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METAPHORS IN COMPLEXITY THEORY AND PLANNING

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Abstract This article reviews the use of complexity theory in planning theory using the theory of metaphors for theory transfer and theory construction. The introduction to the article presents the author's positioning of planning theory. The first section thereafter provides a general background of the trajectory of development of complexity theory and discusses the rationale of using the theory of metaphors for evaluating the use of complexity theory in planning. The second section introduces the workings of metaphors in general and theory-constructing metaphors in particular, drawing out an understanding of how to proceed with an evaluative approach towards an analysis of the use of complexity theory in planning. The third section presents two case studies – reviews of two articles – to illustrate how the framework might be employed. It then discusses the implications of the evaluation for the question 'can complexity theory contribute to planning?' The concluding section discusses the employment of the 'theory of metaphors' for evaluating theory transfer and draws out normative suggestions for engaging in theory transfer using the metaphorical route.

Keywords complexity theory, metaphors, planning theory, theory transfer

Introduction

Planning has been viewed by both its practitioners and theoreticians in various ways – as an art, a skill, a way of practice, a discipline engaged with action; as political, economic, bureaucratic, communicative, etc.; and by some as a discipline engaged with values and norms. Reflecting on these diverse viewpoints and building a body of planning theory is not an easy task for those engaged in it (Campbell and Fainstein, 2003). Approaches used have been generally either historical, in which transformations within planning thought are mapped and its connections with philosophy and social thought highlighted (Camhis, 1979; Friedmann, 1987; Taylor, 1998), or thematic, in which various concerns relating to practice are identified with main features drawn out, and different planning streams accordingly assigned (Allmendinger and Tewdwr-Jones, 2002; Campbell and Fainstein, 2003). Within planning, the activity of theory building itself draws on two sources – first, the empirical domain of planning practice and second, theoretical advances in planning-related disciplines. The domain of planning theory interfaces these two sources and is thus a fascinating arena of interesting and insightful development.

If one were to accept this view of the nature of planning theory then writings attempting to contribute to planning thought would be engaged in a twin endeavour, hoping to both inform planning practice as well as contribute to knowledge claims within planning theory and allied disciplines. This article is, however, not aimed at either of these goals. Rather, it is an attempt to be reflexive about certain aspects of the development of planning theory itself – particularly the way in which it engages with concepts imported from other disciplines. The focus here is on the use within planning theory of concepts from complexity theory as can be assessed from the way in which it has been hitherto employed in published articles. In order to enable the evaluation, a framework based on a theory of metaphors is developed and applied to two different types of published papers dealing with complexity theory and planning-related issues. It is also argued that the framework, by alerting us to possible omissions, has the potential to guide future engagement with use of concepts from diverse sources (unfamiliar to the planning community) within planning thought. The article is targeted at planning theorists – those of us who are engaged in reflections about the nature and scope of planning as an activity as well as planning as a disciplinary concern within a larger body of knowledge.

The first part of the article presents a brief background on complexity theory and its general trajectory of development. It then provides the rationale for the choice of metaphor theory for evaluation. The focus is on highlighting the need for developing a framework for evaluation and the reasons for the particular choice of theory used to inform the development. Concepts within complexity theory per se are not discussed as it is beyond the scope of the argument advanced here. The second part focuses on the

theory of metaphors and develops the framework. The third part applies this framework and illustrates how it might be used by reviewing two different published articles. The relevance of the evaluation results is discussed. The fourth part discusses merits of the framework as a tool that may be fruitfully employed to engage with concepts that might be useful and relevant, yet unfamiliar to audiences within the planning community.

The background of complexity theory

Complexity theory refers to a body of knowledge which assimilates contributions from many disciplines, including the natural sciences (thermodynamics, physics, chemistry, biology, computer science, information technology, etc.) and social sciences (economics, political science, management science, etc.). Since publication of some of its concepts in popular science books written by popular science writers (Gleick, 1987; Waldrop, 1992; Gribbin, 2004) as well as, by and large, accessible books written by scientists (Prigogine and Stengers, 1984; Stewart, 1990), complexity theory has found many adherents in various disciplines including those in social science. Discussions of the theory within social science include philosophical discussions (Cilliers, 2000; King, 2000), discussions of applications (Kiel and Elliot, 1996; Byrne, 1998), discussions of general implications of the theory (Eve et al., 1997; Byrne, 1998; Urry, 2003) and engagements with certain concepts or ideas (Rasch and Wolfe, 2000; Abbott, 2001). Complexity theory has also given rise to profoundly innovative and far-reaching work within sociology such as Luhmann's (1995) voluminous, now classical, work on social autopoiesis, building on work undertaken originally in biology.

