# Human Spiritual Nature and the X of Neurophysiologists

The Delphic exhortation 'Know thyself' is as relevant for us today, as it was for Socrates and his contemporaries. Socrates pursued self-knowledge in discussions with people in the city and shunned nature, as he himself explains "I'm a lover of learning, and trees and open country won't teach me anything, whereas men in the town do."[i] Neurophysiology has changed profoundly the situation within the framework of which we can best begin our pursuit of self-knowledge. Plato viewed light as a body of gentle fire emanating both from the objects we see and from the eyes, coalescing with each other, and propagating the motion caused by light through the eye to the soul; we touch objects around us with rays of light through the eyes as with sticks. On the basis of this view of vision, Plato had no problem with our seeing the world outside us as being really outside.[ii] We now know that this is not how our eyes function. The forms of objects in the outside world that generate visual stimuli are profoundly transformed as they affect the receptors on the retina. What we see is in its totality created by *us* on the basis of transformations that the oncoming stimuli undergo in the brain. We *are* the totality of what we see and what we experience, split as it always is, in dreaming or in waking, into 'me and the outside world'.

It might seem that Plato's Socrates came very near to the realization of this fact in the *Theaetetus*, where he asks whether we dream when we sleep, or whether our waking is nothing but dreaming. But instead of viewing the experience of dreams as an indicator that we can generate the outside world within us and using it as a pointer to understanding the way we encounter the world outside in our waking hours, he induced dreams merely to be an argument for doubting the reality of the world we perceive through the senses.[iii] Contrast even your most vivid dreams with your walking through the countryside. Observe how the scenery changes with every step you make, how trees, branches and leaves on the trees, blades of grass on which you walk, move relative to you and to each other with every step – it is all there, in front of you, behind you, around you, with every step, with every breath you perceive its real existence – and yet it is all you in so far as you see it, hear it, touch it. It is this fascinating experience that neurophysiology enables us to fully appreciate, firmly embedded as it is in the physical world, in physics, in chemistry, in biology; the way in which the stimuli from the outside world affect our sensory receptors is one of its most important areas of study. There is no better way of examining ourselves than going for a walk and in the light of neurophysiology reflecting on what we truly are by observing the countryside as it unfolds in front of our eyes in all its ever changing variety of shapes, colours, movements, plants and animals at ever changing distances … But how do the neurophysiologists themselves view us and the world around us?

Roger Carpenter and Benjamin Reddi conclude their *Neurophysiology* with a chapter on 'Motivation and the Control of Behaviour' which closes with the section on "'Mind' and consciousness". The section begins with a quotation from Charles Lamb "*Nothing puzzles me more than time and space; and yet nothing troubles me less, as I never think about them"*,

which the authors state is "a reaction not very different from that of most neurophysiologists to problems of mind, brain, and consciousness." According to Carpenter & Reddi

> "In a nutshell, 'brain versus mind' is no longer a matter for much argument. Functions such as speech and memory, which not so long ago were generally held to be inexplicable in physical terms, have now been irrefutably demonstrated as being carried out by particular parts of the brain, and to a large extent imitable by suitably programmed computers. So far has brain encroached on mind that it is now simply superfluous to invoke anything other than neural circuits to explain every aspect of Man's overt behaviour." [iv]

The authors view the functions of the brain in terms of stimulus S and response R and enquire whether there is any point in postulating X as an intermediary between the two. Three possibilities are considered:

> (a) "Descartes' dualism proposed some non-material entity – the 'ghost in the machine' – that was provided with sense data by the sensory nerves, analysed them within itself, and then responded with appropriate actions by acting on motor nerves (the mind thus having the same relation to the body as a driver to his car)."
> (b) "Clearly one must modify such a scheme to include the existence of certain automatic reflexes that clearly do not pass through the mind."
> (c) "Modern neurophysiology goes further still, admitting of no other path between stimulus S and response R than unbroken chains of neural connections: X, the ghost in the machine, has finally been laid to rest."

Dissatisfied with (c), the authors assert that "there is still a problem of *consciousness*. However sure I may be that (c) is a fair representation of *your* brain, there remains the obstinate and unshakable conviction that *my* brain is like (a)".[v] They postulate a new form of X: "the ghost in the machine is not an executive ghost, as it is in (a) and (b), but rather a *spectator*, watching from its seat in the brainstem the play of the activity on the cortex above it."[vi]

This view of consciousness is flawed as we are unconscious of neurons and their activities. 'Watching from its seat in the brainstem the play of the activity on the cortex above it', all X could 'watch' would be networks of neurons generating and conducting electrical currents, generating, receiving and releasing chemical neurotransmitters.

The authors consider the most serious objection to their view of consciousness will be "that it is difficult to see what on earth X is for, since it can't actually do anything." Their answer is:

> "Perhaps it does just occasionally intervene. But in any case, what is the audience at a concert for? Or the spectators at a football match? The idea that I am being carried around by my body as a kind of perpetual tourist, a spectator of the world's stage, is not – on reflection – so very unattractive."[vii]

This answer, however, creates a new difficulty. Watching 'the world's stage' and 'the play of the activity on the cortex above it' are incongruous propositions, for 'the world's stage' is organized in accordance with the space, shapes and movements of objects, animals, activities and interactions of people in front of us and around us, all of which is

fundamentally different from the way in which the fabric of the brain is organized within the space of our skull and from the way in which the activities of neurons proceed in time. Neurophysiology provides us with data that enables us to investigate the difference between the two. We can see, hear, smell, taste and touch the objects, animals and people around us, and experience our body, only on the basis of stimuli affecting our senses, which are then transformed into neural impulses that are transmitted to the brain, and processed on the way to the brain and in the brain. These messages exist in all their transformations within the nervous system in forms radically different from the forms we perceive on 'the world's stage'. There must therefore be X distinct from the brain, which transforms the information as it is processed in the brain into 'the world's stage' in which we move, with which we interact, in which we live.

