being a constituent of reality (in this paper, I will be reconsidering the notion of reality). Facing the (possibly terrifying) world we find ourselves in, we may feel some degree of comfort when we have a theory. We no longer live in the darkness (we have seen a great light, as the Bible says), we can understand, we are no longer afraid. There is logic and there is reason. From our explanations we gain some degree of control over the universe—or at least our interaction with it. We can learn to accept what happens to us. These explanations help us accept our lot as human beings: often they may be more to do with the transcendent than the verifiable.

Thus, the position I take is in agreement with Peter Medawar in his simple, yet profound and moving “The Limits of Science” (Medawar 1984) when he says: “...I believe that the acceptability of transcendent answers must be valued by the degree to which they bring peace of mind...”.

Science (as most areas we deal with) is to some extent defined by its imponderables. In some ways, its assumptions (in certain cases, the axioms) are (either necessarily, or taken to be) imponderables. The transcendent answers (to transcendent questions) both define the area in which science may legitimately operate—the area of the ponderable—and aspects of its method of working: to consider whether a question's imponderability is in principle, or is because we have not yet found how to ponder it.

Consider the areas of what Medawar calls the transcendent helps us define science. It is, indeed, part of the method of science.

This paper is derived and expanded from the paper “as is and as if”, presented to the conference (mainly of artists) “Invenção—Thinking the New Millennium” held in São Paulo, Brazil, in August 1999.^{iv, v} That original text focused on both the power of simulation and the basis for our belief in simulation, a matter of prime concern to experimental electronic artists working, often virtually, today. Science may also be understood, of course, to be a simulation of a real world. So this new paper starts from the same position: that there is something to be understood in the matter of simulation, particularly in an age in which we place such faith in our simulations—as we do—especially their ability to emulate the future.^{vi} (For instance, it is apparently now quite common for pilots transferring from flying one kind of airliner to another to learn to fly a new aircraft exclusively on a simulator, and never to

Simulations are, essentially, concerned with experience. That is, the value of a simulation is that it can create similar—eventually so similar they even may be taken to be identical—experiences to the experiences we have of “the ‘real’ thing”. Therefore, in this paper I consider experience. I argue that we cannot know or observe the world except through our experience of participating in the knowing and the observing. So I reflect on what we can understand when we start from this position. (This is in distinction to the approach of writers about simulation such as Baudrillard (1981/1994), who are more concerned with the phenomenon itself.) So I am concerned with how we can understand observing and knowing when treated as active experiences, and how this understanding can inform our epistemology, especially in reference to the concept of reality. This is an epistemological investigation.

Science is (and must be) intimately and interactively married with epistemology, both generating epistemological insights and being, itself, formed by them. The foundations of science, which may be difficult to pin down without some measure of inconsistency (this paper explains how a process of exteriorisation can lead to inconsistencies), are epistemological statements. I suggest, in the italicised text at the end of each section, how an epistemology deriving from, involving and accepting the presence of the observer and the knower, can beneficially modify and in some cases explain/accommodate certain otherwise difficult and/or challenging current scientific understandings. My hope in doing this is that science becomes stronger, cleaner and clearer: clearer in that it accepts more happily its limits, be they limits in science itself or limits to do with our willingness to make certain claims for science (to refer, once again, to Medawar 1984).

In this paper I examine observation and reality, preferring to consider them, to use a grammatical distinction, as verbs rather than nouns—and thus talk of “observing” instead of observation. I insist that there can be no observing without an observer. We are involved in (what I will refer to by the shorthand term of) “a world” in which we act (in the Constructivist’s view, we construct): which acting needs the acting agent—hence our involvement. Thinking, constructing, observing, generalising, finding constancies, etc. are all ways of acting: they are “verbs”.

This position, that we work in a world of acting (of verbs), requiring actors as subjects of the verb, is a position that is slowly permeating science: what I hope this paper offers is a better understanding of the consequences of this transformation-through-permeation. Thus, for instance, in physics, the Indeterminacy Principle tells us of the influence of the observer, and the current shift to consider at least particle physics as a form of poetry, tells us more of this. The equivalent shift, in biology, from studying life as-noun to living as-verb (which is, in effect, what the autopoiesis model indicates)^{vii} has a similar consequence: we live living. The impossibility of avoiding the influence of the observer as an active participant in social systems has been seen as a weakness of those areas, qua science. Now that the observer’s involvement is seen as necessary (and desirable), it is ironic that of all areas of science it is often the social sciences that are most dogmatic in their insistence on following what now appear to be the pseudo-objective conventions of older understandings.

Recent studies in how scientists express themselves show a marked move both towards including the author (use of the first person), and towards understanding the accounts of science as being highly political rather than coldly objective (for a summary of and entry to

these studies see Glanville, Sengupta and Forey, 1998). My intention is to help us understand how the inclusion of the active observer, with all those opinions and intentions that we formerly dismissed as subjective—in contrast to the truth of the objective (which we surely cannot seriously any longer believe we can attain)—changes certain assumptions and understandings, and some of what these changes imply, affect and effect. In this, I am facing what we have thought were imponderables, shifting the line defining transcendence. It is I who does this.

Science is, I believe, shifting, seemingly inevitably, towards a Radically Constructivist position. But the consequences of such a position are not so well explored in science, and may appear alarming. I hope that this paper may alleviate some of this.

So, my hope is that my contribution to the debate over the relationship of Radical Constructivism and Science, and what (and how) Radical Constructivism might offer science, is the following. In the first instance, to show that Radical Constructivism and science can co-exist, and that science benefits from this because it no longer has to exclude the observer, a slight of hand that is both dishonest and becoming harder to sustain. And, secondly, that a Radical Constructivist generated epistemological position is capable of enlightening science by making it better, rather than by taking away from it.

