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Emergence in organizations: The reflexive turn

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Abstract

In this paper we explore the role and meaning of the concept of emergence in the study of organizations. A brief recount of the history of the concept of emergence illustrates a general failure to distinguish between the mechanisms of emergence present in systems comprised of simple material or biological agents and those associated with systems comprised of human actors. We argue that it is reasonable to expect that what can emerge changes as the fundamental characteristics of the agent changes. Human agents are distinctive in the ability to distinguish 'self' from 'other' and in so doing to reflexively interact with our environment. We examine the implications of this observation and propose the definition of distinct forms of emergence. If we are to understand organizations as emergent properties of change then we must understand the nature of emergence itself.

Key Words: emergence, reflexivity, organization ecology, complexity, autopoiesis.

Introduction

In this paper we explore the role and meaning of the concept of emergence in organizations. An increasing number of authors have argued organizations are complex self-organising systems (Fulmer, 2000; Pascale, 2000) which generate emergent phenomena (Stacey, Griffin, & Shaw, 2000) or represent a process of emergence (Tsoukas & Chia, 2002). Despite this the organizational literature fails to distinguish between 'emergence' as it is described in a natural systems context and 'emergence' in social systems (Sawyer, 2005) or organizations. We find this troubling as social systems represent a specific class of system, distinct from other natural systems (Goldspink & Kay, 2003, 2004). We argue that the tendency to use a single general concept to describe what we might reasonably expect to be

somewhat different mechanisms across different system forms limits our ability to develop a coherent understanding of organization.

This problem arises in social and organizational science because the act of observation is itself a part of the phenomena being observed and therefore needs to be explained (Bhaskar, 1997; Lincoln & Guba, 1985). To paraphrase Bateson (1972: 459) the *'difference that makes a difference'* between human and other natural agents, is that in natural systems the process of observation is external to and plays no part in the emergence of the system itself. The same cannot be said of social and organizational systems.

Philosophically, we argue that an appropriate orientation for social inquiry involves the adoption of a realist ontology and relativist epistemology consistent with arguments in the critical realism of Archer (1998) and Bhaskar (1998).

In accordance with this stance we argue that human agents are autopoietic (Maturana and Varela, 1980), and that the nature of their autopoiesis constrains the range and type of behaviours they can generate. This leads us to advocate an enactive approach to cognition (Varela, Thompson, & Rosch, 1992) which argues that the mechanisms by which human action is coordinated is not just rational (centred in the brain) but whole body (Barandiaran & Moreno, 2006; Thompson, 2005)(visceral, emotional, behavioural and, in humans and some other animals, linguistic). This view suggests a distinctive set of relationships between the micro and macro levels of social organization (Goldspink and Kay, 2004). The detail of these relationships is in our view unsatisfactorily understood, as are the mechanisms involved. It stands, therefore, as a threshold issue in the study of social organization.

While the mechanisms of self-awareness, consciousness and the capacity for language are still not well understood we can say with confidence that there will be a qualitative difference in the range of emergent dynamics observed between systems of agents which possess such capabilities and those that do not. As a starting point to further exploration we therefore propose the distinction of two classes of emergence:

- Non-reflexive: where the agents in the system under study are not self-aware, and
- Reflexive: where the agents (actors) in the system under study are self-aware and linguistically capable.

As far as we are aware this is the first time such a distinction has been proposed. These alternatives describe two poles of a likely continuum of emergent forms supported through phase transitions occurring at both micro and macro levels. Our thesis is that as critical thresholds in cognitive capability are crossed by constitutive agents, then the emergent patterns which result from the coordinated action of those agents will also demonstrate phase changes. We begin an exploration of the implications of this distinction by reviewing the historical and contemporary definitions of emergence, paying particular attention to its use in the fields of

philosophy of science and mind, social science, general systems theory and complexity theory. This is followed by a discussion of the distinct characteristics of social systems and the implications of this difference for organization studies.

Brief History of Emergence

The notion of emergence has a long history, having been applied across a number of disciplines with varying degrees of centrality to the theoretical and methodological development of associated fields (Corning, 2001). Yet the concept remains ambiguous and contentious, covering *'…a wide spectrum of ontological commitments. According to some the emergents are no more than patterns, with no causal powers of their own; for others they are substances in their own right…'* (Clayton, 2006: 14).

