Open Minded

Searching for Truth about the Unconscious Mind

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Citation:

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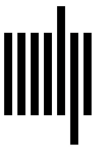
By: Ben R. Newell, David R. Shanks
DOI: 10.7551/mitpress/14922.001.0001
ISBN (electronic): 9780262375375
Publisher: The MIT Press
Published: 2023

The open access edition of this book was made possible by generous funding and support from MIT Press Direct to Open



The MIT Press

1 Reclaiming the Science of the Mind

> The mind is like an iceberg, it floats with one-seventh of its bulk above water.
> —attributed to Sigmund Freud

In July 2017, iceberg A68 split from the Larsen C ice shelf on the eastern coast of the Antarctic peninsula. Despite its unassuming name, A68 covered an area almost four times the size of Greater London (approximately 6,000 square kilometers) and was one of the largest icebergs ever seen in the Antarctic. The calving of this giant 200-meter-thick berg, most of it hidden below the water, sent shockwaves through the scientific community and raised concerns that it might drift into shipping paths.[1]

The analogy of the human mind as an iceberg has been prominent in public discourse for a long time. At the turn of the previous century, Sigmund Freud popularized the idea that much of our mental life exists below the waterline of consciousness.[2] Our behavior, according to Freud, is driven by the desires and beliefs hidden in the depths of the unconscious. The real reasons for our behavior may be discovered only through years of psychoanalysis that allow these dangerous, murky, unconscious motives to bubble to the surface of consciousness. Contemporary perspectives tend to abandon the more colorful notions of repressed primitive urges but still emphasize the prominence of an adaptive, powerful, sophisticated unconscious mind that is essential for our survival in the world.[3]

Why is this idea so appealing, pervasive, and persistent? In this book, we argue that the enduring myth of the unconscious mind is a symptom of a much broader problem facing the social and behavioral sciences. Modern research on the science of mind and behavior has gone badly astray

because of the culture in which scientists operate, which encourages tenuous research built on weak methods. Psychologists are rewarded for making eye-catching claims—we're unconsciously racist, ageist, ableist, and sexist, driven by external nudges rather than free will, for instance—that they hastily publish in highly prestigious scientific journals. Many of these claims turn out to be wrong.

What happened to A68? In the end, it broke up into fragments and melted, and perhaps this provides a more significant metaphor. As we discuss in this book, research conducted over the past few years, together with a much deeper understanding of the biases to which scientists are prone, suggest that the way we think and act can best be understood without invoking a powerful unconscious. The science of human behavior needs to be rebuilt from the ground up on firmer foundations.

* * *

The book is in two parts. Part I is a search for the unconscious mind. What is the evidence that our behavior is determined below the waterline and that a powerful unconscious is necessary for us to survive? In plumbing these depths, we carve out some key definitions for what would count, in our view, as an unconscious influence on behavior. Such definitions are crucial because many words have been devoted to the highly complex pursuit of characterizing our consciousness of various mental processes. Our focus throughout is on the core processes of decision making.

We take decision making to refer to the mental processing that leads to the selection of one among several actions (choices). This broad definition encompasses situations from judging where to run to on a field in order to catch a ball, to choosing jobs, houses, or even a spouse. In each situation, there is information to be perceived, processed, integrated, and acted on. The nature of that information is of course wildly different, but as we will see, in each case there are many similarities in how we make up our minds.

Construing decision making this way excludes examples such as neurons or brain networks making "decisions." Thus, the visual system's computation of low-level properties is not decision making on this definition. We view consciousness as a property of individuals and hence do not believe any useful purpose is served by asking whether the computation of motion in the brain, for instance, is or is not conscious. It is, in contrast, perfectly reasonable to ask whether an individual's judgment of motion is conscious.

Understanding this distinction between the products, or end results (a judgment of motion), and the processes by which that product was created (the firing of neurons in the motion processing part of the visual system, called area V5) is fundamentally important if we are to "invert the iceberg," We are never conscious of these low-level processes, but the products of these processes are available to consciousness and form the basis of our judgments and decisions.[4] This inverted view in which the vast majority, if not all, of thinking is above the waterline frees us to embark on a clear assessment of the evidence for unconscious thought and a radical reconceptualization of the basis of human decision making.

