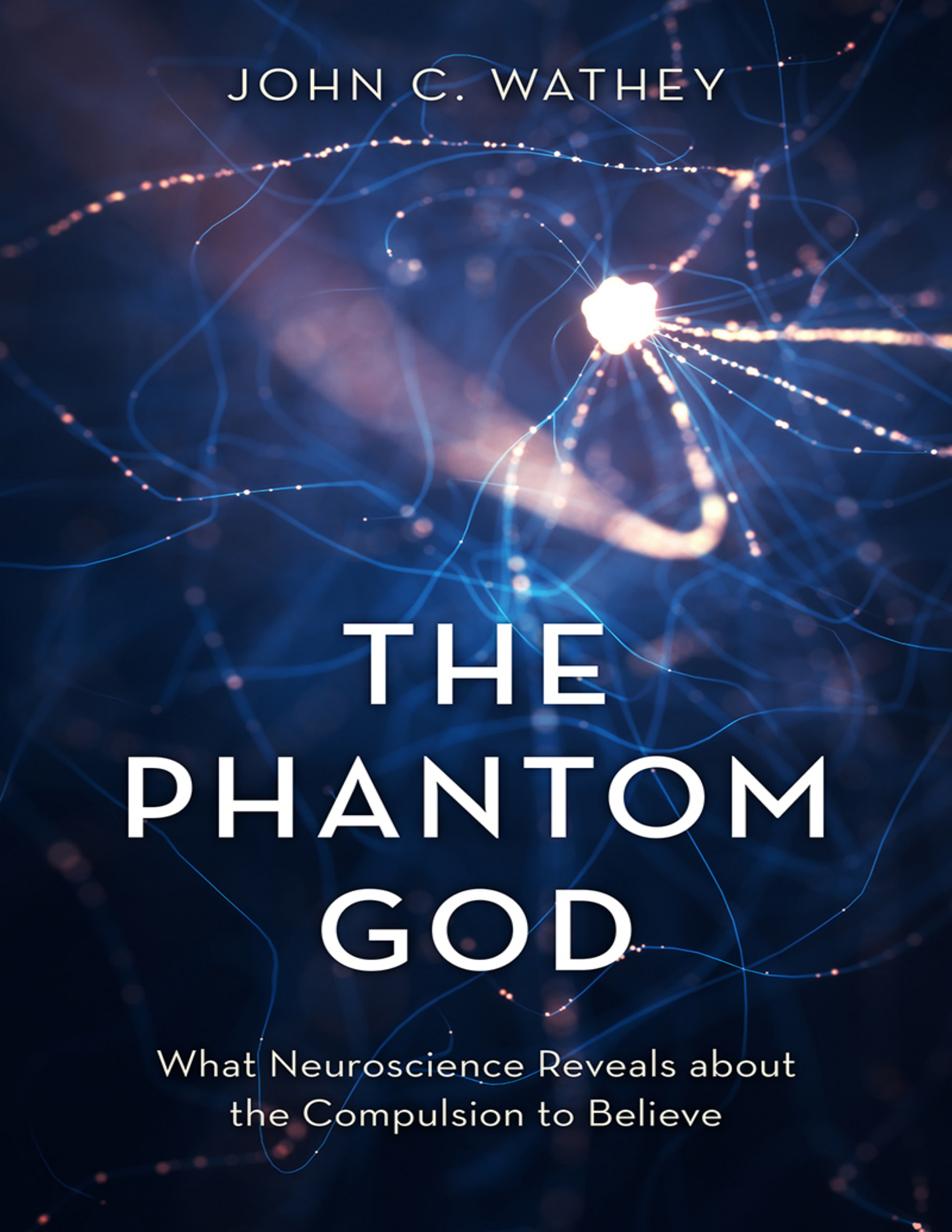
