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REVIEW

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by G. M. Woerlee

Reviewed by Richard DeGrandpre



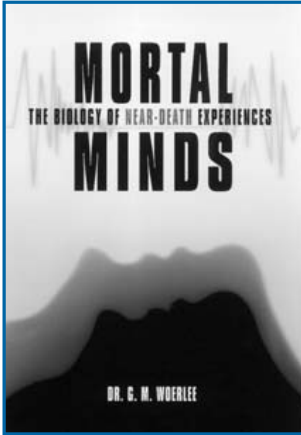
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REVIEW

Neuroscience and the Afterlife*Mortal Minds: The Biology of Near-Death Experiences*

by G. M. Woerlee

Prometheus Books, 2005

282 Pages \$25.00

Reviewed by Richard DeGrandpre, Ph.D.

In 1922, after a search that began in Egypt in 1891, British archeologist Howard Carter finally discovered the Tomb of Tutankhamen in an ancient Egyptian cemetery called the Valley of the Kings, where it had been ever since the death of King Tut in 1322 BC. Carter found Tut had been laid within a series of nested vessels in a small chamber, which also contained a collection of funerary treasures that remain today the greatest royal artifacts ever discovered. The nested vessels consist of four small shrines made of gilded wood, each one smaller than the next, leading to a series of three coffins shaped in a bodily form that has become symbolic of the pharaoh. The first two of these nested coffins were gilded; the last

and innermost is made of solid gold. Beyond this was a red quartzite sarcophagus in which Tut was laid, his face and shoulders covered with an ornate mask of gold. The funerary objects in the chamber were no less regal, including necklaces, bracelets, rings, amulets, and sheaths covering his fingers and toes, all made of gold and other precious materials. But there were also simpler provisions for a life resurrected, including board games, linen undergarments, a stockpile of food and wine, and even a bronze razor. Such a vast and precious collection of funerary treasure, common for Egyptian pharaohs, served several purposes. One was the simple desire to take objects of wealth and utility into the afterlife. No less important, however, was the hope that such riches would facilitate resurrection when the pharaoh was judged for worthiness by the supreme gods. As these abandoned treasures also make evident, belief in the afterlife was all but absolute in the time of the pharaohs. No point leaving behind vast wealth in a sealed tomb if it is just going to sit there useless.

It has been more than 3,000 years since the brief reign of King Tut, and beliefs in the afterlife, in the soul's inherent immortality and the self's eternal consciousness, remain pervasive throughout the world. The Enlightenment and the rise of modern science affected the depth of these beliefs, at least in the West, putting notions of soul and immortality under constant skeptical examination. In fact, this is a chief reason why the prospect of any first-hand evidence of an afterworld waiting for us—at least for some of us—has gained significance in modern times. It was at about

the time that Charles Darwin's theory of evolution was gaining general acceptance, for instance, that the Society for Psychical Research was founded in 1889 to take on the task of researching the claims of spiritualists, who believed not only that an afterlife exists, but that it can be visited via mediums of various kinds. As one contemporary writer commented:

The trouble is that for us jaded moderns the image of heaven has lost its potency, its power to move us as it once moved Dante and his contemporaries. It has become enfeebled, reduced to a mere literary tradition, a curiosity for the archivist. We need convincing that the "kingdom of heaven" is here and alive right now. And what better than testimonies to bring that truth home? Could this be the larger function of near-death experiences in our time?

Today, more than a century after the Society for Psychical Research was founded, a debate rages over the question of life after death, with science, including brain science, invoked by both sides. G. M. Woerlee's book, *Mortal Minds: The Biology of Near-Death Experiences*, is a recent and notable example of science's growing engagement.

Woerlee is a Dutch anesthesiologist who, as the subtitle of his book suggests, has a keen, but I would not say strident, interest in offering a scientific and physiological explanation of near-death experiences, or NDEs. Here is a typical NDE report from *Mortal Minds*:

I saw myself, or what was left of me lying there [on the operating table], and how busy the doctors and nurses were with

me. You could say that I had left my body like leaving a coat. The worst part of it all was that at this point I lost all connection with my body, something which bothered me for quite some time afterwards. After I had floated close to the ceiling for a short time, I was sucked into a tunnel...It was black and dark around me, somewhat frightening, but this did not last long: at the end of the tunnel I saw a clear light towards which I travelled.

