

Process of Believing as Fundamental Brain Function: the Concept of Credition

Glaubensprozesse als fundamentale Hirnfunktion: das Creditionen-Konzept

Hans-Ferdinand Angel & Rüdiger J. Seitz

Abstract

Despite the long scientific discourse in Western theology and philosophy on religion, spirituality and faith, definitions of what a belief is are still virtually lacking. As events and objects in the complex outside world are transformed into probabilistic estimates with personal attributes of meaning and value by involvement of the prefrontal cortex, we argue that these probabilistic estimates represent personal beliefs. We present a model for the processes of believing - termed creditions - that is suited to describe the putative components and mental operations underlying secular and non-secular belief formation.

Keywords

Belief systems, cognition, emotion, valuation, credition, religion, religious experience, prefrontal cortex, temporal lobe, pre-supplementary motor area

Kurzzusammenfassung

Trotz eines langen Diskurses in Theologie, (Religions-)Philosophie und auch (Neuro-)Psychologie fehlen allgemein anerkannte und konsensfähige Definitionen, die das gesamte Spektrum des Glaubensbegriffes abdecken. Da Ereignisse und Objekte in der komplexen Welt unter Beteiligung des Präfrontalkortex als probabilistische Repräsentationen mit persönlicher Bedeutung und Bewertung abgebildet werden, schlagen wir vor, dass diese probabilistischen Repräsentationen persönliche Glaubensinhalte darstellen. Unser Modell der Glaubensprozesse – sogenannter Creditionen – ist geeignet, die Komponenten und mentalen Vorgänge der säkularen und nicht-säkularen Glaubensbildung zu beschreiben.

Schlüsselwörter

Glaubenssysteme, Kognition, Emotion, Bewertung, Credition, Religion, religiöse Erfahrung, präfrontaler Cortex, Temporallappen, präsupplementärmotorischer Cortex

1. Introduction

In the European history of philosophy of mind one can detect different approaches attempting to understand the human mental activity underlying what is called “belief”. It is impossible to retrace all variants of this development but they exert until today a strong influence on the Western concepts to understanding “belief”. Some predominant directions shall be named here:

- Concepts of “belief” are vividly discussed in Christian theology (Smith 1987, Barth 1957, Rahner 2004, Schulz 2001). In the German speaking discussion a position which interpretes theology even as “Glaubenswissenschaft” [“knowledge of belief”] has been promoted (Seckler 1988).
- This fact may influence the implicit but nevertheless widespread idea that all kinds of belief are tightly associated with religion. Moreover, in anthropology “religion” often is understood as by-product of evolution (Boyer 2003) which may lead to the idea that “belief” due to its relation to religion is also an evolutionary by-product. To emphasize the non-religious character of convictions the term “belief system” is being used.
- Since the great Greek philosophers Plato and Aristotle raised the question of the epistemic status of “belief” the question of how belief is related to knowledge and rationality is one of the main topics in Western philosophy (Plantinga & Wolterstorff 1983, Swinburne 1983, Helm 1999, Dirscherl & Dohmen 2008).
- In psychology religious phenomena, and especially religious beliefs, seem to be understood as result of deviant developments and subordinated under pathological labels, such as neuroticism (Hills et al 2004).
- In neuropsychiatry the issue of trying to understand what a belief is (especially in its religious variants) has been discussed within the frameworks of abnormal mental states as well as brain lesions. For example, delusions have been defined as false beliefs which obviously pertain to a different reality (Coltheart 2007, Devinsky 2009, Coltheart 2010, Langdon & Coltheart 2000, Connors & Halligan 2015). A number of clinico-pathological reports described religious experience in relation to epilepsy and stroke affecting the (right) temporal lobe, thereby, supporting the notion that religious experience results from brain pathology (Johnstone et al. 2009).
- In psychology of religion one can observe an increasing interest in the role of belief and unbelief for religious and atheist orientations (Scobie 1994, Schnell & Keenan 2013) and the relation of religion to spirituality and health (Pargament 1997, Koenig & Cohen 2002, Kohls 2007). This brings into discussion the relation of “belief” and distress as well as “belief” and placebo effects (Meissner et al. 2011).
- Cognitive neuroscience implicitly brought up the notion that belief is a component of normal mental activity when attempting to explore the neural correlates of religious experience (Saver & Rabin 1999, Azari et al. 2001).
- Similar research was interested to understand spirituality in a more holistic manner (Newberg et al. 2001). Unfortunately, some of these findings were interpreted in a misleading way pretending to explain religious phenomena as theological matters which prompted the notion of “neurotheology” (D’Aquili & Newberg 1999, Newberg et al 2001, Joseph 2002). Not unexpectedly, these interpretations provoked heavy reactions

and strict contradictions from the theological and philosophical perspectives (Linke 2003, Neuner 2003, Geyer 2004).

This short overview shows that “belief” seems to be an ill-defined phenomenon with quite different considerations in the different disciplines of the sciences and humanities. Furthermore, it becomes evident that there is a notable lack of a coherent understanding of what believing means.

Currently, the scientific situation suffers from two different issues:

- First, there is a tremendous lack of empirical effort to understand belief, which sometimes even is addressed as “neglect of belief” (Connors & Halligan 2015).
- Second, there seems to be a virtually complete absence of theoretical attempts to understand and to conceptualize “normal” belief.

In an attempt to address this deplorable situation we first have to realize that most concepts treat “belief” as a noun. This, however, neglects the procedural aspect of “believing” as a human ability, in general, and as a potential mental act of an individual. Nevertheless, an increasing interest in understanding the poorly understood and neglected human ability “belief” can be observed in the contemporary public as well as in scientific discourse. Departing from the extensive debates on the role of faith, belief, transcendence and spirituality, recently an interdisciplinary research initiative has begun to characterize the features of the psychophysical processes underlying believing. In this contribution we present the concept of credition which was the topic of a recent series of international, interdisciplinary symposia (<http://credition.unigraz.at/de/credition-basic-research/>). Out of these symposia the hypothesis was developed that human beliefs are based on distinct psycho-

physiological processes that are implemented in the human brain. These processes of believing have been termed creditions which is a neologism to indicate their mental properties similarly to but separate from cognition and emotion (Angel 2013a). The notion of credition emphasizes the procedural aspect of belief as “process of believing” similarly to other psychological processes. In this contribution we will explain that the process of believing is different from religion and discuss neuropsychological concepts that are suited to provide an empirical psychophysical basis for the processes of believing.

2. Bridging the gap

At present two different starting points for overcoming the theoretical lack of what believing means can be identified. First, cognitive neuroscience and related disciplines show a new openness for understanding “religious phenomena” including “believing” as human abilities and activities that can be approached empirically (Connors & Halligan 2015). Second, attempts have been made to formulate a theoretical frame for “normal” believing which neither reflects a pathological brain state nor is strictly bound to religions.

Both approaches are instrumental to develop an innovative concept of normal human believing and to understand brain functions underlying believing. Of course, at the current state these initial attempts demand interdisciplinary research to work out the theoretical implications of both approaches as well as the implicit assumptions inherent in this bridging endeavour (Runehov 2007).

