

# Can A Whole Be Greater Than The Sum Of Its Parts? A Critical Appraisal Of “Emergence”

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**CAN A WHOLE BE GREATER THAN THE SUM OF ITS PARTS?**

**A CRITICAL APPRAISAL OF “EMERGENCE”**

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We address the concept of emergence, examining its historical roots and use in the field. We examine the ontological underpinnings of one way emergence is discussed, which we call objective-emergence and define as the existence of a higher-level entity which cannot be reduced to its parts. We note that objective-emergence is not scientifically feasible and may inhibit theoretical and empirical work. We describe research contexts and language that may accidentally foster the use of objective-emergence.

The concept of emergence has captured attention across a variety of disciplines, such as anthropology, biology, cybernetics, mathematics, philosophy, physics, psychology, and sociology (e.g., Anderson, 1972; Goldstein, 1999; Jantsch, 1980; Juarrero, 1999; Kauffman, 1993; Kontopoulos, 1993; Marion, 1999; Phelan, 1999; Polanyi, 1968; Richardson, 2004; Skyttner, 2001; Weinberg, 1975). Having a basis in early works by psychological and evolutionary theorists (e.g., Lewes, 1874-79; Lloyd Morgan, 1923, 1926, 1933), this literature is often rooted in thought from within systems and complexity theory (e.g., Simon, 1962/1981; von Bertalanffy, 1968) and shares historical roots with work on communicative and statistical mechanics (e.g., Ashby, 1956; Schrödinger, 1944; Shannon & Weaver, 1949; Weaver, 1948). Often, within these diverse literatures, emergence is defined as a process which manifests phenomena existing at a level of analysis higher than that of their constituent parts, phenomena which are irreducible to such parts (Corning, 2002; Holland, 1997; Sulis, 2004). According to the concept's originator, "The emergent is unlike its components in so far as these are incommensurable, and it cannot be reduced to their sum..." (Lewes, 1874-79: 413).

With such an interesting and powerful theoretical concept which is, concurrently, so broadly defined, it is no wonder that a great many views on emergence have been espoused and debated using a plethora of theoretical foci and underlying logics (e.g., Axelrod & Cohen, 1999; Nicolis & Prigogine, 1977). This is no less true within management and organization science (see Dooley, 2002; Letiche & Boje, 2001), where emergence and the resulting "collective constructs," or "emergents," have been recruited to aid in understanding complex organizational systems (e.g., Morgeson & Hofmann, 1999). Although not all literature on organizational systems espouses emergence, focusing somewhat more strictly on the elemental nature of higher-level wholes (e.g., James, Joyce, & Slocum, 1988; Lindell & Brandt, 2000), notable works have

used emergence as an important process by which to understand the formation of higher-order constructs (e.g., Glick, 1985; Kozlowski & Klein, 2000).

Within management and organizational studies, however, there has been little literature critical of emergence. As a result, researchers seem to have accepted the existence of emergent processes, processes which, because of their radical departure from traditional scientific principles of reductionism, demand a thorough defense. This has led to discussions of emergence that may leave many researchers wondering just exactly what emergence is, what it is not, and how it may be understood scientifically. The current work attempts to fill this gap for scholars who engage in organizational research, research which (a) relies heavily on understanding the composition of constructs across levels of analysis (see Chan, 1998) and (b) requires developing and testing theories that address phenomena in organizational hierarchies (Dansereau, Yammarino, & Kohles, 1999; Klein, Dansereau, & Hall, 1994). Our discussion unfolds by providing an exposition of how emergence is discussed in management and organization science. Then, a treatment of emergence is given that is critical of the concept. Next, in light of this treatment, we explore reasons why emergence is so appealing and ways researchers may avoid the temptation of theorizing emergence. We conclude by noting that emergence is not scientifically feasible, may act to inhibit meaningful theoretical and empirical work, and therefore should not be discussed further.

#### **EMERGENCE IN MANAGEMENT AND ORGANIZATION SCIENCE**

Although there are many ways to conceptualize the process of emergence and the resulting collective constructs (e.g., Krackhardt, 1994; McKelvey, 1997), here we discuss two perspectives which provide for a stark contrast of ways to think about emergence. First, Schneider (1975) explores the notion that, in an attempt to find closure and meaning, individuals

may perceive a whole out of many distinct parts, a whole which may not be reducible to such parts. Here, we call this type of emergence “perceptual-emergence.” In this view (see Schneider & Reichers, 1983), a whole emerges from the fragmented *perceptions* of individuals. Thus, perceptual-emergence does not mean that a metaphysical shift of levels has occurred, but, rather, it describes the mental processes of individuals who *perceive* collective wholes.

Research exploring the perception of collective wholes by individuals has a basis in Gestalt principles of object perception (see Campbell, 1958). For example, work on “entitativity,” defined as the degree to which a collection of individuals are perceived as a unique and differentiable social entity (i.e., a group; Hamilton & Sherman, 1996), notes that individuals may perceive collective wholes when individual parts are similar, physically proximal, and share common fate (e.g., Yzerbyt, Cornielle, & Estrada, 2001). Thus, perceptual-emergence may be used to describe the cognition of individuals within organizational hierarchies. However, this view of emergence never posits a higher-level whole separate from its lower-level parts.

Perceptual-emergence clearly defines emergent phenomena as inherently rooted at the level of the individual, rather than having an existence which is in any way outside of the individual. When positing perceptual-emergence, the linkage between individuals and emergent wholes is clear: perceived emergent structures are in no way separate from the individuals who perceive them—emergents are in the minds of individuals, rather than in any external reality.

