

The emergent neurobiological self: Beyond the pitfalls of dualism and materialism in *Philosophy for Children* classes in primary school

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Abstract

*Questions about ‘who am I?’ and ‘what makes me, me?’ are likely to be explored in *Philosophy for Children* classes in schools. It would therefore be comforting to know that teachers could turn to philosophy of mind for guidance on how to handle such questions, but sadly that is far from reality. What they would find is often esoteric discussion centred on whether and how we can talk of mind as being distinct from the brain, pitting mind/body dualism against various forms of materialism. From the perspective of this paper, both positions are inadequate. Insofar as materialism reduces mind to nothing but the brain, it fails to take consciousness seriously. Cartesian dualism, on the other hand, radically separates mind and brain into two different substances and it overlooks the extent to which we are both conscious and sub-conscious selves. Moreover, materialism and dualism are both indebted to outdated mechanistic assumptions. In attempting to move beyond the pitfalls of both dualism and materialism, this paper advocates an alternative organic metaphor that allows for a holistic, integrative, emergent neurobiological notion of the self. This, it is claimed, provides a viable basis for discussing mind and the self in schools.*

Introduction

We had been thinking about ourselves as persons and what makes us the people we are when one ten year old boy said: ‘I am me, inside my head, looking out to the world through my eyes. My eyes are like windows’. From the beginning, *Philosophy for Children* has been closely identified with the aim of developing skills of thinking. In the late 1960’s one of the pioneers, Mathew Lipman, felt that something had to be done to enhance the thinking skills of students entering college. The solution, he believed, was to get them thinking much earlier in their education. More recently, Joanna Haynes says that her book *Children as Philosophers* ‘is intended as a contribution to discussion about teaching thinking in schools’ (Haynes, 2002, p.3). She goes on to note that children are frequently not given space to develop their thinking because of ‘the increasingly formalised instruction that passes for education’ (ibid., p. 14).

So one of the aims of *Philosophy for Children* is helping children to think, but how do we help children think about themselves as persons and grapple with questions such as ‘who am I?’ and ‘what makes me, me?’ which primary-age children often raise and can find fascinating? One thing is clear, if this thinking is to be truly philosophical, it places considerable demands on teachers; not only in establishing the right kind of learning environment to nurture philosophical thinking, which is challenging enough, but also resourcing ‘thinking’ lessons. What intellectual resources might teachers turn to in facilitating thinking about issues that philosophers refer to as ‘mind’ and ‘self’? The main aim of this paper is to address this important issue.

The notion of the self and teaching philosophy for children

Unfortunately, if they turn to mainstream philosophy for support they will probably find it highly esoteric (obscure and seemingly intended for the enlightened few) and thus of little solace. Much of the debate has focused on the relationship of mind to matter, mind to brain. The core issue, put simply, is whether it is possible to talk meaningfully about the human mind or ‘mind states’ as

somehow different from the human brain and ‘brain states’? At one extreme Cartesian dualism asserts that minds and brains are different substances: one is spiritual, the other material. On this account, the human person is a spiritual self, though materially embodied. At the other extreme eliminative materialism asserts that not only are mind states *nothing but* brain states, we ought to give up on the very concept of the mental as it is thoroughly outdated, belonging to the realm of folk psychology. According to this account, the human self in all its many manifestations entirely reduces to the embodied brain.

Attempting to classify theories is beset with difficulties, and this is especially true when it comes to the many philosophical strains of materialism. Broadly, it includes *physicalists* (including extreme eliminative materialists), who advocate mind-brain identity; mental states *are* brain states. One problem with this kind of identity is the possibility that any given mental state could be realised by different neurobiological structures; for example, as a result of re-routing neuronal connections through brain plasticity in the event of damage. *Functionalists* therefore insist that mental states should not be identified with the brain’s physical states, but rather with its *functional states*; as software is to hardware in a computer or ‘Turing machine’. Functionalism may take a strong reductionist form (mental states are *nothing but* functional states) or a weaker form in which the machine analogy is only said to illuminate our understanding of mind. Within the materialist camp we can also include Gilbert Ryle’s (1949) *analytical behaviourism* that flourished in the 1950’s and 60’s. A major criticism of materialist theories, insofar as they reduce the mind to being *nothing but* the brain is that they ‘fail to take consciousness seriously’ (Maslin, 2001, p.162). Reductionism constitutes what I mean by the major *pitfall of materialism*.

