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# **The computations underlying religious conversion: a Bayesian decision model**

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## **Abstract**

Inspired by recent Bayesian interpretations about the psychology underlying religion, the paper introduces a theory proposing that religious conversion is shaped by three factors: (i) novel relevant information, experienced in perceptual or in social form (e.g., following interaction with missionaries); (ii) changes in the utility (e.g., expressed in an opportunity to raise in social rank) associated with accepting a new religious creed; and (iii) prior beliefs, favouring religious faiths that, although new, still remain consistent with entrenched cultural views (resulting in the phenomenon of syncretism). From the theory, a multifactorial picture of conversion emerges. Based on which factor is primarily engaged in each case, a classification of different types of conversion can be derived, with a remarkable fit with empirical literature. The theory offers a description of the processes underlying religious conversion and, highlighting the links among apparently incompatible previous views, it reconciles these views within a unifying framework.

**Keywords:** religious conversion; religious reasoning; Bayesian; mysticism; utility; syncretism

## 1. Introduction

For the scientific study of religion, conversion is a central research topic. This can be defined as a shift from a belief system (either religious or not) to a different one with religious content (Rambo & Farhadian, 2014). To some degree, people's beliefs change continuously. Yet, this change can be interpreted as conversion only sometimes, namely when change is substantial or "qualitative" (though what counts as substantial change remains contentious) (Rambo, 1993). A multiplicity of theories has emerged to explain conversion (some of these theories will be examined below) (Rambo, 1993; 1999; Rambo & Bauman, 2012; Rambo & Farhadian, 2014; Richardson, 1985; Snook et al., 2019). Furthermore, many scholars have argued that conversion can be driven by diverse processes, and hence propose to distinguish different types of conversion (some of these taxonomies will be examined below) (Halama, 2015; Kilbourne & Richardson, 1989; Lofland & Skonovd, 1981). To date, no theory or taxonomy has prevailed, and the current research on conversion is often described as a fruitful co-existence of different approaches (Rambo & Bauman, 2012; Snook et al., 2019).

This paper aims at contributing to this debate by proposing a novel perspective on religious conversion which is inspired by Bayesian principles. A highly influential idea in psychology and neuroscience argues that a variety of cognitive processes can be ultimately interpreted as an expression of Bayesian processes (Clark 2013; Knill & Richards, 1995; Oaksford & Chater, 2007). By interpreting phenomena as diverse as perception (Kersten et al., 2004; Knill & Richards, 1995), memory (Hemmer & Steyvers, 2009; Turner et al., 2013), decision-making (Botvinick & Toussaint, 2012; Friston et al. 2015), and social cognition (Gershman & Cikara, 2020; Schröder et al., 2016) adopting the same conceptual framework, Bayesian theories strive to develop a unifying picture of how the mind works in its multiple manifestations. On this basis, applying Bayesian principles to interpret the psychological processes underlying religion appears as a promising endeavour, which can potentially embed these processes in the context of more basic psychological mechanisms. Building on previous work introducing a Bayesian approach to study the psychology of religion (Andersen, 2019; Schjoedt et al., 2013; Taves & Asprem, 2017; Van Elk et al., 2016), a recent proposal has interpreted religious reasoning as an expression of Bayesian decision processes (Rigoli, 2021). Here, we build on this latter proposal to explore the nature

of religion conversion. The next session will overview the model proposed by Rigoli (2021). This will be followed by a section analysing how different factors within the model shape conversion. Finally, the theory will be discussed in the context of previous accounts of conversion.

## **2. The model**

Our theory of conversion is based on a recent Bayesian model developed to explain religious reasoning (for a formal description, see Rigoli (2021)), namely the process through which individuals form their religious beliefs. The model can be considered a synthesis of two influential approaches to the study of religion, namely predictive coding (implementing Bayesian inference) (Andersen, 2019; Schjoedt et al., 2013; Taves & Asprem, 2017; Van Elk et al., 2016) and rational choice (Iannaccone, 1998; Stark & Finke, 2000). The model does so by relying on a formalism called Bayesian decision theory (Bishop, 2006), hence it is referred to as Bayesian Decision Model of Religion (BDMR). The BDMR focuses on the mechanisms through which individuals arbitrate between alternative hypotheses for explaining aspects of life and reality. For example, one hypothesis might claim that an illness expresses God's punishment for recent misbehaviour (a religious hypothesis), and the alternative hypothesis that an illness is due to a frequent interaction with an infected patient (a non-religious hypothesis). According to the BDMR, three factors are critical to establish which of these hypotheses will be endorsed. The first factor is represented by prior beliefs, namely relevant knowledge already available before reasoning. Prior beliefs can capture a variety of aspects such as general beliefs about the world or society, expectations learnt from experience, and tendencies to interpret events in specific ways which have been shaped by evolution. For example, one prior belief might be that God often intervenes in people's life to guide their behaviour, and the alternative view that God is usually uninterested in mundane affairs. Someone entertaining the former prior belief will be more likely to accept the hypothesis that the illness reflects God's punishment.

