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Social constructionism as cognitive science

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Abstract

Social constructionism is a broad position that emphasizes the importance of human social processes in psychology. These processes are generally associated with language and the ability to construct stories that conform to the emergent rules of 'language games'. This view allows one to espouse a variety of critical postures with regard to realist commitments within the social and behavioural sciences, ranging from outright relativism (language constructs all of our concepts) to a more moderate respect for the 'barrier' that linguistic descriptions can place between us and reality. This paper first outlines some possible social constructionist viewpoints and then goes on to show how each of them conforms to the basic principles of information theory. After establishing this relation the paper then argues that this leads to a deal of commonality between social constructionist positions and the baseline aims of cognitive science. Finally, the paper argues that if information theory is held in common this both suggests future research collaborations and helps to 'mop up' some of the arguments surrounding realist commitments.

Key words: Information; Social function; Natural function; Ontology

Introduction

Social constructionism is a broad and diverse perspective within the social sciences and as such would require a book length treatment to survey. None the less, this paper aims to reconceptualize at least certain aspects of social constructionism in terms that are compatible with the project of cognitive science, another equally large field¹. This might appear to be a forlorn aim, for social constructionism has a strong thread of radical opposition to traditional empiricist or positivist views of science running through it, and this, of course, has implications for the doing of psychology. This radicalism, under the influence of some continental philosophers, has been sourced in what is sometimes termed the

'linguistic turn' in social psychology. The linguistic turn was a move to seeing all of our conceptions as a product of language, but a language whose referential terms were opaque such that there was no certainty about the reality of the objects of language, thought and science. Language could only be understood as the product of social processes and convention, and therefore indicative of the intricacies of cultural history. The linguistic utterances of psychology, therefore, are not to be taken as referring to natural psychological kinds, but as the product of a specific scientific culture.

Lurking within the linguistic turn is a potential for relativism, a complete denial of objective reality outside of language, for how can we determine when something is more than a *mere* cultural idea other than through the use of more linguistic behaviour? Much has been written about the nature of the ontological commitments of social constructionism focusing upon the degrees of realism that are acceptable in psychology (Parker, 1999; Potter, Edwards & Ashmore, 1999; McLennan, 2001; Still, 2001). Some theorists (for example, Gergen, 2001) directly criticize what they see as misguided realism in disciplines that have not taken the linguistic turn, such as cognitive science. In so doing, such theorists seek to undermine the fabric of that discipline. As a cognitive scientist I have read such arguments in a mood of some disquiet, not because I distrust my own particular views on realism, but because I recognize that the emphasis upon human cultural behaviour and its effects upon psychology is a research agenda for my discipline too (see Harré, 2002a). I have therefore been perplexed by the move from recognition of the social construction of cultural artefacts (by which I mean anything from technologies through to concepts) to a deep scepticism about the psychological dispositions that allow this to happen. What is more, as Harré (2002a) makes clear, it is crucial for cognitive science to understand humans as symbol users, for example at the linguistic level, and this means that any knowledge of the machinery that underlies human symbolic behaviour must pay heed to the normative "rules" of symbol use. An integrated science of mind and socially embedded action is required. To this end, I have wanted to outline the common interests of both social constructionism and cognitive science, in abstract theoretical terms, in order to facilitate future research and also to slice through the debates about ontology without simply making a position statement from the realist bench. The key to achieving this, I think, is in realizing that both groups are dealing with information systems and this paper aims to explicate this and its consequences.

The paper begins with a brief discussion of social constructionism and various *possible* sub-positions within it. This is followed by a similar treatment of cognitive science including an

introduction to information theory. The paper should be regarded as a lengthy conditional argument following from this discussion of possible positions. The core argument that is then made is that as both social constructionists and cognitive scientists are talking about systems that undergo state changes, as a result of specified input, a significant remaining difference is how each group describes the function of the systems at hand. Social constructionists talk about social functions, and cognitive scientists talk about natural functions grounded in biology – and I shall define these different forms of function below. Any discussion of function carries with it some order of ontological commitments and I show how social constructionism has to concede discussion of types of natural kinds in order to bolster its notions of social functions, which is, in fact all that cognitive science does with regard to natural functions. This leaves us with a form of pragmatic instrumentalism when individuating psychological kinds, at the very least. In passing I note that social functions could be grounded in natural functions and perhaps both groups could unite under the study of the evolution of culture, which is the consequence of both biological and social processes, but such a specific unity is not a necessary consequence of the argument.

What is social constructionism?

The central concern of social constructionism (henceforth SC) is with the social processes that are involved in our conceptualizing the world, including our own psychological machinations and states. The main conceit of SC is that social processes are often overlooked as a putative source of behaviour by mainstream psychology. It is entirely possible that our traditional focus upon individual agency and the internal (cognitive) workings of those agents leads us, at the very least, to ignore key social processes and is, at the most, an unfortunate error, for there are no such things as (cognitive) agents: all is social².

