Mind-Brain & Subconceptual Processing

An Introduction

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This e-book is for the general, though scientifically minded reader who is interested in how AURELIS can be understood based on modern insights in mind & brain, the unconscious and 'subconceptual processing'.

It can be seen as a supplement to my book 'Heal Your Self'. It doesn't overlap much with this book. It does overlap with other texts on the AURELIS website, in blogs etc.

1. The historical brain

Is it all in the brain?

Sometimes I catch myself saying that "I have a body" or "I have a brain". *Who* is supposed to have my body and brain? Most of the time most of us tacitly assume that there is a little man or woman (a *homunculus*) residing in my skull, a couple of inches behind my eyes. That little man sees, hears, thinks, feels, makes me act, and so on. My head is where my conscious mind lives. It is that conscious mind or soul (that ethereal homunculus) that 'has' my body and brain…

It used to be different. In 1580, Michel de Montaigne, a French politician and philosopher, complained that he was at a total loss regarding the exact location of the soul in the body:

> *"Hippocrates and Hierophilus lodge it in the ventricle of the brain; Democritus and Aristotle, throughout the body, Epicurus in the stomach, the Stoics within and around the heart, Empedocles, in the blood; Galen thought that each part of the body had its own soul; Strato lodged it between the eyebrows."*

So many opinions! And even then Montaigne's outlook was somewhat limited geographically and historically. He did look no further than classical Greece. Before that, in Egypt, people strongly believed in an afterlife. In the afterlife the soul would want to move around and be in need of the body. Therefore, most Egyptians, rich and poor alike, wanted their body to be embalmed or 'mummified'. The Greek historian Herodotus (5th century BC) described the different steps of the most costly procedure for mummification reserved to the very rich:

1. Draw out the brain through the nostrils
2. Take out the whole contents of the belly, and clean the interior with palm-wine and spices.
3. Fill the belly with pure myrrh, cassia and other spices and sew it together again.
4. Cover up in natron for seventy days.
5. Wash the corpse and roll it up in fine linen.

It is interesting to note that the first step consisted of drawing out the brain through the nostrils by way of a large hook. Part of the procedure consisted of putting the internal organs in four large jars: a jar for the liver, a jar for the lungs, a jar for the stomach, and a jar for the intestines. The heart was put back into the body in step 3. But what about the brain, you might ask? The Egyptians considered the heart to be the seat of the mind. The brain was just there to 'stuff' the skull cavity. It was thrown away.

The first historical source in which the brain is thought to be the seat of the mind, is Alcmaeon of Croton, who lived in Greece around 500 BC. Hippocrates, who is considered to be the 'Father of medicine', stands in the same tradition. Most people know him from the Hippocratic oath that doctors are still required to take today. Hippocrates wrote that:

> *"men ought to know that from nothing else but thence [from the brain] come joys, delights, laughter and sports, and sorrows, griefs, despondency, and lamentations. And by this, in an especial manner, we acquire wisdom and knowledge, and see and hear, and know what are foul and what are fair, what are bad and what are good, what are sweet, and what unsavory…*

And by the same organ we become mad and delirious, and fears and terrors assail us… All these things we endure from the brain, when it is not healthy… In these ways I am of the opinion that the brain exercises the greatest power in the man."

This did not mean that the battle for a correct understanding of the brain's functioning was won. To Aristotle, for instance, the Greek philosopher who lived about 50 years after Hippocrates, the brain was nothing but a wet and cold slice of meat, devoid of all sensation.

Galen rules

The most important figure in the history of medicine until the 19th century, however, was not Hippocrates, but the Roman doctor Galen (129-199). He had a good idea of the brain as the site of sensation and the origin of movement. However, his views were a strange mixture of scientific accuracy and superstitious nonsense. Galen correctly described the function of a number of cranial nerves and of the spinal cord. The nerves were a conduit of sensory and motor signals, respectively from and to the body. On the other hand, Galen thought that mental diseases were due to obstructions of the passage of 'pneuma' in the brain. Pneuma to Galen was the 'vivifying element' or 'animal spirit' in man.

Others before Galen had (correctly) thought that human intelligence and cognitive faculties were linked to the presence of gray matter in the brain. If you were to slice through a human brain and observe the cut with the naked eye, you would see that on the surface of the brain there is a layer with a somewhat darker color (the gray matter), while the substance on the inside of the brain is lighter (the white matter). The outer layer of gray matter is called the cortex (literally the 'peel') of the brain ('cerebrum'). In mammals, and particularly in humans, this outer layer or 'cerebral cortex' is strongly convoluted and folded inwards. This allows the cortex to have a very large surface area in the very confined volume of the skull. Each half of the brain or hemisphere has a surface area of about 1.3 square feet. We know today that the cerebral cortex plays an important role in perception, attention, memory, thought, language, … Galen, however, minimized the importance of gray matter. Although some of his predecessors thought that gray matter did matter and played a key role in sensation, knowledge or movement, Galen openly ridiculed them.

The fact that Galen wasn't interested in the function of the cerebral cortex hampered neuroscientific progress for more than 1.500 years. In the Middle Ages, Galen came to be seen as the absolute authority on medicine and the functioning of the human body. Hardly anyone wanted to challenge his authority. As a result, progress of our knowledge of the brain stagnated till the 16th century. At that time, Andreas Vesalius, an anatomist born in Brussels in 1514, dared to criticize the by now almost sanctified Galen. Vesalius recognized the importance of gray matter in the brain, but was rather pessimistic about the possibility of further scientific progress. He wrote that, as to how the brain performs its function "I can form no opinion whatsoever. Nor do I think that anything more will be found out by anatomy".

What Vesalius couldn't know

Well, obviously, he was wrong. Vesalius died in 1564. He had no inkling of the new techniques and procedures that were going to be discovered in the centuries after his death. These are some of the more relevant scientific or technical breakthroughs, more or less in chronological order:

- The invention of the microscope. The microscope was invented in the early 1620ies, by a Dutch spectacle maker, though it is much disputed by which one exactly: Janssen, Drebbel, Lipperhey, …?
- Galvani and Volta, who around 1780 applied the newly discovered phenomenon of electricity physiology. Galvani, for instance, was able to elicit muscular contractions in frog legs by applying small electrical currents.
- The technique of embedding and staining tissue samples. In 1873, Italian scientist Golgi developed his 'silver staining method'. This method made it possible to study the fiber detail of nervous tissue under the microscope.
- In 1906 Spanish anatomist Salvadore Ramón y Cajal was awarded the Noble Prize in medicine (together with Golgi) for his work on the structure of the nervous system. He discovered that the brain is made up of different types of cells and described the structure and connections between these nerve cells or 'neurons'.
- The spectacular developments in the science of chemistry in the 19th and 20th century. Galen (2nd century) had been a proponent of the theory of 'humors'. According to this theory, a mixture of four humors was found throughout the human body: black bile, yellow bile, phlegm, and blood. Modern chemistry allowed us to describe the composition of the neurons and the medium in which they are embedded in a little more detail…

Some 'brainy' information in a nutshell

As a result of all these developments, we now know that:

- The human brain consists roughly of the cerebrum (or forebrain), the brainstem, and the cerebellum (literally the 'small brain'). Situated between the cerebrum and the brainstem are two important structures, the thalamus and hypothalamus.
- The brain stem is prolonged into the spinal cord.
- The cerebrum is the biggest part of the brain. It makes up about 85% of the total weight of the brain.
- The cerebrum consists of gray and white matter.
- The gray matter mainly corresponds to the cell bodies of many nerve cells (or neurons) seen together.
- The white matter is composed of the long extensions of these neurons (called 'axons') bundled together.
- The gray matter of the cerebral cortex is very convoluted and folded inwards.
- A neuron is a special cell that can be divided into three parts:
    - The cell body which contains the cell nucleus.

    - Dendrites. Dendrites are numerous, small extensions of the cell body that are ramified as a small shrub. ('Dendrite' is Greek and means 'little plant'.)
    - Axons. The axon is a single, very long extension of the cell body. ('Axon' is also Greek and means 'axis'). Neurons can be several feet long: for instance from the skin of you large toe all the way to your brain.

- Information is carried over neurons by way of electric signals called 'action potentials'. A neuron that carries an action potential is said to be 'activated'. These electrical signals or actions potential involve complex chemical processes.
- Dendrites bring electrical signals to the cell body, while the axon takes information away from the cell body.
- Neurons are connected with one another. The dendrites of a a neuron can capture information of many hundreds or even thousands of other neurons by making contact with them through structures called 'synapses'.
- A neuron sends out an electrical signal over its axon. When this signal (action potential) arrives at the end of the axon, a chemical substance, called 'neurotransmitter', is released into the 'synaps'. This neurotransmitter then bridges the gap between the axon and the dendrite of the next neuron. As a result the target cell can either be excited or inhibited (made impervious to electrical signals). If the next neuron is excited, the electrical signal will travel further along its dendrites, to the main body of the neuron, and then further along its axon to the next cell. And so on.
- Synapses have different strengths, meaning that they can transmit electrical current to the next neuron either strongly, moderately, slightly, or not at all. And as I have said, transmission of the signal may sometimes even result in the inhibition of the target neuron.
- In this way, neurons make up an enormously complex network of billions and billions of connections, along which electrical activity can travel in complex 'patterns.'
- Apart from the neurons, there are other cells in the brain that are called glia cells and have mainly a supportive function. They don't carry action potentials but have a supportive function. For instance, some glia cells transport nutrients to the neurons, others digest the debris of dead neurons.