According to the BDMR, the second critical factor for religious reasoning is represented by novel available evidence. For example, one might have a dream about God blaming the person, and this might

be interpreted as evidence supporting the hypothesis that the illness reflects God's punishment. Evidence might also be conveyed by social sources: for example, a family member might express an opinion which might be relied upon when arbitrating between the alternative hypotheses.

The third critical factor for religious reasoning proposed by the BDMR is represented by the utility (in terms of reward or punishment) expected if any hypothesis is accepted or rejected. In our example, an individual would assess the utility expected to occur (i) if the religious hypothesis is true and is accepted (and time is spent praying; assuming that praying can win God's help for healing), (ii) if the non-religious hypothesis is true and is accepted (and time is not spent praying; assuming that praying is time-consuming and hence costly), (iii) if the religious hypothesis is false but is accepted (and time is spent praying) (iv) if the non-religious hypothesis is false but is accepted (and time is not spent praying). To understand the influence of expected utility, compare two different individuals both arbitrating between the two hypotheses in the example above. A first individual might not be frightened at all by the illness. Such indifference would imply a large cost if the religious hypothesis is accepted (and time is spent praying for receiving God's help to heal) but the hypothesis turns out to be false (and hence praying turns out to be useless). On the contrary, a second individual might be extremely frightened by the illness. For this person, a large cost occurs if the religious hypothesis is rejected (and God is not prayed for receiving help to heal) but the hypothesis turns out to be true (and hence God's favour is not won). According to the BDMR, these evaluation processes are critical because the first individual will be more likely to accept the non-religious hypothesis, while the second individual will be more likely to accept the religious hypothesis. Note that the definition of utility proposed by the model is very flexible, encompassing multiple forms of values such as fostering community bonds, promoting own group's power, supporting moral rules, etc.

Altogether, according to the BDMR religious reasoning is based on integrating information from prior beliefs, novel evidence, and expected utility. The result of this process is the selection of one hypothesis. Note that, because of the influence of expected utility, a hypothesis might be selected because it is the costliest to reject even though it is not the best supported by evidence and prior beliefs. However, prior beliefs and novel evidence remains fundamental, and a hypothesis will be less likely to be accepted if

it is poorly supported by them. In other words, the BDMR conceives religious reasoning as the result of integrating both accuracy (afforded by prior beliefs and novel evidence) and instrumental (afforded by expected utility) factors.

As an example of how in the BDMR accuracy and instrumental factors interact to shape religious beliefs, consider someone aspiring to become emperor of the Holy Roman Empire who is arbitrating between the hypothesis “God wants me to become emperor” versus “God is not interested in who will become emperor”. If only accuracy aspects were relevant, the person would ponder the different evidence in favour or against each hypothesis (e.g., considering whether the pope supports him and whether he has been successful in battles), and select the most plausible hypothesis thereof. Conversely, if only utility was at play, the person would simply endorse the hypothesis which is the most convenient for him, in this example the one claiming that God has chosen him. The BDMR posits that both accuracy and instrumental factors are critical: the person will base his judgement both on evidence (e.g., assessing whether the pope supports him and whether he has succeeded in battles) and on utility (as manifested in a bias toward believing that he is God’s favourite).

What is the phenomenological implication of accepting one hypothesis over the other? The BDMR proposes that the implication is that, phenomenologically, an individual will believe that the accepted hypothesis is true even if, as explained above, it does not necessarily enjoy more support from evidence. In other words, the BDMR postulates that agents are blind to the reasoning process described above; they simply perceive the accepted hypothesis as true, without being aware that their perception is affected by utility considerations. In other words, the model assumes a form of motivated reasoning (Kunda, 1990; Willer, 2009) or self-deception during belief formation. Why should self-deception occur? Following Trivers (2011), in an evolutionary perspective beliefs can be understood as having a fundamental pragmatic nature in as much as they enable one to achieve goals. To be effective, beliefs would need to satisfy three fundamental requisites. First, at least to some degree, they would need to be grounded upon reality, an aspect the BDMR captures by attributing importance to evidence and prior beliefs (if these are ignored, goals will not be obtained). Second, they would need to take utility into account, also in line with the BDMR. Third, because humans are primarily social animals, beliefs will

need to persuade others. Only if this occurs, beliefs will ultimately be effective. In this perspective, self-deception during reasoning might have evolved as an effective strategy to persuade others (a possibility which has received empirical support; Smith et al., 2017; Schwardmann & Van der Weele, 2019). This perspective (combining accuracy with utility masked by self-deception) fits also with the argument that misbeliefs (i.e., beliefs poorly grounded upon reality) are sometimes adaptive, explaining why they are so common among humans (McKay & Dennett, 2009).

