

THE BRAIN AND THE SOUL

Joseph Lee

FOR CHRISTIANS the human soul traditionally represents the spirit within, the life of the body, rationality and a passage through death into eternity. But today questions are being raised about the soul. There can be a disinclination to discuss it because of unwelcome overtones of dualism. Some people are even asking, ‘whatever happened to the soul?’¹ and ‘do we still need a soul?’²

Modern biology demonstrates the role of the brain in how people experience meditation, liturgy and religious behaviour.³ A popular idea is that a ‘God spot’, a specific area active in religious experience, exists in the brain.⁴ But it still appears intuitively improbable that:

... our most private feelings, original perceptions, special skills, hard-won achievements—our individuality, consciousness, our very souls and our ability to explain ourselves in language—are entirely determined by the electrical-chemical activity of a soft, wrinkled, grey-and-white lump of matter that you could comfortably hold in one hand.⁵

¹ See *Whatever Happened to the Soul? Scientific and Theological Portraits of Human Nature*, edited by Warren S. Brown, Nancey Murphy and H. Newton Malony (Minneapolis: Fortress, 1998); *What about the Soul? Neuroscience and Christian Anthropology*, edited by Joel B. Green (Nashville: Abingdon, 2004); Eric L. Johnson, ‘Whatever Happened to the Human Soul? A Brief, Christian Genealogy of a Psychological Term’, *Journal of Psychology and Theology*, 26 (1998), 16–28; and Patrick D. Miller, ‘Whatever Happened to the Soul?’, *Theology Today*, 50 (1994), 507–510.

² Francis Selman, ‘Do We Still Need a Soul?’, *Priests and People* (April 1994), 149–152.

³ Rich Heffern, ‘Our Brains Are Wired for Liturgy’, *National Catholic Reporter* (3 March 2010), 1 and 18; Joel Stein, ‘Just say Om’, *Time*, 30 (4 August 2003), 48–56: this cover story featured the front page title, ‘The Science of Meditation’.

⁴ The expression ‘God Spot’ was coined by Steven Connor, ‘“God Spot” Is Found in Brain’, *Sunday Times* (2 November 1997), 9. He was reporting the findings of Vilanayur S. Ramachandran and others, published as ‘Neural Basis of Religious Experience’, *Society for Neuroscience Conference Abstracts* (1997), 1316. Ramachandran used the less catchy expression ‘God module’. See also Robert Wuthnow, ‘Cognition and Religion, (2006 Paul Hanly Furfey Lecture)’, *Sociology of Religion*, 68 (2007), 341–360; Richard Monastersky, ‘What Happens to Your Brain while Praying?’, *The Chronicle of Higher Education*, 52 (26 May 2006), A17; Jonathan Sunley, ‘Must You Really Have Your Head Examined? Neuroimaging and Its Place in Modern-Day Psychiatry’, *Think*, 9 (2010), 73–84.

⁵ Sheila Hale, *The Man Who Lost His Language: A Case of Aphasia* (London and Philadelphia: Jessica Kingsley, 2007), 104. Sheila Hale writes about her late husband Sir John Hale. ‘Before John’s stroke

Or, as another writer puts it, 'I still can't believe that human beings are wholly contained in the bowl of porridge inside our heads'.⁶

A need exists to defend the soul in order to affirm human dignity.⁷ The Roman Catholic view is that the human body

... shares in the dignity of 'the image of God': it is a human body precisely because it is animated by a spiritual soul, and it is the whole human person that is intended to become, in the body of Christ, a temple of the Spirit.⁸

My intention here is to uphold the value of this 'spiritual soul' in human beings. The 'nothing but biology' trend is reductionist. As Richard Heffern wrote:

When Mary declared that her soul magnified the Lord, in her hymn known as the Magnificat, was she in effect saying that her brain magnified him? Those scientists who equate consciousness exclusively with activities of the brain would say that is the case.⁹

Nevertheless, it is worth learning from the neurosciences. The brain is central to the body, and the body is essentially our humanity in this life. We need functioning brains to be conscious, to communicate and for the soul to express itself. Accordingly I shall explore three areas which may be of interest to spiritual seekers, and to which the study of the brain can contribute: language, emotion and memory. But first I should like to offer some background to the Christian ways of understanding the soul by looking briefly at its biblical origins.

The Soul in the Bible

For Christians, the soul is about both the earthly life and the life beyond. In the Old Testament the Hebrew word *nepeš* is usually translated as

the mind-body problem was for me an abstract issue, somehow unrelated to the anatomy and physiology of the unlovely organ that apparently makes all of us what we are'.