2.1 Empirical attempts open for religious experiences

When talking about “believing” we understand that our topic refers to the psychological process that is brought about by the human brain. However, when it comes to the noun “belief”, there is no acceptable definition what this actually is and what, in comparison, a tentative taxonomy of a false belief or delusion is (Bell & Halligan 2012). Due to a long history of Western thinking beliefs are often understood as closely related to religion. That may mislead to an understanding of believing solely as a religion-related process, although in the last decades social science stressed the comprehensive role of belief systems which may include religions. Following William James (James 1885, 1902), the matter of religion typically has been described as “religious experience”. However, the adjective “religious” is an adjective which can be related to two different nouns. Without empirical evidence the most widespread association is the noun “religion”. The other nouns which are related to “religious” are “religiosity” or “religiousness”. Theoretically, “religious experience” encompasses three dimensions: (a) religion, (b) religiosity, and (c) the (individual or collective) relation between religion and religiosity (Angel 2013b, Seitz & Angel 2014). Typically, “belief” is conceived to be predominantly related to “religion”. For the individual person a tripartite model of religion has been proposed which comprises the elements myth (cognition), ritual (perception and action), and experience of transcendence (emotion) (Schnell 2003). Accordingly, religion is a broad term encompassing beyond the transcendental faith of individuals in supernatural deities or a God also the mandatory ritual behaviour of worship and contemplation, as well as the identity providing belief in a myth about the community or society. In contrast, “religiosity” has been considered to reflect the belief of individuals. For this very reason, it

was considered as irrelevant for the exploration by the natural sciences (Stich 1996). Recently, however, it has been argued that there is an “implicit religiosity” (Schnell 2012). Implicit religiosity suggests the theoretical existence of a non-religious or non-religion-related religiosity which most likely corresponds to a secular belief system. Furthermore, religiosity or religiousness, were hypothesized to employ two different types of cognitive processing: an implicit/intuitive and an abstract/rational mode (Watts 2007). Such a view concurs with the notion and the accumulating empirical evidence that religion can be conceptualized as a by-product or process of normal human cognition (Boyer 2003, Kapogiannis et al. 2009).

First evidence that religious experience has a neurophysiological representation in the human brain was provided by Azari and collaborators (2001). These authors performed a functional imaging experiment in which they asked self-identified Christian subjects to recite Psalm 23. In a categorical comparison to resting wakefulness significant activation of a frontal-parietal circuit was found (Figure 1). Specifically, the activations involved the dorsolateral prefrontal cortex, the dorsomedial frontal cortex including the pre-supplementary motor area (pre-SMA), and the medial parietal cortex. Moreover, a multivariate network analysis revealed the differential engagement of neural networks participating in cognition as well as in emotion (Azari et al. 2005). These findings were substantiated by similar observations related to self-referential processing in religious Christians as compared to Chinese non-religious people (Han et al. 2008).

A large number of imaging studies indicate that these brain areas play a profound role in sustaining on-line reflexive evaluation of thought (Niendam et al. 2012). Therefore, these findings provided neuro-scientific support for the notion

that religious beliefs involve both cognitive thoughts and emotional loadings. Thus, it was

suggested that what makes an experience distinctly religious as opposed to nonreligious are cognitive factors.

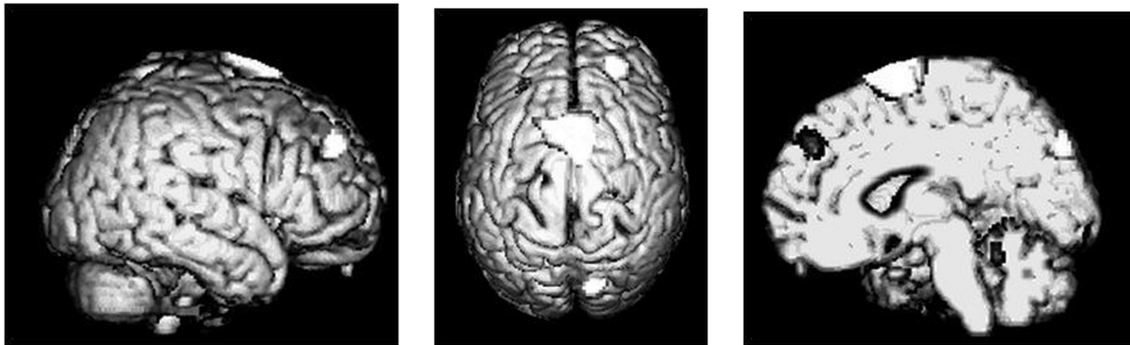


Figure 1: Activations during recital of psalm 23 in a group of Christian volunteers. Note the activation of the dorsolateral prefrontal cortex, pre-SMA, and precuneus (white areas all images) and anterior prefrontal cortex and superior cerebellum (black areas in right image). Shown are a lateral (left), dorsal (middle) and midsagittal (right) view of a standard reference human brain (from Azari et al. 2001)

2.2 Theoretical foundation of “normal” believing: the Model of Credition

We propose that to describe normal believing processes there is a need for a process-theoretical foundation (Angel 2015b). Furthermore, we propose that normal believing is inextricably interrelated with cognition and emotion (Angel 2015a).

The process character of believing includes a number of different mental operations that are heavily involved in the perception of events or objects in the outer world and in control of behavior. The believing process, or credition, accommodates at least three different aspects:

[1] the believing process consists of a bundle of four conceptually successive, but nevertheless in reality heavily interwoven mental functions,

[2] the believing process operates on basic units which are called “bab”,

[3] for a “bab” four characteristics can be named.

2.2.1 Mental functions in the believing process

Credition has been conceived as a psychological term denoting the mental activity related to what we call “he/she believes” encompassing both religious and secular processes of believing. Figure 2 depicts the key functions that have been hypothesized to constitute the formation of creditions. Central to the model is the so-called enclosure function which denotes the self-organizing probabilistic assembly of mental attributes of a given object or event a subject is encountering into a coherent mental construct. Note, that the coherent knowledge constructs

comprehend formal descriptions of the perceived encounters that can be expressed in terms of objective metrics as well as personal values associated with them. The personal values reflect the meaning and relevance the object or event has for the given individual (Seitz & Angel 2014). Importantly, people employ these mental constructs for selecting an action which appears most appropriate for the subject in a given situation. We will see later that the decision to select a certain action involves action planning as well as prediction of the possible reward as well as the costs of arriving at a given

goal. In other word, perception is converted by the so-called converter function into an intended action which is part of and directed within an entire space of action. This cybernetic model of credition assumes that the mental operations are mediated by a presumed operator in the human brain and can be stabilized by repetitions similarly to a learning process. Attitudes, hormonal states, pharmaceutical agents and physical threatening that act on the entire individual can severely influence or modulate these mental operations.