The BDMR integrates two influential research streams investigating religious beliefs: predictive coding models (Andersen, 2019; Schjoedt et al., 2013; Taves & Asprem, 2017; Van Elk et al., 2016) and rational choice models (Iannaccone, 1998; Stark & Finke, 2000). The former stresses the key role of Bayesian inference (where prior beliefs are integrated with novel evidence) in shaping religious beliefs, while the latter advocates a pivotal role for utility. The BDMR shows that these two approaches are not in competition, but can be integrated within a unifying framework. Moreover, the BDMR extends rational choice models by clarifying the psychological mechanisms underlying the role of utility: it proposes that these mechanisms are largely unconscious and give rise to motivated reasoning.

In short, the BDMR assumes that prior beliefs, novel evidence and expected utility all concur to religious reasoning. This implicates that religious reasoning is conceived as integrating accuracy (afforded by prior beliefs and novel evidence) and instrumental (afforded by expected utility) drives. The next session will explore how this framework can be applied to explain religious conversion.

### **3. Religious conversion**

Adopting the BDMR as framework, we propose to cast alternative religious views (e.g., Christianity versus Buddhism) as different hypotheses to be considered during religious reasoning. In this context, conversion would occur when one view (e.g., Christianity) is initially selected but, after occurrence of events affecting the model's representations (see below), is next rejected in favour of the alternative view (e.g., Buddhism). In other words, this perspective interprets conversion as stemming from religious reasoning, occurring when a shift from one hypothesis to another takes place. As described

above, the three key elements of the BDMR are novel evidence, utility, and prior beliefs. Below, we will explore the role of each in the context of conversion.

### **3.1 Novel evidence**

Within the BDMR, acquisition of novel evidence can potentially lead to a hypothesis shift, for example a shift from Christianity to Buddhism, or from atheism to Islam. The model distinguishes between two broad types of novel evidence: direct (namely experienced with the own senses) and social (consisting in reports from other people). Let us first consider direct evidence. With this regard, a variety of events can be interpreted by some people as signs that a specific religious hypothesis is true. As an example, consider the roman emperor Constantine who allegedly converted to Christianity after winning a critical battle near the Milvian bridge in Rome (note that there is ongoing debate among historians about Constantine's religious beliefs, especially about whether, and to what extent, his affiliation to Christianity was deceptive or genuine; Lenski et al., 2012; Potter, 2012). This victory was interpreted by the emperor as a sign of the validity of the Christian faith. Examining this example in the context of the BDMR, we can speculate that Constantine assigned high probability to victory in battle (a specific event) conditional to Christianity being true (one religious hypothesis), and low probability to victory in battle conditional to paganism being true (an alternative hypothesis). Before the battle was fought, Constantine embraced paganism. However, fighting and winning the battle resulted in a re-assessment whereby paganism was now rejected in favour of Christianity. In this example, a single event appears as sufficient to produce conversion. However, usually it is more plausible that a sequence of events (plus other factors described below) is required before conversion occurs (Hood et al., 2003; Zinnbauer & Pergament, 1998) (modern historians apply such cumulative interpretation also to the case of the emperor Constantine; Potter, 2012). Within the BDMR, this process can be described by a progressive increase in the posterior value of a new religious hypothesis (e.g., Christianity) over an old hypothesis (e.g., paganism) up to a point where the posterior value of the new hypothesis becomes the largest, a point corresponding to conversion (see Rigoli, 2021).

Although any direct evidence can be relevant for religious reasoning, mystical events are often particularly salient (James, 1902; Lofland & Skonovd, 1981). These can encompass a variety of exteroceptive or interoceptive experience. Exteroceptive experience can involve hearing voices or seeing appearances. A common example is when someone feels a presence despite no clear sign of it (some have proposed that the human brain is predisposed to perceive agents in the environment (Barett, 2000; Guthrie, 1993; Van Leeuwen & Van Elk, 2019). Interoceptive experience can involve ecstasy, extreme emotions or relaxation, dreams, and states of altered consciousness. Mystical events are particularly influential upon religious reasoning because they are often interpreted as manifestations of a specific religious hypothesis (Van Leeuwen & Van Elk, 2019). Hence, these events are particularly powerful in promoting conversion. Although repeated mystical experiences might often be necessary for conversion to occur, in general a smaller number of mystical events might be sufficient in comparison with other types of direct evidence (Lofland & Skonovd, 1981). A classic example of a sudden and steady conversion elicited by mystical experience is the case of St. Paul, who embraced Christianity after allegedly speaking with Jesus on his way to Damascus (Lofland & Skonovd, 1981).

