Introduction: the cognitive turn

Imagine a particular exhibit that might easily be found in a museum of science and industry. The room housing the exhibit is long and narrow, nondescript save for a gray rectangular structure running from one end to the other, as if the curator has decided to display an extended tool shed. The aluminum shell of the structure is the height of an average person and broken only by a row of two-by-two-foot windows evenly spaced along each side. At first glance, the exhibit is neither visually appealing nor is its educational purpose immediately obvious. Stranger still, the exhibit has attracted the attention of a gathering of school-age children.

As you watch, the children swarm to the opposite end of the room. There is a moment of silence as they disappear around the far end of the structure. Suddenly, you hear a whistle blast and the whirl of machinery engaging. Simultaneously, the children come running back along the side of the structure, faces filled with glee. At the near end, they huddle together once more, visibly trembling with anticipation. After a minute or two, the sound of machinery fades, concluding with the chime of a bell. At the end of the structure a trapdoor snaps open and something comes tumbling out into a catch bin. One of the children steps forward and removes the object. As you watch, the child tears into plastic packaging and holds up, to the delight and envy of the rest, a bright new yo-yo. Erupting with laughter, the children dash off into the museum’s crowded main hall.

Amused but not yet comprehending, you retrace the children’s course. At the far end of the structure you find a sign welcoming you to the Industrial Revolution. Beneath the sign is a slot like those on vending machines. Beside this is a large red button, most of the paint rubbed off from use. Intrigued, you feed $1 into the slot, press the button, and hear the familiar sounds of machinery again coming to life. Slowly you sidle along the side of the exhibit, and when you reach the first window, you realize that the structure houses a miniature factory meant to demonstrate the mechanical complexities of an assembly line. At the first window you observe robotic arms retrieve half-orbs of transparent plastic and send them at walking pace down a conveyor belt. At the next window you watch as the two halves are fused together with a small metal axis before proceeding onward. With each new window you watch the work progress: a string attached and spooled; a sheen of color added; the whole encased in cellophane and labeled. In a few minutes you have walked the span of the structure. The bell chimes, the trapdoor opens, and, momentarily child-like, you claim the freshly made yo-yo.
This imaginary museum exhibit aptly illustrates how the majority of modern consumer goods are constructed. The myriad objects that surround us were brought into being by a raft of finely designed tools and machines. But this imaginary museum exhibit also stands as a useful metaphor for two topics central to the discussion below. The first is the human brain. The structure of the brain and the means by which it does its work are markedly similar to the operation of an assembly line. Perceptions, emotions, ideas, and actions are the end products of specialized mental mechanisms. Second, this imaginary museum exhibit demonstrates the need to reorient the way we study human-related subjects. Like the children’s fixation on the yo-yo, academic analysis has traditionally focused on finished products: a piece of music, a work of literature, an ethical stance, a political system – all the many artifacts that comprise human culture. But culture is the residue of cognition. To fully understand the nature of a finished product, it is necessary to look through the windows at the cognitive processes involved in its creation.

The same can be said for the forms of thinking we call ‘religion’. Since its formal beginnings, the academic study of religion has been dominated by interpretive methodologies ranging from theology, philosophy, and phenomenology to structuralism, symbolism, and feminism (Cunningham 1999; Stausberg 2009). As interesting as this work might be, it has largely failed to illuminate fundamental issues, such as where religious ideas come from and how they work. Behind the lack of satisfying explanatory approaches looms the specter of ‘sacredness’, the notion that religion is an exceptional category set apart from the mundane and therefore beyond the pale of science. At best, so the thinking goes, an empirical investigation of religion reduces away that which makes it unique; at worse, it kills the very thing it seeks to explain.

In recent years, however, the study of religion, like other subjects bracketed in the humanities, has been teetering on the edge of a remarkable paradigm shift. After the ‘Cognitive Revolution’ (the last quarter of the twentieth century) and the ‘Decade of the Brain’ (the 1990s), it is now, in the new millennium, intellectually recalcitrant to discuss religious thinking and experience without direct reference to mental architecture and function. The ‘black box’ of the behaviorists has been made transparent by a consortium of brain specialties and the advent of powerful neuroimaging technologies. It is commonplace today to point out that the brain mediates everything we perceive, feel, and think. The excitement now lies in applying this truth to sociological phenomena.

With respect to religion, this effort is firmly established as the ‘cognitive science of religion’ (Barrett 2004; Boyer 1994; Tremlin 2006). This research program represents a synthesis of state-of-the-art cognitive science and traditional religion studies. Cognitive science is the study of the mind and how it thinks. Cognitive scientists explore the structures of the brain and their respective functions, with an eye to making sense of our perceiving, thinking selves. The cognitive science of religion takes the methods and findings of cognitive science – together with insights drawn from cognate disciplines such as anthropology, archaeology, evolutionary psychology, and philosophy – and applies them to the specific activity of religion. It is an approach that explores how the mind originates and shapes religious thinking and behavior.