In the last few years complexity theory has also made a transition into planning. Discussions have taken place in planning as well as in planning-related disciplines like urban studies, policy science or governance (for instance, Kooiman, 1993; Allen, 1997; Byrne, 2001, 2003; Strand, 2002; Rhodes and MacKechnie, 2003). Specific applications using particular concepts have also been attempted (for instance, Batty and Longley, 1987; Batty and Xie, 1999; Dunsire, 1996; Jessop, 2001a, 2001b). Work that has taken place can be broadly seen as being within two streams – a quantitative stream concerned with modelling-related issues and a non-quantitative stream concerned more with qualitative aspects. Both deal with sometimes similar concerns and concepts related to complexity theory, including the emergence of spontaneous order, robustness, fractals, etc. However, the range of issues that complexity theory is called upon to explicate, together with the admittedly rather 'vague' manner in which it has been employed in some instances, has resulted in a considerable amount of confusion and scepticism about the worth of the theory itself.

Writings for and against the theory have hitherto tended to be based upon either intuitive empathy giving rise to benevolent optimism, or

intuitive rejection giving rise to cynical pessimism. Substantive content of the arguments is based upon all or some of the following factors: first, condemnation of the theory as a whole based on what can at best be termed limited reviews of the use of complexity theory (reactions to one or few authors). The second factor is more commonly seen and I shall term it 'informed speculation' on what constitutes the theory, its nature and features. This is to a certain extent inevitable as the theory has its source in many subject domains in all of which no single person can be said to have an authoritative knowledge. Finally, arguments are also explicitly and implicitly based upon the reviewer's concept of the nature of social science/planning per se. The result is that we have diverse viewpoints that do not easily aid any understanding of the theory or its worth for the advancement or understanding of planning thought. This article argues that for the potential usefulness of the theory to be accepted (Thrift, 1999; Byrne, 2003), or rejected (Horgan, 1995; Stewart, 2001), arguments for or against must be based upon more robust grounds.

The problems highlighted above, it can be argued, are inevitable, as they are to a certain extent inherent in the subject matters involved. How then can one evaluate an application of the theory and conclude whether or not it is a one-off case of an unconvincing translation from the original domain (robust applications will inevitably speak for themselves) or a more fundamental problem of theoretical incompatibility (for planning)? What is required here is a framework that can accommodate the above limitations, yet provide a yardstick rigorous enough to be accepted by those engaged in planning theory and thought. Since the concepts from complexity theory originate from a diverse range of disciplines, a theory of theory transfer and theory construction would address the issue most appropriately. I propose the use of the 'theory of metaphors' as a lens for evaluating the use of complexity theory in planning.

Two reasons justify my choice. First, metaphors are known as vehicles for the transfer of concepts, ideas and notions from one domain to another, though the efficacy of this remains contested. Why then choose a 'vague' vehicle to clarify a vague area of enquiry? The answer, as I argue, is because first, the vagueness of metaphors serves to partly illuminate the reason for the mysticism of complexity and its subsequent, significantly unconvincing, employment within planning. Second, in spite of the vagueness, the theory of metaphors has developed a fairly robust notion of how theory transfer and theory construction take place, which I employ to argue my case.

Before venturing into a discussion of theories of metaphors, a clarification of the use of the word 'scientific' is needed. The word is not used here in a narrow 'scientism' sense but in a much broader one which I explain by borrowing a quote from Byrne (2003). It is meant here as the 'systemic secular knowledge about reality that is somehow validated empirically' (Gulbenkian Commission on Restructuring the Social Sciences, 1996, quoted in Byrne, 2003: 172).

The word 'scientific' in this article also signifies being 'rational' and 'objective'. The sense in which the terms 'rational' and 'objective' are used here connects to Rorty's (1991) discussion of what it means to be '"rational" and "objective"'. Urging in favour of new meanings for terms, he suggests, 'another meaning for "rational" is, in fact, available. In this sense, the word means something like "sane" or "reasonable" rather than "methodical"' (p. 37). Rorty further argues, 'we fuzzies would like to substitute the idea of "unforced agreement" for that of "objectivity"' (p. 38). By the term 'unforced agreement', Rorty is referring to a desire for solidarity with the community with which we as researchers identify ourselves.

'Theoretical' metaphors, their nature and their use

Etymologically, metaphors mean 'to carry over' or 'to transfer' (Hunt and Menon, 1995). The theory of metaphors introduces us to two basic types, each different in fundamental ways: the 'literary metaphors' and the 'theory-constructive', 'theoretical' or 'scientific' metaphors. Literary metaphors and the mechanisms by which they operate on an audience constitute a much discussed area within language studies. Basic terminologies for the systematic study of metaphors are laid out within this domain (Ortony, 1993; Goatly, 1997). Very briefly, there is a 'source' domain and a 'target' domain, with the metaphor itself being the 'vehicle' (Goatly, 1997). The metaphor operates through a tension between congruence and incongruence, expressed by Hunt and Menon (1995: 82) as being 'denotatively false and connotatively true'. In other words, there are always features of the source domain that the metaphor denotes, which are not necessarily possessed by features in the target domain. However, the metaphor carries associative connotative meanings from the source domain which resonate with the target domain and it is these connotative meanings that lend the metaphor richness (Noveck et al., 2001).