Cartesian dualism, on the other hand, certainly takes consciousness seriously. Its major difficulty is explaining how the two utterly different spiritual and material substances causally interact. This issue has proved to be intractable. Arguably, the problem is avoided in *property dualism* which asserts that mental properties though caused by brain properties are nevertheless different from and not reducible to brain properties. However, the notion of properties is subject to much confusion, so, to avoid this problem and to emphasise that mind is the product of brain, it is often referred to as *non-reductive monism* (ibid, p.163). In contrast to the materialist pitfall that mind reduces to brain (is ‘nothing but’ the brain) this position is non-reductive; taking consciousness and the content of human mental life seriously. The notion of ‘monism’ is employed to separate this position from Cartesian ‘dualism’; avoiding what I am calling the *Cartesian pitfall* of viewing mind and brain as two different entities or things. Though agreeing that it is necessary to take consciousness seriously, I believe we should also recognise the importance of the *subconscious* mind in making us who we are. Much of our thinking occurs below the level of conscious awareness and is not retrievable in consciousness. Human beings are thus better described as comprising both ‘conscious and sub-conscious selves’ (Sankey, 2006).

Against the backdrop sketched above, this paper will argue that the pitfalls of Cartesian dualism and reductionist materialism are both historically indebted to mechanistic assumptions. Moving beyond the pitfalls of dualism and materialism therefore entails eschewing the mechanistic analogies so beloved of ‘modern science’ and instead adopting an organic metaphor that allows for a more holistic, integrative notion of the self: what I am calling *the emergent neurobiological self*. My claim is that this notion, that has its foundations in dynamic systems theory, provides a viable basis for discussing mind, brain and the human self in philosophy classes in schools.

The challenge of teaching philosophical thinking to children is not eased when philosophers of education express considerable doubts about whether it is desirable or even possible. Consider, for example, John White who fully supports ‘children being encouraged to ask questions and seek out answers’, but notes that

‘...it is not simply asking such a question that makes a young child into a philosopher. It is the hard thought that comes next that counts - the dwelling on paradoxes, making interconnections with related issues, becoming acquainted with other's writings on the topic. Tots, to my knowledge, do not typically go in for this (White, 2002, p.34).

White is surely correct to say that it is not enough for children to simply pose philosophical questions such ‘who am I?’ and ‘what makes me, me?’ and if that is all that ‘tots’ are doing in philosophy for children, they are not engaging philosophically with the issues. Lurking behind this issue is the concern that this paper is attempting to address, regarding the learning required of a teacher in order to handle a philosophy class for children on the topic of the self. White’s concern is that children do not ‘typically go in for’ the hard thought required to address these issues. He lists dwelling on paradoxes, making interconnections with related issues and being informed about other’s writings on the topic as constituting the ‘hard thought’ of philosophy. Certainly these are important, but it seems to me that this typifies what *does* often occur in a good classroom discussion. For example, children can and do make ‘interconnections with related issues’ and, as educators we should encourage the connections that can be forged between what they discuss in philosophy classes and other subjects on the curriculum. Moreover, I would argue that making connections is largely what is meant by thought; certainly making connections through synaptic signalling is what is happening in the brain in the process of thinking and in producing consciousness. So, why does White think that children do not typically go in for ‘hard thought’ of this kind?

First, I think he is not simply claiming that children ‘do not’ go in for hard thought, but rather that they *cannot* think at the required level; a view that has all the hallmarks of the Piagetian notion of developmental ‘stages’ and *readiness* for learning. By contrast, the dynamics approach adopted in this paper claims that learning does not progress through discrete stages. Rather, it is highly variable and results from a process of emergent self-organisation (Kim & Sankey, 2010). Even so, Piagetian stage theory has often been associated with child-centred education, but not in the case of White. He is opposed to what he calls this ‘individualistic’ approach, saying that: ‘Children need to be inducted into the public heritage constituted by concepts’ and concepts ‘are not private accomplishments which children can accumulate on their own’ (White, 2002, p53). Instead, he suggests:

An alternative approach, indebted to Wittgenstein, rules out such individualist perspectives in favour of the view that, as socially-owned phenomena, concepts can only be acquired by deliberate induction into the public norms governing their correct application (ibid. p.55).

