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Cognition, material culture and religious ritual

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Abstract:
In this paper I argue that material artifacts and other environmental structures that are present during religious rituals both enable and restrict forms of action as well as our capabilities to perform these actions. Moreover, these external prompts have far-reaching consequences on the way the ritual action is established and reproduced within cultures. My main focus is on the cognitive dimension of the problem, however I understand this to be in concert with visible and tangible practice. I argue that religious ritual material artifacts enable a whole range of higher cognitive abilities such as memory, decision-making or computing, and I support this claim by the theory of extended and situated cognition as well as by various specific examples from religious worlds and evidence from experimental research. This paper also contains a brief case study that discusses two religious artifacts (prayer beads and mechanical clicker). I argue that each of them supports a different mix of cognitive abilities and as such they are key elements in religious practice and vital elements constituting the practitioner's competence.

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Extended cognition, a recently emerging theoretical stance that understands thinking as a situated and environmentally depended process, offers invaluable analytical insight into cognitive problems. For that reason, a significant part of this paper will be dedicated to the presentation of a broader framework and also specific analytical concepts related to this theory. Some of these ideas were only recently introduced into the field of cognitive science and may be unfamiliar to scholars in the study of religions and cultural phenomena. Later on, I will present a brief case study

illustrating the theoretical repertoire, based on an observed substitution of ritual material artifacts that exposes the underlying cognitive mechanisms involved in the performance of the ritual discussed: Maha mantra chanting.

Extended cognition and materiality

Michael Anderson proposes a radical notion of cognition (Anderson, 2007). He understands it as a set of *tools* evolved as adaptations to natural settings and in concert with various features that the environment expressed throughout evolutionary and ontogenetic stages of human development (cf. Anderson, 2003; Varela et. al, 1991). Cognition thus defined displays a striking difference from the classical notion of the concept. It is introduced as a toolbox: a set of evolved reactions, responses and behavior forms designed to deal with practical, and in most cases mundane, problems. As elements of cognition, Anderson (2007) also recognizes those features that are external to the organism, namely, a large variety of material and non-material environmental elements. Anderson's view is totalizing in its aim to bring nearly all reasonable task and behavioral strategies under the one umbrella term of cognition. Here, cognition does not denote abstract and often vaguely defined higher mental abilities such as memory, language or decision-making, but elementary and very concrete acts that were traditionally seen as marginal to cognitive theorizing (cf. Malafouris and Renfrew, 2010).

Extended Mind (EM) theory (Clark and Chalmers, 1998, cf. Clark, 1997: 179-192, Hutchins, 1995, Varela et al., 1991) has become a prevalent scientific standpoint that advocates the thinking process as a situated and contextualized activity, and as such it fully corresponds with the broader conception of cognition as outlined by Anderson (2007). The Extended Mind Hypothesis, built upon the conception of *active externalism,* brings forward an active role of the environment in driving both lower and higher cognitive processes (Clark and Chalmers, 2008: 222-26). Active externalism suggest to ignore the metabolic boundaries of skin and skull and to put, analytically, brain, body and world together (Clark, 2008: 30-42). The organism is understood to be in a two-way connection with surrounding entities. All the individual environmental elements, the human organism being one of them, are components of the cognitive system with its causal contributions to the overall thinking process. If we remove any of the entities from the systemic whole, cognitive ability may collapse or change rapidly (Clark and Chalmers, 2008: 221). Although constitutive components of the system may be endowed with individual cognitive capacities, their individual abilities are limited or extensively different from the capacities of the overall system, and the quality of the emergent thinking capacity of a system cannot be inferred from the properties of its components alone (Zhang and Patel, 2006: 334). We should also consider the contribution of individual elements in cognitive tasks. Clark and Chalmers' *parity principle* further suggests:

> "If, as we confront some task, a part of the world functions as a process which, were it to go on in the head, we would have no hesitation in accepting as part of the cognitive process, then that part of the world is (for that time) part of the cognitive process" (1998: 18).

This theoretical stance opens up the possibility of a variety of external cues and material devices being constitutive parts of the thinking process. The notion of symmetry regarding external and internal elements of cognition was later supported by experimental evidence (for example Ballard et al., 1997; Gray et al, 2004, 2006; Yu et al., 2005).