⁶ Susan Wyndham, *Life in his Hands: The True Story of a Neurosurgeon and a Pianist* (Sydney: Picador, 2008), 286. Wyndham writes about Charlie Teo, a notable but controversial Australian neurosurgeon and Aaron McMillan (1977–2007), a young classical pianist. When McMillan was 24, he was diagnosed with an aggressive, rare brain tumour. Dr Teo operated on him and enabled the young pianist to continue performing.

⁷ Keith Ward, *Defending the Soul* (Oxford and Chatham: Oneworld, 1992); Paul Badham, *Christian Beliefs about Life After Death* (London: SPCK, 1978), 97–104.

⁸ *Catechism of the Catholic Church*, n. 364.

⁹ Rich Heffern, 'Rethinking the Soul', *National Catholic Reporter* (8 February 2008), 8. See also Susan Greenfield, 'Soul, Brain and Mind', in *From Soul to Self*, edited by M. James C. Crabbe (London and New York: Routledge, 1999), 108–125.

‘soul’.¹⁰ The soul is associated with life: ‘the man became a living being [*nepeš*’] (Genesis 2:7). When *nepeš* leaves, death occurs (Genesis 35:18). Some texts speak about the preservation of one’s soul: ‘For great is your steadfast love toward me; you have delivered my soul from the depths of Sheol’.¹¹ But these prayers concern liberation, not a separate existence after death.

A comparison between English bible translations reveals several other senses.

Text	New Revised Standard Version (NRSV)	Revised Standard Version (RSV)
Genesis 49:6	May I never come into their council; may I not be joined to their company ...	O my <i>soul</i> , come not into their council; O my spirit, be not joined to their company ...
Jeremiah 31:25	I will satisfy the <i>weary</i> , and <i>all who are faint</i> I will replenish.	For I will satisfy the <i>weary soul</i> , and every <i>languishing soul</i> I will replenish.
1 Kings 17:21	O LORD my God, let <i>this child's life</i> come into him again.	O LORD my God, let <i>this child's soul</i> come into him again.

No one English word can capture this important concept of *nepeš*.¹² The root meaning can be understood as ‘person’ or ‘self’: it is personal, conscious of actions and emotions. The people of Israel viewed things holistically, not in their constituent parts. *Nepeš* is never discrete from the person or body.

In the Greek of the New Testament the word *psuchē* (‘psyche’ or soul) has numerous meanings. It may be surrendered: ‘just as the Son of Man came not to be served but to serve, and to give his life [*psuchē*] as a ransom for many’ (Matthew 20:28). Survival is another idea: ‘When he opened the fifth seal, I saw under the altar the souls of those who had been slaughtered for the word of God and for the testimony they had given’ (Revelation 6:9). The soul cannot be killed, but, critically, both soul and body may be destroyed in hell (Matthew 10:28). Again, different possible English translations help us to understand further senses:

¹⁰ J. L. McKenzie, *Dictionary of the Bible* (London and Dublin: Geoffrey Chapman, 1965), 836–839; W. E. Lynch, ‘Soul (in the Bible)’, *New Catholic Encyclopedia*, volume 13 (Washington, DC: Catholic U. of America P, 2003), 336.

¹¹ Psalm 86:13; also Psalm 16:10; Psalm 49:15.

¹² McKenzie, *Dictionary of the Bible*, 838.

Text	New Revised Standard Version (NRSV)	Revised Standard Version (RSV)
Luke 12:20	This very night <i>your life</i> is being demanded of you.	This night <i>your soul</i> is required of you.
Mark 14:34	And said to them, ' <i>I am</i> deeply grieved, even to death; remain here, and keep awake'.	And he said to them, ' <i>My soul</i> is very sorrowful, even to death; remain here, and watch'.
Hebrews 10:39	But we are not among those who shrink back and so are lost, but among those who have faith and <i>so are saved</i> .	But we are not of those who shrink back and are destroyed, but of those who have faith and <i>keep their souls</i> .

The New Testament soul is 'the totality of the self as a living and conscious subject, and it is the totality of the self which is saved for eternal life'.¹³

The soul features centrally in Christian spirituality and thought, and was methodically studied by medieval thinkers such as Thomas Aquinas and John Duns Scotus. Teresa of Ávila's *Interior Castle* looks inside for the soul, as does Augustine. Bonaventure imagines the soul drawn towards union with God. And when the soon-to-be canonized Pope John XXIII published a spiritual diary, he called it *Journal of a Soul*.