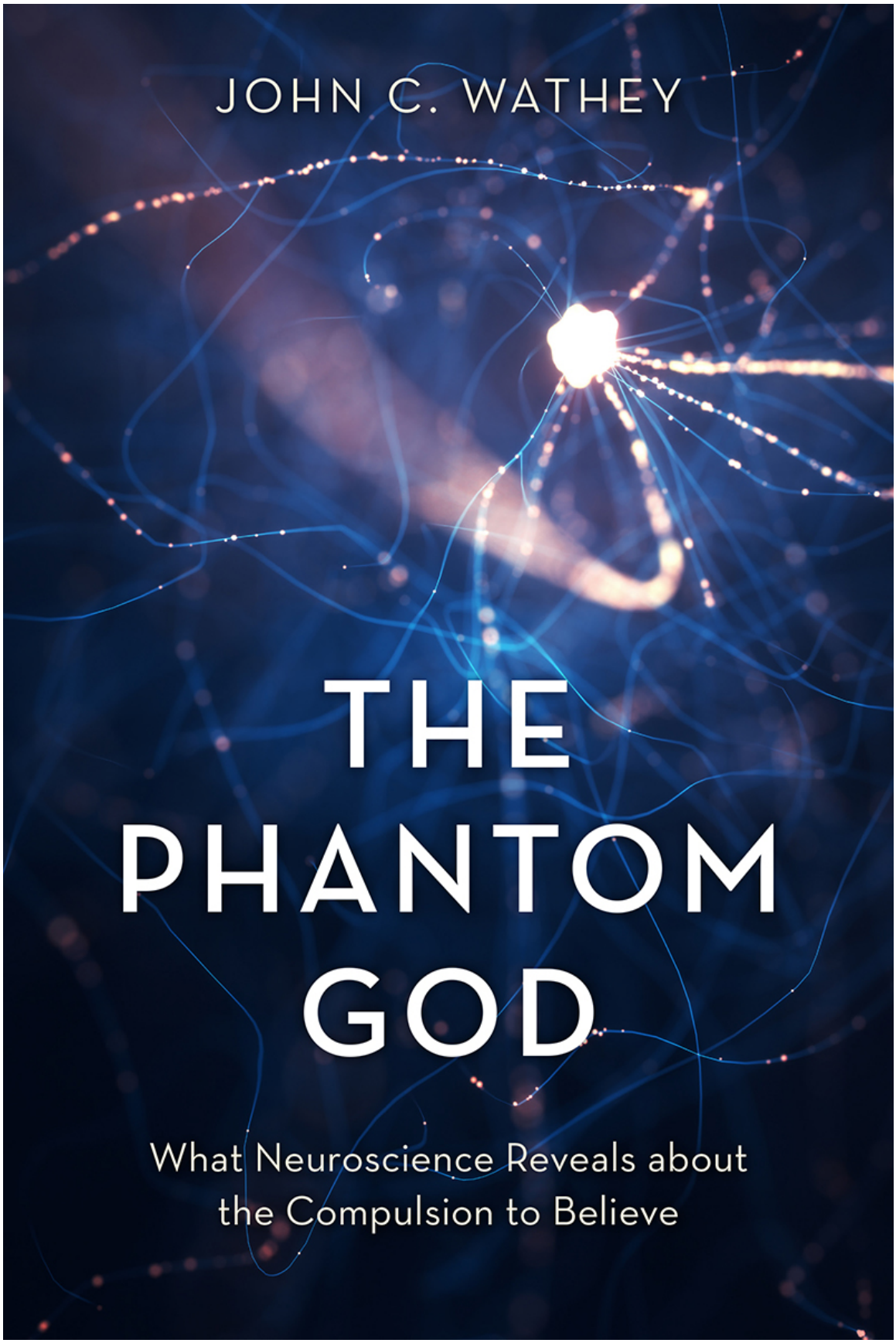

