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Analysis of Russell

'It often turns out important to the progress of science', says Bertrand Russell in *The Analysis of Mind*, 'to remember hypotheses which have previously seemed improbable' (Russell, 1921, p.92). If only he'd been true to his word. On the brink of uncovering a genuinely scientific account of the mind, Russell cobbled together a straw-man substitute and promptly set it alight. His dismissal of 'mnemic causation', as he called it, was intended to ensure the continued prosperity of his favoured belief system, the materialist-mathematical school of thought established by Galileo, Descartes and Newton.

Whether known as the Grand Doctrine, the Mechanical Philosophy, reductionism, materialism or Russell's own 'logical atomism', the basic idea is that the world consists of simple discrete entities that behave and combine according to timeless mathematical laws of nature. Reality is particle and law. All else is imaginary, a pointless if amusing dream. In the new intellectual climate, the job of philosophers, if they still have one, is to accept the atomized worldview without protest and investigate issues of human existence in light of it.

A lecture series published in 1921, Russell's *Analysis of Mind* was geared around the proposal that the mind ultimately boils down to sense data. 'All psychic phenomena are built up out of sensations and images alone', he says (ibid, p.279). 'Beliefs, desires, volitions, and so on' are nothing but 'sensations and images variously interrelated' (ibid, p.300). Images may seem more mental than tangible, but according to Russell they 'have a causal connection with physical objects, through the fact that they are copies of past sensations' (ibid, p.110). Images reduce to sensations, while sensations reduce to the meeting of the external world with nerve endings. From mind to matter in a few easy steps.

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The chief threat to Russell's scheme came from his arch rival, French philosopher Henri Bergson. In his 1911 book, *Matter and Memory*, Bergson asks why, if images are faded copies of old sensations, we never confuse the recollection of a loud noise with the sensation of a soft one (Bergson, 1911, pp.318–319). Unable to answer Bergson's question, Russell can only observe that we have a 'belief-feeling' that a remembered image relates to the past (Russell, 1921, p.159). On what basis do we arrive at this belief-feeling? In a world where all images arise from the current of consciousness, where do we get our sense of *pastness*? Russell cannot say.

The job of the brain, according to Bergson, is to calculate possible actions in response to sensory data (Bergson, 1911, p.20). Inputs are converted in the most efficient possible way to outputs. That's all there is to it. Within those cerebral folds you will find no representations of the world, no emotions, no thoughts, no desires, no psyche. For Bergson, locating the qualities of mind in the brain amounts to a kind of neural mysticism. Is the brain so special that it can simultaneously be part of the physical world and yet step outside it to represent it (*ibid*, p.11)?

Rather than constructing images of the world, says Bergson, our brains simply facilitate our perception of it. Because the brain does its job, we directly perceive what is around us. But how does Bergson grapple with memory? In this case, the images we perceive are no longer physically given. Surely here we must rely on cerebral storage of images.

Just as he maintains that we actually apprehend what is around us, Bergson argues that in memory we literally perceive the past. To explain how this can be, Bergson must reinvent time itself:

'The past has not ceased to exist; it has only ceased to be useful' (*ibid*, p.193). Bergsonian time is not a series of discrete moments, each instant replacing the previous one, but an unbroken *duration* that conveys into our ever-shifting present all that has preceded it. 'Our most distant past adheres to our present and constitutes with it a single and identical uninterrupted change' (Bergson, 1946, pp.180–181). What we call the 'past' only seems to be past in the context of the spatial world of matter. As a material object, the brain can only mark the leading edge of the ever-expanding 'moment' we call time. By contrast, the mind reflects time as it is, in which past (memory) adheres to presence (consciousness).

Russell regarded Bergson's memory as a type of long-range causation. Since he saw causation of any kind as a perfectly impenetrable mystery, he conceded that the direct influence of distant past over

ongoing present cannot be dismissed out of hand (Russell, 1921, p.89). If the present, by some inconceivable mechanism, is influenced by the immediate past, why not by the distant past as well?