If the first does not hold (and Radical Constructivism and Science cannot co-exist) then we have an enormous problem in science, and there is no point in further debates in this journal about the benefits Radical Constructivism can bring to science.

And if the second does not hold, then the synergetic benefits of working together that might be hoped for are frustrated, and we have good reason to feel deeply disappointed.

What I undertake in this paper is to clear the ground in order that the debate, concerning the particular contributions science and Radical Constructivism may make to each other, may be pursued.

1 From Where I Am Now

I write as a cybernetician who has found himself to be a Radical Constructivist.

Cyberneticians have reminded us that there is no observation without an observer, and taught us how to handle the consequent circularity (Maturana, Varela and Uribe 1972/1974/1991, von Foerster 1973, 1975/1995, von Glasersfeld 1987, 1990/1991, Glanville 1975, 1987, 1999d, Pask 1975).^{viii} Although it may sound obvious that there is no observation without an observer, science has, for a long time, liked to pretend otherwise. Viewed from this point-of-view, to pretend otherwise is profoundly dishonest.

For me, I am the observer, and I am always present in my observing. There is no escape from that (i.e. that I do the observing) which would allow me to observe a world made of things independent of my observing.^{ix}

The act of observing involves a circularity. Being based in observing, for there to be an I to do the observing, I must observe myself. Yet there is no observing without the I to do it: so

think of as “it”, the observing is between the I and the it, making of the act of observing a whole that includes the I and the it within (Glanville 1990, 1997b).

I can only write of the world I inhabit (of my world) from where I am now. I cannot return myself to a previous state—to how and who I was. All I can do is remember (reconstruct), and that I do both from where I am now, and at this particular moment. But I have come to believe there was a time and there was a person (or perhaps a proto-person) who existed before the times I can remember and talk about. In talking about this, I speak from where I am now. This presents a difficulty similar to that of talking about the Big Bang, and what went before it.

Thus, I, observing the previous I, am not the I I was. In observing myself I change myself, for I include who I was within who I am, each who I am becoming who I was.

Nevertheless, I will try to venture, from where I am now, towards this proto-world.

The Constructivist (second-order cybernetic,^x) position assumes the explicit, necessary and unavoidable involvement of the observer in observing. In this paper I explore, from this position, a collection of consequences that constitute a theory (in terms of, for instance, Popper’s World 3). Thus, the phenomenon of the need to consider the observer in advanced investigation in physics can be seen as an expression of this theoretical position. Under these circumstances, the involvement of the observer is no longer an embarrassment. Systems in which the involvement of the observer has previously been an embarrassment and something to be mitigated, now become the general norm, rather than embarrassing exceptions.

But there are consequences. One side-effect of the observer-free account of what may be learnt in and through science is that it appears mechanical. No decisions are made: things just happen. This means that the observer (and scientist) bears no responsibility, nor does he cause what he observes. When the observer is included, this can no longer be so. We, observers, scientists, are responsible for what we observe, and for determining the conditions under which we observe. These choices are ethical. Even if we choose to assume a mechanistic approach and description, we must now understand that this is our choice.

Ethics is, as von Foerster has shown (1992), not really a matter for the judgement of others: it is personal, so it is our responsibility: as such, it is akin to our responsibility in observing. But there may be two guidelines that help. In his paper, von Foerster suggested that we should make the choice that which increases our options. And I have, in teaching design, for years argued the designer’s criterion—to give more than is asked for and to give back more than is taken away (The Principle of Generosity—Glanville 1991a, 1991b). These criteria might be adopted to help us evaluate which way to act, given that we are responsible.

2 Experience and Description

The painter Jackson Pollock said “I want to express my emotions, not to illustrate them”. He was talking of communicating, of sharing, of experience, rather than making a description of it (communicating, sharing, etc.). For Pollock, as for most recent artists, the work IS the experience, not a description.

This paper is written mainly in the first person, as the reader will already be aware. This is because, as I have shown, I write it: I am the observer. I can only write as me.

I take it that I experience what I have now come to call the world. My experience is the base on which I learn the world and in which I develop my understanding. My experience arrives in observing, in sensing^{xi}. Even when I am working from rational principles, this is an experience.

I cannot know my experience to be of anything. My experience just is. I experience. Just as with Pollock. I cannot sense the world I talk about without this experience, and the history of this experience leads me to talk from where I am now. My experience is primary, for me. It may correlate with something else, but this I cannot know, for I can never escape that it is my experience.

If this sounds “idealist”, it is not: I do not deny there may be an it which I experience. Only that I can never know whether there is such an it and what it might be, should it be, independent from my experiencing. I do not accept the conceivability of what Herbert Muller calls, so tellingly, a “Mind Independent Reality”.^{xii} Thus, regardless of the possibility of there being an it that my experience may relate to, all I have is my experience. Of it, if you want: but I do not, for that, even when only assumed as a linguistic convenience, is to half-assume and half-insist on the determinable (and independent) presence of an it.

So I cannot talk of a world that is outside or detached from my experience. What I have is my experience, and that is all I have, regardless of whether or not there is some world existing independently of that experience. (If so, does it experience itself? I cannot know.) Thus, my experience is not of anything. It is.

Consider a stream of experiences. Without pattern there is nothing, not even a stream or anything I might recognise as experience. To re-cognise, even to cognise, requires that I draw the distinction of pattern.^{xiii} Finding pattern is finding a way of reducing: two experiences become treated as if one (this is why pattern is the opposite of randomness—Chaitin 1975).^{xiv} But pattern is not found (even if I may occasionally slip up and say I have found it): a better expression is that it is made. Cognising is how I make experience, for it is what makes each experience I have an experience, and the stream a stream.^{xv} To identify and experience as an experience requires (re-)cognition.

