CHAPTER 1

Introduction
Assumptions and Reasons

Why Use Neuroscience to Study Religion?

Well … we need all the help we can get to understand religion. Religion is complex. Neuroscience is one tool in the toolbox. I also think and this book will demonstrate, I believe, that neuroscience can give us some particularly important information about religion that you simply cannot get from other tools or methods. But this latter argument depends on whether or not religious experience turns out to be reliably associated with a consistent set of neural changes (activations and deactivations) that reliably alter from resting patterns in association with some reasonably well-defined religious act. It seems to me that the evidence (to be reviewed in later chapters) accruing from standard neuroscience studies and from studies of serotonergic psychedelics strongly supports this contention. On average, if an individual with some spiritual background ingests a serotonergic psychedelic of sufficient dose, that person will, again on average, report that they experienced mystical religious and spiritual states, often involving encounters with supernatural agents (SAs). The mystical experiences the individual undergoes, furthermore, appear to be dose-dependent: the stronger the dose (up to a point) the more intense and elaborate the experiences. Psychedelic agents are known to produce a relatively consistent set of changes in brain activity that, in turn, is reliably associated with those mystical experiences. The physiologic changes the agents produce in other parts of the anatomy are not associated with the mystical states. Nor are the changes the agents produce in the environment (if any), or the culture or any other relevant entities associated with the reports of mystical experiences. Culture appears to shape the expression of the experiences but its rate of change is slow relative to the appearance of the mystical experience. The thing that reliably changes in close temporal association with the experience is the brain. Clearly, the most proximate causal contributing factor to the mystical experiences are the measurable alterations

we document on functional magnetic resonance imaging (fMRI) scans for all to see (Johnson et al., 2019; Preller & Vollenweider, 2018).

But these kinds of data, concerning the importance of the brain to religious experience, are not good enough for some scholars. I call them the "new Gnostics." The old, ancient Gnostics hated human flesh and refused to ascribe anything of value to human flesh, including the brain. Human flesh was not spiritual enough for them. Interestingly, some nonneuroscientist scholars apparently see the brain as some kind of inert, dead matter that cannot produce anything of enduring value – again is not spiritual enough. They pay lip service to the idea that religion must be "embodied." But strangely, embodiment does not appear to include the brain for them. For them, the brain, at most, is a kind of filtering device that merely allows information to be transmitted in greater or lesser amounts, from one disembodied, ill-defined entity to another. They argue against the idea that religious beliefs, behaviors or experience might be associated with a consistent set of activation patterns of brain regions and networks. They refer to this idea derisively as a search for a "religion circuit" or a "God spot" in the brain. They, rightly it seems to me, point out that religion is too vast and complex a phenomenon to be dependent on any one region of the brain – no matter how complex. But that sweeping assessment of the search for religion–brain correlations as futile throws the baby out with the bathwater. Obviously, no domain of human experience is associated with a single brain region. All forms of human cognition and experience call upon widely distributed neural networks for their realization and religious experience is no different in that regard. The point, however, is that we can reasonably assume that many domains of human experience and cognition are associated with distinct neural signatures, if we remember that the term "neural signatures" is shorthand for complex networks of brain sites exhibiting roughly consistent patterns of activation and deactivation in association with relatively consistent patterns of behavior. In short, some areas of behavior and cognition are probabilistically – not deterministically – associated with consistent brain activation patterns and some aspects of religious cognition are likely to be no different.

If we accept the common sense claim that complex forms of human experience/cognition are mediated by complex networks of brain activity of one kind or another, then *every* domain of human experience very likely has its own specific set of neural networks that probabilistically activate in particular patterns. We call these unique brain activation patterns things like "the neural signature," "brain circuit" and the like to save time and to refer to some pattern of brain activity that reliably engages when that

domain of cognition manifests. Now in most of these cases the circuits in question can also be used for a host of other functions, but when that occurs the overlap is not complete. The pattern and set of networks activated are typically unique to the cognitive domain in question. Evidence for that claim is that if a preferred set of neural networks is damaged, the associated functional domain is degraded to varying degrees in relation to the severity of damage. Other related networks may over time take up some of the slack and restore some functionality in the affected domain, but the domain will typically not attain full functionality.