The process of this transformation is entirely subconscious. Our conscious activities are focussed on and absorbed by the task of perceiving the world constituted by our subconscious activities as the real world outside us. Since our brain with all its neurons is located in the skull, our subconscious, in so far as it registers the brain's activities and transforms them into the world of which we are conscious, must be located in the same space. Its nature must therefore be fundamentally different from the nature of the brain, for 'the world's stage' we perceive is not interfered with by the fabric of the brain, by the electrical currents and chemical transmitters generated by neurons, and the activities of the brain are not interfered with either by 'the world's stage' as we are conscious of it or by the subconscious activities intervening and mediating between consciousness and the brain. This means that the X composed of consciousness and the subconscious cannot be interfered with, detected or manipulated by any physical instruments by means of which science detects physical phenomena in the brain. The X deserves a name. Names such as 'mind', 'soul', 'psyche', which spring to mind, are profoundly misleading for two reasons. Firstly, they are associated with just one pole of the conscious activities of the X, the subjective, the 'I' pole, while the neurophysiological data compel us to view 'the world's stage' as constantly in-acted within the framework of the X's consciousness, which is thus 'split' into 'me' and the world 'outside me'. Secondly, an important aspect of the X is its subconscious, which transforms the information processed in the brain into 'the world's stage' of our consciousness; the contrast between the structure of the brain with its functions and the structure of 'the world's stage' with everything that we perceive as happening there compels us to view the X as ontologically different from the brain; modern psychology and neurophysiology identified 'mind', 'soul' and 'psyche' with brain functions. Let me therefore name the X human spiritual nature; the only way HSN can be interacted with is through the brain with which it is in contact, by which it is influenced, on which it exercises its influence, in which it exists.

This is quite different from how Carpenter & Reddi view it, for they ascribe the subconscious to the brain. They write:

> "While reading through a difficult score at the piano, I have suddenly had the realization that for several bars I have been thinking about something entirely different, yet my brain had been getting on with the complex task of translating printed notes into finger movements perfectly well without me."[viii]

In fact, what they describe is an inter-play between the subconscious reception of music and its conscious reception, which must be different from its reception and processing by the brain, for just as the real space must be perceived by the eye, processed by the brain and transformed by our subconscious into the space we can see in front of us as real, so the 'translation of printed notes into finger movements' is mediated by a complex interplay between the eye and the ear, the visual and auditory cortex, and the subconscious that transforms all this brain activity into the musical score that the musician can see in front of his or her eyes and into music that he or she can hear as generated by and proceeding from the piano in front of them.

When we listen to a piece of music, our actual conscious perception of it runs along with the oncoming sounds of music, and yet the piece as it proceeds affects us as an unfolding whole, enriched and modulated by each new sound. In cases like these we come the nearest to apprehending the functions of our sub-conscious in its relation to consciousness. In complete contrast, the interaction between the subconscious and the brain completely eludes our notice. It is essential that we perceive the music that comes from the piano in front of us as music that does come from the piano in front of us, generated by the musician's finger movements, not as images mediated by our brain, constituted by our subconscious, and perceived by us only as outside, as not-us.

The ancients did not have any word for subconscious, and so the sceptics could argue against the possibility of knowledge as follows: "The argument (*ho logos*) is compounded of judgements (*sugkeitai ex axiômatôn*), but compound things (*ta de suntheta*) cannot exist (*ou dunatai huparchein*) unless their component elements mutually co-exist (*sunuparchêi*), as is pre-evident from the case of a bed and similar objects; but the parts of an argument (*ta de mere tou logou*) do not mutually coexist (*ou sunuparchei*). For when we are stating the first premiss (*to prôton lêmma*), neither the second premiss nor the inference (*epiphora*) is as yet in existence (*oudepô huparchei*); and when we are stating the second premiss, the first is no longer existent (*ouketi huparchei*) and the inference is not yet existent (*oudepô estin*); and when we announce the inference, its premisses are no longer in being (*ouketi huphestêken*). Therefore the parts of the argument do not mutually co-exist (*ou sunuparchei*); and hence the argument too will seem to be non-existent (*hothen oude ho logos huparchein doxei*).[ix]

This argument illustrates the narrow straits within which consciousness apprehends the unfolding of speech. As one speaks and as one listens, sentences emerge from the subconscious into consciousness, where they acquire their form, while the posterior part of the train of thought gets submerged into the subconscious. Thus in the interplay between the subconscious and consciousness the understanding of what is said is being constituted.

Carpenter and Reddi state that functions such as speech and memory have now been irrefutably demonstrated as being carried out by particular parts of the brain. Concerning speech, there is nothing in their book that supports this claim apart from their statement that speech is "to a large extent imitable by suitably programmed computers".[x] Suitably programmed computers can undoubtedly store in their memory immense amounts of words with a great range of meanings, which they can combine according to syntactic rules into meaningful sentences. But there is nothing in computers that amounts to an understanding of what they compose. As an example, consider the word 'spring' and its meanings in the *Oxford Advanced Learner's Dictionary*:

> 'Flowers that bloom in spring', 'There's a feeling of spring in the air today', 'A spring is a twisted piece of metal that can be pushed, pressed or pulled but which always returns to its original shape or position afterwards', 'Spring is a place where water comes naturally to the surface from under the ground', 'She walked along with a spring in her step', 'With a spring, the cat sprang on the table', 'I'm sorry to spring it on you, but I've been offered another job', 'Tears spring to her eyes', 'Plans to spring the hostages have failed', 'Spring into action', 'Spring to life', 'The town springs into life during the carnival', 'Spring a leak', 'Spring a trap', 'Spring for something', 'I'll spring for the drinks tonight', 'The idea for a novel sprang from a trip to India', 'Spring from…', 'Where on earth did you spring from?' …

Suitable equivalents for all these meanings could be found in Czech, German, Russian, or Chinese, stored in a computer so that it could translate all of them without making mistakes. But that would be very different from understanding the word 'spring' in English and the correlated words and expressions in those other languages. Let me take as an example my native Czech. To translate 'Flowers blossom in spring' I would have to use the word 'jaro'. To translate 'Spring is a twisted piece of metal…' I would have to use either the word 'pero', or 'pružina'. To translate 'Spring is a place where water comes naturally to the surface from under the ground' I would have to use the word 'pramen'. For each of these words I could find idiosyncratic Czech usages, as I did for the word 'spring' in English. Each of these words with its different meanings is rooted in different ways of reflecting the world in the English language and in the Czech language. No imitation by suitably programmed computers can alter the fact that computers do not have any understanding of what they perform, whereas human beings cannot properly use their speech without understanding what they say and what they are told when spoken to.