If taken at his word, his approach to learning through ‘deliberate induction’, which he claims is indebted to Wittgenstein, appears indoctrinatory and it is clearly at odds with his portrayal of philosophy as ‘dwelling on paradoxes’ and ‘making interconnections with related issues’. Perhaps he is suggesting that deliberate induction comes *before* philosophical hard thought! Anyway, given his view that children require deliberate induction into the correct application of concepts (whatever ‘correct application’ means), it is easy to see why he questions whether philosophy for children is appropriate or indeed viable in schools.

In contrast to White’s notion of learning, let us assume that children can and often do go in for hard-thinking. Philosophy for children will then need teachers with a commitment to deepen children’s thinking by encouraging them to carefully and thoughtfully examine opinion. As Socrates might have said, ‘the unexamined opinion is not worth opining’. At best this will allow children to reflect on opinions garnered elsewhere in the school curriculum, including, in particular, what they learn in science about the nature of human beings as biological organisms. The notion of

selfhood advocated in this paper is one that is consistent with our status as biological creatures. It therefore connects philosophy for children with science education in schools. Adopting this particular strategy is consistent with the notion that philosophy and science should 'work together in mutual modification on issues of mind' (Sankey, 2007. P. 547) and that: 'Philosophy flourishes in the midst of scientific research, not only because philosophical problems are in good measure empirical, but because scientific problems are in good measure philosophical' (Noë, 2004, p.vii).

In what follows, we will first consider a preliminary move from dualism and materialism towards the notion of 'biological naturalism'. We then look back to the seventeenth century to discover the shared metaphysical roots of dualism and materialism in the 'mechanical philosophy' that became established as the guiding metaphor for the 'new science' at that time. We will then briefly consider nineteenth century Vitalism and twentieth century Panpsychism as possible alternatives to mechanistic analogies of mind. Though dismissing them both as inadequate, they will nevertheless provide an entry point into the notion of emergent self-organisation as a viable non-dualist, non-reductive alternative to dualism and materialism. Finally, we will bring the discussion back to the practicalities of the classroom.

From dualism and materialism to biological naturalism

We are biological beings, and like every other creature on Earth we are subject to the same evolutionary processes that have shaped life on planet Earth. The brain is a product of our biological development, for better, for worse. Eliminative materialist philosophers such as Patricia Churchland (1986) and biologists such as Francis Crick (1995) are happy to conclude, on the basis of our biological being, that mind and brain are the same; the one reduces to the other. In stating what he calls *The astonishing hypothesis* Crick says 'that "You", your joys and your sorrows, your memories and your ambitions, your sense of personal identity and free will, are in fact *no more than* the behaviour of a vast assembly of nerve cells and their associated molecules' (ibid., p.3. emphasis added). Crick's reductive materialism appears to be thoroughly scientific, though uncomfortable as much of what we take to be formative of our self is deemed to be eliminated – we are '*no more than*' nerve cells and molecules. But, perhaps it is not scientific, despite appearances. Perhaps it is really an assumption that is being brought to neurobiological science. In the seventeenth century, Descartes' division of sentient mind from insentient, mechanistic matter also appeared to be thoroughly scientific, but despite the efforts of John Eccles and Karl Popper (1983) to provide a scientific grounding for dualism in our time, it has little current support. Arguably, in eschewing both dualism and materialism, we need an alternative, more fruitful neurobiological/philosophical account that acknowledges the biological substrate of our being, but asserts *we are more than* that. We start that quest with John Searle.