For example, language function X (e.g., grammar) draws upon a host of brain networks in order to realize its operations. For the function in question to be language function X, no other cognitive capacity but language function X utilizes the same pattern of brain networks and activity. It is impossible for language function X and visual function Y to utilize exactly the same pattern. There may be some overlap, such that they utilize some of the same hardware of course, but they cannot utilize exactly the same spatiotemporal pattern of brain activation. If they did, they would yield the same cognitive content and no longer be distinct cognitive phenomena. Most, and probably all, forms of distinctive cognitive content require some level of brain activity to manifest. Differing patterns of brain activity probabilistically produce distinct qualia and cognitive phenomenologies. The relation is probabilistic and dynamic; most of the time the brain activation pattern in question induces or facilitates the cognitive phenomenology – but not always and not deterministically. In addition, cognitive content feedbacks on the brain itself to shape it in ways to make it more responsive to the kind of cognitive content that the environment seems to require.

Religious cognition is distinctive cognitive content – even though it calls upon a host of other cognitive domains. It is both produced by the brain and shapes the brain in myriad ways. Mathematics is another example of distinct cognitive domain. Even though it calls upon a host of other cognitive domains (like language, spatial processing, pattern matching etc.), it clearly has its own content and phenomenology and it clearly, over time, shapes brain structure and function. The distinctive phenomenology associated with the supraordinate cognitive domain must have its own distinct neural signature – inclusive of, but over and above the contribution of the host of other cognitive systems that contribute to the overall domain. This is a version of the binding problem in neuroscience. How do we get unity of a particular type of conscious experience despite a host of differing brain subcomponents contributing to the overall experience and its associated

brain activity? I therefore propose the neural version of Leibniz's Law of the *Indiscernibility of Identicals*, call it the converse of Leibniz's Law or the *Discernibility of Nonidenticals*: if cognitive contents *x* and *y* are distinct then there is at least one property that *x* has and *y* does not, or vice versa. That one property at some point in the analysis must involve a distinct brain activity pattern as understood in the terms noted.

Even if (in the very, very unlikely possibility that) language function Y and visual function X utilized the same exact brain hardware or networks, those networks would be used, orchestrated and activated in temporally differing ways in order to realize differing cognitive phenomenologies. Some scientists, for example, have pointed to various forms of brain activity in the gamma band range that index synchronous firing or at least correlated functional activity across regions of the brain. The spatial and temporal patterning of the neuronal firing and brain oscillatory patterns of these selected brain sites would be different for the two differing cognitive functions and thus there would be a corresponding difference in terms of their experiential and cognitive phenomenology. Each domain of human experience will call upon and draw from the array of fundamental computational capacities the brain offers and the cognitive capacities that support the domain in question. So the brain networks that support each of these fundamental cognitive processes will likely play a role in realization of the domain in question. But the domain in question will utilize that array of networks in a way that surpasses what occurs within any single subdomain and manifests as an overarching unity that is specific to, and for, that domain. There will be a brain signature peculiar to that domain of experience or there would be no such domain in the first place. The alternative view would be that human experience is not produced or mediated by the brain, or that the brain is infinitely plastic. In that case there would be no correlation between cognitive phenomenology and the computational capacities or structure of the brain.

Thus, the claim that religious experience has its specific associated brain signature is a trivial claim – not a bold or unusual claim. Perhaps the investigators who indignantly repudiate the search for a God spot in the brain simply mean to say that there is no one region dedicated exclusively to religion stuff. Who could disagree? But there may be one *pattern* of brain activity distributed across several brain networks, rather than one *region* of brain, that is probabilistically but roughly consistently associated with one type of religious experience – say some elements of mystical experience such as "ego dissolution," or the encounter with SAs, or the ritualization of behavior and then all of religion's subcomponents combined.

