to their model, however, we view ritual as an evolved adaptation that activates these pathways, rather than as a dysfunctional by-product of their operation. We propose that ritual activation of the cortico-limbic-striatal networks kicks socio-emotional appraisal and learning processes into high gear and initiates right hemispheric processing of the complex cost/benefit calculations associated with approach/avoidance decisions that lie at the heart of non-agonistic social interaction between unrelated conspecifics.

If the capacity for ritual is an evolved adaptation, then individual genetic propensities for ritual should display variation throughout a population. B&L note that just such variation has been proposed as an explanation of OCD. Ritual also exhibits considerable ontogenetic and socioecological malleability, as well (Alcorta & Sosis, forthcoming). The continuum of simple to complex behaviors found in both human and nonhuman ritual clearly includes a broad range of both "fixed" and "learned" elements. Within many species, such as songbirds (Marler 1999) and baboons (Watanabe & Smuts 1999), learning is both a necessary and developmentally sensitive component of ritual. As noted by B&L, and as we have discussed elsewhere, this appears to be true of human ritual, as well (Alcorta 2006). Although the capacity and the propensity for learning such behaviors is genetically encoded in each individual, the activation and development of the neural pathways specific to such behaviors requires that learning occur through social transmission. Such learning may be optimally accomplished during particular "experience expectant" developmental periods (Greenough 1986). This model of ritual predicts that ritualized behaviors will vary across the population, will occur predominantly in relation to social concerns, and will display a range of intensity and expression in response to differing individual, developmental, life cycle, and ecological factors. These predictions are borne out by the human data presented by B&L and by ethological research (Ball 1999; Marler 1999; Rogers & Kaplan 2000; Wingfield et al. 1999).

A robust evolutionary theory of ritual requires that we consider both human and nonhuman data, and that we shed false individual/cultural dichotomies, as well. Unlike the by-product theory of ritual, a theory of ritual as an evolved adaptation for social signaling and communication provides a parsimonious and integrated explanation of all the relevant data across disciplines and across species. Testing hypotheses derived from this theory can move us forward in understanding both the proximate and ultimate causes of ritual.

Compulsions and cultural rituals: The need for a drive-motivational framework

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Abstract: Instinct theory parsimoniously clarifies the relationships between emotions, such as fear and anxiety, and perceptions, thoughts, and actions. Its acceptance allows more elegant insights into riddles of obsessions and compulsions. Their relationship to anxiety and dysexecutive function needs to be explained, as does their characteristic egodystonia, while avoiding the pitfalls of cognitivist, empiricist, and teleological thinking.

> *Left to itself, reason is like a … wonderful system of wheels within wheels, without a motor to make them go round. The motive power that makes them do so stems from instinctive behaviour mechanisms much older than reason and not directly accessible to rational self-observation. … These deep strata of the human personality are, in their dynamics, not essentially different form the instincts of animals, but on their basis human culture has erected all the enormous superstructure of social norms and rites whose function is so closely analogous to that of phylogenetic ritualization.*
>
> — Konrad Lorenz (1963/2002, p. 240)

McDougall (1924), who regarded instincts as the "prime movers of all human activity," discerned that the operation of each instinct "is accompanied by its own peculiar quality of experience which may be called a primary emotion" (p. 128). Fear is the "characteristic emotional accompaniment" of the "instinct of escape," which enacts, first, "a running to shelter" and, second, "a lying hid when the shelter has been attained" (pp. 150–51). For gregarious species, shelter may be represented by "the mass of the congregated herd." A loud noise "is perhaps the most nearly universal key" to the "gates of fear," another being "the sudden move of a large object" (p. 152). The impulse of the *gregarious instinct* is to approach conspecifics. Uneasiness and restlessness, and a craving to be back in the company of others, afflict the individual on his absence from the group (McDougall 1924). The likely emotional accompaniment of the *gregarious instinct* – anxiety – may be similar to that of the *instinct of escape*, suggesting the two instincts are evolutionarily related.

