Science, Religion, and Human Identity: Contributions from the Science and Religion Forum

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RELIGION, BRAINS, AND PERSONS: THE CONTRIBUTION OF NEUROLOGY PATIENTS AND CLINICIANS TO UNDERSTANDING HUMAN FAITH

by Joanna Collicutt

Abstract. This article presents a historical overview of the role played by neurology patients and clinicians in the development of understanding brain–behavior relationships and argues that, even with the advent of sophisticated functional brain imaging techniques, this clinical approach remains valuable. It is particularly important in the biological study of religion, where there is a danger that piecemeal and reductionist approaches will come to dominate. It is argued that religion is a socially located, multifaceted, and embodied phenomenon that occurs not in the brain but in the lives of human persons. Insights drawn from people living with conditions affecting the brain are thus vital for a full understanding of human identity, spirituality, and religion.

Keywords: history; identity; neurology; neuroscience; religion; soul; spirituality

In the last 20 years, methodological advances in functional neuroimaging have led to increasing research in the area of neurosciences and religion, sufficient to merit the establishment of the biologically oriented

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journal *Religion, Brain and Behavior* in 2011. Much of this research has involved the application of electrophysiological or hemodynamic techniques to healthy individuals while they are engaged in "religious" activities such as meditation (e.g., Newberg, Alavi, and Baime 2001). Its aim is to identify brain areas and networks that are active under these conditions and, on the basis of existing knowledge concerning the psychological functions instantiated in these areas and networks, to construct a psychological account. For example, an early study by Nina Azari and colleagues reported that religious participants reciting Psalm 23 showed a distinctive pattern of activation in the right dorsolateral prefrontal cerebral cortex, which was not evident when they recited a nursery rhyme. The authors argued that because this area of the brain is thought to be involved in reflective thinking, their findings show that religious experience has a significant active cognitive component rather than being simply preconceptual or emotional in nature (Azari, Nickel, and Wunderlich 2001).

However, there is another approach to exploring the relationship between religion and the brain that dates from before the advent of functional neuroimaging and has been rather eclipsed by it: the study of religion in patients with conditions affecting the brain. A 2019 book coedited by two neurological clinicians made the point that this approach still exists, is being actively pursued, and has several advantages over functional neuroimaging studies:

> We believe that careful observation of the lives of neurology patients can teach us useful things about human religious experience, belief and practice, especially when these observations are critically analysed by theologians and philosophers. … Moreover, we argue that the encounter of the patient with a neurological clinician offers a unique perspective, as we observe how in their spiritual lives human beings overcome and respond to neurological deficits. (Coles and Collicutt 2019, xi).

The Rise of Neurology

This approach has a long history, emerging in recognizable form during the European Enlightenment but with origins in antiquity. There had been a longstanding debate as to whether mental faculties had a biological substrate at all and, if so, where this was to be located. In classical Greek culture Plato (d.347 BCE) favored the brain and Aristotle (d.322 BCE) favored the heart; Hippocrates (d.370 BCE), based on his experience of epileptic patients, had controversially concluded that what many took to be supernaturally mediated events may more rationally be understood in terms of brain pathology (Todman 2008). Modern medicine sided with Hippocrates and Plato, recognizing the importance of the brain in mental life while initially retaining a mind-body dualism.

This retention of a dualistic approach to the human person, which posited a material body together with an immaterial mind or soul, was in part influenced by Christian dogma that had incorporated Neoplatonic thinking in this area via the church father Augustine of Hippo (d.430 CE). Holding this philosophical position alongside the increasing recognition that brain injury and disease had significant effects on "soul functions," such as emotional experience, behavioral control, and higher intellectual capacities, presented something of a challenge. This was famously addressed by René Descartes (1596–1650), who advanced the idea that the soul and body, while separate entities, interact with each other and that the point of intersection was the pineal gland located deep in the limbic system of the brain.

Descartes' analysis was based on anatomical considerations (*Traité des passions de l'âme*, 31). First, the pineal gland is unusual among brain structures in that it is single rather than one of a pair; second, it sits at what appears to be a strategic position in relation to the cerebral ventricles (interconnected cavities that produce and store cerebrospinal fluid). Medical understanding of this time was still to a large extent based on the theory of humors inherited from Hippocrates.[1] This theory led early modern anatomists to concentrate on the cerebrospinal fluid that bathes the brain, identifying it as the locus of the humors. The cerebral ventricles appeared to be reservoirs for this fluid and, conveniently for this argument, there are four, corresponding to the four humors (blood, yellow bile, black bile, and phlegm).