The most complex structure on earth

The human brain is probably the most complex structure on earth. Every human brain contains approximately 100 billion neurons. Such a large number is hard to imagine. Suppose every neuron was a golf ball. And suppose you were asked to stack 86 billion golf balls into a cubic container. How big a container would you need? With a little math we can calculate that the container should be at least 618 feet long, 618 feet wide and 618 high, meaning that it would reach halfway up to the roof of the Empire State Building.

Every neuron is connected with other neurons through its synapses. Neuroscientists differ in their estimates of the average number of connections that a neuron makes with other neurons. Estimates

range from about 1,000 to 10,000 connections per neuron. Furthermore, these connections can have different strengths. As an electrical signal arrives from one neuron to the next, this signal can either activate the receiving neuron or inhibit it, and this to differing degrees. So the number of possible structural combinations of neurons by far exceeds 86 billion.

Neuroscientist Paul Churchland has pointed out that, if "we assume, very conservatively, that each neuron in the brain admits of only ten different functionally significant levels of activity—ten steps between a minimum spiking frequency of 0 Hz and a maximum of 90 Hz, for example—then, since the brain has 10^{11} neurons, we are looking at a space of 10 to the 10^{11} power or $10^{100,000,000,000}$ functionally distinct, a priori possible global activation states." Meaning that the number of possible states of activity of your brain is expressed by a number that consists of 100,000,000,000 (100 billion) figures. How to image such a number? Forget golf balls. The number of possible states of your brain is far greater than the number of all atoms in the universe, which according to physicists is 'only' roughly 10^{80}.

Now we have gathered all the biological building blocks that we need to comfortably move on.

2. The modern unconscious

Several ideas about the unconscious

We all seem to know what it means to be conscious. I am conscious when I am awake. I am not conscious when I am in a dreamless sleep. People who are in a coma, we presume, are not conscious either. The notion of consciousness is not as straightforward as it may appear. Still, let us assume for the moment that we know what it means to be conscious. What then is meant by the word 'unconscious'? Throughout history, people have held different ideas about the unconscious:

1. The unconscious is the inner place where spirits or demons live that make us do what we not really want to do.
2. The unconscious is the whole of 'conscious contents repressed'.
3. The unconscious has no reality. It is a fiction.
4. The unconscious is the state in which consciousness is absent. It is the negative of consciousness. A person is unconscious when in a coma, a dreamless sleep, dead, …

In what follows, I propose a 'modern' definition of the unconscious. This understanding of the unconscious is modern in the sense that it is soundly based on recent neuroscientific and psychological research. It will open up new perspectives on health and healing, on coaching, and on spirituality – to name but a few random subjects…

Sigmund Freud's idea of the unconscious

Most people will be familiar with the second view presented above. It was 'discovered' by Sigmund Freud. Freud used the metaphor of the iceberg to talk about the unconscious. In his view, consciousness is the tip of the iceberg. It consists of all mental processes of which we are aware. Just below the level of the conscious exists what Freud called the 'preconscious'. It is a zone that contains all thoughts and feelings that we are not aware of, but that can easily become conscious if our conscious attention is attracted to them. This is where most of our memories reside. We can access these memories with relative ease and become conscious of them. Deeper under water still, Freud claimed, we find the layer of the unconscious. The unconscious is the repository of mental processes that for several reasons cannot be made conscious, or only with the utmost difficulty. Unconscious processes, however, still influence our thinking, feeling, judgments, acts, etc. The mind is like an iceberg in the sense that the biggest part of the iceberg remains hidden. Freud's description was a 'topographic' description of the mind. 'Topographic' means that all mental contents (conscious, preconscious or unconscious) are assigned to a particular place (which means 'topos' in Greek) in the mind. Freud further claimed that especially the memory of 'traumatic events', to which powerful negative emotions got attached, is not stored in the preconscious but in the deeper realms of the unconscious. These traumatic memories are often of a sexual nature. Exemplary is the case of the person who was sexually abused as a child, but has repressed all knowledge of this childhood trauma. Although the memory of the concrete sexual assault is accessible only with difficulty, it may still influence that person's behavior, feelings, dreams, etc. Sometimes the enormous emotional 'energy' attached to the repressed memory will find a way out in the form of mental disease or aberrant

behavior. Psychoanalysis is needed to bring the memory to the surface so that the 'energy' can released. As a result of this therapeutic process, the disease will be cured.

This is Freud's theory about the unconscious in a nutshell and, admittedly, perhaps a somewhat simplistic presentation of the great man's understanding of the human mind. Freud's views have become part of popular cultural and still color many people's understanding of the unconscious even today. Still, It is a very incomplete, biased, and not very productive theory of the unconscious, as we will see.

A 'modern' understanding of the unconscious

Today, we have evolved far beyond a Freudian understanding of the unconscious, with cognitive neuroscience providing a wealth of data in support of a more modern view. However, as we will see later, there is a profound ignorance of these data in scientific medicine, leading to a tremendous tension that has consequences for all aspects of psychosomatics. What we describe here is the 'modern' view of the unconscious. It is post-Freudian, in the sense that it is of more recent date. (Freud was born in 1856 and died in 1939.) At the same time, the modern view of the unconscious is much older than the Freudian.

Take John Norris, for instance. John Norris was a 17th century English priest and philosopher. He published texts on politics, Christian religion and on quite a number of philosophical subjects, including… the human mind. In 1690 Norris wrote that "there are infinitely more ideas impressed on our minds than we can possibly attend to or perceive", which is a nice, albeit very general definition of the unconscious. At the end of the 19th century (around 1870 and therefore well before Freud) German psychiatrist and philosopher Wilhelm Wundt believed that *mental processes were almost totally unconscious*. According to Wundt, we become consciously aware only of the results of these processes. *It is our unconscious that continuously creates and produces consciousness*. His contemporary, the German philosopher Nietzsche, expressed similar views. Nietzsche too saw fundamental mental activity as unconscious, all knowledge being "the making conscious of the unconscious".

Standing in that tradition, modern neuroscience allows us to propose the following definition of the 'modern' unconscious: *The unconscious is all mental processes of which we are not conscious yet that influence our thoughts, emotions, perception and behavior in meaningful ways.* As such, the unconscious does almost everything of mental importance.

The unconscious is always there

The modern understanding of the unconscious differs from some of the views as expressed above:

- The unconscious is much more than a repository for repressed thoughts or feelings.
- The unconscious is very real, as we will see in a moment.
- The unconscious is not the absence or photographic negative of consciousness, because the unconscious continuously creates and produces consciousness.

Freud's view of the mind was topographic. If we forget about the preconscious for the moment, it is clear that the Austrian doctor made a distinction between two *separate* mental domains or areas, one conscious and the other unconscious. Thinking like this is mainly a Freudian relic. Instead, there is *a whole of mental activity, part of which has the additional characteristic of being conscious*.

Better than thinking of the mind as an iceberg, as Freud did, we might imagine a mountain lake. The lake is the unconscious, while its surface represents the conscious. Can we distinguish the surface of the water from the water itself? Yes, we can make that distinction. But it exists only in our minds. In reality, we cannot 'lift' the surface of the lake from the water of the lake. The surface is not something distinct. There is no surface without lake. It is as Nietzsche said: all knowledge (but also all feeling, perception, willing, …) is the making conscious of the unconscious.

Thoughts crystallize

In what follows, I will be talking about 'thoughts'. For instance, the thought of 'a cat'. However, keep in mind that it may be more correct and inclusive to speak about 'conscious content' instead of thoughts. Conscious contents are not limited to thoughts, but can also be perceptions, emotions, volitions (wishes, desires, intentions), acts, … Everything you can consciously experience. It is significant that we usually have difficulty distinguishing between these different types of conscious content. After all, when I *see* a cat (a perception), I might *think* "oh, there is a cat" (a thought), and, if I am allergic to cats, *feel* anxious about coming too near the cat (an emotion). As a result I might *want* to run from the room (a volition), and then actually experience myself *running* to the next room (an act) – all this more or less at the same time.

A thought or feeling does not simply fall from the sky and enter your head. It is *your* thought, because it has its history or genesis within you. The thought can appear quite suddenly into your consciousness, but it has already gone through a number of processes before that. All this happens in a short time, in milliseconds. We might find that difficult to understand, because it all happens unconsciously. The unconscious processes are very near to us, and still they seem far away, out of reach.

While the thought is forming, it is still under the influence of all kinds of unconscious patterns in your mind. All these unconscious patterns are who you are. They determine how you will react. They form, or more correctly *are*, your character. They influence each of your eventually conscious thoughts from the start.

The word 'crystallize' may be used to describe this process, which is, of course, another metaphor or image. It is as though unformed, amorphous content turns into a gradually more definite expression of this content. This 'more definite expression' is what will eventually emerge into your consciousness, in what appears to us as a more circumscribed thought. Think of a liquid that can become more and more saturated with a solution, until sometimes (but not always) the solution crystallizes and a visible, more definite, and closely circumscribed crystal is formed.

