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## God in the Brain? How much can “Neurotheology” explain?

Much has been written about Michelangelo’s “Creation of Adam”, created from 1508 to 1512 in the Sistine Chapel. The image of God and Adam nearly touching constitutes one of the most prominent paintings in human history. It was widely acknowledged that the artist owed part of his ground-breaking genius to his lively interest in human anatomy, probably ignoring Roman laws against human vivisections at his own risk. But it took centuries until neuroanatomist Frank Lynn Meshberger recognized that Michelangelo’s icon of God and angels clad in a distinctive sphere resembled a depiction of the human skull and brain – from the shapes and scales down to neuroanatomic details (Meshberger 1990).

Since then, people have been wondering what message the great artist might have encoded in his most famous piece. Did he capture the moment of God giving Man the brain-related ability to recognize Him, a creature in His own image? Did he express that any human image of God – including all the artwork of his own – is naturally restricted by the capacities of our brains and should be understood as no more than timid reconstructions of a transcendent reality far beyond our intellectual grasp? Or might the opposite be true: Did the artist encode a notion of hidden atheism, explaining that Adam’s brain was creating God – instead of the other way around?

Unfortunately, we do not (yet?) know for sure. But then, it is hard to imagine a symbol that is capturing very recent debates better than Michelangelo’s painting. For decades, various studies in neurologic foundations of religious experiences have led to sweeping statements and bold hypotheses. And in 1984, James B. Ashbrook from the Evangelical Theological Seminary, Evanston, coined the term “neurotheology” – hoping that the ongoing exploration of religion-related brain functions would lead to renewed, scientific appraisal of theist beliefs (Ashbrook 1984).

Others assumed that the scientific description of religious experiences might help in refuting and overcoming them – finally replacing any classic theologies. In the meantime, literally Hundreds of diverse and conflicting “neurotheological” hypotheses have been flooding the book markets and the internet, many claiming to have a decisive say in the scientific understanding

of religiosity, the philosophic debates concerning reality and the existence or non-existence of God (Blume 2009). But how much can the scientific exploration of religion-related functions of the brain explain?

## Overlapping Perspectives

Many “neurotheological” hypotheses are marketed by claiming to constitute “the” contemporary understanding of brain science(s). But in fact, there is nothing like a single perspective on the human brain. Instead, the organ and its functions are explored by numerous distinctive and quite often competing faculties. Religion-related claims are drawn from classic neuroanatomy refreshed by brain imaging studies – offering new and boldly colored “icons” to a picture-hungry audience – to paleo-archaeological descriptions of human brain evolution and from psychologists numerous observations and experiments to medical studies exploring the results of damaged brains. Some colleagues strictly concentrate on the workings of individual brains while others are emphasizing the emergent, social and cultural interactions. Some are trying to explain “religion” based on implicit definitions while others are content with describing specific experiences or behaviors.

In order to get an overview, the respective flood of publications and hypotheses can be arranged into five distinctive perspectives.

### *1. The God Spot*

In 1983, neuroanatomist Michael Persinger from the Laurentian University in Sudbury, Ontario, hit the news with a publication promoting “a general hypothesis”: According to his claims, religious and mystical experiences would be “mere” artifacts of epileptic micro seizures in the temporal lobe. Western media featured his yellow “God helmet” broadly, which was purportedly able to induce respective experiences by weak magnetic fields (Persinger 1983).

Neuropsychologist Vilayanur Ramachandran from the University of California in San Diego added speculations about the locations of the “God module”, its spontaneous arousal by epilepsy and possible consequences of its removal by surgery (Ramachandran/Blakeslee 1999). In 2001, neuroanatomist Andrew Newberg and colleagues got wide attention with purported brain-“snapshots” of meditating Christian nuns and Buddhists. Their reports of having touched a higher reality corresponded to strong concentration efforts observable in the prefrontal cortex and subsequent decreased activities in the parietal lobe (Newberg/d’Aquili, Rouse 2001).