In characteristic style, Searle opens his book *Mind: A brief introduction* with the assertion that 'philosophy of mind is unique among contemporary philosophical subjects, in that all of the most famous and influential theories are false' (Searle, 2004, p.2). He goes on to identify the theories he is referring to by saying that he means 'just about everything that has 'ism' in its name.... both property dualism and substance dualism, materialism, physicalism, computationalism, functionalism, behaviourism, epiphenomenalism, cognitiveism, eliminativism, pan-psychism, dual-aspect theory and emergentism, as it is standardly conceived' (ibid.). Having emptied the subject of much of its usual content, one might wonder whether there is anything left to discuss. What he is looking for, however, is a way of establishing a discourse about mind and brain that is not hung up on past squabbles about dualism and, at the same time, escapes the reductionism of materialism. Quite correctly, I believe, he calls materialism 'the 'religion of our time, at least among most of the professional experts in the field of philosophy, psychology, cognitive science, and other disciplines that study the mind' (ibid. p.48). I agree, and I also agree that materialism tends to be accepted without question, though it can exert a powerful influence on philosophical debate about

selfhood and being. Moreover, I believe it is possible to trace the roots of this modern day 'religion' back to the religion of the seventeenth century and the rise of the mechanistic view of matter. We will shortly examine this claim.

To distance himself from materialism Searle uses the term 'biological naturalism'. Searle states his position as a set of four theses regarding conscious states:

1. Conscious states, with their subjective, first-person ontology, are real phenomena in the real world. We cannot do an eliminative reduction of consciousness, showing that it is just an illusion. Nor can we reduce consciousness to its neurobiological basis, because such a third-person reduction would leave out the first-person ontology of consciousness.
2. Conscious states are entirely caused by lower level neurobiological processes in the brain. Conscious states are thus causally reducible to neurobiological processes. They have absolutely no life of their own, independent of the neurobiology. Causally speaking, they are not something "over and above" neurobiological processes.
3. Conscious states are realized in the brain as features of the brain system, and thus exist at a level higher than that of neurons and synapses. Individual neurons are not conscious, but portions of the brain system composed of neurons are conscious.
4. Because conscious states are real features of the real world, they function causally. My conscious thirst causes me to drink water for example (Searle, 2004, p.113).

I have quoted Searle at length to use his actual words rather than paraphrase them. He claims that this position provides 'a germ of a solution' to mind and body and the problem of consciousness – our sense of being our self. Though Searle is clearly moving in the right direction, what seems to be missing is any kind of explanation of how, in his third thesis, we get from 'neurons that are not conscious' to 'portions of the brain system composed of neurons that are conscious'? Nor am I quite sure what 'portions' of the brain he is talking about. Later, I will attempt to turn the tide on Searle's notion that neurons are not conscious; suggesting that they are at least 'experiencing' or proto-conscious.

Modern science and the metaphysics of matter

Let us first do some homework and put the clock back to the seventeenth century and the onset of modern science. There is a popular view that the emergence of the 'scientific revolution' was essentially a victory of the progressive moderns over the reactionary medievals. However, many years ago Hugh Kearney (1971) argued that it involved the relative fortunes of *three* competing intellectual traditions; the Aristotelian (organic), the Hermetic (magical) and the Archimedean (mechanist) traditions - with the latter eventually supplanting the former two. The prime analogies in the Aristotelian, organic tradition were drawn from what we would now classify as biology, though not biology as we know it. The language of the organic tradition was of growth and decay, of consistency and change. The analogy of the acorn growing naturally into the oak tree was applied extensively, providing an explanation of the origins not only of plants and animals, but also of non-organic substances such as metallic ores that were said to have 'grown' in the favourable parts of the Earth.

Another major emphasis was the constant change within nature, rather than its regularity and uniformity. Change, however, was not arbitrary for Aristotle, but directed by potentiality and purpose towards every object's 'final cause'. Within this conceptual framework, the natural world was both interpreted and observed. Observation had played a key role in the wide-ranging empirical investigations of Aristotle (384-322BC), the anatomical and medical work of Galen (130-201AD) and the astronomy of Ptolemy (139-161AD). Indeed it was central to Aristotle's inductive-deductive method, in which inquiry is viewed 'as a progression from observation to general principles and back to observation' (Losee, 1972, p.6).