The Contribution from Philosophy of science

The first explicit use of the concept has been attributed to George Henry Lewes, in 1875 (Ablowitz, 1939). Following Lewes the concept rose to prominence primarily within the philosophy of science but more recently has been advanced within three distinct streams: *philosophy*, particularly philosophy of mind; *systems theory*, in particular complex systems; and *social science* where it has largely been referred to under the heading of the micro-macro link and/or the problem of structure and agency. Interestingly there has been relatively little cross influence between these streams of thinking. While it is beyond the scope of this paper to present a full comparison or to attempt a synthesis of the different streams, some brief comments are offered on the alternative perspectives and contribution of each to the wider debate.

The philosophy of science and philosophy of mind stream is arguably the oldest – some date it back to Plato (Peterson, 2006) but the debate is widely seen as having matured with the British Emergentists (Eronen, 2004; Shrader, 2005; Stanford Encyclopaedia of Philosophy, 2006). This school sought to deal with the apparent qualitatively distinct properties associated with different phenomena (physical, chemical, biological, mental) in the context of the debate, prevalent at that time, between mechanism and vitalism: the former being committed to Laplacian causal determinism and hence reductionism and the latter invoking 'non-physical' elements in order to explain the qualitative difference between organic and in-organic matter. This stream remains focused on explaining different properties of classes of natural phenomena and with the relationship between brains and minds (See Clayton & Davies, 2006 for a resent summary of the positions). Peterson (2006: 695) summarises the widely agreed characteristics of emergent phenomena within this stream as follows. Here emergent entities:

1. Are characterised by higher-order descriptions (i.e. form a *hierarchy*).
2. Obey higher order *laws*.
3. Are characterised by *unpredictable novelty*.

4. Are *composed of* lower level entities.
5. Lower level entities are *insufficient* to fully account for emergent entities (*irreducibility*).
6. Some emergent entities are capable of *top-down causation*.
7. Characterised by *multiple realization or wild disjunction* (Fodor, 1974) (alternative micro-states may generate the same macro states).

A key concept here is *supervenience*: a specification of the 'loose' determinisms held to apply between levels such that *'…an entity cannot change at a higher level without also changing at a lower level'* (Sawyer, 2001: 556). Within this stream prominence is given to the intersecting ideas of downward and upward causation. Clayton and Davies (2006) refer to downward causation as involving macro structures placing *constraint* on lower level processes hence *'Emergent entities provide the context in which local, bottom up causation takes place and is made possible'* (Peterson, 2006: 697). This concept appears similar to that of immergence within the social simulation literature and is worth exploring a little more fully as it is otherwise absent within the approach to emergence typical of complex systems inspired approaches (Sawyer, 2003, 2005).

Davies (2006) argues that the mechanism of downward causation can usefully be considered in terms of boundaries. Novelty, he argues, may have its origin in a system being 'open'. If novel order emerges it must do so within the constraints of physics. He concludes *'… top-down talk refers not to vitalistic augmentation of known forces, but rather to the system harnessing existing forces for its own ends. The problem is to understand how this harnessing happens, not at the level of individual intermolecular interactions, but overall – as a coherent project. It appears that once a system is sufficiently complex, then new top down rules of causation emerge.'* For Davies then top-down causation is associated with self-organization, it is the 'openness' of some systems that 'provides room' for self-organising process to arise but he concludes *'openness to the environment merely explains why there may be room for top-down causation; it tells us nothing about how that causation works.'*

In organization science, the work of Donald Campbell (Campbell, 1990) is relevant here, as an attempt to directly translate this notion to the organizational context. His work, led to a significant research stream, characterising evolutionary models of organization (see for example Baum & McKelvey, 1999; Baum & Singh, 1994; McKelvey, 1997; McKelvey, 1994; Rosenkopf & Nerker, 2001). The challenge with this work, despite its considerable promise, is that it remained squarely focused at the macro-level, never dealing with the interplay between the human actors and the emergent organizational outcomes. In essence, although the language of emergence was invoked, this work was not coming from Tsoukas and Chia's (2002) premise of change being the fundamental condition for organization but rather the reverse.

The devil then is in the detail of the mechanisms specific to particular processes in particular contexts and particular phenomenal domains.