Language

A neuroscientific account explains language as a computational system. The brain computes and relates between acoustic signals and thoughts, concepts and desires.¹⁴ There are no 'words' in the brain, only neurons (brain cells) and many brain processes: electrical, chemical and circulatory.

Language production theories highlight the cognitive processes involved in using language: how messages are expressed; how words are retrieved and then configured in sequences according to the rules of grammar; and lastly how they are produced in the form of speech, signs or writing.¹⁵ The production of spoken words requires a widespread neural network, that is, the interconnection of countless neurons.¹⁶ The chief

¹³ McKenzie, *Dictionary of the Bible*, 839.

¹⁴ Gregory Hickok, 'The Functional Neuroanatomy of Language', *Physics of Life Reviews*, 6 (2009), 121–143; Randi C. Martin, 'Language Processing: Functional Organization and Neuroanatomical Basis', *Annual Review of Psychology*, 54 (2003), 55–89.

¹⁵ F.-Xavier Alario and others, 'Architectures, Representations and Processes of Language Production', *Language and Cognitive Processes*, 21 (2006), 778.

¹⁶ Peter Indefrey and W. J. M. Levelt, 'The Spatial and Temporal Signatures of Word Production Components', *Cognition*, 92 (2004), 101–144. See also H. Damasio and others, 'Neural Systems behind Word and Concept Retrieval', *Cognition*, 92 (2004), 179–229.

elements of this network are in areas mainly on the left side of the brain. Hearing people speak involves the basic mechanisms of auditory processing: interpreting the frequency, timbre, pitch and timing of the words heard.¹⁷ Reading and writing require characters, a writing system, semantics and graphic motor patterns (the muscle movements involved in writing something down).

Insights into these processes can come from theories about brain damage, for instance in strokes, which can affect reading ability (dyslexia) and writing ability (dysgraphia).¹⁸ Jesus made the dumb speak (Mark 7:34), but humans may still lose their speaking abilities (aphasia) owing to neurological diseases or brain tumours.

We understand language via a progression of stages as we grasp the meaning of the words, and then sentences, that are read or heard.¹⁹ An outstanding attribute of human speech is our ability to comprehend spoken language fluently at three or four words per second.²⁰ In a time span of a few hundred milliseconds, listening to speech engages various brain regions which work together to analyse the acoustic information, map the sensory input received to select the proper words, extract meaning from those words and integrate them into coherent discourse. It is natural for humans to acquire language rapidly as babies, to gain literacy skills during life and even to learn foreign languages. The soul relies on this giftedness of the brain.

Interpersonal relationships, and relationships with God, are usually formed linguistically, and so are supported by the brain and mind. Without language we could not lift our hearts in praise, ‘Bless the Lord, O my soul, and all that is within me, bless his holy name’ (Psalm 103:1). Being human, social and spiritual are all dependent on language, in speaking, listening and writing. And God, too, uses language—mostly spoken, but sometimes written. In creating the universe: ‘Then God said ...’ (Genesis 1:3). King Belshazzar saw the writing on the wall (Daniel 5:5). God sent the Word to dwell among us and make God known (John 1). Jesus, the

¹⁷ Brian C. J. Moore, ‘Basic Auditory Processes Involved in the Analysis of Speech Sounds’, *Philosophical Transactions of the Royal Society*, series B, 363 (2008), 923–945.

¹⁸ Steven Z. Rapcsak and others, ‘Phonological Dyslexia and Dysgraphia: Cognitive Mechanisms and Neural Substrates’, *Cortex*, 45 (2009), 575–591; Susan E. Gathercole, ‘Models of Verbal Short-Term Memory’, in *Cognitive Models of Memory*, edited by Martin A. Conway (Cambridge, Ma: MIT, 1997), 13–44.

¹⁹ Marc Jeannerod, ‘Language, Perception and Action: How Words are Grounded in the Brain’, *European Review*, 16 (2008), 389–398.

²⁰ Peter Hagoort, ‘The Fractionation of Spoken Language Understanding by Measuring Electrical and Magnetic Brain Signals’, *Philosophical Transactions of the Royal Society*, series B, 363 (2008), 1055–1069.

Word of God, speaks using human words in preaching, telling parables, in prayer; once he wrote something on the ground (John 8:6).