However, this emphasis on the ventricles and cerebrospinal fluid diverted attention from the study of brain tissue itself. In particular, the role of the cerebral cortex was overlooked. It was seen as essentially a wrapping for the important structures beneath. Its appearance, with its many folds and creases, resembled that of the intestines; thus, contemporary theorists saw it as, like them, a kind of conduit. This is illustrated by neuroanatomical drawings of the time, which made no effort to delineate the cerebral cortex with any accuracy and instead treated it as a homogenous wrinkled mass.

Descartes' attempt to hold together the embryonic brain science and Christian anthropology of the time proved to be of limited help to those thinkers who increasingly understood "soul functions" to be the province of medical science rather than theology. This was especially the case in Britain, where technological advances to support empirical methods (such as Robert Hooke's microscope) pulled in one direction but the political and religious climate pulled in another; the monarchy was restored in 1660, and the power of the Church of England was consolidated through the Act of Uniformity of 1662. It was in this politically and philosophically tense context that the modern discipline of neurology was born.

Thomas Willis (1621–1675) became Sedleian Professor of Natural Philosophy at Oxford in 1660 and was also a medical practitioner. He was part of a circle of empirically inclined thinkers that included the young John Locke. Prior to the English Civil War, he had been a physician to Charles I, and he maintained strong links with Anglicanism throughout his life. Willis was an expert neuroanatomist, and his numbering of the cranial nerves still stands today. His neuroanatomical drawings of the cerebral cortex were the first to depict it accurately and to include landmarks indicating that its topography was not random (*Cerebri Anatome* 1664). Perhaps motivated by a need to hold together the teachings of the recently restored national religion alongside his understanding of the brain disorders of his patients and his observation of the many neuroanatomical and behavioral features shared by human beings and other animals, he developed a modified version of Descartes' theory.

Willis hypothesized the existence of *two* souls. The first was a "corporeal soul" firmly located in the brain and shared with animals, that included not only reflex and instinctive systems, but also learned habits, practical reason, and basic problem-solving capacities. This soul is amenable to study by science and medicine. Allowing animals a soul of some sort was more congruent with empirical observations (and common sense) than Descartes' understanding of animals as essentially biological machines. Willis also posited the existence of a soul that is unique to humans and the seat of the highest human capacities of reason and judgment, terming this the "rational soul." This soul enables a human being (whom he termed an "amphibious animal . . . of a middle Nature and Order, between Angels and Brutes,") to respond to or partake of the divine nature. This soul is immaterial and immortal and amenable to study by theology. At one point in his writings, Willis drew on the New Testament distinction between "flesh" and "spirit" to illustrate the relationship between the two souls (*De anima brutorum* 1672).

By making the move from one to two souls, Willis advanced the territorial boundaries of biological science so that the study of at least some aspects of human psychology came under its scope, and thus began the relentless erosion of the domain of theology in this area. Having delineated the boundaries, he also came up with a name for the medical specialism that would rule the territory of the corporeal soul: "neurology."

Apart from his historical importance as an early brain scientist, Willis is notable for the fact that he was well regarded as a highly competent doctor and was in active clinical practice. This meant that his theories of brain-behavior relationships were based on his experience of real-life patients (*Pathologiae Cerebri et Nervosi Generis Specimen*, 1667; *Two Discourses*, 1672), rather than relying exclusively on philosophical ideas. His bringing of some soul functions under the umbrella of medicine anticipated and enabled Sigmund Freud's approach over two centuries later.

(Freud began his medical career as a neurologist before developing psychoanalysis, which arguably snatched the "rational soul" from the hands of the theologians whom, he held, had no business with it.)

Localization of Function

Even as neuroanatomy developed and when consensus on the importance of adequate brain function for mental life had been achieved, understanding of the brain itself remained poor. The physician and neuroanatomist Franz Josef Gall (1758–1828) was perhaps the first to advance the theory of "localization of function." This held that the mind is made up of a number of faculties, each of which is subserved by a particular area of the brain. Individual differences in aptitude and personality can then be explained by the relative sizes of these brain areas, which are evident in the appearance of the skull. His theory formed the basis of the discipline of phrenology that became a craze in the mid-nineteenth century. In Britain, it was embraced by eminent public intellectuals such as George Eliot, who welcomed the possibilities offered by new scientific approaches for addressing old questions before it fell out of fashion and into disrepute (for a full discussion, see Garratt 2010).