JOHN C. WATHEY
THE PHANTOM GOD
What Neuroscience Reveals about the Compulsion to Believe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Prologue

It was not neuroscience that caused former Christian evangelist Dan Barker to lose his belief in God. It was more a gradually escalating discomfort with the unfulfilled promises of the religion, the empirically testable aspects of Scripture that seemed not to hold up to experiment, and the growing realization that its most fundamental ideas no longer made sense. As with many believers, his personal experience of the presence of God had once seemed compelling evidence of the divine, and to this day he marvels that he can still summon those feelings. His flash of insight that appears as the first epigraph to this book beautifully expresses both the joy of seeing through an illusion and the deep questions that immediately follow. *Why* are humans prone to this illusion? *How* does the brain trick us in this way? In my first book, *The Illusion of God's Presence*, I tried to answer the *why* question. Here I deal mainly with *how*, and that takes us into the brain—a journey that a prescient Joseph Campbell could only imagine in 1959.

Since the advent of functional neuroimaging, the temptation to peek into the brains of people praying, meditating, or speaking in tongues has been irresistible. It has spawned a new discipline, or at least a new genre in popular science writing: *neurotheology*. Most of the results, however, have been disappointing. There is no consensus about what kind of mystical experience should be studied, little consistency in findings across studies, a dearth of clear hypotheses to test, and ample room for unconstrained speculation. Understandably, neurotheology has its detractors. Yet religion really is a profoundly important aspect of human behavior, one that merits

scientific scrutiny. The neuroscience of religious experience is in its infancy, its techniques are rapidly improving, and what it most needs now are specific and testable hypotheses that lead to good experimental questions.

I did my PhD in the lab of Ted Bullock, one of the founding fathers of neuro*ethology* (not to be confused with the almost identically spelled neuro*theology*). Ethology is the study of animal behavior in its natural context and emphasizes the evolutionary origin of the behavior and its role in the animal's reproductive success. Neuroethology extends this exploration into the brain. It seeks to understand the brain by applying the methods of neuroscience to the natural behaviors of highly specialized animals. The essence of the idea is that the complexity of the brain is overwhelming, and the only hope of understanding it is to start with a part of the brain where we completely understand the problem it is trying to solve. We can best do this in the brain of an animal that is highly specialized for a distinct and easily understood behavior—preferably one that has already been well studied by ethologists. Famous examples include infrared vision in rattlesnakes, communication and navigation by electric fields in weakly electric fish, echolocation in bats, sexual pair-bonding in prairie voles, the development of singing in songbirds, and the ability of barn owls to catch mice in total darkness using only sound cues.

With each of these examples, understanding the behavior had to come first. It took decades of behavioral study to understand that birds sing to establish territories and attract mates, that their song is partly innate but mostly learned, and that chicks need to hear the normal song during a critical period that precedes their first attempts at singing. Only then did it make sense to explore the neural circuitry in the brain that makes this possible. The behavioral studies mainly address "why" questions: Why do birds sing? Why is their song abnormal if they are raised in isolation? The neurobiological studies address mainly "how" questions: How do birds sing? How does the brain encode the innate aspects of the song? How does the brain of a chick learn the fine details of the song from its father? What neurons, fiber tracts, and neurotransmitters are involved? How do these change during development?

In my previous book, *The Illusion of God's Presence*, I tried to do mainly the first part—the ethological or behavioral part—for the scientific study of religion. The intense and highly emotional longing for a loving

God had been largely ignored in most of the scientific literature on religion, and my background in ethology suggested a new answer to this puzzle. That's what most of my first book was about, and the questions it addresses are mainly "why" questions. I did, however, include a few chapters that touched on neurobiology, and I confessed to my readers that these were mere snippets of a second book that had taken shape, almost by accident, as I was writing the first. Although the second book was unfinished at the time, I knew what it would cover, and I referred to it as "the sequel" throughout *The Illusion of God's Presence*.

This book, *The Phantom God*, is that second book. I wrote it to try to understand the circuitry in the brain that underlies the feeling of God's presence—in other words, to address the "how" questions. More precisely, I try to make sense of experiments that others have done that bear on the problem, and I suggest promising directions for future research. Part of what's new and special about *The Phantom God* is that it draws connections to fields of neuroscientific research previously considered unrelated to human religiousness, like mother-infant bonding in nonhuman mammals and language acquisition in human infants. There are many surprising connections and insights of this kind that can be seen only in the brain. For example, part of the circuitry of mother-infant bonding is also the epicenter of drug addiction—an observation that may explain a lot about the compulsive and tenacious aspects of religious belief. Similarly, the orbitofrontal cortex of an infant specifically responds to the mother's voice and, in adult Carmelite nuns, to their recalling the feeling of God's presence. Damage to this part of the brain causes acquired sociopathy, and the most severe cases are those in which the damage occurred in infancy; here we see the intersection in the brain of the social and neonatal roots of religion I emphasized in my first book.