SC has been formed by a variety of philosophical influences, including those of Foucault and Derrida and other stalwarts of the postmodern intellectual world, as well as Vygotsky and Wittgenstein (see Burr, 1995). These influences have caused SC to place huge emphasis upon the role of language in the social sciences – both in terms of how social scientists use language, and, with regard to

everyday linguistic practice as integral to psychological functioning. Language is to be understood in post-structuralist terms where no one can be sure that the referential terms of a language actually map something real³. Given this lack of referential certainty, and an assumption that language is central to our conceptions of everything, such a position clearly has implications for the doing of psychology as a subject:

(C)onstructionist psychology denies the empiricist notion that theories can correspond to reality. There is no way to put all events in the 'real world' on one side and all our representations on the other and then see how they match up. (Michel & Wortham, 2002: 625)

Language without referential clarity, at best, or at worst, without any claim to reference, leaves us looking for the source of sense within our linguistic practice. Language appears to get things done, people talk to one another effectively, but how is this so under post-structuralist assumptions? The answer must lie in social conventions, or agreed language games. So, traditional psychological explanations should be seen as the product of a culture of psychologists. Within their closed world the 'explanations' that they trade make agreed sense according to socially accepted notions of evidence and argumentation, but beyond that we can make no claim to the reality of their theories.

The SC notion of language also thoroughly embeds our psychology within culture to the extent that our sense of ourselves, as expressed linguistically, is the product of conventions not unlike those determining psychologists and their talk:

A central tenet of social constructionism is that the ways we understand the world are formed by the ways in which we interact with each other in our local cultural milieu... Another is that these relationships are lodged within traditions, being products of particular histories. The nature of these histories remains largely unspecified... but undoubtedly part of the constructionist project is to establish ways in which particular historically constituted social settings afford the specific relationships and understandings associated with them. (Bradley & Morss, 2002: 511)

There are major social constructionist contributions to two different but interconnected domains of psychology: developmental and cognitive... In the former, the results of construction are fairly long term and stable attributes of individual persons. In the latter, the results of construction are ephemeral attributes of the flow of jointly created sequences of meaningful actions. There is a link. Only if the individuals who are members of a certain social/cognitive world are so formed as to be capable of certain kinds of joint action are collective expressions of psychological phenomena possible. There can be a winning goal only if members of the club can play football – which requires that football be a culturally recognized activity. (Harré, 2002b: 612)

SC, then, is both a view of how psychology should proceed as a discipline and a view of how psychology is within our species. We are subject to social convention and referential uncertainty and this affects our theory generation as well as our day-to-day existence. As such there is a degree of similarity between SC and the British Empiricists (see Bradley & Morss, 2002, for a comparable argument). Both groups see a proper understanding of human psychology as *the* grounding for subsequent enquiry. However, unlike the British Empiricists, SC purely focuses upon its own practice of studying psychology and does not seek to apply this perspective to the rest of the sciences (which is not to say there are not related positions in other disciplines).

Types of social constructionism

Edley (2001) has divided SC into two broad types – ontological and epistemic. Epistemic SC, which Edley sees as the main project of SC, focuses upon the notion that our conceptions of the world are filtered through language, or discourse in Edley's terms. However, this epistemic position can encourage misreadings, which in turn flush out an ontological position:

The mistake that (some) critics ... make is to assume that when social constructionists state that 'there is nothing outside the text', they are making an *ontological*, rather than an

epistemological pronouncement; that is, a claim about what the world is actually like...
(T)o claim that there *really* is nothing outside of talk implies that one can somehow *know* that to be the case, absolutely and for all time – which is precisely the assumption that the epistemic sense of social constructionism sets out to disturb. (Edley, 2001:437)

Edley goes on to argue that it is very hard to find theorists who believe the ontological position. Theorists do not deny an external world but rather they think that talk about it is not directly representative and adds extra dimensions to human experience and behaviour. Furthermore, there is a sense in which language allows entities to be considered, but in so doing we are only presented with a version of those entities. In doing this there is a commitment to the reality of *discursive objects* – our talk about, for example, an emotion is *constitutive* of our experience of that emotion.

My other main conclusion is that, when kept apart like this, neither the epistemic nor the ontological sense of social construction looks anything like as contentious as when they are both mixed up together. Most of us are able to accept, I think, that descriptions are seldom neutral; that they are typically purpose-built for the contexts in which they make their appearance. Likewise, I think that most people are able to appreciate how discourses can give rise to forms of social life, such as gender, class and national identity. (*Ibid*, p. 449)

Following from Edley's analysis, one could adopt what I term a *pessimistic epistemic position*, arguing that we have *no reason to believe* in any specific reality outside language, and as such we can make no serious ontological claims and must doubt those that do. If not this then one could hold a *weak ontological position*, arguing that as language seems to achieve some work for us it is conceivable that *some order of indirect representation of reality is achieved*. This is a form of pragmatic instrumentalism (see below).

Rom Harré sometimes appears to adopt a weak ontology position:

It is no part of the social constructionist approach to deny that there are any universal aspects of human life, nor that, in a certain sense, there are some essential attributes of

persons and processes. Nor is it any part of the social constructionist approach to deny that there are better and worse representations of the social world and of human psychology. In short, social constructionism, while at a very great remove from positivistic mainstream psychology, is not radically relativist. (Harré, 2002b: 612)

Here we see a clear statement that SC is aware that there are underlying natural kinds that are responsible for behaviour. It is the contention of this paper that avoiding explicit weak ontology and opting for the epistemic position will not guarantee avoidance of key ontological issues at some point. For example, simply trying to understand how we socially construct cultural artefacts will lead a theorist to consider psychological properties of individuals and of groups, and thus to have a position on the structure-agency debate that has bedevilled sociology. Epistemic social constructionists do not have to be concerned about this, merely aware, and they might feel that the modest outcome of clarifying when to make (weak) ontological commitments is useful work, especially if they can outline some guiding principles. Indeed, the pessimistic epistemic claim reduces to a position that only language and discursive practices are real, with any certainty, and this in turn means that any description of them becomes a description of humans' everyday epistemological work⁴.