Unable to pinpoint why Bergson's proposal had to be wrong, yet firmly convinced that it was, Russell conjured mnemic causation, not quite what Bergson actually said but close enough that in refuting it, he would seem to have shaken off his nemesis without even mentioning him by name. Utilizing terminology developed by German zoologist Richard Semon (who was inspired by the Greek goddess of memory, *Mnemosyne*) Russell explains his idea:

Whenever the effect resulting from a stimulus to an organism differs according to the past history of the organism, without our being able actually to detect any relevant difference in its present structure, we will speak of 'mnemic causation' (ibid, p.86).

A child who has been burned, says Russell, reacts differently to fire than a child with no such experience. If the memory of being burned leaves no trace in the brain, but the child nonetheless reacts to fire in accord with prior experience, this indicates the direct influence of the remote past over the present with no material intermediary (ibid, p.77).

By proposing that mnemic causation is demonstrated by the absence of evidence for a neural marker of past events, Russell rigged the results in advance. As we now know, and as Russell anticipated, the brain harbours 'memory traces' correlated with past events. The standard materialist assumption is that these synaptic configurations record the past, much like the 'memory banks' of a computer hard drive.

A logician by training, Russell should have realized that mnemic influence would not necessarily imply an absence of 'any relevant difference' in brain structure. This is simply the inverse of the fact that the brain's obvious necessity for memory does not equate to sufficiency. Russell makes this point himself, observing that our dependence on brains for memory does not mean recollection is a strictly neural process or that memories are literally stored in brain tissue (ibid, p.91). Yet Russell failed to appreciate that the action of the distant past on the present, even if necessary to account for memory, in no way negates a role for the brain.

Russell's plan seems to have been to dispose of Bergson's past-within-a-present so as to arrive at Semon's concept of the *engram* as the only possible explanation of memory. A kind of neural engraving, the engram is the change in the brain's resting state following an event such as being burned. The engram guarantees that the child who

has been burned will be more alert and therefore less likely to be burned again (ibid, pp.79–83). Semon's explicit denial that engrams could be regarded as 'immaterial or metaphysical' must have been music to Russell's positivistic ears (Semon, 1921, p.275). 'Already existing engrams are never remoulded', writes Semon in *The Mneme*, 'but remain as they were first imprinted' (ibid, p.240). The engram's defining trait, stability over time, not only accounts for memory but helps explain the general stability of the organism in the face of the dominant tendencies of transformation and evolution (ibid, p.14).

Yet it's precisely their stability that makes engrams wholly unlike anything neuroscientists have actually uncovered. Every time an individual remembers an event, the relevant memory trace loses its structure and must be 'reconsolidated' from scratch. As John McCrone explains in *New Scientist*, 'resurrecting a memory trace appears to render it completely fluid, as pliable and unstable as the moment it was first formed, and in need of fixing once again into the brain's circuitry' (McCrone, 2003, p.27). If something interferes with reconsolidation, such as a high voltage current or a protein-blocking drug, the memory can never be accessed again. This finding, which has been consistently replicated, baffles researchers since it means that a memory, once recalled, is lost to the brain and must be re-established on the basis of nothing more than the actual recall, however cloudy, of the past event itself. For a time, just when we're conscious of it, the memory exists yet is not reducible to information encoded in the brain. How can this be?

No matter how hard scientists try to impress memory into gray matter, it always pops back up, bobbing on the ethereal sea of mind. Rather than storing and retrieving information about the past, the brain seems only to facilitate the mental act of recollection. This accords with common sense, since, after all, the whole point of remembering something is that you don't have to look it up. To regard the brain as a kind of organic reference library is to banish memory and replace it with mere information storage. That recollection may indeed revitalize past perception is only a problem for the materialist outlook.

Oddly enough, Semon proposed another concept, known as *mnemic homophony*, that accounts for memory far better than the engram. Russell praises Semon for this ingenious idea, not for its application to memory and habit but its explanation of how the richness of experience is rendered into abstractions, a process that befuddled philosophers ranging from Berkeley to Hume (Russell, 1921, pp.218–219).

