

ADRIAN WOOLFSON

Raising Awareness

Into the Grey Zone: A Neuroscientist Explores the Border
Between Life and Death

By Adrian Owen

(Guardian Faber Publishing 304pp £16.99)

To date – perhaps fortunately – no evidence has emerged to suggest that we share the universe with other intelligent beings. But what of our inner mental space, teeming with private thoughts, images, memories, beliefs, aspirations and anxieties: the products of individual conscious awareness? Although superficially discernible through our words and actions, most of our minds' contents remain unknowable to others.

In this remarkable book, Adrian Owen turns his attention to the invisible workings of the private universe that each of us inhabits. Through examinations of human brains damaged by trauma, tumours, infections and vascular accidents, he attempts to explore the nature of consciousness.

Owen's professional life as a neuropsychologist converged unexpectedly with his personal life when the brain of his former partner was irreversibly injured by the spontaneous rupture of its blood vessels. She was left in a persistent vegetative state, a condition in which patients, though awake, lack awareness of themselves and their surroundings and exhibit no voluntary behaviours or responses.

This led him to speculate about whether such patients might preserve some residual degree of awareness. The remarkable case of Jean-Dominique Bauby, the author of *The Diving Bell and the Butterfly*, who remained conscious but 'locked in' following a massive stroke and was able to communicate only by blinking, suggested that consciousness could persist in unexpected situations. But how could the mental space of an unresponsive vegetative-state patient be probed?

Working at Addenbrooke's Hospital in Cambridge, Owen devised a project to look for evidence of residual consciousness in trauma patients. Active brain regions experience increased rates of blood flow. By injecting a radioactive form of oxygen, the blood flow could be tracked and brain activity monitored.

The first evidence of hidden consciousness in a vegetative-state case was established by showing a patient photographs of family and friends. Following this, the patient's fusiform gyrus, the brain region involved in facial recognition, experienced a spike in activity. This did not happen when the patient was shown unfocused versions of the same images. This demonstration of intact cognitive function in an apparently unaware patient was unprecedented, but critics argued that it might simply have been an instance of automatic brain function. A more definitive method for detecting consciousness was required.

One hallmark of consciousness is the ability to follow commands. Owen showed that if healthy volunteers were asked to imagine playing tennis, the premotor cortex area of their brains lit up, whereas if asked to imagine that they were walking from room to room at home, their parahippocampal gyri became activated. These changes were monitored using a technology called functional MRI, which measures magnetic changes in the brain. Astonishingly, some vegetative-state patients reliably activated these brain regions when given prompts. Owen was therefore able to demonstrate that these individuals were actually conscious and that it was, in a rudimentary manner, possible to read a person's thoughts.

He then cleverly used this approach to establish two-way communication between himself and a patient. Patients were instructed that, if the answer to a question was yes, they should imagine they were playing tennis, and, if no, that they were walking from room to room. For the first time, it became possible to converse with patients who were fully conscious but trapped in their own private universes. Nevertheless, some patients who failed the tennis test and whose conditions subsequently improved reported that they had been conscious at the time, making it clear that the test did not pick up consciousness in everyone. A more objective

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test was required. Conscious brains activate nearly identically when watching films. Owen exploited this to devise a 'Hitchcock Test' for consciousness, which did not require the patient to 'reply'. Patients were shown a Hitchcock film; consciousness was inferred if their brain activity corresponded to that of a healthy volunteer.

Owen's experiments have provided insights into the nature of consciousness and allowed vegetative-state patients with residual consciousness to connect with the

external world. The demonstration that machines have the potential to read our thoughts additionally raises complex questions. It offers the possibility of engagement with inner worlds in a non-verbal manner. But in penetrating our deepest and most intimate sanctuaries, such technologies also threaten to undermine our concept of free will.

The tremendous resilience of consciousness to assorted brain injuries, along with our ability to catalogue residual units of

neuronal function in damaged brains, raises the prospect of defining the neural basis of consciousness. Once we have done so, we may be able to discern, like a modern-day Dr Dolittle, the differences in awareness between porcupines and pythons, and to entertain the possibility of engineering new forms of human and machine consciousness that transcend the natural forms with which we are familiar.