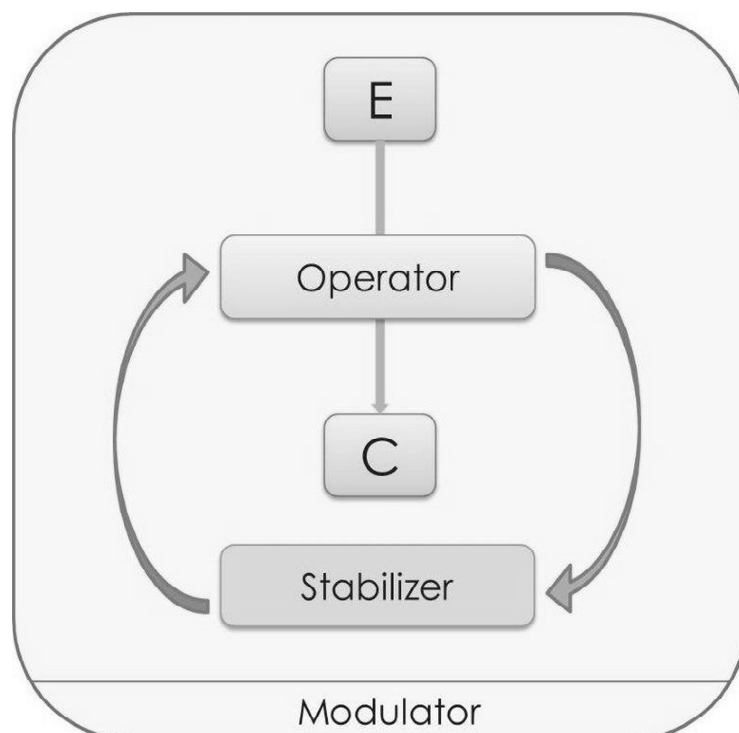


Figure 2: The credition model describing the process of believing. The Enclosure function (E) defines the representation of the stimulus and the Converter function (C) provides the appropriate action in response to the stimulus. Creditions are modulated by the internal state of the individual (© HF Angel; conference presentation 2012, for the first time published here).

2.2.2 Bab as basic unit of the believing process

It has to be stated explicitly that the theoretical model of creditions emphasizes the process character of believing and by this the fluidity of beliefs. However, the theoretical status of the model and its theoretical foundation still cannot be explained in total. Therefore, some of the aspects which are referred to in the following passages may remain partly vague. Specifically, one of the most crucial questions is how to define the basic unit of the believing process. It is important that such a unit accommodates two basic claims:

First, it has to provide a theoretical frame which accounts for the fluidity of the believing process and which allows to integrate different scientific descriptions (physical, biological, neural, behavioural, and so on). Second, it has to provide the possibility to integrate cognitive and emotional processes under a common label. For such a new umbrella-term we propose as basic unit the term “bab”. The name “bab” was derived from the well-known Russian toy “Babushka” which in some regions might be known as “Matryoshka” to indicate the similarity and comprehensiveness of their components.

Having declared “bab” as basic unit we can describe different characteristics which we assign to a single “bab” and we can formulate that in a believing process “babs” do not “exist” as single “monades” but as composite “bab-configurations”. Specifically, “babs” include physical attributes such as colour and form and personal attributes such as subjective meaning and relevance. In fact, “babs” represent pieces of knowledge with emotional loadings which are assembled into coherent knowledge constructs, the so-called stabilized “bab-configurations”.

2.2.3 Characteristics of a bab

Owing to the mental function of attribution we postulate four different characteristics of a “bab”:

- The propositional content: a “bab” can be described as a proposition as for example: “I see something red” or “I feel something sharp”. The proposition becomes explicit by statements such as: “I see this ball to be red” or “I feel this knife to be sharp”.
- The emotional moment: For example, a red light may be perceived as beautiful, warm or attractive, whilst a sharp item may be unpleasant, harmful and, thus, frightening. Note, that the term “bab” comprises the subliminal emotional moment in addition to the propositional content. When this information is expressed verbally, the “bab” will reach explicit awareness both in the speaking and the listening subject.
- The sense of mightiness: The perspective of a subject on a “bab” is not limited to the valence of an emotion but also includes the intensity of the emotion which is reflected by the “sense of mightiness”. Thus, this scaling of an emotion as strong or weak is inherent in the proposition of a “bab”.
- The sense of certainty: this characteristic reflects the conviction of an individual that a “bab” reflects the property of an object or event. The same proposition of a bab can have a high degree of certainty while for others it is uncertain. For instance, “I see something red” or “I see something sharp” has a high degree of certainty in daylight but a low degree of certainty in faint light.

The probabilistic assignment of attributes to an object or event constitutes a believing process. Due to the Converter function, the actual “bab-configuration” determines the concrete action an individual is intending to generate. As many stimuli do not reach our consciousness, we have to accommodate also the subliminal aspect (Teske 2007) in the credition model. For a bab which remains subconsciously the artificial term

“blob” was introduced. In this case we should speak of a “bab-blob-configuration” rather than of a “bab-configuration”. We suggest that effects of placebo or nocebo (Myers et al 1987, Benedetti et al 2006, Jensen et al 2012) are prominent examples for accounting for such a believing process.

3. Human brain function underlying believing

The processes of believing are understood to occur in religious and secular contexts (Angel 2013a). Note, that the concept of “creditions” is not limited to “religion” but extends to “religiosity” in the domain of the individual. Beyond this immediate implication, the notion of creditions has opened a novel perspective on the role of belief systems as it highlights the process character of believing in general. Quite different from religion, creditions are bare of ritual behaviour and do not require myths. Moreover, owing to the processes character, belief systems can be conceived as differentially specified mental functions that are implemented in the human brain. This provides the springboard that belief systems or creditions can be shared, discussed and even reinforced in interpersonal intercourse and even in public (Runehov & Angel 2013).

3.1 Believing and the meaning-making process of the self

Humans are exposed to a constantly changing complex physical, social and cultural environment. From moment to moment information is being processed in terms of sensory quality and intensity by the modality specific sensory brain areas. This bottom-up process might be interpreted within a framework of the “self” – a concept which was vigorously brought up in philosophical reflections since the time of Illumina-

tion (Thiel 2014). Moreover it can be understood as expression of a multi-layered notion of the human “self” (Sugiura 2011, Sugiura 2013) leads to probabilistic internal representations of the physical, social and cultural environment. Notably, there is a highly interwoven interaction of explorative movement generation and object perception (Roland & Mortensen 1987, Jeanerod 1995, Binkofski et al. 2001). These fuzzy representations typically constitute personal knowledge that can be object of investigation and potential verification. However, the mental representations of a person may not be accessible for scientific exploration and are, thus, not provable. Then, they constitute personal beliefs as can be found with high prevalence in societies (Pechey & Halligan 2012). Importantly, the sensory information about objects and events in the complex outside world which humans are exposed to is immediately also evaluated in terms of personal meaning and relevance (Seitz & Angel 2014). The integration of the formal cognitive perspective about the outer world with the subjective emotional perspective about the inner world involves the assembly of many bits of information in the so-called Enclosure function of creditions (see above). Moreover, the valuation process involves the focussing of attention to the incoming information in a bottom-up fashion and forms our probabilistic accounts or beliefs about the event observed in the outside world (Wiese et al. 2014). The comparison with previously acquired knowledge during infancy and growing up allows for the top-down attribution of the personal affective loading to the new information using categories such as aversiveness, dangerousness, pleasantness or utility as well as novelty, certainty and mightiness (Figure 3). Note, that these mental processes cannot be reduced just to the functioning brain but are integral to and brought about by the action of the brain within the human body (Fuchs & Schlimme 2009).