Semon compares the emergence of abstraction to the process of composite photography, in which the same frame of film is repeatedly exposed to different scenes. So long as they're close enough in form, a series of mental images can generate a somewhat fuzzy general image. Each time you see an oak tree, for instance, it calls to mind all the other times you've seen one, and this new image is superimposed over the rest, producing a composite picture you think of as 'oak tree' (Semon, 1921, p.164).

Neither Russell nor Semon saw the contradiction between mnemonic homophony and the engram. As material objects, engrams (or memory traces) cannot simply blend into each other to form vague composites. While mental images may exhibit vagueness or fuzziness, matter always conforms to the principle of identity, that is, $A = A$. An object is exactly itself, no more and no less. A vague object would lose this exact relation, being only somewhat itself and somewhat not. Of course, composite photographs always look a little fuzzy, but the picture itself, as a material object, cannot help but be precisely itself, its 'fuzziness' solely in our interpretation of the picture.

The fact that successive perceptions can coexist in a single generalized perception does not give the brain the power to construct generalized bits of matter. Mnemonic homophony was in fact Russell's worst fear realized, for it revealed where mind resists identification with brain.

The unwillingness of Semon and Russell to accept the irretrievably immaterial nature of mnemonic homophony is ironic given that physics, the foundation of natural science, ceased to be strictly materialistic by the twentieth century. What draws a pair of magnets to each other is not a pair of invisible hands but a magnetic field. The moon remains in the sky because the earth generates a gravitational field that warps the space-time through which the moon travels. In both cases, a force of nature allows objects to act at a distance on other objects. Perhaps organic events can be influenced, at a distance over time, by sufficiently similar previous events.

Mnemonic homophony gives us memory without the need for neural engravings. Semon always thinks of Capri when he smells a particular cooking oil because he once happened to catch a whiff of it from a nearby restaurant as he gazed at Capri across the Bay of Naples (ibid, p.92). No information storage is required, only the principle that any given mental state is influenced by a similar previous state. Rather than recording the past, the memory trace facilitates our direct recall of it, much as radio antennae facilitate the long-range influence of electromagnetic waves.

Not surprisingly, recent neural research reveals that memory involves similarity between past and present patterns of brain activity. During the act of learning, a pattern of synaptic connections appears in the cortex. It's now well established that when we remember the moment the learning took place, something like the original neural pattern is 'reinstated' in the form of a memory trace. As University of California researcher Jeff Johnson reports in the September 10 issue of *Neuron*, reinstatement of prior neural patterns also takes place when recall is limited to the learned information itself, without any details about the moment it was acquired (Johnson *et al.*, 2009, pp.697–708).

Johnson, like Russell, wants to know how the brain accounts for our sense of pastness. Since reinstatement applies to not only episodic memory but knowledge-memory, which involves no sense of the past, neural similarity alone can't provide an answer. However, if recall is more than just synaptic rearrangement but the actual revitalization of past experience, the problem dissolves. We sense a gulf in time precisely when we're reaching across it.

Like episodic memory, which reveals the continued influence of the past through specific recall, habit-memory indicates the cumulative effect of past behaviours on current behaviour. Semon illustrates the role of mnemonic homophony in habit with a hypothetical game of fetch. Each time you cock your arm, the dog understands that you're going to throw the stick. Even if you don't actually toss it but only pretend to do so, the dog will chase the chimera because your gesture has awakened its memory of when you actually did throw it. Of course, this works only so many times. Before long, the dog refuses to run until it has *perfect* homophony between the new stimulus and the old stimulus, that is, when it actually sees the stick emerge from your hand. Habitual behaviours are activated by mnemonic homophony, whether rough or perfect, between current and past circumstances (Semon, 1921, p.156).

Our capacity for habit reveals a fundamental weakness in the synaptic model of stored memories. If memory is located in the brain, we ought to be able to jump around in a text as we recite it from heart. While chanting the *Odyssey*, for instance, Homer should have been able to skip ahead in his poem or revert to a previous passage as easily as carrying on with the flow. But anyone who's recited a passage from memory knows it doesn't work like that. Instead, we reproduce the text without necessarily knowing a given word until we arrive at it. Each passage is recalled only in the right context. Though inexplicable on the model of stored information, where the whole text would be

available at all times, this phenomenon makes perfect sense in light of mnemonic homophony. At any given point in our recitation, we simply say whatever we said the last time we reached that point.

