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REVIEW ARTICLE

Toward an evolutionary psychology of religiosity

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Abstract

How can the evolution of religiosity be explained? To answer this question, we attempt to develop an understanding of the psychological domains underlying religious behaviour. We see four evolved domains, the sum and interaction of which constitute religiosity, namely: mysticism, ethics, myths and rituals. Even if the individual content, accents and implementations differ in each specific religion, they nevertheless derive from evolved Darwinian algorithms that are species-specific adaptations of homo sapiens.

Mysticism. Intuitive ontologies are the basis for mystical experiences. Usually they serve to classify reality into animate and inanimate objects, animals or plants, for example. For a variety of psychological reasons, supernatural experiences result from a mixture of different ontological categories.

Ethics. The basis for ethics lies in the social competency of human beings. Ethics is founded on the concept of social exchange ("social-contract algorithm") with its ideas about reciprocity, fairness, justice, cheater detection, in-group/out-group differentiation, etc.

Myths. The basis for myths is the "language instinct". We interpret myths as the verbal expression of the cognitive content of those individual modules that constitute the belief system. Above all, myths document the experience and processing of contingency and thus help social bonding.

Rituals. Rituals are based on the handicap principle. By making certain symbols and acts more expensive, they signal commitment for a reliable in-group morale.

In conclusion, we argue that human religiosity emerges from a cognitive interaction between these four domains. Religiosity processes contingencies and enhances co-operation through social bonding, norm setting and cheater detection. It fulfils those functions for which the mental modules of its four domains have evolved so that we feel it appears to be justified to attribute to religiosity the evolutionary status of an adaptation.

Introduction

Religiosity is part of the biological constitution of homo sapiens sapiens. Even if the age of human religiosity is not precisely known, its emergence is linked with the cultural explosion of the Upper Palaeolithic [1,2]. However, the question is still unclear of how this unique feature in natural history was able to evolve biologically. Why are people religious? How can a natural organism put questions about the supernatural? Why do living organisms invest so much time and energy in behaviours which do not directly serve maintenance or reproduction? What selective advantage does religiosity offer? Is it a biological adaptation or a functionless byproduct of other biological features? In the following, these questions are going to be pursued with the aid of the heuristics of evolutionary psychology [cf. 3 for more details].

Method

Evolutionary psychology (together with cognitive science, to which it repeatedly refers) assumes that the brain is an information-processing system. Signals from the outside and inside the brain are processed by means of a functional and morphologically structured network of numerous individual, more or less specialised subsystems, which Fodor [4] labelled "modules", while Pinker [5] called them "instincts" and Cosmides and Tooby [6] referred to them as "evolutionary algorithms". Each of these algorithms was shaped by natural selection and is genetically determined. Thus, these are species-specific adaptations, i.e. universals, which have developed and been optimised over the course of evolution.

For Darwin-inspired behavioural researchers, there are fundamentally two heuristic perspectives from which to study biological adaptations in human conduct. Either one starts from an adaptive problem and searches for psychological or ethological mechanisms which could have evolved in adaptation to this problem. Or, one seeks explanations for the evolution of human behaviours by reconstructing adaptive scenarios leading to the biological functionality of the behaviour in question [7]. Of these two proposed paths, this paper takes the second route and thus inquires what is the adaptive problem to which religiosity could be the evolved solution.

Religiosity is a human universal, which offers answers to contingency questions. Religiosity thus can be divided into two issues: namely the questions raised as a result of experience with contingencies, and secondly, the answer to these questions through the idea of transcendence [8].

ad 1. A cognitive dissonance between the understanding of oneself and of the world is experienced as a contingency. Contingency presupposes that humans no longer take reality for granted. Once humans have experienced surprising, non-routine and unexpected events, and once feelings of fear and of hope emerge and possibly the search for an anchor of the contingent event in the well known consistent world commences, this can signal religiosity.

ad 2. There are numerous possible answers to the questions raised by experiences of contingent events. Specific religious answers are characterised by two moments: First of all, by going beyond one's available and familiar world. After that, humans can only find security in what is inaccessible to them. This hereafter remains both invisible and unattainable at the same time. Therefore, in every religion, the unattainable institutions of the hereafter must be linked to relatively true-to-life, concrete and visible ideas and practices such as myths and rituals. This bond to empirically concrete things is what distinguishes religion from all forms of philosophy with which it has a lot in common otherwise.