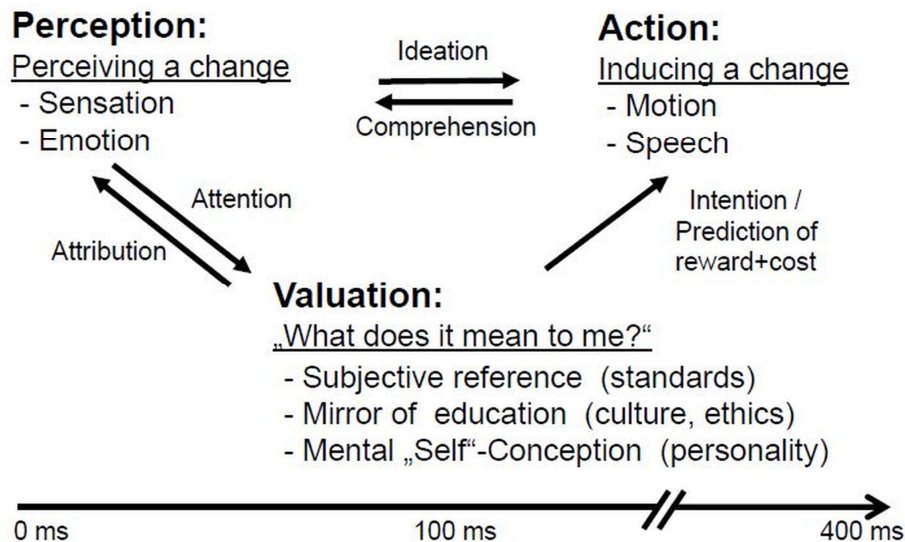


Figure 3: Mental operations affording the rapid flow of information in the perception-action-valuation model (© Seitz, adapted from Seitz et al. 2009).

The mental processes of object perception and evaluation are fast taking place within less than 30 ms and, thus, do not necessarily lead to conscious awareness (Bar et al. 2006, Smith 2011, van Gaal et al. 2012). Particularly in social interactions that typically span over seconds to minutes, the perceived events are set into a formal cognitive as well as subjective emotional perspective (Bird and Viding 2014). Critical for this top-down valuation process which involves a widespread cortico-subcortical network is the participation of the medial frontal cortex (Seitz et al 2009). New insights in empathic processing in the human brain and a new understanding of the role of the mirror neuron system (Keysers & Gazzola 2010, Bird & Viding 2014) are suited to bring onto the floor both the possibility and the need to optimize our emotional interactions which are only partly based on contents and propositions. Moreover, functional imaging has

shown that processing of emotions and cognitions is partly overlapping in the lateral prefrontal cortex (Gray et al. 2002, Prochnow et al. 2014). Repetitive experience of the same objects or events in the environment has a stabilizing function of the cognitive-emotional representations such as familiarity promotes learning and has been shown to increase the trustworthiness of the information (Chang et al. 2010, Henkel & Mattson 2011). These findings support the notion that believing represents normal brain function.

3.2 Believing and the Perception-Action-Value Triad

The probabilistic mental representations or beliefs can be used by the individual in a prospective fashion to generate and initiate subsequent actions and to make predictions about the possible reward and costs of performing them and, above that, how to optimize behaviour (Friston

2010). Again, the motor responses to a stimulus are extremely fast occurring with latencies as short as 200 to 400 ms (Mirabella et al. 2006, Chen et al. 2010). Thus, the space of possible actions is focussed with the aim to select an appropriate action and to suppress inappropriate actions on the basis of personally relevant knowledge which is associated with the sense of agency of the acting subject. Intended proactive and reactive motor control was found to be processed in the supplementary motor area and the adjacent pre-SMA, which are the most dorsal portions of the medial frontal cortex (Seitz et al. 2006, Chen et al. 2010, d’Acremont et al. 2013). In fact, subjects can rely their behavioural decisions on categories such as right or wrong, good or bad, pleasant or unpleasant. This pertains in general but is of immediate importance in personal encounters when the first-person perspective is to be aligned with the second-person perspective (Potthoff & Seitz 2015). While most of the personal decisions concerning the control of actions and adaptive behaviour are subconscious or intuitive (Kahnt et al. 2010), discriminations performed of literal or numerical information require attentive awareness. There is accumulating evidence in the literature that the dorsolateral prefrontal cortex is specifically involved in performing such decisions (Niendam et al. 2012). In fact, the activations of the dorsolateral prefrontal cortex during decision processes have been found to be related to the capacity of the working memory system and fluid intelligence scores which was found to correlate with the expression of gamma-activity (Roux et al. 2012, Fedorenko et al. 2013). Note, that the cognitive-emotional representations of external objects and events are essentially probabilistic exhibiting different degrees of subjective certainty. Those which are accessible to objective verification constitute personal knowledge, while those that cannot be substantiated by objective exploration make up personal religious

or secular beliefs. Accordingly, the psychophysical processes underlying the formation of beliefs, e.g. creditions, critically involve the integration of formal cognitive accounts with subjective emotional loadings.

The nature of believing processes has been elaborated as an integrated model which was based on the perception-action-value triad and applied to three hierarchical levels (Sugiura et al. 2015). This model provides a new interdisciplinary scientific perspective such that the believing process can be understood as an adaptive adjustment process involving the interference of the inner probabilistic estimates of the outside world according to a personal valuation matrix. In fact, the self-organization dynamics in the perception-action-value triad predict the believing process to behave as a personal cognitive-emotional function. Due to the belief selection, which is assumed to be equivalent to action selection, it is expected that the belief of an individual is congruent with the personal valuation processes. With respect to the ontogenetic development, infants begin to construct physical-level belief representations by learning the associations of one’s motor act and feedback sensations, and its cost or reward values. At the next stage of development the environment constituted by family members and friends will shape the interpersonal-level representations by associating the other’s reactions to one’s own behavior. The accumulation of the interpersonal-level representations enables young children and people, in general, to reflect upon the relationship between one’s own behavior in a specific social context and the social evaluation given to it. At the third level, the belief representations of individuals are likely to be biased to beliefs that are held in the society or culture the person lives in. The internal structure of the different belief representations explains the close association of behavior and affective

states in a nested hierarchy of belief contents at different levels of complexity.

Accordingly, the psychophysiological processes underlying believing are intricately interwoven in the mental operations of perception and control of action. As advanced by Jeannerod (1995) actions are generated as mental motor images (ideation) that reflect the temporal and kinaesthetic characteristics of real actions being processed in the same brain areas. Conversely, actions are tuned for optimal sensory exploration affording comprehension of the objects or events. We suggest that the processes described here represent fundamental human brain functions integrating cognitive and emotional perspective taking including personal considerations of secular and non-secular transcendence. Myth, ritual actions and the feeling of transcendence have been hypothesized to be key elements of religions (Schnell 2003). They are supplemented by the notion of creativity, almightiness and truth that have been attributed to deities or God (Fischbeck 2005). Thus, the framework of the processes of believing provides a springboard for interdisciplinary exploration and hypothesis testing in terms of human brain physiology but also in pathological states in patients with neuropsychiatric diseases. Furthermore, it opens new paths of discussions on a wide range of traditional philosophical topics such as the relation of belief and faith, or of belief and knowledge.

4. Credition as a (religion-free) base for understanding religions

4.1 For credition there is no need of referring to a religion

Creditions can be conceived as a human ability which is employed by everybody uncountable times a day. The process of believing can integrate babs which are related to transcendence

and others which do not have an of such a relation. In a single bab-blob configuration “profane” and “transcendent” babs may be assembled.