Thus I have experiences with which I make patterns, as when a baby learns to recognise “Mum”, a pattern made by the baby in the baby’s experiences. I make constancy through and between my experiences, and the constancies I make I may come call objects, after Piaget’s use.^{xvi} (I realise that I am externalising in order to make these statements. Later, I deal with the matter of the translation of experience, via the making of constancies, into externalised objects. This is a circularity I cannot avoid.)

This is the basis of my construction of my world. It is based on (what I come to call) my sensations, which, as they occur, are my reality. The importance of this understanding of what my reality might be will become apparent later. In this context, reality is what I sense, as I sense it, when I’m being honest about it. How I sense it is open: I may, for instance, sense it through such prosthetics as instruments. And the senses I refer to in everyday life (the five senses) are constructed as constancies. So is their “five-ness”

To say that I construct my world is not at all to deny that there are others who construct theirs—indeed, it requires it—nor that there may be things that exist independently of my constructing (which I take to include my construction of what an other may want to tell me). It is only to say that my experience is my experience, and I cannot escape that. That everything I experience I experience as my experience, and that what I experience is that experience. Which is not that experience of.

My experience is always mine, and my experience is always experience.

(For those put off by the apparent circularity, it may help to keep in mind, as Wittgenstein showed us (1971), that all logical propositions are tautologies. Our arguments are based on and in tautology.)

Finding constancy, making pattern, is also a way of experiencing. Thus, I experience my experiences and from this experiencing I create pattern and thus constancy.

That I have created a constancy does not mean that constancy always must and will maintain (be constant). A new experience may not quite fit with the constancy I have made, being recognisable as appropriate, but also distinct and not fitting completely or comfortably. For example, finding discrepancies in how I experience being me in different situations, I often think of myself as several different people: which one do you choose to pursue? (Please do not confuse this with “Multiple Personality Disorder”.) The more I treat myself, or any other constancy, as an object external to (and as if independent from) my observing, the more likely this is to happen, for I have fixed the constancy to externalise and objectify it, whereas when I keep it internal I can modify and extend, and inconsistencies do not matter for inconsistency is a quality I apply in the externalised world.

The so-called Problem of Induction in science remains. A Constructivist position does not remove uncertainty over induction (or, as Wittgenstein (1971) effectively rephrased the problem, because something has always happened does not mean it always will: history does not provide a causal mechanism). As I understand it, this is similar to the position taken by Popper in “Objective Knowledge” (1972). The constancy I create is over my past observing. Having made some constancy between my observings does not mean that future observings that I would like to believe should fit that constancy will necessarily fit it (even when I “fix” it as an external object—see on).

The problem of induction may be considered through the concept of stability. One notion of stability is the ability to continue as at the moment—i.e. to be inductively predictable. Certainly, an inductively predictable system would normally be considered stable. But the notion of stability is intimately connected with notions of inside and outside, and hence with the involvement of the observer. When the observer is inside a system, as is the case in the second order cybernetic and Constructivist view, a stable (self-perpetuating, hence self-reproducing) system might appear to an external observer, i.e. one outside the system, to change in strange manners (see Glanville 1997a). That is to say, what is (taken to be) internally stable may appear, externally, dynamic or chaotic. The notion of internal stability is, of course, a construct of an (external) observer who is by definition outside the system and cannot see into it (hence: taken to be). The notion is, therefore, also of systems that must be assumed to be organisationally closed and circular in form. Under these circumstances, a

on some varying trajectory. The quality of stability is clearly constructed into the system. Consider, as an example, a manic depressive, whose behaviour is unpredictable and probably crazy to us on the outside at least in its timing, but who continues to maintain his or her self. One says that “Ken” is “up”, or “down”, but rarely that he is no longer “Ken”, even when we can find no pattern in his “upness” or “downness” other than that one follows the other, oscillatorily. “Ken” is, we hold, a stable entity with an unstable behaviour: internally, he continues to be while externally (in reference to the external reference, in this case “balance”) he (his behaviour) is chaotic. For a further exploration of inside and outside, in relation to stability, see Glanville 1997a.

Science has considered stability as an externally determined quality. The difficulty here is that it introduces a question: what is the system stable in reference to (what is its stability measured against)? What is the standard? Which leads to the recursive question of how we know the standard is stable—in reference to what is it stable? And so on. This can be interpreted as indicating that stability, as determined in a classical science with an external observer and an external referent, cannot itself be a stable concept (except in the very special case of a recursive function that approaches an eigen-value—see von Foerster 1976). On the other hand, a system may be considered stable if it can be assumed to continue to be through an internal process of self-reproduction by means of which process it is taken to maintain itself. Self-reproduction is, of course, essentially conservative. (So is an eigen-value.) In this sense, the process of the inclusion of the observer can be seen as making for a stable system, although that stability may be, when examined by an external observer, apparently wildly erratic and not at all stable. One expression of this is in Piaget’s notion of the conservation or constancy of objects (Piaget 1955, 1972). See also Greenfield (1999) and Glanville (1993c).