Since its inception in the 1990s, the cognitive science of religion has emerged as a leading theoretical approach for explaining the religious mind. By probing the nature of human thought, investigators working in the field are uncovering the causes of fundamental features of religion, including why people tend to be religious, how minds generate and transmit religious ideas, why these ideas are ubiquitous and universally similar, why religious rituals follow predictable patterns, and how cognitive equipment constrains the content and form of religious systems (Andresen 2000; Lawson and McCauley 1990; Pyysiäinen and Anttonen 2002; Slone 2006). This chapter outlines the argument for viewing religion as a mental phenomenon,
highlights some of the cognitive processes that enable and animate religious reflection, and introduces the significance of the cognitive approach for the contemporary study of religion.

The architecture of the mind

If the cognitive revolution has taught us anything, it is that we cannot understand what we think until we first understand how we think. Sensations, thoughts, decisions, our very sense of 'self', are created by the mental machinery of the brain (Damasio 2010; Hood 2012). Cognitive science works to delineate the links between the parts, processes, and products that comprise human consciousness.

This is by no means an easy task. Given the incredible intricacy of the brain – some 100 billion neurons wired together via 100 trillion interconnections – knowledge about its architecture and operation necessarily comes from a number of related fields. What is referred to in the singular as 'cognitive science' is in fact a highly interdisciplinary endeavor. For example, neuroscience, which studies the brain at the cellular level, provides an anatomical foundation. Consultation with computer science offers insights into computational processes and organization. Developmental psychology helps to clarify what mental capacities are innate as opposed to those that are acquired. Understanding the brain’s biological heritage is also requisite, so interaction with comparative and evolutionary psychology is essential. And, while it is unfortunate, much of what we know about how healthy brains work comes from the study of brain disorders and injuries.

Even a cursory review of such research would outstrip the scope of this chapter. Of the domains of mentation that interest cognitive scientists – e.g., attention, communication, decision-making, imagination, learning, and memory – the focus here is on certain aspects of perception (how the brain identifies and interprets the external environment) and conceptualization (how the brain forms and employs ideas). Likewise, of the many insights into mental operation confirmed by cognitive science, four are particularly salient to the current discussion.

First, ‘the mind is a complex system of cognitive and emotional faculties implemented in the brain which owe their basic design to the processes of evolution’ (Pinker 2011: xxiii). The shaping forces of natural selection have designed neural circuitry, just as they have designed eyeballs, stomachs, and hands. And like these body parts, the brain, too, is an adapted organ. The functioning of the brain evolved in response to challenges faced by ancestral humans. It has its specific architecture and its specific set of mental processes because this architecture and these processes advantaged survival and reproduction. Understanding thinking and behavior requires knowledge of human evolutionary history. Evolved cognition is the skeleton key to human nature (Dunbar, Gamble, and Gowlett 2010).

Second, many aspects of cognition are innate. Innateness implies that particular ways of thinking, like the brain structures that support them, are biologically endowed rather than learned. The mind is not a blank slate awaiting cultural inscription but possesses already at birth the capacities to interface with the natural and social worlds it inhabits (Bloom 2004; Pinker 2002). These prewired intelligences and cognitive predispositions continue to guide perception, emotion, thought, and action throughout the lifespan. The operation of innate mental mechanisms is easily demonstrated through observation and experimentation. One sign that a mental faculty is innate is that it is universally expressed, regardless of cultural setting (Brown 1991). Classic examples include the ability to read facial expressions, early language acquisition, and the intuitive knowledge associated with folk biology, folk psychology, and folk physics.

Third, innate function is tied closely to the brain’s modular design. Human cognition emerges from a constellation of dedicated, functionally specialized mental mechanisms (Kurzban
The brain is not a unitary general-purpose problem-solver but a kluge of independent though interconnected modules, sometimes tightly localized in the brain, sometimes spread across neighboring regions. Modularity is responsible for the instant, efficient, effortless nature of human perception, thought, and response. The aforementioned ability to read facial expressions is the result of a mental module designed specifically for this purpose. The full suite of functionally specialized modules ranges from fundamental mechanisms responsible for each mode of perception, to prosocial devices that subserve interpersonal interaction, to higher-order facilitators of metarepresentation (Barkow, Cosmides, and Tooby 1992). Direct stimulation of brain structures, faculty-loss due to brain damage, and neuroimaging studies confirm the modularity model of the mind.

Fourth, most of the mental processes that undergird perception and conceptualization are nonconscious. The reasoning, deliberative, reflective mode of thinking – a hallmark of the human species – is dependent on mental processes that occur automatically, incorrigibly, and below the level of conscious awareness (Gazzaniga 2008; Vedantam 2010). In the same way that the brain involuntarily oversees bodily functions and instigates physical movement, so too it conceals most of the computational, inferential, and predictive processes involved in interpreting and engaging the world. Extraordinary nonconscious processes hide behind every routine act or experience: maintaining balance, three-dimensional vision, object identification, grasping a coffee cup, erupting bits of memory, the cascading imagery of a daydream. The nonconscious operation of the mind can also be teased out through trickery. Visual illusions ranging from real-world mirages to graphic designs like the Necker cube dramatically illustrate how perceptual processing, like many other aspects of cognition, takes place beyond conscious control.