It is possible for us to experience how thoughts feel just before they crystallize. That feeling is more like a vague intuition, rather than a clearly defined conscious content. In retrospect, we might put a label on this feeling: 'clairvoyance'. For instance, you are informed of the fact that a couple, that you consider to be your best friends, has filed for a divorce. Then you might say: "Isn't is strange, nobody told me, but I have known all along that Stan and Suzy were getting divorced!" You had indeed reached a conclusion about the state of their marriage, but that happened outside your consciousness. The thought never fully crystallized. Therefore, it is better to call this 'clair*feeling*', instead of clairvoyance, as the sharpness of clearly seeing something is lacking. You had felt something, but were unable to pinpoint it. Still, what you very vaguely felt proved to be right in retrospect. This only happens when

the correct patterns are present in the unconscious, through experience, through prior knowledge, by recognizing things without consciously knowing that you recognize them.

I will describe later what all this means in terms of brain physiology and explain these phenomena in terms of neurons and electrical activity in the brain.

Some examples of the unconscious at work

Some examples are:

- You are at a cocktail party, drinking a glass of champagne and talking to a friend. An orchestra is playing. There is music, a lot of chatter and other background noise. Still, suddenly you are sure someone in the crowd mentioned your name, although you didn't really hear it. Somehow, your unconscious was scanning all the conversations and background noises on the lookout for pieces of information that might be of a personal interest to you. All this was going on without you being consciously aware of it.
- If you drive a car, you are probably familiar with the following situation. You drive back home after visiting some friends or family. Parts of the evening or fragments of the conversation are still playing through your head. And then suddenly, and somewhat to your surprise, you already turn into your own driveway. You have no idea how you got there, you have no memory of the road you travelled that night. Your unconscious has driven the car home without a hitch, while you were consciously thinking of other things.
- Robert Bornstein of Gettysburg College devised a series of interesting experiments in which the research subjects, graduate students, were exposed to a number of photographs of individual people. Exposure was very short: only 1/5 of a second or less. As a result, the exposure remained 'subliminal', meaning that none of Bornstein's students could report having (consciously) seen the pictures. Still, when the students afterwards met some of the people represented in the pictures, they reacted more positively to them and in general 'felt better' about them than about persons who had *not* figured in the pictures. In other words, mere exposure to a human face, even when this exposure remains unconscious, results in a more positive valuation of the person in question when you meet him or her afterwards.
- We are all familiar with the tip-of-the-tongue phenomenon. Your mind is actively searching for the name of someone you know, but whatever you do, you cannot come up with the name right-away. The name is, you might say, "on the tip of the tongue". Well, not exactly… You are unable to become conscious of that name, but still convinced that you know it, so where is it? Where then is it stored? The name must be 'present' somewhere in your unconscious.
- There is a phenomenon called ideomotoric behavior. Suppose you are an enthusiastic Dodgers fan and watching one of their games on television. The game is in overtime and the Dodgers need a field goal to win the match. You see the kicker make his approach to the ball and… At that moment, if you are 100 % focused on the game, it is quite possible your foot will shoot out and hit the coffee table. This is called 'ideomotoric behavior': seeing the representation of a behavior (in our example seeing or anticipating it on television) is sufficient for initiating that behavior in you. You have not made a conscious decision to kick the table. There is after all little you can do to influence the game. Your reaction was initiated unconsciously.

- When you are an artist or a scientist you have probably already experienced that the best inspirations often arrive without really knowing how they came about. Henri Poincaré (1854-1912) was a famous French mathematician who, amongst other things, laid the foundations of 'chaos theory'. Poincaré was also fascinated with the discovery of mathematical solutions through a process of intuition. He described "spontaneous and unexpected inspiration as a consequence of prolonged and unmistakably unconscious effort." But you don't need to be an artist or scientist to know that it is sound advice to 'sleep on a problem.' What happens is that, before going to sleep, you invite your unconscious to prepare the solution for you. During the night, unbeknownst to you, the unconscious is busily at work. When you awake in the morning, surprisingly, the solution may be there waiting for you.
- fMRI, i.e. 'functional Magnetic Resonance Imagining', is a technique developed to visualize what parts of the brain are active while performing different mental activities. Recently, fMRI has made it possible to have a new look at the mental processing that goes on *before* conscious awareness. Researchers from the group of John-Dylan Haynes asked people to press a button with their left or their right hand. They were completely free to make this decision anytime they wanted, but had to register the exact moment when they made up their mind. The researchers looked at the brains of these subjects, and could see from the patterns of brain activity which hand was going to push the button *a full seven seconds* before the subjects consciously made their decision. In other words, the *unconscious* has already finished processing the instruction and reached a decision to use the left or right hand, seven seconds *before* the person *consciously* decides what to do. It appears that our conscious awareness lags a good deal behind unconscious processing. What we feel to be a conscious decision, may already have been unconsciously determined. It makes one wonder about the reality of free will…

One can easily add to the above list of examples showing the reality of the unconscious. Remember the definition of the unconscious as "all mental processes of which we are not conscious yet that influence our thoughts, emotions, perception and behavior in meaningful ways". Metaphorically speaking, our consciousness is only the surface of a very deep lake where constant mental activity is going on below the surface. Without the water, no surface. It is hard to deny the reality of unconscious processes, although we may still underestimate its effect. After all, we have – by definition! – no conscious awareness of the unconscious…

3. Conceptual and subconceptual processing

What is a 'concept'?

I define a concept as something that exists in the conscious mind. For instance, the word 'cat' indicates the mental concept 'cat'. OK, this might be a bit confusing, as I am writing about concepts here and in writing I can only use *words* for concepts. This might lead to the common misunderstanding that concepts are words. But, as your experience will most surely tell you, it is possible to imagine a cat, or to think of a cat, without using the word 'cat'. Very young children, who are not yet familiar with language, cannot do otherwise. Certainly, there are cognitive scientists who will claim that consciousness, and thinking, depends on the use of language. "Without words, no thoughts", they say. I think they are wrong.

But let us for the moment assume that a concept is a thought, a feeling, a meaning, a wish, … in fact, anything that can be a 'content' of your consciousness. In the widest sense, a concept is 'something' you are conscious of. Concepts can be simple or complex.

Conceptual processing

Some neuroscientists still think that our conscious minds work like a computer. Sorry for getting a bit technical here, but people who are familiar with how a modern computer works, might benefit from the following analogy. In a computer, there is only one processing thread per CPU (Central Processing Unit). Instructions are executed sequentially, and involve binary operations. Furthermore, each piece of data is stored and processed in one place at any given time. In fact, most modern computers are built on the blueprint of the 'Turing machine'. The Turing machine was a hypothetical machine invented as a thought experiment by Alan Turing in 1936. It could be programmed to manipulate symbols, but only one symbol at a time, according to fixed rules.

For a long time neurocognitive scientists thought that our brains functioned in a similar way. They assumed that concepts were stored at very precise locations in the brain, for instance in a single neuron, or in a fixed combination of neurons. Furthermore, scientists thought that these concepts were easily retrievable from memory and could be processed according to strict logical rules. As with a basic computer, your mind can receive some input from outside (like when you suddenly see a grape), it then retrieves concepts from memory into consciousness and starts to process all the available information in a sequential way, in one logical step after the other. All this processing eventually results in an outcome, for instance in the decision to act in a particular way (putting the grape in your mouth, for instance). This is how it was thought the human brain functioned, at least until the late 1980s.

Subconceptual processing

In 1986 David Rumelhart and James McClelland published *Parallel Distributed Processing: Explorations in the Microstructure of Cognition*', which many still regard today as the bible for cognitive

scientists. What exactly did Rumelhart and McClelland mean by ‘parallel’ and ‘distributed’ processing? And why is it important?

Remember that the human brain consists of 100 billion neurons. A mental concept like ‘cat’ is not stored in just one ‘grandmother-neuron’. A large number of neurons, possibly millions, must act together to allow a person to think about a concept like cat. When we say ‘act’, we mean that these neurons are activated in a particular way. A small electrical current runs along them. Neurons ‘light up’, as it were. Such activation patterns are spread over a large number of neurons. This is what is meant when saying that concepts are *distributed*. Not only are concepts distributed in wide patterns, they are also overlapping or intertwined. Or expressed differently, one single neuron can be part of many patterns. So, the neuronal activation pattern that enables you to think of a ‘cat’ may have many neurons in common with the neuronal activation pattern that allows you to think ‘milk’.

Besides brain processing being ‘distributed’, your brain is also a highly *parallel* device. In principle all neurons (all 86 billion of them) and all synapses (roughly all 10^{14} of them) could be active at the same time. This is similar to 10^{14} analog computers all acting simultaneously. In other words, the brain represents tremendous processing power.