Putative weak ontology theorists agree with the rest of SC that language does not simply represent reality, but, as stated above, they also adopt a form of instrumentalism, which amounts to a stronger claim than that which the pessimistic epistemic theorists are forced to take about discursive practice. This pragmatic instrumentalism is best expressed through the following analogy from computer science. We can agree that there is an ultimate reality to the hardware set up of a computer, but that such a machine can be manipulated in a number of different ways from physical intervention with a screwdriver, through to programming it in C++, to interacting via a visual application. The weak ontologist might argue that a claim for the reality (1) of the windows utilized in the visual application would be misplaced even though they (2) do real work of some kind. In other words, a weak ontologist would say that the windows do not (1) represent real windows, but none the less, manipulating them in the visual application has (2) real effects. From this analogy, the weak ontology theorist might then argue that language occupies a similar niche to that filled by a visual application.

So, the core SC argument is that social discourse is integrally involved in constructing our knowledge of the world and that we act to form cultural artefacts which have a pervasive effect upon

our psychology. However, some social constructionists would bridle at this description for implicit within it is the assumption that individuals make up social groups and have their individual psychologies affected by social processes. Pessimistic epistemic theorists can argue that the notion of the individual self, or agent, is misplaced for it assumes a natural kind for which there is no evidence beyond our use of the relevant terminology in the language games of modern psychology. Gergen supports this view:

Through developments in semiotic theory, poststructuralist linguistic theory, and rhetorical study on the one hand, and Wittgensteinian philosophy, the history of science and sociology of knowledge on the other, we begin to see knowledge not as a possession of individual minds but of human relationships. And if what we take to be knowledge to be socially constructed, then so are the long-standing assumptions about the psychological self. The implications are far reaching. (Gergen, 1999: 173-174)

Weak ontologists could think this too, with a proviso that perhaps there is something in the individual-centred speak of psychology, for example, it might serve as a useful place-marker for as yet undetermined, and quite possibly, undeterminable natural kinds. Also, as mentioned above, an epistemic social constructionist might have to commit to some form of ontology at this point, for they must situate the knowledge garnering somewhere. In other words, there is a base-line assumption that knowledge is being created and used by something that has the properties of being able to create and use knowledge.

A brief overview of cognitive science and its commitments

Cognitive science (CS) has emerged over the last twenty years or more as a dominant force in the science of the mind. It is a multidisciplinary approach attempting to relate brain, cognition and behaviour. Unlike traditional cognitive psychology it uses a number of methods including those of philosophy, linguistics, computer science, artificial intelligence and life research, biology, and to some

interesting extent the social sciences. Like traditional cognitive psychology there is a general focus upon humans, and other organisms, as computational agents that can live in groups.

Computation is an area fraught with its own theoretical debates. Within CS a persistent discussion has been had about the relative merits of connectionist approaches versus classicist approaches. Variously this debate has been about the ecological validity of either approach, the degrees of nativism assumed by each approach, and even whether or not connectionism is truly a computational viewpoint (see MacDonald & MacDonald, 1995). Computation, according to classicists, can be regarded as processes operating over representations. So, by analogy, one view of language has it that there are words, which are representations of objects, events, states-of-affairs and abstract concepts, and they are combined according to formally describable rules into sentential form. Sentential form delivers a semantic content that is novel. Cognitive computation, then, is like language (which is a type of computation), and delivers syntactically structured representations (Fodor, 1975) and these representations play a causal role in the production of output, by changing states in the relevant system (see below). Cognitive processes are to be understood in terms of their function of mediating regular input-output relations.

For the connectionist, representations play no role in the production of behaviour, indeed there are no representations in connectionism but instead patterns of activity that are thought to be analogous to (albeit very abstractly) the patterns of activity seen in real neural networks. Input simply stimulates a specific pathway through this network that results in output. The regularity of input-output relations is to be understood in terms of the internal biases that allow certain pathways to arise. Biases are understood (again very abstractly) as thresholds of activation at synapses such that appropriate levels of input will stimulate a certain set of synapses and hence define a path through the network. Threshold changes are established through various learning rules that have much to do with colloquial notions of associative learning.

Classicist cognitive systems have been further characterized in a number of different ways. For example, thinking systems have been understood in terms of mental states, such that being in a particular mental state will lead to the production of a particular behaviour. Mental states have been categorized as intentional states, with the property of *aboutness* since they are 'about' something. Beliefs, desires, intentions, hopes etc. are all examples of intentional states because one believes *in* realism, wants *a* cake, and hopes for *a* holiday. So intentional states are representational states and

they can be seen to be linked to behaviour. If you are told that Inbal bought a cake from a shop then the likely folk explanation that you would produce is that *Inbal wanted a cake*. Thus you would assume Inbal had mental states and that these mental states caused her behaviour. If asked to elaborate you might posit that Inbal was hungry and receiving some signals of her hunger. This put her in mind of cakes, and then of wanting them and then she went to a shop in downtown Tel Aviv and bought one for a few shekels⁵.