These basic architectural aspects of the brain have prompted researchers to provide metaphors for how the mind works. The brain has been compared to a computer bundled with powerful software, a Swiss army knife sporting multiple gadgets, and a well-equipped workshop. Equally usable is the museum exhibit imagined at the start of this chapter. Housed within the skull is a wondrous organ that, while infinitely complex, is both structurally and functionally quite like a sophisticated factory. Structurally, the human brain is fitted with precisely engineered mental machines that perform specific tasks and are largely automated. Functionally, the human brain builds precepts and concepts in the same way that goods are built on assembly lines. Perceiving and thinking is a constructive process. From raw materials such as light, shape, and motion, the brain fabricates our subjective experience of reality. Similarly, the brain manufactures ideas using innate knowledge, prewired inference systems, personal experience, and learning. Whatever the case, specialized mental machinery contributes to the finished product, be it a vivid quale of the color red, the recognition of a familiar face, or the representation of a horse. Which mental tools and processes are engaged depends on the task at hand. Some mental tools complete all the requisite work on their own; others do their job then pass the product off to different tools further down the line.

The current model of the mind yields some consequential implications for the study of human-related subjects, particularly religion. The first is the seriousness with which we must take both the centrality of the brain and the cognitive foundations of culture. In lieu of ghosts in the machine or homunculi, the brain itself is responsible for creating each person’s mental world. We have no direct access to reality save for the mental simulation projected in the theater of the mind. Drawing on crude, often ambiguous information gathered by the senses, the brain renders a serviceable, yet nevertheless contrived, model of the environment. In Chris Frith’s (2007: 111) arresting turn of phrase, ‘our perception of the world is a fantasy that coincides with reality’. The same holds true for our thought life. Just as the brain is busy transforming photons into visible objects and vibrations into recognizable sounds, so, too, it is at work emoting,
planning, formulating beliefs, and motivating action. It is impossible to make sense of the things people experience, think, and do without reference to the mind. Shifting to the level of culture does not undo this fact. Socially shared ideas, practices, institutions, and technologies are all products of mental activity. Cultural phenomena, as Dan Sperber (1996) points out, originate as mental representations, are transmitted to other minds as public representations, and end up retained as durable cultural representations. Any robust explanation for the presence, content, or form of a specific cultural activity must take account of its noncultural (i.e., cognitive) foundations.

Second, the cognitive approach seriously challenges the notion of cultural relativism. Parallel to other long-standing dictums in the social sciences – the mind as a tabula rasa, the primacy of custom over biology – is the claim that cultural diversity is a barrier to generalized descriptions of people and their activities. Human behaviors and forms of thinking, it is argued, are local, relative, and unique. This anthropological canard is belied by extensively documented cross-cultural universals and the discovery of their underlying mental mechanisms. As David Linden (2007: 222) reminds us: ‘Every human culture has language and music, and we are happy to study the neurobiological bases of these phenomena; every human culture has a form of marriage, and we study the neurobiological basis of pair bonding as well’. And so on with nearly every common human behavior. Because the modern brain, with its many specialized devices and corresponding processes of thought, is characteristic of Homo sapiens as a species, the way people think and the ideas they produce are largely the same for everyone everywhere. Having minds that are predisposed to think in consistent, predictable ways means that all people everywhere build concepts using the same procedures and, ultimately, represent and interact with the world in similar ways. A standardized mental operating system – properties of the mind that are common to all – results in a wide range of persistent representations. This is equally true of the cross-cultural universal that is religion. While individual religions appear to vary enormously, the contrasts between them lose a great deal of their sharpness when they are examined more closely. The cognitive approach reveals that the ideas and practices that lie at the core of religious systems are limited, constrained, and quite similar.

Lastly, knowledge of mental architecture contradicts the aforementioned belief that religious thought is somehow unlike other kinds of thought, and that religious ideas cannot be explained in the same way as ‘ordinary’ ideas. At the level of cognition, religious concepts are not ‘special’ kinds of thoughts, and contrary to recent quests for so-called ‘god spots’ in the brain, there are no mental structures or processes specifically dedicated to religious reflection. Religious concepts are generated by the same mental mechanisms that produce all other kinds of concepts. Many of the marvelous thoughts humans entertain rise well above the level of brute existence, but they can nevertheless be understood as by-products of cognitive skills and tacit forms of knowledge designed to accomplish more mundane calculations. Religious ideas – some of the most sublime uses of the human mind – rest on garden-variety forms of thinking. As E. Thomas Lawson (2000: 79) contends, ‘whatever it takes to explain how minds work generally is sufficient to explain how religious minds work’.

**Cognitive foundations of religious thought**

The cognitive science of religion is demonstrating that the same perceptual, emotional, and cognitive faculties used for the quotidian tasks of life also support religion. Substantiating this position requires isolating specific mental mechanisms responsible for the generation and transmission of religious concepts. While researchers in the field continue to identify distinct mental mechanisms that contribute to religious thinking, two are now well established as foundational to the creation of religious concepts: the agency detection device and theory of mind. As expected, these
mental mechanisms are primitive, part of the core architecture of the mind, and central to survival.