This theoretical shift can be illustrated by two positions. For example, moderate scholars stress the supportive role of external memory storage in the evolution of the modern human mind and the propagation of culture (Donald, 1991, 2010: 76-79). However, more radical scholars consider memory and some other higher mental processes to be fully dependent on these external cues. Cognition is understood as an external process accessible to observation (Alač, 2003, Alač and

Hutchins, 2004). That means that our physical interactions with tools and objects are not just indications of an ongoing thinking process that takes place in our head, rather they are themselves a thinking process. Taking the rudimentary assumptions of EM seriously means that thinking is the *interaction* of brain and body with the world (Hutchins, 2008, 2010a). The Hypothesis of Cognitive Impartiality (Clark, 2008: 197) postulates that the neural control system is indifferent to the information source. The brain, the orchestrator of the problem-solving task, always seeks the least cognitively demanding and most effective mix of elements, regardless of their status or type of cognitive operation (introspection, perception, motor activity). The recruitment of cognitive elements in a temporal or lasting cognitive assembly is driven by proximate constraining mechanisms such as cognitive costs.

Cognitive assemblies are also formed by our cultural predispositions; therefore, it is important to understand that characteristics of specific cognitive elements are products of ongoing cultural activity based on the individual's or others' lifetime contributions (Hutchins, 2010b: 5). As Hutchins rightly points out, if the former task of EM was to understand that the higher cognitive processes are outcomes of interaction between brain, body and world, it is now time to elaborate the idea that the world is a culturally established social and material environment that enables and at the same time constrains our cognitive processes (Hutchins, 2010: 6). This notion resonates also in specific examples of religious cognitive artifacts discussed bellow.

The concept of *cognitive niche* bridges the ground between culture-blind cognitive analysis and culture-sensitive contextual approaches. Cognitive niche can be understood as a subcategory of the broader concept of *niche construction* referring to all artificial and cumulative modifications of the environment done by living species (Laland, 2000: 131). It can materialize in evolved and lasting structures, but it can also be just a momentary environmental adjustment that makes a specific thinking activity easier and more secure regarding a prospective goal. A spiderweb is an example of a *niche* with cognition empowering and enabling features. It modifies the characteristics of the surrounding environment to make navigation and movement in space easier and more precise; moreover, it enables camouflage and mediates information concerning food and potential threats (Ingold, 2010). We can see that specific modifications of our material environments are, after socially shared knowledge and abilities, yet another source of information and an important part in a problem-solving economy (Clark, 2008: 61, cf. Hutchins, 1995).

The idea of a niche is not confined to the world of natural species. Many of our everyday activities display culturally inherited patterns of behavior. By *Intelligent use of space*, Kirsch (1993, 1998) denotes a set of strategies exploiting a spatiotemporal organization of the environment to the greater benefit of ongoing or intended actions. It usually comes as: (1) *spatial arrangements that simplify choice*, such as organizing cooking ingredients in the order needed for preparing a dish; (2) *spatial arrangements that simplify perception*, such as marking documents by color and arranging them in folders; (3) *spatial dynamics that simplify internal computation*, such as reordering Scrabble pieces so as to prompt better recall of candidate words (cf. Clark, 2008: 64-65).

Even in relatively simple tasks, such as those related to motor activities or movement in space, the central nervous system tends to solve the problem by assuming a certain backdrop of intrinsic bodily dispositions such as skeletal construction or properties of muscles. However, many activities cannot be accomplished with the help of our body only. In such situations we have to rely on external assemblies. This exploitation of stable external structures or active cooperation of other conspecifics is referred to as *scaffolding* (Clark, 1997b, 2008: 61-64; cf. Anderson, 2003, Donald, 2010). As a concept, scaffolding originates from the idea of *proximal development* coined by Lev Vygotsky (1978) within the tradition of *cultural historical activity theory.* The notion of proximal development was initially confined to developmental psychology and more precisely to the process of active

support and enhancement of learning provided by adults to their offspring. Supporting a young child in her first steps so the experience of walking is possible, is one good example of scaffolding; spatial distribution of cooking elements to make the choice easier is another.