NDEs are probably the most compelling "direct" or experiential evidence of an afterlife. Entering a tunnel, out-of-body experiences, and visions of loved ones are common

The verdict of science is usually that, although the reported experiences are most certainly real and powerful, even personality and life altering, they can be explained more easily in terms of the brain and its altered states of consciousness than in terms of immortality and close encounters beyond death's door.

NDEs. The problem, of course, is that testimonials from people who have had NDEs—and claim to have sensed the afterlife—are personal and subjective. Science and medicine have been dragged in, usually by skeptics, to resolve the dispute over whether these experiences really reflect contact with another world. The verdict of science is usually that, although the reported experiences are most certainly real and powerful, even personality

and life altering, they can be explained more easily in terms of the brain and its altered states of consciousness than in terms of immortality and close encounters beyond death's door.

SEEING THE "HEAVENLY LIGHT"

The prominence of NDEs in the debate over the afterlife is undeniable. As beliefs in immortality have been challenged, reports from people who have been pulled back from that most attractive and pleasing light have gained import, because these first-hand reports appear to offer a kind of evidence of the afterlife's existence. With the advent of new medical techniques, the number of people having near-death experiences has grown dramatically in the last century. In 1979, a Denver cardiologist, Fred Schoonmaker, reported that during an 18-year period half of his patients reported experiencing an NDE. In 1982, the Gallup organization conducted a poll that found 1 in 20 adult Americans reporting having had an NDE. Instead of deathbed visions, with a person losing consciousness and passing away at home—the common experience a century or more ago—the dying are now supervised in hospital settings, with staff and equipment ready at hand to deny death as long as possible. More NDEs have been the result, stirring up debate about their meaning, with both advocates and skeptics voicing every possible opinion.

The popularization of NDEs began in 1975, when American physician Raymond Moody coined the phrase "near-death experiences" in *Life After Life*. His book became an international best-seller, launching a new

genre dealing with paranormal experiences interpreted as evidence of the afterlife. Moody interviewed people who had experienced NDEs, examined their testimonials, and concluded that, whatever their validity in terms of proof of another world, NDEs are of great practical and scientific significance. "I am not trying to prove there is life after death," he wrote. "My hope for this book is that it will draw attention to a phenomenon which has great significance." Above all, Moody wanted to make clear that NDEs are as profound as they are common. People do not just report being overwhelmed by joyful feelings and the loss of their fear of death. They describe experiences that are qualitatively more substantial than ordinary dreams. Susan Blackmore, author of *Dying to Live*, an important book from the same publisher as Woerlee's *Mortal Minds* (Prometheus Books), notes in a 1991 essay in the *Skeptical Inquirer* that people experiencing NDEs "do not say, 'I've been hallucinating,' 'I imagined I went to heaven,' or 'Can I tell you about my lovely dream?' They are more likely to say, 'I have been out of my body' or 'I saw Grandma in heaven.'" It is this quality of at least some NDEs that seems responsible for a kind of "rebirth" in some individuals. Moody came to appreciate this and wrote his influential book. An account that Moody cites as sparking his interest was that of a Swiss geologist, Albert Heim. During a climbing expedition in the Alps in 1871, Heim took a serious fall and later recounted what happened:

I saw my whole past take place in many images, as though on a stage at some distance from me. I saw myself as the chief

character in the performance. Everything was transfigured as though by a heavenly light and everything was beautiful without grief or anxiety, and without pain. The memory of very tragic experiences I had had was clear but not saddening. I felt no conflict or strife: conflict had been transmuted into love. Elevated and harmonious thoughts dominated and united the individual images, and like magnificent music a divine plan swept through my soul.

Moody's book elicited a huge amount of attention to a previously little-discussed subject, and inspired many more books. One follower and writer was Kenneth Ring, a psychology professor at the University of Connecticut. In the late 1970s, Ring helped establish and became the first president of the International Association for Near-Death Studies (IANDS), which remains active today. After intensive study, Ring argued that NDEs can be broken down to five successive stages: peace, body separation, entering the darkness, seeing the light, and entering the light. While acknowledging that not all individuals necessarily experience the later stages, Ring argued that there was a structure to NDEs, which he interpreted as evidence of a common spiritual realm waiting to be experienced.