3 I and You^{xvii}

Amongst the constancies I construct, one that is of great importance to me is the self—my self—which allows me to create an I and to give my verbs a subject. The construction of the other (that I like to argue goes hand in hand with the construction of the I) allows me to talk as if there were an object (to the verb). Indeed, I argue that, in constructing the I, I must construct the other—and the means of constructing (distinguishing) (Glanville 1990)—and I must grant the other the same potentialities as I grant my self (The Law of Mutual Reciprocity). How we come to construct the I when there is no I (that is, before there is an I) to do this remains and must remain a mystery, beyond this sort of analysis (and beyond the I who talks from where I am now): we should not try to talk about that which we cannot talk about, as Wittgenstein reminds us (1971) and of which limit Medawar (1984) speaks so eloquently.^{xviii}

In this respect, the insights that develop from a (Radically) Constructivist point-of-view are akin to and extend those expressed by Feyerabend (1975), summarised in his adoption of the phrase “Anything goes!”. I take Feyerabend to indicate that there is a multiplicity of in principle equally acceptable interpretations that depend on the choices of those who interpret, in this case the observers. Since, in my view, each of us is different and each must therefore understand differently, Feyerabend’s position is not so much to grant permission as

to reflect (on) the unavoidable. It is not just that, in terms of a truth value, the mythological explanations of what was painted on ancient Greek vases (as Feyerabend indicated, for instance) are as good (and (un-)arbitrary) an explanation as those offered by modern science. It is more that every point-of-view has its own necessities, that is (to use a Cartesian characterisation of space) each point-of-view arises at a unique position and time, and has a particular outlook. It is that each outlook has uniqueness and therefore is unavoidable and, at a fundamental level, different and not generalisable. Thus, individual necessity being connected with individual point-of-view, or position, is also unique, and each individual has its own necessities, if we are to talk in any sense of need, intention or purpose. See also Pask's characterisation of an individual that can know, represent and learn, the p-individual, and Pask's characterisation of the p-individual's understanding of some topic (e.g. Pask 1976, Pask, Scott and Kallikourdis 1973).

4 Externalising and Objectifying

To talk of individual experience, of my experience and, by symmetrical implication (the Law of Mutual Reciprocity), of your experience may sound as though it would be virtually impossible to share experience. If that were so, this would indeed be an autistic world, a solipsist world.^{xix} But this is not what I come to believe through (my interpretation of) my experience.

We can share across our inescapable differences, when we understand that language is not a code, but a medium for negotiation. That communication is dialogical, that is it takes the form of a conversation. In a conversation we build our own experiences (of the experiences of others) while listening to the others describe their experiences. I will return to the act of representation necessary for this: I introduce it here because it helps in introducing the notion of objectification and externalisation.^{xx} (This notion of sharing is not of owning the same in common, but of constructing equivalents in each.)

When Piaget talks of the making of constancy between observations, he also talks of that which is constant, or conserved, which he calls an object. Thus, the child, in Piaget's account, works towards object constancy (see also note 16). E.g. Piaget 1955, 1972. Von Foerster (1976) modelled the recursive aspect of this process in his "Objects: Tokens for (eigen-) Behaviors", which, in the French version, had the revealing title "Formalisation de Certains Aspects de l'Equilibration de Structures Cognitives", while I modelled the notion of object constancy as "Objects" in my doctoral dissertation (Glanville 1975).

When we find that constancy is confirmed time after time, it is easy to ignore that we make this constancy, just as we sometimes ignore that we made the object from our experiences, our observations. Thus, we can easily come to believe that the constancy is in the object. But it is not. For us, we make the constancy, and we make the object—yet it seems we ignore, or, even worse, forget and eventually deny this.

Imagine, then, how easy it is when we believe we share experiences, to think that there is some common reference outside each of us, existing independently. That the experience is based in the exteriorised object (constancy) which, being now (incorrectly and

inappropriately) taken to exist (in its own right) independently of me, I can take to create the same experience in you as in me. And it seems I do this.

Thus, I believe, we choose to objectify our experience. That is, we talk not of our experience, but rather of our experience OF. We forget we make the constancy and hence find objects in our experiencing, objects we can share: and we treat these objects as if they were independent objects that exist separately, without us, in what we come to think of as the “real world” or “external reality”, made of objects that have properties and which we observe. We treat them as if they were as is. That is, we treat them as having an independent existence exactly as if they were as we experience them.

This way, the way of externalisation and objectification, seems to give a simplicity to how we can describe our experience. But it ignores how we come to have that experience (as we understand it), and it leads to some of those difficulties we face nowadays, as indicated earlier in the paper. We have taken short-cuts and made approximations which we no longer remember and recognise to be short-cuts and approximations.

A frequent objection raised against this understanding is that of the physicality of physical objects. This can be understood to be a metaphor for a more general criticism concerning the status of the realm of the physical (usually taken to represent the real), and hence physics (even some Constructivists wish to differentiate physical and non-physical objects at a base level). This criticism is not without force.

Yet the physicality of physical objects is presented as a quality of those objects. In my view, it is in this process of objectification, and of the convenient distortion that this involves, that we find the clue to how objects can appear to have qualities that seem to be so much of them, so out of our control. For instance, consider the apparent solidity of a table, which we do not expect to be able to walk through. This might be taken to be evidence that the object we refer to as “table” has the property of solidity. But this need not be so. Our externalising of a constancy into an object, our rendering of such a constancy to form what we then treat as a mind independent reality—the real out-there—can have qualities attached to it. Externalising the object, we construct a short-cut, so that we do not have to endlessly create constancies, but may take them as given. Taking solidity as given (i.e. objectified) is no more bizarre than taking table as given. Having set up table to have the quality solid, we can understand that it would be hard for us to go against our own decision. We find table to be solid because we have made it so. Just as we take the table to be a table! See especially von Glasersfeld 1990/1991.

It may be countered that the decision to attribute solidity could as well be undone as done. At one level, this is undisputable. But this is so with any world-view, and is not particular to this case: that is, it is always possible that a thesis on which we have relied might be reconstructed, unconstructed—or even deconstructed!—at any point, and there are alternative possible ways of describing, as occur in Kuhn’s scientific revolutions. Less contentiously, we base decisions on other decisions we have already made: and decisions we have made long ago, and on which we have based many other decisions (for instance, the development of the whole of science), which become progressively harder to change. This is the value of the story of Saul’s conversion on the road to Damascus.