Accurate and systematic mapping of the cerebral cortex was finally attained at the turn of the nineteenth century by the neurologist Korbinian Brodmann, who published his work in 1909. Brodmann's system, which is still in widespread use today, divides the cerebral cortex into areas based on surface topographical features and microscopic analysis of neuron (nerve cell) structure. Each area is identified by a number (1–52). Although this is a structurally based system, it was in part informed by observations linking some of these areas with specific higher cognitive functions, based on case studies that were accumulating in neurology clinics.

The logic begins simply but becomes more complex. If a patient suffers focal damage to an identifiable and circumscribed area of the brain and presents with an acquired specific cognitive deficit, it is reasonable to conclude that the brain area that has been damaged plays a role in supporting the cognitive function in question. However, it is possible that this brain area does not play a *specific* role but that the cognitive function is especially demanding, requiring the whole brain to be in good working order so that damage to *any* part of the brain might have impaired it. To ensure that the role of a brain area is specific, one needs to demonstrate that damage to another part of the brain does not affect the cognitive function in question but instead produces an entirely different cognitive deficit. This is termed "double dissociation of function" and is the staple of patient-based approaches to brain-behavior relationships.

The classic example dates from a few years before Brodmann. In 1861, the neurologist Paul Broca reported a patient with a lesion in the left frontal area of the cerebral cortex (in what is now known as Brodmann's areas 44, 45, 46) who was incapable of speech and was only able to utter the word "Tan" (which he did with great expressiveness appropriate to the situation). There was nothing wrong with his vocal apparatus, and his comprehension of language appeared to be normal; the problem was with the cognitive skills necessary to produce words and phrases. Thirteen years later, another neurologist, Carl Wernicke, reported a group of patients with lesions also on the left side of the brain but further back (area 22). These people had the reverse problem: they could talk fluently, but what they said did not make sense, and they could not understand what was said to them. As the discipline of neurology developed, "Broca's aphasia" was used to describe a problem with language expression, and "Wernicke's aphasia" was used to describe a problem with language comprehension. The areas of the cortex involved are often referred to as "Broca's area" and "Wernicke's area".

In addition to demonstrating the link between brain areas and cognitive functions, findings such as these formed the basis of an understanding of the architecture of thought. The fact that language can be fractionated in this way in patients with neurological disorders provides an analytic framework for understanding healthy language function. Something that might otherwise have been thought of as monolithic was shown to be composed of a number of subprocesses.

Of course, demonstrating that a particular brain area has a specific role in supporting a given psychological function only tells part of the story; the nature of that role requires elucidation. The area may directly underpin the function (be something like a "God spot"); or it may inhibit areas that would otherwise interfere with the function; finally, it may be positioned along a communication route between brain areas, perhaps acting as a relay station, so that when it is damaged, the route is blocked. As the twentieth century proceeded, this last possibility was seen as increasingly important. It became clear that the brain works not so much like a series of independent modules but as a complex network of interconnected circuits. This means that cognitive deficits and other psychological problems can arise not only from damage to brain "centers," but also by disconnecting such centers from each other (even if the centers themselves remain intact).

Detailed case studies of patients again played a vital part in understanding this point. Norman Geschwind identified a range of what he termed "disconnection syndromes," for example, difficulties with organizing skilled actions ("limb apraxia"), arising as a result of damage to pathways within the cerebral cortex and between the cerebral cortex and areas deeper in the brain (Catani and ffytche 2005; Heilman and Watson 2008; Geschwind 1965a, 1965b). At around the same time, Roger Sperry, Michael Gazzaniga and colleagues explored the neuropsychological side effects of cutting the connection between the two cerebral hemispheres as a treatment for intractable epilepsy. Their publications on those who came to be known as "split-brain" patients further emphasized the importance not only of intact brain centers, but also of communication between them for healthy psychological functioning (Sperry, Gazzaniga, and Bogen 1969). This insight has had a powerful cultural afterlife through the writing of Iain McGilchrist (2009; for a critical response, see De Haan 2019).

