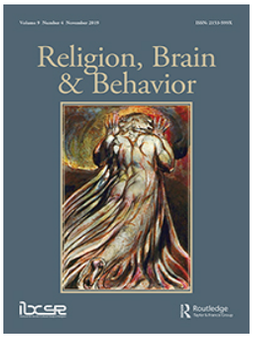

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Cerebral lateralization and religion: a phenomenological approach

Iain McGilchrist

Stellenbosch Institute of Advanced Studies, Stellenbosch, South Africa

ABSTRACT
Both animal ethology and studies of the attentional styles of the two cerebral hemispheres in human subjects suggest that there is a degree of specialization, with the left hemisphere tending to focus more narrowly on detail, and the right hemisphere supporting sustained attention across a broad field. This has clear survival advantages. It also has consequences at the phenomenological level of integrated experience. Although both hemispheres are involved in all experience, the characteristics of right hemisphere phenomenology, in particular its greater capacity to sustain ambiguity, understand meaning that lies beyond language, and perceive systemic wholes, means that it is more likely to be able to accommodate religious thought and experience. Since critiques of religion tend to have the opposite characteristics (those of left hemisphere phenomenology), arguments about the nature and meaning of religion may depend on which hemisphere's "version" of the world is privileged. Some consequent metaphysical, epistemological and ethical issues are explored, drawing on brain studies and a range of other disciplinary and experiential perspectives.

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Hemisphere; lateralization; asymmetry; religion; spirituality

1. Introduction

1.1. The rationale of this paper at the phenomenological level

A consensus is emerging from the literature that religious experience tends to be associated with the right hemisphere. This conclusion is supported by a book-length study of spirituality and the brain (Trimble, 2007), by the comprehensive review of Devinsky and Lai (2008), and by McNamara (2009). McNamara largely implicates right fronto-temporal networks, a view supported by Trimble and Freeman (2006) and by Devinsky and Lai (2008), the latter of whom distinguish what they call the "religion of the everyday man," with its characteristic ongoing belief pattern and set of convictions, predominantly localized to the frontal region, from ecstatic religious experience, more localized to the temporal region, both in the right hemisphere.

As this suggests, much depends on what is meant by religion. In some studies what is measured is essentially a pathological hyper-religiosity; in others an openness to ritual; in others the holding of certain beliefs or practices; in others experiences of a "paranormal" kind. As if to demonstrate difficulties with generalization, in one study the right hemisphere appeared foundational for aesthetic religious experience, while the left hemisphere was associated with ritual religious experience (Butler, McNamara, & Durso, 2011), a distinction that, however it may work in the laboratory, falls short of the complexity of real life experience. Meanwhile, other studies have linked types of meditation in which self/other boundaries are blurred with *decreased* activity in the

CONTACT Iain McGilchrist iain@iainmcgilchrist.com
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right inferior parietal lobule, an area known to be critical to the sense of the self (Johnstone & Glass, 2008).

It is important to note that this body of research is not reductive in intent, nor is this paper. Trimble's book is explicitly non-reductionist about religion and roams well beyond deductions from the psychopathology of epilepsy into art, music, poetry and religious experience of "normals." He writes: "humankind is distinguished from other animals by several fundamental behaviours [he lists seven] … . quintessentially driven by the right hemisphere" (p. 213). McNamara emphasizes that he is "not interested in debunking religion's supposed pretensions or calling it 'nothing but … '" (xiii); and he makes clear that the right hemisphere is integral to religious experience in general, not just in, for example, Parkinson's disease, on which some of his findings are based: "[t]he functionally integrated religion-related brain circuit … nearly always includes the key nodes of the amygdala, the right anterior temporal cortex, and the right prefrontal cortex" (p. xi).

The purpose of this paper is to consider the issues of brain asymmetry and religion from the standpoint of the phenomenology of each hemisphere, and how that may contribute to an understanding of the religious sense. I appreciate that a cognitivist approach requires a more explicitly mechanistic model, but since our understanding is inevitably bound up with the model we use, and since the experiential level is often left out when such a model is applied, this paper adopts an explicitly phenomenological perspective, attending not just to cognition, but to the affective, somatic and spiritual aspects of human experience as a whole.

Attention can be profitably considered at a level superior to that of each perceptual modality: for example, Goodale and Milner's (1992) influential visual model also applies to hearing (and probably to other modalities) (e.g., Zündorf, Lewald, & Karnath, 2016). Individuals with attentional neglect caused by a right hemisphere stroke do not just fail to *see* people to their left, they do not hear them, and they even have tactile and olfactory deficits in the left hemispace—in other words they do not attend (Bellas, Novelly, Eskenazi, & Wasserstein, 1988; Schwartz, Marchok, Kreinick, & Flynn, 1979; Schwartz, Marchok, & Flynn, 1977). Attention is not best thought of as a (primarily visual) "function" alongside other functions, but as an aspect of consciousness (machines cannot attend) which is foundational: it brings the experiential world into being. Half that world may go missing for a subject with a right hemisphere stroke.

Before continuing further, it may be helpful to clear some possible misunderstandings which might be anticipated in talking about the phenomenological worlds generated by each cerebral hemisphere.

If I were to say "there are fascinating and important differences between a cat and a mouse," there are a number of valid responses which would nonetheless miss the point. One might be "they have more in common than they have different," which is true, but irrelevant, because sometimes it is the differences that matter. Another might be of the kind: "we find that in order to see the world they both use a similar combination of specific visual systems (involving the optic tracts and radiations, tectum, visual cortex, basal ganglia)," and so on; this is also true, but irrelevant, since they both "see" the world (and perceive the world in other modalities) differently, and construe the world cognitively in different ways, make sense of it in different ways, which are reflected in different types of behavioral responses that can be experimentally examined. These are not each single independent facts that have to be strung together, or extended from one area, say vision, to another, say audition, because they are all part of one large underlying difference, which makes sense of the whole: what it means and what it takes to lead two very different types of life, that of the predatory cat and that of the timorous mouse. The basic mechanisms that help them see are irrelevant, not just because they are largely held in common by cat and by mouse, but because it is the wrong level of focus. It would be like trying to explain the difference between Fox News and CNN by focussing on the mechanics of studio lighting, TV signal transmission, cathode ray tubes, plasma/LED screens, etc.

It may be responded that "the hemispheres are parts of a mechanism, not separate conscious beings." But that is also a mistake. A machine and a person are both just models that illuminate and obscure different aspects of what they model. The brain isn't actually either simply a machine or simply a person. Each hemisphere can obviously sustain consciousness on its own, and appears to have not just different cognitive strategies, but different goals, values, opinions and emotional

timbre, a fact which becomes apparent as soon as one hemisphere, for whatever reason, loses function, as well as following commissurotomy, and can even be demonstrated in normal subjects. The "person" model looks like a better fit than the "machine" model, especially since a hemisphere is at least a manifestly important part of a person. This view was not just that of Sperry and Bogen, who are well known to have seen the hemispheres as distinct personalities, but also of more recent researchers in the area of hemisphere difference.

1.2. The hemisphere hypothesis

In a book called *The Master and his Emissary: The Divided Brain and the Making of the Western World* (*TMAHE*) (McGilchrist, 2009), I put forward a thesis about the controversial question of the origins and survival value of a divided and asymmetrical brain. In this paper I intend to give only the briefest possible outline of the thesis, before quickly moving on to a consideration of its implications for a religious (or spiritual) understanding of the world. No attempt will be made here to give evidence or argument in favor of the thesis itself: these are presented at length in *TMAHE* and explicitly lie outside the scope of this paper.

Many of the findings of neuroscience simply offer us a description of the brain correlates of human experience. As such they offer a description of experience at a reduced level, but do not directly illuminate the nature of that experience. Indeed, it is argued by certain philosophers that the brain cannot tell us anything about experience that we could not have discovered by introspection, since by definition the "inwardness" of mental life has to be the authority on experience.

The thesis of *TMAHE* is, I believe, different in this regard. It suggests that knowledge about reliable differences between the cerebral hemispheres can tell us something of considerable importance about our mental world which would not easily be discoverable by introspection, since, for reasons of survival, nature has taken care to hide it from us. Awareness of it would bring life to a standstill.

The argument can be very briefly stated. In Darwinian terms, there is a need to be able to feed and to keep a look out for predators at one and the same time. This requires the bringing to bear of diametrically opposed types of attention to the world simultaneously: one, narrow-beam, sharply focussed, fragmentary, already committed to its object; the other, broad, open, sustained, vigilant and uncommitted as to what it might find. This is a difficult feat. The solution adopted by all reptiles, birds, fish, and mammals so far studied is a divided brain, in which the two halves remain sufficiently distinct to function independently, but sufficiently connected to function in concert. This is also, unsurprisingly, the case in humans, where the evidence is that the left hemisphere (LH) tends to yield the first type of attention, and the right hemisphere (RH) the second (e.g., van Zomeren & Brouwer, 1994).

Since the nature of attention, the way in which we attend, governs the nature of the world that *comes* to attention, and since each hemisphere on its own is capable of yielding a coherent experiential world, two radically different types of attention should lead to two radically different experiential worlds, with different qualities, goals and values. Evidence from a wealth of sources, including brain insults (traumatic injury, stroke, tumor, etc.), neuropsychological experiments in normal and post-commissurotomy subjects, and brain imaging in a range of modalities suggests that this is indeed the case. (I should say, at this point, that I am aware that a hemisphere on its own cannot be said to do what only a person can do: "believe," "intend," "decide," "like," and so on. These and similar formulations should be understood as avoiding the repetition of such cumbersome locutions as "a subject relying on the cognitive faculties of the left [or right] hemisphere believes," etc.)

Some of the headline differences, presented very much in shorthand form for present purposes, are

1. The LH is concerned with manipulation of the environment; the RH is concerned with understanding the environment as a whole and how to relate to it (e.g., Desmedt, 1977; Gitelman et al., 1996; Goebel et al., 1997).