The concepts which we use when we think and speak about objects in the outside world encompass in their form the perceptual 'content' delivered to us by our senses, although we become aware of this only on rare occasions of careful conceptual analysis. The well-known optical illusions, namely 'rabbit and duck' and 'reversible figures and vase', enable us to get a glimpse of the interplay between concepts and the sensory content they envelop. Our concepts of things, plants, animals and human beings permeate everything we perceive by our senses, and everything we perceive by our senses enriches our concepts. Plato realized that human speech presupposes conceptual forms that are prior to any act of speech and as such make speech possible. He says that 'human beings must understand according to form that which is spoken (*sunienai kat' eidos legomenon*) for it comes from a multiplicity of

perceptions (*ek pollôn ion aisthêseôn*) brought together into one by reason' (*eis hen logismôi sunairoumenon*).[xi] Kant realized that our empirical perceptions (*empirische Anschauungen*) are organized (*geordnet*) within the framework of conceptual representations (*Vorstellungen*) of extension and shape (*Ausdehnung und Gestalt*), of space and time (*Raum und Zeit*), which are prior to all our empirical perceptions.[xii]

Carpenter and Reddi's observation that '(c) is a fair representation of *your* brain' while 'there remains the obstinate and unshakable conviction that *my* brain is like (a)' is flawed. Neurophysiological data tell us that the way in which the human brain is structured and in which it functions is completely different from the way the world is shaped, organised, and operates. Since we live, move, operate and interact in the same world, I can be sure that HSN in your case as in mine transforms the information processed by our brains into our perception of the world around us, it is like (a) with two exceptions. Firstly, it is no 'ghost in the machine'; the human spiritual nature is the essential part of you and me. Secondly, HSN in your case *is* 'you and the outside world' in so far as these two poles taken together form the totality of your experience, and in my case it *is* 'me and the outside world' in so far as these two poles taken together form the totality of my experience.

Carpenter and Reddi write: 'It is clear that we are conscious of some kinds of brain activity but not others'.[xiii] In fact there are no activities of the brain of which we can be conscious. The authors confuse what they know about their brains' activities from neurophysiology with what they can possibly be conscious of. The ancients were not even sure whether the perceptions go to the brain. Socrates in his youth enquired whether it is blood that we think with, or air, or fire, or none of these, but that it is the brain that provides the senses of hearing and seeing and smelling. His inability to solve such questions contributed to his self-awareness of ignorance.[xiv] In Aristotle's view the proper organ of sense perception is the heart to which perceptions proceed from the senses.[xv]

Carpenter and Reddi explain memory as follows: "All learning by the brain must amount, in the end, to the formation of physical connections between neurons in such a way as to mirror the associations that exist in the real world between the stimuli that those same neurons code for. Memory, the process that models the world within our heads, must operate through synaptic plasticity." Synaptic plasticity is provided for by "the cellular mechanism for 'fire together, wire together'". The experimental foundation for this mechanism the authors derive from "Pavlov's famous experiments on dogs, which for the first time showed that learning could be quantified and treated as a thoroughly scientific phenomenon. A dog is trained by frequent association of sound and food to salivate when a bell is rung."[xvi] Let us examine more closely their explanation of Pavlov's experiments. They denote as A the neural path that links food, that is the unconditional stimulus, to salivation, i.e. to response, and as B the path that connects the conditional stimulus to response, that is the ring of the bell to salivation. They say that on the A pathway "there must be at least one neuron – the one that actually innervates the salivary gland, if no other – that is common to

both pathways and where they first come together; this is the cell X… What we observe is that after sufficient pairings of food with bell, the bell alone eventually produces salivation. Translating this into what is happening in the region of X, this means that the more often A (and hence X) fires at the same time as B, the stronger becomes the connection from B to X, until in the end B is able to fire X all by itself… What it amounts to is *fire together, wire together*: neurons representing things that tend to happen together get physically linked together, so that brain eventually embodies a model of the outside world."[xvii] *Pace* Carpenter and Reddi, in Pavlov's experiments, as far as I can remember,[xviii] the conditional stimulus always preceded in time the unconditional stimulus, and Pavlov engineered a time-gap between them. Memory is undoubtedly one of the most important functions in which the brain is engaged, and neurophysiology ought to be able to shed some light on it, but far from irrefutably demonstrating that it is 'being carried out by particular parts of the brain', the authors' account of it is unsatisfactory.

In their (a) version of X Carpenter and Reddi say that Descartes "proposed some non-material entity that was provided with sense data by the sensory nerves, analysed them within itself, and then responded with appropriate actions by acting on motor nerves". In fact, in Descartes' view the interactions between human beings and the world around them proceed automatically, without any involvement of the human soul.[xix] The world of nature in his view consists of homogenous matter differentiated by motion, rest, and geometrically defined shapes, which make their imprints in the brain; as wax receives the imprint of a seal, so the bodily imagination receives the imprints of objects surrounding the body.[xx] Memory consists in the retention of geometrical forms imprinted on the bodily imagination. In response to sensory imprints the body moves and acts. Descartes' people talk, laugh, cry, scream with pain, conceive and give birth to their progeny without any interference of their souls. In his view the functions of the body-machine follow as naturally from the position of its organs, as the movements of a clock follow the disposition of weights and the various wheels of which it is made.[xxi] This view of nature and the human body compelled Descartes to view the human soul as a completely different entity. As far as the sensory stimuli and bodily responses to these are concerned, Descartes' position is in principle identical with (c). Descartes' immaterial soul brings his position close to the position of the authors with their conception of X that has its seat in the brainstem, merely observes, and perhaps just occasionally intervenes.[xxii]