The BDMR proposes that social, in addition to direct, evidence is also critical for religious reasoning, and hence for conversion. This captures the fact that religious beliefs are shaped by the people and the media (e.g., books, TV, internet) one is exposed to. A person will be generally attracted by the religious hypotheses embraced by these social sources. Moreover, the BDMR proposes that different social sources are imbued with varying degrees of relevance, meaning that each will exert a specific level of impact. For example, opinions expressed by someone high in the social hierarchy might influence religious reasoning more than opinions expressed by someone low in the social hierarchy. Within this framework, the BDMR predicts that conversion will be fostered by changes in social evidence, occurring when relevant social sources change their opinions or when new social sources substitute old ones. An example of relevant social sources changing their opinion is represented by religious conversion of leaders, which fosters conversion among members in the wider community. This phenomenon has been described in a variety of historical and geographical contexts and was well known to Christian missionaries who often concentrated their effort in converting leaders rather than common

people (Laven, 2011). Regarding change in social sources, this often occurs in societies undergoing rapid transformation. For example, this occurs when missionaries of a new religion appear, when the social hierarchy changes (e.g., when priests lose their social status), when the institutions are conquered by foreign rulers, or when people migrate.

Within the BDMR, direct and social evidence can result either from a passive approach or from active information seeking (Kilbourne & Richardson, 1989). A passive approach is encouraged when one hypothesis is largely preferred over the others (formally, when its posterior value is by far the largest), while information seeking is promoted when alternative hypotheses have similar appeal (formally, when their posterior value is similar). A passive approach is adopted by someone who is not interested in collecting new information, and yet, once exposed to such information (in the form of direct or social evidence), has to take it into account and revise religious hypotheses accordingly (possibly resulting in conversion). This is the condition often attributed to prophets in the Abrahamic tradition, being prophets initially uninterested in divine revelation but, once exposed to it, changing their religious outlook accordingly (Blenkinsopp, 1995). When alternative hypotheses have similar appeal (formally, when their posterior value is similar), the BDMR proposes that this results in information seeking and thus in active gathering of novel evidence. Many scholars have pointed to instances where people are initially sceptical about a religious faith and yet, in search for meaning in their life, seek exposure to its community and rituals or to its books and media (Balch, 1980; Kilbourne & Richardson, 1989; Lofland & Skonovd, 1981; Straus, 1979). Such exposure fosters experience of novel evidence which, most of the time, will promote the religious faith. Eventually, this exposure might lead to conversion to the religious faith. Both direct and social evidence might be gathered because of active information seeking. Regarding direct evidence, this might consist in exposure to religious buildings and artefacts (e.g., the first Russian princess who converted to Orthodox Christianity allegedly did so after witnessing the magnificence of the church of Hagia Sophia in Constantinople (Hoerder, 2020)), or to activities such as prayers and rituals. Regarding social evidence fostered by information seeking, this might be conveyed directly by interacting with believers and priests, or indirectly via media such as TV, journals, and books.

In summary, the BDMR offers an explanation of why novel experiences (in the form of direct or social evidence) influence religious reasoning up to a point when conversion ensues. Crucially, for a novel piece of evidence to foster conversion, an individual must have already the belief that such evidence is highly probable given one religious hypothesis, and scarcely probable given alternative hypotheses. In other words, for conversion to take place, beliefs about the implications (in terms of evidence) of religious hypotheses need to be well established. This implies that conversion cannot occur without some knowledge of religious hypotheses and their implications. Conversions where, after a miraculous event, one suddenly shifts to a previously unknown faith are unconceivable within the BDMR (and they are also doubted by empirical research (Stark and Finke, 2000)). To illustrate this, consider St. Paul, an example that at first glance might seem to contradict this point. Despite initially being a fierce opposer of Christianity, St. Paul converted to this faith after allegedly speaking with Jesus. Even though in St. Paul's mind Christianity was unlikely to be true a priori (being he opposed to this position at the start), arguably St. Paul still believed that if he happened to speak with Jesus (supposedly dead), then Christianity must be true. Thus, occurrence of the event (i.e., speaking with Jesus) was interpreted by St. Paul as indisputable evidence of Christianity being true, leading to a sudden conversion. As this example shows, in the BDMR conversion requires to believe that some piece of evidence (e.g., speaking with Jesus) is highly likely given one hypothesis (Christianity), even if this hypothesis is considered to be unlikely a priori.