2. The RH is better at detecting and dealing with novel stimuli, whatever the modality; as they become more familiar they are processed by the LH (Goldberg & Costa, 1981). The RH deals with information from the periphery or background; the LH deals preferentially with what is central and in the foreground (Ellis, Jordan, & Sullivan, 2006; Schutz, 2005).
3. The LH aims to narrow things down to a certainty, while the RH opens them up into possibility. The RH is able to sustain ambiguity and the holding together of information that appears to have contrary implications, without having to make an "either/or" decision, and to collapse it, as the LH tends to do, into a certainty (e.g., Brownell, Simpson, Bihrle, Potter, & Gardner, 1990; Richards & Chiarello, 1997; Tucker & Williamson, 1984). VS Ramachandran calls the RH the "devil's advocate" (Ramachandran, 1994), since it acts as an "anomaly detector," on the look-out for what might be erroneously assumed by the LH to be familiar. Indeed, its style is altogether more tentative (Cutting, 1997; Gazzaniga & LeDoux, 1978).
4. The LH tends to see things as isolated, discrete, fragmentary, where the RH tends to see things as interconnected wholes (e.g., Navon, 1977; Nebes, 1978; Tucker, 1992; Zaidel, 1985).
5. The LH's world tends towards fixity, and stasis, whereas that of the RH tends towards change and flow (Bender, Feldman, & Sobin, 1968; Corballis, 1996; Corballis, Boyd, Schulze, & Rutherford, 1998; Ritsema & Murphy, 2007; Schwartz, Assal, Valenza, Seghier, & Vuilleumier, 2005). All things animate and inanimate—molecules, crystals, cells, cultures and human societies—depend on a proper balance of these properties.
6. The LH tends to see things as put together mechanically from pieces, and sees the parts, rather than the complex whole that the RH sees (Anderson, 1990; Bradshaw & Nettleton, 1981, 1983; Gainotti, 2000; Hécaen & de Ajuriaguerra, 1952).
7. Machines and tools are alone coded in the LH (Gainotti, 2002), and the inanimate is preferentially coded in the LH, while the animate is coded by both hemispheres, though preferentially by the RH (Price & Friston, 2002).
8. The LH tends to see things as explicit and decontextualized, whereas the RH tends to see them as implicit and embedded in a context (Alexander, Benson, & Stuss, 1989; Federmeier & Kutas, 1999; Heilman, Scholes, & Watson, 1975; Kinsbourne, 1988). The LH fails to understand metaphor, myth, irony, tone of voice, jokes and poetry, and takes meaning literally (Anaki, Faust, & Kravetz, 1988a, 1988b; Kaplan, Brownell, Jacobs, & Gardner, 1990; Shamay-Tsoory, Tomer, & Aharon-Peretz, 2005; Shammi & Stuss, 1999; Winner & Gardner, 1977).
9. The RH understands narrative (Hough, 1990; Schneiderman, Murasugi, & Saddy, 1992): the LH, if offered a story whose episodes are taken out of order, will regroup them so as to classify similar episodes together, rather than reconstruct them in the order that has human meaning (McNeill, 1992, pp. 345–52).
10. Both hemispheres need to categorize, but do so according to different strategies. The LH tends to categorize using the presence or absence of a particular feature; the RH tends to do so by reference to unique exemplars, using a "family resemblance" (Wittgenstein, 1967) approach (Burgund & Marsolek, 2000; Laeng, Zarrinpar, & Kosslyn, 2003). Superordinate (more general) categories are dealt with preferentially by the LH, subordinate (more fine-grained) categories by the RH (Grossman, 1981; Laeng et al., 2003). Damage to the RH can lead to a loss of the sense of uniqueness or the capacity to recognize individuals (e.g., Cutting, 1997).
11. The RH contains the body image (not just a visual image, but a multimodal schema of the body as a whole) (Joseph, 1988). The RH has richer connections with the limbic system, the hypothalamic–pituitary–adrenal axis and the body generally, and tends to process in a more embodied, less abstract fashion than the LH (e.g., Spence, Shapiro, & Zaidel, 1996; Yokoyama, Jennings, Ackles, Hood, & Boller, 1987). It is also superior at reading body language and emotion expressed in the face or voice (e.g., Blonder, Bowers, & Heilman, 1991; Narumoto, Okada, Sadato, Fukui, & Yonekura, 2001).
12. The LH is superior for fine analytic sequencing and has a larger vocabulary and more complex syntax than the RH (Querné, Eustache, & Faure, 2000). Pragmatics, the ability to understand the

overall import of an utterance in context, is a RH function (e.g., Foldi, 1987). Understanding prosody, the musical aspect of language, its tone, inflection, etc., depends, like music itself to a very large extent, on the RH (Blonder et al., 1991).

13. The RH is essential for "theory of mind" (e.g., Happé, Brownell, & Winner, 1999; McCabe, Houser, Ryan, Smith, & Trouard, 2001; Stone, Baron-Cohen, Calder, Keane, & Young, 2003). It is better able to understand an other's point of view, and to empathize (Decety & Chaminade, 2003; Drake & Bingham, 1985). It makes moral judgments on the basis of the intention of the doer, the LH on the basis of the consequences of the deed. The LH tends to utilitarianism, the RH to deontology (Miller et al., 2010; Young, Camprodon, Hauser, Pascual-Leone, & Saxe, 2010).
14. In general terms, both emotional receptivity (e.g., Borod et al., 1990; Suberi & McKeever, 1977) and expressivity (eg Sackeim et al., 1982) are greater in the RH.
15. The sense of beauty is preponderantly dependent on the RH (Di Dio, Macaluso, & Rizzolatti, 2007; Habib, 1986; Nadal, Munar, Capó, Rosselló, & Cela-Conde, 2008; Vartanian & Goel, 2004).
16. The RH is better at seeing things as they are preconceptually—fresh, unique, embodied and as they "presence" (Heidegger, *anwesen*) to us. The left, then, sees things as they are "re-presented," literally "present again" after the fact, as already familiar abstractions or signs (Bellugi, Poizner, & Klima, 1983; Goldberg, 2001; Goldberg & Costa, 1981). In a sense, the LH is the hemisphere of theory, the RH that of experience; the LH that of the map, the RH that of the terrain.
17. The LH is, unreasonably optimistic, and it lacks insight into its limitations (Drake & Bingham, 1985; Schacter, Glisky, & McGlynn, 1990; Schutz, 2005; Stuss, 1991). The RH is more realistic, but tends towards the pessimistic.

These could be understood (as seen by the LH) as 17 separate distinctions. But they are in fact (and as the RH would see them) just an arbitrary number of attempts to give different sidelights on two distinct, self-coherent versions of the world.

In one (the LH version), as in a map, things are simplified. Here there are familiar, reliable, clear, certain, static, isolated, fragmentary elements that can be manipulated easily, are decontextualized, abstracted, detached, disembodied, mechanical, relatively uncomplicated by issues of beauty and morality (except in a consequentialist sense) and relatively untroubled by the complexity of empathy, emotion and human significance. They are put together, like brick on brick to build a wall, so as to reach conclusions that are taken to be unimpeachable. There is an excess of confidence and a lack of insight. This world is useful for purposes of manipulation, but is not a helpful guide to understanding the nature of the underlying reality. Its use is local and for the short-term.

In the other (the RH version), which is truer to the world revealed to us by physics, by poetry and simply by the business of living, things are almost infinitely more complex. Nothing is clearly the same as anything else. All is tentative, uncertain, provisional, and complexly interconnected with everything else. Nothing is ever static, detached from our awareness of it, or disembodied, and everything needs to be understood in context, where, if it is not to be denatured, it must remain implicit. Here, wholes are more than the sum of the parts, and beauty and morality, along with empathy and emotional depth, help us to intuit meaning that lies beyond the banality of the familiar and everyday. The overall timbre is sober and tentative. This world is truer to what is, but is harder to comprehend and to express in language, and less useful for practical issues that are local and short-term. On the other hand, for a broader or longer-term understanding it is essential.

Clearly under normal circumstances we are not aware that the world we experience is a synthesis of these two phenomenological versions or "takes." However, it is not just under artificial, experimental conditions, or in illness or injury, that their existence becomes apparent. Every attempt to reflect on life, understand the world or convey its true nature in language—in other words, every project of philosophy or theology—is an attempt to reconcile fundamentally incompatible models

of the world, each of which can claim to reveal aspects of underlying reality. These attempts can, I suggest, be illuminated by an awareness of the conflicting models of the world yielded by the two hemispheres of our brains.

2. Implications of right hemisphere phenomenology for the religious life

I will deal with the implications under three (inevitably, artificially distinct) headings: metaphysical issues, those concerned with the nature of reality; epistemological issues, those concerned with how we approach an understanding of that reality; and what one might call, very broadly, ethical issues, consequences for the way we are disposed towards, and act in, the world.

A. Foundational or metaphysical issues

1. The "Other"
2. "Betweenness"
3. Paradox
4. Causation
5. Embodiment

1. The "Other"

I begin with this, and a consideration of what I have chosen to call "betweenness," because, although metaphysical issues, they are also foundational for considerations of epistemology and ethics.

Whatever else the divine may be, it is different in kind from everyday objects of experience, even if it may be seen as manifesting in those objects. It is not clear, known and familiar in the same sense that, say, a table is. It is intrinsically "Other," not limited by the conceptions or words we bring to bear on it. Indeed, in some traditions it is precisely that which cannot be grasped by our thinking faculty or expressed in language, and that which *can* be so grasped or expressed is by definition not the divine. Compare the "tao that can be named is not the eternal tao" of Lao Tzu, the "*si comprehendis, non est Deus*" ["if you have understood, it is not God (that you have understood)"] of St Augustine, and, in more general terms, the apophatic tradition or *via negativa* in Christian and other theologies.