We may point out that there is a fairly stark difference between those supportive structures exploited by animal species and those recruited by humans. The former are very rigid in their characteristics and often use already existing natural occurrences. For instance, a sponge uses water currents to increase the amount of water flow bringing it important nutrients. This practice displays few or minimal changes over time. In contrast, behavior motivated by cultural knowledge has a rapidly-evolving and cumulative character. New forms of behavior, new institutions and, importantly, new tools emerge throughout the course of human history. We build up tools to think with, and we use these tools in turn to discover still better tools to think with; thus we speak of a cumulative evolution of cultural artifacts (Tomasello, 1999). Each generation of expert users modifies tools inherited from their ancestors and teaches their children to use them. Each generation uses a variety of specialized tools that were constructed with the help of other tools and related technological knowledge. From this derives Tomasello's (1999: 36-39) concept of the *ratchet effect* — a rich culturally-shared network consisting of tools, expertise and social bonds that prevents human culture from falling back. Cultural knowledge, passed down generations through imitation and informed learning, started an evolutionary process on its own.

We may assume that the idea of cultural history is not confined to human species only; however its scope is very limited within animal societies. Phylogenetically, a minimal, however still crucial difference seems to lie in the specifically human ability to understand the mental states of other conspecifics (Tomasello, 1999: 13-24). Humans are natural mind-readers (Baron-Cohen, 1995, Leslie 1994). They are able to infer recursive mental states of several levels which allow them to track behavior in large groups (Kinderman et al., 1998; Stiller and Dunbar, 2007, Dunbar, 1998, 2010) and their brains are able to infer and hold information concerning individuals within relatively large social cliques (Dunbar, 1998, 2004). It is perhaps this special mix of higher-level social abilities that has allowed the rapid spread of cultural knowledge (but see van Shaik et al., 2012), since other necessary prerequisites such as exposure to learning experience, mimicking and imitative learning exist also among other species (Tomasello, 1999: 26).

Cognitive Artifacts and religious ritual

Our cultural environments are populated by material things. Most of the objects we keep in our homes or use at our workplaces were built with a practical goal in mind.

Within the vast category of artifacts of everyday use, cognitive artifacts (Norman, 1990) form a relatively small subset. Cognitive artifacts (Norman, 1991) are those objects that mediate our computational and problem-solving tasks, from a single element of an interconnected system (such as a single device within an aircraft navigation system) to individual portable objects (for example a wristwatch). They are carefully designed devices that maintain, display or operate upon information and change our cognitive performance. For the purposes of a functional analysis of cognitive artifacts, Donald Norman (1991) discusses *system* and *personal* views of a cognitive task. *A system view* appreciates the artifact, person and other elements of a task as individual constitutive parts of a cognitive whole. Elements and their specific contributions are understood in relation to the goal of an overall task. For instance, using a digital calculator, rather than paper and pencil, means enhancing the computational ability of a system, minimizing time per task, reducing the caloric intake of the brain etc. On the contrary, a *personal view* is the perspective of an individual and his or her specific choice of tools regarding procedure and desired goal. One has to undergo a specific set of sub-actions which are largely appointed

and shaped by actually employed tools. Depending on the type of tool utilized and its degree of suitability to a certain task, the procedure is experienced either as a routine and easy to perform, or clumsy and difficult (cf. German and Defeyter, 2000, German and Barrett, 2005).

This brings us to the idea that the demarcating criterion of an artifact's effectiveness is its individually utilized and experienced benefit (however cumulative the impact may be in a population scale). Analysis of a specific cognitive benefit may follow these guidelines:

(a) *Look for the selective advantage.* We should always ask how the attributes in question increase the success of a task (Anderson, 2007: 16). This holds for the analysis of any element in the overall cognitive task. We can either work with descriptive ethnographic analysis or search for a quantitative benchmark that may uncover some measurable pattern.

(b) *Culturally stabilized tasks use artifacts that yield some cognitive advantage.* We should be aware that proximate selective pressures of cultural evolution shape objects and tasks towards greater efficiency. The institution of a new artifact which brings some remarkable cognitive advantage usually results in a marked shift in patterns of cultural practice, followed by a visible change in performed behavior.