The use of metaphors is very much part of our everyday language, expressing exactly what we mean (Glucksberg and Keysar, 1993). There are many theories that account for the way metaphors work. Prominent among these are the substitution theory, the comparison theory and the interaction theory (Ricoeur, 1978; Ortony, 1993). Substitution theory advances the idea that metaphors work by substituting a literal sentence or term for a figurative one (Olsen, 1982). Comparison theory states that metaphors act by making comparisons of attributes or beliefs within the domains involved (Tourangeau, 1982; Xu, 2000). Interaction theory is the most recent and generally accepted one (though details are contested). Here metaphors work by interaction between two domains, whereby the hearer is incited to select properties from the source domain and construct a parallel in the target domain, which in turn may induce parallel changes in the source domain (Black, 1993). Theory-construction metaphors basically build on this view (Black, 1962, discussed in Boyd, 1993).

Lakoff (1993: 203) emphasizes that 'the locus of metaphor is not in language at all, but in the way we conceptualize one mental domain in terms of another'. It is thus 'the ontological mappings across conceptual domains', making it a matter of 'thought and reason', where 'language is secondary' (p. 208). The notion of 'structure-mapping' informs us here. It advocates that an analogy works by mapping knowledge from one domain to another in a way that holds together systems of relations (Gentner, 1982; Gentner and Jeziorski, 1993). Thus features in the target and source domains need not resemble each other, yet correspondences can be mapped by virtue of similar roles in relational structures (Gentner and Jeziorski, 1993) as for instance, the structure of the solar system and the atom. It is again this feature of metaphors that forms the basis of theory construction metaphors.

Opposed to this concept of ontological mapping is the argument that metaphors are essentially sensuous or intuitive, especially in the domain of poetics (Hester, 1967) and that their primary purpose is in invoking images that aid cognition. Alvesson and Skoldberg (2000: 89) argue that 'which image we choose depends on the angle of view, the perspective, and is thus subjectively conditioned'. The authors point out however, that there are limits to the choice of images and the 'objective' degrees of freedom for the choice will depend upon the properties of the two phenomena that are compared. It follows that if the properties are not known, or if the limits of choice are transgressed, a 'bad metaphor' is the result.

The properties must not only be known, but must also resemble each other. This provides the reason for metaphoric transfer. As Ricoeur (1978: 46) argues:

> between the figurative sense of the borrowed word and the proper meaning of the absent word, there exists a relationship that can be called the 'reason' (in the sense of rationale or basis) for the transposition. This reason constitutes a paradigm for the substitution of terms. In the case of metaphor, the paradigmatic structure is that of resemblance.

Let us now return to focus on theory construction metaphors per se by asking specific questions. What is distinctive about theory construction metaphors? What is their role in facilitating and contributing to theory transfer and construction? What is the process of transfer?

Theory construction metaphors act in two fundamentally different ways, dependent on the relative state of advancement of the particular area constituting the target domain. Thus there is a role for metaphors in both the pre-theoretical stages as well as in the more mature stages. In pre-theoretical stages, a creative metaphor induces emotive and cognitive tensions by bringing together two disparate domains. Efforts are then made to ease out tensions by further work, which in turn results in further comprehension (Hunt and Menon, 1995). Thus, conceptually viewing one domain in terms of

another induces by itself a research agenda for further investigation. This is clearly illustrated by Boyd (1993), who uses the example of the domain of computer science and the way it has informed the setting of research agendas in cognitive psychology – suggestions that motoric processes are 'pre-programmed', suggestions that certain information is 'encoded' or 'indexed' in 'memory store' by 'labelling' and so on. The dominant metaphorical function here is one *of generating 'scientific' or theoretical ideas*.

Metaphors, as discussed above, have certain characteristics. First, initially users may not be able to specify *exhaustively* the relevant respects of similarity. In fact it is this open-endedness that allows theoretical transfer and later theory-construction in a new domain. However, this does not mean that there is no responsibility on the user of the metaphor. As stated by Boyd (1993: 488):

> it is part of the task of scientific theory construction involving metaphors to offer the best possible explication of the terminology employed [and] it is certainly the routine responsibility of scientists as the sciences in general . . . are self-reflective disciplines, and the explication of theoretical concepts – metaphorical or not – is an essential part of the task of scientific enquiry.

The reference role of metaphors here is a sort of 'non-definitional' reference and the entities referred to can be viewed ontologically; from a realist point of view, as causal structural relations (Boyd, 1993), or from an instrumentalist or pragmatic view, as substantive or cognitive (Kuhn, 1993). Metaphors provide the terminology to conceptualize features of the world in one domain, whose existence or usefulness may seem plausible, through work in another domain. By metaphoric transfer, the features not only get contextualized in the target domain, but may also interactively inform in turn the source domain. One important conclusion that follows is that for usage of metaphors in theory transfer and theory construction, a good understanding of both the source domain and the target domain is essential, as only then can the structural relations be abstracted.