Research suggests that all new experience of whatever kind—whether it be of music, words, real-life objects, or imaginary constructs—preferentially engages the RH, not the LH. In this sense "new" includes everything that is not already represented as familiar. As and when it is seen as familiar, it begins to engage the LH. Since the RH is vigilant for whatever it is that exists "out there," it alone can help us to apprehend something other than what we already know. The LH is more efficient in routine situations where things are predictable, but less efficient than the RH wherever the initial assumptions have to be revised. The referents of the LH are clear, known and familiar by contrast with those of the RH.

The world made available by the LH appears to be hermetic. Elegant research reveals that the LH sees truth as internal consistency within a system, even when this demands acceptance of what from experience cannot be the case (Deglin & Kinsbourne, 1996). By contrast the RH privileges truth to experience. The RH's world is open, since the attention which grounds it is vigilant and alert for whatever might be, as far as possible without presupposition. The approach of the RH is more receptive. In relation to an apprehension of the divine, it is more capable of what Keats called "negative capability," the disposition of the creative mind, which he felt Shakespeare possessed in the greatest measure, "that is when man is capable of being in uncertainties, mysteries, doubts, without any irritable reaching after fact and reason."

Research has repeatedly and dramatically shown that highly focussed attention, the type offered by the LH, makes us incapable of seeing even the most glaring elements of our environment if they are not immediately relevant to the task in hand, or do not fit our expectations (e.g., Simons & Chabris, 1999). The LH is thus relatively incapable of the tentative, "care-ful" (Heidegger, *fürsorgend*), reaching out towards what lies beyond what we think we already know. This is true whether one thinks of the Other as God, or merely as all else that exists. If intimations of its nature are inevitably implicit, and cannot be made explicit, the LH will not be capable of detecting or interpreting them.

2. "Betweenness"

If we adopt a LH approach to the structure of the world, we look narrowly. Analytic discourse aims to break things down into constituent parts, clarify what the parts are "in themselves," and reconstitute the entity in question by putting the bits together again. While this helps to understand a man-made entity such as a machine—since a machine is put together in the way this mode of understanding aims to simulate—it works only in a limited, and potentially misleading, way for organic entities where there are no separable elements, and where such elements as can be identified are not best understood in isolation.

In the world according to the RH, there is not a collection of things, pre-existing their relationship. There are, it seems, primarily relationships, since entities become what they are only through their situation in a context. All entities are essentially interconnected, changing, flowing, ungraspable. This corresponds to the nature of music, in which single notes have in and of themselves no meaning, nor do the gaps between the notes (in time) that create the melody, nor the gaps between them (at a moment in time) which create the harmony, yet the whole piece when heard is pregnant with meaning. It also reflects the reality of modern physics, where particles change their nature with context, are ultimately entangled, resist precise measurement, and in combination give rise to phenomena with qualities nowhere discoverable in the constituent parts. In neither music nor physics can space be considered "empty." Indeed, the idea of relationship could be reformulated as what I call "betweenness"—not the relative positions of A and B, nor what exists "in the space between" A and B, not even A and B *and* this "space" taken together, but all this *together with the something entirely new that inevitably emerges from their conjunction*. These ideas are reflected in the Hegelian idea of synthetic sublation (*Aufhebung*).

Although this is primarily a metaphysical issue, it has clear epistemological and ethical implications. It means that the attempt to isolate entities to see what they in themselves "really" are will not succeed. It emphasizes that meaning arises from a whole context, and that making something explicit changes the nature of the entity, by artificially isolating and foregrounding it: thus poetry, metaphor, ritual and humor (as well as experiences such as erotic love) lose their meaning when paraphrased, "explained" or put under the spotlight of attention. Indirect or implicit means are more likely than direct or explicit means to succeed where religious truth is involved, for the same reason that such implicit means are required by art: the need to reach beyond the banal to which ordinary explicit language constantly returns us ("Compared with music all communication by words is shameless; words dilute and brutalise; words depersonalise; words make the uncommon common": Nietzsche, 1968).

If, as in the world made available by the RH, nothing is ever repeated or precisely the same as anything else, all is unique and fresh. Creativity is part of the nature of this world—not an occasional, or originating, act, but at the core of all existence. And, everything being essentially new and unique, it is better understood by the RH and by its preferred (indirect) means of understanding—narrative, metaphor, myth—than explicit means such as analytic discourse, which cannot deal with the unique, and return us to the familiar and general.

Similarly, if, as in the world made available by the RH, all is connected, the observer, too, is connected to what he or she observes. The act of observation plays a part in the construction of reality. For this reason alone, there are ethical consequences to every one of our actions or imaginings: it is a

demonstrable fact that just thinking about certain topics, situations or types of people can alter our judgments and our behavior, making us more like the object of our imagining (e.g., Dijksterhuis & van Knippenberg, 1998; Pendry & Carrick, 2001). We are co-creators of ourselves and of "whatever-it-is-that-exists-apart-from-ourselves."

Further, if we are literally connected to everything else, although we are entitled to see ourselves as individuals—much as there are sub-atomic particles—we are equally inseparable from others. As particles will sometimes behave independently, and sometimes as part of patterns or forms greater than themselves (eg, waves), so we can see ourselves as partly individual and partly subsumed into a greater whole for which we have responsibility—suggesting a calling and "re-sponding," a two-way, reverberative, rather than unidirectional and linear, process.

3. Paradox

The RH is more capable of holding together apparently conflicting positions (as the LH would see them), more at ease with ambiguity and conflicting interpretations. It is thus less susceptible to the need to determine truth in an "either/or" fashion. Such ambiguities and "conflicts" of meaning or reasoning lie at the core of the mystical tradition, which is famously reliant on paradox to convey truths that transcend our everyday understanding.

In addition, paradox is often the consequence of bringing the LH's version of the world into sharp contrast with that of the RH. As will be apparent from the Introduction to this paper, these versions are according to our normal way of thinking incompossible (e.g., a thing cannot be both static and in motion, separate and connected, divisible and indivisible, precisely measurable and intrinsically imprecise, at the same time). However, one way of seeing the sorites paradox, the ship of Theseus paradox, the growing paradox, Achilles and the tortoise, the dichotomy paradox, the arrow paradox and many others is that they turn on a conflict of precisely this nature, between the mode of apprehension of the LH and that of the RH—in particular, whether the whole is merely the sum of its parts, as the LH sees it, or, as the RH sees it, a *Gestalt* in its own right. Others, such as the Cretan liar paradox, depend on the LH failing to take into account contextual framing, and relying on an inappropriate (because self-defeating) demand for inflexibility in the pragmatics of utterance.

The nature of mystical truths is that they refer to that area lying outside the familiar and everyday where the LH view is by its nature least reliable. But all truths of a metaphysical kind, concerning "the way things are," will be best understood by the RH, the one that is turned outwards on the world for apprehension of whatever might be, and is less likely to ignore—simply not see—whatever does not fit the paradigm it already holds.

4. Causation

The RH processes in parallel and as a whole rather than, as the LH does, serially and by parts. Hume's attack on the idea of causation, and his substitution of the idea of conjunction, may represent a recognition of the RH's non-linear way of understanding, in which things are related when they co-occur without necessarily implying causation. For example, classical conditioning posits that a stimulus (ringing a bell, previously associated with the provision of food) produces a "conditioned response" in Pavlov's dog (salivation). This is thought of as a linear process, the arrow hitting its target. Thus the dog is reduced to a machine. But a slightly different way of thinking of this would be that there is a context to everything, context being a circular, concentric concept, rather than a linear one. If one imagines Pavlov's dog, in a different experiment, having repeated experience of the bell being rung some time after it has started eating, rather than just before it gets food, one would have to say that, when the dog hears the bell in the absence of food, it experiences an association (a mini-context) in which these two events tend to co-occur. It would have as much reason to start to salivate when it heard the bell, but in doing so it would appear less mechanical, less as though its behavior were *caused* by the bell. The dog is reduced to a mechanism by the

temporal sequencing, an essential part of the concept of causation, and by the stripping away of the context to focus on a sequence.

Equally constraints are not the same as causes. Understanding the structure of the brain and how it functions can help us see the *constraints* on experience, much as the banks of a river constrain its flow and are integral to its being a river at all, without themselves being sufficient to cause the river, or being themselves the river, or explaining it away. All experience in this life as we know it (and this applies whether we conceive the brain as the originator, or as a transducer, of consciousness) comes to us through the brain, and is therefore inevitably constrained, and shaped, by it. This is most obvious to us through there being many elements of our environment—certain pitches of sound, certain wavelengths of light, for example—that, though detectable by the brains of other animals, are not detectable by ours. It also becomes obvious when, through some stroke, injury or other brain insult, aspects of normal experience disappear from the subject's world. But it does not make the brain causative.

The attempt to decide whether changes in the brain cause changes in consciousness or changes in consciousness cause changes in the brain may be mistaken. It does not have to be either, much as the movement of water does not "cause" the wave, nor the wave "cause" the movement of water. Serial processing introduces a question of temporality which may, however, reflect an aspect of the model, rather than of the underlying reality the model is designed to illuminate.

5. Embodiment

As Merleau-Ponty suggested, and as Lakoff & Johnson have more recently emphasized (Lakoff & Johnson, 1999), everything we know is embodied and cannot be abstracted without distorting its essential nature. That spirit and body are not distinct, or opposed, but discernibly different aspects of the same being, is expressed in many traditions through embodied spiritual practices, such as meditation and prayer in conjunction with the assumption of bodily postures. It is also implicit in the existence of holy places, such as shrines, and in holy objects, such as icons. Above all, ritual, which is common to perhaps all religions, is the enactment of embodied metaphor. This does not deny that many traditions, and perhaps particularly the Christian tradition, have had an ambivalence towards the body: the doctrines of incarnation and resurrection of the body appear to assert the inseparability of soul and body, while ascetics (of all traditions, but perhaps particularly of the Christian tradition) have emphasized the abject nature of the flesh.