However, in the second view of emergence, it is suggested that real, higher-order phenomena may emerge from lower-level units and have an existence outside that of their constituent parts (see Morgeson & Hofmann, 1999). We refer to this form of emergence as “objective-emergence.” This view is different from that described by Schneider (1975). In the objective-emergence perspective, higher-order entities are thought to emerge from their lower-

level elements through the unique interrelations and interactions among such elements, but they also have a real existence outside of them

To provide a basis for objective-emergence requires that “the constructs that emerge can have a reality that is partly independent of the interaction that gave rise to them” (Morgeson & Hofmann, 1999, p. 251). This means that the existence of a discrete entity, which is apart from its constituent interactions, must be endowed with a real existence. Other descriptions of such a type of emergence are: “As interaction occurs within larger groups of individuals, a structure of collective action emerges that *transcends the individuals who constitute the collective*” (p. 252, emphasis added) and “Collective structures emerge, are transmitted, and persist through the actions of members of the collective (*or the collective as a whole*)” (p. 253, emphasis added).

With the objective-emergence description of emergent phenomena, it should be clear that any scientist who would like to come to terms with the empirical ramifications of such thinking runs into the difficulty of measuring and explaining the discrete emergent entities described. In fact, this view of emergence, inasmuch as it leads to a lack of affiliation between the objectively-emergent and its constituent elements, makes it somewhat impossible to define the criteria upon which objectively-emergent phenomena may be empirically disconfirmed (cf., Popper, 1959). In other words, the process of objective-emergence seems to be in *prima facie* contradiction with the scientific criterion of empirical verifiability, because it holds that entities can appear without giving an empirical basis for their appearance—the objectively-emergent exists, in part, separately from its constituent elements.

### **IS THERE A VALID ONTOLOGICAL BASIS FOR EMERGENCE?**

One multilevel issue that the concept of objective-emergence tries to resolve is that some phenomena seem to appear at higher levels of analysis, but not at their constituent levels (see



Heylighen, 1989, Simon, 1962/1981; Turchin, 1977). However, objective-emergence presents a theoretical problem for scholars because it requires addressing the age-old scientific question of whether researchers are justified in reducing higher-level phenomena to their lower-level parts (e.g., James et al., 1988), or, instead, whether higher-level phenomena must be discussed as partially or fully independent of their lower-level parts (e.g., Glick, 1985).

We may locate the roots of the above theoretical difference in historic debates, from the natural sciences, between mechanistic and organicist paradigms in describing natural systems (for a review, see Haraway, 1976; Koslowski & Klein, 2000). According to the former view, scientific description ultimately must characterize wholes in terms of their parts, describing in detail the processes by which elemental or “atomic” parts compose larger objects or systems. In contrast, organicist views, emanating primarily from biological and ecological sciences (e.g., Harrison, 1969; Weiss, 1969), as well as sociology (e.g., Merton, 1949, Parsons, 1951), stress the importance of considering systems primarily, and interpreting elemental components in terms of a system’s functioning. Thus, organicist conceptions of systems and organization leave behind the atomistic perspective and view systems as unified wholes.

The literature in management and organization science that addresses objective-emergence prompts a recapitulation of the differences between these two world-views. Mechanistic conceptions give either complete or at least primary dominance to lower-level phenomena as the locus of higher-order constructs, such as organizational climate (e.g., James et al., 1988). Alternatively, organicist conceptions claim elemental status for higher-order wholes, such as institutions and cultures (e.g., Glick, 1985; Morand, 1995). The concept of objective-emergence has often been invoked in support of the latter camp, as a justification for the reluctance to reduce group or organizational phenomena to lower-level constituents (e.g.,

Marion, 1999; Simon, 1962/1981; Zimmerman, Lindberg, & Plsek, 1998); if “the whole is more than the sum of its parts,” then researchers have reason to give ontological primacy to wholes.

The problem with the latter view is that objective-emergence seems to rely on a kind of transcendence that is difficult to justify scientifically. Although researchers from the biological sciences (e.g., Needham, 1968; Weiss, 1969), Gestalt psychology (e.g., Koffka, 1935; Kohler, 1961), and organizational fields of research (e.g., Simon, 1962/1981) have long observed what appear to be qualities of systems that are distinct from the qualities of the parts of the systems, this observation demands theoretical elaboration. These “holistic” explanations have tended to account for such observations by two means. First, the higher-level phenomena are described as fundamental units rather than as composed of lower-level units, referred to as specification of the construct at a higher level of analysis (e.g., organizational versus psychological climate [Glick, 1985]). Second, the composition of the higher-order construct from lower level constructs is acknowledged and often described (e.g., the “double interacts” of Weick, 1979; the dyadic interaction of Berger and Luckmann, 1966), with lower-level interactions providing a basis for the construction of larger social systems (e.g., Kozlowski & Klein, 2000; Morgeson and Hofmann, 1999; Goodman, 2000).

The first strategy, which treats higher-order phenomena as fundamental units and studies their behavior, evolution, and dynamics, has strong roots in the sociological tradition initiated by Durkheim’s (1982) discussion of institutions as “social facts.” While we present no argument against this perspective, we should note that it, either implicitly or explicitly, ignores constituent parts or simply chooses to begin theoretical and empirical analyses at one particular level of analysis. Rather than attempting to explain what parts constitute a given whole, this perspective assumes the whole has some intrinsic value or meaning as a basis for further investigation. Thus,

this approach is not truly multilevel in nature, but is a sensible approach to theory development and empirical analyses because it provides researchers a basis for drawing investigative boundaries that allow maintaining theoretical and empirical parsimony.