Carpenter and Reddi contemplate how a physiologist would proceed to examine consciousness:

> "Once he had accepted the reality of the phenomenon, he might go on to relate it to the fabric of the brain in much the same way as he would in the case, say, of the sense of sight. It is clear, for example, that loss of limb does not lead to blindness, whereas loss of the eyes does; and by the use of inductive reasoning hardly more sophisticated than that, one may proceed into the brain itself and map out, almost neuron by neuron, the mechanism of the visual pathways. This kind of work has not of course been carried out systematically in the case of consciousness, if only because experiments of this sort on animals are useless to us. All

> the same, it is clear that we do in fact already know quite a lot about the functional anatomy of consciousness, even if we have little idea what consciousness actually is. We know, for instance, that while massive lesions of the cerebral cortex and its underlying fibres may blunt our perceptions, paralyse our limbs, impair our intelligence or even our morality, they have little effect on consciousness itself. Conversely, relatively slight injuries – perhaps a blow on the chin – that affect an area in the core of our brainstem can produce complete unconsciousness even though the whole of the rest of the brain is unimpaired."[xxiii]

The authors' suggestion that the phenomenon of consciousness can be related "to the fabric of the brain in much the same way as the sense of sight" would suggest that they view consciousness as just another function of the brain itself, for they view everything perceived by our senses as nothing but a function of the brain. Yet in their scheme consciousness is something different:

> "The ghost in such a scheme would observe the body's actions being planned, and see the commands being sent off to the muscles before the actions themselves began, and so one can well imagine how it might develop the illusion that because it knew what was going to happen, that it was itself the cause."[xxiv]

Consciousness that the authors postulate is thus of things and activities of which one is never conscious, yet deprived of things and activities of which we are conscious.

Neurophysiological research makes it clear that everything we see and hear, touch and smell, as well as everything we perceive by senses related to our own body, such as pains and aches and bodily pleasures, is mediated to our consciousness by the brain. Since the brain activities are structured and organized differently from the way the world we see and experience is organized and structured, the former must be transformed into the latter. This transformation must underlie all conscious activities, experiences and thoughts that depend on the functions of the brain. Of all these transformational functions we are unconscious. I have mentioned that the ancients did not have a word for the subconscious, and this could be viewed as a strong argument against viewing the subconscious as an essential part of our human nature. On closer inspection we find that although they did not have a word for the subconscious they knew a lot about it and operated with it. Socrates says in one of Plato's dialogues: "I direct my inquiries to myself (*skopô emauton*), whether I am a beast more complex and more puffed up than Typhon,[xxv] or a simpler, gentler living being (*zôion*), partaking of some divine and non-Typhonic portion by nature (*theias tinos kai atuphou moiras phusei metechon*)."[xxvi] His awareness of his self-ignorance was the result of a deep self-knowledge. Zopyrus, who claimed to discern every man's nature from his appearance, attributed to Socrates, who was surrounded by his followers, a number of vices, which he enumerated. When he was ridiculed by the rest who failed to recognize such vices in Socrates, Socrates himself came to his rescue saying that he was naturally inclined to the vices named, but had cast them out of himself by the aid of reason.[xxvii] Aristotle says that the Delphic inscription 'Know thyself' (*gnôthi sauton*) provided Socrates with the principle (*archên enedôken*) of aporetic investigations (*aporias kai zêtêseôs*).[xxviii] Concentrating his investigative power on knowing himself, Socrates was focussing his attention on those

aspects of his personality of which he was not immediately conscious, which had to be brought into consciousness from the subconscious.

Socrates' investigations into his own nature were closely connected with his investigations of others. In Aristophanes' *Clouds* (a comedy staged in 423 B. C., when Plato was four years old) Socrates applies the Delphic inscription to Strepsiades, his would be disciple: "I shall teach you from yourself (*apo sautou*, v. 385)", "explain to me your own character (*kateipe moi su ton sautou tropon*, v. 477)", "letting your subtle mind go loose (*schasas tên phrontida leptên*) think about your affairs step by step (*kata mikron*) analysing and investigating them in the right way (*orthôs*)" (vv. 740-3). Clouds, Socrates' deity in the comedy, exhort Strepsiades: "think and inspect yourself in every way!" (*phrontize dê kai diathrei panta tropon te seauton*, v. 700). In Plato's *Theaetetus* Socrates compares his philosophic enquiries to the art of midwifery; he is good at spotting people pregnant with thought, good at helping them bring their thought to light (150b-151d).

Jesus in The New Testament appears to have been well aware of the effects that our words have on the deep recesses of our being of which we are unconscious. When the Pharisees and scribes reproached him, for his disciples transgressed the tradition of the elders by not washing their hands before eating, he called the people (*ton ochlon*) to him and said to them: "Not what goes into the mouth defiles a man, but what comes out of the mouth, this defiles a man." The Pharisees were offended by these words of Jesus, and Peter asked: "Explain the parable to us." Jesus replied: "Are you also still without understanding? Do you not see that whatever goes into the mouth passes into the stomach, and is discarded into a bog (*eis aphedrôna ekballetai*)? But what comes out of the mouth proceeds from the heart (*ek tês kardias*), and this defiles a man." Jesus means by 'heart' that in us from which all actions of which we are conscious proceed, and which in its turn is deeply influenced by all our conscious actions. He goes on to say: "For out of heart come evil thoughts, murder, adultery, fornication, theft, false witness, slander. These are what defile a man."(Matthew 15. 1-20)

Contemplating the way our senses work, not without some hesitation Socrates took recourse to the ancient concept of the soul. In the *Theaetetus* he asks: "Is it more correct to say that the eyes are that *with* which we see (*hôi horômen*) or that *through* which we see (*di' hou horômen*)? Do we hear *with* the ears or *through* the ears?" When Theaetetus answers that "it is '*through* which' rather than '*with* which' we perceive," Socrates approves: "It would be a very strange thing if there were a number of senses sitting inside us as if we were Wooden Horses, [xxix] and there were not **some single form, soul or whatever one ought to call it** (*eite psuchên eite hoti dei kalein*), to which all these converge – something *with* which, *through* the senses, as if they were instruments (*dia toutôn hoion organôn*), we perceive all that is perceptible (*aisthanometha hosa aisthêta*, 184c-d)."