Beyond this general definition of religiosity, religious behaviour can be viewed in a more differentiated way, because it is constituted from various, differently shaped and accentuated modes of behaviour. In accordance with the opinion held by most religious-scholars, every religion is characterised by four constituting elements (mysticism, myths, ethics and rituals). It therefore seems logical to analytically sub-divide the issue of the evolutionary history and the function of religiosity into four aspects and to begin by first examining each of these four components separately.

Results

1 Mysticism

1.1. THE RELIGIOUS PHENOMENON. Individual and collective experiences form the central role in every religious community. There is no religion which does not have a mystical tradition. Mysticism here is not to be understood as an edifice of teaching, but rather as a path of experience. The term is derived from the Greek "myein", i.e. to close one's eyes. The essence of mysticism is one's very own, internal experience with God. Externally, it is characterised by special modes of behaviour, such as adoration, meditation, silence or even dance, the goal of which is a special internal experience. It enables the pious to experience evidence, clarity, security and happiness, in ways that are frequently unexpected and unanticipated. Mystic contemplation is experienced in the form of visions, auditory experiences, ecstasy, or physical insensitivity or over-sensitivity.

When viewing the supernatural beings, there is often a mixture of knowledge about different types of entities in the real world. The frequently unclear external circumstances (e.g. twilight, sunset, but also the dark atmosphere of Romanesque cathedrals filled by one's imagination) overburden the capability of people to classify an event or an object clearly. Often these are contingency experiences, i.e. experiences, the classification of which demands too much of people. Due to the lack of clarity, it becomes likely to mix known categories, ontologies, and experiences with unsuitable ideas about the unknown.

This mixture is often observed in representations of gods in human form [9]. Hybrids of humans and animals and androgynous divine figures can be found, including their ability to undergo a metamorphosis. The oldest known symbolic representation is such a hybrid: the 33ky old Hohenstein-Stadel lion/man. Even multiple "organs" are found: two or three heads, the possession of three bodies, multiple arms or one hundred eyes. How can these representations and the experiences on which they are based be explained?

1.2. THE UNDERLYING ALGORITHM. Humans have intuitive ontologies [10]. They spontaneously classify their perceptions and experiences into existing categories. As the experiments of Keil [11] show, they do this even when important information allowing a safe categorisation is missing. Keil told his probands stories about imaginary beings which he called hyraxes or throtels and which were never described or defined in more detail. The only thing that was said about hyraxes was, for example, that they occasionally sleep. Or that throtels have to be tied up. Kindergarden children, who could never have seen either throtels or hyraxes, nevertheless tended to surmise, on the basis of the aforementioned information, that hyraxes can be hungry, for example, or that throtels might be made of metal. On the other hand, it was inconceivable to the children that a hyrax could be made of metal. Even though no theoretical knowledge whatsoever nor any other information existed, the children nevertheless communicated about hyraxes and throtels like they would about living organisms and artefacts. They thus ascribed a certain ontological status to these beings without having any further knowledge about them. In this connection, Gelman *et al*. [12] speak of an "essentialist bias".

The assumption of such traits and further descriptions are a consequence of the human disposition to produce precise ontological hypotheses, whenever this appears to be useful in a natural context. This includes, in particular, hypotheses regarding the causes of events that can not be understood otherwise, e.g. spectacular natural phenomena, personal catastrophes or feelings of happiness. Like other hypotheses, the majority of these assumptions can be corrected in light of better knowledge – but some of the hypotheses can not be corrected. This opens the door to "false" applications of natural ontologies, in which for example inanimate objects are compared with animated ones (animism) or natural forces are imputed human intentions (anthropomorphism) [13].