The RH is more united with the body than the LH in at least four respects. First, the LH abstracts (from context), and the body is the context of our mental world. What is present in all its embodiment to the RH becomes a re-presentation, a relatively abstract sign, in the LH. Second, the body image, which is not a static visual image, but a kinaesthetic image in all sensory modalities, lies in the RH. The LH has no such image. Third, in the RH there are richer and more profuse connections between the cortex and the limbic system, the part of the brain that "processes" emotion (which is itself intrinsically an embodied experience), and the hypothalamic–pituitary–adrenal axis, which governs autonomic activity throughout the body. Fourth, the RH is more adept at reading embodied expression, whether in the prosody of speech, or in the face, or in the body as a whole.

Summary

The divine is by definition something "Other." Contemporary physics confirms the understanding of the world that has been central to the humanities for centuries, and is enshrined in many of the world's cosmologies—that, however we may usefully distinguish entities ("The 10,000 things"), everything is connected ("All is one"). It also confirms that ultimate reality is paradoxical, as, again, the humanities and the great spiritual traditions of the world affirm. Causation may be an illusion of a certain way of thinking about the world in time. All experience—even the most abstract of thinking—is embodied in nature, and nothing can be separated from its material context without

distorting its nature. In all these respects, the RH is more capable of apprehending the nature of the world and the possible role of the divine in it than is the LH.

B. Epistemological issues

1. Knowledge, belief and truth
2. The implicit and mythos v the explicit and logos
3. Meditation and mindfulness
4. Negation
5. "Active passivity"

1. Knowledge, belief and truth

Since the nature of the world that is brought into being by LH attention is different from that brought into being by RH attention, the type of knowledge favored by each hemisphere also differs. The LH "knows" the world in a way that is most appropriate to the non-living: it amasses "pieces" of information, which are relatively general, impersonal, fixed, certain and the product of a disengaged stance. The RH "knows" the world in a way more appropriate to living beings: it recognizes unique individuals, resists generalization, and its knowledge is personal, comes from experience, depends on betweenness (an encounter), is relatively unfixed and uncertain, and harder to capture in language. Here the whole is not best understood by summing the parts. With the notable exception of English, this distinction between two kinds of knowing is generally enshrined in the language: for example, in French *savoir/connaître*, in German *wissen/kennen*.

The distinction could also be seen as that between propositional knowledge and knowledge by encounter. Belief is also subject to such a distinction. Nowadays belief is often viewed as simply a feeble form of knowing, as in "I believe (but am not certain that) the train leaves at 6.13." But this has not always been the case. Belief is historically not a matter of cognition, but of recognition. The word comes from the same root as the word "love," a sense preserved in the now archaic word "lief," familiar to us from Shakespeare, with which one once described one's friend, sweetheart, or lord—someone in whom one believed. Similar considerations apply to the German *glauben* (related to *lieben*, to love), and to the French *croire* and other derivatives of Latin *credere*, a word which meant originally to "entrust to the care of" (the sense lingers, in reduced fashion, in the idea of "credit"). Belief is about a relationship, in which by definition, more than one party is involved. The believer needs to be disposed to love, but the believed-in needs to inspire another's belief. Whether this amounts to being worthy of that belief cannot be fully determined in advance. It emerges through commitment and experience.

Belief does imply truth, but historically truth was no more propositional than belief. The word "true" brings us to an encounter, a relationship: like the German *treu* (faithful), with which it is cognate, it is related to "trust," and is fundamentally a matter of what one trusts or believes. The Latin word *verum* (true) is cognate with a Sanskrit word meaning to choose or believe: like one's loved one, the one in whom one chooses to believe and place one's trust, to whom one is true. We still speak of two surfaces that "marry" well as being true. Fidelity is implicit in the concept.

Etymology maps the slippage of thought. What it shows in this case is three revealing shifts. First, the words "truth" and "belief" used to describe a reverberative or two-directional relationship, in which each party is "re-sponsible" for the fit. Truth and belief are no longer relational, but have become propositional. The causation is no longer distributed, but linear. Second, it suggests that truth and belief used to be embodied actions or processes, involving commitment, not (as they are now conceived) detached, disembodied "things." Third, as processes, truth and belief derived their value from the context, could never be absolute, and were never single or static. The idea of truth as independent of us, immutable and certain, is a recent invention.

It will be recognized from the above that the shift has been one from RH understanding of knowledge, belief and truth, towards, in each case, that of the LH. However, this shift may not have served us well in some respects. It may be that an understanding that enables evaluation of knowledge, belief or truth cannot always be achieved by simply sitting back and waiting passively for information to accumulate, since some truths become understandable only when we have made a move to meet them. They are incremental and come with experience. There are good reasons to suppose that this is the case in approaching the divine.

2. The implicit and mythos v the explicit and logos

In the Greek world, a linguistic distinction was also made between different kinds of truth, *mythos* and *logos*. *Mythos* did not have the negative connotations associated with our word "myth," suggesting untruth, but was seen as indeed the only way of accessing certain kinds of truth about the world. *Logos,* equivalent to reason in the broadest possible sense, could serve some purposes, but not others. This understanding has been partially recaptured in certain streams of modern philosophy, with an awareness that knowledge cannot get behind or beyond the models or metaphors which it chooses to employ, and that models or metaphors are intrinsic to all understanding, including those for which the greatest claims of objectivity can be made. Models and metaphors are an expression of *mythos*, and both ground the reasoning process at the most fundamental level and enable an understanding of it in context at the highest level. Far from being dispensable, or, worse, misleading, they are the foundations of all knowledge.

Where the RH can see that metaphor is the only way to preserve the link between language and the world it refers to, the LH sees it either as a lie (Locke, expressing Enlightenment disdain, called metaphors "perfect cheats": Locke, 1690/1849, III, x, §34) or as a distracting ornament; and connotation as a limitation, since in the interests of certainty the LH prefers single meanings.

The RH does not have to collapse experience quickly to the familiar. It can allow the intuited and implicit to lead us out of what I (2009) have called "the hall of mirrors" of the LH (a reference to its self-referring, hermetic nature). The RH understands metaphor, myth, narrative, music and poetry, faculties that are grossly impaired in people with RH damage. The richness of these implicit paths to knowledge, which also include drama and ritual, opens up an understanding of whatever cannot be explicitly stated without violence to its subject. Such means are essential to conveying religious truth.

3. Meditation and mindfulness

Meditation and mindfulness are practices that engage mind and body with the purpose of altering awareness. One shared aim of most such practices is to still the constant stream of inner discourse and judgment *about* experience (known in the Buddhist tradition as *xinyuan* or *shin'en*, usually translated as "monkey mind") and achieve a direct awareness of experience itself. Stilling the process of verbalizing and conscious judgment would require engagement of the LH, particularly the left frontal cortex, both in order to inhibit posterior cortex in the same hemisphere engaged in language processing and conscious judgment formation, and to lock focussed attention to a single target, in such a way as to prevent it engaging in the examination of experience. (I am reminded of T.S. Eliot's remark that the surface "meaning" of a poem is like the meat that the burglar tosses the dog, while he gets on with burgling the house: Eliot, 1975). The achievement of blissful states would be accompanied by increased activation of the left frontal pole, which has a strong association with positive emotional states. On the other hand, sustaining attention, whether narrow or broad in focus, requires recruiting RH vigilance; compassion meditation requires engagement of the right frontal cortex; and mindfulness, an attempt to encounter experience behind and beyond verbalization and conceptualization, should also engage widely distributed networks principally in the RH. Thus one would expect to see both hemispheres engaged in meditation, although the desired state of mind involves opening up to the RH's way of being.

These predictions are broadly in keeping with findings on scanning (Berkovich-Ohana, Glicksohn, & Goldstein, 2012, 2014; Hölzel et al., 2007; Hölzel, Carmody, et al., 2011; Hölzel, Lazar, 2011; Leung et al., 2013; Luders et al., 2012; Thomas, Jamieson, & Cohen, 2014)

However, imaging meditation is associated with a number of methodological problems. As suggested above, much of the brain activity which is detected is likely to be inhibitory, rather than facilitatory, in nature. Areas in either hemisphere associated with internal monitoring, irrespective of the task, will also tend to be active. Moreover, the more practiced the meditator, the less key brain areas involved will appear to be active, since metabolism is a measure of effort, proportionate to the difficulty of the task, and the easier the task becomes, the less effort is required. And there are inevitable contextual differences in meditating while being monitored, and being aware of being monitored (not least because of the apparatus involved in doing the measurement), which distinguish it from meditation under normal conditions.

At the level of phenomenology, meditation and mindfulness succeed primarily by freeing RH consciousness from LH processing. The one exception to this is "blissful mind" meditation, which one would expect to cause excitation of the left frontal pole, known to be associated with "positive" emotion (Newberg, d'Aquili, & Rause, 2001). Research by Newberg and colleagues underlines that this excitation of the left frontal pole is strongly correlated with suppression of the superior parietal region in the same hemisphere (Newberg, Alavi, et al., 2001; Newberg, Pourdehnad, Alavi, & d'Aquili, 2003). In relation to this, it is a possibility that, since meditation of all kinds depends on stilling the normal verbalizing activity of the left posterior cortex, the blissful state achieved by some meditators is an (initially incidental) consequence of learning how maximally to recruit the left frontal pole.

4. Negation

A constant feature of all mystical traditions is an emphasis on the creative power of silence and stillness. Value is placed on emptiness, non-doing, unknowing and receptivity, as opposed to knowing, willing and acting. This openness to what is, without will or need to act, is more characteristic of the mode of attention to the world of the RH than the LH, whose nature is to establish, as far as possible, certainties and to will purposive action.

It is also part of most religious traditions that negation can be creative. As Sherrington pointed out, fine sensorimotor control is made possible by pairs of what he called "opponent processors" (Sherrington, 1906). Essentially a relationship of co-operative opposition allows each "opponent processor" to inhibit the other in the interests of achieving finely-tuned outcomes. Kinsbourne has suggested that brain function, too, can be seen as depending on three pairs of opponent processors: the frontal lobes in equilibrium with the posterior cortex; the cortex with subcortical regions; and each hemisphere with the other (Kinsbourne, 1988). The frontal cortex's main function is to inhibit posterior cortex, principally that of the same hemisphere; out of this much that is distinctively human arises.

