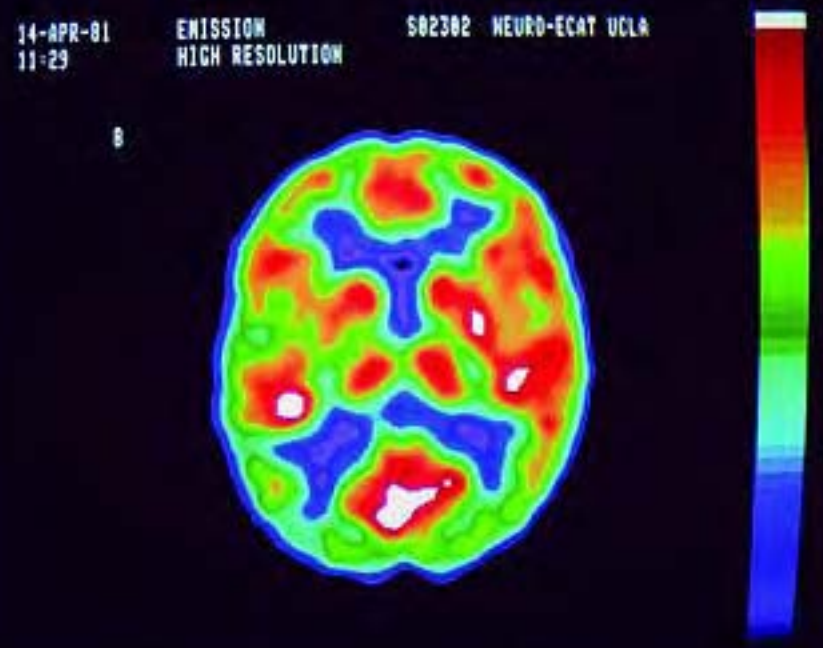
CONTROVERSIES IN SCIENCE

CONSCIOUSNESS

A Guide to the Debates



ANTHONY FREEMAN

Consciousness

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A Guide to the Debates

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For Jacqueline

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Preface

Something is conscious if there is "something it is like to be" that thing. This surprising but widely accepted definition of consciousness was put forward by philosopher Thomas Nagel in 1974 in an article titled "What Is It Like to Be a Bat?" (see Document 5). This definition has three great virtues. First, it avoids the circularity found in most attempts to define consciousness (for example, to be conscious is to have perceptions; to have perceptions is to be aware; to be aware is to be conscious; etc., etc.). Second, Nagel cleverly manages to imply a sense of personal experience, which for many people is the defining quality of consciousness, without actually claiming that consciousness is first-person by definition. This keeps his definition neutral in a major controversy in consciousness studies concerning its subjective and/or objective nature. And third, by concentrating on the verb "to be conscious" rather than the noun "consciousness," Nagel has neatly sidestepped another divisive debate as to whether or not consciousness itself actually exists (Nagel 1974).

The importance of not overdefining the topic ahead of investigating it is routinely stressed by John Searle, another philosopher much involved in consciousness studies. He distinguishes between an analytic definition, which is arrived at only at the end of an investigation, and a commonsense definition, which comes at the start and serves to identify the target of the research program. He advises taking as a starting point a simple statement such as this one: Consciousness consists in those states of awareness that begin in the morning when we awake from a dreamless sleep and continue throughout the day until we fall asleep again, or fall into a coma, or die (Searle 1998).

In this book I look at something of the history and the present state of the scientific study of consciousness, thus broadly defined. Chapter 1 is a brief overview of the story of consciousness research from the ancient Greeks to the present day. It provides a map of the territory to be covered in detail in the rest of the book and serves to introduce some of the major landmarks that will feature in our story. In particular, it highlights the central problem of relating objective science to subjective experience. Chapters 2–4 deal with aspects of the brain, which is the part

of the body most closely associated with consciousness. In Chapter 2, the focus is on its physical structure and function and the techniques developed over the years for studying them. Chapter 3 considers in detail the visual system and the way by which the physical fact of light falling on the eye becomes transfigured into the conscious experience of seeing color, shape, texture, movement, and all the many elements that make up our visual consciousness. Then Chapter 4 begins to tackle, from the scientific side, the big question of how physical events in the brain relate to conscious events in the mind. The same question is pursued further in Chapter 5, this time from the viewpoint of philosophy.