Against Socrates' argument by which he deduces the existence of the soul from the fact that there must be a single entity, something in us *with* which, *through* the senses we perceive

all that is perceptible, it can be objected that Socrates knew nothing of the function of the brain: it is the brain into which all information delivered by the senses converges and where it is processed. And yet, neurophysiology has shown that sense-perception in all its stages, beginning with the senses and ending in the brain, is anything but conveying into the brain the forms of objects as we see, hear, smell, taste and touch them. Let me quote Carpenter and Reddi on the sense of vision:

> "Receptors in the eye convey information about only a miniscule part of the retinal image, in effect a single pixel; but after a few levels have been passed, in the visual cortex, we find units that are able to respond to a specific type of stimulus, such as a moving edge, over wide areas of the visual field[xxx]. … Cells in the visual cortex code for a wealth of information about the visual world, looking for spots and edges and lines of certain orientation, of a particular length and moving in a particular direction and so on[xxxi]. … People often get muddled about the difference between the *stimulus* – the pattern of energy falling on receptors – and the *object* that gave rise to that pattern in the first place. Of course it is the object that has to be recognized, not the stimulus: stimulus is, in a sense a coded version of the object that has to be decoded again. And this is the essential problem of recognition, because the same object can give rise to very different stimuli on different occasions. Objects in the real world are perceived at different times under lighting of different intensities and colours, and from different distances and directions. The stimulus is a coded version of the object that gave rise to it, some aspects being *essential*, and due to the object itself, and some being merely *accidental*, and nothing to do with the object at all. A particular retinal image of a cube under particular conditions is as much a coded version of the cube, that has to be deciphered, as are the four letters CUBE: in many ways the latter presents an easier task."[xxxii]

And yet, on this basis neurophysiologists assign to the brain the task of providing us with all our experiences. Carpenter and Reddi write:

> "All learning by the brain must amount, in the end, to the formation of physical connections between neurons in such a way as to mirror the associations that exist in the real world between the stimuli that those same neurons code for … Neurons representing things that tend to happen together get physically linked together, so that brain eventually embodies a model of the outside world."[xxxiii]

Descartes was entitled to believe that the brain embodies a model of the outside world, for he viewed the rays of light on the analogy to sticks, which through the eye model the outside world in the brain.[xxxiv] But how can such a modelling be supposed to take place on the basis of the anatomy and physiology of the sense organs, nerves, and the brain, as described above concerning the sense of vision? We know now, as Descartes and the ancients did not know, that the brain stuff is made up of interconnected neurons, all of which work on the same principle: depolarization opens voltage-sensitive calcium channels, and the resultant rise in intracellular calcium causes exocytosis containing the neurotransmitter that acts via the synapsis on the next neuron.[xxxv] All neurons in the brain are assigned their fixed place in our heads. We and the world we see and experience exist in a completely different manner both in time and space from the manner in which the information about us and the world is processed in the brain. We do not model ourselves and the world around us in our brains, we *live* in the world, it is there in front of us, all around us, which must be constantly and incessantly reproduced on the basis of the information provided by the brain by an entity that is different from the brain.

How then has the capacity to perform this task been acquired? This question must be asked within the framework of evolution theory. The only way that living organisms can have any access to the world outside them and around them is by constituting that world within themselves. The stuff of which living organisms are made leaves no space or means in them by which the outside world might be physically 'modelled' by means of the stuff of which they are themselves composed. The only possible solution would have to be provided by a fundamentally different entity, one capable of intimate interaction with the developing nerve system. The spiritual nature that re-produces us and the world in which we live on the basis of the information provided by the brain thus appears to be the result of an evolution that goes back to the first living organisms capable of sensing and avoiding the danger approaching them from outside, capable of sensing sources of sustenance at a distance and moving towards those sources. Since this entity must have developed and therefore existed before human beings came into existence, let alone before we were born as individuals, there is no reason to suppose that its existence, in so far as it is individualized in us, will end when we die, or that our life, instead of making a contribution to its further development, will be the end of it. This consideration brings me back to Socrates.

Socrates on his final day closed his arguments on the immortality of the soul as follows:

> "This much is fair to keep in mind, friends: if a soul is immortal, then it needs care (*epimeleias dê deitai*), not only for the sake of this time in which what we call 'life' lasts, but for the whole of time; and if anyone is going to neglect it, now the risk would seem fearful. Because if death were a separation from everything, it would be a godsend for the wicked, when they died, to be separated at once from the body and from their own wickedness along with the soul; but since, in fact, it is evidently immortal, there would be no other refuge from ills or salvation for it, except to become as good and wise as possible. For the soul enters Hades taking nothing else but its education and nurture, which are, indeed, said to be the greatest benefit or harm to the one who has died, at the very outset of his journey yonder."[xxxvi]

Contrast this with the perspective that Carpenter and Reddi open for us in the last chapter of *Neurophysiology*:

> "Why, in fact, do we bother to do anything at all? The answer is basically to do with income and expenditure, of energy. Even at rest, we are remorselessly expending energy: if we don't replace this energy, we die. If like corals or sea-anemones we were lucky enough to live in an environment where we were bombarded by food, we could just glue ourselves to rock and keep our mouths open. But for the big spenders, warm-blooded animals like us, the only way of keeping in surplus is to *gamble*. We spend a lot of energy as a *stake*, in order to perform actions from which we hope to get more in return, rather like a business investing some of its profit in the hope of even huger profits in the future. In a sense this decision-making – *to do or not to do* – is the most difficult task an organism has to undertake. As we shall see, the whole of the brain can usefully be thought of as a mechanism for reducing the risk, by making more and more accurate *predictions* about the likely result of any particular course of action, on the basis of past experience, stored not just in our brains, but in our books. To put it another way, we need to apply the principles of *homeostasis*, which loom so large in general physiology, not just to the milieu intérieur but to the outside world as well. In addition to *internal* homeostasis, controlled by hormones and the autonomic nervous system, we have to add *external* homeostasis, controlled by the brain, achieved sometimes by literally altering our