The second strategy, that of attempting to describe both an objectively-emergent phenomenon and its constituent parts, is truly multilevel in that it attempts to bridge the gap between lower- and higher-level constructs by postulating a mechanism through which lower-level phenomena translate into higher-level phenomena. Thus, for example, Morgeson and Hofmann (1999) describe collective structures as “open interaction systems” (p. 252), where individuals’ interactions create a kind of scaffolding that appears to us as a collective construct: “...the structure of any given collective (e.g., a work team) can be viewed as a series of ongoings, events, and event cycles between the component parts (e.g., individuals). This structure, in turn, forms the basis for the eventual emergence of collective constructs.” (p. 252)

Morgeson and Hofmann (1999) are here attempting to demystify the notion of collective constructs by explaining objectively-emergent phenomena as outcomes of lower-level interactional patterns. Because of this, to better understand objective-emergent phenomena, they continue by recommending researchers use structural-functionalist accounts of system phenomena. Such accounts require specifying the interactional patterns and functional roles of systems parts which give rise to objectively-emergent wholes.

Upon closer inspection, however, implicit in the above quote is the idea that such specification is not adequate to tell the whole story about collective phenomena. Notice, for example, the slippage of transcendental properties into passage: patterns of action form the “basis” for a collective construct that “emerges” from the pattern. One might ask, “What exactly is it that emerges from the patterns if the patterns are not themselves the collective construct we wish to measure?” Is there anything that emerges from these patterns that was not already

contained in the elements which fit together to produce the larger social picture? Given the tenets of the empirical sciences (cf., Popper, 1959), which do not allow for the metaphysical ontology required for structures to exist apart from their constitutive elements, we must conclude that objective-emergence is a rather nonsensical process, or at unscientific.

To be clear, we are not accusing theorists of objective-emergence to be overtly postulating “ghosts in the machine” of lower-level interactions. Further, we are sensitive to the fact that these theorists are attempting nothing more than to advance our thinking across levels in order to improve theory and empirical work. However, the tendency to fall into a reified view of social structures is ever-present, and such views are both tacitly encouraged by concepts such as objective-emergence and are not helpful for management and organization science. For example, even though Morgeson and Hofmann (1999) explicitly reject the teleologism, or purposefulness, of some systems views (e.g., Merton, 1949), their proposal of using structural-functionalist accounts of multilevel systems in the presence of objective-emergence becomes problematic. Even within a purely structural-functional view, allowing for objective-emergence leads to the impossibility of specifying the area “in-between” lower and higher levels because of the lack of specificity of the term “emergence” and the implicit metaphysical implications that it carries, whether openly teleological or not (cf., Haraway, 1976).

To fully rule out objective-emergence, however, requires considering its tenability in systems that are the most amenable to it. For example, Silberstein and McGeever (1999) note that objective-emergence (which they term “ontological emergence”) is a tenable hypothesis within the domain of quantum mechanics, where phenomena such as particle “entanglement” indicates processes that fly somewhat in the face of general relativity theory’s proposition that nothing may exceed the speed of light (see Aspect, Grangier, & Roger, 1982). By exceeding this

theoretical speed limit, these authors then propose that particle entanglement provides support for objective-emergence. Based on the notion that objective-emergence is a tenable hypothesis in the domain of quantum mechanics, these authors then cleverly trap the reader by noting:

“...either everything is reducible to fundamental physics or it is not. If it is reducible, if everything is quantum mechanical, then ontological emergence is ubiquitous, as we have shown. If, on the other hand, the macroscopic is not reducible to the microscopic, if quantum effects really are screened off, then the entire world of classical objects is somehow ontologically emergent. In short, ontological emergence is most probably a real feature of the world.” (p. 200)

We levy four arguments against accepting these authors' position. First, the verdict is still out regarding the tenability of objective-emergence within quantum mechanical systems (see Price, 1994; Wick, 1995). Second, even though physicists have had tremendous trouble connecting the realities of quantum and classical objects, developments within “superstring theory” have been successful at providing theoretical linkages between the two that violate neither the theoretic paradigm underlying quantum mechanics nor general relativity (e.g., Green, Schwarz, Witten, 1987). Thus, the seemingly differential functioning of classical and quantum objects may not be cause to posit the objective-emergence of classical objects from quantum reality. Third, and more relevant to management and organization science, even if objective-emergence truly exists on a quantum level, and relenting that classical objects in our world are objectively-emergent, the levels of “individual” and “group” both already exist within the world of classical objects. Thus, any quantum-physical reality of objective-emergence, and the objective-emergence of classical objects, cannot inform the process linking individuals to groups and, therefore, cannot be used as a metaphor for objective-emergence in larger, social systems. Fourth, and still allowing the idea that objective-emergence may be a reality at the quantum level and classical objects may be objectively-emergent, objective-emergence is simply not useful for the management and organizational sciences. Failing to rely on principles of reduction will lead

us no closer to understanding the real, measurable processes and phenomena that exist within the world of work and organization—managers and organizations require real solutions to their problems, not metaphysical talk about objectively-emergent entities, the basis for which is necessarily mysterious and metaphysical.

In conclusion, we can either characterize organizational systems by their parts, the full complexity of their interactions, and their exchanges with the environment or we cannot. If we can, then ontological-emergence does not exist. If we cannot, then organizational systems are not real entities. In other words, the principles which we must adopt in order to accept ontological-emergence as a possibility render the objects of our study invalid. Therefore, we propose that the costs of accepting ontological-emergence are so high as to render it useless for management and organization science.