The exploits of Inbal make intuitive sense against the backdrop of this folk theory because we all have the experience of having such mental states and we see them as part of a motivational system. What is more, we know we can use mental states to think about possible actions and evaluate them, such that not all mental states lead to behaviour, and can in fact suppress behaviours. This has led to much theoretical discussion, within classicist schools, about the ontological status of intentional states, as well as attempts to refine their characterization in order to capture the formalism of thinking. Under standard physicalist assumptions we might assume that mental states are physically realized in the brain. Theorists have argued that mental states are type-identical with brain states (Place, 1956; Smart, 1959), or token-identical, or supervenient upon brain state transitions (Kim, 1993). Identity theses arguably run foul of Leibniz's Law, which states that if two terms refer to the same entity then what can be said of one term can also be said of the other. Thus, if we claim that brain state X is identical to the mental state of wanting to be unfaithful we ought to be able to say both that wanting to be unfaithful and enduring brain state X are morally dubious, and for those statements to do the same work as one another. Intuitively it would seem that certain types of explanations involving mental states are qualitatively and informationally different from those involving brain states, such that asserting the moral status of a brain state appears meaningless. Supervenience theses leave us with the issue of where to locate causality – if in the brain states then what need is there of mental ascription, if a property of mental states then we run the danger of abandoning physicalism (see Ross & Spurrett, forthcoming). Some, from connectionist perspectives, have argued that mental states are no more than folk-science and there is no reality to them at all. The job of CS is to eliminate such talk from psychology and replace it with a proper neuroscience (Churchland, 1981). Others have taken a more pragmatic instrumentalist view and argued that whatever the ontological status of mental states (and note that all of these positions are talking about degrees of realism, from zero to some) they seem to

have predictive explanatory power and this might be indicative of tapping some real formalism, albeit in an abstract and distant fashion (Dennett, 1987)⁶.

There is much, much more to say about the above discussion but this is not the place for that. Instead, I want to draw out a general point from the above summary. Where classicism and connectionism differ is in their ontological commitments. As with SC there are a number of possible positions available to a cognitive scientist from an instrumental and weak ontology to a very strong and eliminativist ontology. But, just as SC is held together by a concern with social processes and conventions both classicism and connectionism rely upon a basic notion of information processing.

Information and cognition

If a system can exist in S_1 to S_n states, that input which causes it to change from, for example, S_1 to S_2 is *information*. Input can be understood very broadly in this context such that oxygen entering the lungs is a form of input, and also a form of information as it changes the state of the pulmonary system, and in turn we could see this system as computational (Cosmides, personal communication).

Cohen (2000) has noted that the etymology of information “connotes a distinctive arrangement” (p. 13) or form which is an idea emerging from Shannon's (1948) attempts to improve fidelity in telephone transmissions, such that the input matched the output as best as possible. In order to achieve this Shannon required a measure, a method of calculating the amount of information in a message, the degree to which the message conformed to specific arrangement or form. Cohen refers to the property of having a specific arrangement as being 'just-so'. Shannon hypothesized that the degree to which an arrangement is 'just-so' is related to the other possible arrangements of the relevant elements of the message, which can be understood as possible errors. So, if the message in question is a codon ⁷ on a strand of messenger RNA (ribonucleic acid) – CAG – the other possible arrangements are CGA, AGC, ACG, GCA and GAC.

By regarding information in terms of a specific arrangement relative to all probable arrangements Shannon described information as a probability. The more possible errors there are then the lower the probability of the 'just-so' arrangement arising, and when it does arise the 'just-so'

arrangement is surprising. This is another way of phrasing the state shift definition of information. If a system can be in $1 + n$ states then the 'just-so' input that leads to state change reduces the uncertainty of the system, and becomes information. It is the way in which the system can change states that determines the 'just-so' nature of the input⁸.

Cohen claims that “our ability to detect and quantify the information requires a background of knowledge that is extrinsic to the particular message before us” (p. 17). This only applies if we are looking from the outside in. If we wish to determine whether or not a string of elements is a true message then we will need extrinsic knowledge of the whole alphabet of elements and the rules determining their combination. Code-breakers cannot crack a cipher with just one word as a sample. This concern brings to the fore a notion of meaning – the external judgment is essentially based on semantic knowledge. However, there is no need to posit that the system 'uses' such semantics, for any given system in a sense embodies the semantic 'rules' by flipping states on receipt of the appropriate input. But, the key point here is that a natural scientist is taking the external view when trying to decipher the information-to-system relation, and the principal method of beginning this task is to look at the function of the system – what work does it achieve?