The Greek word for truth *aletheia* means an "un-covering" or "dis-closure" (Heidegger), therefore an "opening up" or "dis-covery," of something pre-existing that was obscured but now reveals itself. The creative act, in the sense that it achieves contact with the Other, rather than simply re-arranges what is already known, is, like sculpture, a clearing away of something in order that something else may be revealed. It is not achieved by a process of linear augmentation, putting something together piece by piece, as one builds a wall. In Spinoza's phrase, *determinatio negatio est*, a phrase later taken up by Hegel as *omnis determinatio est negatio* ("all determination is negation"): making something more precisely what it is demands the exclusion of whatever is extraneous to it.

The central nervous system models this at several levels. At the most basic, the brain is shaped by a process of neuronal "pruning" that begins before birth. Neuronal loss is as important for proper functioning as axonal growth. At a later stage some possible pathways are strengthened at the expense of others which become harder to activate. At the level of conscious awareness, the

phenomenological world is inevitably brought about through progressive selective attention to an abundance of stimuli, first through a filtering at the level of preconscious awareness, where the RH plays a primary role (it preferentially processes new and unfamiliar experience), and then by the further restriction involved in focussing on salient stimuli by the LH.

The emphasis in spiritual traditions on "emptying out" and "unknowing," on the illusory nature of what is most easily grasped, could be seen as resisting the LH process of closing down to a familiar certainty and recruiting the RH tendency to open up to an unfamiliar possibility, a determination against determinations. Stillness and silence become not just absences, but rich potential spaces for something that otherwise would be excluded. In this respect it is interesting that in the Lurianic Kabbalah the first act of creation by *Einsof*, the primary Being, is known as *tzimtzum*, or "withdrawal," in order to permit something else to come into being. The Buddhist saying that "the greatest prayer is patience" places letting go, reticence, withholding judgment and acceptance ahead of striving, judging and knowing, at the core of spiritual wisdom. In as much as the LH is the locus of conscious control and manipulation, and the RH the locus of openness to what is, this suggests the primacy of RH modes of attention in the spiritual life.

5. "Active passivity"

The "emptiness" referred to, or *sunyata* (the word comes from a Sanskrit root *sva* which indicates the hollowness of a ripening seed), the non-doing and the unknowing are not simply vacuity, passivity and ignorance, but contain within themselves the potential of their opposite poles, fullness, action, and knowing. A development of this idea, which is familiar within the mystical tradition, is also found outside it, as "active passivity," a concept that in different ways is central to both the poetry of Wordsworth (who referred to "wise passiveness") and the philosophy of Heidegger. In the opening of Book XII of his long poem *The Prelude*, Wordsworth describes how inspiration requires both the effort by which the mind "aspires, grasps, struggles, wishes, craves" and the stillness of the mind which "fits him to receive it, when unsought." Note that despite the necessity of effort, inspiration still only comes when unsought. In this it is like the conscious attempt to remember, whereby we struggle to recapture, say, a name, which only later comes unbidden once we cease to make the effort. De Quincey tells a story of Wordsworth, during the time of the Peninsular War, walking out at night to meet the mail coach from Keswick that would bring eagerly awaited news (De Quincey, 1851). Lying full stretch on the road so that he could put his ear to it and pick up the distant rumbling that would indicate the approach of the mail, his eye happened to chance on a bright star glittering between the brow of Seat Sandal and Helvellyn, and struck him suddenly "with a pathos and a sense of the infinite, that would not have arrested me under other circumstances." The vision comes because of an effort made and then relaxed. It is as if explicit intention to the star would have obscured Wordsworth's sight, the object falling on the blind spot at the center of the field of vision, and it was only when his intention was strongly fixated on something else that he could see things as they really are.

Narrowly focussed attention is the province of the LH, and an increase in stress, fear and excitement actually inhibits the spread of neuronal recruitment in a manner that favors this very closely targeted kind of attention within the LH (Corbetta, Miezin, Dobmeyer, Shulman, & Petersen, 1991). This is the explanation of the "tip of the tongue" phenomenon: the word only comes when LH effortfulness ceases. Yet while the LH is preoccupied with its quarry, like Eliot's dog with its meat, the RH is actually freed, its vigilance also in a state of enhancement, to see the scene afresh, once more authentic, not overlaid by the familiarity that the LH would normally bring to the scene. Attending in LH mode to the scene in front of him, Wordsworth would have been compelled to pre-digest it, so to speak, into another picturesque scene of mountains, lakes or starry skies. The initial effort of close attention is needed, but, its work done, it must give way to an open receptivity, a sort of active passivity.

The stance, or disposition, that we need to adopt for reality to disclose itself is not just an attitude of "waiting for," according to Heidegger, but one of "waiting on" (*nachdenken*) whatever it is; a

patient, respectful nurturing of something into disclosure, in which we need already to have some idea of what it is that will be. George Steiner compares it to "that 'bending toward' of spirit and intellect and ear" to be seen in Fra Angelico's Annunciation in San Marco. A highly active passivity, in other words. There is a process of responsiveness between man (*Dasein*, literally "being there," or perhaps "the being that is in the world") and Being, which is well described by George Steiner in a key passage of his book on Heidegger (Steiner, 1978):

> An *Ent-sprechen* is not "an answer to" (*une réponse à*), but a "response to", a "corre- spondence with", a dynamic reciprocity and matching such as occur when gears, both in quick motion, mesh. Thus, our question as to the nature of philosophy calls not for an answer in the sense of a textbook definition or formulation, be it Platonic, Cartesian, or Lockeian, but for an *Ent-sprechung*, a response, a vital echo, a "re-sponsion" in the liturgical sense of participatory engagement … For Descartes, truth is determined and validated by certainty. Certainty, in turn, is located in the *ego*. The self becomes the hub of reality and relates to the world outside itself in an exploratory, necessarily exploitative, way. As knower and user, the *ego* is predator. For Heidegger, on the contrary, the human person and self-consciousness are *not* the centre, the assessors of existence. Man is only a privileged listener and respondent to existence. The vital relation to otherness is not, as for Cartesian and positivist rationalism, one of "grasping" and pragmatic use. It is a relation of audition. We are trying "to listen to the voice of Being". It is, or ought to be, a relation of extreme responsibility, custodianship, answerability to and for.

Openness to Being provides the space in which creation happens. We can't make it happen, but our "ad-tention" is required, whereby we reach out to partake in, and shape its happening.

Summary

From the consideration of metaphysical issues in section A above, some epistemological issues are already raised. A world characterized by "betweenness," and in which paradox cannot at times be avoided, will not be best understood by a process of analysis. Serial processing leads to possibly artefactual issues of causation, artefactual because the necessity of temporal priority may be only apparent when issues that by their nature may lie outside of time are approached in linear fashion. Something that is by definition "Other" will not be best approached by LH attention, which tends to reduce objects of attention to familiar categories, and is relatively impervious to the essentially new and unfamiliar. Given that implicit knowledge is best conveyed in embodied, rather than abstract, form, religious practices will succeed best when they do not eschew embodiment: hence the importance of ritual itself, and the place of bodily posture in it; the place of poetic language and music within ritual (every known culture uses music to communicate with the supernatural, with whatever is by definition above, beyond, "Other than," our selves); and the presence of holy places and holy objects (icons or relics). All of these can become targets of reforming zeal within extreme Protestantism and Islam. Added to this, from section B, it is apparent that the more ancient understandings of knowledge, belief, and truth, as dispositional rather than as propositional, are more likely to succeed in giving an account of religious experience, and that such knowledge, beliefs, and truths will be inadequately conveyed if narratives, metaphors, myths, poetry, music, and ritual are not central to the process. Furthermore, attempts to understand religious truths by indirect, potentially paradoxical, modes associated with the RH are more likely to be successful than the direct mode of approach more typical of LH discourse.

C. Ethical issues

1. The self
2. Necessary vulnerability
3. The dark side
4. Growth through suffering
5. Healing

1. The self

"Betweenness" suggests that the atomistic idea of the self may be an illusion. Our selfhood may be inseparable from the society of other beings from which it is derived, through which it is enacted, and to whom it returns. When the boundary between self and other is more permeable, acts that look to the ego like acts of self-sacrifice, espoused purely for the benefit of others, become more like the necessary responses of a healthy organism. In a more direct sense still, a disposition of forgiveness, acceptance, and patience, and the associated self-forgetting, leads (to the perplexity of a more rationalist calculus) to self-fulfilment and peace. Nonetheless, by a further twist of paradox (as it may seem to the goal-orientated approach of the LH), if espoused instrumentally for that reason alone, they will fail to do so. The difference of the *type* of attention (instrumental v relational), and the *plane of focus* of the attention (self v Other) make all the difference, leading not just to different conceptions of the self but to a different experience of the world. These differences map onto the modes of being associated with LH versus RH consciousness.

Louis Lavelle wrote "*la charité … est une pure attention à l'existence d'autrui*" (Lavelle, 1939). This other-directed openness which is, according to Lavelle, the essence of love, describes the attention paid by the RH rather than the LH, whether the object of that attention be another human being or the divine ground of being itself.

2. Necessary vulnerability

This reflection is put forward tentatively. In the *mythos* of the Master (RH) and his emissary (LH) is encapsulated the idea of different kinds of knowing that need to be separate, yet held together. Master and emissary each know things the other does not know: the difference is that the Master knows more than the emissary, and knows he needs the emissary, whereas the emissary does not know he needs the Master. For the relationship to work, the Master has to trust the emissary, knowing that the trust may be betrayed. This description of their relationship in some ways reflects the myth of the Fall: the relationship between God and his brightest angel (*angelos*, literally meaning "emissary") Lucifer, whose name means the shining one, and hence between God and man, the story of Milton's *Paradise Lost*. It may be no more than a coincidence that Heidegger uses the word *Verfallen* (translated as "falling away") to describe the inauthentic "everdayness" that would be the result of dwelling in the always already "re-presented" world of the LH. Be that as it may, in the Christian *mythos* of the incarnation lies the idea of the submission of a greater power to a form of resistance or constraint, in order that something still greater can come about. This progression of Potentiality to Actuality, Becoming to Being, involves an intrinsic sacrifice or self-limiting process in the interests of there being an actualized "world" and its beings at all.

