ritual anti-structure as an alternate pathway to social complexity? the case of ancient teotihuacan, central mexico

Q4   tom froese

Q1   There is growing dissatisfaction with the traditional approach to the evolution of complex societies, which treated it principally as a sequence of transformations toward political centralization driven by the construction of increasingly vertical hierarchies by a powerful elite. In Mesoamerica the evidence is more consistent with a variety of alternative pathways to social complexity, and these are fruitfully approached from theoretical perspectives based on social heterarchy (Crumley 2003), collective action (Fargher et al. 2011), and, so I will suggest, ritual anti-structure (Turner 1969).

This shift in thinking is reminiscent of a growing dissatisfaction in cognitive science with the traditional computer metaphor of mind. It is now widely accepted that centralized rule-driven top-down control is not necessary for adaptive and intelligent behavior, and that, to the contrary, it can make systems more susceptible to catastrophic breakdowns. Instead there is increasing emphasis on the emergence of complex behavior from local interactions between components distributed across multiple levels of organization. Accordingly, there is an opportunity to apply advances in cognitive science and complex systems theory in the study of social complexity without the institution of a central controller (Mezza-Garcia et al. 2014).

One suitable approach for this interdisciplinary endeavor is the so-called "enactive" approach, which holds that agency is ultimately rooted in the self-organized autonomy and adaptivity of the biological body (Di Paolo et al. 2017). In this view, behavior is an integral part of cognition, rather than merely an external output of an internal process. Moreover, drawing on insights from complex systems theory, this approach holds that the dynamics of agent-environment interaction cannot be redu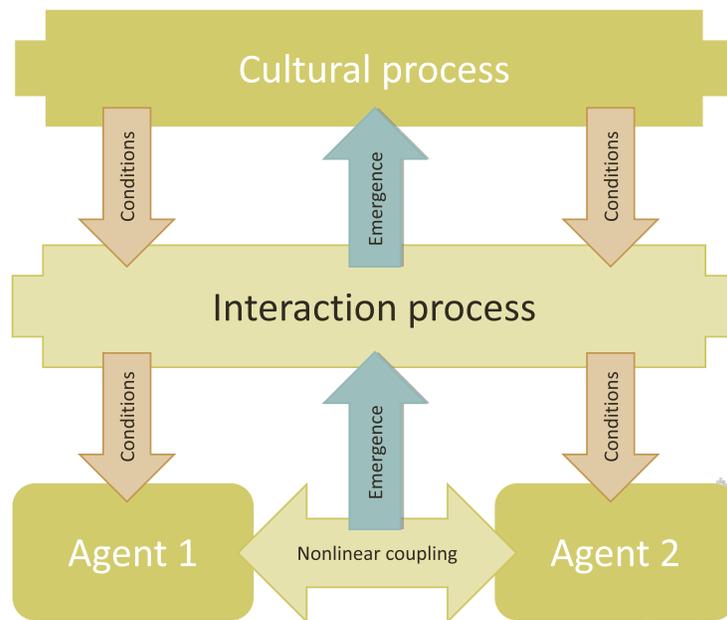ced to the agent. Taken together, this implies that the environment, especially sociocultural factors, can co-constitute an agent's cognition. For example, the dynamics of unscripted interactions can self-organize a relative autonomy with respect to the individual agents and reshape (enable, constrain) their capacities and behaviors.

The enactive approach has been criticized for failing to take into account the role of heteronomy in human social life, i.e. that we are born and enculturated into a world already structured according to preexisting social institutions. To be sure, further interdisciplinary work is required, but it is already revealing exciting new directions for research in the evolution of cultural complexity. For example, it points to an intermediate level between the influences of agency and institutions on individuals' behavior, namely temporary coalitions of people whose emergent interaction process is already heteronomous to the extent that it spontaneously transforms their behavior (Torrance and Froese 2011). This transformation process has been formally and experimentally demonstrated at the dyadic level (Froese forthcoming), but in theory it should also hold at the level of whole groups (Figure 1).

To see how, it helps to update the notion of social heterarchy with the latest insights from complex systems theory. The original key insight was that some societies are organized like the brain, i.e. as a system of fluidly interacting elements capable of collectively producing complex behavior but without higher-level elements in charge of controlling lower-level elements' activity in a top-down manner. This insight still stands, but it is limited by a largely static view of network structure. The brain, on the other hand, is continuously learning to improve its collective activity by reorganizing connections between neurons, again without any supervision of a central controller. Could such plasticity apply to social systems as well? This intriguing possibility is not mysterious, at least not formally: just like a neural network can optimize its collective dynamics via Hebbian learning ("neurons that fire together, wire together"), a social network can optimize its collective dynamics via habitual learning (Davies et al. 2011). The formation of a genuinely collective social memory only requires that people are creatures of habit: two individuals who have coordinated successfully tend to strengthen their relationship such that they are more likely to coordinate again in the future.

As might be expected, this capacity to learn is most effective when the system is exposed to a variety of behavioral configurations, thereby enabling it to generalize to a fuller range of possibilities. This is why it is helpful to occasionally lift the constraints that normally limit the behaviors of the system's elements. Indeed, in the case of neural

1   t.froese@gmail.com

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Volume 0
Issue 0

Material Religion
In Conversation

FIG 1
Key elements of an enactive approach to human sociality. Individual agents are nonlinearly coupled during mutual contact, which integrates them into an overarching interaction process that at the same time transforms them, and which can thereby give rise to novel behaviors that cannot be reduced to properties of the isolated individuals. This is applicable to all organisms. In the case of humans this process repeats itself at a higher level: local interaction processes become integrated into larger cultural processes that in turn transform the way in which individuals interact. Both interaction and cultural processes are partially governed by endogenous dynamics, giving them a relation of heteronomy. This is especially so for cultural processes because they unfold on spatiotemporal scales that can easily exceed an individual's life. Photograph © Tom Froese.

networks this is one interpretation of the adaptive role of sleeping, dreaming, and even of ritually induced altered states of consciousness. What could serve as an equivalent mechanism in the case of social systems? I have suggested that extreme community rituals involving temporary yet profound alterations of social relationships, for example by involving altered states of consciousness, are a suitable candidate (Froese 2015). Metaphorically, we can imagine the collective enaction of a liminal anti-structure during certain rituals, as described by Van Gennep, Turner, and others, as the dream-stage of a heterarchical social system (Figure 2).