Regarding religion(s) the “sense of mightiness” (as an emotional value) and “the sense of certainty” (as a personal conviction) becomes most influential. What some people experience as totally “certain” other may denote as highly ambiguous or untenable. Many people, for instance, entertain the idea or “bab-blob-configuration” that science (at least theoretically) can prove everything – they are probably ready to believe in scientific proofs. In contrast, others have the “bab-blob-configuration” that science always will produce – if at all – only preliminary knowledge. Accordingly, they probably are sceptic towards any scientific argument or position. In the same way some people may integrate a bab with a transcendent content into their “bab-blob-configurations” while others will not.

One of the differences of profane and transcendent “bab-configurations” is their subjectively attributed degree of certainty. The individually accepted/attribution degree of certainty is only partly described by the concept of rationality. Even more, the notion of rationality (as a noun related concept) is sometimes misleading as it presumes a certain valuation process as “normal” or “logic”. This aspect may be the background of a recent development in the Western scientific world: the continuously increasing “belief” in paranormal phenomena. To phrase the relation between religious and profane belief in a metaphoric way: “belief” does not mark the border between “religious” and “profane”. Rather, the border between both orientations passes “through” the process of believing.

On a more general level, many other aspects are touched by the credition project: for instance it pertains to the question of probability, the concept of utilitarianism, the understanding of truth or will, as well as the issue of personal success and satisfaction with life (Welzel & Inglehart 2010). Importantly, the concept of creditions provides openness to the philosophical tradition of process thinking and to the crucial question of the relation of being and becoming. This will be highlighted below. And it seems to underpin – from an innovative standpoint – the idea that there is a narrow connection between “religion and meaning” (Park 2005) on the one hand and – partly similarly – “atheism and meaning” on the other hand (Schnell & Keenan 2011). Thus, the model of credition might give further impulses for the future of psychology of religion and spirituality (Paloutzian & Park 2013).

4.2 Credition-based understanding of religious denominations and the Christian ecumenical dialogue

The claim to represent the (true) belief led in course of the history of the Christian church(es) to the development of a sophisticated “dogmatic” system (Theobald 2007). Along with the councils of the early centuries different “churches” came up and led to the big schism of the Church in 1054 which divided Christianity in a Western and an Eastern sphere (Baum & Winkler 2003, McGuckin 2010, Nichols 2010, Siecienski 2010, Winkler 2013). Later, the Protestant reformation in the 16th century (D`Aubign 2010) which had a tremendous influence in different countries in Europe was one of the most eminent starting points to bring up further denominations. Only, in the second half of the 20th century the idea of reconciliation, dialogue and friendship between the Churches of Europe was promoted. To support this intention in 1959 the “Conference of European Churches”

(CEC) was founded which encompasses more than 100 member churches (<http://www.ceceurope.org/>). A major project was the production of the Charta Oecumenica of Europe's churches which was signed in Strasbourg in 2001. Even within the theological faculties in Europe a network of cooperation was spurred, the so called Graz Process (<http://graz-process.uni-graz.at/>) to improve the understanding and to work on overcoming the differences.

Expressed in terms of the model of credition: the separation can also be understood as a consequence of different “bab-blob configurations” with different emotional loadings of the different babs. If we are ready to analyse the history of churches under this aspect, we can see that the traditional ecumenical issues can be formulated within the framework of credition. On the one hand we are able to find out (of course not in the sense of “historism” but only in a historically hypothetical sense) the prevailing “bab-blob-configurations” of the former actors [similarly to a palaeopathological analysis of historical persons]. On the other hand the model of credition can be a helpful new tool of communication which puts the anthropological processes of believing of the actual representatives of the ecumenical dialogue into the centre of interest rather than the dogmatic “positions”. Thus, it will be possible to analyse and to compare denominational positions of former and actual actors as different “bab-blob configurations” with different emotional meanings and different degrees of certainty. NB: It has to be discussed whether such an approach can be used to understand “denominational” differences in other religions (for instance Sunna and Shia; Orthodox and Liberal Judaism and so on).

4.3 Credition-based understanding of religion(s) and the interreligious dialogue

Belief is not in the same way relevant for all religions and in religions there are different attitudes towards “belief”. Alike, belief is not the only characteristic of religions and it is not sufficient when trying to understand all religious experiences (as for instance mystical experiences) under the perspective of belief. Thus, before any attempt to relate the model of credition to the interreligious dialogue, a profound semantic analysis of the terms and notions of “belief” has to be undertaken. This cannot be undertaken in the context of this presentation. We only can show what perspectives may be taken for future research:

4.3.1 Christianity:

In Christianity the question of belief plays a more crucial role and belief is a fundamental term for understanding any religious articulation or self-articulation. In the tradition of Saint Paul who emphasized the role of belief (Aune 2013; Marguerat 2013). In Christianity belief became a term of self-expression in a such overwhelming manner that theologians have entitled their books as an Introduction into Believing, though they present an introduction into Christian doctrine (Rahner 2004, Beck 2013).

4.3.2 Judaism:

For Judaism the significance of “belief” is somehow less central as for Christianity, because the question of how to act gains a prevailing interest. To understand the Jewish notion of “belief” we have to be aware that there are different traditions in an historical as well as in a contemporary sense. For instance, it might be difficult to define the notion of “belief” in the Hebrew written texts in the Old Testament because it is not expressively interested in the anthropological base of thinking (Janowski & Wolff 2010). It is

mainly in the Greek written parts of the Old Testament that reflections of the notion and the role of belief play a major role (Proverbs 12,2; 16,26; Judith 14,10). The Hebrew root of the word which has the most analogy to the Greek influenced concept of belief is “aman” which might be understood as “being confident” (Hieke 2009).

4.3.3 Islamic Tradition:

In the Islamic tradition the root of the term *Īmān* has the connotations ‘being secure, trusting in, turning to’; whence: ‘good faith, sincerity’ (amana), then ‘fidelity, loyalty’ (amāna), and thus the idea of ‘protection granted’ (amān). The fourth form (amāna) has the double meaning of ‘to believe, to give one’s faith’ and (with *bi*) “to protect, to place in safety”. The root ‘mn is one of the most frequently found in the vocabulary of the Kur’ān, where *Īmān* means sometimes the act and sometime the content of faith, sometime both together.” (Gardet, 1978, 1170). Of course it should be mentioned that there is vigorous and long way of interpreting “*Īmān*” in Sunna and Shia and in other Islamic traditions.

5. Limitations

It should be emphasized that credition denotes a theoretical concept rather than a real entity of the physical world. In fact, credition may be considered as comparable to the concepts of „cognition“ and „emotion“ which at the turn of the nineteenth century were developed as central topics in psychology. In particular, William James (1890) defined a set of mental abilities and processes that constitute cognition rendering it accessible to empirical study. Similarly, the concept of credition is pertinent for interdisciplinary discussions of how to define an epistemology of credition, the underlying theoretical assumptions as well as their relation to empirical data.