Shortly thereafter, geneticist Dean Hamer from the National Cancer institute in Bethesda, Maryland, offered yet another variant by publishing a book

about a “God gene”, purportedly regulating dopamine levels in the brain and, thus, levels of spirituality (Hamer 2004).

All of these – and many more – monocausal hypotheses about the neurobiology of religion got instant attention and were cherished by popular media for offering easy-to-make, picture-rich stories about religion with some scientific flavor. But they were far less successful in scientific discourse. As Pehr Granqvist from the University of Uppsala, Sweden, and colleagues tested the “God helmet” promoted by Michael Persinger in a double-blind study, those participants whose helmet was not really activated reported about the same amount of sensed presences and mystical experiences than those whose helmet was actually “at work”. The scientists concluded that the experiences had not been induced by transcranial magnetic fields, but by suggestibility (Granqvist et al. 2005).

Concerning the correspondence of epilepsy and religiosity, neurologist Detlef Linke from the University of Bonn pointed out that in the highly religious USA, such extraordinary experiences were indeed interpreted as having religious meaning quite frequently. But in more secular Germany, this connection was found to be far less frequent. This clearly indicated that the actual religious or secular interpretations were not shaped primarily by inherent qualities of the respective experiences, but by cultural tradition – in fact constituting feedback loops between nature and culture (Linke 2003).

Although most reviews acknowledged that Newberg and colleagues might have observed a specific result of meditation that could be found throughout diverse cultures, the specific rituals, experiences and interpretations were not accepted as to constitute the roots of all religions, but only as more-or-less important aspects. For example, prayers aimed at superempirical agents (such as ancestors, gods, bodhisatvas or God) were found to be far more frequent globally than non-personal meditations. And such behaviors were accompanied by very different brain activities, experiences and results than those explored by Newberg (Vaas 2009).

Finally, a closer read of Hamer’s “God Gene” showed that he claimed nothing more as having found a genetic sequence corresponding to a two-percent shift in self-reported spirituality of participants. In fact, Hamer supported the hypotheses already formulated by colleagues as a result of various Twin-studies: Religiosity turned out to be a biocultural capacity of human brains – as are intelligence or musicality. Those (and many other) traits were found to be partly inherited by numerous genetic bases and in need of socio-cultural and biographic expression (Bouchard 2009).

Thus, the various trials to decipher a single “God spot” in the brain have all been ended as fruitful failures. At best, they were able to pinpoint more-or-less important aspects of religious life, showing the trait to be polygenic, (bio-)culturally multifaceted and corresponding to diverse brain functions. A

single brain module explaining all religious beliefs and behaviors might have suited some early thinkers and the taste of specific media – but the biocultural phenomenon of religion turns out to be at least as complex as are music, intelligence or speech. Recent studies in the neuroanatomy of religiosity are highlighting the importance of the prefrontal cortex – not as another God spot, but as the primary seat of the “younger” brain functions orchestrating “older” brain activities and complex behaviors as well as assigning interpretations to all kinds of experiences (Harris/McNamara 2009).

### *2. Religion as a Virus of the Mind*

In 1976, Richard Dawkins published “The Selfish Gene”, depicting evolution as a struggle of replicating genes. According to this scenario, organisms and their neuronal systems had been evolved as mere “containers”, skillfully led by the “tyranny of the replicators”. In the final chapter, Dawkins sketched a corresponding concept of “memes”, metaphorically understood as cultural transmitters exploiting their “hosts” as “viruses of the mind” – with religions constituting the current peak of “memeplexes” (Dawkins 1976).

In the following decades, the increasingly popular concept was used and enriched by a range of other authors such as Daniel Dennett and Susan Blackmore. Although a clear definition of a “meme” was never achieved and a “Journal of Memetics” had to close down as no empirical studies could be published, the easy-to-grasp idea caught on and became the most widespread “theory of religion” in popular internet culture.

And since the start of the concept, scholars pointed out that the very metaphor of competing cultural transmitters would lead logically to dual-inheritance models of biocultural evolution, with specific genes and memes bringing about successful symbioses (Kirkpatrick 2010). After having accepted findings and studies concerning the reproductive potentials of religiosity, Susan Blackmore recently acknowledged the empirical failure of the virus-metaphor (Blackmore 2010).