(c) *Examine the moments in the artifact's substitution.* Situations of cultural change tell us much about the former and present object of use and its context. However subtle the change in practice may be, the substitution of an artifact can indicate a profound inner change in engaged cognitive processes. In order to find out more we may ask: Which cognitive mechanisms or capacities does the former/present artifact support and which are left behind?

I believe that cognitive artifacts in religious ritual display many of the functional features expressed by any other cognitive artifact. They are most likely culturally evolved answers for the computational, attentional, mnemonic or conceptual problems posed by religious tasks. In contrast to common modern cognitive artifacts, religious objects do not deal with inputs of a real empirical world and do not seek practical immediate goals. Instead, they engage with the non-existing and the non-observable, that is with supernatural beings, things and experiences. Thus religious cognitive artifact are designed to stand for supra-mundane entities or experiences, and are used in situations when the physical world cannot serve as the best model (Day, 2004, Clark, 2010). The important idea of EM is that our brains seek to avoid environmentally detached thinking and instead use a variety of tricks to translate distant, future or non-existent objects into those that are local and temporal. The contribution of religious cognitive artifacts is of two kinds. First, they refer to the non-existent and the imaginary and give it a solid (material, dimensional, textural) and temporal shape so religious practitioners can face it. Second, these objects preserve, encapsulate and (re)present religious knowledge elaborated by theologians and other religious specialists, and refer to these large bodies of religious knowledge in a *model* and simplistic fashion. In this way they are able to bring together two types of thinking, online and offline cognition—modes that are traditionally conceived as opposites (Day, 2004)

Thus, religious cognitive artifacts are constitutive of *surrogate situations* (Clark, 2005, 2010): tangible and visible settings that serve as a purpose-built cognitive environment which deals with coupling resistant by means of local and coupling-friendly material structure (Clark, 2010: 24). Clark outlines two mutually interconnected types of cognitive support provided by surrogate situations.

First, details are suppressed by amplifying, abstracting or omitting features of the final object or target place. This is a well-known and quite routine strategy for professions involving design and construction. The practice of sketching and modeling for the purpose of rethinking designs is a necessary step in the planning process. Hutchins (2010a) discusses how architects operate with models of buildings

that do not yet exist. They use environmentally-coupled hand gestures to imagine the dynamic flow of people in a planned building. In this example he shows that representations can have a different degrees of commitment to a target domain. Some representations are permanent, such as lines of ink on paper; others, such as sticky markers, are temporary and replaceable; yet others, such as the gestures mentioned above, are only tentative. It is necessary to analyze the whole range of these embodied interactions, from permanent ones to those that are just provisional, to understand the full repertoire of interactions within a material surrogate situation.

By omitting certain features and amplifying others, religious ritual artifacts highlight qualities that are essential to a religious tradition and its doctrine. Surrogate situations emphasize those features that should not be forgotten or neglected and maintain a greater memorability of the material presented. More importantly, they bring to the fore characteristics of beings and items populating the target domain, that is, supernatural religious worlds. From this viewpoint they do not *represent* but *present* entirely new modes and contents of thinking (cf. Clark, 2010: 27).

Second, surrogate situations relax temporal constraints on cognition since they present information along a certain path or step-by-step in time (cf. Ballard et al., 1997). Surrogate situations slow down presented information so our mind can follow what is being presented. Well-known examples from the religious world provide illustrations:

(a) *A giant Buddha statue*. The appearance of such a statue is in stark contrast with actual stories from Siddhārtha Gautama's life, which usually depict him as an ordinary mortal being with rather normal features. In contrast, a giant statue, produced much later in the Buddhist tradition, brings forward those qualities that are understood as religiously important. Thus, the statue is meant to introduce entirely new features and meanings, not merely represent existing ones. Note one important thing: however abstracted many of his features are — bodily disposition, hair, skin, clothes — the eyes stands clearly visible. Intuitively, eyes are important features of any character depiction. Recent experimental research shows that the eyes are the most vital elements of the body for revealing intentions and inner mental states (Baron-Cohen, 1995b: 40). As such, eyes are crucial when designing an object that is meant to suggest the presence of an unusual agency (Taves, 2009: 39-44), usually so important for sacred places of religious worlds.

