**Commentary**

# Thinking inside the box—dynamical constraints on mind and action: Comment on Marsh et al.'s ''Toward a radically embodied, embedded social psychology,'' this issue

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We concur with the embedded–embodied approach to social psychology so nicely articulated by Marsh, Johnston, Richardson, and Schmidt (this issue). In fact, we do not think they went far enough. Their perspective on the contextual and dynamic foundations of mind and action is a useful way to conceptualize and investigate interpersonal dynamics, but it can also be seen more fundamentally as a manifestation of an integrative conceptual framework and research paradigm for psychological processes at all levels of human functioning, from brain dynamics to societal dynamics. For that matter, the dynamical underpinnings of the approach they advocate could be applied reflexively to provide insight into the nature of theory construction in social psychology. We feel this perspective holds potential for generating a unified and coherent account of human experience, one that stands in marked contrast to the fragmented state of affairs that reflects the state of psychological science today (see, e.g., Vallacher & Nowak, 2006). We cannot hope to make a convincing case for these sweeping claims in a commentary. But we do want to expand a bit on the points that Marsh et al. have made and, in so doing, suggest some lines of research that would provide a more concrete sense of what they propose.

At the outset, it is instructive to play devil's advocate and consider why canonical social psychological theory and research has not embraced this perspective, relying instead on a reductionist approach to human interaction. The rationale is actually quite simple and fairly seductive. Different aspects of human experience have distinct operating rules. To expose the nature of these rules, the last thing one should do is contaminate their manifestations with the products of the operating rules for other psychological phenomena. Mental operations can (and should) be understood in terms of information processing rules and cognitive biases; social interaction can be understood in terms of personal concerns, situational factors, and social norms; relationships can be understood in terms of reward-cost considerations, commitment, trust, power, and compatibility; group dynamics can be understood in terms of communication structures, power asymmetries, conflicts of interest, superordinate goals, and accountability; and so on, for the various topics that collectively comprise social psychology. Once the basic processes are identified for each of these domains, one can then investigate how they interact to generate mental, emotional, and behavioral effects in different contexts and for different people. Social judgment in one context (e.g., dyadic interaction involving friends) may look very different from social judgment in a different context (e.g., personal rumination about past encounters with an enemy), for example, but the foundational rules of social judgment are presumably the same in both instances.

What could possibly be wanting in this approach to social psychology? How could we ever understand people's behavior in a complex social environment without first identifying what each part of the puzzle brings to the theoretical table? The answer, as Marsh et al. point out, is that the interaction among different psychological processes and environmental factors is not simply a computational product of these elements, but rather represents an emergent phenomenon with properties of its own that cannot be reduced to the component elements. Emergence, in this view,

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represents the essence of complex social phenomena, not a combinatorial outcome of more basic processes that function autonomously. Emergence is a key feature of dynamical systems theory and complexity science (*cf.* Holland, 1995; Strogatz, 2003). The metaphors and principles of dynamical systems have been embraced by virtually all areas of science in recent years, with disciplines as disparate as chemistry and economics framing their respective subject matter in common terms. The dynamical perspective has also made its presence felt in social psychology (*cf.* Vallacher & Nowak, 2007), thanks in part to the theoretical and empirical contributions of Marsh et al. (e.g., Richardson, Marsh, & Schmidt, 2005; Schmidt & Richardson, 2008).

The emergence of higher-order patterns in mind and action is not dictated by outside agents, nor is it orchestrated by actors' internal mental representations. But this does not mean that the emergence process is unconstrained or that the emergent higher-order patterns are unpredictable. As Marsh et al. suggest, an emergent phenomenon in a social context represents the *self-organization* of the relevant elements comprising the social context. In generic terms, self-organization means that the inter-connected elements in a system influence each other over time to achieve a coordinative structure that functions effectively in a given context. Features of the social niche in which an individual is embedded clearly qualify as elements to be configured via self-organization in the emergence of action meaning and direction. The emergent higher-order structure can be manifest in different ways: As a global judgment that provides coherence for an individual's thoughts and feelings that arise in a given context; as a shared reality among interacting individuals engaged in joint action; or simply as the synchronized motoric behavior of interacting individuals. Once coordination among the relevant elements is achieved, the emergent pattern constrains the subsequent interaction among the elements and thus promotes stability in the system. The notions of embedding and embodiment advanced by Marsh et al. capture this interplay between the temporal evolution of social patterns and the constraints provided by the emergent patterns on subsequent behavior. Neither individual minds nor outside agents are in charge; rather, the social pattern controls itself by means of dynamic processes.