Attention then turns to a number of specific areas of interest that have emerged as the science of consciousness has developed. The fascination of conscious machines and chess-playing computers is discussed in Chapter 6, and then in Chapter 7 the emphasis shifts in the opposite direction, with a look at those scholars who argue that embodiedness is an essential feature of consciousness. This discussion leads naturally to the question of who we are, and Chapter 8 looks at the central role of memory in our identification of ourselves as conscious beings. Science takes center stage in Chapter 9 in the form of quantum physics, a subject that some believe to be closely entwined with consciousness at the deepest levels of reality. Among the problems that might be solved by quantum theory is the vexed question of how the experience of free choice is compatible with an orderly world that obeys the laws of physics. This paradox is explored in Chapter 10, along with related matters concerning our consciousness of time.

In Chapter 11, I look at three areas of conscious experience that might appear to be at the opposite end of the spectrum from scientific study: the strange world of dreams, the heightened states of consciousness associated with certain religious practices and traditions, and the appreciation of artistic beauty. It turns out that none of these aspects of consciousness has escaped the attention of the neuroscientists. Then finally, in Chapter 12, we return to Thomas Nagel's basic question, What is it like to be conscious? Here we pick up a number of philosophical matters left unresolved in Chapter 5 and consider some responses to the "hard problem" of consciousness: Why and how is there conscious experience in the universe at all?

I am grateful to my colleagues Keith Sutherland and Joseph Goguen at the *Journal of Consciousness Studies* for their encouragement to write this book and to a number of scholars who have read and commented on parts of the draft manuscript, especially Bernard Baars, Jean Burns, Rodney Cotterill, Stanley Krippner, Jonathan Lowe, Geraint Rees, Henry Stapp, and John G. Taylor.

1
The "Impossible" Science

Science and consciousness make strange bedfellows. We think of science as a series of precise, measured, repeatable experiments, all carefully ordered and recorded. Scientific issues might be hotly debated and the outcomes of research condemned or applauded, but the exercise itself is almost by definition a matter of detached, impartial, and objective study. Conscious experience is quite the reverse. My consciousness is an unending stream of sounds and colors and shapes and moods and feelings. Only with the greatest effort can my perception of these things be ordered and regulated, and they come to me quite unbidden. These experiences are quite at odds with the planned, unruffled procedures of the laboratory, and they are all my own. They are there when I am alone; they are there when I dream; and even in company, my experience is not yours, and yours is not mine. Where science is objective and public, conscious experience is subjective and private. So a "science of consciousness" is a contradiction in terms.

There, in a nutshell, is the case against the "impossible" science of consciousness. It is simple and obvious; who could deny its logic? Yet since the earliest stirrings of scientific study way back in ancient Greece, natural philosophers (as scientists were then called) have been fascinated by the nature of the conscious mind and its relation to the physical world. This book is about the ongoing battle between the logic that says there can be no scientific study of consciousness and the human spirit of inquiry that defies the logic and goes ahead with the study anyway.

Science—for all its boasted success—can still make spectacular mistakes. There are no assured results. The constant process of seeking, searching, asking, and questioning means that researchers will sometimes have to give up a cherished belief, even after it has been held for centuries, in the face of new and apparently incontrovertible

evidence, perhaps to see their new theories overthrown after only a few years. Physics, the most basic of all the natural sciences, provides an excellent example of such turns of fortune. The history of the atomic theory of matter demonstrates two things that are important for the present work. First, it illustrates the seesaw quality of scientific thinking, which should teach us never to dismiss an old idea just because it is out of fashion. And second, it introduces an aspect of today's science that has an immediate bearing on consciousness and has forced scientists to take it seriously.