(b) *Time lapse of a sand mandala.* Ritual construction of sand mandalas allows the depiction of different parts of a religious world in mutual spatial relations that otherwise cannot be experienced. Its process of construction allows the manipulation of and meditation on specific parts of the mandala in time. An important aspect of this surrogate situation is a flow of dynamics that mediates focus and plays with our attention. At the end of the ritual, the slow diligent action quickly changes into the experience of the abrupt destruction of the whole virtual world.

(c) *Borobudur*. This is yet another example of a surrogate situation belonging to the Buddhist world. Borobudur reveals a striking geometrical shape when viewed from a bird's perspective, but this is not the way generations of pilgrims experienced this colossal Buddhist *stūpa*. Instead, climbing slowly up its large stairs and walking around each balcony with its thousands of statues and depictions of the Buddhist world keeps the mind in a constant flux of information. This gradual flow and order of information presented at walking speed makes the very experience and the comprehension of a variety of details possible.

There is yet another and perhaps even more fundamental type of support provided by cognitive artifacts, namely anchoring of concepts in material structure (Hutchins, 2005). As with surrogate situations, *material anchors* also work as stimulations and

prostheses of higher cognition. By definition, material anchors are “perceived relations of material elements that are taken as proxies for conceptual elements” (Hutchins, 2005, cf. Clark, 2006, 2008: 53-60). Let me illustrate this by practical examples:

(a) *Spatial landmarks* serve as inputs for our cognition while still staying untouched in their original place. For instance constellations, perceived formations of stars in a dark sky, become established as cultural conventions when turned into stable sets of connections and named. When used in sailing navigation, the individual star serves as a proxy that represents a point in a navigation system. However, the act of navigating according to constellations is partially independent of actual stars and works, though with some difficulty, even when stars are obscured by clouds. In other words, the system can be executed imaginarily, as a purely mental representation detached from real stimuli. This is also true for other basic material anchors but not for more elaborated ones (Hutchins, 2005: 1574-1575).

Another case is when naturally existing spatial landmarks are turned by our active mind into a powerful mnemonic strategy called the *method of loci*. Here, a series of memory items are mapped, in the imagination, onto spatial features of the environment such as monuments in a landscape. The memorized sequence of concepts is later on recalled by establishing a trajectory of attention across the set of environmental features that trigger the recall of the desired items. This practice is well documented in the ancient world, and was probably also widely used in Shakespeare's Globe theatre (see Sutton, 2010).

(b) *Material structure designed to solve a particular problem*. Special-purpose devices such as compasses or slide rules, but to certain extent also the prayer beads discussed later, are in stark contrast to the examples of material anchors discussed above. These artifacts are specifically designed memory and processing devices that are actively used in the course of certain activities (cf. Hutchins, 1992, 2005). Here, a part of the cognitive task is delegated to the object itself. These artifacts usually have constraints on the task written into their material structure. In this way they reduce the overall cognitive demands of the task by limiting the possible number of operations, and more importantly by converting conceptual operations into perceptual ones (McGraw, 2011: 236). A slide rule is a good example of such an artifact. With the help of sliding parts accompanied by numerical scales engraved in the material, it allows the execution of several different mathematical operations. The artifact is operated by means of a slider that changes the positions of points on several parallel scales. The result of the demanded computational task is revealed by the target location of engraved numerical symbols and their mutual relations.

(c) *Anchors for conceptual blends*. This covers situations in which material objects enter the thinking process as a direct and important constitutive element for the fixation or recall of cultural models. The basic idea is that concepts can benefit from their embodiment in materiality, since material structure can offer them temporal durability and enrich their semantic stability. Embodiment also extends the number of possible semantic manipulations of a concept and strengthens the process of their blending (cf. Fauconnier, 2001), while setting up precise semantic boundaries for the resulting conceptual blends. Material structure encapsulates the whole process of conceptual blending to make the manipulation less fragile and susceptible to decline then if done as mental processes only (Hutchins, 2005).