5 Representation ^{xxi}

In this paper I have talked about. The experience I have made and which you may have shared was a talking about experience. For instance, writing in this paper I did not experience making the constancy that I (and maybe you) call “Mum”: I talked about it. This paper is illustrative. But it also offers an experience. We can and do experience illustration.^{xxii, xxiii}

Talking about is a form of representation. You do not have the experience, you have the illustration of the experience—and this illustration in some sense stands for the experience.

Representation can occur when an observer brings together two different constancies usually in the presence of an audience (which might be just the observer)^{xxiv}—see Glanville 1996.^{xxv} The two constancies are taken to stand the one for the other. They are, from the point of view of the observer in the act of representation, the same. Yet they are also different, otherwise there would not be two and therefore there would be no way each one could stand for the other. Although seen as the same, they must, using Spencer Brown’s term, remain (as I have argued elsewhere—see Glanville 1980) distinct—that is, different.^{xxvi}

In representation, one constancy is treated as if it were another. Since we have tended to objectify our constancies, we have one external object treated as another. Thus a picture (of a tree) is treated as if it were a tree.

(Less familiarly, but using the same Saussurian example, a tree may be treated as if it were a picture: this completes the circularity that is sometimes forgotten when we talk of A representing B without remembering B, therefore, equally represents A.)

But we experience each object, or each constancy, as is: that is, we experience, and we relate that experience to each. The as if-ness we create. I have an experience I identify with my constancy called “tree”, and I have an experience I identify with my constancy called “picture (of a tree)”, and I treat my constancy “picture (of a tree)” as if it were my constancy “tree”. If you prefer to use the word object in preference to constancy, you may do so, provided you keep in mind that object is an externalisation.

Representation, which is a necessary constituent of communication, introduces the notion of “as if”. The two elements in representation are as if they were the same. If they were the same, there would be only one.

As is and as if.

My experience of each is as is.

My experience of how I relate the two is as if.

But note that I have made the relation (and, if we communicate successfully, you have, too). And how I make the relation is personal, my way, and not yours.^{xxvii}

These notions of representation are in keeping with the conversational approach to communication developed by Gordon Pask (1976, Pask, Scott and Kallikourdis 1973). As already indicated, I have expounded on Pask’s approach in the context of language elsewhere (Glanville 1996). What it is important to emphasise here is not so much the personal quality of understanding and meaning that conversation theory assumes (that is, that we each make our own understanding, in contrast to the account of the coded transmission of meaning

(Shannon 1949)), but how this relates to language. Language, as we use it, is amongst other things a set of conventions. When we learn a language, we join a club: and the club has its own rules regardless of what we may individually desire. The point of this is that we are looking for a short-cut: we wish not to have, on every occasion, to negotiate everything, so we accept socially agreed conventions to the effect words have meanings and can only fit together acceptably in certain way. So the exteriorisation of a Generalised Constancy concerning communication becomes relatively fixed and makes demands on us.^{xxviii}

The confusion between our observing and our externalising of whatever constancies we make from our observing, has lead to one of the most inappropriate type of claim made for science. We have confused description (and the extraction of explanation from that) for what I will refer to as Mechanism, where mechanism may be taken to be an explicit set of procedures that constitute the (proper) working of the system under consideration (Glanville 1993b). (Thus, gravity is a mechanism, as is the set of connected states that a robot may follow.) Theories in science are explanations that have had—and continue to have—a good run, having been tested by application through prediction (and, in principle at least, continuing to be tested in this manner, to destruction). They belong in the realm of representation. They are not mechanisms but descriptions of mechanisms. The relationship between that which is represented and that which represents is, as de Saussure convincingly showed us (1966), arbitrary. The qualities of the one are not the qualities of the other, and need they need not reflect each other at all. Thus, the mechanism of explanation is just that. It is not the mechanism of the constancies observed, but is the mechanism of the explanation of the constancies observed. The description of a constancy (even when externalised as an object) is a description: it is not that constancy (or object). This confusion is perhaps most screamingly apparent in the assertions of Dawkins (1986), who, it seems, regularly confuses explanation with actuality, and description with mechanism—not only in his own work, but in his discussion of the work of others.^{xxix}

Furthermore, in representation, two separate “objects” (I shall use this term here as a convenient short-cut) are brought together, the one to stand for the other, the other (equally) for the one. They are treated as substitutable, and, in this sense, as being the same. They are different and remain distinct: otherwise there would not be two and representation would be impossible. These objects are determined by constancies we observe in our observings (Glanville 1999b). Consider, now, what happens when we represent one as fundamental. Since, in representation, we are equating two different objects yet insisting they are different, there is at least one respect in which the fundamental is not fundamental, for it has been split into two parts: the part that is the same and the part that retains the difference. Then the object was not fundamental. To say something is fundamental is to split it and thus render it not fundamental. All the recent evidence of fundamental physics attests to this. The very act of representing (as fundamental) destroys the claimed fundamentality (Glanville 1977, 1980). This might not be so if the description was the object. But it is not.

6 Qualities, Attributes and Properties

What do I use to create this (representational) relation?

I find qualities that these constancies, these objects, have in common.^{xxx} And then I equate them, just as I equated different experiences to make constancies. Qualities are just constancies in a particular role. As I like to say, “A part is a whole in a role”. Qualities are constancies that I find shared by other constancies (objects).^{xxxii}

Such qualities (in constancies) are attributes. When I claim the quality of being constant in what I find in common in several experiences, those qualities that I see in these constancies—indeed, those qualities (in common) I often list when asked to explain these constancies—are attributed by me. That is, they are my gifts to these (object) constancies. They do not belong to (are not owned by or integral to) the constancies themselves, for the constancies have no belongings (other than the constancies of being constantly and uniquely themselves, in my estimation).

Which is to say, when we construe in terms of the as if of an “external” world, this world is essentially flat. Any hierarchy there may be comes about not from structures in the world, but through how we observers compose together the constancies of our worlds.