The concept of mnemonic homophony would have served Semon well in his attempt to legitimize the inheritance of acquired characteristics. Like Darwin before him, Semon regarded evolution as a wholly implausible process without the ability of organisms to inherit and build upon the behavioural and bodily modifications of their forerunners (ibid, p.290). Otherwise, adaptation to changing environments would play no role in evolution, leaving us with a lifeless mechanism of chance mutation and natural selection to explain the world's dazzling array of exquisitely adapted creatures. Semon reports on salamanders coaxed into either holding their young in utero longer than usual or releasing them early, in both cases their young carrying on the newly-altered behaviour (ibid, pp.58–60). He reports on trees transplanted from temperate to tropical regions and *vice versa*, either way their new adaptations continuing to crop up in progeny (ibid, p.64). Echoing Darwin's observations on farm animals, he reports on praying mantis populations becoming more tame with each generation in captivity despite the complete absence of selection for this trait (ibid, p.133).

Austrian theorist August Weismann tried to refute claims such as these — and there were many, many more — by cutting off the tails of hundreds of mice and observing that all their offspring still grew tails as usual (Gould, 2002, p.201). Yet experiments demonstrating inheritance of acquired traits succeeded precisely because researchers induced organisms to make the changes themselves, just as the environment, rather than mechanically imposing new behaviours, prods plants and animals into adapting on their own. But this distinction was lost on Weismann, who saw organisms as nothing more than automata to be reconfigured like watches or water pumps.

While the debate seemed to go Weismann's way through much of the twentieth century, it has now been rendered superfluous by the weight of evidence. We now know, for instance, that when the application of fertilizer changes the way a crop grows, these altered patterns of growth continue appearing for generations in progeny (Durrant, 1974, pp.133–143). When the *Daphnia* water flea develops defensive spines in the vicinity of predators, these spines emerge in offspring, even when they're never exposed to predators (Young, 2008, pp.28–33). A Dutch study has found increased health problems and lower lifespans among people whose grandparents, in their youth,

had gorged themselves during rare seasons of overabundance (Cloud, 2010, p.50).

The question is no longer *whether* adaptations are inherited but *how*. Since none of these examples involve genetic changes, biologists refer to the phenomenon as ‘epigenetic inheritance’, whereby newly acquired traits are passed on via modifications of chromosomes or even cytoplasm. Semon’s belief that migrating engrams transmit traits by altering germ cells may not be so far-fetched after all. But mnemonic homophony gives us another option. If past and present can be connected on the basis of similarity, perhaps past and present organisms of the same type can be connected across the generations, allowing current organisms to pick up adaptations of their predecessors.

Russell never mentions mnemonic homophony by name. Nor does he mention Semon’s insistence that evolution is unworkable without inheritance of acquired traits. You would never suspect, reading Russell, that Semon denies the reduction of memory to a machine-like process. With his ‘law of ephory’, Semon contends that in contrast to machinery, which requires a complete input to produce a complete output, a memory can be fully realized even when the trigger, such as the smell of cooking oil, contains only a hint of the original event (Semon, 1921, p.124). He notes that embryos, again in stark contrast to machines, are capable of weathering ‘large and arbitrary subtractions’ of their tissues and resuming normal development as if nothing happened (*ibid*, p.177).

Though Semon seems to have resembled Bergson more than he was willing to admit, Russell was too committed to establishing Semon’s materialist credentials to notice where he and Bergson overlapped.

A half century after Russell’s investigation, the task of synthesizing Semon and Bergson fell to a young biologist-in-training at Cambridge University, a theoretical nonconformist who took a year off from his laboratory work to study philosophy at Harvard. Unlike Russell, whose reading of Bergson was coloured by professional rivalry, Rupert Sheldrake was captivated by Bergson’s radical take on time and its implication for memory. By coupling Bergson’s time-as-duration with Semon’s mnemonic homophony, Sheldrake obtained the basis for a scientific theory of mind, the very prize Russell had sought in his *Analysis of Mind*.