Existing alongside but in contrast to the organic tradition was a second 'aesthetic' tradition that Kearney refers to as the 'magical', because of what he identifies as overtones of mystery that were involved. Arguably, it might seem more appropriate to call this tradition the 'mystical', for a sense of wonder, surprise, beauty and mystery lay at the heart of the tradition. Nevertheless, the magical element is there, for this tradition owes its Greek origins to Pythagoras, and, as Jacob Bronowski explains:

Pythagoras was a kind of magician to his followers, because he taught them that nature is commanded by numbers. There is a harmony in nature, he said, a unity in her variety, and it has a language: numbers are the language of nature (Bronowski, 1973, p.156).

A second source of this tradition was the Hermetic Writings, attributed to a pseudo-author Hermes Trismegistus (thrice blessed), which claimed to expound the wisdom of the ancient Egyptians back to the time of Moses. In fact, as the late medieval scholar Casaubon (1559-1614) realised, they belong to the mystical and philosophical movement of neo-Platonism, founded by Plotinus (AD 205-270), which, among other teachings, had placed the sun at the centre of the universe. As Kearney is keen to stress, the neo-Platonic approach made an enormous impact upon the intellectual world of the sixteenth and seventeenth century and can 'be seen in Moore's *Utopia*...and particularly in the writings of Copernicus and Kepler' (Kearney, 1971, p.40). The magical, mystical strain in Copernicus is clearly to be heard in the Preface of his seminal book (*De Revolutionibus*) arguing that the Sun is at the centre of the universe and not the Earth. Copernicus wrote:

In the middle of all sits the Sun enthroned. In this most beautiful temple could we place this luminary in any better position from which he can illuminate the whole at once? He is rightly called the Lamp, the Mind, the Ruler of the Universe; Hermes Trismegistus names him the Visible God, Sophocles Electra calls him the All-seeing. So the Sun sits as upon a royal throne ruling his children, the planets which circle around him... the Earth conceives by the Sun, and becomes pregnant with an annual rebirth (as cited in Kuhn, 1957, p.179).

The third medieval tradition with origins going back to the ancient Greeks drew its analogies from technology, machines, and 'the detached intellectual curiosity of Archimedes' (Kearney, 1971, p.46). Here we see the origins of both Cartesian dualism and materialism. In spirit and belief it contrasted strongly with both the magical and the organic world views and their approaches to the investigation of the natural world. It was thoroughly materialist in spirit, eschewing every trace of the occult found in the other two traditions. For example, both the magical and the mechanist traditions relied heavily on mathematics, though for the mechanists numbers held nothing of 'the mystical appeal they did for the Platonists and neo-Platonists' (ibid., p.47). And, there were clear differences in their conceptions of God. For the mechanist, God was the Great Artificer, while within the organic tradition he was the logician revealed in the purposes and teleological ends of the universe, in contrast to the mystical, artistic and wonder working god of the magical tradition. The importance of reconciling 'the new science' with theistic belief was of central importance in the seventeenth century, especially for the founders of the Royal Society in Britain, including Isaac Newton and Robert Boyle.

The common assumption that mechanism was adopted for rational, empirical reasons, turns out not to be the case. If Kearney is correct, it was preferred by many of the founding fathers of science because it provided a mechanistic notion of God as the great designer of the mechanical universe, which fitted their personal and scientific temperaments. It also provided a model of clockwork predictability that was readily applied in bringing order, stability and predictability to a turbulent seventeenth century Europe. Nobody was

more influential in establishing the mechanistic doctrine than Rene Descartes, in opposition to Newton who espoused mystical elements in his thinking (McGuire & Rattansi, 1966). Cartesian cosmology is now forgotten, but Descartes was 'the first to construct a scientific system, which conflicted at almost every point with Aristotelian principles' (Kearney, 1971, p.153). Descartes cosmos of swirling vortices in space was more 'mechanical' than Newton's seemingly occult notion of gravity acting at a distance. For much of the seventeenth century, Cartesian cosmology provided a real alternative to Newtonianism, particularly in the countries of continental Europe. Galileo was a mechanist, and so rejected as occult the idea that tides are caused by the attraction of the moon and sun. As for Descartes, having constructed a thoroughly mechanistic and materialist account of matter, into which he included all animals, he was left with the gaping problem of trying to rescue humanity as something more than a mechanism; hence his dualism, comprising a mechanical materialist notion of matter and a spiritual non-mechanical, non materialist mind/soul. In short, Cartesian dualism and reductionist materialism have precisely the same materialist metaphysical roots: the mechanical philosophy of the seventeenth century.