Language structures used in everyday conversations do not usually lack stability and support; in fact, they are well grounded in socially shared everyday reality. However, their subtlety is revealed in situations of change (for example when new or unusual concepts emerge). The institutionalization of religious concepts in human prehistory illustrates this problem. Newly emerging religious concepts might appear extraordinary and unnatural, especially in societies where vocabulary is limited and abstract thinking is just evolving. While religious concepts seem to violate our domain expectations in order to be attention-grabbing and culturally salient

(Boyer, 2004, 2001), these concepts also need to conform to some ordinary aspects of our world in order to have a survival value. This, according to Mithen (1998), seems to explain why religious statuettes often display anthropomorphic features. In earlier material culture theory, religious objects were understood solely as a medium of externalization that depicted internally-formed concepts, thus helping to overcome the limits of human biological memory (Mithen, 1998; cf. Mithen, 2010). However, we can give religious material culture a higher value. In what he calls a *second-order anchoring argument*, Malafouris (2007) understands hybrid concepts of religious worlds as the result of enactment between the human mind and material objects, "as enactive signs, that is, as signs that bring forth rather than simply represent a pre-existent concept" (Malafouris, 2007: 207). By stabilizing representations from both natural and supernatural domains, religious ritual objects facilitate cognition by providing it with a content (cf. McGraw, 2011: 242). The artifact enacts and materializes the conceptual blend that comes from both intuitive and counterintuitive domains (e.g. the lion man of the Hohlenstein Stade). The resulting conceptual blend may exist only as an objectified and situated structure used in relevant ritual occasions. In other words, pre-historical religious concepts that manifested a higher level of counterintuitiveness were not even present in human thought: the material structure could be enough to recall these concepts when needed in a ritual setting. Only later did they come into language use.

Excursus: Prayer beads vs. mechanical clicker

(a) *Mind is like a naughty child*

In what follows, I offer a brief case study illustrating the active role of material artifacts in ritual cognition.

A friend of mine, a committed devotee to *Gaudiya Vaishnavism,* was one of those devotees who was never willing to display his religious commitment publicly. Therefore, when chanting in public he always hid his prayer beads *(japa mālā)* in a bag to avoid the looks of passers-by. This changed at some point in his religious practice. Instead of using prayer beads, he benefited from a small technical device that was originally used for counting the number of target hits at a rifle range.

Later, I found there was considerable controversy around this change, however limited in impact and scope it had been. I asked myself: Can this mechanical device change the way Maha mantra chanting is traditionally done? No it cannot, as later developments showed. However, the momentary slip from routine opened a whole range of questions that are worth mentioning. These issues run on two levels.

On a micro level, there is the devotee, the device and the prayer: these features together constitute a temporal engagement of elements into a cognitive system that is nearly invisible because of its mundane, routine and intimate nature. On a macro level, the practice is situated in the broader institutional context of Maha mantra chanting, which has an important position within that religious tradition. There are also distinctive mechanisms, running on both these levels, that protect the practice from changes and distortions. I will start the discussion of these mechanisms with a short anecdotal excerpt that illustrates the importance and profound position of practice within a religious tradition:

> "Meditation can be quite a tricky practice because the mind is like a naughty child."
> "It is a tool [*mālā*] used to keep your mind on the meditation practice."
> "By its very nature, the mind tends to wander off during the meditation practice...."
> "If one's energy is low at the time of meditation, falling asleep can result. If the energy is too high, fantasy and distraction become the barriers. At such times, the mala provides the much needed anchor."
> (International Society for Krishna Consciousness - ISKCON, 2012)

> "Srila Prabhupada's program for chanting japa requires devotees to chant sixteen rounds over the course of the day. " (Charnell, 2012)
> "… making all necessary efforts to make it happen — such as giving one's chanting the first priority in the day" (Citraka Das 2012)

These, and many more short quotes on websites dedicated to the practice of private chanting show at least two important points: First, Maha mantra chanting is considered as a sort of meditation, and as such it needs a special and exact level of attention (cf. Barsalou et al. 2005: 45). The dictum "Mind is like a naughty child" (ISKCON, 2012), epitomizes the idea that our minds are easily distracted; by contrast, the practice of chanting needs the devotee to be focused, that is specifically attuned, with a mind furnished with right thoughts and at the same time detached from any possibly disturbing objects of thought.