Theory-construction metaphors used in the above manner also undergo a different developmental history from that of literary metaphors. Literary metaphors when used over time lose their dramatic quality and tend to become 'stale' or 'dead' (becoming incorporated into literal usage). Theory-construction metaphors on the other hand, if successful, will be used by many researchers (Boyd, 1993; Hunt and Menon, 1995), heuristically informing new research agendas within disciplines, and thereby undergoing a change or evolution of exact meanings within disciplines over time. This will continue until the research community finally establishes and defines the metaphor within the discipline itself in relation to theories and knowledge within the discipline (Knudsen, 2003). Thus, even though one can imagine metaphors losing their productive quality over time, they never become trite.

There is also a less rigorous, yet nevertheless indispensable role for metaphors in knowledge advancement. This is in performing the social role of persuasion and indoctrination, found mostly in popular science writings and also in 'technical' publications that interface with the public. Knudsen's (2003) study of the use of metaphors in scientific and popular science journals written by scientists themselves, reports not only on the increased use of metaphors within popular science journals, but also on what she calls a 'democratization' of all metaphors, including theory construction ones, whereby they are transferred into pedagogical metaphors with a merely descriptive or exegetic function. Thus their use changed from hypothesis to explanation, making the same metaphors 'closed' in non-scientific discourse, even when they remained 'open' in the minds of the scientists writing articles for non-scientific audiences.

In mature disciplines metaphors perform yet another important role, that of 'catachresis' – the introduction of theoretical terminology where none existed earlier (Ricoeur, 1978). According to Boyd, catachresis is a process of 'accommodation of language to the causal structure of the world, . . . making possible socially coordinated *epistemic access* to a particular sort of thing or natural phenomenon' (Boyd, 1993: 483, emphasis in original).

Thus metaphors again perform a social role in providing through accepted usage both heuristic and conceptual access to theoretical concepts, hitherto unnamed.

The case for the relevance of metaphors as a vehicle for theoretical transfer and consequent theory construction in a new domain has been stated above. However, this endorsement of metaphors in a theory-transfer and theory-construction context must be qualified by evidence of several aspects, including: reasonable knowledge of both the source and the target domains, sufficient to enable a pertinent abstraction of key relational characteristics from within each; an effort to draw out and explicate key similarities and analogies; an effort to abstract and elucidate essential relational features, and also an attempt to explore the abstractions with relation to other theoretical work in the target domain. In the absence of the above the use of metaphors may fall short of 'theoretical', even though still employed in 'scientific' work, either as a descriptive medium for pedagogical or persuasive purposes, or as a gap-filling device for inadequacies of language. In both cases the author of such work might then have to ensure that the audience understands both the source domain and any features of the source domain the author wants to convey, otherwise the result might be an 'asymmetrical understanding', that is, the meaning meant by the author is not grasped by the audience (Goatly, 1997) and could cause considerable confusion.

Having laid a broad framework for evaluation of theory transfer between two domains using the theory of metaphors, I shall now discuss some uses of complexity theory within planning thought. Since the purpose of this discussion is essentially an illustration of the above ideas

from the metaphor theory, I restrict my discussion to a review of two articles. Both engage with what their authors regard as insights of complexity theory in a general sense. The articles have been chosen for several reasons: their general level of engagement which offers potential to examine how various ideas or concepts have been discussed; the authors' explicit, sustained and serious engagement with complexity theory, demonstrated by the quantity of their publications, which deal with complexity theory and planning (Byrne, 1997, 1998, 2001, 2003; Innes and Booher, 1999, 2000, 2001) and the difference in scope the articles present in order to demonstrate how the analytical framework could be used to yield different types of insights. It must be emphasized here that my discussion of the articles is limited to a critique of the use of complexity theory as viewed through the lens of the theory of metaphors; the intention being to illustrate the employment of the theory as an evaluative tool for theory transfer. Detailed discussions of the content of the articles are thus regarded as ancillary.

Complexity theory within planning: a comparison of two articles

Article 1

Innes, J.E. and Booher, D.E. (1999) 'Consensus Building and Complex Adaptive Systems – A Framework for Evaluating Collaborative Planning', *Journal of the American Planning Association* 65(4): 412–23.

Innes and Booher draw on complexity science, along with other sources such as their own research findings and the Habermasian concept of communicative rationality, to evolve a framework for evaluating consensus-building processes. Their use of complexity science is as a metaphor. They claim 'Complexity science provides a powerful metaphor to help understand why and in what ways consensus building can work more effectively in today's complex, fragmented policy context' (p. 413).

I begin this review from the authors' concluding frameworks, expressed in terms of 'process criteria' and 'outcome criteria' for evaluation of consensus-building processes (p. 419), and work backwards. Features listed as outcome criteria are almost exclusively based on the authors' own research, rather than being introduced from complexity theory, except in the use of the term 'co-evolution' and 'adaptation' in the third order effects listed. 'Adaptation' has a literal use; the identification with complexity theory being due to the fact that the adapting process is introduced as part of

processes associated with complexity theory. The word 'co-evolution' per se is not introduced but within the context the reader can make an informed guess as to the authors' meaning. Among the process criteria, the authors specify that the process of consensus-building must be 'self-organizing', the meaning of which was briefly introduced earlier in this article. Thus in terms of meanings conveyed by the metaphoric use, the authors do communicate successfully with the reader.