### **3.2 Utility**

Within the BDMR, utility plays a fundamental role, so much so that religious beliefs are ultimately the result of utility maximization. Does the utility component play any role in conversion? The BDMR proposes that changes in the utility expected for accepting/rejecting the different religious hypotheses will foster conversion. We propose two broad factors responsible for change in utility, one social and the other personal. Regarding the social domain, social conditions might change in a way that the utility expected for accepting/rejecting the different religious hypotheses also changes. For example, this would apply to regimes suddenly becoming more intolerant toward disfavoured religions, such as when

in 1492 the king Ferdinand expelled Jews from Spain unless they converted to Christianity (Gerber, 1994). In these circumstances, the BDMR predicts that adherents to disfavoured religions will be tempted to convert to favoured faiths (in the case of Jews expelled from Spain, while many leaved the country or pretended conversion, some sincerely shifted to Christianity (Gerber, 1994)). Another case where social factors lead to changes in utility, thus fostering conversion, is when an individual is exposed to a new religion which offers advantages compared to a previously-established faith. For example, this might have applied to Indians of low cast when exposed to Buddhism or Islam (Gajrani, 2004), to slaves and women in the Roman empire when exposed to Christianity (Hyde, 2008), and to German kings eager to expropriate church land and oppose the Holy Roman Emperor Charles the V when exposed to Lutheranism (Hillerbrand, 1968).

Besides social factors, personal factors can also elicit change in utility, thus fostering conversion. These involve personal events unrelated with social processes. For example, contraction of a serious illness might enhance a person's fear of death. In turn, this might increase the perceived cost of rejecting religion in favour of atheism (e.g., expressed in the thought that, if God exists but I endorse atheism and I do not pray for God's mercy, I will be damned after death) up to a point when the person converts to religion and abandons atheism. More generally, personal events impacting on mood and emotion might lead to restructuring the utility associated with rejecting/accepting different religious views, so much so that conversion might ensue. This notion is supported by empirical observations showing that, in a variety of contexts, conversion is often preceded by emotional crisis (Heirich, 1977; Rambo, 1993; Ullman, 1989).

In sum, the BDMR proposes that social and personal factors can restructure the expected utility associated with rejecting/accepting the different religious hypotheses, and that such restructuring might contribute to conversion. Changes in utility can occur at different speed, resulting in conversions characterised by different durations. Notably, events affecting expected utility (e.g., change in social structure or contraction of an illness) might not be directly related with religion (hence, in the context of the BDMR, they do not represent any direct or social evidence relevant for religious hypotheses).

Yet, through their impact upon utility, these events are proposed to indirectly affect religious reasoning, and therefore to be influential for conversion.

### **3.3 Prior beliefs**

Prior beliefs, capturing broad views about the world or society, are one last element of the BDMR. Do they play any role in conversion? We suggest that they explain a frequent phenomenon characterising conversion, namely syncretism (Leopold & Jensen, 2016). This occurs when a newly embraced religion does not correspond precisely to the creed professed by official religious authorities, but it integrates previous religious and cultural elements. Syncretism is common when an individual or community converts to a religion which is not yet well established in a region (Leopold & Jensen, 2016). Among the many examples of syncretism identified by historians, we can mention the cults developed after Alexander the Great's conquest of the middle east (Potter, 2003), the Christian faiths among indigenous people emerged after Columbus' voyages to America (Camara, 1988), and the faiths integrating Islam with indigenous religions in Indonesia (Geerts, 1971; Woodward, 2010). Arguably, syncretism is virtually ubiquitous every time a new religion sets foot in a community, because entrenched cultural assumptions will be translated to the new religion in some form or another (Peel, 1968). Within the BDMR, prior beliefs capture such entrenched cultural assumptions. Remember that, within the BDMR, the selected religious hypothesis derives from integrating utility, novel evidence and prior beliefs. Hence, even if novel evidence and changes in utility push someone towards a new religion, prior beliefs will ensure that a version of the new religion will be embraced where entrenched cultural assumptions are preserved.

In short, according to the BDMR, while novel evidence and change in utility are potential sources of religious change and, in so doing, foster conversion, prior beliefs can be interpreted as conservative elements, ensuring that fundamental prior cultural assumptions are preserved.

#### 4. Discussion

The paper offers a novel perspective proposing that conversion is the result of religious reasoning, and that the latter is driven by a Bayesian decision process (Rigoli, 2021). Novel relevant evidence (in the form of direct or social information) or changes in the expected utility (associated with rejecting/accepting the different religious hypotheses) are proposed to be at the root of conversion, with prior beliefs favouring religious faiths that, although new, still remain consistent with wide entrenched cultural views. Here we discuss our theory in the context of previous accounts of conversion. Because this literature is overwhelmingly vast (Rambo, 1993; 1999; Rambo & Bauman, 2012; Rambo & Farhadian, 2014; Richardson, 1985; Snook et al., 2019), the focus will be on accounts more relevant for the BDMR.