> environment (wearing a pullover, for instance), but more often by moving to somewhere nicer, or by engulfing or penetrating things we like."[xxxvii]

Although homeostasis is composed of the Greek words, *homoios*, 'similar', and *stasis* 'standing still', it is a new word. But although the Greeks did not have the word *homoiostasis*, the concept was not new to them. It comes to the fore in a humorous way in Plato's *Euthydemus* through the mouth of two sophists, Euthydemus and Dionysodorus, who arrived in Athens professing to be able to teach virtue better and quicker than anyone else (273d8-9). Socrates and his friends were at that time in love with a beautiful youngster Clinias whom they wished to become as accomplished as possible. Socrates therefore asked the two sophists to make a trial of the young man. The sophists responded by a display of sophistries. When Socrates showed to them how far removed their sophistries were from true education, Dionysodorus asked whether Socrates and his friends were serious in wanting the young man to become wise. When Socrates replied that they were in profound earnest, Dionysodorus asked "You wish him to become wise and not ignorant? You wish him to be what he is not, and no longer to be what he is?" When Socrates answered positively to these questions, Dionysodorus declared triumphantly: "You wish him no longer to be what he is, which can only mean that you wish him to perish. Pretty lovers and friends they must be who want their favourite not to be, or to perish!"[xxxviii] Far from being appalled at this suggestion, Socrates said that if the two strangers knew how to destroy men in such a way as to make good and sensible men out of bad and foolish ones, "let them destroy the youth and make him wise, and all of us with him".[xxxix]

Aristotle realized that the problem of change involved in education and in cognitive activities deserved serious consideration. He resolved it with his concepts of *dunamis* and *entelecheia*, *potentiality* and *actuality*. He distinguished two kinds of changes involved, that of a potential knower who in the process of learning changes from the state of ignorance, and that of a knower who has knowledge which he activates. In the second case either no change is involved at all (*hoper ê ouk estin alloiousthai*) or 'a different kind of change' (*ê heteron genos alloiôseôs*), for in thinking one becomes actually what one is potentially. The word for change here used is *alloiôsis*, *alloiousthai*, which means 'to be made different', which involved *paschein*, 'to be acted on', to be deprived of this or that quality; as such it had negative connotations and was to be avoided or resisted – perfectly in line with the principle of homeostasis. This is why Aristotle proposes a new concept of change to describe changes that a potential knower undergoes in the process of learning: a change that involves acquisition of positive qualities and aims at fulfilment of one's nature (*metabolên epi tas hexeis kai tên phusin*).[xl]

Carpenter and Reddi are right when they say that the principle of homeostasis governs the physiological functions of our brain; this is why it is so important to reflect upon the motives that transcend it. What was it that motivated Socrates in his pursuit of self-knowledge? He viewed the Delphic inscription 'Know thyself' as a divine command, addressed to all men; since the human being is the soul (*hê psuchê estin anthrôpos*, *Alc.* 130c5-6), we are

commanded by God to know the soul (*psuchên gnôrisai*, *Alc.* 130e8). If the soul wants to know itself, it must look into the soul (*eis psuchên autêi blepteon*), and more specifically into that region of the soul (*eis touton autês ton topon*) in which virtue, that is wisdom, is generated (*en hôi engignetai hê psuchês arête, sophia*). There is nothing more divine in the soul than that which is concerned with knowledge and thought (*peri ho to eidenai kai phronein estin*). If we look at God (*eis ton theon ara blepontes*) and into the soul's virtue (*eis tên psuchês aretên*), we will be using that most splendid mirror, and thus we will best see and know ourselves. (*Alc.* 133b7-c16)

Socrates had a very personal relation to God. Defending himself against the accusations of impiety and of corrupting the youth of Athens, he put his obedience to God and his care for the soul into the centre of his defence:

> "Men of Athens, I honour and love you, but I shall obey God rather than you, and while I have life and strength I shall never cease from the practice and teaching of philosophy, exhorting any one whom I meet and saying to him after my manner: You, my friend, - a citizen of the great and wise city of Athens, - are you not ashamed of heaping up the greatest amount of money and honour and reputation, and caring so little about wisdom and truth and the greatest improvement of the soul, which you never regard or heed at all?"[xli]

Jesus too derived from and related to God all positive human effort: "You must be perfect (*esesthe oun humeis teleioi*) as your heavenly father is perfect (*hôs ho patêr humôn ho ouranios teleios estin*)." (Matthew 5, 48) Jesus does not ask the impossible, he does not exhort his followers to acquire divine perfection, but rather asks them to reach their full potential by doing what is good; to reach a human perfection, just as God's is his divine perfection. The word used is *teleios* which means: 'accomplished, perfect in his kind'.[xlii]

Aristotle's God appears to be impersonal: the first mover, the unmoved principle of motion (*prôton kinoun akinêton*) eternally unchanged (*ouk endechetai allôs echein oudamôs*, *Met*. XII, 1073a23-4), desirable and knowable (*kinei de hôde to orekton kai to noêton*, *Met*. XII, 1072a26); it moves everything (*kinoun panta*, *Met*. XII, 1070b35) by being desired (*kinei hôs erômenon*, *Met*. XII, 1072b3). We begin to comprehend how intimately Aristotle's conception of God was nevertheless connected with his own activities and desires when we see in what way he defined God's being. God is pure intellect (*nous*) whose being consists of eternal, continuous, self-reflective thinking of thought (*hauton noei*, *Met*. XII, 1072b19-20):

> "On such a principle, then, depend the heavens and the world of nature. And it is a life such as the best which we enjoy, and enjoy but a short time (for it is ever in this state, which we cannot be), since its actuality is also pleasure … If, then, God is always in that good state in which we sometimes are, this compels our wonder; and if in a better this compels it yet more. And God is in a better state. And life also belongs to God; for the actuality of thought is life, and God is that actuality; and God's self-dependent actuality is life most good and eternal. We say therefore that God is a living being, eternal, most good, so that life and duration continuous and eternal belong to God; for this *is* God."[xliii]