But when we talk of these constancies as inhabitants of some “external reality”, thinking of them as externalised and objectified, the objects are taken to have an existence separate from us.^{xxxiii} We see these qualities as qualities in and of the object; that is, as properties.

It is this differentiation, between attribute (a quality given to an object by an observer) and property (a quality the observer claims to find in the object itself), that is crucial. For, forgetting that we are treating our constancies as if they were objects, we treat each object as is instead. And forgetting that the qualities we find in these constancies are attributed by us, we treat these qualities not as attributes but as if they were properties of our objects.

Science has long been caught in problems that derive from treating attributes as properties. Hence the power and the lesson of the Turing Test for intelligence (artificial or other) (Turing 1950)^{xxxiii}: Turing understood intelligence not as a property but as an attribute, thus dissolving the problems of defining intelligence (as a property) and of our wish to treat intelligence as exclusively human.^{xxxiv} It is a further reason we should not talk of knowledge, but rather of knowing: what is known is known by knowers—it is not known unless there is someone (or some agent) to know it—and what is known is composed to make patterns and, thus, hierarchies (see von Glasersfeld 1990/1991)^{xxxv}. This clarifies the value of the composer Harrison Britwistle’s comment (to me when I was a schoolboy) that analysis is not about a true understanding of the (musical) work analysed, or of what the composer did or what was in his mind, but rather how the analyst understands, him/herself.

To assert this does not, in my view, take away from science or from its considerable achievements. In some respects, science seems more remarkable when we see it as a result of a most highly co-ordinated social construction: what a wondrous and selfless effort! How intensely human! It does remove, it is true, its status as providing absolute truth. But scientists themselves have moved towards this view (both in what they say and how they say it: Glanville, Sengupta and Forey, 1998), philosophers of science have formalised it in argument, and nowadays perhaps not many scientists would argue for science qua absolute truth any longer. Not being obliged to provide absolute truth encourages us to be both more honest and more open, as scientists: and that can be no bad thing for a “searcher after

framework, the views of both Kuhn (1970) and Lakatos (1970), as well as Feyerabend (1975), Popper (1969, 1972) and Medawar (1963, 1984). How we construct a social object (how many of us construct together in spite of our different and personal understandings) is another matter, but the sharedness of language gives at least one other example of a system in which this happens (Glanville 1996).

From the concepts explored here, others can be developed: rationality, the way concomitant restrictions develop in an expanding plethora of constancies built on constancies made from experiences, experiences of experiences, and eventually, experiences of constancies, the range of the possible, social construction and so on. I am more interested in exploring the less symbolic, with paring back to the progressively more abstract. To move towards distinction and its conceptual origin in as is and as if.

7 In Conclusion

I have attempted, in this paper, to demonstrate that it is possible to reconcile the apparently mutually exclusive views of, on the one hand, (Radical) Constructivism, which holds that there is no observing without an observer, no knowing without a knower, and therefore that what we observe and know is never a mind independent reality; and, on the other hand, scientific convention (which I argued is changing towards a position closer to that of constructivism), that there is a reality independent of our constructions to which we can refer, which exhibits behaviours through which we can discover at least aspects of its separated reality. My attempt was based on establishing the difference between the as is of our experiences and the as if which allows us to treat these experiences as if they were of external objects, and I used notions akin to Piaget's notion of the conservation of objects to allow the construction of constancies between experiences (observations). By these means I hope to have established the possibility of science and (Radical) Constructivism co-existing and even being mutually supportive. I have also considered how the relationship I develop between (Radical) Constructivism and science may modify our understanding of the reality we try to understand; of our understanding of our understanding; of the types of understandings we may develop within this understanding (together with their values); and various other concepts that result from this investigation.

When I was writing this paper, I visited the physicist, neurologist and inventor of second order cybernetics, Heinz von Foerster. He told of a meeting at his house at which, amongst those present, was the eminent philosopher, J.R. Searle. According to von Foerster, what Searle found so very difficult in any Constructivist approach was the notion that the trees and rocks might not survive him. To Searle, according to this story, it was of the greatest emotional importance that he could argue the trees and the rocks had an existence outside and independent of his relationship with them.

The interesting question is not this. I cannot possibly know whether the trees and rocks survive me.^{xxxvi} The nearest I can get (Glanville 1992) is to believe the reports of others, that they have preceded me. But these reports are based on their observations: and for the reports to mean anything to me, I have to observe them. I cannot escape this.

So the question is not whether they survive me (or my knowing), or not. I can believe what I like about this, as I can believe that there is an external reality independent of my observing, or not, as I like. What I cannot believe is that I can, in any meaningful way, know this—one way or the other. What I can know is based in my observing and is known by me.

Thus, the answer is that it cannot possibly matter whether the trees and rocks survive J.R. Searle, or me, or any one of us. For, if there is no I to observe, what difference can it make, either to me, or to the trees and rocks, at least as far as I can know? And, if there is an I, then I can observe them—for I am (still) there.

(It might matter to the trees and rocks: but I cannot know that. I might believe it matters to them, in which case it is their business. Then, it is for them to decide. Not me.^{xxxvii})

Nevertheless, surely one of the great difficulties of a Radical Constructivist approach is expressed in this need of Searle's. All my life, I have been encouraged (as have most of us, I suppose) to externalise and to make objects, and to believe in their independent existence in a real world, out there, and existing independently of any observer as a mind independent reality. I have grown up and been educated to live in a world of externalisation, in the accounts of which the basis for objectification has been long forgotten. The constructive origin has not been expressed. It has become alien and now it is foreign, and it is surely very hard to comprehend and to take on board. I have to argue for it against much doubt and on an uneven playing field (which I am allowed to assume when pursuing a mind independent reality), whereas it might otherwise seem quite normal.

