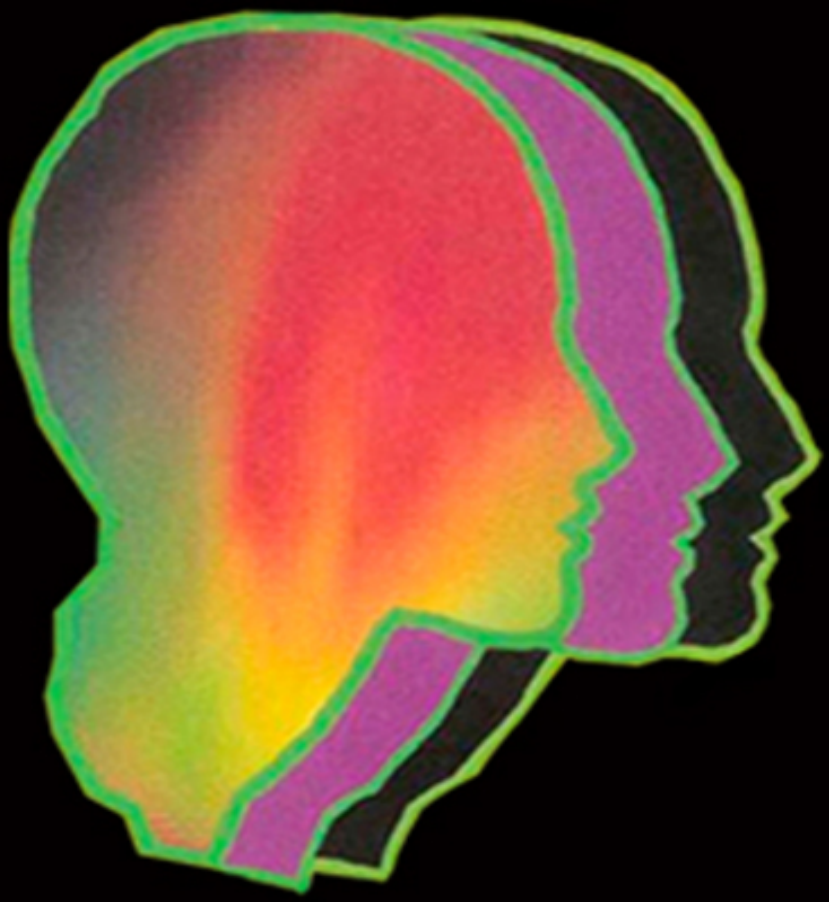
The unconscious zone

The secret life of your brain



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Content

Introduction
Intuition and the unconscious zone

The concept of “The Unconscious Zone” in this book pertains to our mind areas where many intuitive decisions and subliminal influences are unconsciously. As people are we exposed daily for hidden impacts that are not recorded by our consciousness. We says that we have decided after our gut feeling or that we, without conscious knowledge, intuitively just know how something is connected. Many famous scientists (for example Einstein, Maxwell) have shown to their intuition when they suddenly discover new previously unknown lows in physics. New findings in brain research on perception suggest that our consciousness only to a little extent can take advantage of all the information as our senses produce.

Brain researchers have shown that we have a delay of approximately 0.5 seconds before we become aware of such as sights that are generated in order of 10 MB/s (10 million bits of information per second). This delay would be able to be fatal in situations where we need to react instinctively when any dangerous occurrence (escape, risk of injury). The brain has solved this by reacting automatically without a conscious mind in many situations. If we for example run the car often do not know how we have operated the car forward to destination, then driving has become an automatic activity until it eventually something happens unexpectedly.

We may in many cases work out a capability to automatically conduct as a Budo sports, in which the body is trained to instinctively perform appropriate parades without

conscious intervention. Even in many monotonous work situations tend we perform work to daydreaming, while the body automatically performs the learned work phases. As difference from previous position is “Flow” a special condition where you go into a task and literally engulfed by the workflow and to become unaware of time and environment. It requires some prerequisites for that end up in the flow State.

We are also talking about hidden (silent) knowledge in different work areas, which sometimes says that the company’s knowledge is sitting in the walls. Faithful employees with many years of experience in a company have often an unconscious knowledge which, as it was, sitting in the spinal cord. An example is from Ericsson Microwave (former employment) where a waveguide for microwaves to Tele-X satellite with especially high demands on accuracy (1/100 mm) were turned. They got hire a pension based turners with long experience of a special lathe in order to keep the necessary accuracy of the wave guide.

In everyday life is contemporary man prone to unconscious influences in many contexts. Behavioral Science has revealed our buying habits and thus designed the stores to merchandising, the lighting, the color and background music has been adapted in order to trigger optimal needful things of the customer. Even the advertising industry is exploring how best to get the attention of newspaper ads and TV commercials. In this context, talking man of subliminal perception where we have made attempts to put in the occasional advertising images in movies which we do not see consciously but that nevertheless can give subconscious message.