3. The dark side

Jung wisely emphasized that there is a dark side to human consciousness, which it is healthy and healing to accept, and dangerous to deny. The spiritual life and its practices are no exception. In terms of hemisphere differences this is often consistent with relying too heavily on a LH-congruent understanding of the world, but it can also come from relying on the RH's understanding alone. The Greeks have a saying: "When God builds a church, the Devil builds one right next door." The worst excesses can masquerade as a single-minded devotion to the spiritual. Most of these will be obvious. Attempts to contain bodily desires can become an attack on the body. Fear of "superstition" can become an attack on the created world and a retreat into abstraction. Spiritual texts can become frozen as the source of the "One Truth." A belief that there is a "right" way of acting or knowing, and a desire to "purify" oneself or, much worse, a society, can lead to sterile perfectionism and spiritual pride, and ultimately to intolerance, fanaticism and aggression. This illustrates how easily a thing and its opposite can morph into one another, an observation that is commonplace in most religious

traditions, and accords better with the RH's awareness that apparent opposites are not mutually exclusive and sometimes coincide than with the LH's linear construction of reality whereby more of something (now, and in this particular context, perceived as good) must be better.

4. Growth through suffering

"A deep distress hath humanised my soul." So wrote Wordsworth ("Elegiac Stanzas Suggested by a Picture of Peele Castle in a Storm, painted by Sir George Beaumont") after his brother John drowned in the wreck of the "Abergavenny." According to a linear view, suffering is simply bad, and a life without any suffering would be the ideal. Such a life is of course impossible, but more importantly involves a contradiction, since it would require a life equally devoid of pleasure or happiness, which would itself be a form of suffering.

While suffering should not be sought out for its own sake, and all efforts should normally be made to relieve it, suffering can be "humanising," deepening experience and enhancing compassion for others. It is also true that it can lead to embitterment, and preoccupation with the self, but in my experience as a psychiatrist this is relatively unusual, and is generally a sign of a personality type that is as much the cause as the result of suffering. Some people who have experienced depression, epilepsy or psychosis may at times have access to experience of a spiritual nature from which the rest of us are normally excluded. This is neither to romanticize illnesses that often seem without redeeming features, and destroy lives, nor in any way to underestimate the truly appalling suffering that, for example, depressive illness can cause. It is worth noting that several lines of evidence link depression with the right frontal pole, which is also the most important brain region in the development of self-other relationships and in empathy.

5. Healing

It follows from the conception of mental illness as having a spiritual dimension that spiritual practices may be involved in healing. The use of mindfulness, a Buddhist meditative practice, is now widespread in psychiatry, as is cognitive therapy, effectively the formalization of Stoic practices of self-examination. It is also common practice to engage people with depression, once well enough, in activities designed to help others, since this decreases introspection, improves feelings of self-worth and is a powerful way to restore a sense of "meaning" to a life that has lost all such sense. "Meaning" in this sense is another concept that is better understood by the RH than the LH.

3. Implications of left hemisphere phenomenology for the religious life

So far I have not explored the contribution of the left hemisphere. Its affinity for what is familiar and resoluble into parts, rather than "other" and resistant to serial analysis, its characteristic tendency to need precision and certainty, and its relative intolerance for ambiguity and paradox, taken together with its relative imperviousness to meaning that lies beyond language, and its tendency to abstraction, mean that it is unlikely to have the capacity to experience the Divine, or, on reflection, to find the concept coherent. Despite its relative lack of capacity to engage with the qualities I have considered above, it must also have a way of approaching the divine. This would be less congenial to the mystical, more to the systematic. It would prize the written word over the visual image or music, and would tend to take the written word literally. It would be relatively uneasy with un-knowing and would claim certainty. It would lack an understanding of embodied worship, including the metaphorical nature of icons and statues. It would not see religion as a historical and cultural phenomenon, with its own context, but would see religion as timeless and universal. It would believe that religion could be used to control the uncertainties of the future, perhaps through the power of prayer, and that it would bring its true believers power and material wealth. It would be unable to

accept the creativity of negation, or active passivity, and would have a belief in its own capacity to "make things happen." It would see the dark side as simply to be rejected, suffering as purely negative. Its tone would be optimistic.

4. Conclusion

In *The Master and his Emissary*, analysis of a vast neurological literature over many decades concerning hemisphere differences in birds, animals and humans led to the conclusion that the differences were not in what "functions" the two hemispheres carried out, since both were clearly involved in every brain process, but in the manner in which they each engaged with the world, especially as mediated by clear and reliable differences in the kind of attention they paid to it. Since attention is intrinsic to the nature of the phenomenological world, and since the nature of attention paid changes the kind of world that comes to attention, it could be expected that each hemisphere would bring into being its own version of the world, with its own goals, concerns and values. This means that each hemisphere should have a quite distinct "take" on every aspect of human experience and behavior. The realm of the religious is no exception to this.

There are reasons to suppose the RH may be more able to mediate religious experience or is more prone to accept it as a reality, depending on one's point of view.

Hitherto there has been a tendency in the literature to associate religious experience with activity in the right frontal and temporoparietal cortex, though at times in the left frontal cortex, the interpretation of which is open to question (some reflections on the topic are contained in this paper). People with autism, who in many respects approximate a RH deficit state, are known to be more inclined to atheism (Bering, 2002; Norenzayan, Gervais, & Trzesniewski, 2012). On phenomenological grounds one would expect the RH to be more open to intimations of the divine and to adopt a stance that would not automatically rule out the possibility of something beyond everyday experience and language. This paper offers some reflections on the issues raised, and suggests that hemisphere differences may cast light on why some avenues of approach to religious belief and practice are likely to prove more illuminating than others.

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References

Alexander, M. P., Benson, D. F., & Stuss, D. T. (1989). Frontal lobes and language. *Brain and Language*, *37*(4), 656–691.

Anaki, D., Faust, M., & Kravetz, S. (1988a). Cerebral hemisphere asymmetries in processing lexical metaphors (1). *Neuropsychologia*, *36*(4), 353–362.

Anaki, D., Faust, M., & Kravetz, S. (1998b). Cerebral hemisphere asymmetries in processing lexical metaphors (2). *Neuropsychologia*, *36*(7), 691–700.

Anderson, J. R. (1990). *Cognitive psychology and its implications*. New York, NY: Freeman.

Bellas, D. N., Novelly, R. A., Eskenazi, B., & Wasserstein, J. (1988). Unilateral displacement in the olfactory sense: A manifestation of the unilateral neglect syndrome. *Cortex*, *24*(2), 267–275.

Bellugi, U., Poizner, H., & Klima, E. S. (1983). Brain organization for language: Clues from sign aphasia. *Human Neurobiology*, *2*(3), 155–170.

Bender, M. B., Feldman, M., & Sobin, A. J. (1968). Palinopsia. *Brain*, *9*(2), 321–338.

Bering, J. M. (2002). The existential theory of mind. *Review of General Psychology*, *6*(1), 3–24.

Berkovich-Ohana, A., Glicksohn, J., & Goldstein, A. (2012). Mindfulness-induced changes in gamma band activity: Implications for the default mode network, self-reference and attention. *Clinical Neurophysiology*, *123*, 700–710.

Berkovich-Ohana, A., Glicksohn, J., & Goldstein, A. (2014). Studying the default mode and its mindfulness-induced changes using EEG functional connectivity. *Social Cognitive and Affective Neuroscience*, *9*(10), 1616–1624.

Blonder, L. X., Bowers, D., & Heilman, K. M. (1991). The role of the right hemisphere in emotional communication. *Brain*, *114*(3), 1115–1127.

Borod, J. C., Welkowitz, J., Alpert, M., Brozgold, A. Z., Martin, C., Peselow, E., & Diller, L. (1990). Parameters of emotional processing in neuropsychiatric disorders: Conceptual issues and a battery of tests. *Journal of Communication Disorders*, *23*(4–5), 247–271.

Bradshaw, J. L., & Nettleton, N. C. (1981). The nature of hemispheric specialization in man. *Behavioral and Brain Sciences*, *4*(1), 51–91.

Bradshaw, J. L., & Nettleton, N. C. (1983). *Human cerebral asymmetry*. Englewood Cliffs, NJ: Prentice-Hall.

Brownell, H. H., Simpson, T. L., Bihrle, A. M., Potter, H. H., & Gardner, H. (1990). Appreciation of metaphoric alternative word meanings by left and right brain-damaged patients. *Neuropsychologia*, *28*(4), 375–383.

Burgund, E. D., & Marsolek, C. J. (2000). Viewpoint-invariant and viewpoint-dependent object recognition in dissociable neural subsystems. *Psychonomic Bulletin & Review*, *7*(3), 480–489.

Butler, P. M., McNamara, P., & Durso, R. (2011). Side of onset in Parkinson's disease and alterations in religiosity: Novel behavioral phenotypes. *Behavioural Neurology*, *24*(2), 133–141.

Corballis, M. C. (1996). Hemispheric interactions in temporal judgments about spatially separated stimuli. *Neuropsychology*, *10*(1), 42–50.

Corballis, M. C., Boyd, L., Schulze, A., & Rutherford, B. J. (1998). Role of the commissures in interhemispheric temporal judgments. *Neuropsychology*, *12*(4), 519–525.