It may be possible to pray without words, as without images,²¹ however most prayer and liturgy use words and language. Language is vital to the *lectio divina* form of prayer, especially in the stages of *lectio* (reading) and *meditatio* (meditation). The devotee seeks inner responses to passages of scripture through thoughts and emotions. *Oratio* (responding) and *contemplatio* (resting) allow God to enter the mind and heart of the person praying. But this involves many brain processes, too. God speaks to the soul via the brain and body.

Emotions

Emotion and Reason

The soul is united profoundly with the body, and therefore with the brain's emotional and cognitional systems. Cognition and reason are often contrasted with emotion and affect: head with heart. And, since Plato, the emotions have been undervalued—even by Freud.²² An accepted scientific understanding of emotion has yet to be achieved;²³ while the terms 'emotions' and 'feelings' are often used interchangeably, neuroscientists usually speak of 'emotions'.²⁴ But, 'Cognition would be rudderless without the accompaniment of emotion, just as emotion would be primitive without the participation of cognition'.²⁵ Moreover the duality between reason and emotion is inconsistent with the 'architecture of the brain'.²⁶

²¹ See Anne Mouron, 'Praying Without Images', *The Way*, 51/4 (October 2012), 91–101; and compare Psalm 6; Romans 8:26–27.

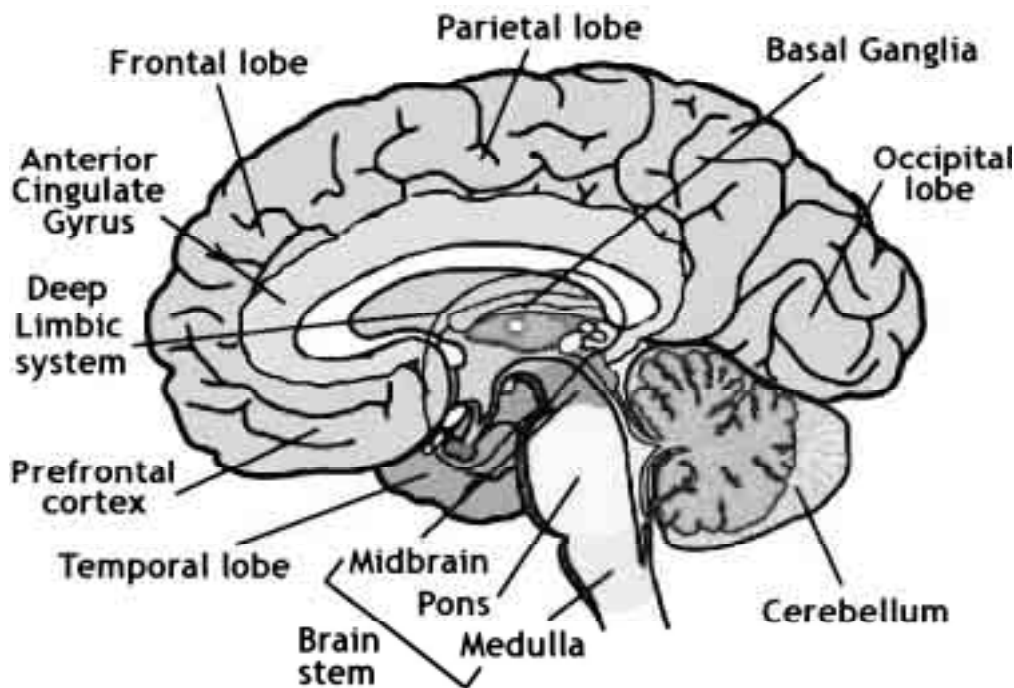
²² Jay Schulkin, Barbara L. Thompson and Jeffrey B. Rosen, 'Demythologizing the Emotions: Adaptation, Cognition, and Visceral Representations of Emotion in the Nervous System', *Brain and Cognition*, 52 (2003), 15–23.

²³ Carroll E. Izard, 'Emotion Theory and Research: Highlights, Unanswered Questions, and Emerging Issues', *Annual Review of Psychology*, 60 (2009), 1–25.

²⁴ Many more words may be treated as effective synonyms. Affects, feelings, affective information, affective cues and perceptions, mood, emotional attention, mood-inducing stories, and emotional quality and length: all these terms and phrases, and others, were used, for example, in a paper examining how individual differences in emotional attention influence the role of affect in evaluating risk. See Karen Gasper and Gerald L. Clore, 'Do You Have to Pay Attention to Your Feelings to Be Influenced by Them?' *Personality and Social Psychology Bulletin*, 26 (2000), 698–711.