Interest in NDEs continued in the 1980s and, as part of a burgeoning New Age movement and industry, exploded in the 1990s. In 1994 alone, several popular books appeared on the subject of "seeing the light," including P.M.H. Atwater's *Beyond the Light* (Birch Lane Press Books), Dannon Brinkley's *Saved by the Light* (Villard Books), Betty J. Eadie's *Embraced by the Light*

(Bantam), Kevin D. Randle's *To Touch the Light* (Pinnacle Books), and Brad Steiger's *One With the Light* (Signet Books).

SKEPTICAL SOUL SEARCHING

Woerlee's *Mortal Minds* is a distinctive contribution to this literature on NDEs, albeit one that falls on the side of the skeptics. As an anesthesiologist, Woerlee has long been a close observer of the connection between dying and NDEs. As a Dutch writer (*Mortal Minds* was published first in Dutch in 2003), his analysis has relatively little overlap with the popular American literature. These two aspects of the book are both good and bad news for readers interested in NDEs, or in death and dying. Woerlee has a fresh perspective, but readers expecting an updated scientific and medical summary of what we

Assessing the scientific basis of the soul is a place where angels should rightly fear to tread, but Woerlee's exploration into the matter is an earnest one, rooted in logic. Woerlee believes that all evidence supports the conclusion that NDEs are fundamentally biological events because they are mental events—and mind is wholly reducible to brain.

know about the biology of NDEs are likely to be disappointed.

Following an introduction that spells out the author's motivations and interest in the subject of NDEs and dying, Woerlee

gives us almost a dozen short chapters on whether close examination of the body and brain yields any evidence that humans have a soul. He seems to believe that he must first disabuse the reader of the notion that he or she has a soul before we can move on to his ultimate thesis that NDEs are bodily processes explainable in biological terms. To this he turns in the book's final chapters and concludes that, to the extent that there is a common, basic structure to NDEs, this commonality reflects not a universal realm of transcendence, but a common set of bodily structures affected by the very biology of dying.

Assessing the scientific basis of the soul is a place where angels should rightly fear to tread, but Woerlee's exploration into the matter is an earnest one, rooted in logic. Woerlee believes that all evidence supports the conclusion that NDEs are fundamentally biological events because they are mental events—and mind is wholly reducible to brain. He then posits that if, indeed, this is the case, and if NDEs are nevertheless to be taken seriously as evidence of another, spiritual realm, then logically we should be able to find some material connection between biology and the soul. Said another way, if NDEs can be shown to be rooted in biology, but the soul cannot be, how can there be any connection between NDE's and the afterlife? This question shows why the connection between NDEs and the bodily events inherent in dying are crucial to the thesis of the book, for if the soul is truly independent of the body, as we might assume, then we should also expect NDEs to be quite independent of what is going on

in the body. But they are not. We are getting ahead of ourselves, however, for Woerlee does not really focus on the biology underlying NDEs until later in the book. First, he must deal with the soul—a problem that could never be a small one.

Woerlee begins his exploration of soul by looking first at death in terms of the dying of the body. The body gives us life, so what is going on when the body can no longer sustain life, he asks? Defined in the negative, death is that biological state from which we never recover consciousness and come back to life. Returning from an NDE, according to this definition, is an instance of having been in the process of dying but, at least for the time, having escaped death. In physiological terms, dying usually means that the heart is no longer beating and that breathing has stopped, a situation that obviously can stem from myriad causes. Woerlee summarizes all this by reviewing basic human physiology (the heart pumping blood that carries oxygen through the body and so on), ultimately tracing the fundamental structure for sustaining life to the brainstem. Unlike virtually all our other organs, structures, and processes, the brainstem is both necessary and sufficient for sustaining life, including consciousness. "Brainstem function determines whether the body is alive or dead... The death of the body is death to the brainstem," writes Woerlee.