### *3. Religion as a Narration of the Brain*

Preceding evolutionary biology by more than a century, David Hume assumed in his classic “Natural History of Religion” (1757) that human beliefs and myths would be rooted in the natural functions of our perception systems, for example assuming “faces in the clouds”. In 1993, the concept was revived by anthropologist Stewart Guthrie (Guthrie 1993). In 2001, cognitive psychologist Pascal Boyer brought about a public breakthrough of the idea with his bestselling “Religion explained” (Boyer 2001).

Since then, dozens of cognitive studies and experiments exploring religious narrations have been conducted throughout the world – and many yielded rich results. As a consequence, scholars increasingly agreed that “the-

re is no single cognitive starting point for religious concepts. (...) Concepts of supernatural agents likely derive from early agent concepts. Belief in afterlife likely draws from assumptions based on folk-psychology. Early assumptions about causality likely form the basis for belief in creation and the efficacy of prayers and rituals” (Richert/Smith 2009).

Thus, early notions and hopes about deciphering a single cognitive domain giving birth to “religion” have been largely abandoned. Instead, the emerging pattern is that of a network of interacting modules affecting human perceptions, narrations, experiences and evolutionary outcomes – actually constituting a strikingly similar fate compared to early God-spot-hypotheses (Vaas 2009; Frey 2010a).

#### *4. The Religious Brain in Interaction*

In 1962, Walter Pahnke, theologian and physician at Harvard University, conducted a double-blind study that became famous as the “good Friday experiment”. Before visiting a good Friday church service, twenty protestant students got a dose of psilocybin, a hallucinogens included in mushrooms used within several religious rituals of Native Americans. In fact, only ten students got the real substances and the other ten a placebo. Those who had ingested the psilocybin reported on average far stronger religious experiences a week and six months after the service than those who had gotten the placebo (Pahnke 1963). In a recent follow-up study, John Griffiths and colleagues from the John Hopkins University School of Medicine in Baltimore duplicated the study with contemporary precautions – and found the findings of the “good Friday experiment” soundly supported (Griffiths et al. 2006).

In 2001, Nina Azari, Petra Stoerig and colleagues at the neuropsychological department of Düsseldorf University published their findings of another well-devised brain-imaging study. They explored the brain activities of participants reading the biblical psalm 23 – comparing a group of devout Christians with one of declared Atheists. Among the believers they found distinctive patterns in the frontoparietal lobes indicating various processings of social interaction – with God, a superempirical agent purportedly hearing and answering prayers. The participants not believing in this agent did not show the respective brain activities (Azari et al. 2001).

In 2006, psychologist Jesse Berings from the Institute of Cognition and Culture at Belfast University was able to manipulate the behaviors of children toward rule-observance just by telling them that they were observed by a nice but invisible “Princess Alice” (Bering/Johnson 2006). A year later, Ara Norenzayan and Azim Shariff from the University of British Columbia in Vancouver found higher levels of prosocial behavior among participants in a game who had been primed by concepts of a (watching) God (Shariff/Norenzayan 2007).

And in 2009, neuropsychologist Shihui Han from Peking University presented a brain-imaging study about religious beliefs affecting neurocognitive processes of the self in comparison to (Chinese) Christians and Seculars (Han 2009).

All of these – and many more – findings tore down an implicit and old wall between classic neuronal perspectives implicitly assuming that “religion” would take place “just in the brain” on the one side and those that explored the histories and effects of cultural artifacts such as “holy” places, substances or mythological beings on the other side. But instead of floating ready-to-trigger through “empty” spaces, our brains were found to be inevitably immersed into a rich social and cultural world, interacting with narratives, meanings and emotion-triggering symbols.