Once incomprehensible natural phenomena have experienced an anthropomorphic reconstruction, however, it is only logical to ascribe anthropomorphic behavioural and social theory to these supernatural entities. Although the gods may be unusual in certain ways, yet at the same time, they are the plane of projection of our intuitive psychology. They harbour intentions, experience desires and perceive emotions, and this precisely makes them mostly calculable despite a transcendental reverie [5, 10, 14]. If there were absolutely no correspondence between the supernatural beings and the intuitive knowledge of the world, humans would not be able to imagine the world of the supernatural.

1.3. THE EVOLUTIONARY BENEFIT. What biological benefit underlies the natural ontologies? It is very obvious, that these ontologies are not only significant with regard to the order and systematisation of the environment within the human mind, but they also have direct consequences for human conduct. Intuitive ontologies serve as a means of orientation in the realm of reality and help to provide quick and adequate reactions to the objects to which they refer. They thus serve the heuristics and the decision-making process of the individual facing adaptive problems in highly uncertain environments. If the perception is not unambiguous and intuitive ontologies undertake an erroneous classification, it is adaptive, however, to avoid possibly risky errors and instead to tolerate low-risk ones. This explains why inanimate objects are more likely to be seen as animate objects than vice-versa [13, 14].

Human rationality is not based on the capability to apply fixed rules, such as logic or probability theory to all possible problems without reference to the content. Instead, human rationality is understood to be the ability to select and apply simple and efficient inherent heuristics that are adequate for dealing with the specific problem [15]. Accordingly, human thinking is not adapted to probability theory or logic, but to the risks and opportunity structures of the environment. In this context, intuitive ontologies have their place.

2 Ethics

2.1. THE RELIGIOUS PHENOMENON. Every religion has a certain understanding of humans and their world, which is reflected in its social practice. This is why religion and morale are so closely linked to one another. In addition to rituals, moral conduct is the manifest expression of a religious attitude. Even if religions can differ considerably with regard to their justifications for morals, they nevertheless show amazingly strong large parallels in their content when issuing ethical instructions. This pronounced similarity in the basic ethical attitudes made possible a joint declaration to be presented to the Parliament of World Religions for the first time in the history in 1993. In the so-called "World Ethics Project", some 6,500 members of numerous religions elaborated the details of which moral values and basic moral convictions are common to all of the religions in the world despite their differences [16]. The so-called "golden rule" assumes a prominent position here. It is very obviously deeply rooted in all ethical traditions of mankind and is a normative precept in most religions. Of course, the "golden rule" very often remains limited to a clearly defined moral "in-group" [17, 18], which at the same time reinforces outward competitiveness.

2.2. THE UNDERLYING ALGORITHM. It is well known that reciprocal systems are not spontaneously stable. Reciprocity constantly runs the risk of being exploited, be it because opportunities for reciprocity are too rare for demographic reasons, or because some cheaters deliberately make an effort to take advantage of the benefits of the system for themselves, but do not bear the costs. In the same degree to which natural selection rewards co-operation, it wil automatically promote at the same time, the development of mechanisms offering the best possible protection against exploitation. This is why there is selective pressure with regard to the detection of fraudulent rule-breakers. In fact, Cosmides und Tooby [6], and Gigerenzer and Hug [19], were able to prove very impressively with the aid of the "Wason selections"-tasks, that our perceptive, recognition and thinking apparatus is very specifically designed to detect social cheaters. Human intelligence is primarily social intelligence, and therefore it is clearly easier for us to detect deviations from social rules as violations of the rules than logically similar deviations from rules that do not have any social component. In short: It is easier to expose cheaters than to think logically. The findings of Mealey *et al*. [20] and Oda [21], according to which we obviously remember the faces of persons of whom we believe that they have a cheating past better than the faces of presumably honest persons, corroborate these insights.

The basis of ethical universals are hence cognitive algorithms, such as the cheater detector mechanism, which evolved hand in hand with a developed co-operative lifestyle. The products of these social-contract algorithms are ideas and concepts, such as reciprocity, fairness, defection, justice, guilt, in-group/out-group differentiation, and other regulatory ideas of human morals, which have in common that they are based on cost/benefit representations of social relationships.