Here is where Woerlee turns to his experience as an anesthesiologist. He knows that people do not have unusual near-death type experiences if they are kept unconscious, as they are supposed to be under general anesthesia. On rare and often terrifying

occasions, however, people are conscious during a surgical operation when they should not be, and this sometimes gives rise to unusual reports:

A man once told me he found himself flying above the lawn outside the hospital at the same time he was undergoing an operation under general anesthesia inside that same hospital...A woman once related a similar experience. She told me she found herself awake, and standing next to her body at the same time as it lay upon the operating table under general anesthesia.

These experiences make people feel as though mind and body are independent, Woerlee points out, which is closely linked with the belief that the soul, too, is independent of the body. But Woerlee knows that mind is not independent of body and that NDEs are closely linked with consciousness. This makes him suspicious of the soul as well, and so he decides “to learn whether each person has a soul.”

The properties of the soul are usually considered to be non-physical, or metaphysical, so few would pursue the analysis that Woerlee does, trying to find the soul as “manifested by the living human body.” But, for the reasons already noted, Woerlee is not doing this in jest, or as an academic exercise. If we take him at his word, and I see no reason why we should not, he really wonders whether biology is under the guidance of an immortal soul. After all, the material body does somehow give rise to an animated being and, in the case of humans, a conscious being. That is to say, nature does give rise to something larger and rather inexplicable, even for science. And herein lies

a problem that Woerlee clarifies and exploits. On the one hand, most believers maintain that soul is separate from body, which it must be if the soul is immortal and promises us eternal consciousness. On the other hand, the soul as the spirit that animates our actions and defines our consciousness must

If the body is animated and controlled by a soul, the soul must still somehow interact with the material body, Woerlee argues, and thus evidence of this connection should be there for the finding.

also somehow join with and take command of the body. But how can soul be disconnected from and connected to the body at the same time? If the body is animated and controlled by a soul, the soul must still somehow interact with the material body, Woerlee argues, and thus evidence of this connection should be there for the finding.

At this point in *Mortal Minds*, a soul searching begins, with Woerlee showing just how much of the body can be out of order yet still have consciousness and spirit. Vital organs and tissues can go, as well as cells from here and there, and yet spirit remains. Similarly, when the body is exposed to psychoactive substances, the spirit is clearly affected; rare are occasions in which it is immune. Here, the importance of the brainstem resurfaces, for death of the brainstem means brain death and the end to the bodily spirit. If there is a soul to be found in the body, it seems it must lie within the

brainstem. Woerlee does not find it, and here he must let the matter rest. There can be no positive evidence for the nonexistence of the soul in the brainstem, of course, so the burden of the proof shifts to those who assert that evidence for the soul exists. In the end, Woerlee must conclude his case with the observation that the brainstem functions according to the laws of nature and there is no evidence or basis of other, spiritual attributes. “People are alive because their bodies are alive,” he writes. This analysis, which dominates the first portion of the book, is likely to have little effect on readers of any persuasion. Skeptics will remain skeptics, with few new arguments at hand, while the believers will remain believers, never really convinced that there is not a soul in there somewhere.

SOMETHING IN THE BREATH OF LIFE

The second part of *Mortal Minds* may prove more satisfying. Here, Woerlee’s thesis becomes clear, and the book begins to offer some new insights into why, from a biological and cultural point of view, NDEs might appear as they do. The clarity of the book also improves, as when Woerlee returns to his main thesis, that most deaths ultimately result from a break in the “chain of oxygen supply.” Oxygen is key not only because lack of it leads to death of the brainstem and other organs, but also because focusing on it sheds a light on why, when dying, people have the kinds of NDEs that are commonly reported.

As is explained in some detail in *Mortal Minds*, more than 90 percent of all deaths occur with the body starved of oxygen—the acute cause of death. Poisons, cancers, fatal

injuries, infectious diseases, hypothermia, and diabetes may all have different initial effects on the body, but these effects, left unchecked, will ultimately converge in the form of some break in the oxygen cycle. In the popular book *Last Breath*, Peter Stark illustrates the problem of oxygen starvation with the example of drowning:

0 MINUTES, 3 SECONDS. Oh, shit! That’s your only thought as your kayak wheels upside down through the air over the huge boulder that sits midstream in the river, creating an enormous hole. You manage to suck in one big breath—five liters of air before going under. Since air is made up of four-fifths nitrogen and one-fifth oxygen, this gives you one precious liter of oxygen trapped in your lungs. Plunging headfirst into the hole, you’re instantly ripped out of the kayak. The cold water slapping your face triggers your mammalian “diving response”: Your heart rate drops and your veins and arteries constrict to channel the oxygenated blood to your brain and organs instead of to your limbs...