Now we are also in a position to understand what neurocognitive scientists mean when they talk about subconceptual processing. There is a direct link with the unconscious. Suppose that in a particular area of your brain a pattern lights up, distributed over millions of neurons. Let’s call this pattern A. All the neurons involved in the pattern are activated at the same time, in parallel. The pattern is widely distributed. Now several things may happen. It is possible that pattern A fades away, that the ‘lights’ slowly dim, without any of this activity ever resulting in a conscious thought or concept. It is also possible that pattern A interacts with and influences another pattern B, with which it overlaps, sharing perhaps thousands of neurons. This in turn could trigger a new, and again partially overlapping pattern C. And so one. It is possible that at a given moment one of these patterns, for instance pattern C, will become active enough to ‘emerge’ into consciousness. You then become conscious of the concept that corresponds to activation pattern C. Perhaps not ‘cat’ (A) or ‘milk’ (B) but ‘thirst’ (C). The processing that went on in the millions of neurons involved in pattern A and B remained below the threshold of your consciousness. The cat was on the landing, it ran to its saucer of milk. You were reading a newspaper, you didn’t really (consciously!) perceive cat nor milk, but, hey, … suddenly you felt thirsty. A and B were processed unconsciously.

However, this is not a complete description of ‘subconceptual processing’. It is the activity in individual neurons, or in smaller sub-sets or sub-patterns of neurons, that together make up pattern C. These neurons, or sub-sets of neurons, can be viewed as the ‘building elements’ of concept C. They are smaller than the pattern needed for a concept to emerge. The sub-patterns in these neurons will not give rise to concepts independently, therefore the processing that goes on in them is also called ‘subconceptual processing’.

Is the mind a clock?

It is clear from the above descriptions that there are two views on how the human mind works.

The first view is the ‘conceptual’ view. In it, the mind behaves like a clock. A clock has many small parts: wheels, dials, springs, nuts, hooks… Everyone who wants, can pry open a clock and observe its different parts. A clock is a machine: its parts interact in a mechanistic way. True, the precise function

of the smaller parts and the intricate ways they work together may be difficult to understand for a lay person. However, I am sure the detailed working of the clock is fully transparent to the eye of a specialist, to the eye of the clockmaker. Furthermore, the clockmaker will have the necessary knowledge and the required skill to interfere with the working of the clock. If, for instance, it no longer keeps the exact time, the clockmaker may open its mechanism and change a defective part. In a purely conceptual view of the human mind, it functions like a clock. One thinks the mind can be understood and approached as *a mechanism: it is in principle open to all observation ('objective'), fully transparent and comprehensible, and perfectly controllable.*

According to the strictly conceptual view, our mind is best understood as being composed of concepts and the links between these concepts. (The clock consists of small parts that interact.) We are consciously aware of these concepts, or can become aware of them if we so wish. (The moving parts of the clock are open to observation). Understanding concepts and the links between concepts is sufficient to understand the mind. (With sufficient knowledge, it is possible to get a full understanding of the working of the clock). Specialists, who understand the mind, can work on the concepts. They have the illusion that they can replace defective concepts with others.

In a conceptual understanding of the mind, the only important level below the level of concepts is the true 'hardware' of the mind. The concepts and the links between them are understood to be 'just the software'. (Of course, here the metaphor of the clock breaks down.) The hardware 'below' is the biology and chemistry of brain cells and the medium in which they are embedded. Such things as psychoactive drugs can be used to act upon this hardware.

Is the mind a cloud?

But, as we have seen, there is an alternative view of the mind, the 'subconceptual' view. In the subconceptual view the mind can be represented as a cloud, instead of a clock. Why is the metaphor of a cloud so apt?

OK, on the off-chance that you are knowledgeable about meteorology, you will be able to think of a cloud as being composed of individual parts: the water droplets that make up the cloud. But for most people, when they watch a cloud drift by on a summer's day, the first thought that comes to mind will not be that of the cloud as a mechanism. That would be a very artificial and not very useful or productive way of thinking about clouds. There are so many minuscule droplets of water in a cloud that for practical purposes they are innumerable. Furthermore, they interact in ways that are extremely complex, not in the way the parts of a machine interact. As a result, the whirls and movements of a cloud are unpredictable in principle.

The human mind is still more complex than a cloud. In the subconceptual view I compare the mind to a cloud in order to underline that the mind is unknowable in the end, and mostly operating outside of our conscious control. If we try to consciously grasp something on the subconceptual level, we will not seize the mind. If we try to do that, it will be like laying our very coarse conceptual frameworks over the subconceptual level. That would be comparable to trying to catch parts of the cloud in a hundred little boxes. Once having firmly locked these cloud-parts into their boxes (mental concepts), we would then try to determine how the little boxes interact in a 'mechanical' way, in the hope of explaining the innumerable changes in form and movement of the cloud. Well, good luck to that! To

say the least, this would not be a very helpful or fruitful way of thinking about clouds. Neither is a purely conceptual understanding of the mind a very useful approach.

Modern medicine has been developed largely on a conceptual foundation. That allowed modern medicine to gain credibility as a 'solid' science, akin to physics, and to distance itself from the realm of magic. Within present-day medicine, we see the positive results of this choice. The use of clear and well-defined concepts certainly has many advantages. However, we should also be sufficiently aware of the difficulties that arise from a rigid and exclusively 'conceptual' view. The goal must be to retain its benefits while addressing its difficulties.

To recapitulate, we can think of the mind either as a clock or as a cloud:

The mind as clock	**The mind as cloud**
Mechanic.	Organic.
Fully open to observation.	Not fully open to observation.
Fully transparent (in principle).	Not fully transparent.
Fully comprehensible.	Not fully comprehensible.
Predictable.	Unpredictable
Under full conscious control.	Not under full conscious control.

Beware of talking too glibly about the unconscious

Sigmund Freud compared our unconscious with the part of the iceberg that remains hidden below the surface of the sea. It had better be compared with the sea itself. In any case, the unconscious is tremendous. But that still does not make it a 'thing'. The unconscious is not a 'thing'. You can only speak about it by means of a metaphor or symbol. It is not something you can meet. It is forever volatile and fickle and so huge that it representationally becomes the thing it sees, whether this is a house or the universe. About the 'unconscious' one can only talk in terms of a metaphor. One can only point at the unconscious by way of a symbol. For instance, the cloud as metaphor of the unconscious. And if you keep in mind that this metaphor substitutes something that cannot be grasped itself, then you are on the right track. Only then can you safely continue to speak of the unconscious. Whenever I mention the contact with the unconscious, or the unconscious that takes care of you all the time, it should be clear that I am not talking about a rectangle in a smart scheme of the human mind.

A symbol is not a sign

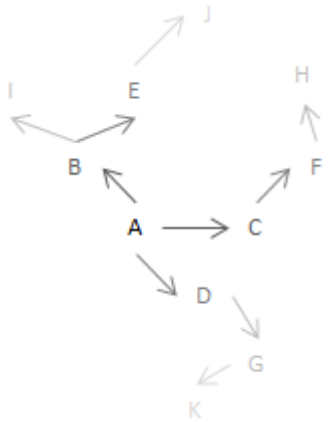
There is a lot of confusion about signs and symbols. A sign is not a symbol. We can talk symbolically about the human mind, but should never use our symbols as signs.

A traffic light is a sign. If the light is red, you know what that signifies. It says: stop. What happens in our mind whenever we see a sign, is simple. A points to B, in a very straightforward manner:

A → B

A in this case is the mental ‘concept’ that we can indicate with the words ‘red light’. B is another concept that we can indicate with the word ‘stop’.

Saying that a cloud is a symbol of the human mind is something different altogether. What happens in our mind when we use A (‘cloud’) as a symbol instead of a sign? This cannot be represented by a straightforward arrow, but is rather something like this:



The diagram illustrates that the concept ‘cloud’ evokes many other concepts, either directly or indirectly. Many things come to our mind when we say ‘cloud’. Some will come to the foreground of our conscious attention, into the clear light. Others will stay in the wings or appear shrouded. K in the diagram, for instance, may have more of a vague feeling than of a clear conscious thought. Here we get an impression of complexity, gradual fading, some circularity even. People sometimes ask: “What does that symbol (cloud) stand for? Explain it to me.” One may try so, but only with partial success!

In the diagram, what does the symbol A stand for? Well, it certainly doesn’t connect with just another single well-defined concept in a single straight line. What does the symbol stand for? We cannot say that straightaway, and cannot put it into words exhaustively. In a sense, that makes the symbol irreplaceable. Signs on the other hand can be replaced easily. Before there were red traffic lights, a policeman lifted his right arm straight into the air. What did that say? It said: stop.

If you like poetry, you will be familiar with the attempts of literary critics to ‘explain’ a poem. Very often, such efforts are seriously misguided. Poems are full of symbols. The more a literary critic exerts himself to conceptually explain a symbol, the more that symbol turns into… a sign. The sign in that case only points to the learned explanation. As a result, the poem risks losing its evocative or poetic power. The poem will be reduced by a purely conceptual explanation, rather than enriched.

Symbols, on the other hand, remain *fundamentally inexplicable*. Or, put differently, *a symbol is a symbol of a symbol of a symbol of…* And so on. In a process that knows no end. You can, as it were, ‘fall’ into a symbol – and keep falling. This is what the above diagram tries to show. Is there a L, M, N, etc.? In any case, this is *not* a network of concepts!

Of course, human beings are very eager to ‘get things clear’. We want to bring everything into the glaring daylight, because that gives us the illusion of control. Therefore, we are tempted to represent only part of the symbolizing process, for instance only A → C. Then we may erroneously convince ourselves we have fully understood or ‘grasped’ the meaning of A. Because of our constant search for conscious unidimensionality, we readily reduce symbols to signs. So keep in mind that when saying that ‘the mind is like a cloud’, the cloud is a symbol, not a mere sign!