The contribution from Social Science

The micro-macro problem – the relationship between the actions of individuals and resulting social structures and the reciprocal constraint those structures place on individual agency – has long standing in social science. The problem is central to many (notably European) social theories developed throughout the 19th and 20th century. Examples include: Marxian dialectical materialism (Engels, 1934) built upon by, among others, Vygotsky (1962) and Lyont'ev (1978); the social constructionism of Berger and Luckmann (1972); Gidden's structuration theory (1984); and the recent work of critical realists (Archer, 1998; Archer, Bhaskar, Ciollier, Lawson, & Norrie, 1998; Bhaskar, 1997, 1998). These alternative theories frequently are founded on differing assumptions extending from the essentially objectivist/rationalist theory of Coleman (1994), through the critical theories of Habermas and then to the radical constructivism of Luhmann (1990; 1995).

Fuchs et al (2005: 33) has attempted to classify the ontological position of alternative approaches to the micro-macro relationship. They concluded that the majority of existing social theory falls into either bottom-up determinism or top down determinism. What has been largely agreed, despite the very different theoretical handling of this problem, is that structure and agency come together in *activity*. Both Vygotsky and Giddens, for example, focus on *action* as the point of intersection between human agency and social structures. Orlikowski summarises the position by observing that *'…social actions are situated temporally and contextually, and they always involve interaction between humans. Social structure conditions these social practices by providing the contextual rules and resources that allow human actors to make sense of their own acts and those of other people'* (Orlikowski & Robey, 1991: 147)

The contribution from Systems Theory

Systems language was clearly evident in the work of the early emergentists and in a great deal of sociology and anthropology – notably that of Margaret Mead and Gregory Bateson. However, 'systems' as a focus of systematic research arguably took form with von Bertalanffy's attempt to establish a General Systems Theory in 1950 (Bertalanffy, 1968; Bertalanffy, 1950). Systems theory can be described as the science of wholes and contrasts to reductionisms concern with parts. In many respects systems theory was put forward as a counter to what was perceived to be the excessive reductionism that dominated scientific discourse during much of the 20th century.

While in the early stages of its development, systems tended to be modelled as 'black boxes' (effectively masking the relationship between micro and macro), the application of the concept to social science, in particular through the development of social cybernetics (Keeney, 1987), and soft systems approaches (Checkland, 1999) provided additional theoretical frameworks as well as methods useful for describing

the systemic behaviour of social systems. While the aspiration of General Systems Theory to establish a general science of systems is widely regarded not to have been realised (Jackson, 2000), systems approaches have contributed valuable methods for the study of the interplay between levels, in particular, furnishing techniques such as dynamic modelling and computer simulation.

The Systems view of emergence was founded on three main principles:

- Holism, the whole is greater than the sum of its parts
- The presence of *feedback both positive and negative*.
- The presence of boundaries and boundary conditions.

More recently the development of complex systems theory and its application to: natural (Bak, 1996; Kauffman, 1993; Prigogine, 1997), social (Buckley, 1998; Cilliers, 1998; Eve, Horsfall, & Lee, 1997; Goldspink et al., 2003; Kauffman, 1987, 1988), organizational science (Marion, 1999; McKelvey, 1997, 1999; Stacey et al., 2000) and cognitive theory (Kennedy & Eberhart, 2001) has provided valuable concepts, methods and techniques upon which much current debate about emergence draws. In contrast to the position taken by the British Emergentists, who argued that irreducibility was the exception (Eronen, 2004), most real world systems are argued to be non-linear (Kauffman, 2000; Kauffman, 1993, 1996; Stewart, 1990) and it is non-linearity which contributes to these system's capacity for novelty, and unpredictability in principle through the presence of deterministic Chaos (Lorenz, 2001; Williams, 1997) and/or equifinality (Richardson, 2002a, 2002b).

There is some debate about whether the presence of Chaos does lead to unpredictability in principle. It comes down to whether you think that the need for infinite precision qualifies as sufficient for the problem to move from one of practical constraint to in-principle constraint. Equifinality, as it is known within systems theory, or the principle of 'wild disjunction' as it is known in philosophy, refers to a system where a single high level property may be realised by more than one set of micro-states which have no lawful relationship between them (Richardson, 2002a, 2002b; Sawyer, 2001). As there is no a-priori basis by which the likely micro-state can be determined, such systems are irreducible and unpredictable in principle.