2.3. THE EVOLUTIONARY BENEFIT. The evolutionary benefit of morals originates, as a rule, from the gains from co-operation for all of the members of a moral community, frequently in competition with neighbouring moral in-groups. It should not be overlooked, of course, that morals, as an exploitative instrument, can also lead to an asymmetrical distribution of the pay-offs [18, 22].

3 Myths

3.1. THE RELIGIOUS PHENOMENON. Every religion has its myths. In some cultures, they are transmitted in writing, in others through pictures, and still others through oral traditions. Myths teach about occurrences that transcend space and time in an illustrative, reporting manner. In contrast to a rational and conceptual grasp of reality, myths have their own individual 'logic'. This inherent logic stems from the symbol of the absolute and hereafter as meant in the religious act, the symbol which is constructed of elements of reality. Myths are by-and-large a coherent system of experiences. This system is based on the fundamental ways in which the being and the real are generally perceived, classified and interpreted [23]. It therefore stands to reason that religious myths might be understood as verbal elaborations of religious experiences. However, as religious experiences exceed what is normal or unambiguous, myths are characterised by multilayered meanings. In this sense, myths stand for the typical human irritations due to the experience of the contingencies of chaos and ambiguity. Only myths open up these incomprehensible experiences and fill them with meaning. This process, which has cognitive and emotional aspects, is to be approached as the fundamental function of religion; in this sense, a core value for the religion can be attributed to myths [24].

As the world experienced by human beings is, however, ultimately similar everywhere, myths can be typified in accordance with certain horizons of experience, e.g. genesis myths (cosmogonic myths, creation myths), anthropological myths (creation of man, mortality, sacrifices, tribulations) or myths with a legitimising function for religious ceremonies and service to what is sacred [25].

3.2. THE UNDERLYING ALGORITHM. According to Pinker [26], language is not a cultural artefact, but a clearly defined part of the biological features of the human brain, which he refers to as "language instinct". But how do the contents of what is being communicated come about? According to Pinker [26], they are the product of complex interactions between universal human nature and the conditions under which humans live. Consequently, indications of mental concepts can be found in language. It suggests itself therefore, that this perspective can be transferred to myths. Instead of a structuralist connection of myths to elementary biological modes of behaviour [27] or to elementary developmental psychology experiences [28] from the perspective of a "language instinct", it would also be possible and necessary to examine myths for their cognitive foundations. A corresponding, systematic analysis has yet to be done, however. Such an analysis would have to cover the content comprised by the following mental modules assumed by Cosmides *et al*. [7]:

1. for risks: fear and caution;
2. for impurities: feelings of disgust and the intuition for the risks of contagion and illnesses;
3. for the awareness for current emotional states, such as happiness and sadness, the moods of contentment and restlessness;
4. a mental archive of status and rank as well as criteria for their evaluation;
5. kinship;
6. partnership, including sexual attraction and love, as well as faithfulness and separation.

An initial and unsecured examination makes it clear that, indeed, all of these elementary themes are of central importance in the religions and can be found on the ritual, ethical and mythological levels. To this extent, this approach could form a successful trace.

1. Risks, fear and caution: The significance of dealing with fear is already indicated in the definition of religion as a process for coping with contingencies. Religion absorbs fear and frustrations and simultaneously explains the inevitability of pain. The numerous attempts from the the philosopher Kierkegaard [29] to the biologist Dobzhansky [30] to explain religion as a consequence of imaging time and the knowledge of death have fear as their starting point. Of course, it should not be overlooked, that systems of belief, especially if they have an authoritarian structure, can also generate anxiety and fear.
2. Purity and impurity: Cleansing acts are one of the elementary acts of human life and co-existence. According to Douglas [31], impurities are to be understood as risks to social orders. As an anomaly that breaks social norms, the impurity symbolises the area which drops out of the complex of ordered relationships. It is no wonder, therefore, that ritual cleansing acts, such as baptism when joining a church, or the cleansing acts of the Hindus in the Ganges, are widespread in all religions.
3. Restlessness and happiness: One of the most frequently cited sayings of St. Augustine deals with restlessness: "My heart is restless until it rests in you". This is taken from St. Augustine's biography called Confessions. It is not only a description of a life, but can also be understood as a report from the internal topography of the human soul [32]. Restlessness and the search for happiness are typical for human conduct and thus are mirrored in all religions. Its external expression is found in the motif of the pilgrimage, which is also widespread in all of the great world religions.
4. Status and rank: The term "hierarchy" (from the Greek 'hier-arkhia', sacred rule) shows how firmly status and rank are anchored in religious thought.
5. Kinship: The elementary nature of this theme can be illustrated by the universally widespread religious prohibitions of incest.
6. Partnership: Once again, the importance of this theme is illustrated by the universal religious precepts related to marriage.