²⁵ Richard J. Davidson, 'Cognitive Neuroscience Needs Affective Neuroscience (and Vice Versa)', *Brain and Cognition*, 42 (2000), 89–92, here 91. And see Richard J. Davidson and Steven K. Sutton, 'Affective Neuroscience: The Emergence of a Discipline', *Current Opinion in Neurobiology*, 5 (1995), 217–224, here; Jaak Panksepp, 'At the Interface of the Affective, Behavioral, and Cognitive Neurosciences: Decoding the Emotional Feelings of the Brain', *Brain and Cognition*, 52 (2003), 4–14.

²⁶ Davidson, 'Cognitive Neuroscience', 91.



The brain structure linked to the seat of emotions is known as the limbic system.²⁷ This brain circuitry for the emotions partly overlaps with the circuitry for cognition, and a two-way interaction between cognition and emotion is probable.²⁸ Parts of the ‘emotional’ limbic system are vital for particular processes of cognition and memory. Likewise, areas of the brain once thought to be dedicated to complex thinking are now seen to be involved with emotions as well, for instance the prefrontal cortex (PFC). The PFC signals to other regions of the brain that guide behaviour towards more adaptive goals such as delaying gratification: an instant reward may not serve a person’s long-term aims.²⁹

It should be noted that ‘reward’, as it is understood in affective neuroscience, is itself a complex concept. As outlined by Kent C. Berridge and Morten L. Kringelbach, it involves *liking*—‘the hedonic impact or actual pleasure of a reward’; *wanting*—motivations towards the reward, including conscious desires; and *learning*—‘associations, representations, and predictions about future rewards based on past experiences’.³⁰

²⁷ David W. Patterson and Louis A. Schmidt, ‘Neuroanatomy of the Human Affective System’, *Brain and Cognition*, 52 (2003), 24–26.

²⁸ Davidson, ‘Cognitive Neuroscience’, 89. See, too, Richard J. Davidson, ‘Seven Sins in the Study of Emotion: Correctives from Affective Neuroscience’, *Brain and Cognition*, 52 (2003), 129–132.

²⁹ Richard J. Davidson, ‘Affective Neuroscience and Psychophysiology: Toward a Synthesis’, *Psychophysiology*, 40 (2003), 655–665.

³⁰ Kent C. Berridge and Morten L. Kringelbach, ‘Affective Neuroscience of Pleasure: Reward in Humans and Animals’, *Psychopharmacology*, 199 (2008), 457–480, here 458.

Moreover, 'Pleasure is never merely a sensation. Instead, it always requires the activity of hedonic brain systems to paint an additional "hedonic gloss" onto a sensation to make it "liked".'³¹ 'Liking' is 'an objective hedonic reaction, measured behaviorally or neurally, whether or not accompanied by conscious pleasure'.³² This is distinguished from 'wanting':

One can 'want' a reward without necessarily 'liking' the same reward. Irrational 'wanting' without liking can occur ... in drug addiction addicts may irrationally and compulsively 'want' to take drugs even if, at a more cognitive and conscious level, they do not want to do so.³³

Motivations such as pleasure and the other psychological components of reward are produced in the brain. Berridge and Kringelbach note that 'pleasure is essential to a normal sense of well-being. Pathological losses of pleasure may be a devastating part of many affective disorders ranging from depression to schizophrenia and addiction.'³⁴ Western Christianity, however, has often tended to underestimate pleasure, and Christians have sometimes 'preferred the role of moral guardian and been more concerned to stem the abuse than to facilitate the enjoyment of God's gifts. In this sense morality has taken precedence over grace.'³⁵

Aquinas notes how some delights are of the body and some are of the soul.³⁶ But as a unity of body and soul, the *person* experiences pleasures from the senses as processed by the brain. An excessively epicurean lifestyle may not good either for the soul or the body. Addiction, whether to drugs, alcohol, gambling, pornography, shopping or the internet, can harm both the soul and human relationships. It may require therapy, and the grace of God, to overcome: Paul identifies Christ's enemies, for whom, 'their god is the belly' (Philippians 3:18–19).

But if happiness is not reducible to pleasure, the attainment of happiness, 'must surely include the ready capacity for pleasure reactions. Some might even suggest that "true" happiness or bliss might be a state of "liking" without "wanting".'³⁷ For Christians, there is one thing missing from this account—the presence of God. The psalmist prays, 'I say to the

³¹ Berridge and Kringelbach, 'Affective Neuroscience of Pleasure', 459.

³² Berridge and Kringelbach, 'Affective Neuroscience of Pleasure', 473.