Situations or objects are perceived because "they are specific excitants of these instincts" (McDougall 1924, p. 273). An object *recognised* or *thought about* "evokes in [the subject] an impulse to effect some change"; conative experience in proportion to the strength of the underlying instinct – as the "felt impulse to action," – is integral to all our "sense-impressions" (p. 265). Thus, certain cues evoke fears of contamination, which lead to washing or cleaning rituals. Other cues evoke concerns about intrusion by others, leading to checking rituals, but anxiety indeed forms an important context for *compulsive* actions. Perception of threats and ideas about possible threats may represent *displacements* – unconscious attempts to convert overwhelming anxiety into concrete forms of fear that allow specific responses in form of specific rituals. The subject's attention to potential threats may be heightened inasmuch as his anxiety cannot be resolved through secure interpersonal relatedness (Heidegger's [1927/1962] notion of "fleeing anxiety"). Compulsive actions, then, may relieve a specific fear – the immediate motivational impetus behind these actions – but they would not substantially alter the background of anxiety. "Goal-demotion" (see target article) of normal fear responses and their repetition would be due to the fact that the ultimate motivational force – existential anxiety – is not addressed.

Although "patients who perform more rituals are typically more anxious," this does not mean that anxiety is one of "the long-term effects of ritual performance" (target article, sect. 7.3). If anxiety does increase in the course of obsessive-compulsive disorder (OCD) then this may be due to social debilitation. Conversely, helping the patient in therapy to develop secure interpersonal relatedness addresses his anxiety and can reduce obsessions and compulsions (Gabbard 1990). The key difference between *normal* "ritualized action-plans to avoid […] dangers" (sect. 7.1, para. 1) and pathological compulsions may not lie in "appraisal" of dangers but in the presence or absence of background anxiety. Specific fears can be abreacted under most circumstances, but anxiety often cannot – because secure social relatedness may be beyond reach for the individual, particularly if *impulsivity* is a confounding problem.

Much of social behaviour is determined from a drive-motivational perspective by successive impulses of "aggression, fear, protection-seeking and renewed aggressiveness" (Lorenz 1963/2002, p. 55). In *phylogenesis*, ritualisation creates new instinctive motor patterns by welding together conflicting impulses (Lorenz 1963/2002). The display of such behaviours often acquires signal function in social situations. *Submissive gestures* are ritualised behaviour patterns that elicit in members of the same species an active inhibition against aggression. Norms of social behaviour developed by *cultural ritualisation* started to play an important part in human society "when invention of tools was beginning

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to upset the equilibrium of phylogenetically evolved patterns of social behaviour" (p. 249). Social manners represent "culturally ritualised exaggerations of submissive gestures most of which probably have their roots in phylogenetically ritualised motor patterns conveying the same meaning" (p. 77).

Illness or misfortune may provide occasions for complex cultural rituals indeed, but it makes sense to insist that their function – like that of social manners – is to foster *social cohesion* in complex societies. What makes collective rituals attention-grabbing and compelling is not their presumed ability to "activate the Hazard-Precaution system by including cues for potential danger" (sect. 8.5, para. 2); instead, their compelling nature and stability within traditions may stem from their role as a socially acceptable outlet for instinctive intraspecific aggression and culturally appropriate medium for negotiation of rank order. Participation in cultural rituals – and adherence to social norms in general – is not compulsive, but compulsory – that is, demanded by the group – insofar as it deflects instinctive intraspecific aggression from the group and signals submission and conformity. Deviation from norms and rituals is *dangerous* indeed because it leads to social rejection; and it is in this sense that fear plays a role.

Boyer & Lienard's (B&L's) suggestion that their attempt to "explain a disposition to participate in coordinated social action" stands out from other such attempts in that they resolved "why these common endeavors should include scripted, goal-demoted, redundant scripting of familiar actions" (sect. 9.1, para. 2), attests to today's ignorance of Lorenz's work. In contrast to Lorenz, B&L dispute that "obvious similarities between human rituals and various forms of animal communication, notably in the context of agonistic and sexual displays" could be seen as "evidence for the deep phylogenetic ancestry of ritual" (sect. 9.2, para. 1). Their model *demands* that apparently similar behaviours "actually stem from very different cognitive processes," – suggesting, for instance, that *in animals* "signals must be clear and distinct enough to preclude ambiguities." However, human cultural rituals too have a signal function: they signal social assertion or submission in aggressively motivated competition within the group for ranking positions and resources.