Not least, it allows us to delve more deeply into the idea that our decisions are controlled by two (or more) different systems that compete and conflict. One system is often characterized as automatic, reflexive, and operating largely outside our awareness, the other as deliberative, rational, and (cognitive) resource intensive. This dual-system view has had enormous influence in recent times, pervading not only psychology but also economics, medicine, business, and government.[5] We will see that this duality stems from the misguided iceberg metaphor, and when we invert the iceberg, evidence for dual systems begins to melt.

Thus, the aim of part I is to present a strong rebuttal to claims that much of our behavior is determined outside of awareness. We will show that many high-profile examples of unconscious influences evaporate once scrutinized, or at least admit alternative explanations that do not require the invocation of unconscious processes. With this reclaimed landscape of the mind established, we turn to the equally puzzling question of how we, as a discipline but also as a society, got to this point.

Part II presents a path toward a true understanding of mind and behavior and begins by asking how we reached the uncritical acceptance of an all-encompassing unconscious mind. We will pursue a trail of fraud, intrigue, and claims about extrasensory perception in an exposé of some of the fake and pseudoscience that has contributed to our current state of affairs. Our journey will take us beyond eye-catching findings to examine the nuts and bolts of how we do research—not only in psychology but also across science and medicine.

Revelations of the instability of many published findings in science and medicine over the past decade or so have raised uncomfortable questions about things we thought we knew.[6] These reevaluations have highlighted

the importance of replicating scientific findings, a cornerstone of robust science. Perhaps because such replications are not seen as "exciting" or "sexy," they have been sorely neglected in psychological research. Finding the same effect as somebody else has or redoing the same experiment isn't going to lead to a splashy headline, a high-profile publication, or a TED-talk, but it is, of course, imperative if we hope to build our scientific knowledge on firm foundations. As other commentators have noted, we need to think of each new finding not as a definitive answer but as a single datum in a much larger web of interconnected findings. When we take this more "metalevel" or "meta-analytic" view, we get a much more coherent picture of findings that we should retain and include in our body of psychological knowledge and findings that we can safely disregard as spurious and false.[7]

Our exploration forces us to consider questions that are fundamental for assessing science's role in society: How should science be funded? How should scientists be incentivized and rewarded? How should the outcomes of research be made available to the public? Are current publishing models broken? At first blush, such questions might suggest navel-gazing by researchers. Why should anyone apart from scientists themselves care about scientific publishing practices? In fact, such issues have never been more central to the fabric of our society. We are in an era in which information and data reign supreme; it's never been easier to fact-check, but also never harder to know if the "facts" one discovers are real or "alternative." Sound science is the ultimate fact checker—whether it be psychological science, climate science, or vaccine development—and so knowing how to evaluate, how to consume the science around us, is crucial if we are to maintain science's central role in guiding society.

The overarching theme here might appear negative—debunking, exploding myths, separating the wheat from the chaff—but our goal is a positive one: to reignite and (re)engender confidence in psychological science in particular and science in general. The scientific method is the best one we have for understanding our world, and when it is applied properly and effectively to understanding our own minds, the potential insights and benefits to society are immense. Psychology has already contributed enormously across a wide range of domains. In fact, it is currently enjoying a heyday in the application of behavioral science principles in all spheres of life.[8] We are excited and optimistic about its future, but to ensure we realize the potential, we need to reclaim the science of the mind.

What Is Consciousness?

This book is about the shaky foundations of the idea of a smart unconscious. So what do we mean by the term *unconscious*? Being an absence of something, it is best unpacked by considering the sorts of things that are commonly described as "conscious" or the senses of the word *consciousness*. This is not a straightforward undertaking: the concept has several meanings. One set of meanings is related to levels or altered states of consciousness. States such as sleep, hypnosis, coma, delirium, intoxication, mindfulness, and hypervigilance describe conditions in which we are less (sleep) or more (hypervigilance) aware of our surroundings than normal. As states, these endure over some extended period of time (at least a few minutes) and hence are distinguishable from momentary experiences such as being conscious of a pain when touching a hot saucepan. We can see this distinction in the linguistic use of the word *conscious*, where we talk about just being conscious or about being conscious *of* something. It is used intransitively to refer to states, as in, "The patient was conscious," or transitively to refer to particular experiences, as in, "She was conscious of the loud drilling outside her window."

Another meaning of consciousness relates to our knowledge of ourselves—self-consciousness or self-awareness. We know that we tend to get anxious at parties, that we enjoy sports, and that what goes on in other people's minds is different from what goes on in our own. Curious experiments, in which a mark is placed on an animal's face and its subsequent behavior in front of a mirror is observed, suggest that many species, such as chimpanzees, have some concept of the self and some sense of self-awareness.[9] And finally, we talk about conscious experiences, such as our perceptions (seeing yellow, hearing a violin), bodily sensations (pain, hunger), and emotions and moods (anger, boredom).