Meticulous studies of neurology patients, sometimes described as "nature's experiments," formed the basis for understanding the role of the brain in human psychology for much of the twentieth century. Perhaps the most significant case was that of the Canadian, Henry Molaison (known as "HM"), who suffered from permanent dense amnesia from the age of twenty-seven following brain surgery to treat otherwise intractable epilepsy in 1953. It would not be an exaggeration to say that most of what is known about the brain and human memory is based on this tragic case, carefully and compassionately reported over many years by the neuropsychologist Brenda Milner (Milner and Klein 2016).

These types of case descriptions by neurology clinicians have rarely been confined to reporting clinical examinations, laboratory or psychometric test results but have included information about the everyday difficulties faced by the affected individuals and the changes in their roles and key relationships. For example, HM's inability to recall that his favorite uncle had died, resulting in a fresh sense of bereavement each time he heard the news, is movingly recorded.

Neurology and "Religion"

From the early days of neurology, clinicians noted "religious" changes in some of their patients. This has been most consistently reported in patients with focal epilepsy arising from pathology in the temporal lobes (TLEs). The start of a seizure is often signaled by random but highly specific experiences referred to as "auras," such as smelling bacon cooking, seeing flashing lights, or hearing a snatch of a particular song. Sometimes such auras involve a mystical-like experience or a sense of presence. The most famous case is that of Fyodor Dostoyevsky (1821–1881), who described his experiences in letters and through the character of Prince Mishkin in his 1869 novel *The Idiot*:

> …during his epileptic fits, or rather immediately preceding them, he had always experienced a moment or two when his whole heart and mind, and body seemed to wake up to vigour and light; when he became filled with joy and hope, and all his anxieties seemed to be swept away for ever; these moments were but presentiments, as it were, of the one final second (it was never more than a second) in which the fit came upon him…"What matter though it be only a disease, and abnormal tension of the brain, if when I recall and analyse the moment, it seems to have been one of

> harmony and beauty in the highest degree – and instant of the deepest sensation, overflowing with unbound joy and rapture, ecstatic devotion and with completest life?". (Dostoyevsky 1869/1887, 139–40)

Subsequently, several studies have reported series of similar cases (e.g., Ogata and Miyakawa 1998; Hansen and Brodtkorb 2003). I am also part of a research group that has interviewed a sample of epilepsy patients who have undergone such experiences, and our findings confirm Dostoyevsky's account in an interesting respect: the personal and metaphysical significance of these experiences do not seem to be diminished by the affected individual's knowledge that they arise from brain pathology (Collicutt et al. in preparation). This is perhaps not surprising, as similar findings have been reported in relation to mystical experiences occasioned by the administration of psychedelic medication (Doblin 1991).

The converse effect of attenuation or complete loss of religious feeling can also occur, although perhaps because it is less dramatic, it has been less often reported:

> When Mary was involved in a serious road-traffic accident a few years ago, she was working as a magistrate and was a committed, active Christian. When she woke up in hospital, after lying unconscious in a coma for three weeks, her sense of the presence of God had all but disappeared. It was not a crisis of faith brought on by questions about suffering, she says. Instead, it was a physical loss: an area of her brain had been so injured that its capacity for spirituality had been permanently impaired. She explains: "I did not feel I had a loss of faith; more that I was in a kind of limbo, with a sense of bereavement and little awareness of the presence of God. I regret that some emotional, prayerful, and worshipful part of me was missing. I tried to cope by 'acting' as if it were still there." She hoped for years it would come back, and, although things have improved, her relationship with God is still different from what it was. (Paveley 2008)

Again, this is perhaps not surprising, as the loss of the ability to recognize and feel emotions ("alexithymia") and form empathetic interpersonal connections are well-known consequences of some conditions affecting the brain (Henry, Phillips, and Crawford 2006). There is a suggestion of double dissociation here; one type and location of brain injury appears to lead to intensification of spirituality; another appears to result in its attenuation.