Corbetta, M., Miezin, F. M., Dobmeyer, S., Shulman, G. L., & Petersen, S. E. (1991). Selective and divided attention during visual discriminations of shape, color, and speed: Functional anatomy by positron emission tomography. *Journal of Neuroscience*, *11*(8), 2383–2402.

Cutting, J. (1997). *Principles of psychopathology*. Oxford: Oxford University Press.

De Quincey, T. (1851). *Literary Reminiscences*. Boston, MA: Ticknor, Reed & Fields.

Decety, J., & Chaminade, T. (2003). When the self represents the other: A new cognitive neuroscience view on psychological identification. *Consciousness and Cognition*, *12*(4), 577–596.

Deglin, V. L., & Kinsbourne, M. (1996). Divergent thinking styles of the hemispheres: How syllogisms are solved during transitory hemisphere suppression. *Brain and Cognition*, *31*(3), 285–307.

Desmedt, J. E. (1977). Active touch exploration of extrapersonal space elicits specific electrogenesis in the right cerebral hemisphere of intact right-handed man. *Proceedings of the National Academy of Sciences of the USA*, *74*(9), 4037–4040.

Devinsky, O., & Lai, G. (2008). Spirituality and religion in epilepsy. *Epilepsy and Behavior*, *12*, 636–643.

Di Dio, C., Macaluso, E., & Rizzolatti, G. (2007). The golden beauty: Brain response to classical and renaissance sculptures. *PLoS ONE*, *2*(11), e1201.

Dijksterhuis, A., & van Knippenberg, A. (1998). The relation between perception and behavior, or how to win a game of trivial pursuit. *Journal of Personality and Social Psychology*, *74*(4), 865–877.

Drake, R. A., & Bingham, B. R. (1985). Induced lateral orientation and persuasibility. *Brain and Cognition*, *4*(2), 156–164.

Eliot, T. S. (1975). The use of poetry and the use of criticism. In F. Kermode (Ed.), *Selected prose of T. S. Eliot* (pp. 79–96). New York, NY: Harcourt Brace.

Ellis, A. W., Jordan, J. L., & Sullivan, C. A. (2006). Unilateral neglect is not unilateral: Evidence for additional neglect of extreme right space. *Cortex*, *42*(6), 861–868.

Federmeier, K. D., & Kutas, M. (1999). Right words and left words: Electrophysiological evidence for hemispheric differences in meaning processing. *Cognitive Brain Research*, *8*(3), 373–392.

Foldi, N. S. (1987). Appreciation of pragmatic interpretations of indirect commands: Comparison of right and left hemisphere brain-damaged patients. *Brain and Language*, *31*(1), 88–108.

Gainotti, G. (2000). What the locus of brain lesion tells us about the nature of the cognitive defect underlying category-specific disorders: A review. *Cortex*, *36*(4), 539–559.

Gainotti, G. (2002). The relationships between anatomical and cognitive locus of lesion in category-specific disorders. In E. M. E. Forde & G. W. Humphreys (Eds.), *Category Specificity in brain and mind* (pp. 403–426). Hove, UK: Psychology Press.

Gazzaniga, M. S., & LeDoux, J. E. (1978). *The integrated mind*. New York, NY: Plenum Press.

Gitelman, D. R., Alpert, N. M., Kosslyn, S., Daffner, K., Scinto, L., Thompson, W., & Mesulam, M.-M. (1996). Functional imaging of human right hemispheric activation for exploratory movements. *Annals of Neurology*, *39*(2), 174–179.

Goebel, C., Linden, D. E. J., Sireteanu, R., Lanfermann, H., Zanella, F. E., Singer, W., & Goebel, R. (1997). Different attention processes in visual search tasks investigated with functional Magnetic Resonance imaging. *NeuroImage*, *5*(4, pt. 2), S81.

Goldberg, E. (2001). *The executive brain: Frontal lobes and the civilized mind*. Oxford: Oxford University Press.

Goldberg, E., & Costa, L. D. (1981). Hemispheric differences in the acquisition and use of descriptive systems. *Brain and Language*, *14*(1), 144–173.

Goodale, M. A., & Milner, A. D. (1992). Separate visual pathways for perception and action. *Trends in Neuroscience*, *15*(1), 20–25.

Grossman, M. (1981). A bird is a bird is a bird: Making reference within and without superordinate categories. *Brain and Language*, *12*(2), 313–331.

Habib, M. (1986). Visual hypoemotionality and prosopagnosia associated with right temporal lobe isolation. *Neuropsychologia*, *24*(4), 577–582.

Happé, F., Brownell, H., & Winner, E. (1999). Acquired "theory of mind" impairments following stroke. *Cognition*, *70*(3), 211–240.

Hécaen, H., & de Ajuriaguerra, J. (1952). *Méconnaissances et hallucinations corporelles: intégration et désintégration de la somatognosie*. Paris: Masson & Cie.

Heilman, K. M., Scholes, R., & Watson, R. T. (1975). Auditory affective agnosia: Disturbed comprehension of affective speech. *Journal of Neurology, Neurosurgery, & Psychiatry*, *38*(1), 69–72.

Hölzel, B. K., Carmody, J., Vangel, M., Congleton, C., Yerramsetti, S. M., Gard, T., & Lazar, S. W. (2011). Mindfulness practice leads to increases in regional brain gray matter density. *Psychiatry Research: Neuroimaging*, *191*, 36–43.

Hölzel, B. K., Lazar, S. W., Gard, T., Schuman-Olivier, Z., Vago, D. R., & Ott, U. (2011). How does mindfulness meditation work? Proposing mechanisms of action from a conceptual and neural perspective. *Perspectives on Psychological Science*, *6*, 537–559.

Hölzel, B. K., Ott, U., Hempel, H., Hackl, A., Wolf, K., Stark, R., & Vaitl, D. (2007). Differential engagement of anterior cingulate and adjacent medial frontal cortex in adept meditators and non-meditators. *Neuroscience Letters*, *421*, 16–21.

Hough, M. S. (1990). Narrative comprehension in adults with right and left hemisphere brain-damage: Theme organization. *Brain and Language*, *38*(2), 253–277.

Johnstone, B. & Glass, B.A. (2008). Support for a neuropsychological model of spirituality in persons with traumatic brain injury. *Zygon*, *43*(4), 861–874.

Joseph, R. (1988). The right cerebral hemisphere: Emotion, music, visual-spatial skills, body-image, dreams, and awareness. *Journal of Clinical Psychology*, *44*(5), 630–673.

Kaplan, J. A., Brownell, H. H., Jacobs, J. R., & Gardner, H. (1990). The effects of right hemisphere damage on the pragmatic interpretation of conversational remarks. *Brain and Language*, *38*(2), 315–333.

Kinsbourne, M. (1988). Hemispheric interactions in depression. In M. Kinsbourne (Ed.), *Cerebral hemisphere function in depression* (pp. 133–162). Washington, DC: American Psychiatric Press.

Laeng, B., Zarrinpar, A., & Kosslyn, S. M. (2003). Do separate processes identify objects as exemplars versus members of basic-level categories? Evidence from hemispheric specialization. *Brain and Cognition*, *53*(1), 15–27.

Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to Western thought*. New York, NY: Basic Books.

Lavelle, L. (1939). *L'Erreur de Narcisse*. Paris: Grasset.

Leung, M., Chan, C., Yin, J., Lee, C.-F., So, K.-F., & Lee, T. M. C. (2013). Increased gray matter volume in the right angular and posterior parahippocampal gyri in loving-kindness meditators. *Social Cognitive and Affective Neuroscience*, *8*, 34–39.

Locke, J. (1690/1849). *An Essay concerning human understanding*. London: W. Tegg.

Luders, E., Kurth, F., Mayer, E. A., Toga, A. W., Narr, K. L., & Gaser, C. (2012). The unique brain anatomy of meditation practitioners: Alterations in cortical gyrification. *Frontiers in Human Neuroscience*, *6*, 34.

McCabe, K., Houser, D., Ryan, L., Smith, V., & Trouard, T. (2001). A functional imaging study of cooperation in two-person reciprocal exchange. *Proceedings of the National Academy of Sciences of the USA*, *98*(20), 11832–11835.

McGilchrist, I. (2009). *The Master and his emissary: The divided brain and the making of the Western world*. New Haven, CT: Yale University Press.

McNamara, P. (2009). *The neuroscience of religious experience*. Cambridge: Cambridge University Press.

McNeill, D. (1992). *Hand and mind: What Gestures reveal about thought*. Chicago, IL: University of Chicago Press.

Miller, M. B., Sinnott-Armstrong, W., Young, L., King, D., Paggi, A., Fabri, M., … Gazzaniga, M. S. (2010). Abnormal moral reasoning in complete and partial callosotomy patients. *Neuropsychologia*, *48*(7), 2215–2220.

Nadal, M., Munar, E., Capó, M. A., Rosselló, J., & Cela-Conde, C. J. (2008). Towards a framework for the study of the neural correlates of aesthetic preference. *Spatial Vision*, *21*(3–5), 379–396.

Narumoto, J., Okada, T., Sadato, N., Fukui, K., & Yonekura, Y. (2001). Attention to emotion modulates fMRI activity in human right superior temporal sulcus. *Cognitive Brain Research*, *12*(2), 225–231.

Navon, D. (1977). Forest before trees: The precedence of global features in visual perception. *Cognitive Psychology*, *9*(3), 353–383.

Nebes, R. D. (1978). Direct examination of cognitive function in the right and left hemispheres. In M. Kinsbourne (Ed.), *Asymmetrical function of the brain* (pp. 99–137). Cambridge: Cambridge University Press.

Newberg, A., d'Aquili, E., & Rause, V. (2001). *Why God won't go away*. New York, NY: Ballantine Books.

Newberg, A. B., Alavi, A., Baime, M., Pourdehnad, M., Santanna, J., & d'Aquili, E. (2001). The measurement of regional cerebral blood flow during the complex cognitive task of meditation: A preliminary SPECT study. *Psychiatry Research: Neuroimaging*, *106*, 113–122.