Atomic Theory: A Roller-coaster History

The story starts with the Greek philosopher Leucippus of Miletus (c. 440 B.C.E.). He proposed that all matter is composed of tiny particles of identical "stuff" existing in a vacuum of totally empty space and that physical objects get their different qualities according to the number, size, and arrangement of their constituent particles. It was an essential feature of his theory that although these particles might differ from one another in size, each one was in itself indestructible and indivisible (*atome* in Greek). In consequence of this last feature, they were named atoms. The atomic theory of matter was quickly championed by another philosopher, Democritus (460–361 B.C.E.), with whose name it is most often associated, and for a while it flourished. But after a century of dominance it fell into disrepute, because the famous Aristotle (384–322 B.C.E.), pupil of Plato and teacher of Alexander the Great, opposed it. Democritus and Aristotle agreed about a very strange prediction of atomic theory: if it were true, then all objects in a vacuum would fall at an equal rate, a feather as fast as a stone. They also agreed that in practice, heavy objects fall through the air faster than light objects. Where they disagreed was over the reason. Democritus said it was because the light objects were slowed down by collisions with atoms of air and that in a true vacuum (which he of course lacked the technology to produce) all objects would fall equally fast, as predicted by his theory. Aristotle said that would be absurd, and therefore the theory must be wrong. Because the question could not be settled experimentally, Aristotle's influence carried the day. Atomism had been knocked down and stayed on the canvas for nearly two millennia, but it was not knocked out. At the end of the sixteenth century, Galileo (1564–1642) proved Democritus right in the matter of equal rates of falling, and by the first decade of the nineteenth century, the English chemist John Dalton (1766–1844) was putting atomic theory right back on its feet. He proposed, on the

basis of careful experiments, that all physical substances were either "elements" or "compounds," compounds being made up of two or more different elements (for example, water is a compound composed of the two elements hydrogen and oxygen). Furthermore, according to Dalton, his results would be explained if each element consisted of a cluster of identical basic particles (which he called atoms), each element having a basic particle of different weight. After 2,000 years, atomic theory was back in business.

For the next hundred years, this modernized version of atomism underpinned all chemistry and physics. It gave us the "ball and stick" type of molecular model, familiar to generations of students and used by James Watson and Francis Crick in the 1950s to crack the double-helix structure of DNA. Even today, such models still provide a useful description of the physical world at a certain level. But as early as the opening of the twentieth century, it was already clear that Dalton's "atoms" were not indivisible after all. They were themselves composed of even tinier and more fundamental particles. So a new picture of the atom—like a miniature solar system, with miniscule electrons orbiting a central nucleus—has become another icon of modern physics. It is as instantly recognizable as the ball-and-stick molecule and well known to many who have not the slightest notion what the figure represents. If that were all that had changed, then even though the chemist's "atom" had ceased to be the smallest known particle, the essence of atomism—the idea that the physical world is composed of tiny indestructible bits of matter flying around in a void—would still have remained unscathed. But that was not all that changed. Further developments in the early twentieth century not only upset the newly restored atomic theory but also brought the question of consciousness to the heart of physical science.

First of all, Albert Einstein (1879–1955) showed in 1905 that tiny bits of matter are not indestructible after all: they can be converted into huge amounts of energy in accordance with the famous equation $E = mc^2$ (which, in English, says that the amount of energy produced by such a conversion equals the amount of material destroyed, multiplied by the speed of light and then multiplied by the speed of light again). Twenty years later came "quantum theory" and Erwin Schrödinger's "wave equation," which says that subatomic entities like electrons should not be thought of as "particles" at all. A particle would be a tiny bit of material flying through space, and at any instant it would have a precise position, speed, and direction. But quantum theory (at least one influential version of it) says that none of this is true of electrons and the like. At the subatomic quantum level,

we are told, the physical world is not made up of tiny individual bits and pieces in empty space but is a continuous interweaving whole, like the waves on the surface of the ocean. It is only when it is "observed" that this wavelike and ever-spreading continuum "collapses" and has the appearance of a particle in a fixed position. Atomism—championed by Democritus, scorned by Aristotle, and triumphantly revived by Dalton—seemed due for another spell in exile.