These case reports focus on distinctive "special" or "singular" experiences (Taves 2009), which might often, although not always, be described as "spiritual" or "religious" by those who undergo them. The authors are not in the business of offering an account of religion as a broader phenomenon. However, other researchers have been bolder and more ambitious. Since an early report describing "exaltation of religious sentiment" as a personality characteristic of epileptic patients (Howden 1873), assertions of a general association between epilepsy and religiosity have repeatedly appeared in the literature. Alongside his interest in disconnection syndromes, Norman Geschwind claimed to have identified a syndrome of hyperreligiosity in some epilepsy patients reflected in a tendency to religious conversion, prolific writing on religious themes, decreased interest in sex, and increased irritability (Geschwind 1979). He took this to be related to excessive activity in the amagdalae (a pair of structures in the limbic system deep in the brain, now known to be important in the processing of emotion).

Geschwind's studies have not been reliably replicated, although reports of increased general religiosity in epilepsy continue (Trimble 2014). They nevertheless contributed to Michael Persinger's controversial theory of religious experience as a manifestation of microseizures in the temporal lobes (Persinger 1983). Persinger tested his theory by applying weak transcranial magnetic fields to healthy volunteers using what came to be popularly known as the "God helmet" and claimed to have elicited a sense of divine presence in many of his participants (Persinger 2002), although the data have been hotly debated (Granqvist, Fredrikson, and Unge 2005). These experiments were exploited in several new atheist apologetic works (e.g., Shermer 1999).

The move away from the study of religious/spiritual/special experiences to the construction of explanatory accounts of religion (and in some cases God) saw the beginnings of a methodological shift that would be fulfilled with the coming of functional neuroimaging. The move begins with relinquishing extensive conversations with and observations of individual neurology patients in favor of less personal and much briefer approaches involving psychometric assessments administered to groups of patients and sometimes healthy controls. It is essentially a move from the clinic to the laboratory.

Recent examples include the work of Erik Asp and colleagues, who examined the relationship between damage to the frontal areas of the brain and religious beliefs. They administered psychometric tests of authoritarianism, fundamentalist thinking, and specific religious beliefs to ten patients with frontal lobe damage (of diverse cause); they compared the scores with patients who had damage elsewhere in the brain and a control group of patients who had undergone life-threatening illness but without any effect on their brains. They found that the patients with frontal lobe damage scored more highly than the other groups on authoritarianism and fundamentalism and had more strongly held specific beliefs (Asp, Ramchandran, and Tranel 2012; see also Zhong, Cristofori, and Bulbulia 2017). These findings fit with some current theories arguing that parts of the frontal lobes are necessary for the detection of cognitive conflict and the initiation of doubt (Pennycook et al. 2014); hence, it is argued that damage to these areas can result in increased religious conviction.

Using a similar approach to examine another aspect of religiosity, Cosimo Urgesi and colleagues carried out psychometric assessments of "self-transcendence" in 88 patients undergoing surgery for tumors in different brain areas (Urgesi et al. 2010). They compared patients with tumors in the frontal areas of the brain with those with tumors further back in the parietal areas. They found that the patients with parietal tumors scored higher on the self-transcendence measure than the patients with frontal tumors before surgery (when that part of the brain was presumably already compromised) and even more after surgery (when the tumor and surrounding area had been removed).

The use of psychometric assessments such as those described above allows investigators to focus their research more sharply. They need not assent to the idea of religion as a unitary concept at all but can confine their conclusions to circumscribed areas such as religious experiences, beliefs, or practices. However, there is sometimes slippage so that a measurement in one domain is interpreted as a proxy for religion as a whole or presented as its essential heart. William James set an early precedent here in his privileging of private experience over public religious affiliation and practice (James 1902). Today, there is an analogous move by some to present the heart of religion(s) as a spiritual capacity based on the sort of self-transcendence investigated by Urgesi and colleagues: the propensity for the sense of self to become less salient so that the individual is more open to experiences of unity and interconnectedness that are said to be the hallmarks of mysticism (Yaden, Haidt, and Hood 2017; Johnstone and Cohen 2019). This is a fascinating hypothesis, but it is quite a specific way of understanding spirituality, never mind religion. Care therefore needs to be taken when making wider claims about the relationship between brain pathology and "religion" or indeed "spirituality" because much depends on the way these concepts are operationalized.

For example, several studies (e.g., McNamara, Durso, and Brown 2006) have concluded that Parkinson's disease is associated with a decrease in religiosity and attributed this to reduced function in the dopamine-based brain pathways typically affected in this condition. However, a review of the questionnaires used to measure religiosity in some of these studies found that they contain many items relating to religious practice and community participation that would naturally be limited by the effects of a physically disabling condition. On the other hand, more personal ethnographic approaches in which Parkinson's patients were interviewed indicated that their religious faith was maintained but that it was expressed differently due to the physical and social effects of this health condition and the consequent change in life priorities for the affected individuals (Redfern and Coles 2015).