Concepts of “belief” have been discussed previously in different fields of research like philosophy or psychology of religion. However, there is no generally accepted definition which conceptualizes believing with respect to its psychological properties. In fact, due to its highly complex character the issue of “believing” (i.e. as process) is scientifically orphan. In consequence, there is no a-priori given theoretical base which could serve as a starting point for carving out the concept of credition. Neither exists a genuine scientific base, which comprises all the different research approaches concerning “belief” as “processes of believing”.

However, if one accepts the concept of credition in a heuristic sense as granted, it will open the floor for a diversified discourse of how to relate empirical data to this model. But most likely, the outcome will depend on the given scientific discipline such as molecular biology, neuro-anatomy, sociology of religion, cognitive science, or in other fields.

Owing to this multi-facetted situation, we propose that the concept of credition has primarily a heuristic scope. In its relation to neuroscience it is suited to push the question of how believing processes are organized in the human brain. Though there is some first evidence that human brain function underpins the believing process, it has to be stressed that beliefs and believing are just starting to become possible targets for neuroscientific research. Moreover, we propose here that a number of cognitive processes are operative for the psychological act of believing. Thereby, we liberate the process of believing from metaphysical connotations, though the believing process might be one of the anthropological bases for religious experiences. If the premise is accepted that believing is a physiological process of the human brain, “believing” becomes potentially accessible for neuroscientific investigations.

6. Conclusions

Under these considerations it might be fruitful to understand the believing process in the sense of the credition model and to discuss the possible relations of the credition model to the different notions of “belief/faith/believing” in the named religions. Taking into account the above mentioned neuro-scientific insights into the profound interdependence of emotion and cognition a new culture of appreciation may be established which provide means to keep cognitive and emotional impulses in balance. This intention could be supported by implementing the model of credition as a communication tool for a better understanding of the interaction of humans belonging to different cultures and to different religions. This innovative perspective may also influence our discussions of blasphemy and tolerance. It might be a fruitful enterprise to discuss different religious attitudes by referring to those non-religious possibilities which are given by the concept of creditions that provide an integration of cognitive and emotional processes of humans. Moreover, theoretical impulses taking into account the different anthropological starting-points may be expected to improve the model of credition and, thereby, render it better understandable in non-European cultural settings.

7. References

- Angel, H.-F. (2013a). Credition. In: Runehov, A.L.C., Oviedo, L., Azari, N.P. (eds) Encyclopedia of Sciences and Religion, Springer Reference, Dordrecht, volume 1, pp. 536-539. <http://www.springer-reference.com/docs/html/chapterdbid/357430.html>
- Angel, H.-F. (2013b). Religiosity. In: Runehov, A.L.C., Oviedo, L., Azari, N.P. (eds): Encyclopedia of Sciences and Religion, Dordrecht, volume 4, pp. 2012 – 2014 <http://www.springerreference.com/docs/html/chapterdbid/357427.html>
- Angel, H.-F. (2015a). No believing without emotion: The overlapping of emotion and cognition in the model of credition, in: Studies in Science and Theology (SSTh) 15 [in press]
- Angel, H.-F. (2015b). Process and Creditions: How to Understand the Process of Believing? In: Jakub Dziadkowiec / Lukasz Lamza (Eds): Advances in Process Thought: Society, Education, and God (2015) [appearing soon]
- Aune, D.E. (2013). Recent Readings of Paul Relating to Justification by Faith, in: Aune, D. E. (ed.): Jesus, Gospel Tradition and Paul in the Context of Jewish and Greco-Roman Antiquity. Mohr pp. 472-523, Tübingen
- Azari, N.P., Nickel, J., Wunderlich, G., Niedegen, M., Hefter, H., Tellmann, L., Herzog, H., Stoerig, P., Birnbacher, D., Seitz, R.J. (2001). Neural correlates of religious experience. European Journal of Neuroscience, 13, 1649-1652
- Azari, N.P., Missimer, J., Seitz, R.J. (2005). Religious Experience and Emotion: Evidence for distinctive cognitive neural patterns. International Journal of Psychology of Religion, 15, 263-281
- Bar, M., Neta, M., Linz, H. (2006). Very first impressions. Emotion, 6, 269-278
- Barth, K. (1957). Kirchliche Dogmatik, ausgewählt und eingeleitet von Helmut Gollwitzer, Frankfurt/M
- Baum, W., Winkler, D.W. (2003). The Church of the East. A concise history. Routledge Curzon, London, New York
- Beck, M. (2013). Glauben – wie geht das? Styria Press, Wien, Graz, Klagenfurt
- Bell, V., Halligan, P.W. (2012). The neural basis of abnormal personal belief. In: Kruger F, Grafman J (eds) The neural basis of human belief. Psychology Press, Chapter 10, pp. 300-329, Hove
- Benedetti, F., Amanzio, M., Vighetti, S., Astegiano, G. (2006). The biochemical and neuroendocrine bases of the hyperalgesic placebo effect. Journal of Neuroscience, 26, 12014-12022
- Binkofski, F., Kunesch, E., Dohle, C., Seitz, R.J., Freund, H.-J. (2001). Tactile Apraxia: unimodal apractic disorder of tactile object exploration associated with parietal lobe lesions. Brain, 124, 132-144
- Bird, G., Viding, E. (2014). The self to other model of empathy: Providing a new framework for understanding empathy impairments in psychopathy, autism, and alexithymia. Neuroscience Biobehavioural Reviews, 47, 520-532
- Boyer, P. (2003). Religious thought and behaviour as by-products of brain function. Trends in Cognitive Science, 7, 119–124

- Chen, X., Scango, K.W., Stuphorn, V. (2010). Supplementary motor area exerts proactive and reactive control of arm movements. *Journal of Neuroscience*, 30, 14657-14675
- Devinsky, O. (2009). Delusional misidentifications and duplications Right brain lesions, left brain delusions. *Neurology*, 72(1), 80-87. doi: 10.1212/01.wnl.0000338625.47892.74
- D` Aubign, M. (2010). *History of the Reformation in the Sixteenth Century (Volume 3)*, Cambridge Scholars Publishing, Cambridge
- Dirscherl, E., Dohmen, C. (eds) (2008). *Glaube und Vernunft. Spannungsreiche Grundlage europäischer Geistesgeschichte*. Herder, Freiburg, Basel, Wien
- Chang, L.J., Doll, B.B., van 't Wout, M., Frank, M.J., Sanfey, A.G. (2010). Seeing is believing: trustworthiness as a dynamic belief. *Cognitive Psychology*, 61, 87-105
- Federenko, E., Duncan, J., Kanwisher, N. (2013). Broad domain generality in focal regions of frontal and parietal cortex. *Proceedings of the National Academy of Sciences USA*, 110, 16616-16621
- Churchland, P. (1979). *Scientific Realism and the Plasticity of Mind*. Cambridge University Press, Cambridge
- Fischbeck, H.-J. (2005). *Die Wahrheit und das Leben Wissenschaft und Glaube im 21. Jahrhundert*. Herbertz Utz Verlag, München, ISBN 978-3-8316-0482-1
- Coltheart, M. (2007). The 33rd Sir Frederick Bartlett Lecture - Cognitive neuropsychiatry and delusional belief. *Quarterly Journal of Experimental Psychology*, 60, 1041-1062. doi: 10.1080/17470210701338071
- Fodor, J. (1980). *The Language of Thought*, Harvard
- Coltheart, M. (2010). The neuropsychology of delusions. *Annals of the New York Academy of Science*, 1191, 16-26. doi: 10.1111/j.1749-6632.2010.05496.x
- Friston, K. (2010). The free-energy principle: a unified brain theory? *Nature Reviews Neuroscience*, 11, 127-138
- Connors, M.H., Halligan, P.W. (2015). A cognitive account of belief: A tentative roadmap. *Frontiers of Psychology*, 5, 1588. doi:10.3389/fpsyg.2014.01588
- Fuchs, T., Schlimme, J.E. (2009). Embodiment and psychopathology: a phenomenological perspective. *Current Opinion of Psychiatry*, 22, 570-575
- d'Acremont, M., Schultz, W., Bossaerts, P. (2013). The human brain encodes event frequencies while forming subjective beliefs. *Journal of Neuroscience*, 33, 10887-10897
- Gardet, L. (1978). IMAN in; van Donzel, E., Gibb, H.A.R. (eds): *The encyclopaedia of Islam*. V, Leiden: Brill: 1170 – 1174
- D`Aquili, E., Newberg, A. (1999). *The Mystical Mind: Probing the Biology of Religious Experience*. Fortress Press, Minneapolis.
- Geyer, C. (2004) *Hirnforschung und Willensfreiheit*, Frankfurt/M
- Gray, J.R., Braver, T.S., Raichle, M.E. (2002). Integration of emotion and cognition in the lateral prefrontal cortex. *Proceedings of the National Academy of Sciences USA*, 99, 4115-4120