Designed to explain organic development from egg to maturity, Sheldrake’s theory of *morphic resonance* is based on his Bergsonian reading of Semon. Where ‘mnemonic’ emphasizes the emergence of organic form as a memory-based process, Sheldrake’s use of

‘morphic’ turns it the other way round, highlighting the proposition that organic memory operates on the basis of form. The more similar — or homophonous or resonant — a current organic form is to a previous form, the more likely that it will be influenced by that form.

It was Sheldrake who extended the mnemic principle beyond the organism, reconfiguring memory into a property of species as much as individuals. Thus human embryos develop along the same lines as previous human embryos, while chimpanzee eggs divide and grow the same as previous chimpanzee eggs. Like reciting text from memory, at each passage the embryo simply replicates the actions of its ancestors when they reached that stage.

Sheldrake also realized that this principle, if correct, applies not just to the whole organism but to all levels of structure comprising it. Every organ, every tissue, every cell is busy reproducing the actions it undertook in previous similar situations. The body-memory that maintains the adult organism on the basis of its personal past is no different, fundamentally, from the oceanic species-memory that guides the offspring through its developmental journey.

Morphic resonance is revealed wherever successive generations of a given species become more adept at a given task without receiving guidance from their parents. The best-documented spontaneous case of this kind concerns birds that learned to pop open milk bottles in Western Europe. The technique was first observed in 1921 in Southampton, England among blue tits and spread primarily through simple imitation. However, since blue tits rarely travel more than a few miles, it’s unlikely that imitation could account for the appearance of this habit in Sweden, Denmark and Holland. ‘The Dutch records are particularly interesting’, writes Sheldrake. ‘Milk bottles practically disappeared during the war, and became reasonably common again only in 1947 or 1948. Few if any tits that had learned the habit before the war could have survived to this date, but nevertheless attacks on bottles began again rapidly’ (Sheldrake, 1988, p.178).

Of course, it’s possible that postwar birds learned the process again from scratch. For a really compelling demonstration of the direct influence of past behaviour over current behaviour, we must turn to controlled laboratory conditions. The most celebrated example is William McDougall’s experiment on learning in rats. One of many scientists around the turn of the twentieth century to have demonstrated the inheritance of acquired traits, McDougall placed rats in a water maze and found that each generation solved the maze more quickly than the previous generation. Like Semon, he assumed that the animals’ genes were somehow incorporating and transmitting the acquired ability.

But when the experiment was replicated, first in England and then Australia with rats unrelated to McDougall's, the tendency for improvement continued as before, an outcome totally inexplicable except in light of species-memory via morphic resonance (*ibid*, p.175).

Long-range memory has also been revealed in tests on human subjects. In one such test, non-Japanese speakers were better able to memorize authentic Japanese nursery rhymes than rearranged, non-sensical versions (*ibid*, pp.189–190). According to Sheldrake, this result follows from the fact that untold millions of people have already learned the rhymes, and anyone trying to memorize the correct versions is influenced by their cumulative experience. When subjects of another experiment were shown Persian words for ten seconds, some real and some only Persian-like fakes, and then asked to reproduce the words from memory, they fared significantly better at reproducing the real words (*ibid*, p.192).

Flabbergasted by Sheldrake's audacious proposal, neuroscientist Steven Rose designed an experiment that would surely dispose of it once and for all. The experiment involved day-old chicks divided into two groups, test chicks that pecked at yellow diodes and control chicks that could peck at chrome beads. After pecking, the test chicks were injected with lithium chloride, a toxic substance that made them mildly nauseous, while control chicks were injected with a harmless saline solution. The same procedure was followed for 37 days with a new batch of chicks each day. The data indicated that successive batches of test chicks became gradually more hesitant to peck relative to control chicks.