This last point draws our attention to the way in which "religion" is decontextualized in much of this research. Those who understand it as a complex. multifaceted, but recognizably unitary phenomenon that goes beyond individual beliefs, experiences and practices to include community affiliation, together with consequences for morality and health (Glock and Stark 1965), would also say that it has been excessively reduced. Although automated individualist techniques such as structural brain scans combined with psychometric assessments may be highly informative in relation to some of the purported building blocks of religion, personal encounters in real-life social contexts (even where this is a clinical setting) reveal much that is not accessible to them.

From brains to Persons

Greater access to this sort of contextual information becomes possible when brain-injured patients move from the phase of acute medical care to medium- and long-term rehabilitation settings. I was privileged to work for many years in a specialist neurological rehabilitation facility with both residential and community-based services, most of whose patients could have stepped out of a neuropsychology case book. Indeed, several of them have achieved lasting, if anonymous, fame as published individual neuropsychological case studies or patient cohorts. Before starting work in this new clinical speciality, my knowledge was based on reading such publications as a student. Despite the human touches in the writings of clinicians such as Milner, I had somehow gained the impression that the affected individuals were primarily exemplars of prized neuropsychological syndromes or vessels housing interesting constellations of deficits. This perception changed dramatically when I met some of them.

I still recall my first day at this facility in 1987 when, shocked and ashamed, I quickly realized that my prospective patients were not brains or cases but people. Despite their fractionated cognitive abilities, they were whole persons, each with a different story, part of existing social networks, and trying as best they could to get on with their lives. Later, I found that most of them were deeply troubled and struggling with major existential questions that centered on why devastating health events happen, why one had happened *to them*, who they were now, and whether this new impaired version of themselves merited any self-worth (Yeates, Gracey, and Collicutt 2008; Collicutt 2011).

None of the neuropsychology research that I had read up until that time prepared me for the self-reflexive capacities of even the most impaired individuals living with the effects of serious neurological illness or injury, nor for their courage in the face of adversity. However, I was also unprepared for the degree of physical disability that can accompany conditions affecting the brain. Most of these people had damaged minds *and* damaged bodies (as in the case of the Parkinson's patients in the previous section). This in itself is a salutary reminder that the brain is the origin of both somatic and mental phenomena. Cognition (including "religious" cognition) is not only "embrained" (Saver and Rabin 1997; Geertz 2010) but embodied (Watts 2021). Bodies are not shells that house the brain; the brain and body are a unified whole. This whole is embedded in and extends into a social context (Vasquez 2011); it also has a diachronic aspect, often expressed in narrative form.

Understanding the place of the brain in religion requires a whole-person approach that pays due attention to narrative (taking a patient's "history" is a key clinical skill), and that understands neurology patients as not simply sources of data to support high-level neuroscientific theories but of scholarly interest in their own right. There is, as yet, relatively little work published in this area (Dein 2020), but one example is my case report of the continuing life of faith of a Christian academic theologian who acquired a dense amnesic syndrome similar to that of HM at the age of 50 (Collicutt 2019). Some of the many things demonstrated in this report were the importance of preexisting character; the significance of the broader faith community for holding identity and extending the individual's cognition (Kevern 2015); the pervasive nature of religious identity (for example, this individual criticized one of the measures of religiosity used in the McNamara et al study for spuriously placing religion as a single discrete item among others when it in fact pervades the whole of life); and the perhaps surprising finding that rational propositional memory played a relatively small part in this senior academic's life of faith compared with embodied habits and emotional intuitions.

This final observation connects with the proposal of some psychologists of religion that the important form of cognitive processing in religion more broadly is the highly embodied and intuitive implicational system that cannot give an account of itself but on which convictions and relationships are based: "I would want to argue for the importance in religious cognitive processing of the implicational system, a subsystem concerned with meanings, albeit at a nonpropositional level. Indeed, the discernment of such meanings seems to be at the heart of religion…It is not unusual for important but difficult insights to be glimpsed initially at the level of inarticulate meanings…" (Watts 2002, 87).