0 MINUTES, 37 SECONDS. Your blood, normally a rich, oxygenated red, is turning blue. Dimly, you feel your arms and legs burn from the buildup of lactic acid caused by oxygen deprivation. Your head breaks the surface of the water and you let out a great sigh of carbon dioxide. Just as you start to take a breath, the hole pulls you back under. You gag, your larynx in spasms as it reflexively closes to keep water out of your lungs.

1 MINUTE, 23 SECONDS. 220 milliliters of oxygen remaining. You lose consciousness. The water you inhaled has washed out the surfactant—a protein coating—that keeps your lungs’ air sacs from

collapsing. If rescued now, you could die a few hours later of “secondary drowning” as your damaged lungs fill with fluid.

4 MINUTES, 21 SECONDS. Your feeble heartbeat pushes some residual oxygen to your brain. On dry land, brain damage begins roughly four minutes after breathing has stopped; after ten minutes there is almost zero chance of recovery.

These times can decrease when the victim is underwater, particularly in cold water.

As Woerlee points out, the scientific literature on oxygen starvation establishes that certain parts of the body are more demanding of oxygen than others. As a consequence,

Reports of a bright light, tunnels, and pleasant feelings are all accountable in terms of oxygen starvation in certain areas of the brain. Deprived of oxygen, consciousness begins to fade, and, as it does, NDEs arise.

these parts—including parts of the brain, which also happen to be implicated in NDEs—are more quickly affected as oxygen starvation takes place. Reports of a bright light, tunnels, and pleasant feelings are all accountable in terms of oxygen starvation in certain areas of the brain. Deprived of oxygen, consciousness begins to fade, and, as it does, NDEs arise. Those NDEs we know about are those that people can remember, of course, for the losing of consciousness is also associated with a loss of memory.

In her 1999 essay, Susan Blackmore cites a study looking at the effects of drugs

like LSD on oxygen in the brain. This study showed that a drug-induced lack of oxygen causes a disinhibition of certain neurons in the brain, including the visual cortex, which can then result in the perception of a tunnel. As Blackmore explains, the center of the visual field in the brain is represented by more cells than are the edges, which means that, as starvation occurs, the center of the visual field will be affected first.

These aspects of human anatomy and physiology transcend race, culture, and religion, which Woerlee, Blackmore, and others argue explains why NDEs are common across cultures. “Each degree of oxygen starvation causes a specific cluster of mental and perceptual manifestations,” writes Woerlee. Certainly race, culture, and religion affect individuals’ interpretation of NDEs, but behind the meaning there appears to be a cluster of experiences that conform to what occurs during oxygen starvation. Woerlee gives an example of a woman who experienced an NDE that consisted of several visions, including the experience of a bright light that she experienced as a “lovely brightness,” as well as a vision of loved ones. These visions followed heart failure, which naturally resulted in oxygen starvation throughout the body. As Woerlee notes, however, “even though her visions had a biological and socio-cultural origin, they transformed her death from a mere biological event, to an event with a profound spiritual meaning for her, for her family, as well as for those who attended her deathbed.”

The eyes also appear to be implicated in NDEs, first because NDEs are highly visual experiences, but also because the eyes

are highly demanding of blood and oxygen. According to Woerlee, oxygen starvation impacts the eyes and visual cortex together, as in this account of a woman who nearly bled to death during a caesarean section:

This woman first experienced a degree of oxygen starvation causing the functioning of her retina's [sic] to fail, which is why she first experienced only "darkness." Subsequent improvement in the supply of oxygen to her eyes restores some function to the central parts of her retina's [sic], and this caused her to pass from darkness into a "tunnel." Oxygen starvation also caused her brain to malfunction, so she combined her sensation of tunnel vision with other sensory effects of oxygen starvation to generate the experience of being sucked into a tunnel.