For humans as for many other species, the elemental concerns of life revolve around sustenance, safety, sex, and status. These concerns in turn involve interaction with other living beings, or ‘agents’. Because agents are the most relevant things in the environment, it is essential that brains come prepared to effectively detect and differentiate objects and agents. A person who fails to recognize buzzing coils as a snake is unlikely to fare for long. A person who can’t distinguish another human from a tree is not fit for social life. Though objects are important, agents deserve special attention. Objects are inanimate, predictable, and generally harmless. Agents are self-motivated, capricious, and capable of both beneficial and exploitive behaviors. Anticipating and successfully reacting to agents requires the initial step of discerning them within otherwise inchoate surroundings. The mental mechanism dedicated to this task is commonly called the agency detection device. This powerful mental tool constantly scans for the presence of agents, effortlessly parsing the world into animate and inanimate, thing and being. The agency detection device is the epitome of modular design; its operation is quick, automatic, nonconscious, and evident in infancy.

But we can add another adjective to this list of characteristics that reveals more about the agency detection device’s role in our mental lives. The agency detection device is not just quick, automatic, and nonconscious, it is also hyperactive. Because it is so important that we rapidly recognize agents – and in particular other human agents – the agency detection device is functionally hypervigilant, hypersensitive, and therefore prone to over-attribute agency. In addition to instantaneously identifying the people and creatures that cross our paths, the agency detection device is cued by signs, traces, and unusual events that indirectly suggest the presence of an agent. A rustling bush, creaking floorboards, moving objects, coincidental occurrences, even animated shapes, as famously demonstrated by Fritz Heider and Mary-Ann Simmel (1944), easily trigger an attribution of agency. The tenacity of the agency detection device makes frequent appearances in daily life: we sense things in the dark, see shadows as people, and startle at unexpected noise and movement.

As these examples show, the agency detection device is not perfect; it can easily sound false alarms. Having a hyperactive agency detection device leaves us open to annoying practical jokes and unnecessary rushes of adrenaline. Yet when survival is at stake, false alarms are advantageous. The lion beside the path may in fact turn out to be a rock. The ominous person you think you see standing in the alley may be, upon closer inspection, just a rubbish can. But such mistakes are harmless. Failing to see the lion or the mugger is not. So nature accepts the trade-off between speed and accuracy. It is better to be safe than sorry. Stewart Guthrie (1993) has argued persuasively that our incorrigible proclivity to suspect agency results from an evolved, hardwired ‘strategy of perception’. When in doubt, the agency detection device assumes the presence of an agent until proven otherwise.

One inevitable, seemingly frustrating, but certainly provocative result of having a hyperactive agency detection device is pareidolia – the psychological phenomenon of perceiving patterns where none exist. Because the agency detection device is necessarily tightly strung, it is prone to mistakes and misattributions, to see agents where none are in fact present. Iconic instances of pareidolia abound. In 1921, Swiss psychologist Hermann Rorschach launched the celebrated technique of using a patient’s perceptions of ambiguous inkbloths to assess personality traits, emotional functioning, and thinking processes. In 1976, Viking I’s photographs of shadowy plateaus in the Cydonia region on Mars left people seeing a humanoid face and speculating about alien civilizations. The State of New Hampshire lionized its ‘Old Man of the Mountain’, stoically gazing out over Franconia Notch, until the weathered granite cliffs collapsed in 2003.
Whether in the laboratory, the natural world, or the world of pop culture, we readily and quite naturally ‘see’ agency everywhere. We perceive faces in clouds, hear voices on the wind, apprehend patterns in randomness, anthropomorphize objects, and respond to advertisers’ personified products.

How does the agency detection device and its idiosyncratic functional design relate to religion? It should be apparent that these provocative yet quite natural examples of pareidolia are but one step removed from what might be dubbed ‘religious pareidolia’, definable as the psychological phenomenon of perceiving religiously construed agents and patterns where none exist. Numerous so-called apparitions and theophanies are reported annually around the globe and across religious traditions. Consider these well-known cases:

- Just before Christmas in 1996, a pattern of rainbow-colored swirls formed on a panel of windows at a finance building in Clearwater, Florida. To many, the swirls appeared to resemble the outline of the Virgin Mary. As word spread, an estimated one million people traveled to the site bearing offerings, transforming the parking lot into a shrine, and seeking cures for ailments.

- In 1998, a concrete traffic barricade placed in San Francisco’s Golden Gate Park by a city worker made headlines when it was found that the phallic-shaped pillar had become a major site of worship for Hindus. Recognizing the pillar as a swayambhu, or ‘self-manifested’ image of the god Shiva, local Indian nationals and Hindu devotees from around the world have visited the park to adorn the barricade cum lingam with flowers, bathe it with milk and honey, sing bhajans, and perform pujas.