However, the insights provided by this more clinically based approach struggle to find a voice in an area that has increasingly moved from clinic to laboratory and beyond that to brain scanner. The methods employed in these settings play down a life history perspective in favor of a very brief snapshot; operationalize the concept of interest in terms of the sort of formal analog task that can be carried out within the confines of the scanning machine; and thus constrict embodied socially enactive cognition so that it becomes disembodied, individual, and essentially immobilized cognition. Above all, there is a relentless move from persons back to brains.

The Advent of Functional Neuroimaging

> To those who say clinical observation has been made redundant by sophisticated brain scanning, we respond that imaging experiments are powerful but potentially reductionist, methodologically limited…and with their ecological validity hampered by the paraphernalia of the scanning environment. (Coles and Collicutt 2019, xi)

In the second half of the twentieth century, brain imaging techniques rapidly advanced so that brain structure could be examined by procedures that produced images analogous to a series of X-ray films to give a three-dimensional picture of the brain: computerized tomography (CT) and magnetic resonance imaging (MRI). This enabled the location of brain pathology, such as tumors, to be pinpointed exactly, reducing the need for exploratory surgery.

At the same time, techniques were being developed to measure brain *activity* in different areas while a person is carrying out a task or responding to a stimulus. The brain is an electrochemical organ, so one way of doing this is to exploit changes in brain electrical activity in response to particular stimuli or activities. Electrical signals are measured outside the skull using the electroencephalogram (EEG), and as the century progressed, this "electrophysiological" approach became increasingly sophisticated. These methods have extremely good temporal resolution so they can pinpoint the event that the brain is responding to but relatively poor spatial resolution, so they are weak at pinpointing which part of the brain is responding.

The alternative approach is to exploit chemical changes in the brain. Because brain cells use a large amount of oxygen and glucose when they are active and because brain cells with similar functions tend to cluster together, measures of local uptake of these substances in terms of blood oxygenation or rate of flow give an indirect measure of local brain activity; hence, these are referred to as "hemodynamic" methods. The most common are functional MRI (fMRI), single-photon emission CT (SPECT), and positron emission tomography (PET). The principle behind them all is to introduce a disturbance (magnetic or chemical) into the brain for a very brief period. Measures are based on the differences between cells in terms of their recovery from the disruption, which is directly related to hemodynamic activity. Because the hemodynamic response is slower than the electrical response of cells, these methods have poorer temporal resolution than electrophysiological methods, but because the hemodynamic changes are highly localized, they have much better spatial resolution (they can potentially pinpoint which part of the brain is responding). More recently, the advantages of both electrophysiological and hemodynamic methods have been combined in magnetoencephalography (MEG).

These procedures generate a very large amount of information that needs to be processed by a powerful computer. The data are very "noisy," and their interpretation has to be supported by algorithms to correct for factors such as head movements and generally to smooth and enhance the data. Decisions on whether differences in the proxy measures of activity between groups of cells are significant are based on inferential statistics but are also open to enough personal interpretative freedom for theoretical bias to creep in.

Perhaps more importantly, the task undertaken by the research participants must be carefully chosen. It must be physically possible to carry it out within the scanner (where extraneous movements can ruin the measurements); it must be sufficiently brief and focused to be captured by the procedure (hence the objection of the Carmelite nuns participating in an fMRI study of mysticism that it was not a suitable subject for this method because "God can't be summoned at will" (Beauregard and Paquette 2006, 187)), and it needs to be compared with a control task because unless the brain is dead, there will always be background electrochemical activity (this is why, for example, the Azari et al study required participants to recite both Psalm 23 and a nursery rhyme). All of this means that the final highly processed data set is not only a proxy of local brain activity during an artificial analog task, but also a comparative rather than an absolute quantity.

This is not to say that, when designed well and interpreted with a due degree of caution, functional neuroimaging studies are not useful and informative; they clearly are. They have, for example, contributed helpfully to work on the nature of forgiveness (Billingsley and Losin 2017). It is simply to note their significant limitations, an important consideration in view of the way they are reported in the press. The computer programs involved can transform the data into colorful images of the brain. These make for good copy, and it is all too easy to assume that they are photographic in nature. When the most active brain areas are colored yellow or red, the impression of light or heat is conveyed. Again, because the brain is often presented independently of the skull that houses it, the notion of the disembodied brain gains cultural purchase.