"THE TRUE NATURE OF DEATH"

Woerlee concludes *Mortal Minds* in a confident but sober mood:

I had learned the true nature of death. I had learned what I will experience as I die. I had learned I have no soul. My mind is a product of the functioning of my body, so my mind will die with my body, and I will not live for eternity in a life after death... After all, the knowledge and analysis presented in this book finally does away with all the hope, and all the comfort afforded by uncertainty about the possibility of a life after death, as well as finally demolishing many ancient belief systems forming my upbringing.

These insights and conclusions may leave the author with a certain peace, but I am not so sure they will have the same effect on most readers. Clearly there is reason to agree with Woerlee that the visual and emotional elements of NDEs appear to correspond,

often in a striking way, with changes taking place in the body during the last stages of dying. For many people, however, there is still something more, and more mystical, about NDEs that cannot be accounted for by contemporary science's philosophy of materialism. NDEs are central to much of spiritualism. Experiences are difficult to deny, and those of a profound, spiritual nature have long been a fundamental source of religious development within and across cultures.

What, then, is gained, and what is lost, in a materialist account of NDEs? In my own view, from understanding NDEs, we can learn something about the brain, and this knowledge may be more lasting in importance than the attempt to refute spiritualism, which seems to be more the focus of Woerlee's book. The science of religious experience will never bring an end to religion itself, but it may clarify our own basic humanity, something that *Mortal Minds* may achieve, but only, as it were, in passing. ■

EXCERPT

From *Mortal Minds: The Biology of Near-Death Experiences* by G. M. Woerlee © 2005 by G. M. Woerlee. Reprinted with permission from Prometheus Books.

Dying people sometimes say they see 'celestial landscapes,' 'angels,' 'bright figures of light,' 'bright light that does not hurt the eyes,' 'tunnels,' and 'darkness.' Indeed, many people believe that because dying people are so close to the world of the dead, they are able to glimpse the world they will soon inhabit for the rest of eternity. But people

have no souls, so there is no supernatural world inhabited by the dead. Nonetheless, some dying people really do see such visions of the eternity they believe awaits them. These dying people are neither mad nor hysterical; they are simply reporting their visual sensations in a clear and honest manner. But how is it possible for these people to see these things when they do not exist? I wanted to know the answers to this question.

So I studied how the process of dying affects the functioning of the eyes, as well as the way the dying mind interprets visual sensations. And I found that the visions reported by the dying are actually products of changes in the functioning of the eyes, as well as the ways the dying mind interprets visual sensations.

The pupils of dying persons are often wide open shortly before death. There are several reasons why pupils may widen before death. Pupils may widen due to emotions, disease, fever, medicines, or oxygen starvation. Widening of the pupils affects the functioning of the eyes in two ways. Widened pupils allow more light to enter the eyes, as well as reducing the focal depth of the optical system of the eyes. These two effects are evident in the reports of visions related by the dying.

People see because light enters their eyes, and light only enters the eyes through the pupils. Pupils have a circular shape, and the diameter of the human pupil may be as small as one millimetre, or as large as ten millimetres. This means that extreme widening of the pupils can allow as much as one hundred times more light to enter the eyes, than when

the pupils are as small as they can be. More light enters the eyes of a person with wide-open pupils than enters the eyes of a person with narrow pupils, which is why a person with wide-open pupils perceives their surroundings as brighter, or even bathed in light. Consider the situation where several people are in a room where the lighting does not change. If the pupils of one of these people widens due to any one of many causes, that person will say that the lighting in the room has become 'brighter,' or that the room is 'bathed in bright light that does not hurt the eyes.' But if the pupils of the other people in the same room do not widen, these people will notice no change in the lighting of the room. They may even say the person who claims the room has become brighter is mad. Yet the person saying the lighting in the room has become 'bright,' or 'even bathed in bright light that does not hurt the eyes' is quite correct. More light does enter that person's eyes, causing that person to perceive the room as being brighter.

This is the same situation sometimes described during deathbed visions. Several people cluster around the bed of a dying person. The pupils of the dying person widen as their condition worsens. And as the pupils of the dying person widen, they notice that the lighting in the room becomes brighter, or even that the room is bathed in bright light. No one else notices that the lighting in the room has changed, only the dying person, because only the pupils of the dying person widen. This is why dying people may say they see 'bright light,' 'bright light that does not hurt the eyes,' or even 'bright landscapes.' ■