### **WHY IS OBJECTIVE-EMERGENCE SO APPEALING?**

Given the scientific difficulties associated with objective-emergence, and the inability of the most tenable argument for objective-emergence to provide support for the concept, one may wonder why scholars have allowed objective-emergence to remain within their accounts of organizational systems. Here, we explore two possible reasons we see for objective-emergence being popular within management and organization science. We base our reasons on two key observations: (a) scholars are human perceivers, subject to Gestalt rules of object perception, and (b) organizational systems are tremendously complex and, therefore, difficult to describe.

#### **Perceiving a Whole from Parts**

It is notable that management and organization scholars are, just as all of us, human beings. As noted above, all humans rely on Gestalt principles of object perception to navigate their physical and social worlds (Köhler, 1959). These principles guiding perception suggest that

various heuristics are used to infer the existence of meaningful groups from collections of individual units (Dasgupta, Banaji, & Abelson, 1999; Schneider, 1975). As noted above, these heuristics include properties of lower-level parts, such as their similarity, proximity, and common fate (Campbell, 1958). Given these heuristics, it is likely that scholars themselves perceive what appear as objectively-emergent systems from a series of parts—or at least they can relate to the concept in their “gut”—and, based on this perception, have incorporated objective-emergence into their theories of organizational systems and processes.

Such an understanding of the reason for positing objective-emergence is sensible given the manner in which researchers often justify interpreting an agglomeration of parts as collective wholes. Consider, for example, within-group agreement (WGA) as a method for interpreting a group of individuals as a meaningful system. As individuals become more proximal within the construct space of interest (i.e., as they become more similar), we are more likely to observe high levels of WGA (James, Demaree, & Wolf, 1984) and, based on such WGA, we are more likely to interpret the individuals as a meaningful group (Dasgupta et al., 1999).

An important point to make regarding this practice is that indices of WGA are simply operationalizations of the Gestalt principles we use for everyday object perception—although this does not mean that WGA is not a very useful index with meaningful antecedents and consequences (see Klein, Conn, Smith, Sorra, 2001; Patterson, Payne, & West, 1996). Based on the fact that the methods we utilize for the purposes of multilevel research rely on our natural Gestalt principles of object perception, it is reasonable to believe that our reliance upon such principles also permeates our theoretical postulations regarding multilevel phenomena and processes, leading to the postulation of objective-emergence.

### **Organizations are Complex Systems**

Another reason multilevel researchers may posit objective-emergence is because the concept may have somewhat of a relief-valve function when approaching complex organizational systems. If objective-emergence is real, then we may not have to trouble ourselves with looking at the infinite complexity of parts and their interactions, because they do not fully compose the larger system. This reason for positing objective-emergence has been described elsewhere as epistemological-emergence (e.g., Silberstein & McGeever, 1999), the point of which is that organizational systems are so complex that we can't possibly hope to account for all of their parts *and* their interactions. Therefore, we invoke a process of emergence to aid in the simplification of our objects of study.

Support for such a proposition comes in the form of extensive theory and empirical findings which note that individuals use heuristics to simplify their worlds for the purposes of decision making and attitude formation (e.g., Kahneman, Slovic, & Tversky, 1982; Petty & Cacioppo, 1986; Tetlock, 1983), and that such simplification is positively associated with affective outcomes (e.g., Winkielman & Cacioppo, 2001). In the face of the complexity scholars face when addressing organizational systems, it is logical to expect that some simplification processes are likely to occur, even if such simplifications are not allowed by the ontology of the empirical sciences. In our view, such simplification is not only understandable, but it is required for limiting the scope of theoretical and empirical endeavors which span multiple levels—as noted by Klein and Kozlowski (2000), without developing a focus precise enough to be adequately parsimonious, multilevel research endeavors may easily spin out of control. However, the cost of such simplification should not be our ontological footing within empirical science and, therefore, we should not allow objective-emergence to permeate our literature.

#### **IMPLICATIONS FOR MANAGEMENT AND ORGANIZATION SCHOLARS**



Given both the inability of objective-emergence to exist outside the domain of metaphysics and the likely causes of objective-emergence's integration into our science, the implications for multilevel researchers are centered in their ability to overcome possible reasons for considering objective-emergence and eliminating jargon which seems to imply objective-emergence. To doff the notion of objective-emergence, and as explored by other scholars (e.g., Klein & Kozlowski, 2000; Klein et al., 1994), multilevel researchers should first attempt to maintain an awareness of the complexity inherent in their research. To focus such awareness, we (a) propose three possible causes of perceiving objective-emergence when confronting systems commonly encountered in organizations, (b) show that our multilevel data-analytic techniques may imply objective-emergence, and (c) provide an example of how language used in the management and organization sciences can forward the notion of objective-emergence.

### **Complementary, Supplementary, and Interactive Functioning**

One possible reason for perceiving objective-emergence is the fact that many systems function in a way not allowed by any single element in isolation. In such complementary and interactive systems it is true that the individual parts, when put together, do not function in the same way as when alone, but it is not the case that the whole is more than the sum of its parts. An example of such a system is a team operating with a distributed, unshared knowledge base across its members. Such a transactive memory system within a team, where the team may only be effective when all members contribute their unshared knowledge (Austin, 2003; Hollingshead, 1998), may give the false impression that there is an objectively-emergent effect within the team. However, although the team functions in a way which could not be accomplished by any of the members on their own, the team's functioning is reducible to the independent contributions and interactions among its members; transactive memory and other,

similar systems do not lead to phenomena which are objectively-emergent. Researchers examining such systems should not be tempted to assert an independent higher-level entity simply because the team members have complementary functions and interact with one another.