There are two regrettable tendencies in the popular reception of neuroscientific data, colluded with to varying extents by the academic community (Geertz, 5–6). The first is the tendency to commit the mereological fallacy, described at length by Max Bennett and Peter Hacker in their 2003 book *Philosophical Foundations of Neuroscience*. They define this as attributing qualities to parts of a system that are only properly attributable to the whole, in this context misattributing psychological qualities to the brain. They refer to this as a new form of dualism—"a degenerate form of Cartesianism" (72)—that instead of separating mind from body separates brain from person. They insist that the brain does not think or love, or indeed believe or pray; the *person* does these things when the appropriate parts of the brain are active. To say otherwise is to depersonalize human life. Clinical and ethnographic studies of people living with acquired brain pathology offer a significant potential corrective to this.

It has been noted that what counts as a whole system, and thus a mereological error, can vary between disciplines (Croasmunn 2017, 22), so it could be argued that under certain conditions, psychological qualities are more properly attributable to social groups and communities than individual persons, as suggested in the previous section. This seems to be a particularly important consideration in the human phenomenon of religion, where a full account is likely to involve biological, psychological, sociocultural, and historical considerations.

The second tendency is to attribute spurious authority to statements made using neuroscientific vocabulary. Deena Weisberg and colleagues found that explanations of psychological phenomena generate more public interest when they contain neuroscientific information, whether or not the neuroscience is relevant to the explanation. Furthermore, irrelevant neuroscientific information made a psychological explanation of a psychological phenomenon more plausible to nonexperts even when the psychological explanation was itself bad. That is, in contemporary Western culture, neuroscientific language can interfere with critical capacities, acting to mask flaws in arguments (Weisberg, Keil, and Goodstein 2008). David McCabe and Alan Castel found a similar effect with the use of brain images, and they suggested that such images feed a human preference for reductionist explanations (McCabe and Castel 2008).

Concluding Reflections

The study of spirituality and religion in neurology patients brings into sharp focus a host of questions about human nature and identity, how concepts of religion are understood, the relation of parts to wholes, and the mystery of the most subjectively disembodied and transcendent experiences being instantiated in localized material substance. These patients have historically formed the battle ground for arguments between theists and atheists, dualists and monists, medical practitioners and laboratory scientists. These concern, among other things, territorial boundary disputes and jostling for the right to speak with authority. For example, in contemporary Western culture, neuroscientific experts appear to have taken the place once occupied by religious leaders in pronouncing on existential questions such as the nature of free will and personal responsibility or the practice of transcendence.

This article has argued that the major potential contribution of neurology patients to some of these questions is to be found at least as much in their lives as their brains. For example, "there is academic value in observing how focal lesions fractionate the human experience of religion, just as our knowledge of the basis of language has thrived on the dissociative effects of brain lesions" (Coles and Collicutt 2019, xi). Less obviously, the way that faith persists in the context of loss of the capacities that many would say render us fully human, such as memory, empathy, rational thinking, or language, should give some pause for thought.

This is a particular issue where the heart of religion is conceived as "meaning-making," an increasingly popular understanding among psychologists (Park and Paloutzian 2013). The spirituality and religion of neurology patients challenge this conception to the extent that these patients may not only be in situations that lack any obvious inherent meaning but are also facing those situations stripped of many of the usual human resources necessary to make meaning. This turn toward meaninglessness is a reminder that the great spiritual traditions of the world attach relatively little importance to "special" experiences, coherent theology, ritual practice, and certainty of conviction; they instead focus on living well in the context of loss or marginalization (Pargament 2002), persevering in periods of darkness and, instead of making meaning, "making meaninglessness inhabitable" (Collicutt and Gray 2012, 13). This is perhaps where neurology patients come into their own.

Within the Christian apophatic tradition, for example, writers such as John of the Cross and the anonymous mediaeval author of the *Cloude of Unkowing* point to personal and cognitive disorientation as the place of encounter with the divine, a paradoxical assertion that takes seriously the opening words of the Sermon on the Mount: "Blessed are the poor in spirit, for theirs is the kingdom of heaven" (Matthew 5:3).

Note

1. Although Hippocrates had correctly recognized that epilepsy is related to brain impairment, he incorrectly understood this to be due to an excess of phlegm that, as it were, poisoned the system (Todman 2008).

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