Most neuroscientists agree that most functional brain networks contain one or two central nodes in the network, that if damaged, create downstream effects that dramatically alter the functionality of that network. For example, while language production is not reducible to Broca's area, Broca's area is nevertheless a crucial node in the network for language production for most right-handers. In this analogy, if examination of the data on brain and religion point to a single region as crucial for that domain of experience, we would assume that the region in question can be provisionally conceived as a potential key node in a larger network or set of networks that mediate various aspects of religious experience. In summary, if we assume that religious experience is like any other domain of human experience then it is reasonable to assume that religious experience, like any other complex domain of human experience, is probabilistically associated with relatively specific brain activity patterns – a brain signature that is realized in turn as dynamically ongoing recruitment of a relatively consistent set of neural networks, with critical and less critical operational nodes and that operate in unison to realize what we call religious experience.

This brings us to another assumption concerning brain and religion. I assume that the brain is not infinitely plastic. Religious experience cannot be realized with just any old part of the brain or set of networks. Religious cognition has its own computational requirements and peculiarities just like any other domain of human cognition. There is a line of thought coming mostly from investigators who are rightly impressed with both the abundance of evidence for brain plasticity even in the adult, as well as with the power of culture to shape brain response and functions. Here is the not the place to address these issues in detail. Suffice it to say that despite the impressive plasticity displayed by the brain, that plasticity has limits. The brain exhibits relatively stable structure and an array of existing functional networks. It observes some population norms, consistent processing preferences and general operating principles. For nonhuman primates and human beings, the prefrontal lobes, for example, tend to support executive control, planning, working memory and related functions while the somatosensory strip supports bodily sensory processing and so forth. These evolutionarily shaped brain localization patterns are relatively stable functional configurations that give culture something to operate with when shaping contextually appropriate behaviors. In effect, culture does not have to "reinvent the wheel" each time it selects a configuration of brain networks to work with when shaping the brain and behavioral repertoire of individual human beings.

Religion Definition

Now given that our fundamental assumptions concerning brain and religion issues are explicit, let us turn to the more fundamental problem of just what religion is. As every student of religion knows there is no universally agreed-upon definition of religion. Religious activities are too multifarious and varied to be reduced to a single set of classificatory criteria. Religion should not be "essentialized" into one set of things and only that set of things. Rather I treat religion as a flexible class of things (artifacts, group effects, practices, cultural events, beliefs, cognitions, behaviors and experiences, etc.) held loosely together by Wittgensteinian "family resemblances." This is also consistent with attributional theories of religious phenomena. There is no set of characteristics that is present in all and only members of the class of religious things. Instead, each of the flexible class of characteristics that are associated with the family of religious things occurs in a majority of religiously defined phenomena. This once again is adopting a probabilistic approach to the phenomena in question. What are those family characteristics of religion that are typical of the majority but not all of the phenomena deemed religious? These are things like SAs, rituals, distinctions between sacred and profane places, sacrificial altars, temples, churches, mosques, highly entitative groups, pilgrimages, afterlife beliefs and so on. For the purposes of this book, however, I focus on a restricted subclass of the family of religious things – namely psychological phenomena associated with religious behaviors, cognitions and experiences that refer to, or involve, ritualistic elements relating to SAs.

The justification for this focus is that SAs appear in virtually all religions (even in those that officially eschew the "gods" as illusions), in all places and across all epochs. When Murdock chose a sample of 168 societies to represent the full range of human experience in various types of societies, "religious rituals" and "beliefs in supernatural agents" occurred in almost all of them (Murdock & White, 1969). Thus, I will tend to treat religion in this book as rituals, cognitions and experiences concerning SAs and SA-imputed reactions, concerns and associated mythologies. I will emphasize experiences on the "mystical" end of the spectrum as the brain-related data are more clear concerning mystical-type experiences. Now obviously not all of the authors of the studies I review in this book adhere to this kind of restrictive definition of religion. So some of the neuroscience data reviewed in this book must be understood to refer to religious phenomena that surpass my restrictive definition of religion as ritual practices directed toward SAs and SA reactions thereto. I acknowledge that this definition

excludes spiritual experiences that do not involve reference to any deities or SAs, but I note that even so-called atheistic religions, such as Theravada Buddhism, which posit no ultimate supernatural agency or agencies, will often nevertheless include adherents who in fact do believe in SAs. For example, many of these nontheistic Buddhists imagine, understand and relate to the figure of the Buddha as a kind of moralizing SA who can be invoked to help, intercede or facilitate individual enlightenment goals, and then dispenses help, makes adherents aware of concerns, blessings, insights and so forth.