To order this book from the Literary Review Bookshop, see page 38.

JOHN SWEENEY

Aftershocks

Ghosts of the Tsunami

By Richard Lloyd Parry
(Jonathan Cape 276pp £16.99)

Roughly a year ago, I was fast asleep in bed in Perugia when the ground shook so violently I woke and vowed there and then to give up drinking. I drifted off back to troubled sleep. Twenty minutes later, the ground shook again and then I got it: I was living through an earthquake. Sixty miles away, in Amatrice and its environs, 299 people were killed. There is something horrible about an earthquake. It undermines your faith in the normal, the everyday, the notion that the earth is, to borrow a phrase, strong and stable. On the scientific level, you can read up on plate tectonics and learn all about the ongoing subduction of the Eurasian Plate beneath the Adriatic Plate and so on. But, at a human level, you fear that you are losing your grip on reality. That sense of mental dislocation – the idea that the floor beneath my feet might turn into a fizzing liquid – still troubles me. The day after the big quake there was an aftershock. I was sitting in a cafe when the whole building wobbled like jelly and people began to run, dementedly, away.

The 2011 earthquake in Japan triggered a tsunami with waves 120 feet high, shifted Japan's main island a whole eight feet further east towards the United States, swamped a nuclear power station and killed more than 18,000 people. Richard Lloyd Parry's extraordinary *Ghosts of the Tsunami* examines the mental dislocation arising from that disaster front and centre. It's not

about geology or nuclear disaster or the tsunami, although all of that is here. It's about parents who lost their children in a school and the ghosts who haunt them, about minds unhinged by the catastrophe wrestling with the reality of nature.

When extreme events happen, good people can end up doing entirely the wrong thing for what is normally the right reason. During the 9/11 attacks, security personnel told panicking workers in the Twin Towers to stay put because, according to the standard advice, it was safer than leaving the building. Many of them ended up jumping. The same advice was given to residents of Grenfell Tower.

And so it was with the tragedy in Japan. Tsunamis tend to build over time. The quake struck at 2.46pm. At Okawa Primary School, the head teacher remained calm. The children were safe, he believed. There was a steep hill at the back of the school, but no order was given to evacuate there. At 3.30pm loudspeaker vans raced through town telling people that the sea was breaking in, exceeding the height of the tree tops. The children were moved out of the school to a traffic island but one with no significant height or protection. When the wall of water came, seventy-four children and ten teachers were swept to their deaths. For far too long, the authorities did their best to cover up their terrible mistake. Had they acted in a timely fashion,

probably no child or teacher would have died. Inaction led to an unnecessary massacre by nature; bureaucracy did its best to conceal that inaction.

A few parents, heeding the warning signs, went to the school and took their children out. Most didn't. Lloyd Parry writes movingly about the emotional chasm that now separates the parents who saved their children and those who assumed the authorities knew best. Grief is supposed to be ennobling. The reality, he reports, is often embitterment and fury at avoidable loss.

The bodies of some of the children were found but those of others remain missing. Into that darkness and emptiness come the ghosts, the shamans and the exorcists. God isn't very popular in the West these days, so it's striking to read a book written in civilised, elegant prose that doesn't rip apart Buddhist priests and Christian pastors at the first mention. But Lloyd Parry paints a grim picture of the day when the souls of the dead were believed to have left their bodies. The shaman and the pastor walked towards the sea, but as the sorrow and anger of the grieving parents mounted, neither Buddhist incantations nor Protestant hymns worked: shrieks and howls predominated. The pastor could not bear to look at the sea.

In the end, judges ruled that the authorities had made a terrible mistake. The grieving parents were given around £470,000 for the loss of each child. Reason, logic and the rule of law have somehow been re-established. But what do you give someone who has been driven mad by cruel nature and obdurate authority? What is the payout for the loss, even if temporary, of your mind?

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