This tale illustrates well the dizzy lifestyle of a scientific hypothesis, but what does it have to do with consciousness? The answer lies in the idea that only when the quantum world is observed does it take definite shape. So long as nobody is looking, say some quantum theorists, the subatomic world is a vast array of possibilities, with nothing fixed or certain. Conscious observation is the event that turns this wealth of possibilities into the single actual world we know. It has to be granted that quantum theory and its interpretation is fraught with problems and disagreements, but this unlikely proposal remains a persistent theme in all the arguments and debates. If it is true, then conscious minds, far from being detached observers of a preexisting universe, are in a continual process of creating the very world they inhabit.

These are contentious issues, and their detailed role in the study of consciousness is discussed further in Chapter 9. For the moment, I note that they throw into question the assumption at the start of this chapter that science and the world it investigates are totally objective. That is sufficient to dent the claim that a science of consciousness is self-contradictory. For the remainder of this chapter, I trace the study of the mind from ancient times, through medieval Europe and the Enlightenment, and to the beginnings of modern psychology at the end of the nineteenth century and the battle throughout the twentieth century to establish a scientific study of consciousness.

Body, Mind, and Soul in Ancient and Medieval Times

It is hard, if not impossible, to study pre-Enlightenment thinkers without reading back into their words the categories and concepts of more recent years. Even to ask a question such as, "How did Aristotle think the body and mind were related?" is already to assume that the mind and body are two different things, maybe two completely different kinds of things, that must be related in some way. Yet that way of thinking about human beings and their makeup might be quite alien to ancient ways of thinking. If that is so, then any attempt to answer the question as posed will be a distortion of Aristotle's teaching. Consequently, today's scholars have created no simple and uncontroversial

account of how the philosophers of old understood human nature or how they would have tackled what we now call "the mind-body problem." However, the writings of the ancient Greeks were very influential in the European Middle Ages, out of which the modern world grew, so some understanding of the great thinkers of the past is necessary if we are to appreciate how present-day views evolved.

'ARISTOTLE.'

For Aristotle, the essence of an object was not the material it was made of, but the functional structure or "form" imposed on the material. In the case of a living thing, he called this essence or form its "soul." (Courtesy of Thoemmes Press)

An immediate example of the problem we confront is a confusion in terminology. The nearest Greek equivalent to our concept of the conscious "mind" is probably the word "psyche," which has given us the modern English word "psychology" for the scientific study of the mind. However, in English translations of Greek philosophy, psyche is more often rendered as "soul," which to modern ears has a separate and narrower meaning. Furthermore, Aristotle used the term in ways different from the modern uses of either mind or soul. In many cases, "life" would seem a better translation. Given these difficulties, I shall follow a common practice in philosophy textbooks and use the terms "mind" and "soul" interchangeably, depending on the context.

Aristotle rejected the notion that the distinctive features of an object resulted from the number and nature of the atoms that were alleged to make it up. For him, the essence of an object was not the material it was made of, but the functional structure or "form" imposed on the material. In the case of a living thing, he called this essence or form its "soul." For Aristotle, this form (or soul or essence) does not refer—as the English word might seem to imply—to the object's shape or its constituent material but to its power to exercise certain functions. As he once said, if an axe had a soul, that soul would be chopping. In fact, of course, he did not attribute a soul to an article such as an axe but only to living things: to plants a "nutritive" soul that sustained them as living organisms; to animals a "nutritive and sensitive" soul that sustained life and also made it possible for the creatures to respond to sensations and move about unaided; and to humans a

soul that was "nutritive, sensitive, and rational." This last—restricted to humans alone—allowed thinking to take place, in addition to sustaining life and permitting movement (see Honderich 1995 for a summary of Aristotle's discussion of the soul).