If we now consider the 'Principles of Evaluation' (p. 418), the authors advance normative principles, two of which are based on complexity. They maintain 'a complexity perspective suggests that a high quality consensus building process in an uncertain and changing society should be self-organising and evolving, good at gathering information from the environment and effective at making connections among participants' (p. 418) and 'a complex adaptive system depends on each individual being empowered to act autonomously and in an informed way, so that manipulation of any participant or suppression of their own views can only make a system less intelligent' (p. 418).

These are normative inferences which not only use the terminology of complexity science, but also are explicitly grounded in it. How do Innes and Booher reach these normative conclusions? They are based on a perspective that views consensus-building process as a complex adaptive system and also a particular reading of the features of a complex adaptive system. I will discuss these groundings in detail after first considering whether this is a metaphoric theory transfer at all.

The notion of complex adaptive systems within complexity theory has evolved to become an ontological claim based upon experiments conducted across disciplines ranging from physics to biology to computer science. Any talk of the features of a complex adaptive system is thus based upon an already abstracted set of features and characteristics, which constitute what is known as complexity theory. Thus a source domain here does not exist in the true sense. What is at issue then is whether it is possible to extend the ontological claim of complex adaptive systems to inform the target domain of consensus-building processes, or whether alternatively it is possible to use the concepts metaphorically to inform consensus-building processes. In the case of extension of an ontological claim, the 'vehicles' (as in the theory of metaphorical transfer) used for extension are inevitably the terminology, which denotes ontological relationships in the source theory. However, the terminology remains a metaphor in the target domain until validated, potentially signifying either useful cognitive concepts or causal relationships depending on one's philosophical viewpoint. The process here is that of structure mapping as introduced earlier – the mapping of relational attributes.

This point leads to the question of how to ascertain the validity of a structure mapping. How does one contest the validity of any theoretical application to any domain? I maintain that in the case of metaphoric theory

transfer this must be done by a description of the target domain that establishes its position as one at least equivalent to the source domain, in terms of features that compel a comparison, and within which the structural correspondence makes some possible sense. In this case then an unavoidable task for establishing the validity of mapping would be to draw out the correspondence of consensus-building process with that of a complex adaptive system. Taking off from the earlier concern of grounding, I now examine how far this has been done by Innes and Booher.

Features of complex adaptive systems are sketched out in the text. Features of the consensus-building process, based upon findings from the authors' previous research, are sketched out separately. I quote from the text and underline the words/phrases that establish congruence with complex adaptive systems, as later sketched out (p. 417). The authors maintain:

1) learning and change can be the most far-reaching effects of consensus building (p. 415).
2) they (participants in a consensus building process) may learn how all participants' interests are interconnected (p. 415).
3) consensus-building is not grounded in the authority of law and tradition (p. 415).
4) typically it (consensus-building) is adaptive and evolving often with spin-off working groups and other self-organizing activities (p. 416).
5) consensus-building is mutually interactive with its environment (p. 416).

Though not specifically stated, one can infer that the authors claim that there is validity in applying the insights of complexity theory to consensus-building because these features of consensus-building resemble those of complex adaptive systems.

But what are the insights? From their research, Innes and Booher claim that 'much of what consensus building accomplishes, such as new levels of trust, shared knowledge, alliances, personal networks and working relationships, depends on collaboration and a mutually respectful process' (p. 416).

From a Habermasian perspective, they argue that 'for dialogue to produce emancipatory knowledge, the stakeholders must be equally informed, listened to and respected, and none can be accorded more power than others to speak or make decisions' (p. 418).

I quote from their principles of evaluations once more:

> a complexity perspective suggests that a high quality consensus building process in an uncertain and changing society should be self-organising and evolving, good at gathering information from the environment and effective at making connections among participants. (p. 418)

> A complex adaptive system depends on each individual being empowered to act autonomously and in an informed way, so that manipulation of any participant or suppression of their own views can only make a system less intelligent. (p. 418)

The authors thus finally recount features of consensus-building, although actually arrived at by other means, as insights from a complexity theory perspective.

What does complexity theory contribute to the argument? At best it can be said to couch and repackage the authors' findings in terms enabling them to make a circular normative argument. This can have a social role in promoting and favouring certain values that may otherwise be difficult given the scattered nature of the findings. Thus it can serve a gap-filling linguistic and possibly a conceptual function, consolidating findings into a unified theory, which though known individually, is otherwise dispersed through the target domain.

One last point worthy of note is the value dimension of metaphors. The authors opine 'at the edge of chaos – a good analogy to the current period of social transformation – innovation and dramatic shifts in activity patterns can occur, and systems can move to higher levels of performance' (p. 417).