But because you or I cannot see this difference does not mean it is not conceivable. I have habits of thinking, expression and representation (as if), and even when and if I can change those it may be hard for me to operate in a different manner. Habits are hard to change, I have spoken and thought for so long in the "as if" mode that it is almost impossible for me consistently to give up operating within this conventional framework no matter how well and convincingly the counter (Radically Constructivist) case is argued. We may not even be prepared to accept the argument, rejecting it dogmatically because it seems to attack a convenience we have come to (mis)take for a truth. Yet, as has been pointed out, the expression, practice, theory and understanding of science all move towards explicit constructivism, with a seeming inevitability. This paper can be seen as an attempt to resolve the apparent mutual exclusion of a Radically constructive understanding and our science and technology, thus easing and (to some extent) explaining this inevitability.

The argument concerning the involvement of the observer seems unassailable (as many philosophers have been forced to accept—see von Glasersfeld 1987, 1990/1991). It may not be until our children, or our children's children and later generations, perhaps fired by the virtual worlds made available through computation, have learnt to live with explicitly alternative realities, constructions and understandings of our construing—coming from learning to live with these alternatives—that we can comfortably marry argument and prejudice, and learn to live with and in this view.

The matter at hand, then, if we wish to further our comprehension of the relationship we take to hold between each of us individually, the collections of all of us, and the rest of what we find to constitute what we call the world, is to consider the act of constructing, in so far as we

we understand our construction? How do we understand what we understand through and of our construction, and how can we understand what can we do with it?

These questions are questions of and for psychology and epistemology. Everything we can understand depends on them: on our understanding of our understanding.

Bizarrely, given this position, we insist on treating our experience as wrong, and the externalised object, together with its properties, as right. We confuse the as if with the as is of our experience. This position cannot, in my view as presented through this paper, be sustained. It is my view that, in the end, that to perpetuate this delusion is to act insane. To resolve this, however, the mother of all sciences becomes not physics, but psychology and/or epistemology (as argued above): for our basic study is not the world we make but treat as if we find, but the means of making (it)—and that is a matter of how we conceive and assemble our understandings.

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The best advice, however, comes, as usual, from Aartje Hulstein.

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Notes

ⁱ This paper is based on and considerably extended from the paper “as is and as if”, presented at the conference “Invenção—Inventing the New Millennium”, São Paulo, Brazil, August 1999.

ⁱⁱ The computer is a Black Box. See Glanville 1979, 1982 for a thorough and contemporary examination of this concept, which is archetypically Constructivist, giving us a model for developing understanding from ignorance (for developing constancies, as they are called in this paper). In this view, the Black Box is definitely not a stimulus-response mechanism (a “trivial machine”).

ⁱⁱⁱ Experiencing the “Dream House” was a magical and awesome experience, and one I treasure. It would be totally inappropriate for me not to record this here. We all too often replace discussion of experience by discussion of explanation. This is point is central in this paper.

^{iv} I received financial assistance in writing and presenting that paper, and in attending the conference, through grants from the British Academy and the UK Government’s Department of Industry’s Innovation Initiative. Their help and support is gratefully acknowledged.

v For an account and review of that conference, see Glanville 1999a.

vi If we emulate the future, surely we are shaping it. For we emulate that which we have already described. In emulating the future, we shape it to fit our emulation rather than making a cold prediction and waiting to see what happens. An extraordinary example is the self-confirming hypotheses we extend as a result of planetary flybys, for instance the invention of the landscape and geological chemistry of Triton derived by photographic enhancement made from the satellites we fly past it.

vii Autopoiesis was a term introduced by Maturana, Varela and Uribe (1972/1974/1991) to describe a revolutionary conceptual model of a processes of self-generation and maintenance that characterises life when it is considered as a living. It has spawned an industry in a variety of fields.

viii I have argued that circularity is the form of designing, and that second order cybernetics is the study of the form that designing, as a verb, takes. Pursuing this argument, I have pointed out that science is a specialised and particular form of design (Glanville 1981, 1999d). Consequently, (scientific) research—understood as an outward expression of science—is also seen as a form of design. Design is a Constructivist activity. So science, as a specialised form of design, is a Constructivist activity.

ix Which is not to deny there may be things out there is the real world beloved of scientists and some philosophers, only to say I cannot know whether this is so, or not. (Elsewhere (Glanville 1990), I also argue that, if there is to be a me, there must also be others, which removes the basis for a solipsist argument.)

x Second order cybernetics is a Radical development from the original cybernetics of Wiener and the Macy Conferences, in which cybernetic understandings are applied to the subject of cybernetics itself. In it, the circularity that characterises cybernetic systems is taken seriously. It may be characterised (to use von Foerster's words) as being interested in observing, rather than observed systems—hence its appropriateness in a Constructivist discussion of science. The term originated with Heinz von Foerster, who suggested it for an address given by Margaret Mead (1968). It can be seen in action in von Foerster (1975). I will not go further here except to say that I am currently completing a large encyclopaedic article which is intended to represent the field generously and generally (Glanville forthcoming).

xi In this paper, I use the words experience, sensation and observing more or less interchangeably.

xii As per his semi-public web discussion site.

xiii The notion of drawing a distinction and the logic that derives from this provides one of the building blocks used by those who pursue this approach. It derives from Spencer Brown 1969. The introductory command in Spencer Brown's book, "Draw a Distinction" was used as the complete abstract of von Foerster's paper "On Constructing a Reality" (1973).

xiv The phrase "as if" (Als-Ob) was first introduced in this context early last century by Hans Vaihinger (1911), whose work has been profoundly influential in Constructivist undertakings, as has the earlier work of Giambattista Vico. There is a long history, for those who wish to pursue it.

xv This is the importance of Occam's Razor. It is also, essentially, the argument about randomness.