*

If information is only defined in terms of state shifts then the focus upon cognitive systems is a focus on types of states, and types of states have attendant types of information. What, then, marks the line between a cognitive and a non-cognitive system? One clear answer is the function it performs – pulmonary systems are for oxygenating blood and thinking systems are for producing behaviour.⁹ Another answer, and one that must relate to any functional typology we choose to adopt, is that cognitive systems have many layers of information processing some of which include processes that resemble hypothesis construction and inference, or more minimally, pattern completion. This means that cognitive systems are set-up in such a way as to generalize from minimal input and produce a state change. This adds a probabilistic element, for the system is acting *as if* it has the full message when in fact it does not. Pulmonary systems cannot rely on pattern completion in the advent of an inadequate oxygen supply. So, pulmonary systems rely, for their continued success, upon an informationally

stable environment. Yet, it would seem that cognitive systems can exist in more variable informational conditions and this affords a degree of plasticity for those organisms utilizing such systems.

Cognitive systems, as information processing systems, are often hierarchically organized. This means that when the system receives an appropriate input this is transformed into an output that then becomes an input for another system. Having hierarchically organized systems like this allows for a great deal of sophistication in processing environmental inputs, for it allows for a multiplicity of responses to a situation, and is another contribution to cognitive plasticity.

This hierarchical plasticity effect can be thought of in another way. Higher order cognitions, such as thinking systems, are to be seen as the product of multiple lower-level, or dumb systems such that cognitive science is not looking for an essential ghost in the machine in order to explain behaviour (see footnote 9). Indeed, the arrangement of lower-level systems to produce higher-order systemic effects places a focus upon design 'decisions' that allow for appropriate functional organization to produce higher-order cognition. Under naturalist assumptions the source of such design is evolution through natural or sexual selection. Thus, function is conceived of in terms of the putative adaptive effects of specific cognitions.

Given the last point we can conceive of an evolutionary history of increasing systemic complexity. More importantly, we can see each sub-system that contributes to higher order effects as having its own function or set of functions, and such functions, under naturalism, can be understood as possible adaptations. We shall return to this idea when discussing notions of social and natural functions.

Interim summary

I have now introduced two basic overviews of SC and CS. I have argued that SC can afford a weak ontology, and an epistemic position. In my description of CS I have shown how there are also a variety of ontological positions on offer. There is also, in fact, a branch of CS that uses theory to further the British Empiricist project of understanding how science is possible and how we do it (see Carruthers,

Stich & Siegal, 2002). This provides a form of epistemic project, but one that is very different from that of SC.

I have also maintained that the varieties of SC positions are held together by a concern with social processes, whereas the varieties of CS cohere under information theory. The rest of this paper will now argue that SC and CS also cohere under information theory and I shall draw out the consequences of this for future research.

Social information

SC relies on the concept of information. This is not to say that social constructionists directly espouse information theory, but simply that SC can only achieve its ends by discussing information, albeit indirectly.

As we have seen information is to be understood in terms of its role in the reduction of uncertainty, and, information can only be made sense of by relation to extrinsic factors such as (a) a backdrop of knowledge, such as that which allows the recognition of the message (Cohen, 2000), or (b) in light of the function of the system in question. It is to function that this paper now turns.

Social constructionists – whether ontological or epistemological – see language as playing a crucial role in human life: language use affects behaviour. They can either locate their behavioural descriptions in individual agents or in groups, but what is of interest is that they posit state changes as a consequence of language use, and 'use' can be construed as language input into a social system. The SC view of language has led to a variety of ontological commitments but what is not debated is that language performs a function. This generally takes the form of discussing language games that are the product of some order of social convention. The convention determines the function and this function is sufficient to make sense of the message – to provide some semantic content, howsoever you wish to conceptualize such a thing.

This description is commensurate with the baseline program of CS. CS has many debates about natural kinds but all approaches discuss regular input achieving state change. The nature of the kinds of computation that operate over information is the subject of much theory, but there is no

disagreement about the role of information. CS, that has taken the naturalist turn, looks to uncover the functions of systems that change states in terms of evolutionary theory. They look for natural functions, and this in turn makes sense of the information processing¹⁰. SC might not regard itself as part of the new naturalism and therefore not in the business of looking for natural function. Nonetheless, they do look for functions, and these might be termed social functions.

Natural and social functions

The concept of function under discussion is simply the concept of the work done by a system that can be changed by informational input – in a sense it is the consequence of state change. The distinction between natural and social function in this paper has been contrived in order to draw a distinction between the natural science project of much CS and the project of SC. The argument is that both CS and SC discuss system change through input, and therefore are dealing with information, but in order to make sense of that information both CS and SC need to be clear about the work done by the relevant systems.

A social function, for SC, is some order of social work. For example, we might decide to analyze the arena of occupational psychology, as Johnson and Cassell (2001) in fact do, using a discourse analytic approach, which is not the only tool in the SC box. Johnson and Cassell argue that non-SC approaches to occupational psychology have focused, among other things, upon conceptions of stress and job satisfaction. Measures have been constructed that purport to record the level of these psychological states within individuals and in so doing this adds legitimacy to ontological claims to stress and job-satisfaction as actual psychological kinds, and has become part of the discourse of people in the workplace. Unsurprisingly, Johnson and Cassell dispute the wisdom of this on the grounds of referential uncertainty¹¹ and argue that, by declaring the ontological status of such states, an industry of interventionists has been spawned. From Johnson's and Cassell's perspective what is really going on is the construction of a discourse that is dependent upon social approvals and conventions, and goes on to have effects upon how people interact. They make the following point:

Organizational members may be differentiated according to their participation in a discourse which shapes their subjectivity. For instance, those groups that accept and deploy discourses enjoy an aura of expertise and material privilege within organizational hierarchies while those who are unable to deploy that discourse lose status. Indeed, deployment of any discourse is seen as empowering those people with the right to speak and analyze while subordinating others who are the object of knowledge and disciplinary practices produced by the discourse. (pp. 136-137)

This is a statement of social function. The authors see the function of producing accounts of stress and job satisfaction as that of imposing a social hierarchy on a particular group – and to some extent that group is defined by its acceptance of such accounts – and the implication is that status, which is a relational property, has effects upon other aspects of individual lives and group composition. So this is the work done by the social system as a result of particular linguistic input.