Second, the practice of chanting was never considered to be easy. It was meant to be one of the devotee's duties of utmost importance and priority, to be started on early in the day. Devotees often wake up by 5 a.m. or earlier, long before the working day begins. In modern society, the right scheduling becomes even more urgent, since there are many calls on one's time that need to be met within specific time-frames.

(b) *Prayer beads versus mechanical clicker*

A brief analysis of both the surface and functional features of these objects suggests striking implications for a course of prayer. *Prayer beads* come in a form similar to a necklace holding 108 beads. While praying, each bead is briefly touched by devotee's thumb and forefinger as he proceeds towards the very last bead on the necklace, 'Krishna's bead', at the end of a cycle. Since there are only 108 prayer beads, the devotee has to remember the number of cycles to reach a final count of 1728 prayers (16 cycles of 108 mantras each). Prayer beads assist a cyclic yet continuous practice of chanting. They establish chanting as a solid and ongoing activity that discourages breaks and pauses, since it is nearly impossible to remember on which bead one actually stopped. Practically, one can make a break after each 108th mantra, but one still has to keep in mind where in the overall number of cycles one has paused.

In contrast, the *clicker* is a mechanical device. It has a display of four digits, each made out of a circular element with numbers running from 0 to 9. The clicker stores information on the overall number of prayers digitally; technically it can display any number from 0 to 9999. It embraces a linear conception of chanting, but allows the devotee to make as many stops as needed, since information about the actual prayer count is always visibly displayed. From this vantage point, it no longer makes sense to think of prayers as organized cycles of 108 mantras. With the clicker, each prayer is an individual action towards the final goal of 1728 prayers in a day. The devotee operates the clicker by pressing a small button on its side; some advanced models also allow decreasing the count. The clicker allows the devotee to spread his or her prayers throughout the whole day and to execute even a single mantra when time allows.

Prayer beads may be seen as a special-purpose cognitive device. Without being able to offer a valid cross-cultural comparison, I can state that similar artifacts are used in a variety of other religious traditions — for instance the Greek Orthodox church prayer rope *(komboskini)* and Islamic prayer beads *(misbaha)*. The lack of surface detail and the simplicity of their construction predisposes prayer beads to become a device onto which a variety of meanings can be mapped. For that reason, prayer beads function as a sort of material anchor. According to tradition, the number of beads refers to 108 Upanishads or Hindu deities — the interpretation seems to rest on convention passed on by exegetic tradition. From the perspective of a religious institution, prayer beads may work as an *embodied cultural model,* a stable material representation referring to a body of foundational scriptures. In contrast, for

a devotee prayer beads are most likely just *tangible items* onto which he maps specific information relating to his personal religious commitment or current preferences at the moment of prayer. As such, the device can serve as a *method of loci,* a mnemonic tool discussed earlier.

However, a more sober analysis suggests that prayer beads work as an *attention-mediating device* with a double function. First, as the devotee whispers each mantra (note that chanting is aloud, and as such it provides active sensing, constituting an important feedback loop), he "loads" another prayer bead in his fingers; and that reminds him to focus his attention on religious image he may have in mind. In this way he contemplates while whispering the words of the mantra, half vigilant, half distracted. The end of the mantra always reminds him to load yet another bead and start the whole sequence again from the beginning. Motor activity of fingers is vital here, because it brings yet another modal sense into play (Barsalou, 2008: 625-6), which helps sustain the right level of attention. Second, it is an anchor in time and place. A string of prayer beads is a device that helps to detach the devotee from surrounding stimuli. It helps to keep his mind here and now, while it mediates specifically religious mental images and types of thoughts that he learned to attribute to a material object. This is the double function of a surrogate situation: (a) It helps to detach our minds from a certain material situation and (b) by the same token to refocus it on a new target item of the religious domain. The right orchestration of different elements in time — oral chanting, motor activity of the fingers, meditation on the beads — and all possible but limited combinations coming from their enactment, make the prayer less cognitively demanding and at the same time more situationally stable than if the chanting were performed as an environmentally decoupled activity only.