Where Freud got it wrong

Freud had a very mechanical understanding of the unconscious. The human psyche is governed by largely unconscious forces or drives. If a drive is repressed, more and more tension will build up. The tension will then seek release in what Freud called 'sublimation' or in mental illness. The mind is like a machine that thrives on energy, in this case psychological energy. 'Libido' or sexual energy took front stage in Freud's thinking. The science of mechanics teaches that energy is always there and cannot be destroyed. A machine will only displace or transform the energy into other forms. Freud was convinced that his theory of sexual energy, libido, could explain the human mind in strictly causal terms. From causal explanation to control is only a small step. So Freud believed that doctors could cure the psyche by means of well-defined techniques for releasing energy in a controlled way, by remembering repressed traumatic events. He certainly carried the matter too far when he described the unconscious as a rutting horse that can be tamed in therapy with a Grandmaster (him being the psychoanalyst). Because, rutting or not, the unconscious is not a 'thing', neither a horse, nor a plant or mineral, not even a lake or a sea. And not a cloud either…

The unconscious is not a place 'behind the fence', as Freud seemed to suggest, where we can observe well-defined concepts. In the unconscious there are no thoughts present as we know them consciously. That is only logical, otherwise they would, by definition, not be unconscious any longer. There is no such thing as a 'fence', behind which 'thoughts outside consciousness' are kept. Neither can we peep through a hole in the fence at these presumed unconscious thoughts. The 'unconscious' aspect of unconscious thoughts is by definition a characteristic of these 'thoughts'. In other words, they are not thoughts at all. Watched from a distance it might briefly look as if they were. It is far better to compare unconscious substances with clouds. These clouds are intensely enlaced. They can usually not be spotted individually, unless one of them is illuminated by local flashes of lightning. From close by, you will still not be able to see the cloud. From far-off you may see something that could give cause for a conscious thought.

Certainly, some of us may find it frustrating to acknowledge that clouds are not seen better when one draws closer. More frustrating still is the finding that we cannot grab the clouds and manipulate them. Indeed, it is impossible for us to exercise *direct, causal, conscious control* over our own minds, let alone over the minds of others. The mind cannot be manipulated. That is not to say that we cannot influence the mind. We certainly can. We can change ourselves. We can invite ourselves to grow into more complete persons and to enjoy life more deeply and fully. But never by chasing clouds.

Perhaps Freud's biggest error was that he tended to use his descriptions and concepts of what is happening in the human mind more in the way of signs than as symbols.

Some patterns may be more distributed than others

We said earlier that the activation pattern (meaning the electrical and biochemical activity in neurons) that enables us to think of the concept 'cat' is distributed over many neurons, possibly even millions. Some concepts however are more 'distributed' than others. It is conceivable that relatively concrete concepts, such as 'cat', 'flower', or 'bread', are less widely distributed than abstract concepts, such as 'philosophy' or 'love'.

Some concepts / patterns may be so widely distributed that we never gain a very clear notion of them and even have no name for them. These 'broad subconceptual patterns' lie at the threshold of

conceptualization. At the same time, because of the very wide distribution of these neuronal activation patterns, they are also the ones that evoke the most ‘associations’. Indeed, very widely distributed concepts overlap with many other, less distributed concepts, and bring the latter to our minds. Perhaps, in your mind, the concept ‘happiness’ may come close to being such a very widely distributed concept. If that is the case, ‘happiness’ will evoke a thousand things, some of which are perhaps very concrete, others equally vague as happiness. The most widely distributed patterns are felt to be inexpressible. Is that perhaps why some religious people say that God cannot (and should not) be named?

We may hypothesize that the most widely distributed patterns are perhaps also the most stable. They could remain in our minds for a very long time and fundamentally influence our personality and wellbeing our whole life long.

Of course, we are not aware of the minute details of what happens in our brain at the neuronal and synaptic level. We are consciously aware of a concept, not of its distributed behavior and relations at the subconceptual level. In fact, an extremely complex mental world with many levels of increasing subtlety and complexity underlies our awareness which remains superficial. This is the 'unconscious’ that guides and drives us, continually making decisions of which we normally are not consciously aware (by definition). We can be made aware of some widely distributed concepts and their relations with other concepts under exceptional circumstances. However, some patterns may forever remain outside of consciousness. Highly distributed patterns, which may also be the ones that most influence our lives, are the best candidates for this permanently hidden life.

4. Mind is body is mind is body is …

Let's not forget: the brain is part of the body

To some people it still comes as a surprise that the brain, on the one hand, and the rest of the body, on the other hand, are closely linked. In fact, they are so intimately connected that it is better just to speak of 'the body', thereby implicitly including the brain. How are the brain and the rest of the body linked? This question can be answered in two equally valid and equally important ways. First by describing the physical connections between the brain and the rest of the body. Second, by zooming in on the 'bodily' aspects of all things mental.

There are different 'pathways' that link the brain with the rest of the body. I am not going to discuss these in detail. Just a brief description of the two most important connections:

– Efferent and afferent nerves. 'Efferent' means that these nerves carry information or impulses from the brain and the spinal cord towards the rest of the body. 'Afferent' nerves carry information in the opposite direction.

– The Hypothalamic-Pituary-Adrenal axis (HPA-axis). The hypothalamus and the pituary gland are both anatomical locations in the brain. The adrenal glands, on the other hand, are small organs situated on top of the kidneys. The HPA-axis is responsible for the regulation of many hormones in the body. It influences nervous activity and metabolism. There is also mounting proof that the HPA-axis modulates our digestive system and immune system.

There is quite an impressive amount of research on how, through these and other pathways, the brain can influence sickness and health. As we will see in one of the following chapters, saying 'brain' or 'mind' are but two different ways of looking at the same thing. Therefore, the following table also shows some pathways through which the *mind* influences sickness and health:

Systems or processes under influence of the brain/ mind	**Medical conditions**
Skeletal muscle tension	Lower back pain, wry neck
Smooth muscle tension	Irritable gut syndrome
Regional blood flow	Raynaud's syndrome, coronary artery spasms
General blood flow	High or low blood pressure
Immune system	Eczema, asthma, allergic rhinitis, progression of infections (e.g. AIDS)
Hormones	Menstruation disorders, pain
Inflammatory reactions	Rheumatic arthritis, Crohn's disease

Nervous system	Heart palpitations, tremors

My mind is 'bodily'

I can say "I feel anger" and think that anger is something in my mind, a concept. But what exactly do I experience when I am angry (rarely happens)? I feel my heart thumping in my chest, my gut contracting, my hands are making fists, the overall muscle tone in my body increases, there is blood flowing to my face and head, etc. I experience all of this and much more…

Thus, an experience of 'anger' is also bodily. It is hard to evoke a memory of anger without evoking bodily sensations. This is of course just one example of a mental content (anger) that is for the largest part identical to bodily sensations. But if I apply careful introspection, were I to look deeply within myself, I might find that most mental experiences, perhaps even the most abstract ones, are also very bodily. What, for instance, do I experience when the concept 'distance' enters into my mind? Perhaps I am mentally (in my imagination) 'stretching my arms', a very bodily feeling?

David Eagleman describes the case of Tammy Meyers. As a young woman Tammy Myers was victim of a motorcycle accident. In the accident her 'orbitofrontal cortex', that is the part of the brain just above the eye sockets, got injured. As a result, Tammy Myers could no longer experience what Eagleman calls "her body's emotional summaries". The orbitofrontal cortex processes the signals from the body that tell us what states the body is in: nervous, excited, embarrassed, angry, joyful, eager, etc. Because Tammy's brain could no longer 'read' bodily signals, her mental capacities were also attained. She could, for instance, no longer make up her mind. Even the simplest decisions became impossible! Mired in perpetual indecisiveness, Tammy Myers spent most of her day lethargically lying on the sofa. This exceptional (and sad) clinical situation shows that even the best thought-through decisions aren't the outcome of a purely logical, sequential, conceptual, cognitive process that happens only 'in the head'. As though the brain was a strange appendix, a sort of machine screwed on the body. On the contrary, all mental experiences and states are 'bodily'. In this sense, mind and body are one.

This brings us to the age-old problem of the relation between mind and body.

The mind-brain problem

All my desires, joys, ambitions, emotions, plans, loves, thoughts, in fact my whole life, takes place in about three pounds of gray matter. But does that handful of gray matter 'produce' my mental states? Or does my brain, on the contrary, only exists in my mind? If not, where else would it exist?

If I move my arm, how does that movement come about? If my fear changes my heart rate, how does that happen? Does my fear change my brain, or does my brain cause me to feel fear? How can the mind influence the body, and vice versa, if they are two separate entities, the one material and the other not?

And if they are not separate entities, *what exactly is the relationship between the mind and the brain, between the mental and the material, between the psychological and the physical?* This is what

philosophers have called the ‘mind-brain problem’. As the brain and the body are one whole, I prefer to call it the ‘mind-body problem’. Philosophers have writhed with this problem for ages.

Some attempts to solve the mind-brain problem

Philosophers have proposed several theories that address the mind-brain problem. This is only a selection. Some theories may seem more inventive than others. Or more weird…

Cartesian dualism.