- Han, S., Mao, L., Gu, X., Zhu, Y., Ge, J., Ma, Y. (2008). Neural consequences of religious belief on self-referential processing. *Social Neuroscience*, 3, 1-15
- Helm, P. (1999). *Faith and Reason*. Oxford University Press, Oxford.
- Henkel, L.A., Mattson, M.E. (2011). Reading is believing: the truth effect and source of credibility. *Conscious Cognition*, 20, 1705-1721
- Hieke, T. (2009). „Glaubt ihr nicht, so bleibt ihr nicht“ (Jes 7,9). Die Rede vom Glauben im Alten Testament. *Theologie und Glaube*, 99, 27-41
- Hills, P., Francis, L.J., Argyle, M., Jackson, C.J. (2004). Primary personality trait correlates of religious practice and orientation. *Personality and Individual Differences*, 36, 61–73
- James, W. (1890) *The principles of psychology*. H. Holt & Comp. New York
- James, W. (1985). *The varieties of religious experience: A study in human nature*. Cambridge MA, Harvard University Press (Original work published in 1902)
- Janowski, B., Wolff, H.W. (2010). *Anthropologie des Alten Testaments*. Gütersloh 2010
- Jeannerod, M. (1995). Mental imagery in the motor context. *Neuropsychologia*, 33, 1419-1432
- Jensen, K.B., Kaptchuk, T.J., Kirsch, I., Raicek, J., Lindstrom, K.M., Berna, C., Gollub, R.L., Ingvar, M., Kong, J. (2012). Nonconscious activation of placebo and nocebo pain responses,” *Proceedings of the National Academy of Sciences USA*, 109, 15959–15964
- Joseph, R. (2002). *NeuroTheology: Brain, Science, Spirituality, Religious Experience*, San Jose.
- Kahnt, T., Heinzle, J., Park, S.Q., Haynes, J.D. (2010). The neural code of reward anticipation in human orbitofrontal cortex. *Proceedings of the National Academy of Sciences USA*, 107, 6010-6015
- Kapogiannis, D., Barbey, A.K., Su, M., Zamboni, G., Krueger, F., Grafman, J. (2009). Cognitive and neural foundations of religious belief. *Proceedings of the National Academy of Sciences USA*, 106, 4876-4881
- Keysers, C., Gazzola, V. (2010). Social neuroscience: mirror neurons recorded in humans. *Current Biology*, 20, R353-354
- Koenig, H.G., Cohen, H.J. (2002). *The Link between Religion and Health. Psychoimmunology and the Faith Factor*, Oxford/New York
- Kohls, N.B. (2007). Psychological distress, experiences of ego loss and spirituality: Exploring the effects of spiritual practice. *Social Behaviour and Personality*, 35, 1301 – 1316
- Langdon, R., Coltheart, M. (2000). The cognitive neuropsychology of delusions. *Mind and Language*, 15, 184-218. doi: 10.1111/1468-0017.00129
- Linke, D.B. (2003). *Religion als Risiko. Geist, Glaube und Gehirn*, Reinbek b. Hamburg
- Marguerat, D. (2013). The Pauline Gospel of Justification of Faith, in: Marguerat, David (Ed.): *Paul in Acts and Paul in His Letters*, Mohr: Tübingen: pp 179-219
- McGuckin, J.A. (2010). *The Orthodox Church: An Introduction to its History, Doctrine, and Spritual Culture*, Blackwell Publisher, London

- Meissner, K., Kohls, N., Colloca, L. (2011). Introduction to placebo effects in medicine: mechanisms and clinical implications. *Philosophical Transactions of the Royal Society, London B Biological Sciences*, 366, 1783-1789
- Mirabella, G., Pani, P., Paré, M., Ferraina, S. (2006). Inhibitory control of reaching movements in humans. *Experimental Brain Research*, 174, 240-255, erratum (2009). *Experimental Brain Resesearch*, 193, 651
- Myers, M.G., Cairns, J.A., Singer, J. (1987). The consent form as a possible cause of side effects. *Clininical Pharmacological Therapy*, 42, 250-253
- Neuner, P. (Hg.) (2003). *Naturalisierung des Geistes – Sprachlosigkeit der Theologie*, Freiburg, Baselm Wien
- Newberg, A., D`Aquili, E., Rause, V. (2001). *Why God won't go away: Brain Science and the Biology of Belief*. Random House Inc., New York
- Nichols, A. (2010). *Rome and the Eastern Churches*, Ingnatius Press, San Francisco
- Niendam, T.A., Laird, A.R., Ray, K.L., Dean, V.M., Glahn, D.C., Carter, C.S. (2012) Meta-analytic evidence for a superordinate cognitive control network subserving diverse executive functions. *Cognitive Affective and Behavioral Neuroscience*, 12, 241-268
- Paloutzian, R.F., Park, C.L. (2013). Directions for the future of psychology of religion and spirituality: research advances in methodology and meaning systems. In: Paloutzian, R.F., Park, C.L. (eds). *Handbook of Psychology and Spirituality*. 2nd edition, Guilford Press, pp. 651-665
- Pargament, K.I. (1997). *The psychology of religion and coping*, New York
- Park, C.L. (2005). Religion and meaning. In: *Handbook of Psychology, Religion and Spirituality*. Paloutzian, R.F., Park, C.L. (eds). Guilford Press, New York, pp. 295-314
- Pechey, R., Halligan, P. (2012). The prevalence of delusion-like beliefs relative to sociocultural beliefs in the general population. *Psychopathology*, 44, 106-115
- Plantinga, A., Wolterstorff, N. (1983). *Faith and Rationality: Reason and Belief in God*. University of Notre Dame Press, Notre Dame.
- Potthoff, D., Seitz, R.J. (2015). Role of the First and Second Person Perspective for Control of Behaviour: Understanding other People's Facial Expressions. In: Emmans, D., Laihinen, A. (eds). *Comparative neuropsychology and brain imaging. Neuropsychology: an interdisciplinary approach*. LIT Verlag GmbH & Co. KG, Vienna, pp. 85-101
- Prochnow, D., Brunheim, S., Steinhäuser, L., Seitz, R.J. (2014). Reasoning about the implications of facial expressions: A behavioral and fMRI study on low and high social impact. *Brain and Cognition*, 90C, 165-173
- Rahner, K. (2004). *Grundkurs des Glaubens*. 2ne ed, Herder, Freiburg, Basel, Wien
- Roland, P.E., Mortensen, E. (1987). Somatosensory detection of microgeometry, macrogeometry and kinaesthesia in man. *Brain Research Reviews*, 12, 1-42
- Roux, F., Wibrals, M., Mohr, H.M., Singer, W., Uhlhaas, P.J. (2012). Gamma-band activity in human prefrontal cortex codes for the number of relevant items maintained in working memory. *Journal of Neuroscience*, 32, 12411-12420