- After the World Trade Center was struck by jetliners on September 11, 2001, numerous television viewers were convinced they saw the face of Satan, complete with horns and a malevolent grin, emerge from the clouds of billowing smoke. Captured in still frames and rapidly disseminated via social and mainstream media, the images fueled theological commentary on the terrorist attack.

- In April 2005, a salt stain on the wall of the I-94 underpass at Fullerton Avenue in the City of Chicago struck pedestrians with its resemblance to the Madonna, her face shrouded by a shadowy cloak. Flocks of the faithful as well as curious onlookers soon arrived to pay tribute with gifts of candles and flowers.

- In September 2007, residents of Hong Kayh, a housing district in Jurong, Singapore, noticed that a callus formation on a particular African mahogany tree looked like a monkey. Following reports of the phenomenon in local newspapers, hundreds of people from all over Singapore arrived at the site to pray, pay homage to the Chinese monkey god Sun Wukong, and tap into the tree’s magical properties.

- The American television series Ghost Adventures premiered on the Travel Channel in 2008. Armed with high-tech cameras and recording devices, crewmembers stage visits to famous haunted sites and reportedly capture paranormal activity and ghostly presences in shifting light patterns, dust motes, and random noise. Awards and strong ratings have earned the show a seventh season.

- In 2012, a man in Albuquerque, New Mexico, sat down to eat a tortilla his mother had baked for Ash Wednesday when he noticed a burn pattern that bore a striking resemblance to the face of Jesus. The flattened bread, now commonly referenced as ‘a sign’ and ‘a miracle’, has become a social media sensation.

The preceding examples highlight two pertinent points about the obstinate operation of the agency detection device and its consequential role in our interpretations of the world. First, both
natural and religious forms of pareidolia are the result of the same perceptual bias. Whether seeing the Man in the Moon or the Madonna on a grilled cheese sandwich, the same mental mechanism is at work. Second, the question of veracity is not relevant in this context. Brains were not designed to work as ‘truth machines’. Natural selection designed mental modules to piece together a model of the physical world that ‘works’ – does the model make us act appropriately and survive for another day? It does not matter whether this model is actually true. Our minds find agents everywhere, and the attribution of agency underpins many of our beliefs and subsequent behaviors. Clearly, religious thinking capitalizes on this in-built system. Ironically, while natural forms of pareidolia are recognized to be nothing more than charming illusions, many people accept religious forms as genuine events of perception.

More intricate but functionally related to agency detection is the mentalizing ability referred to as theory of mind. Because agents are so consequential – they can be cooperative and competitive, friendly and deadly – it is not enough to simply see them; they need also to be understood. For humans, the quintessential gregarious species, this need particularly extends to those agents that matter most: fellow persons. We require a way to explain and predict the actions of others, and the best way to do this is to assume, in Daniel Dennett’s (1987) phrase, an ‘intentional stance’; that is, to consider that beings think. Toward this end, nature fitted the brain with cognitive mechanisms that regularly generate mentalistic interpretations of the world. Theory of mind, the underlying algorithm of this machinery, entails the working assumption that agents act on the basis of intentions, beliefs, and desires.

Like agency detection, theory of mind is absolutely crucial to daily life. Unlike agency detection, theory of mind is expressed, at least to such a profound degree, only in our species. Indeed, it is reasonable to place theory of mind alongside symbolic thought, language, and abstract reasoning as the most human of human faculties. A robust theory of mind allows for unprecedented engagement with the world. Attributing mental states to others is the best way to make sense of behaviors, ascribe motivations, foresee goals, and anticipate the outcome of personal interactions. The truncated nature of life without a properly functioning theory of mind is illustrated by the ‘mindblindness’ symptomatic of autism spectrum disorders (Baron-Cohen 1995).

The running occupation of theory of mind is ‘mindreading’, a term that aptly characterizes our astounding ability to discern the beliefs and intentions of others (Malle and Hodges 2005). All normal humans are adept mind readers. We naturally assume that people have minds and we invest a great deal of time in trying to divine their thoughts. Does he really mean what he said? Why did she do that? What is he thinking right now? Does she know I lied? This sort of mental analysis is the foundation of interpersonal relations, allowing us to successfully negotiate the social networks on which human life depends. Interestingly, most of the cues used to read minds are physical rather than linguistic. Words alone can easily deceive; emotions and body language are much harder to fake. When we interact with others, we constantly monitor their reactions, gleaning information about their mental states from their eyes, facial expressions, and gestures. Despite the hidden nature of mental activity, our assessments are remarkably accurate. We have little difficulty inferring the thinking behind most of the behaviors we witness around us.

As a fundamental system of cognition, theory of mind is quick, automatic, and spans both conscious and nonconscious thought. While the neurological substrate supporting theory of mind is prewired, this complicated mental skill requires a period of maturation to reach its full potential, progressing from infant imitation to pretend play to a grasp of false beliefs around the age of four (Wellman 1992). From this point, individuals possess the sophisticated social reasoning necessary to navigate the Machiavellian challenges of group living. Telling truth from
deceit, identifying allies and antagonists, sharing and manipulating gossip – theory of mind underlies the political games that people play.