³³ Berridge and Kringelbach, 'Affective Neuroscience of Pleasure', 473–474.

³⁴ Kent C. Berridge, 'Pleasures of the Brain', *Brain and Cognition*, 52 (2003), 106–128.

³⁵ Dorothy A. Lee, 'Pleasure: A Biblical Perspective', *The Way*, 33/1 (January 1993), 19–33, here 19.

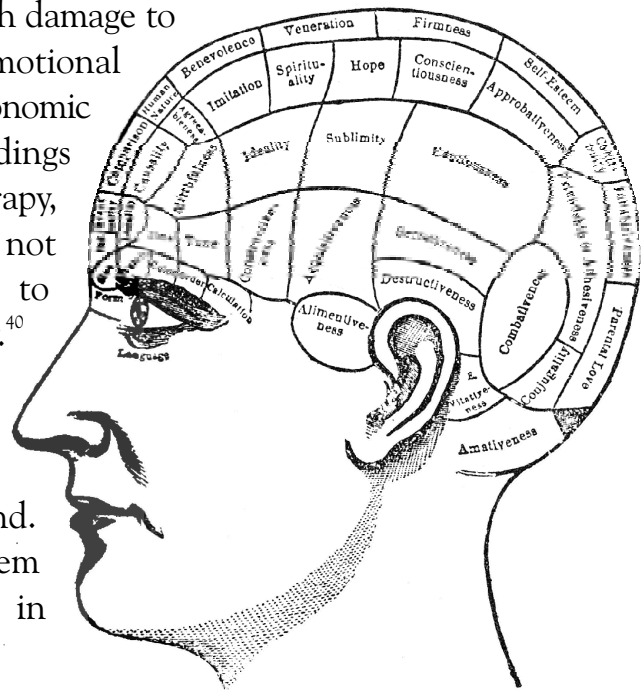
³⁶ *Summa theologiae*, 1. 2, q. 31, art. 3.

³⁷ Berridge and Kringelbach, 'Affective Neuroscience of Pleasure', 473–474.

Lord: “You are my God. I have no good apart from you.” (Psalm 16:2) Jesus spoke of the state of blessedness (Matthew 5: 1–12), and Paul knew something greater than happiness: love (1 Corinthians 13:1–13). He rejoices because the Lord is near (Philippians 4:5). The experience of Augustine and many others has been, ‘you made us for yourself and our hearts find no peace until they rest in you’: eternal happiness is found through salvation.³⁸

Emotion and Autonomic Physical Response

The heart, digestive system, breathing and similar bodily functions are part of the autonomic or visceral responses. These have been associated with the part of the brain called the ventromedial prefrontal cortex (VMPFC), whereas feeling is linked to the right somatosensory cortex (RSS).³⁹ It appears that autonomic response, unlike cognition, can be separated from emotional experience. In one study, patients with VMPFC brain damage were found to have impaired autonomic responses to music, tested by measuring skin conductance, although they retained normal emotional experiences of music. However, patients with damage to the RSS of the brain reported impaired emotional response to music, yet produced normal autonomic (skin conductance) responses. These findings may be valuable, for example, in music therapy, since they suggest that patients who do not demonstrate normal physical responses to music may still experience it emotionally.⁴⁰ Music may still move their souls. The hymns that elderly worshippers learnt long ago may still assist them to pray even when they have no physical reaction to the sound. Conversely, the autonomic nervous system itself can enter into prayer, for example in meditation focused on breathing.



³⁸ Augustine, *Confessions*, 1.1, translated by R. S. Pine-Coffin (Harmondsworth: Penguin, 1961).

³⁹ Erica L. Johnsen and others, ‘A Neuroanatomical Dissociation for Emotion Induced by Music’, *International Journal of Psychophysiology*, 72 (2009), 24–33.

⁴⁰ Johnsen and others, ‘A Neuroanatomical Dissociation’, 33. Another point to note was the preservation of the capacity to recognise the intended emotion of the music in all subject groups. See also David Rudrauf and others, ‘Enter Feelings: Somatosensory Responses Following Early Stages of Visual Induction of Emotion’, *International Journal of Psychophysiology*, 72 (2009), 13–23.

There are many biblical examples of the relationship between the emotions and the body. The body of the psalmist is racked with pain and the bed is drenched with tears (Psalm 6). In the Garden of Gethsemane, Jesus' anguished prayer becomes more earnest, 'and his sweat became like great drops of blood falling down on the ground' (Luke 22:44). Once again there is unity in the person: 'Therefore my heart is glad, and my soul rejoices; my body also rests secure' (Psalm 16:9). Emotions have physical foundations in the brain and the body; as such, they are part of our humanity and our spirituality.