Whenever we try to explore the neuronal and psychological workings of Homo sapiens, we are reminded by observations and findings: Culture has long evolved into a part of our nature, embedding any human being into a non-reducible and interactive web of biological and cultural co-evolution. Rozin formulated: “It is time for evolutionary and cultural psychologists to work together and to focus together on how humans function, behaviorally and mentally, in the major dimensions of life.” (Rozin 2010)

##### *5. The Religious Brain as a Part of the Evolutionary Story*

Thus, one could assume that the whole enterprise of “neurotheology” ended up as a failure – having to accept that there is neither a distinct “God module” nor a single root of religious beliefs and behaviors. But in science, failure can help pave the way for new discoveries. In fact, those numerous brain studies and debates led many to take on biological and finally biocultural perspectives on the topic. More and more, the scientific exploration of religion turned from “mere” neurology to broader, evolutionary studies. Therein, the various findings of archaeology, biology, psychology, sociology and neurology have been integrated into an increasingly testable and coherent evolutionary history of religiosity and religions. Religious beliefs, values, behaviors and communities have been found to exert influence on cooperative and especially reproductive choices, leading to reproductive potentials and (on average) higher birth rates among religiously participating Homo sapiens. While numerous high-fertile religious communities have been described, not a single secular population attaining replacement levels for a century has yet been found (Blume 2010).

In a certain twist in the history of science, the prevailing perspective of religiosity as an adaptive trait based on diverse brain modules is rediscovering respective hypotheses formulated by Charles Darwin himself. In his eminent “Descent of Man”, the theologian and founder of evolutionary biology observed:

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There is no evidence that man was aboriginally endowed with the ennobling belief in the existence of an Omnipotent God. On the contrary, there is ample evidence, derived not from hasty travellers, but from men who have long resided with savages, that numerous races have existed and still exist, who have no idea of one or more gods, and who have no words in their languages to express such an idea. The question is of course wholly distinct from that higher one, whether there exists a Creator and Ruler of the universe; and this has been answered in the affirmative by the highest intellects that have ever lived. If, however, we include under the term 'religion' the belief in unseen or spiritual agencies, the case is wholly different; for this belief seems to be almost universal with the less civilised races. Nor is it difficult to comprehend how it arose. (Darwin 1871, Ch. 2 p. 65)

Note how his early understanding of religion as “belief in unseen or spiritual agencies” is anticipating contemporary definitions such as religion as “beliefs in supernatural agents” and “supernatural watchers” [cp. Shariff/Norenzayan/Henrich 2010). And Darwin went on, looking for cognitive biases that could give rise to such religious beliefs and formulating a hypothesis of brain-based animism:

I cannot but suspect that there is a still earlier and ruder stage, when anything which manifests power or movement is thought to be endowed with some form of life, and with mental faculties analogous to our own. (Darwin 1871, Ch. 2 p. 66)

Today, respective hypotheses are formulated in terms such as Hyper-Agency Detection (HAD) or Theory of Mind (TOM). (Frey 2010b) Darwin proceeded, featuring his dog as a comparative example to illustrate pre-religious traits (Darwin 1871: Ch. 2, p. 67). And he expected those modules to evolve into a new system of religiosity as another universal of human behavior:

The belief in spiritual agencies would easily pass into the belief in the existence of one or more gods. For savages would naturally attribute to spirits the same passions, the same love of vengeance or simplest form of justice, and the same affections which they themselves experienced. (Darwin 1871, Ch. 2 p. 67)

Finally, Darwin concluded that the natural (that is: neuronal) bases of religiosity would interact with cultural developments in an integrated picture of biocultural evolution leading to (mono-)theism:

The idea of a universal and beneficent Creator of the universe does not seem to arise in the mind of man, until he has been elevated by long-continued culture. (Darwin 1871, Ch. 21 p. 395)

He would have argued that scientific studies of the “religious” brain could be very helpful – if connected to cultural, sociological and historical studies. And after the failure of isolated perspectives, more and more contemporary scholars tend to agree. There can be no distinct “neurotheology” as the brain

doesn't tell the whole story of biocultural evolution by itself. But notwithstanding, our brain turns out to constitute a scientific window into that greater story.

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