Our approach receives further confirmation from the idea discussed above according to which intuitive ontologies slip into religiosity. What is typical for the experience of the supernatural is that it infringes intuitive knowledge. This infringement should also be reflected in the myths of the world. The definitions of myths previously discussed show that this is the case. Accordingly, myths do not report a rational or comprehensible grasp of reality, but they describe precisely what goes beyond all recognition and understanding.

3.3. THE EVOLUTIONARY BENEFIT. In the evolution of primates, the social ability to live in larger social groups has turned out to be a very crucial survival factor. Human evolutionary history has followed this trend to larger and more complex social systems. After the early hominids had asserted themselves as the ecologically dominant species in their African habitat, their survival and their reproduction was mainly jeopardised by competing neighbouring groups. And the larger a group was, the bigger its benefit in the context of between group competition [33].

In order to be able to take advantage of the benefit of larger communities, the development of a social bonding mechanism was necessary, of course. Grooming – the social glue of monkeys and apes – became increasingly unsuitable, due to the necessary time involved, and was therefore replaced. In its stead, we have language [34]. Language binds because it fulfils an eminently important biological function: The exchange of social knowledge about one's fellows – without personal observation, if need be. Nonhuman primates are incapable of this. Although they can regulate their dyadic social relationships by means of grooming, yet they run into efficiency limits, which humans have overcome through the evolution of language. Even without personal contacts, we know about the features and traits of our fellow humans, their reliability, their honesty and even their fraudulent tendencies, their suitability as partners in co-operation and mating, their courage and their drive, their social dominance and willingness to help – in fact, about their social tendencies and character traits in general. Sure, one also occasionally blindly accepts false rumours and slander as being true. But occasional erroneous information is the price which does not outweigh the benefit, which we get by being able to acquire social knowledge faster and more efficiently than our ape ancestors.

If myths document the experience and processing of contingencies, then they serve the same purpose as language: By allowing every member of the group to share in the experiences of another, myths help to cope with what appears to be impossible to master. This way, a bond is created, a sense of community, and thus a social identity. Myths serve the yearnings of humans for wanting to belong to an in-group and to distinguish themselves from the out-groups.

4 Rituals

4.1. THE RELIGIOUS PHENOMENON. Essentially, religious rituals are not solely characterised by repetitions, but by the fact that routines receive a sense of meaning in addition to a sense of purpose [35]. In this way, a certain act or object is symbolically charged up. Rituals only rarely serve an utilitarian purposes, but instead are integrated into other communication structures.

Despite all of the differences between cults, rites can be recognised, that presumably can be found in all religions. It is noticeable that they are closely co-ordinated with biological processes or turning points. Thiel [36] has systemised them as follows:

- Apotropaic rites dispel imminent evil and evil spirits
- Through elimination rites, communities attempt to isolate something evil from themselves, i.e. by transferring their sins to a scapegoat, for example.
- Cleansing rites
- "Rites de passage" accompany a change of place, state, social position or age.

4.2. THE UNDERLYING ALGORITHM. Rituals serve to make certain symbols and acts more expensive, in order to establish reliability between the sender of the signal and its recipient. They are subject to the functional logic of the handicap principle [37] and signal moral commitment [38].