The key thing to note here is that all these uses of the word "soul" related to the organization of the physical body. The soul was not therefore the same as matter or composed of matter, but neither could it exist independently of matter. This was a crucial point of difference between Aristotle and his teacher Plato (428–347 B.C.E.). Plato believed in the existence of a nonmaterial soul, which was itself the essential person. The soul's association with a physical body was a temporary and in some ways unfortunate occurrence. This difference between the teachings of the two ancient philosophers posed problems for medieval Christianity when it tried to combine their ideas in a single unified scheme.

The medieval scholar who set himself the task of reconciling current Christian teaching, which was based on the Bible and some second-hand ideas from Plato, with the then newly rediscovered philosophy of Aristotle, was St. Thomas Aquinas (1225–1274). It took him 8 million words (Magee 1988, 60). Prior to Aquinas, St. Augustine (354–430) had been the major force in shaping Western Christian doctrine. Augustine did not read Greek but had adopted a revised version of Platonism that was currently available in Latin translation, including the claim that the human soul was immortal and lived on after the death of the body. By the thirteenth century, that was official church teaching, despite its apparent conflict with the Bible, which spoke of the afterlife in terms of the resurrection of the body rather than the immortality of the soul. Aquinas needed to bring together into one system the contradictory views presented by Plato, Aristotle, and the Bible. The synthesis he achieved formed the backdrop to the modern study of consciousness. Here is how he did it.

Basically, St. Thomas kept to Aristotle's definition of the soul as the form of a living organism, apart from which it was unable to exist. So when a plant or animal died and ceased to exist physically, its soul also ceased to exist. But humans were different, because their souls were not only "nutritive and sensitive" but also rational, which meant they engaged in thinking. Aquinas noted that intellectual activity was unlike anything that plants or animals did, because it was not in itself a bodily process. Anything done by a plant—taking up water, growing, wilting, producing flowers, and so on—was a process bringing about a change in the plant's physical state. In the same way, anything done by an animal—feeding, moving, fighting, breeding, and so on—involved a

change in the animal's body. So it followed that the governing principle of both plants and animals, their soul, had no role apart from the physical organism with which it was associated. But humans were different. They could think. And so far as Aquinas could tell, thinking—that is, things like imagining, deciding, or planning—involved no necessary bodily process or change. So unlike the situation with plants and animals, in humans the governing principle—the rational soul—did have a role over and above that of directing the body and its organic processes. This discovery gave Aquinas the opening he needed. If the rational soul could do things that did not directly bring about changes in the body, then it was not entirely nonsensical (as it would have been in the case of plants and animals) to think of that soul as continuing in existence even after the body had died and been destroyed.

Plato believed in the existence of a nonmaterial soul, which was itself the essential person; the soul's association with a physical body was a temporary, and in some ways, an unfortunate occurrence. (Courtesy of Thoemmes Press)

This conclusion had a further consequence. According to Aquinas's way of thinking, it would not be possible for the soul to survive the death of the body if it had come into being along with the body, simply as part of the natural process. A soul produced naturally (like those of plants and animals) would be subject to the natural process of death and decay. So if the human soul really could survive bodily death, as now seemed probable, then it must have been directly created by God outside the natural course of events. But because this rational soul was still first and foremost the life-principle of a human body, rather than a Platonist's free-floating spirit, it was not immediately clear how exactly it could exist in isolation from the body.