In contrast, the clicker is a cognitive device by choice. It was never designed to serve in this ritual situation. In fact, it does not have any specific domain of application: it has been utilized by betting agents as well as sport-shooters. All the considerable benefits of a clicker rise and fall with its main purpose, which is counting. Devotees chose this device because it lowers the *cognitive load* caused by a computational component of a prayer task. It cannot do anything else; however this ability brought such an advantage that it overruled and left behind many other features originally supported by prayer beads. It seems that there is a certain beauty in simplicity. What the clicker does, it does extremely well. It is small, easily to use and portable. This seems to make the whole business of chanting much easier. The device allows devotees to chant wherever they want and as long as they want.

However, what seems like an advantage for an individual can be troubling for a religious tradition. The mechanical clicker does not involve any of the features that traditionally attach to prayer beads. There is no reference to mythology and tradition, no focus of attention, no continuity in chanting, etc. One may ask: Why did devotees use it? The answer is: Exactly because in this way devotees could fulfill their daily duties without much additional commitment. They could chant when commuting to their workplaces, during their office job, while doing housework or gardening. For this same reason it was soon banished by officials who rightly pointed out that this can lead to a decline and marginalization of the Maha mantra chanting ritual.

While prayer beads contribute to our ability to reconnect for the purpose of meditation with the non-existent target domain of religious items, they also help to withdraw us from our environmental context since they demand a relatively high level of attention and stipulate the continuity of meditation process. We can abstract that cognitive artifacts often operate on these two levels: (a) They empower or modify the cognitive aspects of action but at the same time also (b) embed the very action in more broader institutional framework and place the performance in the social world.

This second public face of cognitive artifacts reveals the social aspect of the meditative practice partly institutionalized by the use of object itself. In traditional settings, which can still be seen in contemporary India, Maha mantra chanting with

prayer beads is performed routinely in public. It seems to be an inseparable and constitutive behavioral trait that marks a certain social position. Thus it expresses social status and also ensures that the performing person will receive an appropriate tactful response from others. The expressive action of performance is followed by a confirmative response.

The importance of an object and in turn the threat posed by its substitution is greater, the more vital the object is for the smooth routinization of actions, in other words the more specific and constraining function it provides. Cognitive artifacts are exactly those types of material things that help to internalize sets of perceptive dispositions. From this reason, they set a very strong control mechanism that monitors the process of the action and also secures the action from modification or deterioration. In fact, the institution of a cognitive artifact in the center of an action stabilizes the action itself. Hence the cognitive functions of prayer beads constitute a very strong normative control mechanism of the overall Maha mantra chanting ritual. With an artifact's substitution, the meditation enters a phase of a normative uncertainty, and by the same token the religious tradition becomes vulnerable and insecure. From this point, we can clearly see why the substitution of a mechanical clicker for prayer beads was followed by such strong criticism from religious officials, and also from some of more faithful devotees.

The situation becomes clearer when we understand the mechanical clicker not just as any indifferent tool but as a specifically modern tool. Then, the fear of a possible *random change* in meditation practice becomes fear of its *redefinition* in a specifically modern way, and that seems even more dangerous. Modernity seems to display a specific cognitive style for organizing bodies of shared knowledge. Perhaps not accidentally, these cognitive patterns of modern institutions seems to shape functional features of a mechanical clicker. Peter Berger and his colleagues (1973: 31-2) discuss the following cognitive aspects of modernity: *mechanisticity*, *reproducibility* and *componentiality*. The first two aspects refer to organization of the workplace and knowledge directly tied to a professional career in industrial production. The last refers to a more general way reality is organized and experienced. These aspects are geared to the conduct of modern professions, primarily those that engage with bureaucratic apparatus or production tasks. However instrumental and rigid the classification may be, it resonates with the motives behind using the mechanical clicker. We may note again that devotees intimated that the clicker helped them fulfill their religious duties while commuting to work, being in the office or waiting. The mechanical clicker with its counting functions allowed them to incorporate their religious activity with other mundane tasks or to divide the activity into elementary pieces so it could be performed practically any time, though in an impoverished and marginalized form. Such a redefinition of this traditional activity is in stark contrast with the expectations of those who protect the purity of *Gaudiya Vaishnavic* religious practice.

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