that individuals with a normative identity style tend to base their self-view on the relevant social norms and standards that their group and significant others value and adopt. In contrast, individuals with an informational identity style come to think about themselves on the basis of a complex exploration process. That is, they actively seek out self-relevant information by testing out beliefs, activities, and interests and assessing the degree to which they fit to themselves (e.g., Do I really want to be a lawyer?). In contrast, individuals high in normative identity style tend not to question their culturally prescribed commitments (e.g., of course, like my father, I will be a lawyer because it is a well-paid and respectable job).

The fact that individuals with a normative identity style prefer to cut short the taxing process of deeply questioning and exploring their identity is consistent with Veissière and colleagues' framework, in that norms are herein recruited as a short-cut to a great deal of uncertainty (or free energy). Consistent with this idea is the finding that normative identity style is related to higher levels of need for structure and need for cognitive closure (Soenens et al. 2005). However, I am not sure that informational identity style could be understood through Veissière and colleagues' framework. How should we understand that some cultured agents seek and tolerate the uncertainty of questioning their identity beyond social norms and voluntarily go about a long process of thinking autonomously about themselves, rather than using norms as an antidote to this uncertainty?

Mclean and colleagues (McLean & Syed 2015; McLean et al. 2017) make similar observations in their research on identity development, which focus on the relationship of identity and society in personal narratives. This team focuses on the narratives that are the cultural templates for the experiences one should expect to have in their lives, which they call master narratives. They define the latter as shared narrative expectations regarding what is a culturally valued biography. They found evidence that individuals develop their identities by negotiating the degree to which these narratives are maintained or changed when individuals create their own life story.

A particularly relevant result is that individuals who develop alternative narratives (i.e., changed relative to the master narrative) are also engaged with more identity work (McLean et al. 2017). Specifically, it was found that those who develop alternative narratives made a greater number of explicit connections between life events and their selves and displayed higher levels of identity exploration. These results are consistent with Veissière and colleagues' framework because they suggest that identifying with cultural norms requires less effort. However, these results also challenge the TTOM framework because they suggest that some individuals decide to exert the effort of developing alternatives to these cultural norms.

Social norms are attractive because they provide ready-made answers to the difficult and urgent questions we face throughout our lives. This may explain why conformism is endemic but does not preclude that some individuals are willing and able to go about the costly process of questioning these social norms. Furthermore, this questioning might be an essential part of the iterative process underlying the cumulative culture phenomena described by Tomasello et al. (1993). Individuals thinking about norms in a unique and original way instead of just blindly assimilating them may catalyze the generation of useful ideas and solutions that are integrated in culture and passed on to future generations. The adaptiveness of today's culture may owe a lot to individuals in past generations who distanced their thinking from their culture. If we lose the thinker in others mind, we may lose much of the adaptive potential of culture.

Unification at the cost of realism and precision

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doi:10.1017/S0140525X19002760, e95

Abstract

Veissière et al. must sacrifice explanatory realism and precision in order to develop a unified formal model. Drawing on examples from cognitive archeology, we argue that this makes it difficult for them to derive the kinds of testable predictions that would allow them to resolve debates over the nature of human social cognition and cultural acquisition.

Veissière et al. have uncovered an interesting set of high-level regularities, which appear to show up wherever humans attempt to calibrate their behavior against one another. They have also shown that the FEP provides a unified mathematical framework that is useful for describing these regularities. Highly general and unified explanatory models such as TTOM can be extremely useful. For example, where a discipline lacks a common theoretic language for describing competing perspectives, such models can be deployed to *dissolve* disputes by bringing rival positions under a single theoretical framework. Veissière et al. assume that such a strategy will prove fruitful in *resolving* persistent disagreements within the cognitive science of cultural acquisition and social cognition, as TTOM seems to provide a unified framework for characterizing insights from a number of otherwise incommensurable theories. We applaud their attempt to provide a more unified account of social cognition and the acquisition of culture; but we contend that bringing these phenomena under a single mathematical framework is unlikely to resolve the relevant disputes.

Providing a simple, overarching characterization of complex and inherently variable biological systems is challenging. Abstract mathematical models of biological phenomena, such as TTOM, attempt to overcome this challenge by prioritizing explanatory generality over competing ideals such as explanatory precision and biological realism (Levins 1966). If successful, this strategy can offer unifying explanations of seemingly disparate biological phenomena, such as the action of different but analogous biological systems, or of heterogeneous parts of the same system. Yet, unification comes at the cost of explanatory realism and precision. In order to draw parallels between non-identical systems, general models must make idealizing assumptions about patterns of biological variation as well as the causal specificities of the particular systems being described. This allows such models to capture the general properties of a system, by focusing on

broadscale similarities. But as a result, they fail to be entirely precise and accurate when it comes to the particularities of the system (Woodward 2005). The mathematical framework provided by the FEP does give TTOM a high level of generality; but we worry that this involves stripping away fine-grained causal details and evolutionary histories without much obvious explanatory pay-off.