In order to see how intimately Aristotle's concept of God is interconnected with his view of man, we must consult his *Nicomachean Ethics*:

> "The activity of reason, which is contemplative, seems both to be superior in serious worth and to aim at no end beyond itself , and to have its pleasure proper to itself (and this augments the activity), and the self-sufficiency, leisureliness, unweariedness (so far as this is possible for man), and all the other attributes ascribed to the supremely happy man are evidently those connected with this activity, it follows that this will be the complete happiness of man … But such a life would be too high for man; for it is not in so far as he is a man that he will live so, but in so far as something divine is present in him … If reason is divine, then, in comparison with man, the life according to it is divine in comparison with human life. But we must not follow those who advise us, being men, to think of human things, and, being mortal, of mortal things, but must, so far as we can, make ourselves immortal, and strain every nerve to live in accordance with the best thing in us."[xliv]

To conclude: If we look around us and see how the space in front of us is structured, how we and all else in it moves in space and time, and contrast it with the structure of our brain and the activity of neurons of which it is composed, we cannot but identify ourselves with HSN that is different from the brain. Since we have every reason to view human spiritual nature as the result of evolution, we have every reason to believe that its evolution does not end with us as individuals, but that we in our lives, in the way we live, play a significant role in its evolution. The God of Socrates, Aristotle, and Jesus calls upon us as individuals to achieve our best. Jesus introduced his command "You must be perfect as your heavenly father is perfect" by exhorting his disciples: "Love your enemies" (*agapate tous echthrous humôn*, *Matthew* 5. 44). We shall properly appreciate the significance of this command when we fully realize that everybody with whom we come into contact can be encountered, seen, and be talked to by us only in so far as we recreate them in us on the basis of the activities of our brains. 'Your enemies' translates *tous echthrous humôn*; *echthros* is used both in a passive and in an active sense, 'hated' and 'hating'. If we hate a person that hates us, we recreate that person in us both in his or her being hated by us and in their hating us, they become part of us. The more one hates another person, the more one damages oneself. By removing hatred from our hearts we become liberated from it and thus more wholesome. 'Love' translates the Greek *agapate*, which means 'regard', 'treat with proper regard'. Treating those who hate us with proper regard is the best we can do to change their hatred for us into a reciprocal regard for us. This does not mean that we should stop objecting to those who are objectionable. Jesus did not mince his words in rejecting those whom he found doing wrong.

Atheists who transcend the homeostatic tendencies of the brain and strive to attain self-perfection deserve our deepest regard. But the widespread atheistic propaganda that intends to save the world by getting rid of God is wrong. Human spiritual nature with its drive to self-transcendence points to God as the end towards which it is outstretched.

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[i] Plato, *Phaedrus* 230d3-5, tr. R. Hackforth.

[ii] In the *Timaeus* Plato describes the creation of the sense of vision by gods and its function as follows: "And of the organs they first contrived the eyes to give light, and the principle according to which they were inserted was as follows: So much fire as would not burn, but gave a gentle light, they formed into a substance akin to the light of every-day life; and the pure fire which is within us and related thereto they made to flow through the eyes in a stream smooth and dense, compressing the whole eye, and especially the central part, so that it

kept out everything of a coarser nature, and allowed to pass only this pure element. When the light of day surrounds the stream of vision, then like falls upon like, and they coalesce, and one body is formed by natural affinity in the line of vision, wherever the light that falls from within meets with an external object. And the whole stream of vision, being similarly affected in virtue of similarity, diffuses the motions of what it touches or what touches it over the whole body, until they reach the soul, causing that perception which we call sight." 45b2-d3, tr. B. Jowett.

[iii] Socrates raises a question whether things we perceive exist in reality: 'Well, there is one dispute about them, especially about sleeping and waking, which you can surely call to mind, can't you?' Theaetetus: 'What sort of dispute? Socrates: 'Something I imagine you've often heard people asking: what evidence one would be able to point to, if someone asked at this very moment whether we're asleep and dreaming everything that we have in mind, or awake and having a waking discussion with each other. Theaetetus: 'Yes, Socrates, it certainly is difficult to see what evidence one should use to prove it; because all the features of the two states correspond exactly, like counterparts. The discussion we've just had could equally well have been one that we seemed, in our sleep, to be having with each other; and when, in a dream, we seem to be telling our dreams, the similarity between the two sets of occurrences is extraordinary. Socrates: 'Well then, you see that it isn't hard to get a dispute going, since there are disputes even about whether we're awake or sleep. What's more, the time we're asleep is equal to the time we're awake, and during each period our minds contend that what seems to be the case at the moment is certainly true; so we spend equal periods of time saying that each of the two sets of things are things which are, with similar insistence in each case.' Plato, Theaetetus 158b5-d6, tr. J. McDowell.

[iv] Roger Carpenter and Benjamin Reddi, *Neurophysiology, A conceptual approach*, 5th edition, Hodder Arnold, London 2012, p. 294.

[v] Carpenter and Reddi, p. 294.

[vi] Carpenter and Reddi, p. 296.

[vii] Carpenter and Reddi, p. 296.

[viii] Carpenter and Reddi, p. 295.

[ix] Sextus Empiricus, *Outlines of Pyrrhonism*, II. 144, tr. R. G. Bury.

[x] Carpenter and Reddi, p. 294.

[xi] Plato, *Phaedrus* 249b6-c1.

[xii] Immanuel Kant, *Kritik der reinen Vernunft*, Felix Meiner, Hamburg 1956, pp. 63-65.

[xiii] Carpenter and Reddi, p. 295.

[xiv] Plato, *Phaedo* 96a-c.

[xv] See Aristotle, *Peri zôês kai thanatou*, *Peri zôiôn geneseôs*, *Peri zôiôn moriôn*, as referred to in H. Bonitz, *Index Aristotelicus*, s.v. *kardia*, i. *animae facultates quae in corde sedem habent*.