So the big human brain – big, according to Robin Dunbar (1996), precisely because of the social intelligence demanded by intense group living – operates on the overarching assumption that events in the world, like agents themselves, are caused by intentions, beliefs, and desires; that is, by minds. Consequentially, as with the task of agency detection, theory of mind necessarily displays a functional peculiarity. For the same reason that agency detection is hyperactive – it is too important to be left to a slower, more deliberative processing path – theory of mind is prone to promiscuous expression. Perceiving others and the environment in mentalistic terms predisposes us to another manifestation of pareidolia: the presumption of minds at work where none are in fact present. The misattribution of mind is easily extended to objects, imagined agents, and random events.

Everyday examples of mentalistic misattribution are close to hand. We naturally ascribe minds to things that act like agents, such as robots, misbehaving computers, and ventriloquist dolls. Interestingly, this bias can be co-opted for therapeutic effect, as demonstrated by the use of mechanical animals with dementia patients (Harmon 2010). Mind is also frequently employed to animate notions of chance, fortune, and fate, resulting in both folk and official beliefs in real, controlling agents. This form of thinking is visibly expressed in eccentric behaviors, including the use of amulets and ritualized activities common to superstitions, phobias, and gambling. The driving assumption of intentionality is even apparent in our propensity to personalize and often personify otherwise random events. We query the meanings of arbitrary accidents, question the purposes of sickness and disease, and intuit meanings behind pointless calamities. Conversely, we readily suspect that an intentional will is linked to fortuitous occasions, such as disasters nearly missed, illnesses overcome, and lotteries won.

Once again, it is a small step from the mundane to the mystical. Understanding the operation of theory of mind gets some important work done with respect to religious thinking. Like agency detection, theory of mind is essential to the creation of religion. Consider these examples:

- **Teleological reasoning** – A general element of religion is that final causes, design, and ends are inherent to reality, however defined. Our mentalistic interpretation of the world, intuitive and already promiscuously at work in the minds of children (Kelemen 2004), logically suggests that, like human actions and pocket watches, things and events in the environment have intentional form and purpose, resulting in varieties of theistic and magical thinking.
- **Intelligent design** – For the same reason, myths about the origins of the cosmos and all life within it are universal and tenacious. Our inexorable intentional stance suggests that an eyeball or a flagellum, let alone a striking woman or a spiral galaxy, are too complex to have come about by impersonal means. Creation by hand and intent intuitively feels right, making ‘mindless’ processes like natural selection difficult to accept.
- **Supernatural agents** – The notion that there are creating, concerned, and controlling minds behind the visible curtain of reality leads to the need, at least metaphorically, to give flesh to these minds. Deities, devils, spirits, and so on are the theological outcome of the intuitive belief in unseen intentionality.
- **Body/soul dualism** – The natural interpretation of mind as the animating principle of agents, and especially the subjective experience of our own minds, has resulted in the ancient and persistent understanding of persons as physical bodies possessed of immaterial souls.
- **Afterlife** – Dualist thinking, the difficulty of imagining subjective nonbeing, and the ease with which we allow for unseen mentation, results in the idea that minds can endure beyond death. While the dissolution of the physical body is easily grasped and accepted, it is harder
to negate the disembodied continuance of mental life – a tendency that Jesse Bering (2006) demonstrates is already fully active in young children – hence the various forms of afterlife conceived by religions.

- **Prayer** – Ubiquitous across religious traditions, the practice of prayer presupposes a subject of address. Regardless of the form or intent of prayer, the practice requires acceptance of an exterior mind that is both receptive and responsive.

- **Worship** – Likewise, the bulk of religious practices, which can be largely characterized as worship – ritualized expressions of devotion, adoration, awe, and praise – are predicated on the notion that the focus of this activity – god, spirit, ancestor, and so on – is ‘aware’ of the presence and purpose of the action. Most of the behaviors that comprise religion make little sense apart from the assumption of an unseen mind that thinks, knows, and cares.

**Cognitive constraints on religious thought**

Clearly, knowledge of mental function begins to render the supernatural as natural. Just considering the functionality of agency detection and theory of mind – two basic cognitive processes common to all normal brains – goes some distance to explaining the origins and persistence of religious thinking, as well as how the suite of mental mechanisms we use for making sense of everyday life are co-opted to conceive of a whole range of religious notions about spiritual agents and dimensions. But as noted in the introduction, the cognitive approach also helps explain the shared features of religion and the forms that religious systems take.

Returning to the factory of the mind, we find that in addition to mental mechanisms responsible for agency detection and theory of mind – the latter primarily specialized for life in the social domain – there is a consortium of complicated machinery designed for apprehending the world at large. Pascal Boyer (2000, 2001) has produced a fruitful model of how this machinery operates. Utilizing innate taxonomical templates that coincide with the evolutionary environment, the brain classifies things according to natural categories: person, animal, plant, and object. Mental inference systems then automatically enrich thinking with native expectations of what members of each category are like. We tacitly understand, for instance, that stones are inanimate, that trees are rooted in place, that lions feed, and that our neighbors possess psychological properties.