In comparison with most theories emphasising a single path to conversion (Rambo, 1993; 1999; Rambo & Bauman, 2012; Rambo & Farhadian, 2014; Richardson, 1985; Snook et al., 2019), the BDMR proposes a multifactorial picture where different types of novel evidence (direct or social), changes in utility, and prior beliefs all shape conversion. Based on the specific role played by each factor, different paths to conversion can be identified by the BDMR. This connects the BDMR to taxonomic models of conversion (Halama, 2015; Kilbourne & Richardson, 1989; Lofland & Skonovd, 1981). Taxonomic perspectives stress that conversion is not a unitary phenomenon, but that different categories of conversion can be recognised (theories differ regarding the number and definition of the different types). Based on the prevailing factor at play, a taxonomy of conversion can be derived also from the BDMR (fig. 1) (note that not all manifestations of conversions are covered by this taxonomy, because cases where multiple factors have equal weight in conversion fall outside the taxonomy). Categories derived from this approach are: (i) everyday-direct-evidence (where conversion is primarily driven by non-mystical experiences such as when participating in prayers and rituals), (ii) mystical-direct-evidence (where conversion is primarily driven by mystical experiences), (iii) interpersonal-social-evidence (where conversion is primarily driven by interactions with social actors such as believers and priests), (iii) mediatic-social-evidence (where conversion is primarily driven by books, TV shows and other media), (iv) social-utility (where conversion is primarily driven by utility changes in the social domain),

(v) personal-utility (where conversion is primarily driven by utility changes in the personal domain). Although conversion for each category can virtually unfold at either slow or fast pace, arguably some categories (everyday-direct-evidence and mediatic-social-evidence) are in fact associated only with slow pace, given that the processes involved are slow by their very nature (everyday and mediatic evidence is normally not very dramatic, hence cumulative experience is necessary for conversion to occur when these are involved). This taxonomy has analogies with the one proposed by Lofland and Skonovd (1981) which includes intellectual, mystical, experimental, affectional, revivalist, and coercive conversion. Their notion of intellectual, mystical, and experimental conversion map to our mediatic-social-evidence, mystical-direct-evidence, and everyday-direct-evidence conversion, respectively. Their revivalist conversion can be considered a special case of our interpersonal-social-evidence conversion: while the former encompasses only mass gatherings characteristic of religious revival, the latter encompasses also other cases of social interaction such as those occurring in small groups. Lofland and Skonovd's (1981) affectional and coercive categories (the former promoted by seeking social bonds and the latter inculcated by coercion from social powers) can be considered special cases of our social-utility conversion. Finally, our personal-utility conversion is unrelated with any category proposed by Lofland and Skonovd (1981). Altogether, the differences between the two taxonomic systems are minor, so much so that the BDMR can be regarded as a systematic description of the principles underlying the classes initially proposed by Lofland and Skonovd (1981) on an empirical basis.

Early models of conversion emphasise the passive role of individuals, the mystical experience, and the abruptness of conversion (Coe, 1916; James, 1902; Starbuck, 1987). More recent models have argued in favour of the exact opposite, namely in favour of active information seeking, of the role of everyday religious experience such as prayers and rituals, and in favour of a slow, cumulative nature of conversion (Lofland & Stark, 1965; Rambo, 1993; 1999; Richardson, 1985). The BDMR views both older or more recent models as special cases; this is because some forms of conversion postulated by the BDMR (especially sudden mystical-direct-evidence conversion) fit with earlier models, while other forms of conversion ensuing from the BDMR (especially everyday-direct-evidence conversion) are consistent with later models.

One of the most influential models of conversion is the so-called world-saver model (Kox et al., 1991; Lofland & Stark, 1965; Snow & Phillips, 1980). This maintains that, when a person is seeking meaning in her life, if bonds with adherents to a new faith outstrip bonds with adherents to a previous faith, the person will convert to the new faith. The world-saver model can be viewed as a special case of the BDMR, and precisely as an instance of social-utility conversion. The strength of social bonds can be interpreted as an aspect of utility. If bonds with adherents to a new faith increase, the utility expected by accepting the new faith will increase accordingly, hence fostering conversion.

The idea that considerations about utility are involved in conversion is not new, as some have previously argued that individuals often weight costs and benefits associated with embracing a new religion (Gartrell & Shannon, 1985; Gooren, 2007; Stark & Finke, 2000). The BDMR builds on this notion and integrates utility in a broader framework where prior beliefs and novel evidence also play a role. In other words, according to the BDMR considerations about utility are important, but they are not exclusive in shaping conversion. For example, mystical experiences, religious writings, and preacher's speeches are often pivotal in fostering conversion, and yet they do not have any impact upon utility (the BDMR cast these as novel evidence).

To summarise, building on previous theories of religious conversion, the BDMR offers a systematic description of the fundamental principles that might underly conversion. The advantage of this approach is twofold. First, the processes at play can be described clearly and formally. Second, by clarifying these processes, the links among apparently different theories can be highlighted, hence allowing the model to integrate multiple perspectives under a unifying framework.