Common to the above uses of the term *conscious* is the idea of knowledge and awareness, as when we look at a clock and say, "I'm conscious of the time." The difference between consciousness and awareness is subtle, and we often use them interchangeably. Most dictionaries define *awareness* as being either conscious of or knowing something. But *awareness* doesn't quite have the baggage that *consciousness* does; we tend to talk of altered states of consciousness rather than altered states of awareness, for example.

The association between consciousness and knowledge is also subtle. For many aspects of knowledge, saying, "I know such-and-such," and, "I'm

conscious [or aware] of such-and-such," is virtually the same thing. But there are many things we know, such as skills and abilities, where this equivalence breaks down. "I know how to tell a burgundy from a claret" and "I'm aware of how to tell a burgundy from a claret" are very different, as are, "I know how to hit a backhand," and, "I'm aware of how to hit a backhand." Thus, the sorts of things we know—in the sense of being conscious of—are generally taken to be things we can report on. The ability to report or describe some fact about ourselves or the world is the signature of us being conscious or aware of that fact, and reportability is crucial because it's something that an external observer can record. Note, importantly, that we talk about being able to report something rather than simply being able to describe it using language. Language is certainly sufficient to report our awareness of many things ("I know that it's midday"), but it is not necessary. If you're asked to stand up when it's midday, then by standing up, you are reporting your awareness that it's midday but doing so without the use of language. In effect you are reporting, "I understand the instructions you gave me and am standing up to indicate that it's midday." Thus, our ability to demonstrate possession of many types of knowledge can be achieved either linguistically or via a nonlinguistic voluntary report.[10]

The sense of consciousness that's most important for us in this book is the sense in which it refers to states that can be reported, and conversely, unconscious means ones that cannot be.

The Unconsciousness of Mental States

An argument is often made to the effect that there necessarily must be unconscious processes going on in the brain. It points out that there must be such processes because we lack awareness of many events going on in our own brains (for instance, in the visual system). The neural processes by which signals are registered at the retina, transduced along the optic fiber, and decoded in the visual cortex according to properties such as color, shape, and movement are completely unconscious. Indeed, in this sense, we lack awareness of all brain processes, apart from such things as headaches and light sensitivity. This type of argument would obviate the need for any kind of examination of the empirical evidence for unconscious mental processes.[11]

But this argument confuses two different senses of the term *unconscious*. There can be unconscious mental events or states and unconscious

nonmental ones. The latter are not particularly contentious. Everything that goes on in a car engine is unconscious, but only in the uninteresting sense that a piece of physical machinery is not the sort of thing that could be conscious. A car engine lacks consciousness in the same way that it lacks bravery. Likewise, the fact that we are unconscious of most of the neurophysiological processes that take place in our brains is uncontroversial. Things become much more interesting when we focus on mental states, such as thoughts, emotions, beliefs, perceptions, and desires—states that represent something in the world—and ask whether such events can cause behavior even if they are unconscious.[12]

The standard view of the relationship between brain events and mental events, known as *functionalism*, views it as akin to the relationship between hardware and software in a computer. These are not fundamentally different things: the hardware is what realizes or causes the events taking place in the software. Imagine that a computer spreadsheet is doing some arithmetic—it's working out 27×56. It is a correct and sufficient description to say that it's manipulating symbols according to a set of rules and the meanings of various functions such as multiplication. This explanation is in no way invalidated by the fact that underneath the spreadsheet, billions of electrical events are going on that don't feature in the higher-level explanation. By the same token, the existence of unconscious neural, nonmental events in the visual system is irrelevant to the issue of whether our behavior is best explained with or without reference to unconscious mental states. This can only be established by the normal methods of scientific observation and experiment.