Supplementary organizational systems act differently than those which are complementary and interactive, but they have the same implications for researchers in terms of avoiding objective-emergence. Consider, for example, individual affect within a group. It is well known that affect can “spill over” from one person to another within a group (cf., Kelly & Barsade, 2001), called affect or emotion contagion (Hatfield, Cacioppo, & Rapson, 1994). Such a spillover process will have a homogenizing effect along affectivity within a group (Hackman, 1992; George, 1990). As noted above, one might view such homogenization as indicating a meaningful group effect existing across the individuals of interest. Such a postulate is reasonable, given the correlates of homogeneity within groups (see Klein et al., 2001), and it is certainly reasonable to proceed with group-level investigations given the presence of WGA if the group level is the research focus. However, explorations of “the effect of the group” or “effects at the group level” should not be understood as if a separate group level is operating “on” the individuals that compose the group. Instead, such explorations must be undertaken knowing that the group is composed of real individuals who, in the absence of facilitative or inhibitory environmental conditions, may be thought of as fully accounting for the affective contagion observed—although adequately modeling the complexity of such a process may be difficult or impossible.

### **Contextual Effects**

Another possible reason for perceiving objective-emergence is the fact that within complex systems there are often legitimate, higher-level influences on lower-level parts, or

contextual effects (Mossholder & Bedeian, 1983). Such effects may be able to account for influences on individuals unseen in their interactions with others, influences which may lead to researchers proposing objectively-emergent effects. For example, consider a team of individuals who rapidly socialize new members, but who appear to not put much effort into new-member socialization. Such a rapid process of socialization, in conjunction with individuals' lack of effort to do so, may lead a researcher to believe a higher-order entity has objectively-emerged from the lower-level parts to influence incoming members. In this case it is likely that non-compositional higher-order influences are aiding the socialization process, such as human resource policies and strategically-composed symbolic environments (Trice & Beyer, 1993), but such influences do not occur because of a metaphysical shift of levels. Such influences, such as policy decisions, resource endowments, or organizational structural features may be objectively specified as separate level effects, because they originate at a different level, and are not entirely composed of "parts" at lower levels. Thus, researchers should be constantly vigilant for contextual effects which may be able to explain away appearances of objective-emergence.

### **Construct (Mis)Specification at Lower Levels**

Researchers may be tempted to explore objective-emergence as a reasonable postulate when they observe different effects among variables at different levels of analysis. Consider, for example, Ostroff's (1992) finding that the satisfaction-performance link appeared at the organizational-level, rather than at the individual-level. This effect may be understood as being due to the fact that helping behaviors aiding the organization were not reflected in individual performance ratings (Borman & Motowidlo, 1993). However, if these behaviors were important for organizational functions, one should ask why they were not included in the performance evaluations of the people that carried out the activities. Although, as Katz (1964) noted, it is

practically difficult for jobs to be constructed that take into account all their functional properties, part of this difficulty may be due to the fact that job-specification methods often do not consider the organization or industry-level importance of functions in the job-analytic process (Ployhart & Schneider, 2002), more often relying on micro-level, critical incident behaviors and expert description rather than a more system-integrative view (Harvey, 1991). In the domain of job analysis, this means an overemphasis on conservative definitions of jobs at the individual-level may lead to the illusion of objective-emergent effects at the group level. More generally, this means that effects at higher levels of analysis, which are not observed at lower levels, may be due to construct specifications which do not take into account system-relevant aspects of the construct at the lower level (Berson, Avolio, & Kahai, 2003). Thus, researchers should reject postulating objective-emergence in favor of examining their constructs for misspecification at lower levels of analysis.

### **Multilevel Data-Analytic Techniques Imply Objective-Emergence**

Another reason researchers may be wont to explore emergent effects is the way some data-analytic technologies model nested observations. Consider, for example, the hierarchical linear model, or HLM (see Raudenbush & Bryk, 2002). This modeling paradigm posits a variable  $Y$  associated with a lower-level part  $i$  nested in a unit  $j$ . (i.e.,  $Y_{ij}$ ). Then, the unit effect  $\mathbf{b}_{0j}$  is modeled as a *determinant* of the lower-level variable (see Hofmann, Griffin, & Gavin, 2000). Such a model may be likened to a reflective measurement model, where all parts within the units are seen as equally valid *indicators* of the unit effect (see Mehta & Neale, 2005). In other words, the HLM modeling paradigm may lead researchers to implicitly assume that unit effects are latent and influence the lower-level parts within a unit in a “top-down” manner.

Such a modeling paradigm, and the underlying ontology it represents, has been critiqued as falsely represent the true state of affairs in group contexts. For example, Kenny and colleagues (Kenny, Mannetti, Pierro, Livi, & Kashy, 2002) note that influences of individuals within groups neither function in a ‘bottom-up’ or ‘top-down’ manner. Instead, individuals influence *other* individuals within their group and, thus, influence is lateral rather than vertical—even if individuals who influence each other exist in different levels of an organizational hierarchy (Brass, 1984). Therefore, statistical models not accounting for the lateral influences within groups may put researchers in a mindset ripe for contamination with objective-emergence.

### **Our Jargon May Imply Objective-Emergence**

The final comment we make regards how objective-emergence may be implicitly propagated within management and organization science is due to the language we often use in describing influence and effects in groups. As noted above, influence in groups is neither bottom-up or top-down (Kenny et al., 2002). However, the use of these terms is quite common and may give the false impression of objective-emergence. For example, in their thorough and precise treatise on emergent effects in groups, Kozlowski and Klein (2000) explore the notion that emergent effects are necessarily bottom-up, where individuals provide the elemental content for higher-level structures which are brought about via interactions among the individuals; “the form of the interaction process, in combination with the elemental content, comprises the emergent phenomenon” (p. 56). These authors then go on to provide great insights regarding the ways individuals may interact, the contextual factors constraining and shaping such interactions, and how these contribute towards different kinds of arrangements among individuals which may be meaningfully categorized in an attempt to describe the process of organizing (e.g., composition versus compilation models describing systems of individuals).