This statement is made without a proper qualification of what is an 'edge of chaos system' (in complexity theory it means a system with certain properties including the presence of a certain order). It therefore has the potential to be interpreted rather arbitrarily and (possibly) dangerously, given the literal meaning of the word 'chaos'. As Hunt and Menon state (1995: 88) 'what an adopting discipline borrows in a metaphoric transfer is not just a positive collection of concepts and theories, but either explicitly or implicitly, a set of norms as well'.

In terms of theory construction then has the use of complexity theory served any function? I would say that the authors have been able to show that reasonable grounds exist for a re-conceptualization of consensus-building as a complex adaptive system – a useful first step no doubt. This will, however, remain a redundant exercise if it yields no insights. If it is to yield anything to the target domain, the re-conceptualization must be taken further to achieve three objectives: to explore the connotative meanings associated with complexity theory as revealed in different source domains from which the theory originates (this is an area where metaphoric theory transfer has its utmost potential); to undertake a fuller and more detailed exploration of the abstracted features so as to yield the relational structure within the abstraction in finer detail; and to undertake empirical work to detail out how the imported structural mapping plays out in the new target domain, thereby yielding new insights relevant to this domain, while changing and contextualizing the received concepts. This is the final benefit of innovativeness triggered by a re-conceptualization.

Article 2

Byrne, D. (1997) 'Chaotic Places or Complex Places – Cities in a Post Industrial Era', in S. Westwood and J. Williams (eds) *Imagining Cities*, pp. 50–70. London: Routledge.

In this essay, Byrne attempts to use chaos/complexity theory insights to comment on and argue for a viewpoint on the internal processes that he regards as taking place in post-industrial cities in the UK. Byrne uses this viewpoint to reflect – with the aid of chaos/complexity theory – on the larger issue of the role of structure and agency in urban transformation. An explicit ontological claim for the theory runs through the essay as the author attempts to empirically test an hypothesis based not upon the contextualization of a transfer based upon structural mapping, but rather an hypothesis derived directly from the theory itself.

Byrne introduces early in the article the notion of 'chaos', as in chaos theory (p. 51). Sensitivity to initial conditions and the possibility of order emerging from chaos are highlighted as insights gained from chaos theory. Specific terminology is introduced, namely 'strange attractor', 'torus attractor' and 'phase states' all of which are not explicitly expounded, though one might guess that they have something to do with stability (pp. 52, 53). The author proceeds to use these terms to argue for a qualified determinacy, which he contrasts with 'linear determinacy'. This is a central theme of the essay. As far as is made explicit, the justification for the use of chaos theory starts with this felt or sensed correspondence – that of non-linearity in chaotic systems and in the real world.

The word 'torus' comes up again later in describing Graham's account of possibilities of urban transformation. Byrne uses the word in a substitutive sense for the literal meaning 'reconstitution within limits' (p. 54). Though torus can be said to possess this property it is not *the* defining property of a torus, for all attractors excluding the point attractor possess it. In addition, later in the text the author defines a 'torus' as 'characterised by self-similarity' (p. 56). This however is not a property of 'torus', as self-similarity is a feature of strange attractors which torus is not (see Gleick, 1987; Stewart, 1993, for a description of phase spaces, different types of attractors including strange attractors). Therefore one must conclude that the choice of the word is a case of a wrong metaphor, although here it makes no difference, as the metaphor is not really introduced to the reader who will probably not be able to understand it. It thus conveys little or no additional insight to readers not well versed in the terminology of complex systems.

Further on Byrne (p. 55) introduces defining features of complex systems, quoting from Reed and Harvey (1992: 359). The defining features

are said to be 'governed by an evolutionary dynamic that is of a far from equilibrium state', are 'inherently historical and intensely innovative' and have capacities for 'spontaneous change and long range tendencies towards evolutionary behaviour'. Their 'internal dynamic is said to be ontologically unique' as it is predicated on 'self-replicating, non-linear feedback'. Though literal meanings of terms 'far-from-equilibrium', 'non-linear feedback', and 'long range tendencies towards evolutionary behaviour' are known, their connotative meanings cannot be expected to be known to a planning or social science based audience, at least not in 1997 when the article was published. Hence a serious reader is left with a sense that the writer refers to something more important which has its base in complexity theory but it is difficult for them to guess what. This leaves the reader with a sense of mysticism about complexity theory as such. Effectively the same response results when the author (p. 55) quotes Nicolis and Prigogine (1989: 238, in Reed and Harvey, 1992: 370) and uses the terminology of complexity theory to make the claim that 'perturbations of far-from-equilibrium conditions can originate in the values and actions of humans themselves'. How is a reader to agree or disagree when the full meanings of the terminologies are obscure? As stated earlier, it is the task of the author, when using concepts in one domain in another domain, to explain the meanings he/she attributes. (In the original work by Reed and Harvey, the meanings are explained.)