Moreover, there is another fallacy with the claim that there necessarily must be unconscious processes going on in the brain. The claim rests on an overly bottom-up view of brain processes, in which information flows in only one direction. The senses register energy such as light falling on the retina; this is transmitted to brain areas that decode color, shape, movement, and so on; and then eventually information reaches "higher" brain areas where the meaning of the object in front of us (a picture of Barack Obama, for instance) is finally determined. On this view, we become aware of information computed only in the later stages of this processing pipeline, with everything preceding that being unconscious. But it is a gross mistake to think of the linkage between brain activity and consciousness as one-directional and purely bottom-up. The relationship is much more intimate than this, and

indeed there are remarkable examples of top-down influences of consciousness on brain processing. For example, recent neuroscience experiments on individuals with electrodes implanted in their brains (for the assessment of epilepsy) have shown that we can exert conscious, volitional control of single neurons. We can consciously decide to make individual neurons in our own brains fire in both sensory and higher-level brain regions.[13]

Although the concept of the unconscious has a long history going back at least as far as the Swiss physician Paracelsus (1494–1541) and includes a substantial treatment by Gottfried Wilhelm Leibniz in his book *New Essays on Human Understanding* (finished in 1704 but not published until 1765), it is most commonly associated with the work of Sigmund Freud (1856–1939). Freud believed that unconscious motivations and emotions taking place below the surface of the mind play a significant role in human behavior. For Freud, unconscious mental states are not simply those states of which we are unaware; they are a subset comprising socially unacceptable urges and desires, as well as traumatic memories, all of which we actively repress from reaching consciousness. Although they are not introspectively accessible and cannot be explicitly reported, techniques such as free association and dream analysis allow them to be revealed.

The modern fields of psychology and psychotherapy have not been particularly kind to Freud's views, often regarding psychoanalysis as a pseudoscience.[14] But it is worth distinguishing between his conception of the unconscious on the one hand and his empirical methods on the other. Today we tend to regard dream interpretation as akin to storytelling: the psychoanalyst provides an interpretation of the dream in terms of psychoanalytic theory, but since this is necessarily done after the fact, such interpretations are untestable. The hallmark of scientific theories is their ability to make potentially falsifiable predictions, something that psychoanalysis struggles to do (and even when it does, they rarely emerge in credit when tested). None of this means that the concept of the unconscious is itself incoherent, although modern conceptions of the unconscious are rather more general than those accepted by Freud. For example, we have no difficulty today in accepting the possibility of unconscious perception, in which events and objects in the environment around us can in theory influence our behavior even when we are unaware of them (as in subliminal perception).

Reportable, conscious states seem to underlie many of our decisions and behaviors. To state the obvious, we often do things because we have conscious

reasons for doing them. This may seem trivial but is nonetheless worth dwelling on, not least because many influential schools of thought—most notably behaviorism—have been deeply skeptical about drawing straightforward links between conscious reports and behavior. Some of this skepticism is partly justified. For example, we need to be very careful about the reactive effects of verbal reports: the very act of giving a description of our mental states may change those states.[15] However, modern theories and methods make an emphatic case for the importance of conscious knowledge, beliefs, and attitudes in determining behavior.

This is exemplified in the theory of planned behavior (TPB), one of the most influential and truly deep theories in all of the behavioral sciences.[16] TPB offers a deceptively simple explanation for why we act as we do. It says that only two things matter: our intentions and our control. When we have a strong intention to engage in a behavior and perceive that we have control over that behavior, then we will do it. Take smoking cessation as an example: people who intend to give up smoking and perceive that they have control over whether they smoke will give up, whereas those without either the intention or the perception of control (or both) will not.[17] The theory in addition says that intentions come from three sources. First, we are very strongly influenced by subjective norms, our internalization of the views of other people whose opinions matter to us. If your partner's views matter to you and your partner takes a dim view of your smoking, you're more likely to form the intention to give up. Second, our attitudes to the behavior are important. The better you feel about giving up smoking, the more likely you are to form the intention to give up. Finally, your estimation of how easy or difficult it will be to give up will also influence your intention. This sense of control is the same factor mentioned above: it is assumed to have a direct impact on behavior as well as an indirect impact via intentions.

According to TPB, it is only these factors, and no others, that matter. You might object, for example, that surely personality matters. Aren't extroverts less likely to quit smoking than introverts? The theory doesn't deny that such factors could be associated with giving up smoking, but it says that the only pathways by which they can do so are via subjective norms, attitudes, or perceived control. Thus, if extroverts do indeed struggle to stop smoking, it must be because they feel less pressure from other people's views, or they have a less favorable attitude to stopping smoking, or they do not feel they have adequate control.