While this finding indicated the influence of previous experiences of test chicks, the most clear-cut result concerned control chicks that were allowed to peck at either the yellow diodes or the chrome beads three hours following their injection of saline solution. Over the course of the experiment, successive batches of control chicks became increasingly reluctant to peck at the yellow diodes, suggesting that they were influenced by the cumulative experience of chicks that had pecked at the yellow diodes and then been injected with lithium chloride. After stalling for months, Rose reneged on his agreement to write up the results with Sheldrake for publication (Sheldrake, 1992, pp.431–444).

Needless to say, a handful of anecdotes and mostly unrepeatable experiments falls short of proof. While interesting, Sheldrake's theory remains largely untested. But at least it could potentially explain

organic form. The same cannot be said of the quaint notion that DNA is a kind of blueprint or program of the developing organism.

Around the time he was mutilating mice in a misguided effort to disprove the inheritance of living adaptations, August Weismann proposed that organisms develop from the egg on the basis of information transmitted from parents via ‘determinants’ (now known as genes) (Gould, 2002, p.207). Though subsequent research seemed to confirm this idea, the gains in molecular biology that fleshed out Weismann’s theory would ultimately abolish it.

A theory is scientific insofar as it reduces a complex phenomenon, such as the organization of a living body, to something simple, such as the information stored in its DNA. At the core of Weismann’s proposal was the assumption that genes are relatively simple static structures that generate the developmental machinery which, in turn, produces the immensely complicated systems that comprise the organism (Bertalanffy, 1933, pp.32–33). Different species are differently formed because each kind has a unique set of genes and therefore a unique mechanism of development.

Neither Weismann nor any of his intellectual descendants anticipated that developmental or ‘homeobox’ genes would turn out to be virtually identical in species ranging from insects to people. What changes in the course of evolution is not so much the genes themselves but the regulatory DNA that switches them on and off to ensure that development is species-appropriate.

Usually adjacent to the homeobox genes they regulate, epigenetic tags or ‘switches’ operate at blinding speed. According to molecular biologist Sean Carroll, typical developmental processes involve ‘tens of thousands of switches being thrown in sequence and in parallel’ (Carroll, 2005, p.114). The operation of switches is so complex that they can only be analyzed with combinatorial logic. ‘Because the combination of inputs determines the output of a switch, and the potential combinations of inputs increase exponentially with each additional input, the potential outputs of switches are virtually endless’ (ibid, p.124). Every switch position and associated pattern of protein production is but a snapshot, a single frame in ‘one hell of a movie with nonstop action’ (ibid, p.128).

Imagine a forest overflowing with lightning bugs, except that this forest is actually *produced* by the incomprehensibly complex and ever changing patterns of lightning bug flashes. Altering this pattern alters the shape of the forest. This, according to molecular biology, is essentially how our bodies develop.

Whether we're looking at cycling networks of proteins in a cell or webs of feedback loops governing everything from immune response to patterns of neurotransmission, the number of possible outcomes stemming from any given input is virtually infinite, blocking the way to successful physical analysis. Genes were supposed to be the exception. Genes were something we could bring within our orbit of comprehension. Now we find that computation of genetic activity also escalates infinitely, leaving us with the absurdity of reducing one complexity to another. Gene expression shows no more potential for calculability than the tissues and organs it allegedly determines.

But let's assume, for the sake of argument, that a given set of complex genetic operations does lead, in a purely mechanical fashion, to a given bodily form. The problem here is that we've only pushed the question back a step: what gives rise to the complex pattern of gene activity in the first place? We're back to morphic resonance, except that now, instead of newly developing organs resonating with previous organs under similar conditions, current genetic expression resonates with prior genetic expression. Whether or not the whole reduces to the gene, the organism is still explained by resonance and not genetics. It's a reduction alright but to the past rather than the small.

In light of mnemonic reduction, there's no longer a compelling reason to reduce the organism to its genes. Instead, both gene expression and organ development are informed by similar past activities. Rather than construct higher-level structure, the genetic level does just what it appears to do, pumping out the proteins required by cells to carry out their tasks. That certain proteins are necessary for certain phenotypic traits in no way implies gene-protein sufficiency in the shaping of the organism.