Lessons from history

In attempting to understand the relationship between micro and macro processes the devil is in the detail. Nevertheless this brief review of the way in which the concept has developed, allows us to draw some basic linkages between system types and their associated forms of emergence.

Specifically we can conclude that there are systems which:

- are inherently analytically reducible (to which the concept of emergence does not apply);

- are analytically reducible in principle but difficult to reduce in practice and/or where an advance in science/knowledge is needed for reduction to be possible because the results were 'unexpected' (Chalmers, 2006) (to which the concept of 'weak' emergence may be applied);
- are not reducible in principle (to which the principle of 'strong' emergence is relevant).

To which of these three classes do organizations belong? We argue it is *always* the latter and our reason for arguing this and a discussion of the implications are taken up below. In the following section we outline mechanisms fundamental to the emergence of social organizations and in so doing, attempt to clarify where and in what way these mechanisms rest on the biological characteristics of human actors and therefore differ from those which generate emergent order in non-human natural systems.

Why are Human Social Systems Different?

Our ontological starting position is that physics constrains chemistry; chemistry constrains biology and biology, sociality – in other words we advocate a form of naturalism. However, at each of these ontological levels, novelty occurs due to the emergence of unique micro-configurations within the space of possibilities allowed by the lower level. Downward causation is possible by the way in which higher order patterns change the boundary conditions of lower levels and constrain the situation specific interactions that are possible as a result. This suggests the existence of both an instantaneous co-penetration of levels (synchronic emergence) and also a sequential one (diachronic emergence).

At the same time the nature of the micro agents (their characteristics and action potentials), the heterogeneity and the structure of their relationships will influence the range and type of macro structures that can emerge. So far though there is nothing here that is not true of any natural system in which non-linearity is present. What then are the fundamental characteristics of human agents and what effect might the range and type of action potentials have on emergent social structures including organizations?

Human agents are cognitive. Within the biological sciences human cognition is recognised as involving nervous system activity in all sensory spaces; visual, auditory, tactile etc, where external perturbation on sensory surfaces results in a set of behavioural dispositions and responses to the environment. Like many animals, humans form social systems by coordinating their behaviour through reciprocal action. Unlike many other animals, humans are capable of coordinating their coordinations of action by way of language. The biologists Humberto Maturana and Francisco Varela developed a comprehensive theory of this process - the theory of autopoiesis (1980). This was subsequently developed and its implications for human social systems explored (Maturana, 1988a; Maturana, 1988b; Varela, 1981,

1987; Varela et al., 1992). Elsewhere we have argued that the theory of autopoiesis and its associated theory of enactive cognition is consistent with complex system ideas and that when combined with complexity, provides one possible pathway for understanding the substantive mechanisms of sociality and of organization (Goldspink et al., 2004).

From this, a minimum of two systemic mechanisms suggest themselves as the generative source of emergent patterns which we commonly refer to as social structures – the first of these is pre-linguistic (and by definition pre-reflexive) and the second involves language and hence reflexivity (Gardenfors, 2006).

Non-reflexive social emergence

The pre-linguistic mode operates through the mechanism of structural coupling between agents. Structural coupling will arise between biological (autopoietic) agents with sufficient behavioural range, located in a common medium. Through the process of recurrent mutual perturbation each will adjust its structures so as to accommodate the other – their structures becoming mutually aligned or structurally coupled. For us, two or more agents in structural coupling represents the minimum requirement for a system to be regarded as social.

An 'observer' may notice regularities or patterns in the resulting interaction and it is through this process that we would argue something has become emergent. These patterns represent mutual accommodations and an observer might attribute to those accommodations some social 'function'. The accommodations an agent makes to remain viable in one domain of interaction will need to be reconciled (within its body-hood) against accommodations being made as it also participates with different agents in other domain/s in which it is simultaneously participating. The accommodations made will be those that allow the agent to remain viable and to maintain its organization (i.e. which 'satisfice' the constraints and allow conservation of identity) based on its unique ontogeny (structure resulting from its history of interactions in a variety of domains).