The precise details of the theory are not crucial; what matters is that the theory is eminently testable (and indeed it has survived more or less intact despite thirty years of extensive testing) and that all its ingredients are conscious, reportable aspects of behavior.[18] When researchers set out to test the theory, they do so by constructing questionnaires comprising many items, all of which attempt to measure different aspects of the person's subjective norms, attitudes, and perceived control. Each item (such as *Most people who are important to me think I should give up smoking in the next 12 months*) is accompanied by a rating scale on which the respondent indicates their agreement or disagreement with the statement, and the different items under each type are averaged to give a single measure of the three predictors for that person. Then an analysis is conducted to determine whether those individuals with strong subjective norms, attitudes, and perceived control for quitting smoking are indeed more likely to quit. Clearly, the questionnaires elicit conscious, reportable beliefs and attitudes; this is a theory that fundamentally attributes behavior to a combination of fully conscious factors. The theory *could* be supplemented by additional unconscious factors, though these would of course have to be measured by some means other than explicit reports (the implicit association test, discussed at length in chapter 5, would be an example). What is remarkable is that TPB has achieved the explanatory successes that it has even without the addition of unconscious factors (the jury is still out on whether there are domains in which such factors would extend its power even more).[19]

A final distinction, between access (A) consciousness and phenomenal (P) consciousness, deserves some mention. Two things are going on when a state is reportable. One is that the state exists in such a form or has reached the necessary level of internal strength that it can be turned into a report via the relevant mental apparatus. The state is accessible, in other words, to that apparatus. The other is that the state has a subjective "feel" to it, that there is something it's like to experience that state. Think of being asked to report the level of pain (between 0 and 10) you feel to different stimulations. When pricked on the finger, you say "2." The pain you consciously feel connects to the reporting apparatus in your brain and causes you to make this report; the pain is accessible to that apparatus. At the same time, the pain feels a certain way to you and has certain *qualia*: it is very sharp and unpleasant, not at all like heat, but brief. This is the pain's subjective feel, its phenomenology (a term philosophers favor to refer to the way we experience things).

This distinction between access and phenomenal consciousness is a profoundly deep one. Broadly speaking, we have a very good understanding of the former and not the least inkling about the latter. The sort of machinery that is necessary to enable states to be accessible is well understood. When we run a spreadsheet on our computer and ask it to perform a complex arithmetic calculation, the result that it prints on the screen is a "report" on the spreadsheet's calculation. That calculation is accessible to the function that prints the output. But we don't imagine for one moment that the computer has any conscious experience associated with generating the answer; we do not attribute to the computer any subjective what-it-is-like-ness to do so. The philosopher Thomas Nagel famously reflected on what it's like to be a bat. Perhaps the bat has some conscious experience of the world around it, as revealed by its echolocation system, an experience no doubt profoundly different from our own familiar subjective experiences of color, taste, touch, and so on.[20]

The mystery of P-consciousness is one of the most fundamental unresolved problems in all of science, and not for nothing has it been given the label the "hard problem." We simply have no idea what the processes are in the brain that generate the experiences of redness, saltiness, euphoria, and so on. We can build a computer that tells colors apart just as accurately as the human eye, but we have no conception of why the human (and perhaps chimpanzee, dog) brain, but (presumably) not the computer, experiences colors subjectively in the way it does. As the famous nineteenth-century biologist T. H. Huxley (1866) asked, "How it is that anything so remarkable as a state of consciousness comes about as the result of irritating nervous tissue, is just as unaccountable as the appearance of Djin when Aladdin rubbed his lamp."[21] But the good news is that for the purposes of this book, we don't need to solve this hard problem. Our focus is on determining whether there are any major mental processes that cause or influence our behavior without being A-conscious—that is, without being reportable.

Consciousness and the Brain

However mysterious it is that states of consciousness come about as a result of irritating nervous tissue, the brain obviously is the seat of consciousness. Neuroscience has made enormous strides in understanding the linkage between brain activity and conscious experiences and has wholeheartedly rejected dualism—the claim that the mind cannot in any sense be

understood in terms of the physical world, of which the brain is a part. There are any number of examples of this linkage. In pioneering research in the 1960s, the physiologists G. S. Brindley and W. S. Lewin were able to induce the conscious experience of a small, bright dot in a very specific part of the visual field by electrically stimulating a corresponding part of the visual cortex in the occipital lobe of the brain. These bright dots (called "phosphenes") were always experienced at the same location for a given point of brain stimulation, and nearby stimulation sites induced nearby phosphenes.[22] It is hard to imagine a more compelling linkage between brain activity and conscious experience.