In introducing the property of 'sensitivity to initial conditions', Byrne makes good his earlier omission and expounds the meanings/properties he attaches to the phrase. However, the same obscuring of meaning happens when the term 'dissipative systems' is used. 'All dissipative systems have to be understood as being characterised by a dominance of information over energy with information representing both order and the origins of disorder' (p. 55). It is impossible to decide whether or not social systems can be dissipative as the meanings of 'energy' and the phrase 'information representing both order and the origins of disorder' are obscure. Thus, any claims made for social systems based on classification as a dissipative system remain unconvincing at best.

The use of the concept of 'fractals' takes another turn. From Casti (1994) the author quotes fractals as:

> Moreover they have exactly the same degree of irregularity at all scales of measurement. If you start looking from a distance (i.e., with a long ruler) then as you get closer and closer (with smaller rulers) small pieces of the curve that looked like formless blobs earlier turn into recognizable objects, the shapes of which are the same as that of the overall object itself. (p. 56)

Byrne wants to argue that expressions of global restructuring can be primarily seen in intra-urban rather than in inter-urban analysis. He maintains that:

> studies which emphasise the distinctiveness of localities, and especially whole city regions, have been using too long a ruler, . . . we need to look within cities, at intra- not inter-urban differentiation, if we are to find the expressed consequences of what is certainly a phase state change. (p. 56)

Several immediate questions arise: why should we consider cities to be fractals and what makes them so? If fractals exhibit self-similarity across all scales and conceding that cities are fractals then how exactly does scale matter for bringing out consequences of global restructuring? Should not the effects the author is searching for be visible across all scales as properties of self-similarity are exhibited across scales? The use of the term fractals here seems to be actually counterproductive to the argument that Byrne wants to make. Further questions include: what is the significance of the metaphor 'phase change' since it is explicitly asserted? How does it add to the argument for detecting what the author is seeking? What emerges is a deficiency in terms of both joining two domains through an unconvincing metaphor, primarily because the nature of compatibility is not clearly stated, and also improper explication of the meaning of the metaphor, which with the information available seems to be incommensurate and counterproductive to the argument for which it is used. Additionally, the introduction of unfamiliar redundant metaphors serves to distract from, rather than expound, the argument.

The text actually is packed with usage of unfamiliar metaphors not clarified by the author. Thus, we read terms and phrases like 'autopoetic', 'change from torus form to a butterfly form' and whole sentences which can only be ignored by a reader not well-versed in complexity theory. An example is – 'the conception of a butterfly attractor as descriptive of household/individual possible phase states is profoundly pessimistic for simple talent/energy-based models of individual or household social mobility' (p. 56). This sentence is also puzzling for someone who is passably acquainted with complexity theory, as the sense in which the author uses it is not explicitly made clear. As Goatly (1997: 127) states, 'through misunderstanding, infelicitous uptake can occur with all speech acts, utterances like metaphors which are highly dependent on pragmatic inferencing are particularly risky'.

The empirical part of Byrne's article is based upon a hypothesis of the urban process as a complex system. From a study of selected industrial cities, the hypothesis that Byrne seems to advance is that 'they (industrial cities) have indeed changed from toruses into butterflies. Complex models suggest that we should look for changes in key variables which have increased by about a factor of 3' (p. 62).

Following from this hypothesis, the tasks laid out come to show that cities have changed from toruses into butterflies and that there is an increase by a factor of 3 in key variables. A reader of this article may remain confused as to why cities should be considered as 'toruses' in the first place and second, how they can be considered as 'butterflies'. Neither term is

systematically presented or argued in the text. Here also the problem of comprehension extends to those reasonably familiar with complexity theory as it is not known which properties of toruses or butterflies the author is referring to and wants to emphasize.

I contend that the need for linking the empirical work to complex system dynamics and the need for describing it in terms of 'chaotic' or 'complex' places itself remain unclear. Butterfly attractor is not the only strange attractor that a complex system can possess. It is just one among many. In addition, as I understand it, Byrne is looking for bifurcations and an increase in a key parameter by factor 3. In doing this he is assigning the key parameter as equivalent to something called 'Feigenbaum' numbers in complexity theory. He states: 'I don't want to reify Feigenbaum numbers but here we have one and we have the phase form which it suggests would occur' (p. 63).

Neither Feigenbaum numbers, nor the relevance of the number 3 for social systems, are introduced. One must assume that Byrne's intention in claiming a Feigenbaum number in his analysis is to prove that the system is a complex system. (In the natural sciences, this is a method used for proving that a system is a complex.) However, to date, it is nowhere stated or proved that Feigenbaum numbers are accepted, or even necessary, proof for complex *social* systems. The argument for complexity in social systems normally adopts a line of argument starting from what systems are, what an open system is and what complexity in social systems means (see, for instance, Luhmann, 1995).

Later in his article, Byrne discusses how policy must respond to the empirical analysis presented. He argues that two sorts of policy have created the butterfly form. This argument is separate from complexity theory or the empirical work. It builds on the author's understanding of urban processes. He then reviews the potential for 'complex founded policies' (p. 65). The review is again separate, using general properties of complex systems. Byrne presents three forms of the policy, leading to an argument for a 'creative engagement with complex urban realities, based on a clear Gouldian understanding of the historical process by which we got to where we are now' (p. 67). This for Byrne, 'can be illuminated precisely by a consideration of how the present butterfly form of industrial cities has developed, and of the role of housing and planning policies in its creation' (p. 67).