Applying the term 'natural function' to the work done by cognitive systems could be read simply as a distinguishing nomenclature, so as not to confuse it with social work. However, under the naturalism already outlined in this paper, it can have a more specific meaning. Those cognitive systems that have been selected for by evolutionary processes, i.e. those systems that have emerged as adaptive responses to specific ecological contingencies over long historical time, have the natural function of delivering the adaptive response under specific conditions – those conditions providing the appropriate informational input. Many behaviours, from a preference for a certain waist-to-hip ratio in sexual partners (Singh, 1993), to a disposition to make optimal decisions in low information circumstances (Gigerenzer & Todd, 2000), can be conceived of as the outcome of natural or sexual selection and the product of cognitive information processing systems. This could potentially lead to a pan-adaptationist view such that all cognitive functions are seen in this light, or to a more moderate view that some cognitive functions are like this. If one takes the latter position, one still has to assume affects of evolved natural functions upon the rest of the hierarchically organized complex cognitive system, unless one wishes to deny naturalism, or some of the suppositions of cognitive plasticity.

Natural functions, then, can be interpreted against a backdrop of evolutionary theory. Evolutionary theory has a clear view of what an adaptation is – a trait that causes the underlying genes to increase in frequency within the gene-pool relative to other genes (see Andrews, Gangestad &

Matthews, 2002) – and allows for the production of behavioural predictions in light of knowledge about ecological contingences. Predictions serve to test the integrity of the functional analysis, but there is no commitment here to a precise (ontological) description of the system that delivers the function.

Natural functions could still be described without a commitment to naturalism for one can see the effects of output from cognition and the description of such input-output relations amounts to an account of the work done. But testing the integrity of such functional analyses is difficult without an extrinsic theory such as evolutionary theory. SC seems to lack just such an extrinsic theory when it comes to describing social functions.

Naturalism and system boundaries

There has been much discussion of systems throughout this paper, with especial reference to their role in information theory. Although practitioners of both CS and SC can readily talk about systems and system related concepts, such as hierarchies, one question has been left hanging in the discussion – what are the boundaries of a system¹²?

A simple definition of a system is “a group or combination of interrelated, independent, or interacting elements forming a collective entity” (Collins English Dictionary, 1991) but this definition does not provide a principle for individuating a “collective entity.” There is, however, an answer to this problem from naturalism.

The second law of thermodynamics states that the physical universe is constantly moving toward maximum disorder. Maximum disorder is a condition with no systemic properties and is referred to as entropy. Interestingly, Shannon used the concept of entropy to refer to the uncertainty of a system, and as we have seen it is the formalism of an input that resolves this uncertainty for a system and is thereby informative. Given this law it is noteworthy that we find matter organised into ordered lumps delivering apparent functions, such as we see in organic life. Organic life, then, is fragile, surprising and clearly requires a process to establish and maintain its organisation. The kind of naturalism outlined in this paper argues that natural selection is this process (Tooby, Cosmides & Barrett, 2003).

From an information theoretic perspective the process of natural selection becomes one of designing organisms that can take inputs from the environment and use them informationally. Those inputs help the organism to survive (which amounts to maintaining coherence despite the prevailing drift to disorder) and reproduce. In this sense natural selection builds information processing systems that represent the external environment veridically (see footnote 10) and it is this notion of natural functionality (see above) that determines an adaptation.

For those taking the new naturalism seriously, the answer to the question of system boundaries becomes an empirical question understood in terms of the preceding framework. The task confronting any such behavioural scientist is to take a candidate behaviour and apply an adaptationist analysis. This means analysing behaviour with regard to its effects upon survival and reproduction, or more precisely its effects upon relative gene frequencies. Such analyses will often lead to new precision in describing and characterising behaviours. For example, Profet (1992) applied an adaptationist analysis to morning sickness, asking the simple question “why is something that is so apparently detrimental to a mother so regular an occurrence across cultures and pregnancies?” This led Profet to investigate the precise timings of morning sickness during pregnancy as well as the precise triggers. Through this work she was able to establish that morning sickness occurs at a point when the foetus is most vulnerable to a variety of teratogens¹³ that are present in normal foodstuffs consumed by the mother. Thus it would appear that morning sickness is an evolved disposition to be sensitive to certain food inputs at an appropriate time, and to remove them before they cause harm. Morning sickness, therefore, is not just general sickness. The adaptationist analysis provided a detailed functional decomposition and suggested the outline of a system that responds to particular inputs; in this case a certain class of teratogens. Once we know that teratogens are the input and sickness is the output we can begin to hypothesise the necessary processes that go on in between input and output, and this characterises the system and marks its boundaries, for it should only process teratogens in this way. From such characterisations more precise metabolic hypotheses can be derived and tested.¹⁴