Although *The Phantom God* clearly grew out of my work on *The Illusion of God's Presence*, it stands on its own. You can understand *The Phantom God* without reading its predecessor because part I, comprising two chapters, summarizes the essential ideas and evidence from the first book that form the behavioral foundations of this one. The title of the first chapter is an all-encompassing "why" question: "Why Is God Two-Faced?" Why do believers tell you that their God will damn you to hell yet in the same breath insist that he loves you unconditionally? The answer, in my view, is the key to an ethological understanding of human religiousness.

Equipped with that answer, we embark on an expedition deep into the human brain.

In part II, I lay the foundation for some promising new mechanistic questions, mainly by addressing this fundamental one: where in the brain is the circuitry that produces the illusion of a divine presence? Along the way I describe evidence from neuroscience that bears on the central hypothesis I lay out in chapter 1. My broader goal, however, is to explain as best I can the neural mechanisms behind that illusion and the emotions of spiritual experience.

The overarching hypothesis is that the illusion of God's presence comes from an innate neural model of mother, the purpose of which is to establish the infant's part of the mother-infant bond. Anomalous activation of this circuitry in the mature brain gives rise to a specific kind of spiritual longing and the expectation that a primordial savior exists. If this idea is right, then some of our most powerful spiritual feelings and experiences arise from the neural circuitry of neonatal emotion and expectation, and this insight leads to testable predictions. The desperate helplessness that precipitates the comforting sensation of God's presence and the crying of a newborn for the comforting arms and breast of its mother should share a common neural mechanism. Similarly, the satisfaction and enfolding love experienced by an infant at its mother's breast and the feelings that typically constitute spiritual experience—unconditional love and ecstatic union with a divine presence—should also have a common neural substrate. The correspondence of these infantile and adult mental states should be evident in similarities of localization in the brain, of neuronal activity, and of sensitivity to drugs. If that correspondence cannot be found, then the hypothesis is wrong.

One strength of the hypothesis is that it suggests specific experiments not only in humans, but also in nonhuman animals. If religious experience is a uniquely human phenomenon, as is widely assumed, then we are limited to those experimental techniques that can be used with human subjects. If, however, the neurology of the sensation of God's presence is intimately related to the neurology of infantile crying and mother-infant bonding—behaviors that occur in nearly all mammals—then many new experimental possibilities appear, and a large body of existing research becomes relevant to the problem.

Part II is a journey through those parts of the brain where various aspects of the innate model of the mother appear to be implemented. The discussion comprises five chapters, each of which deals with one aspect of the innate model as follows:

- Crying
- Innate knowledge and feelings
- The appetitive longing for mother
- The sensed presence
- Short-circuit certainty

For each of these I describe evidence that associates the behavior or sensation with various brain regions. Where relevant I also discuss the role of these neural networks in some adult behaviors, such as maternal caregiving, adult sexual pair-bonding, or drug addiction. My goal here is to try to explain what these parts of the brain do and how they do it. Although it is mainly infantile experience that guides us to these places, the rationale for exploring them is that they are likely to be involved in spiritual emotion and experience.

The story that emerges is that there is probably not a specialized part of the brain dedicated exclusively to neonatal behavior. Instead it appears that the innate neural model of the mother is the seed around which crystallizes the *social brain*—those widely distributed neural networks that we use as adults to read the minds of others through facial expressions, body language, gestures, tone of voice, and other nonverbal cues and that generate socially appropriate emotions and behaviors in response.[1] The social brain includes areas in the prefrontal cortex that do not fully mature until adolescence and so have long been considered irrelevant to neonatal cognition and behavior. Recent evidence, however, paints a more subtle and complex picture in which even these late-developing regions embody innate knowledge that is accessible in infancy. This revised neurological view is consistent with behavioral and psychological evidence that the mother-infant bond is the template for adult social relationships.[2]

Throughout development, however, that neural seed probably remains intact and distinct, partly by virtue of the unusual sensory stimuli and conditions of infancy to which it is attuned, but also because of the way innate information is represented in the brain. It is this innate neonatal

kernel of the social brain, activated in an abnormal adult context, that is the proposed neural substrate for the illusion of God's presence—the "trick of the brain" that Dan Barker found so strange and wonderful. When seen from this perspective, however, the illusion also appears remarkably similar to one that has long been familiar to neurologists: the phantom limb of the amputee, spawned by the expectation of the patient's brain that the missing limb should still be there. In chapter 7 I argue that the innate neural circuitry that expects the presence of mother can spawn a phantom divine presence in much the same way. Hence the title of the book: God is a phantom, conjured by a brain that expects a primordial savior to exist and compels that belief, both in infancy and, for many people, in adulthood.