Obsessive and compulsive phenomena are not just exaggerated versions of risk avoidance behaviour, as B&L maintain. Compulsions and obsessions are characteristically *egodystonic*; they are accompanied by inner resistance reflecting a conflict between drives. This is usually between an urge to escape a specific hazard and fear of aggression. Expectations of punishment, which relate to patients' preserved insight into the abnormality and social unacceptability of their compulsions – psychoanalytically conceptualised as fear of the superego – are the source of much of their suffering. Obsessive thoughts about harming or offending others indeed elicit fears of social ostracism, representing a conflict between the individual's aggressive drive and his fear of becoming the target of others' aggression.

Rather than linking obsessive-compulsive disorder (OCD) to "a *dysfunction in a satiety signal*, plausibly generated in brainstem structures" (sect. 3.3, para. 4; emphasis in the original), we should emphasise the motivational instability between conflicting drives, ultimately between existential anxiety urging human relatedness (transformed into a specific fear) and the fear of aggression. As B&L recognise, "conflict in groups threatens each member's access to resources," so that the motivational conflict derives its immediacy precisely from the "human dependence on conspecifics for all aspects of survival" (sect. 5.4.3). These conflicts would be expected to activate the anterior cingulate gyrus in patients with OCD, consistent with findings by Fitzgerald et al. (2005), bearing in mind that the anterior cingulate cortex is more likely a structure representing basic motivational/emotional states, including fear and anxiety (Behrendt 2005; Ploghaus et al. 2003), rather than an "error-detection network" (Winterer et al. 2002). What may be of greater pathophysiological relevance is the association of OCD with prefrontal lobe/basal ganglia pathology, given that compulsiveness is clinically related to *impulsivity* – part of the dysexecutive syndrome.

What else is driving ritualized behavior, besides the "Hazard-Precaution system"? Developmental, psychopathological, and ethnological considerations

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Abstract: The target article presents arguments for a motivational system dedicated exclusively to the detection of, and reaction to, particular threats to fitness, the so-called "Hazard-Precaution System," which, according to the authors, drives ritualized behavior. We approach the issue of a motivational system from three perspectives – developmental, psychopathological, and ethnological.

The goal of an integrated model of ritualized behavior, put forward by Boyer & Lienard (B&L) in the target article, is both ambitious and laudable. Yet the search for commonalities might sometimes overlook differences between partly or superficially similar phenomena. Like the authors, we approach from three perspectives – developmental, psychopathological, and ethnological – a key aspect in this search: the issue of a motivational system dedicated exclusively to the detection of, and reaction to, particular threats to fitness, the so-called Hazard-Precaution system, driving ritualized behavior.

From a developmental perspective, one of the major claims by B&L draws our attention: that ritualized behavior cannot be routine-like or automatic, but rather, requires high-order cognitive control. The distinction between routines and rituals *per se* is conceptually a worthy one. However, there is a corollary claim that rituals involve an explicit emphasis of the agent on his or her own proper performance of actions – and, at the clinical end, that rituals even involve a patient's recognition of his own irrationality. But this *self-reflection* or *autonoetic consciousness* (Tulving & Markowitsch 1998) involves a degree of *metacognition* which is not easily present in the cognitive system of 2 to 4 years old children.

The positing of such self-consciousness is even more problematic with regard to what is the most flourishing period of compulsive behavior in normal children, that is, age 2 to 4 years (see Evans et al. 1997). Evans and Gray (2000) have suggested that younger mental age groups (MA) (2–5 years) exhibit a greater number of ritualistic behaviors than do older ones. Yet, far from functioning maturely, some "basic ingredients" of self-reflection are barely emergent during the same age interval: ingredients such as, self-concept (Howe & Courage 1993; Povinelli et al. 1996), understanding mental representations (Perner & Ruffman 1995), and episodic thinking about the personal past (Nelson 1993; Welch-Ross 1995) and future (Atance & O'Neill 2005). Therefore, it might be worthwhile to further explore the very construct of ritualization as proposed by B&L, in relation to early childhood compulsive behaviors.

In exploring the early beginnings of ritual behaviors, a closer look at child development suggests a possible link with knowledge structures, for example, scripts and narratives, rather than with fear management.

Script theory (Schank & Abelson 1977) assumes that people have generic knowledge structures that reflect an understanding of the temporal and causal sequences of actions. For early childhood, scripts are considered basic building blocks of

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