Cartesian dualism is a very straightforward theory. It is called ‘dualism’, because it assumes that there exist two completely separate entities: the mind and the body. The theory is furthermore called ‘Cartesian’, because it is traditionally attributed to French philosopher Réné Descartes (1596-1650). Calling the mind ‘the soul’, Descartes wrote: “Thus this self (*moi*), that is to say the soul, by which I am what I am, is entirely distinct from the body, […] and even if the body were not there at all the soul would be just what it is.” According to Descartes, the soul is quite distinct from the body and can survive the death of the body. Traditional religions usually favor this Cartesian-type of dualism.

Dualism, however, comes in many forms. With some of these versions Descartes would agree, but not necessarily with others:

Interactionism.

This theory claims that mind and body, though separate, interact. Physical events causally influence mental events, while mental events causally influence physical events. That is very much in line with our common-sense beliefs. When I drink too much alcohol I can directly experience that physical events (the alcohol in my body) influence mental events (the feeling of being drunk). When I am sexually aroused… Mm, well, let’s just say that it is possible to experience how mental events also influence physical events. Most people are unacknowledged ‘interactionists’. The theory is felt to be self-evident. However, interactionism is far less straightforward than it seems. There are a few problems… How exactly could a mental event influence a physical one, or the other way around?. After all, the mental and physical are of a completely different nature. Being so utterly different, it is hard to image where or how the interaction between the mental and the physical could take place… Anyhow, one might represent this theory as follows: (In which B stands for ‘body’ and M stands for ‘mind’.)

B <-> M

Epiphenomenalism.

An epiphenomenon is a by-product. In this theory the mind is a by-product of the body. It assumes that the material world is causally closed. Material effects have only material causes. Still, it is possible for material events to have mental byproducts. That is how mental events may result from material causes. However, the inverse is never true: mental causes can never have material effects. Cause only works in one direction. This can be represented as follows:

B –> M

Materialism

We may categorize epiphenomenalism as a form of dualism in which the body gives rise to the mind. But just as easily it might be understood as a form of monism. In monism there is only one true

substance, in this case matter. People who believe that there is only matter are called materialists. Materialists claim that 'mind arises as a property of matter'. It is hard to see how that differs from saying that mind is a 'by-product' of the body (matter). In my opinion, it is principally unclear what epihenomenists and materialists mean by all these phrases. Anyhow, materialism may be represented as:

B (-> M)

Subjectivism.

Once we have set materialism on the map, it is not so hard to think of a second type of monism. Instead of saying: 'There is only matter', one might try to say: 'There is only mind'. After all, how can I prove that the world is really 'out there'? Is it not conceivable that all physical things are only figments of my imagination. Can one really prove conclusively that this life is not a dream? In that case, all material things would only exist in my mind, my body included. This is extreme subjectivism or solipsism:

M (-> B)

Parallelism.

The problem with interactionism was that it is difficult to imagine how the two entities, mind and matter, being so very different, could possibly interact with one another. The answer of parallelism to that question however is simple: they don't. Although minds and bodies may appear to interact, this is just what it is: an appearance. So if I want to stretch my legs (mental), and I stretch my legs (physical), while I feel that I am stretching my legs (mental), etc. the mental events and the physical event run on parallel tracks. Parallel tracks that never cross! Parallelists think that mental events do not influence physical ones, nor can physical events have any impact on mental ones. Strange. Parallelism can be represented as follows:

B || M

Occasionalism.

Of course, parallelism begs the obvious question: If the brain and the body move on parallel tracks, how come that they do? Is this just.. coincidence? That would stretch credulity, wouldn't it? For that reason occasionalism was invented. Occasionalism is a particular case of parallelism. The theory was propagated by the French priest and philosopher Nicolas de Malebranche, who was very familiar with the works of Descartes. Malebranche claimed that *God* coordinated the mental with the physical. If I want to move my arm (mental), God makes sure that it moves (physical). Or, on a more fundamental level, God causes *both* the idea in my mind *and* the actual movement of my body. Why not? If God is indeed at the origin of all mental and physical phenomena, it should not come as a surprise that all changes of mind and body are so beautifully coordinated and move on parallel tracks. This I represent as:

G

B || M

There are many more mind-body theories, some of them extremely sophisticated. However, this brief overview will suffice, as it is only a preparation of the ground for what follows next. I will make a case for the *identity* of body and mind. An idea that can be represented as:

B = M

A mind or soul? Yes, but not apart from the body

We may all have a natural prejudice in favor of a particular variant of dualism, called interactionism: Many (if not most) people tend to think that the mind and the body are separate entities that interact. Mind influences body and body influences mind. However, this type of dualism poses many insurmountable problems. Patricia Churchland has discussed these problems extensively in her book *Brain-Wise*. Let us just give a brief overview of some of the most gaping holes in the fabric of (Cartesian) dualism.

First, it is difficult to imagine how and where the mind would interact with the body. René Descartes, who is traditionally considered to be the inventor of dualism, thought that the mind interfaced with the body in the pituary gland. The pituary gland is a small structure at the base of the forebrain. Descartes had no particular reasons for thinking this, except perhaps that, in his time, the pituary gland was a very mysterious organ, deeply hidden within the skull and located on the midline of the brain. Most other brain structures are double, present in the left as well as in the right half (hemisphere) of the brain. But wherever such interaction is supposed to take place, it is the fact of the possible interaction that is problematic, not its location. Today we know of a law of physics called 'the Law of Conservation of Mass-Energy'. This law states that in physical systems, although mass can transform into energy respecting Einstein's famous equation $E = mc^2$, the total amount of mass and energy in the universe in constant. The relevance of the Law of Conservation of Mass-Energy to our mind-body problem is immediately clear: If my mind is a completely separate entity from my body, and if my intention to move my arm (supposing that this is a purely mental event) is the sole cause of actually moving my arm, I would be adding energy to the physical universe. In other words, interactionism necessitates violations of the Law of Conservation of Mass-Energy.

Second, over the years an enormous amount of medical evidence has accumulated showing that there is a strong relationship between the integrity of the brain and normal mental functioning. Just one example: When neurologists look at the brain of people suffering from Alzheimer's disease, they see (apart from other 'hallmarks' of the disease) a gradual loss of connections between neurons. In some parts of the brain neurons die and the corresponding gray matter begins to shrink. This physical damage is correlated with a gradual loss of memory, learning and other cognitive functions. If one of your loved ones has suffered from Alzheimer, you will probably know what this means. You might have grieved and wondered: 'Where is the person I used to know?' Seeing this certainly makes it hard to maintain the naïve belief in a strict separation of body and mind. Why would Alzheimer's disease that attacks the brain necessarily attain the mind, if the mind is an entity that exists independently from the brain?

Third, researchers have described a strange phenomenon called 'the Disconnection Effect'. In very exceptional cases people suffer from epilepsy to such an degree that the disease is extremely invalidating and life-threatening. In the 1960s some of these patients underwent a radical form of surgery in which the connection between the two halves of the brain was cut. Strangely enough, in the first months after surgery, not only had these patients 'split-brains', they also exhibited 'split-personalities'. It happened that a patient with a split-brain started to read the newspaper, holding the paper with his left hand. Then suddenly the same person's right hand tried to pull the paper away and toss it to the floor. It was as though one self, living in one half of the brain, wanted to read its

newspaper, while another self, living in the other half of the brain, wanted to do something different. This is just one illustration of the well-documented Disconnection Effect, in which two separate 'selves' seem to perceive things independently and sometimes even make conflicting decisions. As such, the Disconnection Effect is hard to reconcile with a single mental self leading a separate and independent existence from the body.

For these and other reasons, it is problematic to assume the existence of a mind or soul *separate* from the body: 1) Dualism would violate the Law of Conservation of Mass-Energy. 2) It would require a very tortuous explanation of the effect of Alzheimer's disease. 3) Dualism makes it also hard to explain the strange phenomenon called 'Disconnection Effect'. However, having said this, *I do* not *mean to say that there is no mind or soul*. The only conclusion one may draw from these findings is that 'dualism' as Descartes expressed it ("even if the body were not there at all the soul would be just what it is") is difficult to maintain, even though most people seem to have a natural prejudice in favor of it.

The paint is the art is the paint is…

What could it possible mean to say that the mind is the body and the body is the mind (M = B)? Perhaps *body and mind are different ways of looking at the same thing*.

Today, being familiar with the basics of brain science, many people seem to think that changes in the body, or more particularly in the brain, *cause* changes in the mind. In people who suffer a stroke it may happen that neurons in the left half (hemisphere) of the brain get damaged because of a lack of oxygen. If a specific area called 'Broca's area' is attained, these patients may have problems with speaking. Their speech will be halted or fragmented, as they have difficulty finding the right words. Broca's area seems to be the area where articulated language is 'produced'. Is it therefore not correct to say that damage to Broca's area 'causes' this particular form of speech impairment, just as damage to other brain areas 'causes' other specific mental deficiencies? Or more general still, that brain activity causes the mind? Well, no… Thinking in causal terms is not the best or most useful way of tackling the body-mind or mind-body problem.

Aristotle, the great Greek philosopher who, amongst other things, was the teacher of Alexander the Great, already had his doubts about dualism in the 4th century B.C. In his book, *De Anima* (About the Soul), Aristotle writes:

> *We should not doubt whether psyche and body are one thing, any more than whether the wax and its imprint are, or in general whether the matter of each thing is one with that of which it is the matter*.