## References

- Andersen, M. (2019). Predictive coding in agency detection. *Religion, Brain & Behavior*, 9(1), 65-84.
- Balch, R. W. (1980). Looking behind the scenes in a religious cult: Implications for the study of conversion. *Sociological Analysis*, 41(2), 137-143.
- Barrett, J. L. (2000). Exploring the natural foundations of religion. *Trends in cognitive sciences*, 4(1), 29-34.
- Bishop, C. M. (2006). *Pattern recognition and machine learning*. springer.

- Blenkinsopp, J. (1995). *Sage, priest, prophet: Religious and intellectual leadership in ancient Israel*. Westminster John Knox Press.
- Botvinick, M., & Toussaint, M. (2012). Planning as inference. *Trends in cognitive sciences*, 16(10), 485-488.
- Camara, E. M. (1988). Afro-American religious syncretism in Brazil and the United States: a Weberian perspective. *SA. Sociological analysis*, 299-318.
- Clark, A. (2013). Whatever next? Predictive brains, situated agents, and the future of cognitive science. *Behavioral and brain sciences*, 36(3), 181-204.
- Coe, G. A. (1916). *The psychology of religion*. University of Chicago Press.
- Friston, K., Rigoli, F., Ognibene, D., Mathys, C., Fitzgerald, T., & Pezzulo, G. (2015). Active inference and epistemic value. *Cognitive neuroscience*, 6(4), 187-214.
- Gartrell, C. D., & Shannon, Z. K. (1985). Contacts, cognitions, and conversion: A rational choice approach. *Review of Religious Research*, 32-48.
- Geertz, C. (1971). *Islam observed: Religious development in Morocco and Indonesia* (Vol. 37). University of Chicago press.
- Gerber, J. S. (1994). *Jews of Spain: A History of the Sephardic Experience*. Simon and Schuster.
- Gershman, S. J., & Cikara, M. (2020). Social-structure learning. *Current Directions in Psychological Science*, 29(5), 460-466.
- Gooren, H. (2007). Reassessing conventional approaches to conversion: Toward a new synthesis. *Journal for the Scientific study of Religion*, 46(3), 337-353.
- Guthrie, S. E. (1993). *Faces in the clouds: A new theory of religion*. Oxford University Press on Demand.
- Halama, P. (2015). Empirical approach to typology of religious conversion. *Pastoral Psychology*, 64(2), 185-194.
- Hemmer, P., & Steyvers, M. (2009). A Bayesian account of reconstructive memory. *Topics in Cognitive Science*, 1(1), 189-202.
- Heirich, M. (1977). Change of heart: A test of some widely held theories about religious conversion. *American Journal of Sociology*, 83(3), 653-680.
- Hillerbrand, H. J. (Ed.). (1968). *The protestant reformation*. Springer.
- Hyde, W. W. (2008). *Paganism to Christianity in the Roman empire*. Wipf and Stock Publishers.
- Hoerder, D. (2020). Introductory Essay: Migration—Travel—Commerce—Cultural Transfer. The Complex Connections Byzantium-Kiev-Novgorod-Varangian Lands, 6–14th Century. In *Migration Histories of the Medieval Afroeurasian Transition Zone* (pp. 50-78). Brill.
- Hood Jr, R. W., Hill, P. C., & Spilka, B. (2003). *The psychology of religion: An empirical approach*. Guilford Publications.
- Iannaccone, L. R. (1998). Introduction to the Economics of Religion. *Journal of economic literature*, 36(3), 1465-1495.
- James, W. (1902). *The varieties of religious experience* (Vol. 15). Harvard University Press.