Importantly, the set of cognitive mechanisms used to apprehend the world is also at work when we construct concepts about it. The process of building mental representations of things believed to exist in the world relies on the same taxonomical templates and inference systems. This is true regardless of the use or creativity of the concept conceived. Taking the idea of a ‘horse’ as an example, the basic animal template and inferences apply whether the horse in mind is a familiar one (say, the American Quarter Horse), one never personally encountered (say, the Przewalski’s horse), or one wholly imaginative (say, a unicorn). Whether normal or novel, the products of conceptualization are both limited and constrained by the mental tools the brain has to organize and interpret the world.

This process of mental representation is also strikingly visible in religious thought. Consider the concepts of ‘god’, ‘goddess’, ‘spirit’, or the other supernatural beings that are central to religious belief and practice. The concept ‘god’ is decidedly different from the concept of ‘stone’ or ‘tree’ or ‘horse’; nevertheless, each of these concepts is constructed using the same set of mental templates and inference systems. Gods are at bottom person concepts. Person is the only category that the mind possesses for comprehending the type of entities that gods are said to be. Because the conceptual blueprint for building a god is based on the template for person, cognitive inference systems activate the set of native expectations about what a person is like.
Gods think, feel, care, and act. Consequently, people represent gods in relational terms and interact with them in person-al ways.

Comparative religion confirms on the ground what cognitive psychology finds in the laboratory. From culture to culture and religion to religion, supernatural beings are consistently represented and described using person terms. There is theological diversity from place to place, but the bottom-up view provided by the cognitive approach reveals how shallow such diversity truly is. God concepts start with the person template, much like a wire mannequin, and this basic framework is then dressed up according to local preference. We conceive of supernatural beings anthropomorphically, be they the spirits encountered by shamans, the ancestors lingering at the edge of a hunter-gatherer village, the personified powers of Indic religion, or Christianity’s omniscient creator. And this act of anthropomorphism is not confined to image – which many would argue is simply a metaphorical necessity – but extends to supernatural beings’ motivations and behaviors. What Emma Cohen (2007: 107) says about the gods populating contemporary Afro-Brazilian religion is by and large universal: ‘The gods [in these cult communities] display very humanlike demeanours in their social dealings with one another, acting on the basis of their desires and whims. Jealousy, vengeance, bad blood, and trickery colour the conniving between the characters of this Elysian soap opera’. There is good evidence that we not only make god in our own image physically but mentally as well. According to experimental work led by Nicholas Epley (2009), people of faith think, at least when it comes to controversial moral issues, that god believes as they do – a finding redoubled by an fMRI study showing how individuals map god’s beliefs onto their own.

Viewed in this light, religious behaviors and ritual practices are no more mysterious than the act of shaking hands with a friend or buying a wedding gift. The machinery of social cognition that evolved to help us negotiate competitive/cooperative interpersonal relationships also guides our relations with supernatural beings. We take oaths, make vows, and enter into covenants. We offer sacrifices and give tithes. We praise, entreat, and confide. We utter prayers and keep commandments. We bow our heads, bend our knees, prostrate our bodies, and avert our eyes. We do acts of dedication, acts of confession, and acts of contrition. In exchange, we hope for a bit of reciprocal blessing, concern, comfort, peace, and protection. At every turn, religious practice pirates the social adaptations humans use to interact with each other.

Of course, gods and other supernatural beings are not merely persons. Gods, after all, are gods. They possess special qualities, attributes, and abilities that, relative to the natural expectations we have about persons, are counterintuitive. Gods can be omnipresent and omnipotent, immutable and eternal, immanent and aloof, gracious and retributive, and much more besides. Counterintuitive characteristics add to the noteworthiness of these concepts, which in turn gives them an advantage in the busy marketplace of ideas (Boyer and Ramble 2001). But the cognitive approach reveals that the counterintuitive characteristics that really matter to people are those that directly impinge on our personal lives. Gods observe events in our world, care about our moral actions, and, unlike fallible mortals, have open access to our hearts and minds (Pyysiäinen 2009). Gods know information we strive to keep private. To minds predominantly designed for social life, such concepts are especially engaging. If such beings are out there, they are surely worth consideration and, for many, deep commitment. God concepts are pervasive and persuasive because they capitalize on the brain’s most powerful system: social cognition. Gods are particularly salient because their conceptual structure makes them highly relevant to minds like ours.