Here the emergent structure can be seen to be 'in' (i.e. internalised within its own cognitive structure) each agent to the extent that each has had to make structural adjustments to operate in the shared domain. The structural adjustment each needs to make in order to persist will, however, be unique – in other words the structural accommodations each has made in order to contribute to the pattern will *not* be the same. As any agent could leave the domain and have minimal effect on the resulting pattern, each agents 'contribution' will be relatively small. The pattern can be thought about as like a hologram: the whole is in every part (agent) such that removal of parts (agents) reduces the resolution (coherence) but does not constitute loss of overall pattern. However, the loss of too many components may reduce the coupling to the point that the existing pattern de-coheres and transforms into something different. Each agent contributes to the pattern formation so it is conceivable that the pattern will only be realised with some critical minimal number

of agents present which have had a sufficient mutual history to have aligned their structures (become socialised within that context). As agents leave, the coherence may degrade until, beyond some critical point, it may de-cohere or take up an alternative 'shape' due to the influence of external perturbations (acting through the remaining agents as points of intersection of domains) or to the entry of new agents with different ontogeny.

Note that this emergence is consistent with that we would observe between agents in any complex natural system – the emergent pattern is the product of local interactions only. While feedback from macro to micro levels is possible, it is only through the effects of collective action on the environment and then the environment on the individual.

In natural systems, local level interactions between agents give rise to macro-level patterns. Importantly the dimensionality of these interactions is always limited by the existing structure of the agent (i.e. set of relations between the components of the agent as a system) and the state of its environment. With biological agents the system is open in that any emergent structure is possible as long as it remains consistent with the biological viability of the agent as a living (autopoietic) entity. This biological constraint includes limits to environmental conditions conducive to life (i.e. not too hot or too cold, the need for energy, limitations to sensory channels, channel bandwidths and affective/psychomotor response capabilities etc). These are primarily a product of phylogeny (the evolutionary history of the organism at the level of the species) rather than ontogeny (the history of development at the level of the individual) and are therefore slow to change and not under the control of the social system. As a consequence the basic dimensionality of the phase space of the social system does not change over the time frame of interest for understanding social systems. The dimensionality of the phase space is determined by the dimensions of variability possible by the individual – i.e. the plasticity of their nervous system and the higher order dimensions emerging from their interaction.

Reflexive Social Emergence

Our sensory surfaces are designed to detect difference in some dimension of the world and our cognitive apparatus is thus geared to make distinctions. Once our cognitive complexity exceeds a critical threshold (Gardenfors, 2006) these distinctions can be represented in language. Maturana and Varela (1980) describe language as involving the co-ordination of the co-ordination of actions – i.e. language provides a meta process by which agents orientate themselves within a world. Structural coupling can arise purely through behavioural coordination of action between agents as described above, however, it can also take place in and through linguistic exchange – the mutual co-ordination of co-ordination of behaviours. This gives rise to a consensual linguistic domain characterized by a more or less shared lexicon.

The advent of language radically increases the behavioural plasticity of agents and has significant implications for the dimensionality of the phase space and of the resulting higher order structures it can generate and support. This is because language makes possible the emergence of domains of interaction that can themselves become the target for further linguistic distinction and hence new domains. In other words, language allows the agent to make distinctions on prior distinctions (to language about its prior language, to build further abstractions on prior abstractions). This supports the possibility of recursion and branching within biological constraints. Furthermore, a capacity to distinguish (label or categorise) processes supports reification, simplifying the cognitive handling of processual phenomena and allowing the resulting reifications to be treated by the agent in the same manner as material objects (Berger et al., 1972).

These capabilities greatly expand the structural flexibility of the agent – allowing agents to invent shared epistemic worlds. The phase space of agent cognition is now based primarily on constraints of ontogeny rather than phylogeny (as with non-linguistic agents) and is hence under the influence of the agent/s.

Language makes possible a further major qualitative difference between pre-linguistic and linguistic modes of emergence. Humans have developed sufficient cognitive capacity to become self-aware and as such exhibit reflexive behaviour. This occurs when the agent is capable of distinguishing 'self' and 'other' i.e. the agent can entertain the notion of 'I' as a concept and treat that concept as an object (Damasio, 2000). The advent of this capacity for reflexive identity also supposes the existence of a range of conceptual operators that act on identity – identity construction and maintenance becomes a part of the agent's world creation. This gives rise to what Gilbert has called second order emergence *'second order emergence occurs when the agents recognise emergent phenomena, such as societies, clubs, formal organizations, institutions, localities and so on where the fact that you are a member or a non-member, changes the rules of interaction between you and other agents.'* (Gilbert, 2002). In other words, agents notice patterns that arise as they interact with others and distinguish those patterns in language.