Given this history, it follows that one important way of avoiding the pitfalls of both dualism and materialism is to avoid mechanistic models of the human self - and of animals one hastens to add. That is not to say that all who are dualists or materialists are also mechanists, though many are. It does mean however that mechanism is a slippery slope into either dualism or materialism. If teachers have some awareness of the origins of dualism and materialism they may be encouraged to steer children's thinking away from mechanistic analogies; especially mechanistic notions of the self (as in functionalism) and of learning (information-processing) in which the brain is said to be a computer; with hardware and software (wetware in the brain), brains as hard-wired, memory as a computer tape or digital chip, and so forth. Human beings are organisms, not machines, and the human brain is organic, not mechanical.

Vitalism and Panpsychism

If, as I am suggesting, the move beyond the pitfalls of dualism and materialism requires a move beyond the mechanistic tradition with which both are strongly associated, it is tempting to look to the two other traditions to see if we can find a way forward. In fact, in Germany, well into the nineteenth century, the mechanistic model was strongly opposed by the tradition of nature-philosophy with its roots in the 'magical tradition'. In particular, the Vitalism of Paracelsus (who anticipated the germ theory of disease), provided a real alternative to mechanism. It flourished well into the nineteenth century, following Lorenz Oken's (1810) *Elements of Physiophilosophy*. Central to nature-philosophy, and in direct contrast to mechanism, was the belief that there is no such thing as inert matter. Rather: 'All substances, even mineral and chemical compounds are alive, for they are permeated by a vital force which caused growth and determine the form which the growth assumed' (Mason, 1962, p.351). Before immediately condemning this notion, we should note that Nature-philosophy strongly influenced the development of embryology, morphology and cell theory. Embryology 'was largely a German science during the late eighteenth and early nineteenth centuries... cell theory was almost entirely a German development' (ibid. p.361). In the twentieth century the idea of conceiving matter as in some way sentient (panpsychism) runs through the work of Henri Bergson, Alfred North Whitehead, Charles Hartshorne and on into the present with philosophers such as David Ray Griffin. Griffin advocates a notion of pan-experientialism that is set within a post-modern conception of scientific naturalism (Griffin, 2000).

Sentient neurons, sentient minds and emergent self-organisation

So, if the extremes of dualism and materialism are not acceptable, perhaps some form of panpsychism or pan-experientialism might provide the better middle-way? I do not think we should assert that all matter is in some way sentient. Searle's inventory of erroneous doctrines includes

panpsychism; quite correctly I believe. However I do suggest we need a return to biology for our prime analogies when considering the brain and I do assert that neurons are capable of experience. As previously noted, Searle seems to reject this idea when saying that 'individual neurons are not conscious', but perhaps it depends on what one means by being conscious. They do not possess 'higher-order consciousness' (Edelman, 1989), but they do experience and respond to signals from other cells. This is significant given Colin McGinn's comment that, if neurons are credited with proto-conscious states, 'it seems easy enough to see how neurons could generate consciousness' (McGinn, 1991, p28n). If proto-consciousness is taken to mean that neurons are capable of *experiencing*, I agree it is not difficult to see how neurons could generate consciousness through a process of emergent self-organisation, as advocated by dynamic systems theory. 'Self-organisation refers to the process by which new structures, patterns or properties arise spontaneously and are characterised by multiple feedback loops involving non-linear dynamics' (Mennin, 2010, p.22). Thus, I am suggesting that our conscious states, our feelings of selfhood and of being a person arise spontaneously from, *emerge from*, the global self-organising activity of experiencing neurons (Kim & Sankey, 2010).