So cognitive mechanisms directly shape our thinking about the nature of supernatural beings. More broadly, these cognitive mechanisms also dictate the boundaries of theological reflection and the development of religion systems. Like water channeled by surface slope and contour,
religious thinking is constrained by the cognitive landscape of the mind (Atran 2002; Tremlin 2005; Whitehouse 2004). Because religious concepts are constructed in the factory of the brain, the mental machinery that builds them necessarily limits their variety and usefulness. Regardless of theological tradition, supernatural beings conform to the native expectations people hold about all intentional beings. Christians, Jews, Hindus, and atheists use strikingly similar concepts of gods (Barrett 1998). Theologians cannot propose just any notion and expect it to work. If they are to be meaningful and relevant, supernatural beings must fit within the framework of social cognition, which provokes the relational and emotional responses that drive religious experience. In spite of the profundity of theologians and the sublime abstractions they are capable of conceiving – god as 'ground of being', nirguṇa Brahman, the state of neither perception nor non-perception – ordinary believers display an acute 'theological incorrectness', precisely because they hold in mind concepts that are rather more concrete (Barrett 1999; Slone 2004). Indeed, the propensity to think of deities as persons gives rise to our readiness to render persons as deities, as with the worship of ancestors, the making of saints, the elevation of religious founders, and the belief in contemporary incarnations of the divine.

The ongoing tension between the cognitive (mental mechanics) and cultural (theological) foundations of religion helps to unwind another conundrum. Scholars who study religion on the ground have long noticed that it frequently takes two contrasting forms. There is 'official' religion – which is based on texts and the teachings of specialists – and there is 'folk' or 'popular' religion – which is what real people in the real world think and do. Despite attempts to get people to think according to official concepts, they often ignore or distort doctrine. Insight into the nature of cognition suggests that the mental mechanisms that guide thinking actually work against certain aspects of official religion. Only concepts that closely fit the way minds operate have a chance of becoming meaningful and widespread. In this way, culture is channeled by cognition. We should expect, for example, that when religious systems feature god concepts that are too far removed from natural cognition, they will likely be pulled back in the opposite direction. Historical instances might include the development of Sufism, the rise of Pentecostalism, the preference for provincial Hindu deities, the popularity of Pure Lands over parinirvana, and the advent of living buddhas and bodhisattva, despite early teachings about Siddhartha Gautama.

**Conclusion: cognitive science and the nature of religion**

To understand human nature, including the things we think and do, we must look at our prehistory. 'It was during this time', Steven Mithen (1996: 7) points out, 'that the distinguishing features of the human mind arose'. Similarly, to understand the origin, function, content, and history of religion, we must apprehend the deeper roots of the human mind. The cognitive approach pursues this line of investigation, offering an incisive account of the natural foundations of religion. Succinctly put, religion is dependent on perceptual, emotional, and cognitive scaffolding erected by natural selection to help our ancestors meet recurrent challenges in the human niche. Chiefly, the social psychology that orchestrates our thinking and behavior in the real world also guides our thinking about imagined ones. Due to mental mechanisms adaptively designed to interpret the natural world and other people, humans possess a powerful set of cognitive endowments that make their minds susceptible to producing supernatural concepts and, as a consequence, religion itself.

Researchers in cognitive and evolutionary psychology refer to such epiphenomena as 'byproducts'. Byproducts, sometimes also referred to as 'spandrels', are behavioral, physiological, or psychological traits that have not been specifically selected but arise as side effects of traits
adapted for other purposes. A trait can evolve for one reason and then be employed for another. With respect to religion, we have the kinds of minds for which religious thinking comes naturally. Religion has flourished to the extent that it capitalizes on evolved tendencies basic to everyday human life. Religion, therefore, originated for the same reason that it persists: the mental mechanisms that support religious thinking are hardwired into the brain. As David Whitley (2009: 207) recognizes, ‘we are all born with these [mental mechanisms], whether we are individually religious or not’. Religion resides in the modern human mind – an elaborate byproduct of evolutionary adapted, socially oriented, symbolically thinking brains reflecting on the world in novel ways (Tremlin 2012).

From a cognitive perspective, then, religion is neither the result of some spiritual ‘big bang’ in the history of human development nor an evolutionary adaptation, as is often argued, but an accidental byproduct of the way the brain was designed to think. Religion is an enticing error, the outcome of a brain prone to make perceptual mistakes. Evolution has molded the human mind with powerful cognitive biases and predispositions, which, when employed in the natural environment, provide an effective means of survival. However, these same tightly strung biases and predispositions also produce false perceptions and cognitive blunders that are the wellspring of superstitious, magical, and religious thinking (Davis 2009; Shermer 2011; Subbotsky 2010). In this sense, religion can be viewed either as a ‘dangerous delusion’ (Dawkins 2006a) or a ‘seductive illusion’ (Bering 2011), depending on one’s mood.

Empirical investigation of this fascinating set of ideas and behaviors has arrived at a set of scintillating conclusions. First, religion is a purely natural phenomenon, generated and mediated by the brain. Religion is a byproduct of mental devices originally designed to serve other adaptive functions, primarily social cognition. Second, religion takes the universal forms it does because it is shaped by shared cognitive processes. By virtue of a common evolutionary history, people everywhere possess the same mental architecture and as a result think in predictable ways. Third, religion retains its place in the modern world because humans have a hardwired susceptibility to religious notions, which keeps them pervasive across time and place. A suite of powerful mental propensities makes it extraordinarily difficult to consistently render the world in wholly materialistic terms. Immerse this hardwiring in the sea of socialization in which we all swim, and religious thinking, as we see, is nearly irresistible.