Profet’s morning sickness system is one of many adaptations geared toward the major function of reproductive success. Evolutionary psychology continues to find many such systems serving this ultimate function and in so doing is helping to build a picture of the interrelatedness between various reproductive subsystems, such as Profet’s, and the overarching function. The overarching function of reproductive success makes it legitimate to discuss a reproductive success

system, but only with due reference to the multiple problems and solutions that go to deliver this overarching function. Put more bluntly, there is no such thing a general problem of reproductive success that can be solved, instead there are many problems from mate finding, through mating to pregnancy and child rearing. In this way evolutionary theory provides detailed analysis of system and subsystem boundaries.

It is quite possible that, for various reasons rehearsed in this paper, the solution from the new naturalism would be found wanting by some SC theorists (see below). However, if one takes a weak ontological position one can appeal to some notion of order in the universe, and in so doing one can implicitly assume its opposite; disorder. Given this, a weak ontological theorist should also admit the requirement to explain order, relative to disorder, but they might not see the need to look for a unifying theory such as that outlined by the new naturalism. This is fine, but, however many theories of order might satisfy them, each and every such theory will amount to an extrinsic theory of function, in just the same way as an adaptationist analysis does.

To summarise, then, one possible answer to determining the boundaries of systems is to adopt an extrinsic theory of function. It is very hard to avoid discussion of function both as an SC and a CS theorist, as this paper has made clear, and as soon as function is discussed systems are assumed. To date the new naturalism provides a strong extrinsic theory of function.

What are the consequences for SC?

Clearly, some evolutionarily minded cognitive scientists might wish to ground social functions in theories of natural functions. Human responses to social events and the very fact of the human 'instinct' to live socially (which in itself might be an adaptation), suggest some specific cognitive systems dedicated to this. What is more, many theorists see abstract intelligence as predicated upon social cognitions (Byrne & Whiten, 1988; Cosmides, 1989) thereby suggesting a partial architecture for a hierarchically organized set of information processing systems.

Pessimistic epistemic social constructionists would balk at this last suggestion because such a suggestion is a scientific theory and therefore subject to the problems of being part of a language game,

and in turn raising issues of reference and realism. Weak ontology social constructionists might not be so dismissive and they would find plenty of work being done that would enable this relation to be established – broadly under the title of the evolution of culture. Here they would not find a simple biological determinism but rather an appreciation of humans' capacity to generate novel information for themselves under a variety of functionally describable situations – some directly adaptive, others not (see Plotkin, 2003; Wilson, 2003). That this work looks to source the social construction of culture and cultural artefacts in an evolved psychology (see Barkow, Cosmides & Tooby, 1992) might find accord with Harré's views cited above. For example, within contemporary CS there is a move to externalize much cognitive processing based upon our use of external tools such as pencil and paper as well as upon our use of socially shared resources, such as discussion groups to come up with new solutions to problems (Clark, 1997; Simpson, 2004). The debate focuses upon how much internal machinery one needs to deliver complex human behaviour. The occasional weak ontology social constructionist might have qualms about positions that posit any internal machinery, but, as said, such claims can be treated instrumentally. More importantly, given the functional commitments of evolutionary theory such cognitive science does not amount to an ontological commitment beyond discussing the functional demands of cognition and the likely carving up of that functionality.

Not all within SC would wish to adopt the new naturalism of CS, yet they might concede that both SC and CS are labouring under information theoretic conceptions. To all intents and purposes such SC theorists might feel they can carry on, despite this concession, as before. I doubt that this is the case for all of SC.

The pessimistic epistemic position that this paper has identified supports an extreme scepticism about any claims to knowing about ontology. However, as we have already noted, an adherence to information theory, bounded by functional descriptions of states and state change, amounts to an ontological commitment best stated as 'there are systems that can be in $1 + n$ possible states.' More critically, the fact that such systems require a functional description also commits theorists to a variety of ontological claims. Ontologically Johnson and Cassell are at the very least committed to the existence of groups with specific structural qualities – for example, hierarchical organization – as well as contributions from individual's properties such as an ability to understand, or merely react to, the relation property of status. In order to have the systemic effect that Johnson and Cassell lay claim to there must be some input to the group. As with CS, this functional decomposition

has assumed underlying natural kinds, and more importantly, has actually begun to say something about how they might be. This is always a consequence of describing a function. It does not amount to an actual description of psychological kinds, for many different types of machine could implement the same function, but it does amount to a description of the *type* of psychological kind involved. Johnson and Cassell, under my conception of SC, cannot avoid classifying themselves as at best weak ontologists.

Conclusion

The lengthy 'take-home' message of this paper is as follows:

Both SC and CS can be understood in terms of information theory. To understand the system that is undergoing change, as a result of inputted information, one must know the function of that system. To understand the function of a system is to understand the work that the system achieves and this cannot be done atheoretically. SC might be said to look for social functions, whilst CS might be said to look for natural functions, but both of these kinds of functions can be related.