McGinn, however, is frightened, fearing that 'Panpsychism now threatens' (ibid.) and he therefore nullifies his own insight. I see no such threat, so long as one is not trying to claim that all substances, even mineral and chemical compounds, are alive. That seems to me to be fantasy. It is not fantasy, however, that neurons experience. This idea is central to our contemporary understanding of neuronal signalling and is exemplified in neuronal migration when neurons arrive at their 'appropriate' place in the brain as it develops in the womb. Though long thought to be entirely a matter of genetic programming, it is now known that stem cells implanted into the brain will respond to signals from neighbouring cells in 'deciding' where they migrate. And, as previously noted, it seems that global signalling provides the substrate of consciousness in the brain; it is the signalling process between global maps that shuts down when sleeping, even though the sleeping brain is still locally active.

So, if this line of reasoning is correct, our conscious sense of *who we are* is produced by neural signalling in the brain. On this account, consciousness is not a product of insentient matter as many philosophers seem to assume, including McGinn who, having ruled out the possibility that neurons possess proto-consciousness, places consciousness in the realm of unfathomable mystery. Instead: 'every elementary part of our organism, every cell in the body is not just animated but living. Even more dramatically, every cell is an individual living organism – an individual creature' (Damasio, 2003, p.127). When the living activity of the brain (the neurons, neuronal maps and their molecular processes) reaches a certain level of complexity (as in human beings and some other 'higher' species), it produces the conscious experience that we refer to as conscious self awareness. In other words, 'minds and consciousness result from, 'emerge from, the immense complexity of human brains; that is what highly complex brains do' (Kim & Sankey, 2010, p.88).

I am aware that it might seem that I have rejected reductionist or eliminative materialism only to embrace it in another guise. Let me therefore hasten to add that I am not saying that all that constitutes sentient mind is 'nothing but; or 'can be reduced to' the electro-chemical processes of the brain, as eliminative materialists believe. The notion of emergent self-organisation is strongly opposed to reductionism of this kind. Indeed, by invoking the notion of emergence, which affirms that the whole is greater than the sum of the parts, the approach I am taking is the very opposite of reductionist; it turns the reductionist thesis on its head by asking how all that constitutes the living self, arises from the biological, chemical and physical parts. Thus we have 'a biologically valid, but nonreductionist, account' (Thelen & Smith, 1994, xviii) of the self.

That said, in employing the notion of emergence I am aware that one needs to tread carefully. Searle includes it on his no-go list; though he qualifies that by saying he means 'emergentism, as it

is standardly conceived' (Searle, 2004, p.2). He seems to be referring to what is often called 'strong' or 'ontological' emergence; the claim that genuinely new causal agents or causal processes come into existence over the course of evolutionary history (Clayton, 2006, p.7). Whether or not that claim can be maintained, it is not what I am referring to, or require. To sustain my argument, I require only an acknowledgement of 'weak' emergence or 'epistemological' emergence, which refers to our current inability to explain or predict a certain property by reference to its constituent parts – though it is conceded that this could change in the future. For example, sodium may spontaneously ignite on water and chlorine is so toxic that it is a favoured substance in chemical warfare. However, put one atom of sodium and one atom of chlorine together, and you have the totally unpredictable (non-linear) result of producing table salt. There is nothing about either sodium or chlorine that makes this outcome predictable. Salt is thus a non-linear emergent property of combining sodium and chlorine, it is simply the way the world works and given the current state of knowledge we can provide no further explanation. I am saying that, by the same token, what we experience as our mind, our conscious self, emerges from our non-linear highly complex brain.

If the position I am advocating is not reductionist or eliminativist, is it nevertheless materialist? Clearly not, if materialism is conceived in terms of linear mechanistic analogies, as it has been since the seventeenth century, if not before. Central to that position has been the claim that organic nature involves no principles of operation that are not found operating in non-organic nature. In other words, brains work according to physical principles; the so-called 'laws' of physics. From that principle, given the triumph of the mechanical philosophy, a slippery slope led directly to the claim that human beings and animals are simply machines. I am resisting that materialist move by invoking emergent self-organisation. Indeed, as Philip Clayton has noted, all present-day: 'Emergence theories presuppose that the once-popular project of complete explanatory reduction – that is, explaining all phenomena in the natural world in terms of the objects and laws of science – is finally impossible' (ibid, p.1).