If the object of the empirical analysis is to prove that cities have come to a butterfly form, it is again not clear what contribution it makes to better comprehension as the connotative significance of the term, in the sense of what it means in complexity theory, is not introduced. Other arguments in a similar vein are thus quite lost on the reader: 'it could be argued, using the vocabulary of complexity, that policy sought to create an attractor state which did not exist in the range of possible attractors' (p. 68).

The use of complexity theory here thus remains unconvincing both for those readers who are curious about the theory as such and for those whom the author targets when he states: 'the point of this chapter is to try to

present a framework for understanding the situation to be dealt with and to assert that the task is actually a do-able one' (p. 69).

To summarize, the article remains unconvincing overall, due to four main reasons. First, it is not based on a careful mapping of concepts, with meaning and relations, from one domain to another. Second, the author starts from a hypothesis derived directly from complexity theory itself (as developed in the natural sciences), without attempting to contextualize or give reasons why the concepts might hold promise for the target domain discussed. Third, the empirical work highlights results that are *described* using terminology from complexity theory. The empirical work as such does not *use* the theory, nor are any new insights gained from the re-conceptualization of the results highlighted. The use of complexity theory thus loses its legitimacy and strength. Finally, the numbers chosen to verify the empirical work and the significance attached to them are not explained clearly, causing the claims made to remain unconvincing.

From examination of the two case studies we can conclude that there is some ground for scepticism in the use of complexity theory in planning texts. For instance, there are ontological and epistemological claims that complexity theory makes which need to be mapped into the social domain and contextualized. A realist view would advocate a structural mapping that retains relational features, while a pragmatist or constructivist view would emphasize the cognitive function of the mapping as demonstrated by Morgan (1998). Second, there needs to be greater appreciation for the conditions of metaphoric theory transfer. If these conditions are not met, the result is actually counterproductive rather than innovative or original. Third, metaphoric theory transfer can only be effective if appreciated, as Rorty (1991) says, by 'us' meaning the community with which the writer is communicating. This is because theory construction metaphors demand that they be explored and contextualized within the target domain. Only then will they give rise to other research agendas, the articulation and exploration of which are best advanced by the effort of a research community.

Conclusions

In the initial part of this article I have laid out a framework for evaluation and then discussed the use of complexity theory in planning through a critique of two articles. I now reflect on how far the framework has aided an evaluation of the transfer. First, the framework stipulates adequate knowledge of the target domain and source domain. If there is not enough evidence for this, either because the terms are not explained to the reader or because they are inappropriately used, an unconvincing argument can easily be the result. Second, the framework calls for an explicit explication of key similarities and analogies across domains that justify the transfer. This applies whether the theory is used directly (because in the target domain

where it has not been stabilized and accepted, it still acts as a metaphor) or the concepts or properties are used by themselves. An a priori analogical likening can be drawn stressing parallel concepts between ideas or processes, which urge the reader to proceed further as there could be something in the similarity waiting to be drawn out. Third, the framework calls for an attempt to abstract and elucidate essential relational features from the source domain which contribute to establishing a causal claim or a cognitive claim. This is a key step for theory transfer as it is through this process that a reader gets to know the worth of the metaphor, its denotative and connotative meanings. The final point in the evaluative framework requires that there must be an attempt to relate the imported abstraction to other theories and empirical results in the target domain, for only then will the metaphor attain full meaning in the target domain and thus become stabilized.

In examining the use of complexity theory in planning by employing the theory of metaphors, I have also shown how it helps us to understand to a large extent the mysticism or scepticism accorded to complexity theory and its utility. The theory of metaphors also helps us appreciate that there may yet be possibilities for exploring the application of complexity theory in planning through a more rigorous methodology and equally rigorous articulation. The path that such a research agenda might adopt is sketched out in the framework of evaluation itself, with an illustration of pitfalls that one needs to be careful to avoid. It must be stressed that there is no claim made here for the exclusiveness of the theory of metaphor as a method for theory transfer. It might equally well be possible by 'reach of reason' or inference (Green, 1993), or by substantiation of an ontological claim such as transcendental realism (Martin and Harré, 1982). A full theory transfer, contextualization and construction may ultimately be a mix of all these methods attaining importance at various stages of the theory transfer and development. It should also be stated that unearthing disanalogies need not be seen as totally detrimental. Rather, it is intrinsic to a process of refinement of the theory in the target domain, especially in the initial stages. Transfer of complexity theory into the social science and planning fields is still in its infancy and hence there is a case for examining the metaphorical method of transfer more closely at this stage. I hope that this article serves to shed some light on how this might be more rigorously done. The final verdict on the relevance of metaphors from complexity theory will rest, as Knudsen (2003) points out, with the specific discipline, which will finally determine the value of the metaphor.

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