This is not to deny that unification can offer new perspectives, but we doubt that there is more to say about social cognition and cultural acquisition at the highly abstract level afforded by the FEP than is already being said at a less general, but causally richer, level of description. This concern might be mitigated if TTOM succeeded in providing a common framework for usefully describing and comparing competing theories in cognitive science, but we worry that any theoretical unification achieved via TTOM will be more perspectival than substantive, as the unification it provides is generated by looking at the issues from a level of abstraction that makes the details disappear. Long-standing debates in cognitive archeology illustrate these problems nicely.

The story one tells about the evolution of hominin cognition is highly dependent on the position one adopts on social cognition. Debates between dynamicists/externalists (Malafouris 2016; Noble & Davidson 1996; Overmann 2016; Tomlinson 2015) and representationalists/internalists (Cole 2016; Coolidge & Wynn 2018; Mithen, 1996) in cognitive archeology mirror broader debates in cognitive science. For instance, Noble and Davidson (1996) employ an externalist and Gibsonian approach to the analysis of stone-tools and the evolution of social cognition, whereas Mithen (1996) employs an internalist and modular approach. If TTOM provides a tool for resolving debates in cognitive science, it should also offer the resources for arbitrating between these different views, and for finding a clear route to a resolution. Unfortunately, even if TTOM can express these rival accounts in the general, abstract, mathematical language, this redescription seems to add little to our existing, much richer causal understanding of the systems in question.

Debates about hominin cognitive evolution largely concern the kinds of cognitive traits that are required to produce lithic technologies. And resolving such debates requires generating mutually exclusive and testable empirical predictions to compare against the Paleolithic record and findings in contemporary cognitive science; any common vocabulary for comparing theories must be causally rich enough to engage with such evidence. Unfortunately, TTOM is so abstract and multiply realizable that the evolutionary histories and fine-grained causal information that instantiate the competing views about hominin cognitive evolution are largely omitted. Given this causal frugality, TTOM seems incapable of generating the testable predictions cognitive archeologists require to resolve these debates, and hence the overall payoff for deploying it is unclear.

We suspect that the state of affairs in cognitive archeology is a reflection of broader debates in the study of human social cognition and cultural acquisition. Recent experiments have revealed significant intra- and inter-personal variation in mentalizing capacities (e.g., Warnell & Redcay 2019); this may reflect heterogeneity in the underlying biological systems (Schaafsma et al. 2015), or it may suggest the development of different kinds of sense-making strategies (De Jaegher 2013). An approach that focused on patterns of qualitative variation might yield empirically tractable predictions in this domain; and given a plausible set of bridging principles, the resulting data may be useful for adjudicating the relevant disputes. By contrast, the unified theoretical framework advanced by Veissière et al. can only reveal the points where these different kinds of approaches are likely to converge. As we see it, TTOM mistakenly equates formal unification with explanatory power. Explanation in science is, alas, far more complex; and generality comes at the cost of valuable explanatory realism and precision. In light of this worry, we contend that the explanatory value which TTOM appears to have is likely to reflect its ability to systematize existing data, rather than its ability to produce novel hypotheses, or novel ways of negotiating intractable disputes.

Normativity, social change, and the epistemological framing of culture

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doi:10.1017/S0140525X19002681, e96

Abstract

The authors deploy an epistemic framework to represent culture and model the acquisition of cultural behavior. Yet, the framing inherits familiar problems with explaining the acquisition of norms. Such problems are conspicuous with regard to human societies where norms are ubiquitous. This creates a new difficulty for the authors in explaining change to mutually exclusive organizational structures of human life.

Thirty years of work in cultural evolution, primatology, human behavioral ecology, and cognitive science has established a consensus framework for understanding culture. This framework characterizes agents as voracious epistemic optimizers: Individuals who exploit cues, adopt strategies, and intervene on situations to extract high-quality information relative to their goals. This framing extends out into the world, seeing it in epistemic terms: the physical environment and other agents are repositories of, and instruments for, information acquisition.

Veissière et al. (hereafter, "the authors") adopt and synthesize this consensus framework. Their particular concern is the thoroughly social character of the informational world in which humans develop and live – and their novel contribution is to wed empirical research on this topic with the apparatuses of variational Bayesian inference and the free-energy principle. These tools, they suggest, provide means of modeling key features of enculturation, behavior, and cultural change.

Yet, an important feature of this account needs to be noted at the outset. The authors' epistemic framing grounds both culture and enculturation in the extraction and employment of information, and in so doing, minimizes the explanatory clout of other core aspects of human life; notably, deliberative choice, affect, and normativity. On the authors' account, these latter features are either reducible or subsidiary to variational inference. The result is a conservative model of culture, one already well-formulated by David Laitin (2007): cultures are "circumstances in which members of a group [. . .] are able to condition their behaviour on common knowledge beliefs about the behaviour of all members of the group" (p. 64). Such a model renders cultures largely homeostatic; enculturation means both learning and expecting others to stay within the bounds of established behavior.