For example, a reflexive agent can notice an emergent pattern of social behaviour and explicitly denote it as a 'norm'. While this denotation may be idiosyncratic (i.e. based on the necessarily limited perception of the individual agent), the agent can nonetheless act on the basis of this denotation. Once distinguished and reified within a domain, agents can decide (on the basis of rational as well as value based or emotional criteria) how to respond – they can choose to ignore the 'norm' or to behave in ways they believe will limit the reoccurrence of the behaviours that are outside the agreed/shared patterns of the group. This suggests, for example, that an agent can form hypotheses about the relationship between a macro structural aspect of the organization in which it is a participant and then act on that hypothesis, potentially changing the structure which it participates in generating. This gives rise to a feedback path between macro and micro phenomena that is not present (as far as we know) in any other natural phenomena. In this sense reflexive agents

continuously bootstrap a social structure and contribute to its maintenance, with the emergent form being the product of continuous interaction or change consistent with the perspective put forward by Tsoukas and Chia (2002).

Reflexive agents will display qualitatively different behaviours from non-reflexive through the ability to modify their own sets of behavioural change triggers, as for agents with linguistic capability, the two processes (linguistic and non-linguistic) intertwine or even become one and would not be able to be empirically disentangled.

The Role of the Observer

Another significant implication of the relationships described above is the observer dependant nature of emergence in social systems. In natural systems, the agents of the system are unaware they are being observed and as such the process of observation has no impact on the dynamics of the system or the way in which emergence takes place. In social systems, including organizations, every member is an observer of the system and the manner of their observation affects the process of emergence and hence the form and dynamics of the organization.

This was of course evident in the Hawthorn experiments of the 1960's where the marked changes in the behaviour of the organization were observed to occur simply as a function of the fact that the agents were being observed. The role of the observer in systems is represented in extremis in the concept of second and third order cybernetics (Keeney, 1987). The problem of the observer is that it threatens to wreck any theoretical treatment by ending in either infinite recursion or in paradox. A degree of both, however, may well be fundamental to the type of systems being described (Hofstadter, 2007).

The view being proposed here is that any agent that becomes a part of the system being observed has the potential to influence that system. An agent can become a part of the system simply by being itself observed or conceived as observing by those who constitute the system. The effect of the entry of a new observing agent is to change the system boundary so as to include that agent. The boundary is itself a concept of ambiguous status – it is an epistemic distinction albeit one based on potentially ontological markers. This carries both ethical and philosophical implications that are beyond the scope of this paper but are fundamental to any research program seeking to expand on the themes identified here.

Conclusions

While it is increasingly argued that organizations are emergent and dynamic – constituted in and through processes of change, the concept of emergence is problematic. It has a long history, having been contributed to by at least three distinct strands of theory – philosophy of science and mind, social theory and systems theory. The tendency, however, is to use a single general concept to

describe what we might reasonably expect to be somewhat different mechanisms across different system forms. The concept has also proved difficult to make operational: it has defied a concise specification or explication of mechanisms. This limits our ability to develop a coherent understanding of its implications for social organization.

We have argued that it is reasonable to expect that the range and type of structure that can emerge is influenced by the fundamental characteristics of the constituent agents, as well as their history of interaction and the nature of their relationship to one another. We use autopoietic systems theory to understand the implications of the distinctive biological characteristics of living systems and propose two distinct mechanisms of emergence applicable to natural biological systems. The first is non-reflexive emergence and applies to the range and form of emergence possible with systems of non-linguistic agents. This is contrasted to the second mechanism – that of reflexive emergence. Reflexive emergence operates where the agents of the system, like humans, have a capacity to distinguish self from other and therefore to interact reflexively with their environment. This reflexivity results in a unique feedback path between the emergent structure and the individual agents – each agent being an observer of the structure he/she contributes to producing and the process of observation contributes to what emerges.

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