Somewhat problematically, however, from such discussions researchers may be getting the false impression that individuals within groups have the capability of influencing some higher-order, objectively-emergent entity called “the group” or “the team.” This is not the case. Instead, (a) individuals may laterally influence each other (e.g., affect may “spill-over” from one person to the next; George, 1990), (b) individuals may upwardly influence truly higher-level phenomena (e.g., by placing symbols in the workplace which are viewed by all team members; CITE), and (c) truly higher-level phenomena may downwardly influence individuals (e.g., all individuals within an organization may be influenced by a human resources policy, CITE). However, it is not possible for an individual to influence a group or a team, unless what is meant by such a description is that the lateral influence of an individual on other individuals is complete across all who exist within the group or team. As noted by Kozlowski and Kein (2000), “the representation of an emergent construct is an effort to capture or freeze the result of a dynamic process” (p. 64). By this, we understand these scholars to mean that descriptions of higher-level constructs are useful for their heuristic value, and we wholeheartedly agree—again, see Klein et al.’s (2001) exploration of the theoretical and practical value of WGA for understanding sets of people. However, researchers should be wary of codifying such heuristics as ontological reality by allowing objective-emergence to subtly permeate their theories of organizational systems.

## **CONCLUSIONS**

In this review we have attempted to argue that the notion of objective-emergence in management and organization science is a misleading way to alleviate the concern over how to relate lower- and higher-level phenomena. The core of our argument is that the holism inherent in the concept of objective-emergence allows positing entities that cannot, in principle, be explained. If, on the one hand, objective-emergent phenomena are truly different than the

elements from which they are composed, then it seems that different levels of analysis are doomed to forever be irreconcilable; if, on the other hand, these compositions can be specified, then the construct of objective-emergence may occlude important aspects of organizational life. We believe that the latter explanation best characterizes objectively-emergent phenomenon.

As discussed above, however, it is important to stress that the difficulty posed by objective-emergence points to real epistemic problems that researchers must face when conceptualizing organizational phenomena. Social phenomena can be studied from a vast number of levels (some might say an infinite number [see Pfeffer, 1983]), from intra-individual phenomena to global-historical and economic phenomena, with an indefinite list of potential levels “in-between.” This means that researchers must isolate the levels of analysis that they believe can provide the most practical vantage point for the purposes of their research (Dansereau, Alluto, & Yammarino, 1984; House, Rousseau, & Thomas-Hunt, 1995). However, because of this, any such isolation will necessarily leave out some intervening process.

In conclusion, we have attempted to steer thought regarding multilevel phenomena in organizations towards a more scientifically valid location. This is important because the task of management and organization scholars goes to the heart of social science questions, dealing with the fundamental difficulties in understanding the relations between individuals, groups, organizations, industries, and economies (Morgeson & Hofmann, 1999). We have attempted to clarify the task at hand in dealing with these difficulties by noting that research that doesn't allow connecting lower and higher levels of analysis, by allowing metaphysical processes such as objective-emergence, may hinder the development of management and organizational science. Only by paying serious attention to the real multilevel processes inherent in organizations, and avoiding entrees into metaphysics, may we further our field.

## References

- Anderson, P. W. 1972. 'More is different': Broken symmetry and the nature of the hierarchical structure of science. *Science*, 177: 393–6.
- Ashby, W. R. 1956. *An introduction to cybernetics*. London: Chapman & Hall.
- Aspect, A., Grangier, P., & Roger, G. 1982. Experimental realization of Einstein-Podolsky-Rosen-Bohm gedankenexperiment: A new violation of Bell's inequalities. *Physical Review Letters*, 49: 91-94.
- Austin, J. R. 2003. Transactive memory in organizational groups: The effects of content, consensus, specialization, and accuracy on group performance. *Journal of Applied Psychology*, 88, 866-878
- Axelrod, R., & Cohen, M. 1999. *Harnessing complexity: Organizational implications of a scientific frontier*. New York, NY: The Free Press.
- Berger, P., & Luckmann, T. 1966. *The social construction of reality*. New York: Anchor.
- Berson, Y., Avolio, B. J., & Kahai, S. 2003. Level specification: Using triangulation in a grounded theory approach to construct validation. In F. Dansereau & F. Yamarino (Eds.), *Research in Multi-level Issues*, Vol. 2: 85-112. Oxford: Elsevier Science Ltd.
- Borman, W. C., & Motowidlo, S. J. 1993. Expanding the criterion domain to include elements of contextual performance. Chapter in N. Schmitt and W. C. Borman (Eds.), *Personnel Selection*: 71-98. San Francisco: Josey-Bass.
- Brass, D. 1984. Being in the right place: A structural analysis of individual influence in an organization. *Administrative Science Quarterly*, 29: 518-539.