Memory

Memory is important for identity and the self. It can be understood as the 'capacity that permits organisms to benefit from their past experiences'.⁴¹

The notion of residues in the soul left by mental experience is ancient. Yet the notion that these residues exist physically in the brain is recent.⁴²

Such memory traces are also known as *representations* and *engrams*.

**Our life is
captured,
coded and
stored bodily**

These are neuron or brain-cell changes that accompany mental experiences. The individual can revisit past mental experiences thanks to these memory traces.⁴³ This implies that our life is captured, coded and stored bodily in our brains: people carry their autobiography in their heads, so to speak. Even the actions of divine grace are 'memorialised' in our being in this way. Remembering is biblical, liturgical and spiritual.

O Lord, remember in David's favour all the hardships he endured.
(Psalm 132:1)

Jesus, remember me when you come into your kingdom. (Luke 23:42)

Do this, as often as you drink it, in remembrance of me.
(1 Corinthians 11:25)

Generally the memory trace for conditioning (learning through the association of stimuli) is in the cerebellum, which means 'little brain'. This structure is found at the back of the brain and mediates movement and coordination. Higher-order memory traces are linked to the hippocampus, deep inside the brain. Memory traces related to learning can also be

⁴¹ Endel Tulving, 'How Many Memory Systems Are There?' *American Psychologist*, 40/4 (April 1985), 385.

⁴² Endel Tulving, 'Coding and Representation: Searching for a Home in the Brain', in *Science of Memory: Concepts*, edited by Henry L. Roediger III, Yadin Dudai and Susan M. Fitzpatrick (New York: Oxford UP, 2007), 65–68.

⁴³ Richard F. Thompson, 'In Search of Memory Traces', *Annual Review of Psychology*, 56 (2005), 1–23.

stored in parts of the brain associated with the senses, for example in the human auditory cortex (A1).⁴⁴ In a study of eyeblink conditioning, a musical tone was associated with an air puff: the tone was sounded and air was blown into the cornea of a subject's right eye, causing the eye to blink. Positron emission tomography was used to test regional cerebral blood flow. All experimental subjects developed a conditioned response to the tone: if the tone sounded but there was no puff of air, the eye would still blink. Results showed significant increase in A1 regional blood flow during the course of the experiment.⁴⁵

Remembering by conditioning has an important place in communal worship. In the Roman Catholic Mass in English, before the revision of the Missal, the people's response to 'The Lord be with you' was 'And also with you'. It was thus for forty years. The new translation of the response is, 'And with your spirit'. Learning this new response is a brain and mind process that needs time. Memorised prayers such as the Lord's Prayer become imprinted on the brain, mind and soul. Patients in palliative care and the terminally ill may eventually lose their ability to speak. But if they can hear, those who believe may still mouth the words of the Lord's Prayer with a chaplain or family member. At the end of life, the words Jesus gave us, held in the memory, may be our last prayer before the soul passes through death to God, leaving the body.

Memory research has also investigated the relationship between memory and the emotions, for example in the fear-learning system of the brain. There is no consensus on where such memories are stored. Some scientists have tracked the fear engram by using pharmacological experiments on a part of the amygdala, situated in the temporal lobe of the brain.⁴⁶ Their findings suggest that the long-term storage of emotional memory traces depends on local changes in the amygdala. These physical processes in the brain are fundamental when a traumatic event such as violent assault or warfare leads to post-traumatic stress disorder.⁴⁷

⁴⁴ Norman M. Weinberger, 'Specific Long-Term Memory Traces in Primary Auditory Cortex', *Nature Reviews Neuroscience*, 4 (2004), 279–290.

⁴⁵ Weinberger, 'Specific Long-Term Memory Traces', 284. Weinberger cites S. E. Molchan and others, 'A Functional Anatomical Study of Associative Learning in Humans', *Proceedings of the National Academy of Sciences of the United States of America*, 91 (1994), 8122–8126.

⁴⁶ Glenn E. Schafe, Valérie Doyère, and Joseph E. LeDoux, 'Tracking the Fear Engram: The Lateral Amygdala Is an Essential Locus of Fear Memory Storage', *The Journal of Neuroscience*, 25 (2005), 10010–10015.