Newberg, A. B., Pourdehnad, M., Alavi, A., & d'Aquili, E. G. (2003). Cerebral blood flow during meditative prayer: Preliminary findings and methodological issues. *Perceptual and Motor Skills*, *97*, 625–630.

Nietzsche, F. (1968). *The will to power*. (W. Kaufmann, Trans.). New Delhi: Vintage [Der Wille zur Macht: nearest German compilation 1906].

Norenzayan, A., Gervais, W. M., & Trzesniewski, K. H. (2012). Mentalizing deficits constrain belief in a personal God. *PLoS ONE*, *7(5)*, e36880.

Pendry, L., & Carrick, R. (2001). Doing what the mob do: Priming effect on conformity. *European Journal of Social Psychology*, *31*(1), 83–92.
Price, C. J. & Friston, K. J. (2002). Functional imaging studies of category specificity. In E. M. E. Forde & G. W. Humphreys (Eds.), *Category specificity in brain and mind* (pp. 427–447). Hove, UK: Psychology Press.
Querné, L., Eustache, F., & Faure, S. (2000). Interhemispheric inhibition, Intrahemispheric activation, and lexical capacities of the right hemisphere: A tachistoscopic, divided visual-field study in normal subjects. *Brain and Language*, *74*(2), 171–190.
Ramachandran, V. S. (1994). Phantom limbs, neglect syndromes, repressed memories, and Freudian psychology. *International Review of Neurobiology*, *37*, 291–333.
Richards, L., & Chiarello, C. (1997). Activation without selection: Parallel right-hemisphere roles in language and intentional movement? *Brain and Language*, *57*(1), 151–178.
Ritsema, M. E., & Murphy, M. A. (2007). Palinopsia from posterior visual pathway lesions without visual field defects. *Journal of Neuro-Ophthalmology*, *27*(2), 115–117.
Sackeim, H. A., Greenberg, M. S., Weiman, A. L., Gur, R. C., Hungerbuhler, J. P., & Geschwind, N. (1982). Hemispheric asymmetry in the expression of positive and negative emotions: Neurologic evidence. *Archives of Neurology*, *39*(4), 210–218.
Schacter, D. L., Glisky, E. L., & McGlynn, S. M. (1990). Impact of memory disorder on everyday life: Awareness of deficits and return to work. In D. Tapper & K. Cicerone (Eds.), *The Neuropsychology of everyday life* (pp. 231–257). Boston, MA: Kluwer.
Schneiderman, E. I., Murasugi, K. G., & Saddy, J. D. (1992). Story arrangement ability in right-brain damaged patients. *Brain and Language*, *43*(1), 107–120.
Schutz, L. E. (2005). Broad-perspective perceptual disorder of the right hemisphere. *Neuropsychology Review*, *15*(1), 11–27.
Schwartz, A. S., Marchok, P. L., & Flynn, R. E. (1977). A sensitive test for tactile extinction: Results in patients with parietal and frontal lobe disease. *Journal of Neurology, Neurosurgery & Psychiatry*, *40*, 228–233.
Schwartz, A. S., Marchok, P. L., Kreinick, C. J., & Flynn, R. E. (1979). The asymmetric lateralization of tactile extinction in patients with unilateral cerebral dysfunction. *Brain*, *102*, 669–684.
Schwartz, S., Assal, F., Valenza, N., Seghier, M. L., & Vuilleumier, P. (2005). Illusory persistence of touch after right parietal damage: Neural correlates of tactile awareness. *Brain*, *128*(2), 277–290.
Shamay-Tsoory, S. G., Tomer, R., & Aharon-Peretz, J. (2005). The neuroanatomical basis of understanding sarcasm and its relationship to social cognition. *Neuropsychology*, *19*(3), 288–300.
Shammi, P., & Stuss, D. T. (1999). Humour appreciation: A role of the right frontal lobe. *Brain*, *122*(4), 657–666.
Sherrington, C. S. (1906). The Integrative action of the nervous system. New Haven, CT: Yale University Press.
Simons, D. J., & Chabris, C. F. (1999). Gorillas in our midst: Sustained inattentional blindness for dynamic events. *Perception*, *28*(9), 1059–1074.
Spence, S., Shapiro, D., & Zaidel, E. (1996). The role of the right hemisphere in the physiological and cognitive components of emotional processing. *Psychophysiology*, *33*(2), 112–122.
Steiner, G. (1978). *Martin Heidegger*. New York, NY: Viking.
Stone, V. E., Baron-Cohen, S., Calder, A., Keane, J., & Young, A. (2003). Acquired theory of mind impairments in individuals with bilateral amygdala lesions. *Neuropsychologia*, *41*(2), 209–220.
Stuss, D. T. (1991). Disturbance of self-awareness after frontal system damage. In G. P. Prigatano & D. L. Schacter (Eds.), *Awareness of deficit after brain injury: Clinical and Theoretical issues* (pp. 66–83). Oxford: Oxford University Press.
Suberi, M., & McKeever, W. F. (1977). Differential right hemispheric memory storage of emotional and non-emotional faces. *Neuropsychologia*, *15*(6), 757–768.
Thomas, J., Jamieson, G., & Cohen, M. (2014). Low and then high frequency oscillations of distinct right cortical networks are progressively enhanced by medium and long term Satyananda Yoga meditation practice. *Frontiers of Human Neuroscience*, *8*, 197.
Trimble, M., & Freeman, A. (2006). An investigation of religiosity and the Gastaut-Geschwind syndrome in patients with temporal lobe epilepsy. *Epilepsy and Behavior*, *9*, 407–414.
Trimble, M. R. (2007). *The soul in the brain: The cerebral basis of language, Art, and belief*. Baltimore, MD: Johns Hopkins University Press.
Tucker, D. M. (1992). Developing emotions and cortical networks. In M. R. Gunnar & C. A. Nelson (Eds.), *Minnesota symposium on child psychology* (vol. 24, pp. 75–128), Developmental Behavioral Neuroscience. Hillsdale, NJ: Lawrence Erlbaum.
Tucker, D. M., & Williamson, P. A. (1984). Asymmetric neural control systems in human self-regulation [review]. *Psychological Review*, *91*(2), 185–215.
van Zomeren, A. H., & Brouwer, W. H. (1994). *Clinical neuropsychology of attention*. Oxford: Oxford University Press.
Vartanian, O., & Goel, V. (2004). Neuroanatomical correlates of aesthetic preference for paintings. *NeuroReport*, *15*(5), 893–897.
Winner, E., & Gardner, H. (1977). The comprehension of metaphor in brain-damaged patients. *Brain*, *100*(4), 717–729.
Wittgenstein, L. (1967). *Philosophical investigations* (3rd ed.). (G. E. M. Anscombe & R. Rhees, Ed., and G. E. M. Anscombe, Trans.). Oxford: Blackwell [Philosophische Untersuchungen 1953].

Yokoyama, K., Jennings, R., Ackles, P., Hood, P., & Boller, F. (1987). Lack of heart rate changes during an attention-demanding task after right hemisphere lesions. *Neurology*, *37(4)*, 624–630.
Young, L., Camprodon, J. A., Hauser, M., Pascual-Leone, A., & Saxe, R. (2010). Disruption of the right temporoparietal junction with transcranial magnetic stimulation reduces the role of beliefs in moral judgments. *Proceedings of the National Academy of Sciences of the USA*, *107*(15), 6753–6758.
Zaidel, E. (1985). Language in the right hemisphere. In D. Benson & E. Zaidel (Eds.), *The Dual brain: Hemispheric Specialization in humans* (pp. 205–231). New York, NY: Guilford Press.
Zündorf, I. C., Lewald, J., & Karnath, H. O. (2016). Testing the dual-pathway model for auditory processing in human cortex. *Neuroimage*, *124*(Pt A), 672–681.

COMMENTARIES

OPEN ACCESS

Cerebral lateralization and religion: the roles of ritual and the DMN

Candace S. Alcorta

Department of Anthropology, University of Connecticut, Storrs, CT, USA

Introduction

Why humans universally believe in counterintuitive supernatural agents that demand costly and sometimes deadly sacred rituals of adherents is a question that has long fascinated evolutionary theorists. McGilchrist's cerebral lateralization model of religion offers a new perspective on this question. Drawing on a large body of research, he proposes that phenomenological differences between the two brain hemispheres render the right hemisphere "more likely to be able to accommodate religious thought and experience." He views cognitivist theories of religion that fail to integrate affective, somatic, and spiritual phenomena as incapable of adequately explaining religion. According to McGilchrist, "arguments about the nature and meaning of religion may depend on which hemisphere's 'version' of the world is privileged."

Cerebral lateralization

McGilchrist's model posits a fundamental phenomenological difference between the left and right hemispheres of the human brain. Clinical and split-brain studies demonstrate hemispheric differences; ongoing neuroimaging and experimental studies support these findings, as well. Hemispheric asymmetries have "deep phylogenetic roots'" (Bisazza, Rogers, & Vallortigara, 1998, p. 411); they occur in fish, reptiles, birds, amphibians, and across numerous species of mammals. Cerebral lateralization exists at multiple levels, including "the brain's functional layout, cytoarchitecture and neurochemistry" (Toga & Thompson, 2003, p. 37), varying "from subtle differences in the size or synaptic connectivity of neuronal nuclei to more dramatic forms of lateralization in which unique groups of neurons exist on one side only" (Concha, Bianco, & Wilson, 2012, p. 8320). "The widespread occurrence of CNS [central nervous system] asymmetries in diverse animal species indicates that this feature of nervous system organization confers a survival advantage" (Gotts et al., 2013, p. 83). Proposed benefits include: (1) increased neural capacity through specialization and elimination of duplication, (2) reduction of interference and conflict between the hemispheres with concomitant promotion of simultaneous parallel processing, and (3) more rapid and efficient processing through localization of function. Laboratory experiments in non-human species provide

CONTACT Candace S. Alcorta candace.alcorta@uconn.edu
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