This problem, however, turned out to be a blessing. Dealing with it enabled Aquinas not only to reconcile Aristotle with the church's official teaching but also to resolve the contradiction that still existed in Christian teaching on the afterlife between the bodily resurrection found in the Bible and the immortality of the soul inherited from Plato. The rational soul, said Thomas, must be able to maintain some kind of existence without a body, but it was a very unsatisfactory state

St. Thomas Aquinas believed that it would not be possible for the soul to survive the death of the body if it had come into being along with the body. (Courtesy of Thoemmes Press)

for it to be in. It would not be able to do anything except think. It needed a body to receive information through the senses, express itself, act, communicate with others, and so on. What the rational soul needed, in short, was to be reunited with its body in order to restore the whole person. Here, then, was the explanation, lacking in the Platonist version of Christianity, for the resurrection of the body. It would be the occasion for the reuniting of the body and soul of those who had died, ready to face the final judgment and either eternal bliss or damnation (see Richardson and Bowden 1983 for more on Aquinas's discussion of the soul).

René Descartes and the Enlightenment

Brilliant as Aquinas's synthesis was, it was not perfect. His theory of an intellectual element that rendered the soul independent of the body still left awkward questions. For example, was this view really compatible with Aristotle's notion of the soul as the "form" of the body? And could the rational soul really function—even temporarily—when it was cut off from the bodily senses, which (according to both Aristotle and Aquinas) were its sole means of gaining knowledge? The answer given by René Descartes (1596–1650) to these two questions marks a watershed between the later Middle Ages and the Enlightenment. Quite simply, Descartes dispensed with Aristotle. It had been a mistake, he said, to suppose that the rational soul (that is, the thinking mind) and the physical body were bound together by some kind of necessity. There was a close working relationship between them, certainly, but each existed quite independently of the other. In particular, it was the mind and not the body that constituted the person, the human subject. The "I," of whom Descartes famously wrote, "I think, therefore I am," was his mind alone (see Cottingham et al. 1985–1991 and Document 1 in this volume).

By proposing a sharp distinction between a nonphysical "thinking

stuff"—minds/souls—and a physical "material stuff," of which everything else was made, Descartes made it possible for the physical sciences to blossom. Seventeenth-century Europe was a scene of religious turmoil, but the "Cartesian cut" between mind and material, between soul and body, meant that science could keep apart from the bloody religious conflicts of the times, claiming to be concerned only with the physical world. But the same division that allowed science to flourish without interference from religious questions about the soul also had a less fortunate result. It established the idea, stated at the outset of this chapter, that subjective experience—because it relates to the mind—is not a proper subject for scientific inquiry.

Because this attitude has been so powerful and has influenced so strongly the story told in this book, it is worth noting that Descartes himself was aware of a basic problem with his ideas. He had moved decisively away from the Aristotelian view that the mind was dependent for all its knowledge on the bodily senses. On the contrary, said Descartes, the thinking mind is self-sufficient. In 1637 he published an introduction to his philosophical ideas, called the *Discourse on Method.* It was aimed at a popular market and was written in his native French rather than the Latin still used at that time for scholarly works. In the book he summed up his new approach by saying, "I am a substance the whole nature or essence of which is to think." (*Discourse On Method,* Part Four). And this thinking mind, which was the essential person, was not tied to any physical location and did not require physical senses like touch and sight to gain information. It "does not need any place or depend on any material thing," he insisted (*Discourse on Method,* Part Four). But there was one difficulty.

Even though a body might not be essential for a mind to exist and think, the fact remains that all of us—including Descartes himself—have bodies with which we (that is, our thinking minds) are closely associated. It might be possible in theory for us to function as pure minds, without bodies, but in practice we don't. Our minds and bodies are not independent. My body is getting dehydrated, and my mind registers that I am thirsty. So my mind decides to have a glass of beer, but my body has to respond by getting up from my desk and going through to the kitchen. Then if I cut myself opening the can, I feel the pain as mine. I don't merely observe it as damage to something else, my body, but I experience it myself. Descartes was aware of this relationship, and it bothered him. In a famous passage from his sixth *Meditation,* he admitted that such experiences taught him "that I am not just lodged in my body, like a pilot in a ship, but that I am very closely united to it, and as it were so intermingled with it that I seem to compose with it