A visit to a village that is squalid as can be, makes us aware of how expensive religious rituals are. As a rule, the church, or the temple, respectively, is the largest building in the village, even though it is only used for a few hours a week. Nevertheless, years or even decades of sacrifice were often necessary, to erect this building. However, the costs of religious rituals lie not only in the financial sector. Almost every sermon and almost every meditation targets the individual believers. It is not merely about putting money into the offertory box, but about sacrificing one's own life. Initiation rituals, in particular, which can frequently be found in rituals of so-called high-religions only in a stylised form, illustrate the costs of being accepted by a religious community: Acceptance involves not only the time which is invested, but also the anxiety and the handling of pain, such as that evoked by circumcision.

Because rituals guarantee the reliability of in-group morals and signal commitment, it can be assumed that the more expensive a religion's rituals are, i.e. the more time, resources or vitality they consume, the more efficiently they help to build up intra-group solidarity. And vice-versa, it is to be expected that the more important co-operation is for the survival and welfare of a group, the more expensive this group's rituals will become [38].

4.3.THE EVOLUTIONARY BENEFIT. Religious rituals coincide with language as they communicate a group code and thus establish conventions. They do not merely contain the symbolic representation of a social contract, but at the same time, they are also its implementation and excecution. Thus, they give conventions expression and acceptance. Accordingly, the ritual is the fundamental social act. Rappaport [39] assumes, that language and the social orders based on language would not have arisen without the support of what is regarded sacred. Since lies and alternative meanings are inherent in language, it cannot establish reliability – as rituals do.

If there are any binding words within a society at all, then it is also necessary to establish such words. "The Word is established by the invariance of liturgy. It may be suggested, furthermore, that it emerged phylogenetically as some expressions drawn from the burgeoning language of earlier hominids were absorbed into, and subordinated to, the invariance of already existing nonverbal rituals which seem to be common in the animal world" [40]. Because those who practice rituals accept high costs, their spoken word has a corresponding importance [41]. Due to the fact that a ritual is visibly expensive, it achieves its own authenticity – therefore it can not cheat, as a matter of principle.

Discussion

In our view, religiosity is characterised by four domains, which have each passed through their own selection history (Table 1). Mysticism is based on intuitive ontologies and serves to cope with contingencies and decision-making in a highly uncertain environment. Ethics increases social competency and enables gains from co-operation. Myths serve to promote social identity in a world that differentiates in-groups from out-groups. Finally, rituals implement hard-to-fake signals to establish reliable moral standards within the group. Thus religiosity represents a biologically functional phenomenon. What remains to be explained of course, is how from an originally domain-specific psychology such a complex system of behaviour as religiosity could arise. Together with Mithen [1,2] we assume that in the evolutionary history of homo sapiens sapiens, for reasons which await further exploration, a cognitive network of originally separate domains emerged. The consequence was an increasingly cognitive fluidity, which finally led to what has been called the "symbolic revolution" – religiosity being part of it.

The interlinkage of the four domains of religiosity has produced numerous and diverse possibilities for interaction. Myths can reproduce the ontologies of the belief system, or carry ethical convictions. Rituals can evoke mystical experiences, and they can in turn draw on ethics in their content. Thus, evolutionarily novel potentials were created, which eventually constitute religiosity. To be sure, this line of argumentation does not address the question of whether God exists or not. However, it attempts to outline a possible research per-

Table 1: Overview of the four constituting domains of religiosity and their evolutionary functions

	Mysticism	Ethics	Myths	Ritual
Adaptation	Intuitive ontologies	Social competency	Language instinct	Handicap principle
Function	Processing of contingencies through categorisation and decision making	Gains from co-operation are possible	Social identity and bonding in the service of an in-group /out-group differentiation	Cheater detection in view of the free-rider problem

spective for what may become a Darwinian theory of human religiosity (Table 1).

With the emergence of religiosity from its four domains, there has no doubt been an increase in complexity of human behaviour, but there has not been any transformation of function. Religiosity *in toto* continues to fulfil those four functions, for which the evolutionary algorithms of the four domains evolved. It processes experiences of contingency and enhances cooperation through social bonding, norm setting and cheater detection. It is our perception that there is no additional function, so that it appears to us be justified, in contrast to Kirkpatrick [14], Mithen [2], Pinker [5] and other authors, to attribute the evolutionary status of an adaptation to religiosity, and not the status of an exaptation, a spandrel or a functionless by-product.

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