⁴⁷ Ryan G. Parsons and Kerry J. Ressler, 'Implications of Memory Modulation for Post-Traumatic Stress and Fear Disorders', *Nature Neuroscience*, 16 (2013), 146–153.

Endel Tulving describes three distinct memory systems: procedural, semantic and episodic.⁴⁸ Procedural memory is needed for skills such as doing up a button or making the sign of the cross. Semantic memory involves knowing the world through concepts and facts, such as 'Christmas Day is 25 December'. Episodic memory adds the ability to retain knowledge about personal experiences in time, such as childhood memories of Christmas. This subjective recollection of past experiences is centred on the sense of self over time.⁴⁹ The prefrontal lobe, located at the front of the brain, is important here 'in implementing self-related retrieval strategies'.⁵⁰ The hippocampus, too, has a role in re-experiencing the past, especially for more remote memories.⁵¹

Impairments to autobiographical memory might be expected to imply a faded sense of self. However, some studies of age-related deficits in

© Chalmers Butterfield



autobiographical memory do not show a weakening self-coherence in healthy elderly subjects. There are data that show the preservation of the personal sense of remembering the distant past, and of some episodic memories enabling the healthy elderly to 'travel back into their past'.⁵² This is different from the experience of patients with depression, schizophrenia, Alzheimer's disease, or frontal lobe damage with severe retrograde amnesia and loss of self-identity.

Memory is taken away against a person's will—stolen, as it were—in many forms of dementia. This has

⁴⁸ Tulving 'How Many Memory Systems Are There?', 387.

⁴⁹ Pascale Piolino, Béatrice Desgranges and Francis Eustache, 'Episodic Autobiographical Memories over the Course of Time: Cognitive, Neuropsychological and Neuroimaging Findings', *Neuropsychologia*, 47 (2009), 2314–2329.

⁵⁰ Piolino, Desgranges and Eustache, 'Episodic Autobiographical Memories', 2327.

⁵¹ Piolino, Desgranges and Eustache, 'Episodic Autobiographical Memories', 2319.

⁵² Piolino, Desgranges and Eustache, 'Episodic Autobiographical Memories', 2323–2324. 'They still had a sense of personal identity, in that they could answer the question "Who am I?": they knew their name, those of family, friends and colleagues, some general information such as that given in a curriculum vitae, and also repeated personal events. However, they were frequently unable to recollect the slightest specific personal event, even the most relevant and emotional ones.' (2324)

spiritual effects for many patients, reflected in an excerpt from a prayer for people with dementia:

Lord, we remember those who find it difficult to remember for themselves.

We remember our brothers and sisters who have lost their memories of earlier times, and those who forget their loved ones and what they have meant to them.

We pray for those who are aware of their brain and body's decline and for their grief about what is being lost.

We pray too for those who remain unaware of what is happening to them and who live without the context of an earlier life⁵³

The soul is spiritual, yet it is united with the body and the brain. Human memory is based in the brain and its failures are commonly due to brain degeneration. Nonetheless, the soul stores and carries our identity and life memories, even if the body and mind deteriorate. God reassures every generation, 'I will not forget you' (Isaiah 49:15). In the Fourth Week of the Spiritual Exercises, St Ignatius invites us to recollect in memory the gifts we have received. He offers a prayer, the *Suscipe*, to be prayed with deep affection: 'Take, Lord, and receive all my liberty, my memory, my understanding, and all my will' (Exx 234). This is a willing surrender in loving response to the abundance of what God has done for us.

Whole Persons

The soul in the Christian tradition is rich in meanings. Though neuroscience is advancing, the idea of the soul can be harmonized with our growing understanding of the brain by envisaging unities of brain and body, and body and soul. The awe-inspiring workings of the brain do not make the soul redundant. Indeed, we should welcome scientific discoveries and delight in how wonderfully humans are made (Psalm 139:14).

To use language, to feel, to remember and even sometimes to forget—these are all human experiences. God, too, uses language; Jesus showed his emotions; and he asks his followers to remember him through all

⁵³ Catholic Health Australia, *Ministering to People with Dementia: A Pastoral Guide* (Deakin: Catholic Health Australia, 2008), iv.

time. Since body and soul are united in life, the soul shares in all the brain functions that make us human. That same soul waits for its transformed body in the resurrected life.

Joseph Lee SDB is rector of the Gawler and Brooklyn Park Salesian community in Adelaide, Australia. He has been a teacher in secondary schools, and is currently parish priest of the Parish of St John Bosco and St Aloysius at Brooklyn Park and Richmond in South Australia.