We need to bring together body and mind in the domain of health and healing. I think of body and mind as *unified.* Just as it would be foolish to try to separate the imprint from the wax, the mind cannot be separated from the body. Aristotle's image is very apt. Still, one may find it hard to wrap one's mind around the idea of mind-body unity. It seems to come naturally to most of us to think of mind and brain as being separate entities or 'things'. Therefore, let us approach the problem from yet another angle.

Professor Max Velmans of the University of London has given a beautiful rendering of mind-body (or mind-brain) unity in his book *How Could Conscious Experiences Affect Brains?* Full quote:

> *Suppose you have a calming image of lying in a green field on a summer's day, and you feel the difference this makes in producing a relaxed state, slowing your breathing, removing the tension in your body, and so on. You give a causal account of what is going on, based on what you experience. From my external observer's perspective, I can also observe what is going on – but what I observe is a little different. I can measure the effects on your breathing and muscle tension, but no matter how closely I inspect your brain, I cannot observe your experienced image. The closest I can get to it are its neural correlates in the visual system, association areas, and so on. Nevertheless, if I could observe all the neurophysiological events operating in your brain to produce your relaxed body state, it would be a complete, physical account of what is going on. So, now you have a first-person account of what is going on that makes sense to you and I have a third-person account of what is going on that makes sense to me.*

In this short description, the first-person– and third-person perspectives are two different – but equally valuable – ways of looking at the same thing. In contrast to Cartesian dualism, every human experience can be understood as being both psychological and physical, both mental and bodily. Experience, Velmans continues, is "not either physical or conscious [mental] experience, it is at once physical and conscious experience (depending on the observational arrangements). For lack of a better term one may describe this nature as psychophysical."

Professor Velmans comes to more or less the same conclusion as Aristotle by another route: mind and body are *perspectives on one and the same reality*. In the same way, the famous painting by Dutch artist Johannes Vermeer, *The Milkmaid*, can be seen *in my personal first-person perspective* as the representation of a milkmaid, or – alternatively – as an entry into a very friendly and peaceful world, or as an idyllic rendering of the pure life, or as the evocation of a long-forgotten childhood memory, or… perhaps as many other personal experiences for which I do not seem to find sufficiently expressive words as they are 'subconceptual'. At the same time, the painting could be viewed *from a third-person perspective* – perhaps from the perspective of an art restorer – as a purely physical organization of canvas and chemical substances (varnish, paint, …) that adhere to the canvas in particular layers and patterns.

What is best: the psychological or the physical perspective on the mind-body?

What is the best way of looking at *The Milkmaid*? Well, that depends on the goal you want to achieve. Independent from that goal, there is no 'best way'. Thinking of ourselves in terms of 'mind' or in terms of 'body' is equally valid and valuable. But of course, if you want to restore a painting, it is best to take a material perspective (chiefly, but not exclusively of course). As an art restorer you will want to know about the state of the canvas, the frame, the varnish, the paints that were used, etc. However, if you are an artist, or just an admirer of art, these material details will matter less. You will take another perspective. You will find 'meaning' in the painting. The art may affect you and move you deeply.

So, depending on the goal we want to reach, we can either take a psychological (mental) or physical (material) perspective on the mind-body unity. Professor Tania Lombrozo of the University of California in Berkeley, likes to bake cakes. She has presented us with a very beautiful and homely metaphor:

> *[A] theory of baking wouldn't be very useful if it were formulated in terms of molecules and atoms. As bakers, we want to understand the relationship between—for example—mixing and texture, not between kinetic energy and protein hydration. The relationships between the*

variables we can tweak and the outcomes that we care about happen to be mediated by chemistry and physics, but it would be a mistake to adopt "cake reductionism" and replace the study of baking with the study of physical and chemical interactions among cake components. […]

But if you are interested in the project of explaining, predicting, and controlling the quality of your baked goods, then you'll need something like a baking theory to work with. […]…

Rejecting the mind in an effort to achieve scientific legitimacy—a trend we've seen with both behaviorism and some popular manifestations of neuroscience—is unnecessary and unresponsive to the aims of scientific psychology.

So, depending on your goal, you are free to describe the brain with the aid of mental or psychological terminology, using words like 'fear', 'pain', 'hope', 'meaning', and so on. Or you might describe the brain using strictly material or physical terminology, with such words as 'neural activity', 'action potentials', 'neurotransmitters', 'ions', and the like. But it is not very helpful to believe that one perspective excludes, precedes, causes, or is more valuable than the other.

Subconceptual processing provides a unified picture of mind and body

When you think in concepts, it is tempting to believe that concepts can exist independently *in* your head. From that belief, it is only a small step to believe that concepts can also exist independently from you, that is: *outside* your head. Plato (427 BC – 347 BC) was a Greek philosopher who believed that 'ideas' (or concepts) existed somewhere outside of the human mind, in another dimension. These ideas, Plato thought, were perfect templates of the things we encounter in this world. According to him, there must be an ideal concept of 'cat' existing somewhere outside of my mind. My own cat is but an imperfect shadow of that ideal 'cat'.

Somehow conceptual thinking seems to predispose us to dualism. Many people naturally assume – often without giving it much thought – that concepts are 'in' their head, that a concept is something that consciousness can 'grab' or take hold of. Probably they also think that concepts are entities that can be easily defined, clearly circumscribed, and fully comprehended. If clearly circumscribed (separate) concepts are 'in the head', then surely they are not 'of the head'. In other words, it then becomes very tempting to assume that concepts that are 'in our mind' can also survive separately and independently from the brain and the body. Then next logical step then seems to be that all such concepts taken together constitute a separate realm called 'the mental'.

No. The theory of subconceptual processing presents a unified picture of body and mind. Neuronal patterns are made up of thousands (or millions) of neuronal and synaptic nodes. These nodes all act together physically. Their electrical and biochemical activity, that constitutes the neuronal patters, 'give rise to' psychological phenomena such as thoughts, feelings and motivations. Smaller parts of these patterns, including the individual neuronal and synaptic nodes themselves, are 'subconceptual'. The activity in these smaller parts remains unconscious, or only touches upon consciousness as a very vague sense, intuition or premonition.

This view of the brain-mind, which takes into account subconceptual processing, can help us to realize that the difference between the physical and psychological level is much more fluid and arbitrary than we previously may have thought. Are subconceptual patters 'neuronal' and therefore

brain? Or are they ‘unconscious’ – perhaps only whispers of consciousness – and therefore better called ‘mind’? They are both. Subconceptual processing makes it a lot harder to think of the body *influencing* the mind or the mind *influencing* the body. Body and mind are the same thing, although described in different terms. They are like paint and Milkmaid.

5. Entering the third wave

But what is 'consciousness'?

French professor Stanislas Dehaene, who holds a Master's degree in applied mathematics and computer science and a PhD in applied psychology, has been studying 'consciousness' and the neural correlates of consciousness for more than fifteen years. Dehaene is one of the leading researchers on the subject in the world. He presented the gist of his research to the general public in his book *Consciousness and the Brain* (2014). This is how he defines consciousness:

> *"As we will see, the contemporary science of consciousness distinguishes a minimum of three concepts: vigilance—the state of wakefulness, which varies when we fall asleep or wake up; attention—the focusing of our mental resources onto a specific piece of information; and conscious access—the fact that some of the attended information eventually enters our awareness and becomes reportable to others. What counts as genuine consciousness, I will argue, is conscious access—the simple fact that usually, whenever we are awake, whatever we decide to focus on may become conscious. Neither vigilance nor attention alone is sufficient. When we are fully awake and attentive, sometimes we can see an object and describe our perception to others, but sometimes we cannot – perhaps the object was too faint, or it was flashed too briefly to be visible."*

To Dehaene "genuine" consciousness is "conscious access": the fact that attended information enters our awareness and becomes reportable to others.

Some critical remarks about consciousness

First, Dehaene's definition smacks of circularity, especially when he goes on to say that "conscious access" has to do with something that can become "conscious". In the first part of the quote Dehaene describes consciousness in terms of 'awareness'. But isn't awareness just another word for consciousness? (The Oxford English Dictionary for one defines consciousness as "The state of being *aware* of and responsive to one's surroundings.) Perhaps this only goes to show how even renowned scientists find it *difficult to define 'consciousness'*. We all think we know what consciousness is, but it still seems to elude us.

Second, I would like to draw attention to another pitfall hidden in this definition. Conscious access is to information we are aware of and that is *reportable to others*. We humans usually report to others by way of the written or spoken word. As a result, there is a danger that consciousness or 'conscious contents' (the "piece of information" that enters awareness) is the same as *words*. I, and many others with me, am of the opinion that this is not the case. Nonetheless, some neurocognitive scientists seem to have fallen into this trap. Jerry Fodor, for instance, introduced the hypothesis of 'mentalese', which supposedly is a "language of thought". Mentalese might not be like English or any other known language, but has a mental vocabulary and syntax just the same. Fodor maintains that any account of the full range of human mental experiences or capacities must make use of such inner language. But, surely, consciousness is much more than language.