In my estimation, reference to interactions with religious SAs as opposed to ordinary agents or to magical beings like Santa Claus makes religious cognition unique from all other forms of cognition. When we relate to religious SAs we do so ritualistically. That ritual relation puts us in a kind of reduced, deferential, petitionary mode in terms of our agentic powers. It simultaneously elevates the SA as due sacrifices from us – or at least social honors, fear and some degree of reverence or awe, if not reverence. The SA then reacts to our ritual deference and exhibits special cognitive powers and concerns that help define the ritual relation as religious. We (adults at least) do not relate to Santa Claus via rituals, but we do require rituals to relate to beings like demons, angels and gods. To the extent to which we direct ritualistic behaviors toward SAs or magical beings or dead ancestors and so on we tend have religious experiences. In addition, the extent to which we direct ritualistic behaviors toward powerful human beings like kings or presidents, we invest these individuals with supernatural auras and powers. Think of the "divine kings" that ruled most human polities for many thousands of years. Rituals plus SAs then establish a minimal example of religious cognition/experience. Given that representations of SAs are distinct from representations of other social agents, religious cognition cannot be easily reduced to, or explained by, social cognition alone. I therefore assume that religious cognition, insofar as it includes references to religious SAs, will be associated with a unique neural signature (in the sense of neural signature described).

Religious beliefs involving SAs are distinguished from all other beliefs by their epistemic properties. They often appear intuitive, noninferential, and when operating as ultimate regress blockers they may discourage reflection. But they also very often arise as a product of sustained reflection upon experiences of various kinds (Yilmaz & Isler, 2019). More importantly, we humans tend to want to relate to these SAs in ways that we do not relate to other human beings; that is, ritualistically. Other unique properties of SAs include:

1) the SA is nonphysical though visualizable;
2) the SA often has unusual and bizarre visual characteristics and features (e.g., haloes, therianthropic features, extra appendages like wings);
3) the SA has unusual powers and capacities (e.g., pass through barriers, become invisible, metamorphosis, like Proteus);
4) the SA makes unusual demands on the individual (e.g., requires sacrificial offerings);
5) in the case of moralizing SAs the extra demands put on the individual involve restrictions on certain behaviors and even thoughts, thus promoting a future-oriented motivational state within the individual to realize a desired or ideal self;
6) the SA often (though not invariably) elicits intense emotional reactions and demands an unusual level of emotional commitment from the individual;
7) the SA often, especially in the case of moralizing SAs, has "full strategic access" to the mind of the individual thus precluding deceptive interactions with the SA.

The associated neurobiology of SA cognition overlaps to some extent with networks involved in normal forms of social cognition, but the overlap is not at all perfect. We will see that it deviates in interesting ways that underscores the uniqueness of religious cognition.

In addition, when thinking about the minds of SAs we use the neurobiology associated with theory of mind (ToM) attributions differently than when we reason about human agents. For example, Epley et al. (2009) found that when individuals were asked to reason about God's beliefs the parts of the brain involved in self-referential processing (dubbed cortical mid-line structures by Northoff et al. [2006]) were activated in addition to ToM networks. This did not and does not occur to the same extent when reasoning about minds of other people. For some reason when we think about SAs we involve a reference to our sense of self in a way that does not occur for thinking about ordinary human agents. I assume that what occurs when we think about SAs is that we prefer to think about those SAs that can give us something we need or want (e.g., help, healing, transformation, power). We therefore most often see ourselves as less powerful than the SA we prefer to think about. The sense of self therefore appears in this context in a kind of formal but diminished petitionary role or stance, whereas this is typically not the case when we think of other people.