- Chan, D. 1998. Functional relations among constructs in the same content domain at different levels of analysis: A typology of composition models. *Journal of Applied Psychology*, 83: 234-246.
- Dasgupta, N., Banaji, M. R., & Abelson, R. P. 1999. Group entitativity and group perception: Associations between physical features and psychological judgment. *Journal of Personality and Social Psychology*, 77: 991-1003.
- Dansereau, F., Yammarino, F. J., & Kohles, J. C. 1999. Multiple levels of analysis from a longitudinal perspective: Some implications for theory building. *Academy of Management Review*, 24: 346-357.
- Dooley, K. 2002. "Organizational Complexity". In M. Warner (Ed.), *International Encyclopedia of Business and Management*: 5013-5022. London: Thompson Learning.
- Durkheim, E. 1982. *The Rules of the Sociological Method*, (W.D. Halls, trans.) New York: Free Press, 1982.
- George, J. M. 1990. Personality, affect, and behavior in groups. *Journal of Applied Psychology*, 75: 107-116.
- Glick, W. H. 1985. Conceptualizing and measuring organizational and psychological climate: Pitfalls in multilevel research. *Academy of Management Review*, 10: 601-616.
- Goldstein, J. 1999. Emergence as a construct: History and issues. *Emergence: Complexity Issues in Organization and Management*, 1: 49-62.
- Goodman, P. 2000. *Missing organizational linkages: Tools for cross-level research*. Thousand Oaks, CA: Sage Publications.
- Green, M., Schwarz, J., Witten, E. 1987. *Superstring theory*. Cambridge: Cambridge University Press.

- Hackman, J. R. 1992. Group influences on people in organizations. In M. D. Dunnette & L. M. Hough (Eds.), *Handbook of industrial and organizational psychology*: 199-268. Palo Alto, CA: Consulting Psychologists Press.
- Haraway, D. 1976. *Crystals, fabrics, and fields: Metaphors of organicism in twentieth-century developmental biology*. New Haven, CT: Yale University Press.
- Harrison, R. G 1969. *Organization and the development of the embryo*. New Haven: Yale University Press.
- Harvey, R. J. 1991. Job analysis. In M.D.Dunnette & L.M.Hough (Eds.), *Handbook of industrial and organizational psychology*, Vol. 2, 2nd ed.: 71-163. Palo Alto, CA: Consulting Psychologists Press.
- Hatfield, E., Cacciopo, J., & Rapson, R. L. 1994. *Emotion contagion*. New York: Cambridge University Press.
- Heylighen, F. 1989. Self-organization, emergence and the architecture of complexity. *Proceedings of the 1st European Conference on System Science*, AFCET, Paris: 23-32.
- Hofmann, D. A., Griffin, M., & Gavin, M. 2000. The application of hierarchical linear modeling to organizational research. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations*: 467-511. San Fransisco: Jossey-Bass.
- Holland, J. H. 1997. *Emergence: From chaos to order*. Reading, MA: Perseus Books.
- Hollingshead, A. B. 1998. Retrieval processes in transactive memory systems. *Journal of Personality and Social Psychology*, 74: 659-671
- House, R., Rousseau, D. M., & Thomas-Hunt, M. 1995. The meso paradigm: A framework for the integration of micro and macro organizational behavior. In L.L. Cummings, & B.M.

- Staw (Eds.), *Research in organizational behavior*, Vol. 17: 71-114. Greenwich, CT: JAI Press.
- James, L. R., Demaree, R. G., & Wolf, G. 1984. Estimating within-group interrater reliability with and without response bias. *Journal of Applied Psychology*, 69: 85-98.
- James, L. R., Joyce, W. F., & Slocum, J. W. 1988. Comment: Organizations do not cognize. *Academy of Management Review*, 13: 129-132.
- Jantsch, E. 1980. *The self-organizing universe: Scientific and human implications of the emerging paradigm of evolution*. New York, NY: Pergamon Press.
- Juarrero, A. 1999. *Dynamics in action: Intentional behaviour as a complex system*. Cambridge, MA: MIT Press.
- Kahneman, D., Slovic, P., & Tversky, A. 1982. *Judgment under uncertainty: Heuristics and biases*. Cambridge, UK: Cambridge University Press.
- Katz, D. 1964. The motivation bases of organizational behavior. *Behavioral Science*, 9: 131-146.
- Kauffman, S. 1993. *The origins of order: Self-organization and selection in evolution*. New York, NY: Oxford University Press.
- Kelly, J. R., & Barsade, S. G. 2001. Moods and emotions in small groups and work teams. *Organizational Behavior and Human Decision Processes*, 86: 99-130.
- Kenny, D. A., Mannetti, L., Pierro, A., Livi, S., & Kashy, D. A. 2002. The statistical analysis of data from small groups. *Journal of Personality and Social Psychology*, 83: 126-137.
- Klein, K. J., Dansereau, F. & Hall, R. J. 1994. Levels issues in theory development, data collection, and analysis. *Academy of Management Review*, 19: 195-229.

- Klein, K. J., & Kozlowski, S. W. J. 2000. From micro to meso: Critical steps in conceptualizing and conducting multilevel research. *Organizational Research Methods*, 3: 211-236.
- Kontopoulos, K. M. 1993. *The logics of social structure*. New York: Cambridge University Press.
- Kozlowski, S. W. J., & Klein, K. J. 2000. A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel theory, research and methods in organizations: Foundations, extensions, and new directions*: 3-90. San Francisco, CA: Jossey-Bass.
- Krackhardt, D. 1994. Graph theoretical dimensions of informal organizations. In K. M. Carley & M. J. Prietula (Eds.), *Computational organization theory*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Letiche, & Boje 2001. Phenomenal complexity theory and the politics of organization. *Emergence*, 3: 5-31.
- Lewes, G. H. 1874–1879. *Problems of life and mind*. London: Truebner.
- Lindell, M. K., & Brandt, C. J. 2000. Climate quality and climate consensus as mediators of the relationship between organizational antecedents and outcomes. *Journal of Applied Psychology*, 85: 331-348.
- Lloyd Morgan, C. 1923. *Emergent evolution*. New York, NY: Henry Holt.
- Lloyd Morgan, C. 1926. *Life, mind and spirit*. London: Williams and Norgate.
- Lloyd Morgan, C. 1933. *The emergence of novelty*. New York, NY: Henry Holt.
- Marion, R. 1999. *The edge of organization: Chaos and complexity theories of formal social organization*. Thousand Oaks, CA: Sage.
- McKelvey, B. 1997. Quasi-natural organization science. *Organization Science*,

8: 351- 380.