- Kersten, D., Mamassian, P., & Yuille, A. (2004). Object perception as Bayesian inference. *Annu. Rev. Psychol.*, 55, 271-304.
- Kilbourne, B., & Richardson, J. T. (1989). Paradigm conflict, types of conversion, and conversion theories. *Sociological Analysis*, 50(1), 1-21.
- Knill, D. C., & Richards, W. (Eds.). (1996). *Perception as Bayesian inference*. Cambridge University Press.
- Kox, W., Meeus, W., & Hart, H. T. (1991). Religious conversion of adolescents: Testing the Lofland and Stark model of religious conversion. *Sociological Analysis*, 52(3), 227-240.
- Kunda, Z. (1990). The case for motivated reasoning. *Psychological bulletin*, 108(3), 480.
- Laven, M. (2011). *Mission to China: Matteo Ricci and the Jesuit encounter with the east*. Faber & Faber.
- Leopold, A. M., & Jensen, J. S. (2016). *Syncretism in religion: a reader*. Routledge.
- Lenski, N. E. (Eds.). (2012). *The Cambridge companion to the age of Constantine*. Cambridge University Press.
- Lofland, J., & Skonovd, N. (1981). Conversion motifs. *Journal for the scientific study of religion*, 373-385.
- Lofland, J., & Stark, R. (1965). Becoming a world-saver: A theory of conversion to a deviant perspective. *American sociological review*, 862-875.
- McKay, R. T., & Dennett, D. C. (2009). The evolution of misbelief. *Behavioral and Brain Sciences*, 32(6), 493-510.
- Oaksford, M., & Chater, N. (2007). *Bayesian rationality: The probabilistic approach to human reasoning*. Oxford University Press.
- Peel, J. D. (1968). Syncretism and religious change. *Comparative studies in society and history*, 10(2), 121-141.
- Potter, D. (2003). Hellenistic religion. *A Companion to the Hellenistic World*, 407-430.
- Potter, D. (2012). *Constantine the emperor*. Oxford University Press.
- Rambo, L. R. (1993). *Understanding religious conversion*. Yale University Press.
- Rambo, L. R. (1999). Theories of conversion: Understanding and interpreting religious change. *Social Compass*, 46(3), 259-271.
- Rambo, L. R., & Bauman, S. C. (2012). Psychology of conversion and spiritual transformation. *Pastoral Psychology*, 61(5-6), 879-894.
- Rambo, L. R., & Farhadian, C. E. (Eds) (2014). *Oxford Handbook of Religious Conversion*. Oxford handbook
- Richardson, J. T. (1985). The active vs. passive convert: Paradigm conflict in conversion/recruitment research. *Journal for the Scientific Study of religion*, 163-179.
- Rigoli, F. (2021). A computational perspective on faith: religious reasoning and Bayesian decision. *Religion, Brain & Behavior*, 1-18.
- Schjoedt, U., Sørensen, J., Nielbo, K. L., Xygalatas, D., Mitkidis, P., & Bulbulia, J. (2013). Cognitive resource depletion in religious interactions. *Religion, Brain & Behavior*, 3(1), 39-55.

- Schröder, T., Hoey, J., & Rogers, K. B. (2016). Modeling dynamic identities and uncertainty in social interactions: Bayesian affect control theory. *American Sociological Review*, 81(4), 828-855.
- Schwardmann, P., & Van der Weele, J. (2019). Deception and self-deception. *Nature human behaviour*, 3(10), 1055-1061.
- Smith, M. K., Trivers, R., & von Hippel, W. (2017). Self-deception facilitates interpersonal persuasion. *Journal of Economic Psychology*, 63, 93-101.
- Snook, D. W., Williams, M. J., & Horgan, J. G. (2019). Issues in the sociology and psychology of religious conversion. *Pastoral Psychology*, 68(2), 223-240.
- Snow, D. A., & Phillips, C. L. (1980). The Lofland-Stark conversion model: A critical reassessment. *Social problems*, 27(4), 430-447.
- Starbuck, E. D. (1897). A study of conversion. *The American Journal of Psychology*, 8(2), 268-308.
- Stark, R., & Finke, R. (2000). *Acts of faith: Explaining the human side of religion*. Univ of California Press.
- Straus, R. A. (1979). Religious conversion as a personal and collective accomplishment. *Sociological analysis*, 40(2), 158-165.
- Ullman, C. (1989). *The transformed self: The psychology of religious conversion*. Springer Science & Business Media.
- Taves, A., & Asprem, E. (2017). Experience as event: event cognition and the study of (religious) experiences. *Religion, Brain & Behavior*, 7(1), 43-62.
- Trivers, R. (2011). *The folly of fools* New York. NY: *Basic Books*.
- Turner, B. M., Dennis, S., & Van Zandt, T. (2013). Likelihood-free Bayesian analysis of memory models. *Psychological review*, 120(3), 667.
- van Elk, M., Friston, K., & Bekkering, H. (2016). The experience of coincidence: An integrated psychological and neurocognitive perspective. In *The challenge of chance* (pp. 171-185). Springer, Cham
- Van Leeuwen, N., & van Elk, M. (2019). Seeking the supernatural: The interactive religious experience model. *Religion, Brain & Behavior*, 9(3), 221-251.
- Willer, R. (2009). No atheists in foxholes: Motivated reasoning and religious belief. *Social and psychological bases of ideology and system justification*, 241-264.
- Woodward, M. (2010). *Java, Indonesia and Islam* (Vol. 3). Springer Science & Business Media.
- Zinnbauer, B. J., & Pargament, K. I. (1998). Spiritual conversion: A study of religious change among college students. *Journal for the scientific study of religion*, 161-180.

**Figure 1**

Description of the categories of conversion identified by the BDMR. These categories are: everyday-direct-evidence, mystical-direct-evidence, interpersonal-social-evidence, mediatic-social-evidence, social-utility, and personal-utility. For categories marked with an asterisk, conversion can unfold at either slow or fast pace. For categories with no asterisk, conversion is predicted to unfold always at slow pace.