Images of consciousness

We should not overestimate consciousness. Stanislas Dehaene:

> *"[A] staggering amount of unconscious processing occurs beneath the surface of our conscious mind. […]*
>
> *Out of countless potential thoughts, what reaches our conscious mind is la crème de la crème, the outcome of the very complex sieve that we call attention. […]*
>
> *The discovery that a word or a digit can travel throughout the brain, bias our decisions, and affect our language networks, all the while remaining unseen, was an eye-opener for many cognitive scientists. We had underestimated the power of the unconscious."*

I have already compared consciousness to the surface of a lake, rather than to the tip of an iceberg that sticks out above the water. The surface of the water cannot be separated from the water. Without the water, there is no surface. Consciousness is a perception of the unconscious. Whirls and wisps and patterns of smoke mean nothing, until they align in a particular way and then suddenly… I see (a face, a horse, a car, …). The face is *in* the wisps and whirls and patterns. It *is* the patterns. In this sense, Dehaene is right: we continuously underestimate the power of the unconscious and of subconceptual pattern formation. The conscious and unconscious are *not* two separate mental domains. So it is perhaps better to say that 'conscious content' does not 'emerge to' the surface, it *is* the surface – the surface of what goes on *below* the surface and *makes* the surface. And all these things taken together.

But beware of metaphors. As we will see, they can easily lead us into error. So even these metaphors of smoke and lakes should be taken with a grain of salt.

Neurons and consciousness

What we did just now – talking about awareness, conscious content, and the unconscious – is an attempt to understand consciousness in mental terms. Let us now take a more material, bodily, or third-party perspective on consciousness.

Can we see *in the brain* what happens when a person is conscious? Well, yes, Dehaene and his team can. Our consciousness is limited in scope. We can only have one conscious experience at one time. What happens then, is that

> *"When enough brain regions agree about the importance of incoming sensory information, they synchronize into a large-scale state of global communication. A broad network [all throughout the brain] ignites into a burst of high-level activation."*

When this broad network lights up, information is widely broadcast within the cortex of the brain. In this way, relevant information is shared between several areas of the brain that can process the incoming information each in its own way. For instance, the motor cortex may initiate bodily movement, while at the same time a new memory may be stored, etc. This is 'why', according to Dehaene and his team, there is consciousness. This corresponds to what I have mentioned before: consciousness gets involved when something unexpected happens, or when different systems in our brain – which usually act together – *un*consciously start to pull in different directions. In that case, the incoming information is important enough to trigger different brain regions into synchronizing "into a large-scale state of global communication", which is the neural hallmark of consciousness.

To switch to mental terms yet again: when this happens, all the unconscious activity shows itself in consciousness. I perceive the cat I am allergic to. I now need to decide whether to walk out of the room or not.

Are we entering the third wave?

Now that we have some idea of what consciousness is (might be), we can take a very broad look at the history of life and distinguish three successive phases or 'waves':

1. The birth of attention at the same time as life itself. This is unconscious but not-dissociated attention.
2. Conscious-but-dissociated attention.
3. Un-dissociated attention that incorporates conceptual rationality and subconceptual poetry in one go.

The first wave

Approximately 3.5 to 4 billion years ago the first life on earth arose. That life probably was *not conscious*, but still had to have some '*attention*' for its surroundings in order to survive. Even very primitive organisms, organisms that consist only of one cell, have to separate the chemical reactions within the cell from the chemical reactions in their environment by way of a cell membrane. The membrane, as all other cellular biochemical structures, needs to be kept intact. Single-cell organisms ingest substances. They replicate by division. Some of them are attracted to water, others thrive better in anaerobic environments (environments without oxygen). The *selective* processes that are needed to keep all this going can be called attention. In that case, it is clear even single-cell organisms need a primitive form of 'attention'. Without it, they would soon cease to exist. Attention, understood in this sense, was born at the same time as life itself.

If we move on along the evolutionary scale, and consider more evolved life forms like jelly fish, worms, or flies, it becomes even easier to understand that they have to take care about where to swim, crawl or fly. The jelly-fish, the worm, and the fly must make selective efforts to find nourishment and to avoid threats. As organisms become more evolved, attention becomes more complex and more specialized. Some of you might even ask: is a dog conscious? A chimpanzee? Do these species possess *conscious* attention? Let us not enter into this discussion. It is sufficient to realize that most living species are in *a state of attention that is not dissociated from life itself*. It is unconscious but not-dissociated attention. I call this 'the first wave'.

The second wave

If the first wave was characterized as life in a state of unconscious but not-dissociated attention, we can define the second wave as *life in a state of conscious-but-dissociated attention*.

We humans are conscious. Whatever this may mean and whatever purpose consciousness may serve. Anyhow, it is certain that what we perceive as consciousness offers an evolutionary advantage or else it wouldn't have emerged to begin with. It allows us to image the future, to plan ahead, to integrate different bodily functions in order to most effectively reach our planned goals. But while evolution brought us, humans, the gift of consciousness, it also dissociated attention from its

unconscious ground, from first-wave nature. We now know, thanks to modern neuroscience, that every thought, feeling, or experience is deeply embedded in the unconscious mind. However, human beings immersed in the second wave hugely ignore this – and organize their lives as if there is only consciousness. One can, of course, not live without the unconscious, but one can pretend one does. In the second wave people have conscious but dissociated attention – dissociated from the unconscious or deeper self. It is as if the roots of life were cut off, so to speak.

The evolutionary advantages of the road towards consciousness, if taken too far, come with a big price: mounting depression, psychosomatic disease, addiction to drugs, food, sex, etc.

The third wave

The third wave combines the best of both worlds: conscious thinking as well as unconscious mind. More is involved than just recognizing that the unconscious is real. The conscious and the unconscious are not two separate spheres or areas that are cut-off from one another. They are not separate but in synthesis with each other, as one complex whole. In the third wave people recognize that life can be lived in a 'reintegrated' way, in which their conscious self is re-connected with the deeper self. The corresponding experience in all life domains will be one of 'depth'.

Today, science is beginning to show that autosuggestion – which is nothing other than intense communication between conscious thinking and unconscious mind – offers immense possibilities in the fields of health and wellness, and in domains far beyond. The conditions of optimal autosuggestion are openness, freedom, depth, respect for the total person, and trustworthiness. Gradually, tools are being developed to support the individual in attaining an un-dissociated, 'integrated' state of attention. Almost as a side-effect, this may bring relief on many domains: people can stop smoking, find relief from pain and stress, and so on. In the future, it will be possible to share the tools and insights for 're-connecting with the deeper self' between more and more people. My hope is that a worldwide community will take form: a community of people directed towards the realization of the 'third wave' and of its profound implications in every human undertaking. I freely admit that these words may sound highly impassioned to some of you. Much of the potentially huge influence of the deeper mind on conditions such as cancer, rheumatoid arthritis, multiple sclerosis etc. remains largely uncharted. Today, however, scientific research already supports some of the beneficial effects of re-connecting the conscious with the deeper self (the unconscious). It goes without saying that these claims should continue to be scientifically investigated as much as possible in the near future.

Three waves in one life: an illustration

Some of you may have heard of the 'Recapitulation Theory' of German zoologist, Ernst Haeckel (1834-1919). Haeckel claimed that "ontogeny recapitulates phylogeny". Ontogeny is the way the individual of a species (for instance humankind) develops from an embryo into a fetus, then into a child, and finally into a fully grown-up person. Phylogeny is the evolutionary history of that species through billions of years of evolution. It is, for instance, a description of how a one-cell organism developed into *Homo Sapiens*. Haeckel thought that – in my individual lifetime – I went through all the stages mankind had gone through in billions of years of evolution. After all, hadn't I started out in the womb as a single-cell organism? Recapitulation Theory was, of course, far too ambitious in its scope. In that sense, Haeckel was wrong. Still, the way every individual seems to recapitulate in his or her own

life-span the entire evolution of the species has some basis in reality. Not altogether as Haeckel intended, recapitulation theory could therefore be reused as a didactic tool to help us understand the evolution of humanity from the first wave, into the second, and finally into the third wave:

1. As a new-born baby, Peter (or Ann, or William, …) led a life of attention that was not divided from life itself. At that time, Peter was not 'conscious' – at least not as professor Dehaene would define consciousness. Peter was submerged in the first wave.
2. Then Peter grew up into an adult. He began to lead his life in a completely 'dissociated' way, living under the illusion that the unconscious was unimportant. To be honest, Peter did not give the unconscious any thought at all. He was convinced that he had his whole life under *conscious control*. Peter tacitly assumed that every single life domain – including health, relationships, business, politics, religion, and so on – could be described in conceptual language, using well-defined, seemingly self-evident terms, strung together in a logical way. Meaning was only superficial or 'semantic' meaning: the meaning one can find in a dictionary. Peter, for instance, was religious, but he thought there was nothing about religion that could not be described by theology. But Peter got ill: he suffered from colitis and eventually had to stop working, diagnosed with a 'burn-out'.
3. Is there another way for Peter to lead his life? There is. In *Heal Your Self*, I describe what it means to 're-connect' the conscious self with the deeper self (the unconscious). This can bring relief, not only to our imaginary person, Peter, but to everyone who wants to give autosuggestion a real chance. Realizing the third wave in one's life will have effects on health and on other domains such as spirituality and human relations. Collectively humanity may now be on the brink of the third wave, a whole new stage in the evolutionary history of life.