CS, of a naturalist persuasion, has a theory of natural function, that of evolution through natural and sexual selection. Evolutionary theory not only provides an historical view of function, but it also allows us to evaluate our functional descriptions of systems by asking questions about the adaptive value of a system and also by predicting input-output relations under novel circumstances.

A pessimistic epistemic position advocate of SC would argue that the use of a scientific theory to augment functional analysis is suspect because it is merely another example of a culturally derived language game, namely positivist science, and as such there is no reason to believe in the ontological claims that support the theory. None the less, the same SC theorist would also produce a discussion about how the use of such language in science serves the function of maintaining hierarchies and certain power-relations. Implicit in such a discussion are ontological claims about social structure, and the very nature of linguistic information relative to a social system that is being defined. This SC theorist might claim to have made no reference to an external theory of social function, but under the information theory interpretation it is impossible for SC theorist to escape any ontological

commitments. This means that a pessimistic epistemic SC theorist cannot argue that, despite the information interpretation, language is still all-pervasive – because in order to make sense of that language they have had to minimally embed it in a theory of social functions which in turn entails ontological commitments beyond the initial description.

At best then, SC theorists can only take the weak ontology line and this, as I have indicated, amounts to a brand of instrumentalism. Much of CS is instrumental in its approach, relying on functional decompositions of input-output regularities to help individuate the kinds of cognitive systems that there are. There is no commitment to actual mechanisms, merely to the order of architecture that will deliver the behaviour, and all of this is measured against an extrinsic theory of natural function. Given this, and given that instrumentalism is the only route for SC, it would appear to be a worthwhile project for SC theorists to develop their own extrinsic theory of social function, or at least, to ground social functions in natural functions as suggested above. In this way SC theorists would capture the subtle complexities of social processes and their affects upon psychology.

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¹ Readers should note that the forms of social constructionism referred to in this paper are predominantly those adopted within psychology and especially social psychology. Other forms exist, for example within sociology and its sub-disciplines. The social constructionism of psychology is focused upon linguistic or verbal constructionism, but some sociologists argue for situational processes as constructive processes and these are not linguistically based. I am indebted to an anonymous reviewer for pointing this out. As this reviewer noted there might be a story to tell from naturalism for situational constructivism that is similar in kind to one that I am about to suggest for linguistic constructivism.

² More radically still SC theorists could argue that the traditional categories in cognitive science are grounded in discourse about cognition and such grounding is central to the construction of social reality.

³ The problem of the indeterminacy of reference is not peculiar to SC alone, and is a central problem in the cognitive sciences especially with regard to language acquisition. Here the focus is upon Quinean indeterminacy (Quine, 1960), as faced by an infant learning new words. None the less, this is regarded as a resolvable problem for language users and the modern view is that infants are equipped with a set of perceptual biases that effectively canalise learning of word-to-object relations (see Bloom and Markson, 1998; and Dickins, 2003 for an evolutionary treatment).

⁴ To put this in terms that will fit later arguments in this paper – a functional description of discursive practices, based on a foundational ontological *belief* that language is in some sense real, will help to individuate the natural kinds of such practice in much the same way that functional analyses in cognitive science aid in individuating the types of cognition responsible for a given phenomena, but not a detailed description of the *actual* computations involved.

⁵ It is possible to hold a view that language, in a more computational sense of the term than that used by SC, is constitutive of intentionality.

⁶ This is exactly the same order of pragmatism adopted by the putative weak ontology position.

⁷ A codon is a triplet sequence of bases that codes for a specific amino-acid. Amino acids are the building blocks of proteins. There are only four bases involved in protein synthesis: Cytosine (C), Adenine (A), Guanine (G) and Thymine (or Uracil at certain stages in the process).

⁸ The “just so” nature of the input can be regarded as a property of the *relevant* alternative configurations of all the possible elements in a message. The parameters of relevance are set by the (non) behavior of the system.

⁹ It is important to be clear about this view. What is not being claimed is that, by performing a functional typology, one in some way accesses the essence of the systems under consideration. Indeed, the whole project of CS is to delineate the various sub-functions of cognition in order to make statements about the types of minds that would be required to perform such functions. In no sense does CS aim to deliver the exact algorithms that produce behaviour. Indeed, even the discussions about classicist versus connectionist minds are carried out under the aim of achieving better functional typologies. CS sees an understanding of types as affording predictive utility and scientific explanation.

¹⁰ There are interesting semantic theories about cognitive content attached to natural functions (e.g. Millikan, 1993) but discussion of these approaches will have to wait for another paper.

¹¹ It is worth noting that most non-SC theorists would argue that stress and job-satisfaction are in fact behaviors with specific functions, and not individuated psychological kinds or mental states. For example, the function of stress behaviors is to advertise difficulty to conspecifics in order to enlist help in removing the organism from a deleterious situation. Job satisfaction is a description, and thereby a verbal behavior, of a set of emotional responses that have occurred in the context of a job. Both of these accounts take note of the function of the behavior and require no commitment to specific internal causal machinery.

¹² I am indebted to an anonymous reviewer for raising this issue.

¹³ Teratogens refer to any substances that cause foetal abnormality during pregnancy.

¹⁴ But it has already been noted in this paper that being in the business of delimiting kinds of systems is sufficient, especially for a theorist adopting pragmatic instrumentalism.