Q2

I have applied these ideas in a simulated network model of the collective government that has been hypothesized for the ancient city of Teotihuacan, the first highly urbanized civilization in the Americas. We explored the scenario that the city was founded by around 20 different groups whose leaders had roughly the same status, who could adjust the strengths of their ties, and who would have therefore faced the problem of reaching consensus about matters affecting all of the groups (Froese, Gershenson, and Manzanilla 2014). However, this coordination problem was overcome when we introduced regular rituals involving all of the leaders by temporarily lifting the normal social constraints on their behavior, which allowed the whole network to pass through periods of anti-structure before re-converging on another

constrained behavioral configuration. In this way the social network "learned" the general features of its configurations, and the relationships between leaders became optimized such that a consensus that satisfied all constraints was consistently reached. Remarkably, this restructuring occurred without a central controller that represented the problem and then planned and enforced an appropriate course of action. It emerged from the interplay between local interactions of selfish individuals and emergent top-down constraints on their behavior.

This network model illustrates a simple heterarchical mechanism that generates stable large-scale interpersonal coordination, which could precede the development of more centralized and hierarchical forms of social complexity. This fits with Teotihuacan because it was the first highly urbanized city in the Americas and at its beginning more sophisticated political structures still had to be invented. Although it is difficult to test such an abstract model in practice, it is a useful conceptual tool. It is increasingly accepted that Teotihuacan was a markedly heterarchical system, and there is growing evidence that its society valued rituals that could have served as the system's "dream-stage", as shown in mural paintings of collective intoxication to the extent of vomiting and loss of motor control (Nielsen and Helmke forthcoming).

FIG 2
View of the ceremonial core of ancient Teotihuacan. The author is standing on top of the Pyramid of the Moon, from which Teotihuacan's priests were probably coordinating large-scale community rituals in the plaza below. The plaza is connected to the Avenue of the Dead, lined with temple platforms on both sides, and along which citywide ritual processions likely took place. The Pyramid of the Sun looms in the background. Photograph courtesy of Iliana Mendoza.

On the other hand, the model's abstractness implies that it should also be applicable to other complex societies with an emphasis on heterarchical organization and extreme community rituals. Crumley (2003) had already intuited the general principle that chaos is a potent source of a social system's creativity, enabling its parameters to fundamentally change and thereby to become more richly networked. We now better understand the formal basis of this social learning process and have begun to realize that it can be heterarchically induced at the level of cultural processes.

Q3

3

References
Crumley, C. L. 2003. "Alternative Forms of Social Order." In *Heterarchy, Political Economy, and the Ancient Maya*, edited by Vernon L. Scarborough, Fred Valdez, Jr, Nicholas Dunning, 136–145. Tucson, AZ: The University of Arizona Press.

Davies, A. P., R. A. Watson, R. Mills, C. L. Buckley, and J. Noble. 2011. "'If You Can't Be with the One You Love, Love the One You're with': How Individual Habituation of Agent Interactions Improves Global Utility." *Artificial Life* 17 (3): 167–182.

Fargher, L. F., V. Y. Heredia Espinoza, and R. E. Blanton. 2011. "Alternative Pathways to Power in Late Postclassic Highland Mesoamerica." *Journal of Anthropological Archaeology* 30: 306–326.

Froese, T. 2015. "The Ritualised Mind Alteration Hypothesis of the Origins and Evolution of the Symbolic Human Mind." *Rock Art Research* 32 (1): 90–97.

Froese, T. in press. "Searching for the Conditions of Genuine Intersubjectivity: From Agent-Based Models to Perceptual Crossing Experiments." In *The Oxford Handbook of 4E Cognition*, edited by Albert Newen, Leon De Bruin, and Shaun Gallagher. Oxford, UK: Oxford University Press.

Froese, T., C. Gershenson, and L. R. Manzanilla. 2014. "Can Government be Self-organized? A Mathematical Model of the Collective Social Organization of Ancient Teotihuacan, Central Mexico." *PLoS One* 9 (10): e109966. doi: 10.1371/journal.pone.0109966.

Mezza-Garcia, N., T. Froese, and N. Fernández. 2014. "Reflections on the Complexity of Ancient Social Heterarchies: Toward New Models of Social Self-organization in Pre-Hispanic Colombia." *Journal of Sociocybernetics* 12: 3–17.

Nielsen, J., and C. Helmke. in press. *"Los bebedores de Tetitla. Representaciones del consumo ritual de pulque en los murales de Teotihuacan." In Las Pinturas Realistas de Tetitla, Teotihuacan*, edited by L. Staines Cicero and C. Helmke, 135–163. Mexico City: Instituto de Investigaciones Estéticas, UNAM and INAH.

Torrance, S., and T. Froese. 2011. "An Inter-enactive Approach to Agency: Participatory Sense-Making, Dynamics, and Sociality." *Humana Mente* 15: 21–53.

Turner, V. 1969. *The Ritual Process*. Piscataway, NJ: AldineTransaction.