Adopting the notion of dynamic, emergent self-organisation, which applies to all dissipative, non-linear systems (Prigogine, 1997), casts a very new light on what we mean by the laws of physics. These are systems, including human brains, which operate far from thermal equilibrium. It also gives a very different account of organic nature, including the possibility that Darwinian natural selection has not been the only process governing evolution; emergent self-organisation has also played a major role (Goodwin, 1994; Kauffman, 1995). However, I hasten to add that the process of emergent self-organisation is entirely natural, not supernatural, though the way the natural is conceptualised goes well beyond the reductionist and mechanistic assumptions of materialism as generally understood. In that case, Searle's notion of *biological naturalism* seems entirely appropriate, though, as noted above, what I mean but that term includes the idea that neurons are proto-conscious, which Searle rejects.

I must also add that invoking the *biological* in biological naturalism comes with some caveats. Human brains have evolved to reach a level of complexity that enables very sophisticated signalling, not only within each brain but also between brains, in community. When it comes to selfhood it is not sufficient to be self-aware, though that is necessary. Neurologically we need other selves in order to become truly our 'self'. Or to put it another way, brain processes have social and cultural origins that 'transcend the reach of conventional neurobiological approaches' (Singer, 1999, p. 245). Moreover, at the level of the individual brain, it is now appreciated that brain plasticity enables brains to change themselves. Simply by taking thought, we can literally change the physiology of our brain's neuronal connections (Doidge, 2007). Whether this amounts to the kind of 'downward causation' that Searle was seeking in his fourth thesis, above, and which is generally acknowledged to be 'the most distinctive feature of strong emergence' (Clayton, p.4) is not entirely clear. However, I do submit that emergent self-organisation provides a strong basis for

asserting, contrary to Crick and all other materialist reductionists, that all that makes us what and who we are is *very much more* than nerve cells and molecules.

Conclusion

Needless to say, young children in primary school cannot grapple with this level of detail, any more than they need to grapple with any school subject at this level. However, I do feel *teachers* need to grapple with these issues. To that end, I will be content if the discussion in this paper has raised a number of important questions and provided some provocative answers, as a possible resource for teachers when tackling questions of mind and the self in the context of philosophy for children. As already noted, it is not enough to let children pose the questions; we also need to encourage them to think sensibly and as deeply as they can about possible answers. I have suggested an avoidance of mechanistic analogies; human beings and human brains are not machines they are organisms. We need to be careful (and encourage children to be careful) with the metaphors we use. Teachers should also note that the scope and import of this debate is not only philosophical and biological, it also cuts across all faith traditions that teach that there is life after death - whether through soul-migration, resurrection or reincarnation. Teachers need to be aware that students may have religious sensitivities when engaging with issues of the self, mind and brain, especially if teaching in a multi-faith society.

Back to the classroom and the ten year old boy who said: 'I am me, inside my head, looking out to the world through my eyes. My eyes are like windows'. 'Hey, that's an interesting thought, tell us more, Ryan. What *is* inside your head?' 'A brain is inside your head?' 'So, are you inside your brain, Ryan, looking out through your eyes?' Other children will soon join in. The conversation will flow. Perhaps at some point the children might draw a representation of themselves and their brain, and that will take the discussion further. The teacher does not need to intervene, deliberately inducting the children into the public norms governing the correct application of concepts, as White supposes. Words are poetic, metaphorical, imaginative, and the concepts the children seek to capture are often prior to their expression in words. The concept of face, for example emerges at the point of birth, not after the child has correctly learnt the word 'face'. But there is also a discipline to the lesson and the teacher, acting as facilitator, subtly steers the children around conceptual pitfalls, including the pitfalls of dualism and materialism. It is fun and at the end teacher and children can together draw out what they feel they have gained from engaging in philosophy for children, when discussing the self and mind.

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