[xvi] Carpenter and Reddi, p. 258.

[xvii] Carpenter and Reddi, p. 258.

[xviii] 'As far as I remember' takes me back some fifty five years. Inspired by Tolstoy's doctrine of non-violent resistance to evil, I refused military service and was imprisoned. I began my imprisonment by a protest hunger-strike and on the second day was force-fed in the infirmary by a doctor, himself a prisoner, under the supervision of the prison doctor. Since I was a vegetarian I refused to eat meat and so was taken to the infirmary again. The prison doctor ordered extra portions of milk for me. Since the doctor was interested in following my health, I was often in the infirmary. After a few visits the doctor who was himself a prisoner donated to me I. P. Pavlov's *Izbrannye Sochinenia* (*Selected works*) in Russian. Pavlov fascinated me. When I was released from prison, I borrowed from the university library Pavlov's *Sobranie Sochinenij* (*Collected works*) in four volumes, which I read avidly all through. As I followed one experiment after another, I became more and more convinced that Pavlov's attempts to explain the dogs' performances purely in terms of the dogs' brains were faulty. I was particularly impressed by the conditional reflexes induced by visual stimuli. Pavlov would show a dog a circle on a screen for a few seconds then withdraw the circle and after a short period would present the dog with food. After several trials the dog would begin to salivate after seeing the circle on the screen. Pavlov would then present the dog with an ellipsis, the dog would salivate, but no food would come; the food would follow only if the dog was presented with a circle. After a few experiments the dog learnt to differentiate, would salivate only when presented with a circle. Pavlov approximated the ellipsis nearer and nearer to the circle, and thus tested the discriminatory abilities of the dog. – I was convinced that the dog *saw* the circle, *saw* the ellipsis, and I could not see how the dog could *see* these objects inside his brain. Pavlov's experiments compelled me to postulate doggy-X, which saw the circle and ellipses in close connection with and on the basis of the processes in dog's brain. As part of the experiment, Pavlov removed

the dog's visual cortex by excision; the conditional reflex disappeared, but after some time it spontaneously recurred. Pavlov concluded that brain does not obey any strict demarcations into visual, auditory, olfactory etc. regions, in which he was undoubtedly right. In addition, I read the experiment as a confirmation of the involvement of doggy-X in the formation of conditional reflexes. If the circle was actually seen by doggy-X distinct from dog's brain but closely linked to it, then neurons randomly activated by the visual stimulus in parts of the brain outside the visual cortex could trigger the response in doggy-X, but could not conjure up any vision of the circle or ellipses in the brain from which the visual cortex had been removed.
Since then I have not seen any of Pavlov's writings.

[xix] See Descartes, *Traité de la Lumière*, *Ouevres,* ed. Ch. Adam and P. Tannery, Paris 1897-1909, vol. XI, p. 48.

[xx] See Descartes' commentary to his twelfth rule, *Ren. Cartesii Regulae de Inquirenda Veritate*, *Ouevres* X, Paris 1908, pp. 412-415.

[xxi] See Descartes, *Traité de l'Homme*, *Oeuvres* XI, pp. 200-202. All Descartes' works, which I have cited, were published posthumously. His world of nature was held in motion by the Earth revolving around the Sun, and just when he was about to publish his work entitled *The World*, composed of his *Treatise on Light* and his *Treatise on Man*, he learnt about the prosecution of Galilei. The Church decree passed in 1620 allowed the contemplation of Copernicus' heliocentric view of the world on the condition that it was not presented as the truth. This is why Descartes placed his world and man into an imaginary space in his *Monde*. The Church decree of 1633 deprived Descartes even of this way of presenting his views to the public.

[xxii] Carpenter and Reddi, p. 296.

[xxiii] Carpenter and Reddi, p. 295.

[xxiv] Carpenter and Reddi, p. 296.

[xxv] Typhon was a hundred-headed mythical monster, enemy of the gods (*theôn polemios*); see Pindar, Pyth. I, 15-19.

[xxvi] Plato, *Phaedrus* 229e-230a.

[xxvii] See Cicero, *Tusculan Disputations* IV, 80.

[xxviii] Aristotle, *On Philosophy* fr. 1.

[xxix] Cornford translates Plato's *Deinon gar pou ei pollai tines en hêmin hôsper en doureiois hippois aisthêseis enkathêntai* as follows: "It would surely be strange that there should be a number of senses ensconsed inside us, like the warriors in the Trojan Horse." F.M. Cornford, *Plato's Theory of Knowledge*, London, Routledg&Kegan Paul, 1949, p. 103.

[xxx] Carpenter and Reddi, p. 10.

[xxxi] Carpenter and Reddi, p. 252.

[xxxii] Carpenter and Reddi, p. 253.

[xxxiii] Carpenter and Reddi, p. 258.

[xxxiv] Descartes appears to have conceived of the nature of light in analogy to a stick, which enabled him to view light as a material potency that acted at any distance at one and the same moment, in his commentary to his Nineth rule, *Regulae*, *Oeuvres* X, p. 402. Cf. Descartes, *La Dioptrique*, *Oeuvres* VI, pp. 83-86 and *Traité d'Homme*, *Oeuvres* XI, pp. 151-163.

[xxxv] Carpenter and Reddi, p. 47.

[xxxvi] Plato, *Phaedo* 107c1-d5, tr. D. Gallop.

[xxxvii] Carpenter and Reddi, p. 274.

[xxxviii] Plato, *Euthydemus*, 283d5-8, tr. B. Jowett.

[xxxix] Plato, *Euthydemus*, 285a6-b7, tr. B. Jowett.

[xl] Aristotle, *On the Soul*, 417a21-b16.

[xli] Plato, *Apology* 29d2-e3, tr. B. Jowett.

[xlii] See Liddell & Scott, *A Greek-English Lexicon s.v.*

[xliii] Aristotle, Metaphysics XII, 1072b13-30, tr. W. D. Ross.

[xliv] Aristotle, *Nicomachean Ethics*, X, 7. 1177b19-34, tr. W. D. Ross.