Merton, R. K. 1949. *Social theory and social structures: Toward the codification of theory and research*. Glencoe, IL: Free Press.

Morand, D. A. 1995. The role of behavioral formality and informality in the enactment of bureaucratic versus organic organizations. *Academy of Management Review*, 20: 831-872.

Morgeson, F. P., & Hofmann, D. A. 1999. The structure and function of collective constructs: Implications for multilevel research and theory development. *Academy of Management Review*, 24: 249-255.

Needham, J. 1968. Organizer phenomena after four decades: A retrospect. In K. R. Dronamraju (Ed.), *Haldane and modern biology*. Baltimore: John Hopkins University Press.

Nicolis, G., & Prigogine, I. 1977. *Self-organization in non-equilibrium systems*. Chichester, UK: Wiley Interscience.

Ostroff, C. 1992. The relationship between satisfaction, attitudes, and performance: An organizational level analysis. *Journal of Applied Psychology*, 77: 963-974.

Parsons, T. 1951. *The structure of social action*. New York: McGraw Hill.

Patterson, M. Payne, R., & West, M. 1996. Collective climates: A test of their sociopsychological significance. *Academy of Management Journal*, 39: 1675-1691.

Petty, R. E., & Cacioppo, J. T. 1986. *Communication and persuasion: Central and peripheral routes to attitude change*. New York: Springer.

Pfeffer, J. 1983. Organizational Demography. In L. L. Cummings & B. M. Staw (Eds.), *Research in Organizational Behavior*, Vol. 5: 299-357. Stamford, CT: JAI Press.

- Phelan, S. E. 1999. A note on the correspondence between complexity and systems theory. *Systemic Practice and Action Research*, 12: 237-246.
- Ployhart, R. E., & Schneider, B. 2002. A multilevel perspective on personnel selection: Implications for selection system design, assessment, and construct validation. In F. Dansereau & F. Yamarino (Eds.), *Research in multi-level issues*. Oxford: Elsevier Science Ltd.
- Polanyi, M. 1968. Life's irreducible structure. *Science*, 160: 1308-12.
- Popper, K. R. 1959. *The logic of scientific discovery*. London: Hutchinson.
- Price, H. U. W. 1994. A neglected route to realism about quantum mechanics. *Mind*, 103: 303-336.
- Raudenbush, S. W., & Bryk, A. S. 2002. *Hierarchical linear models: Applications and data analysis methods*, 2<sup>nd</sup> Ed. Sage: Newbury Park, CA.
- Richardson, K. A. 2004. The problematization of existence: Towards a philosophy of complexity. *Nonlinear Dynamics, Psychology, and Life Science*, 8: 17-40.
- Schneider, B. 1975. Organizational climate: An essay. *Personnel Psychology*, 28: 447-479.
- Schneider, B., & Reichers A. E. 1983. On the etiology of climates. *Personnel Psychology*, 36: 19-39.
- Schrödinger, E. 1944. *What is life?* Cambridge University Press: Cambridge.
- Shannon, C. E., & Weaver, W. 1949. *The mathematical theory of communication*. Champaign, IL: University of Illinois Press.
- Silberstein, M., & McGeever, J. 1999. The search for ontological emergence. *The Philosophical Quarterly*, 49: 182-200.

- Simon, H. 1962/1981. The architecture of complexity. Reprinted in *The sciences of the artificial*, 2<sup>nd</sup> ed. Cambridge, MA: MIT Press. (Original work published in 1962.)
- Skyttner, L. . 2001. *General systems theory: Ideas and applications*. Newark, NJ: World Scientific.
- Sulis, W. H. 2004. Archetypal dynamical systems and semantic frames in vertical and horizontal emergence. *Emergence: Complexity and Organization*, 6:52-64.
- Tetlock, P. E. 1983. Accountability and complexity of thought. *Journal of Personality & Social Psychology*, 45: 74-83.
- Trice, H. M., & Beyer, J. M. 1993. *The cultures of work organizations*. Englewood Cliffs, NJ: Prentice Hall.
- Turchin, V. 1977. *The phenomenon of science: A cybernetic approach to human evolution*. New York: Columbia University Press.
- von Bertalanffy, L. 1968. *General System Theory: Foundations, Development, Applications*. New York: George Braziller.
- Weaver, W. 1948. Science and complexity. *American Scientist*, 36: 536-544.
- Weick, K. E. 1979. *The social psychology of organizing*, 2<sup>nd</sup> ed. Reading, MA: Addison-Wesley.
- Weinberg, G. 1975. *An introduction to general systems thinking*. New York, NY: John Wiley.
- Weiss, P. 1969. The living system: Determinism stratified. *Proceedings of the National Academy of Sciences*, 52: 1024-1029.
- West, S. G., & Hepworth, J. T. 1991. Statistical issues in the study of temporal data: Daily experiences. *Journal of Personality*, 59: 609-662.

Wick, D. 1995. *The infamous boundary: Seven decades of controversy in quantum physics*.

Boston, MA: Birkhauser.

Yzerbyt, V., Cornielle, O., & Estrada, C. 2001. The interplay of subjective essentialism and entitativity in the formation of stereotypes. *Personality and Social Psychology Review*, 5: 141-155.

Zimmerman, B., Lindberg, C., & Plsek, P. 1998. *Edgware—Insights from complexity science for health care leaders*. Irving, Texas: VHA, Inc.