xvi In order to avoid confusion, I will use Piaget's term "object constancy" as little as possible. I will retain the word object to refer to things assumed to be in an external reality. But please wait until they are introduced before assuming too much!

xvii In deference to Buber's "I and Thou" (1970)

xviii Yet there are moments when we seem to shift into pure experience, without any of the contingencies we normally consider, such as I, other, time, place. During these moments we approach, I believe, the nirvana that is experience without person and without it being distinguished even as experience. It is possible that this is a

shared, a universal, experience, in balance with the unique and exclusive personal experience this paper deals in. I believe that this is at least one of the things are, especially music, can do for us (Glanville 1997a, 1999c, 1999a).

xi^x What I consider a strong argument against solipsism is made by von Foerster (1973, 1992), a major supporter of the Constructivist position, which I summarise to emphasise the difference. Von Foerster argues that, in the solipsist view, if all is my invention, I invent you. But if you can converse with me, you have invented me. So who invented whom first? Thus, there can be no primary inventor.

xx^x There is a vast body of work in this area, particularly Pask's Conversation Theory (Pask 1976, Pask, Scott and Kallikourdis 1973). I will not elaborate, here. (But see the section on Representation, and also Glanville 1993c, 1997c).

xxiⁱ Heinz von Foerster objects to the use of the word represent because each presentation is, in his view, unique. Thus, there can be no repetition of a presentation and, therefore, no representation. While I appreciate this point, I use the term representation (sometimes in the form (re-)presentation) as another short-cut!

xxiiⁱⁱ I am aware that this sounds like objectification: the paper existing to give us something. This is the convenience of objectification: with it we gain a short-cut. It is the short-cut I am using here, not the possible interpretation that I am objectifying this paper.

xxiiiⁱⁱⁱ This paper was, in its earlier form, originally written to be read out loud (to an audience of, mostly, artists working in electronic media).

Since the paper is concerned with the difference between description and experience, and the written version exists essentially as a description, at the last minute I decided instead to recreate the paper at its presentation, from scratch—thus sharing with the audience the experience of making the paper. In order to enhance their attention to the sound of the words that embodied the (re-)creation of the paper (and to deny me access to props and supports that might encourage laziness and reversion to a description) I turned out the lights in the room and spoke very slowly, with long pauses, in the pitch dark.

Perhaps if the reader keeps this presentation in mind, and tries to make an equivalent for him/herself, they will be able to read the paper in a more “experiential” manner.

xxiv^{iv} The term representation, implying the notion of againness, invokes time. Holding ideas in mind over time invokes memory, so we can make the comparisons between “what was” and “what is”. We have usually thought of memory as making representation possible, but we can also say that representation gives us reason to invent and call on memory. In my doctoral dissertation, the formulation I develop requires that time is invented, rather than time being given. I do not wish to enter into a discussion of memory in this paper, but it may help the reader to consider that memory is invoked in many of the processes called upon in the text. As to whether memory and time logically precede these processes, that is another matter entirely.

xxv^v This is a mechanistic description. Others are concerned with (for instance) semiotic, semantic and symbolic conditions. These are not my concern. However, that in no way denies these concerns to others.

xxvi^{vi} This understanding of representation comes from de Saussure (1966). Although we often think of representation as working in one direction (e.g. the representative of the people), in circular systems it works both ways: a fact that many political representatives might do well to learn!

xxvii^{vii} For an explanation of what sort of structures allow us to observe differently—as we must—but believe we observes the same thing, see my “Theory of Objects” (Glanville 1975). But also, for me to explore your “as is”, it would have to be represented. I can only access your “as is” through an “as if”, i.e. I cannot actually access it at all: for “as if” is exactly not “as is”.

xxviii Thus the exteriorisation of constancies-as-objects places demands on us. These are, for instance, the demands that are recognised when we refer to subjects to be studied as disciplines. This is the mechanism that permit science, as a complex exteriorisation (created in social negotiation across generations), to admit some but not nearly all ideas. It is interesting, given this argument, that science is now often referred to as a language.

xxix This confusion is perpetuated in the many radio interviews I have heard, in which Dawkins is scathing and mocking of others, preferring a belittling and abusive polemic to argument.

xxx These need not be enumerable or listable. They might be quite intuitive and outside vocabulary.

xxxi For a discussion of how qualities can be accounted for as constructs, without need to have recourse to properties, see von Glasersfeld (1990/1991).

xxxii Even though this cannot actually be, but is, according to the arguments here, a mental slight of hand.

xxxiii The power of the Turing Test for intelligence makes it (in my opinion), along with Occam's Razor, one of the great tools of philosophy: the embodiment of a philosophical insight of enormous importance and power.

xxxiv Artificial Intelligence, as a field, was essentially based on the proposition that intelligence was a property, which it they tried to simulate. As a collection of tricks, it has been in some ways successful. However, it has always been subject to a number of in principle arguments (including the early one of Lady Lovelace, made in reference to Babbage's Engines, that the intelligence exhibited in a programmed machine originates in the—presumably intelligent—programmer). Turing's Test was deeply unpopular in A.I. circles because the fundamental and in principle challenge disappears when what was thought of as a property is seen as an attribute.

xxxv Pask and I had publicly disputed the appropriateness of the terms knowledge and knowing since the mid 1970's. I do not believe either of us recorded the dispute at the time, although we both debated our views in public at conferences, and, often, excitedly in private. However, in work from about the mid 1980's on, Pask's vocabulary (in his publications) shifts from talking of knowledge to talking of knowing. I refer briefly to this in Glanville (1993a).

xxxvi Unless I survive me, myself, in which case, the question does not arise.

xxxvii This is not an animist argument. I cannot know. If I choose to believe it matters to the trees and rocks that they survive, then my assumption is at least quasi-animist. However, to set out the conditions (such as animism) for something to occur is not to support that argument, merely to consider it.