In the past two or three decades, neuroscience has provided tools for establishing brain-consciousness linkages vastly more complex than Brindley and Lewin's demonstration. Functional magnetic resonance imaging (fMRI) can be used to measure the level of activity in distinct parts of the brain. The method achieves this by detecting the amount of oxygen in the blood, which increases when a brain region becomes active. The technique has been used to determine, entirely noninvasively, whether an experimental participant is thinking about a chair or a shoe. Although the pattern of neural activity is never quite the same on two occasions when you're thinking about a chair, this activity is sufficiently different from the activity evoked by thinking about a shoe that it can be measured by fMRI and correctly classified as representing conscious thought about one or the other.[23] This method has been used to detect consciousness in individuals in a vegetative state following head trauma. Imaging via fMRI was able to detect different patterns of brain activity in one woman when she was asked to imagine playing a game of tennis versus when asked to imagine walking around the rooms of her house. Although she was unable to give any behavioral indication that she understood what she was being asked to do, her brain reacted in a way that strongly suggested consciousness.[24]

Several theories have been proposed in recent years attempting to explain the relationship between consciousness and the brain in more detail. The most influential of these is global workspace theory (GWT). One of the key ideas in this theory is that (access) consciousness arises when the intensity of activity in a particular brain module exceeds a threshold, at which point it becomes amplified and broadcast to the central controller—the global workspace—and to other modules. A distant object may not be consciously registered until it gets closer, at which point "ignition" takes place: the

object is now consciously perceived, and its existence becomes shared with other brain systems such as the ones that control movement (hence enabling avoidance of a collision) and speech (enabling issuing a warning to others). Ignition involves the allocation of attention to the object and the sharing of information globally across the brain. The most recent versions of GWT suggest that the global workspace comprises interconnected neurons in frontal, parietal, and anterior temporal brain areas, connected to the specialized peripheral modules via bidirectional links. The theory predicts, therefore, that the sorts of imaging techniques described above should reveal conscious experiences in frontoparietal areas, with long-distance connections between these areas being fundamental to consciousness.[25]

Despite this progress in understanding the brain basis of consciousness, it is fair to say that we are still very far from being able to explain consciousness in terms of brain machinery. Indeed, as far as phenomenal consciousness is concerned, its relationship to the brain is as mysterious now as it was in Descartes' time. For access consciousness, experimental tests of GWT have proved disappointing. In contrast to the theory's claim that consciousness depends on frontal and parietal systems, virtually every part of the brain seems to have some linkage to consciousness.[26] Given Brindley and Lewin's ability to induce conscious phosphene experiences by stimulation of the visual cortex, perhaps this should not surprise us. It may be the case that for almost every brain region, whatever the particular set of functions it contributes to our mental life, it is also necessary for conscious awareness of that function. So the visual cortex is necessary for visual consciousness, auditory cortex for auditory consciousness, and so on. In this sense there is no "Cartesian Theater" (the philosopher Daniel Dennett's evocative phrase), a single location where consciousness happens like a movie being projected onto a screen.

* * *

The nature of consciousness is one of the most perplexing problems in all of modern science and philosophy. But we don't need to wait for a solution to this problem before we can ask what the role and scope of *unconscious* mental processes is. This is the question we address in the following chapters.

The MIT Press would like to thank the anonymous peer reviewers who provided comments on drafts of this book. The generous work of academic experts is essential for establishing the authority and quality of our publications. We acknowledge with gratitude the contributions of these otherwise uncredited readers.

This book was set in Stone Serif and Stone Sans by Westchester Publishing Services.

Library of Congress Cataloging-in-Publication Data

Names: Newell, Benjamin R., 1972– author. | Shanks, David R.
Title: Open minded : searching for truth about the unconscious mind / Ben R. Newell and David R. Shanks.
Description: Cambridge, Massachusetts : The MIT Press, [2023] | Includes bibliographical references and index.
Identifiers: LCCN 2022038725 (print) | LCCN 2022038726 (ebook) | ISBN 9780262546195 (paperback) | ISBN 9780262375368 (epub) | ISBN 9780262375375 (pdf)
Subjects: LCSH: Subconsciousness. | Thought and thinking. | Self-consciousness (Awareness)
Classification: LCC BF315 .N479 2023 (print) | LCC BF315 (ebook) | DDC 154.2—dc23/eng/20230316
LC record available at https://lccn.loc.gov/2022038725
LC ebook record available at https://lccn.loc.gov/2022038726