Part III reexamines neurotheology from the new perspective developed in parts I and II, and it meanders into related research not specifically aimed at religious experience. Important themes include embodiment; the sense of agency; insights from neuropsychiatric illness; specialization of the left and right hemispheres; and the role of memory, expectation, and attention in conscious perception—both real and illusory. The book concludes with a discussion of predictions that may be empirically testable.

In my first book, I used the image of hiking to a high mountain summit and gazing at the landscape we had traversed as a metaphor for the new perspective on religion I had tried to present. In this book, the trail is steeper, the route is confusing in places, and the summit is higher. At times you may feel it is beyond your ability, but I urge you to persist. I warn you of the challenge ahead only to prepare and encourage you. You need not master every neuroscientific detail to see and understand the big picture. What you most need are the curiosity and courage to seek truth wherever that journey leads. Neuroscience is amazing, fascinating, and magnificent. On this trek, the summit experience is well worth the effort.

Part of what makes this book challenging is the complexity of the brain itself. There is no way to avoid this complexity and still do the subject justice. I shall therefore use conventional neuroanatomical terms for parts of the brain and their spatial locations. Some of these words have entered the popular lexicon, but most have not. I have tried to make it clear from the context that I am referring to a part of the brain (nucleus accumbens, orbitofrontal cortex, temporoparietal junction) or a spatial direction in the brain (rostral, caudal, medial, lateral, rostroventral) or a neurotransmitter or neuromodulator (dopamine, acetylcholine, endorphin) or an experimental

method (fMRI, NIRS, EEG, MEG). It should be possible to follow the essential ideas without knowing exactly what all of these strange words mean, but if they make you uncomfortable, I recommend a careful reading of appendix A. It explains some basic neuroscience and includes links to helpful websites. Chief among these is Wikipedia, which often provides excellent overviews and illustrations when searched using the technical name of a part of the brain.

A few excerpts from this book appeared in condensed form in chapter 12 of *The Illusion of God's Presence*. I hope the repetition is more reinforcing than tedious. Also, feel free to skim or skip part I of this book if you already know that material.

I include cross-references to related ideas in different chapters of this book. Some readers of my first book objected to this, expressing frustration that I would tease them with hints of what was coming without simply making the point in one place. To reduce that frustration, I've tried to flesh out these connections with more complete descriptions, but there are good reasons for retaining the cross-references. Complex ideas that rise in conceptual layers are best explained sequentially, and that is how I write. But a good scientific theory must cohere throughout its structure. If an experimental result supports one aspect of the theory yet contradicts another, then something is wrong. Conversely, if a result supports not only the part it was intended to test, but also other aspects, then the whole edifice is strengthened. This is why I often point out links between seemingly disparate experiments or ideas scattered throughout the book. Theology, by contrast, is notorious for its lack of coherence.[3] For example, we are told that a loving, omnipotent, and omniscient God allows evil and suffering because he wants us to have free will, yet we are also told, in other contexts, that this omniscient God knows all that will happen in the future. This means that all future events are determined, even if known only to God, and therefore none of us—God included—can have free will.[4]

Finally, I write in a time when religious groupthink has seized a significant minority of Americans and, through their disproportionate influence, much of the American government. *Seizure* is the right concept, as a grand mal episode of hyperpartisanship leaves our nation aimlessly convulsing in the face of real and serious problems. Religious groupthink is not the only factor behind our political polarization, but it is one of the most difficult to fix. Elsewhere I have written about how science and

mathematics can help us with the more easily remedied defects in our electoral system.[5] This book is not about politics and it won't save the world, but it may at least shed some light on one of the most vexing puzzles of human nature: our strange compulsion to believe in God.