- Runehov, A.L.C. (2007). Sacred or Neural? The Potential of Neuroscience to Explain Religious Experience. Vandenhoeck, Göttingen:
- Runehov, A.L.C., Angel, H.-F. (2013). The Process of Believing: Revisiting the Problem of Justifying Beliefs. *Studies in Science and Theology (SSTh)*, 14, 205-218
- Saver, J.L., Rabin, J. (1999). The Neural Substrates of Religious Experience. In: Salloway, S., Malloy, P., Cummings, J.L. (eds). *The Neuropsychiatry of Limbic and Subcortical Disorders*. Washington, London, pp. 195-207
- Schaff, P. (ed) (2005). *The Seven Ecumenical Councils*. The Christian Classics Ethereal Library
- Schnell, T. (2003). A framework for the study of implicit religion: the psychological theory of implicit religiosity. *Implicit Religion*, 6, 86-104
- Schnell, T. (2012) Spirituality with and without Religion. *Archive for the Psychology of Religion*, 34, 33-62
- Schnell, T., Keenan, W.J.F. (2011). Meaning-Making in an Atheist World. *Archive for the Psychology of Religion*, 33, 55-78. (download PDF: www.sinnforschung.org)
- Schnell, T., Keenan, W.J.F. (2013). The Construction of Atheist Spirituality: A Survey-Based Study. In Westerink, H. (ed.) *Constructs of Meaning and Religious Transformation*, pp 101-118. Vandenhoeck and Ruprecht Unipress, Vienna:
- Schulz, H. (2001). *Theorie des Glaubens*. Mohr, Tübingen
- Scobie, G.E.W. (1994). Belief, Unbelief and Conversion Experience: in Hutsebaut, D., Corveleyn, J. (eds) *Belief and Unbelief. Psychological Perspectives*. Amsterdam: Rodopi
- Seckler, M. (1988). Theologie als Glaubenswissenschaft, in: Kern, W., Pottmeyer, H.J., Seckler, M. (eds) *Handbuch der Fundamentaltheologie*, Volume 4, pp. 180-241
- Seitz, R.J., Nickel, J., Azari, N.P. (2006). Functional modularity of the medial prefrontal cortex: involvement in human empathy. *Neuropsychology*, 20, 743-751
- Seitz, R.J., Franz, M., Azari, N.P. (2009). Value judgments and self-control of action: The role of the medial frontal cortex. *Brain Research Reviews*, 60, 368-378
- Seitz, R.J., Angel, H.-F. (2012). Processes of believing - a review and conceptual account. *Reviews of Neuroscience*, 23, 303-309
- Seitz, R.J., Angel, H.-F. (2014). *Psychology of Religion and Spirituality: Meaning Making and processes of believing*. *Religion, Brain and Behavior*. DOI:10.1080/2153599X.2014.891249
- Siecienski, A.E. (2010). *The Filioque: History of a Doctrinal Controversy*, Oxford University Press, Oxford
- Smith, M.L. (2011). Rapid processing of emotional expressions without consciousness awareness. *Cerebral Cortex*, 22, 1748-1760
- Smith, W.C. (1987). *Faith and belief*. Princeton University Press, Princeton, New Jersey
- Stich, S. (1996). *From Folk Psychology to Cognitive Science. The Case against Belief*. 2nd Ed., Cambridge Massachusetts.

Sugiura, M. (2011). The multi-layered model of self: a social neuroscience perspective. In: Kawashima, R., Sugiura, M., Tsukiura, T. (eds). *New Frontiers in Social Cognitive Neuroscience*. Tohoku University Press, Sendai, pp. 111-135

Sugiura, M. (2013). Associative account of self-cognition: extended forward model and multi-layer structure. *Frontiers in Human Neuroscience*, 7, 535. doi: 10.3389/Fnhum.2013.00535

Sugiura, M., Seitz, R.J., Angel, H.-F. (2015). Models and neural bases of the believing process. *Journal of Behavioral and Brain Science*, 5, 12-23

Swinburne, R. (1983). *Faith and Reason*. Oxford University Press, Oxford.

Theobald, C. (2007). *Le christianisme comme style*, Tome 1, Cerf, Paris

Thiel, U. (2014). *The Early Modern Subject. Self-Consciousness and Personal Identity from Descartes to Hume*, Oxford University Press, 2nd ed.

van Gaal, S., Scholte, H.S., Lamme, V.A., Fahrenfort, J.J., Ridderinkhof, K.R. (2011). Pre-SMA gray matter density predicts individual differences in action selection in the face of conscious and unconscious response conflict. *Journal of Cognitive Neuroscience*, 23, 382-390

Watts, F. (2007). Emotion regulation and religion. In: Gross, J.J. (ed). *Handbook of Emotion Regulation*, Guildford Press, New York, pp. 504-520

Welzel, C., Inglehart, R. (2010). Agency, values, and well-being: a human development model. *Social Indicator Research*, 97, 43-63

Wiese, E., Wykowsky, A., Müller, H.J. (2014). What we observe is biased by what other people tell us: beliefs about the reliability of gaze behavior modulate attentional orienting to gaze cues. *Public Library of Science one*, 9, e 94529

Winkler, D.W. (ed) (2013). *Syriac Christianity in the Middle East and in India: Contributions and Challenges*. Pro Oriente Studies in Syriac Tradition 2. Gorgias Press, Piscataway, New Jersey

8. Authors

Prof. Dr. Hans-Ferdinand Angel
Karl Franzens University Graz,
Heinrichstraße 78B/II
8010 Graz, Austria.
Phone: +43 316 380 – 6230
Fax: +43 316 380 – 6269
ferdinand.angel@uni-graz.at

Director of the Institute of Catechetical and Religious Education, Scientific Director of the Creditation Research Project

Prof. Dr. Rüdiger J. Seitz
Department of Neurology,
Centre for Neurology and Neuropsychiatry
LVR-Klinikum Düsseldorf, Heinrich-Heine-University Düsseldorf.
Bergische Landstrasse 2, 40629 Düsseldorf, Germany.
Phone: +49 211 922 4600
Fax: +49 211 922 4603
seitz@neurologie.uni-duesseldorf.de

Department Head, Clinical Neurophysiology, Cognitive Neuroscience, Cerebral Plasticity, Co-Director of the Creditation Research Project