Weismann's proposal captivated generations of biologists — and it might even be true — but it has no potential as an explanatory theory. Sheldrake, on the other hand, reduces the body's stupendous complexity to an elementary property of nature, a kind of inertia of organic form. With the demise of the DNA-based theory, morphic resonance is the only game in town.

Given that we don't seem to be machines, it's odd that Russell had such faith in the reduction of organism to mechanized assemblage of atoms. The most compelling data in opposition to this belief are generated daily by that ongoing half-baked experiment we call life. Unlike materialism, the mnemonic theory makes room for the mind as a thing-in-itself, the seat of our self-existence and autonomy. We appear to be thinking, feeling, freely acting people — and not genetically programmed organic robots — because we are in fact people leading

meaningful human lives. Atoms, by contrast, do not lead meaningful lives, no matter how they're combined.

Weismann, Russell and Semon clung to materialism like children to their mother. Bergson and Sheldrake, on the other hand, recognized that it's precisely *against* matter that memory is defined. With memory freed from the smothering embrace of matter, mind is at last made sensible.

So long as it's restricted to the brain, the mind can be dismissed as mere shadow play. But extended throughout the body, it finds its home. By reproducing prior behaviour on the basis of similar context, the brain is no different from any other organ. Mentality is associated with every organ in the body, guiding its development and maintaining its form via resonance with similar past forms.

'Mind and body' is more phrase than reality. We have two words for the same thing because we see body-mind from two perspectives, one in terms of space and the other in terms of time. As the living body is the spatialized surface of the mind, so the mind is the temporal depths of the body. Accordingly, death is where the body loses its mind, where matter and memory cease to be united.

What the ancients called soul or spirit has been translated in modern consciousness as the *immaterial* element of life. But we don't have to define organic memory in the negative, any more than body-mind must be defined as the *unconscious*. The immaterial element is simply the influence of the remote past on the present. Past actions undertaken in situations most resembling the current situation are the ones most likely to materialize.

That the abstract image of 'oak tree' can take shape in human thought is only a faded reflection of the deeper biological process whereby past forms of growing oak trees overlap into a developmental map accessible to every sprouting acorn. Where the individual mind is the seat of imagination, species-mind is the seat of living formation.

Blinded by his need to verify the reduction of the world to tangible matter and timeless law, Russell missed the message of the mind, which is neither one nor the other. In the end, he got it wrong because he just had to be right.

References

- Bergson, Henri (1911), *Matter and Memory* (London: Swan Sonnenschein).
 Bergson, Henri (1946), *The Creative Mind* (New York: Philosophical Library).
 Bertalanffy, Ludwig (1933), *Modern Theories of Development: An Introduction to Theoretical Biology* (Oxford: Oxford University Press).

- Carroll, Sean B (2005), *Endless Forms Most Beautiful* (New York: W.W. Norton and Company).
- Cloud, John (2010), 'Why DNA isn't your destiny', *Time*, January 18, 2010.
- Durrant, Alan (1974), 'The association of induced changes in flax', *Heredity*, **32**, pp. 133–143.
- Gould, Stephen Jay (2002), *The Structure of Evolutionary Theory* (Cambridge, MA: Belknap Press).
- Johnson, Jeffrey D, McDuff, Susan, Rugg, Michael, and Norman, Kenneth (2009), 'Recollection, familiarity, and cortical reinstatement: A multivoxel pattern analysis', *Neuron*, **63** (5), pp.697–708.
- McCrone, John (2003), 'Not-so total recall', *New Scientist*, May 3, 2003.
- Russell, Bertrand (1921), *The Analysis of Mind* (London: George Allen & Unwin).
- Semon, Richard (1921), *The Mneme* (London: George Allen & Unwin).
- Sheldrake, Rupert (1988), *The Presence of the Past* (New York: Times Books).
- Sheldrake, Rupert (1992), 'An experimental test of the Hypothesis of Formative Causation', *Rivista di Biologia - Biology Forum*, **86** (3/4), pp. 431–444
- Young, Emma (2008), 'Rewriting Darwin: the new non-genetic inheritance', *New Scientist*, July 9, 2008.

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