But why stop there? Dynamical systems are recursive: The lower-level elements comprising a system at one level are dynamical systems in their own right, composed of even lower-level elements. The various levels of functioning are hierarchically arranged, each embedded within a higher-level system and embodied by a lower-level system. This arrangement produces a cascade of bi-directional influences passing through all the levels of the hierarchy. This micro–macro linkage is easy to appreciate in human behavior (Vallacher & Nowak, 2007). Properties at the social system level (e.g., norms, values) emerge through the self-organization of interacting individuals with specific thoughts and feelings (*cf.* Nowak, Szamrej, & Latané, 1990). Each individual's thoughts and feelings, in turn, emerge from lower-level cognitive and perceptual systems, which are emergent from brain dynamics, and so on, down to the level of subatomic particles. In principle, the recognition of systems nested in systems is necessary for fully embedding and embodying mind and action. In practice, there are diminishing returns in expanding the level of analysis to include systems at the macro end (e.g., culture) or the micro end (e.g., neural dynamics) when attempting to capture mental and behavioral processes of interest to social psychologists. Where one draws the line, however, is an unsettled matter and warrants further consideration, particularly on the part of those who are wedded to the embedded–embodied approach.

Framing social psychological processes in terms of fundamental dynamics observed in complex systems is clearly an important step in promoting theoretical coherence and integrating the diverse phenomena that define the field. But if this perspective is to achieve status as a major paradigm for social psychology, it must do more than argue the point, however convincingly that is done. Paradigms live or die by their heuristic value as much as by their integrative potential. Very little in the way of new research agendas, let alone falsifiable hypotheses, were offered by Marsh et al. To be fair, the point of their paper was to show the merits of the embedded–embodied perspective, not to list unresolved issues and describe the means by which they could be resolved. Because such issues and means will ultimately determine whether social psychology rethinks its approach to investigating interpersonal experience, we can offer some suggestions regarding possible research agendas that complement the empirical efforts already undertaken by Marsh et al. and others. These agendas are intended not only to verify the account offered by Marsh et al., but also to refine it in ways that might allow for greater specificity.

To begin with, emergence via self-organization is a general phenomenon that can be manifest in different ways. What specific form does it take in various social contexts? Coordination of individuals' movements and actions is critical to social interaction and relationships, for example, but what forms of coordination are likely to be observed in different types of interactions, relationships, and settings? Mimicry, arguably the simplest form of coordination, has received considerable attention, as noted by Marsh et al. It occurs spontaneously under the least intense forms of social contact,

even among total strangers (e.g., Chartrand & Bargh, 1999; Richardson et al., 2005). Does mimicry capture the dynamics of coordination in more intense and meaningful contexts, or do more complex forms of coordination become manifest? Perhaps there is correspondence between the intimacy of social contacts and the complexity of coordination dynamics or the time scale on which coordination occurs. Is coordination symmetrical in dyadic interaction, or do such factors as power asymmetry and role relationship promote asymmetry, with one person's behavior lagging the other's rather than vice versa?

Beyond that, one can question whether coordination is inevitable, or even easy to achieve, in certain social encounters. If coordination problems are observed, does this reflect the inherent difficulty in achieving and maintaining coordination in some settings or with respect to certain actions? Or does poor coordination reflect incompatibility in the internal states (i.e., intrinsic dynamics) of each person (*cf.* Nowak & Vallacher, 2005)? More generally, can the valence and quality of social relations be linked to the ease versus difficulty of achieving or maintaining a coordinated pattern of behavior in a relationship? Perhaps conflict in a relationship, for example, reflects the partners' inability to coordinate their actions and internal states, apart from any incompatibility in their respective attitudes and desires.

If coordination is linked to the valence of interpersonal relationships, this may have important implications for social behavior in some conditions. Perhaps people attempt to prevent coordination from occurring when interacting with someone who is disliked, stigmatized, or a member of an outgroup. Or if temporal synchronization of behavior or affect is observed with such a person, perhaps people will attempt to break the coordination, even if this means overriding their spontaneous propensity for action and emotion in that context.

Another issue that warrants investigation concerns the conditions that promote conscious monitoring of one another's behavior in an attempt to establish or maintain coordination. If coordination develops spontaneously in social interaction, do explicit attempts to achieve coordination have the ironic effect of promoting coordination failure? A more intriguing possibility, based on a model of social coordination developed by Nowak, Vallacher, and Zochowski (2002), is that a person's explicit attempt to mimic or otherwise coordinate with another person's behavior could be quite successful in the short run but prove counter-productive in the long run. Strong coupling attempts ensure that behavior matching will occur, but the resultant coordination does not necessarily filter down to lower-level systems of the individuals. Hence, when the strong coupling is broken (e.g., the partners are separated or cannot monitor one another's actions), their patterns of behavior may drift apart, shaped by internal mechanisms that were never synchronized. In the Nowak et al. model, then, relationship synchrony (and presumably relationship satisfaction) is maximized by loose rather than strong coupling of behavior in social interaction. This finding is consistent with the observation by Marsh et al. that social interaction is typically characterized by loose coupling, but it also suggests that coupling strength is a variable in social interaction with consequences for relationship quality, stability, and resilience.

Yet other empirical questions can be generated from the embedded–embodied perspective, particularly when this perspective is couched in terms of basic dynamical concepts and principles such as self-organization, emergence, and attractor dynamics. Marsh et al. have made a well-reasoned case for the intrinsic value and integrative potential of this perspective and they have linked it to important developments in social psychology and in science generally. But to seal the deal, Marsh et al.—and the rest of us, for that matter—have to become embedded in actual research that is embodied with real bodies and real minds in real time.

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