Assumptions Concerning Evolution of Religion, Brain and Culture

I also assume in this book that the best way to understand the role of the brain in religious experiences is to view the brain as a product of natural selection *and* cultural evolution. Therefore, to illuminate brain and religion topics I adopt standard Darwinian frames of reference using cultural evolutionary models, evolutionary anthropology and neuroscience to probe religion.

In cultural evolution, individuals often acquire and recombine their cultural traits via social learning processes involving imitation of prestige models like charismatic teachers or gurus.

Cultural processes often favor different behavioral outcomes when, for example, cultural processes interfere with or inhibit expression of genetic traits. Conversely, cultural processes can amplify genetic traits.

Most students of religion, including the neuroscientists who study religion, when considering evolutionary accounts of religion assume that religion must in some way be adaptive. The typical function assigned to religion is support for social cooperation. But evolution does not necessarily always produce optimal adaptations to an environment. Therefore, the search for adaptive functions of religion should be supplemented to include the ways in which evolutionary factors produce things like costly arms races instead of nicely functioning adaptations or "spandrels" associated with the adaptations. In this book I suggest (as in its first edition) that one very potent evolutionary force that shapes religious cognition and experience is genetic conflict or sexual conflict.

Sexual Conflict

As Moon (2021) and many others have noted, most religions seem to be specially concerned with sexuality and sexual morality. Moon proposes something he calls the "reproductive-religiosity model," which posits that religion serves to promote what life history theorists call k-selected reproductive strategies. In human terms these are individuals who pursue committed, highly invested and long-term mating strategies. Religions doctrinally and ritually support these k-selected strategies and impose costs on behavior inconsistent with these mating strategies. As I argued in the first edition of this book, I think there is a lot of truth in the idea that religion promotes k strategists – especially in the form of promoting morally "ideal selves" that exhibit strong executive functions, future orientation,

self-control of impulses, long-term planning and so on. However, religion and all of its associated practices can also be a kind of flexible cultural facultative process that can flexibly switch to promoting r strategists when appropriate to do so – as in cases of chaotic environments with high local mortality rates. In addition, even among the modernized religions that specialize in promotion of k strategists there are all kinds of exceptions to the rule like celibates, costly rituals, mystical experiences that care not a whit for long-term plans, and visionary forms of religiously ecstatic practices that blast apart all kinds of k-selected behaviors.

Taking into account sexual conflict theory can help us understand a broader range of religious phenomena than relying on life history theory only. Sexual conflict occurs when the genetic interests of males and females diverge (Gavrilets & Rice, 2014). Such conflict can result in arms races where adaptations in one sex are harmful for the other sex. These coevolutionary arms races are now recognized as one of the key evolutionary processes shaping life history parameters.

Sexual conflict in humans stems from some unusual reproductive biology in humans relative to other primates. Women's effort in gestating and raising offspring is significantly greater than men's, lasting at a minimum at least nine months. In comparison, men's obligatory investment can end with a single copulation. Thus for r-selected strategists men's mating strategy can be more short-term oriented (or r-selected: live fast, reproduce early, die young) unless cultural or other pressures promote k-selected strategies (develop slowly, reproduce later, live longer) among men. In short, men (relative to women) on average would benefit more from short-term, low investment in parenting strategies, while women would benefit more, on average, from long-term, high-investment strategies.

In addition, human females do not visibly advertise when they are sexually receptive or most fertile as do other female primates. Indeed, due to internal fertilization and gestation, ancestral men could not have been certain that their children were, in fact, genetically their own. This is known as paternity uncertainty. Paternity uncertainty in turn triggers all kinds of male adaptations to counter this female innovation. Females may have developed the innovation to prevent male primates from killing infants/juveniles given that they could not tell that the juveniles were their own. This reduction in aggression then made it possible to form longer-term bonds between parents and offspring. In addition, new male innovations to overcome paternity uncertainty emerged at every level, from sperm competition inside the female reproductive tract to behavioral displays by males seeking to mate.