A different unconscious influences which we daily suffer for is our relationship to body language. We have more often an intuitive way to interpret the signals as the surroundings gives. Chapter 6 provides an overview of how we can become aware of this influence.

New development of electronic devices for measurement via electrodes on the body by normal unconscious endocrine functions has resulted in a new therapy work activities referred to as biofeedback. The equipment is designed so that the patient visually or sonically can see the current status of the measured variable. Through biofeedback can you affect the heart rate with conscious suggestions and immediately see the effects on pulse rhythm. Therapeutic biofeedback is used to, among other things affect stress-related medical conditions. Similar effects on the body's endocrine system, it has in thousands of years been able to influence via Yoga training. Methods for reducing the respiratory rate, heart rate and metabolism are included in many Yoga traditions.

Later time brain research has completely new possibilities to measure the brain's internal work by identifying the neural networks via computer-controlled measurement methods such as functional magnetic resonance tomography (fMRI) and Magnetoencephalography (MEG) and Transcranial magnetic stimulation (TMS) and others. Through these methods can we today in detail follow the brain's work and identify many of the unconscious activities that shape our thoughts. For people with neurological disorders, this will result in completely new treatments.

Hypnosis is used in medicine as stunning at certain operations, and as therapy for, among other things smoking cessation and curative of phobia. More recent research has shown that hypnosis is a special State of consciousness in

which to measure eye movements and EEG (measuring electrical activity in the brain via electrodes on the outside of the scalp) which gives specific patterns that differ from normal awake consciousness.

Placebo/nocebo effects that affect us, among other things in disease treatment have been identified via modern research methods. Even in Sweden carried out this type of research at the Karolinska hospital in Stockholm under the leadership of Professor Martin Ingvar. Results from the placebo research have already had an impact on the development and testing of new medicinal preparations to safeguard the positive impact that placebo can bring.

In psychoanalytic terms, according to Freud, so he talks about different layers in the personal consciousness that he resembles at the iceberg which floats on the water's surface. Over the surface of the water is the conscious ego and beneath the surface is the subconscious as similar to iceberg have the greatest content. Water surface is symbolized by the term preconscious containing perception which can be reached with some effort.

C G Jung, one of Simon Freud's earlier assistant, drew up its own theory when he introduced the term the collective unconscious state where the concept of archetypes was introduced.

In the book outlines for parts of the latest research results of the brain's complex neurological structure. In Chapter 3 "Can brain be hacked" is given a selection of brain research that in a future even that can penetrate below the skull and register the inner monologue of an experiment object. Chapters in the book can be read independently of each other as articles in each topic area. Each chapter ends with a summary of its contents. Chapters 1 and 2 provide a more

neurological background regarding the brain’s inner workings. Tentatively, it is in the table of contents, select any chapter that arouses most interest to read first and then read about the neurological background in chapters 1 and 2. Then each chapter keep new definitions and background descriptions should be in order to get a full understanding of the book “The Unconscious Zone” do a second reading from the beginning to what is between the lines shall be shown.

Chapter 1 Consciousness, human's perception and limitations

The universe of neurons

The human brain as well as the deep seas is two of the planet's remaining non-researched white places, where the science stands before big challenges. Mankind has relatively recently invented tools for being able to identify the physiological-strategic processes in the brain witch humanity earlier only have been able to explore through speculation and assumptions. During the last few decades in the context of the fast computer development have brain researchers got new methods of magnetic imaging (fMRI), EEG, PET, MEG and TMS. These methods have open possibility's to map out the many different activities in the brain's neural networks and led to that we started to make out individual thoughts in a person's brain. The human brain is probably the most complicated structure in the universe with about 100 billion brain cells (neurons) and where each neuron can have up to 10000 nerve connections with other neurons in the gigantic network. The complexity of these networks carrying gigantic amount of connections and in comparison are current supercomputers, far from being able to simulate these complex neural networks.

Researchers have successfully mapped the genetic information in the human genome within an international project for 10 years on the project, HUGO (Human Genome Organization). Recently started a long-lasting project in the United States at UCLA University in Los Angeles where the research under the direction of Professor in Neurology,

Arthur Toga on corresponding way should identify the entire brain neural network. This project is called “The human connectome project”. In Europe there is a similar 10-year project entitled “Human Brain Project” (HBP), which focuses on with computer simulation of single neural network gradually try to make simulation of the whole brain networks.

It is said often that we as humans use only about 10 % of our brain power. The truth is probably in the reverse that the majority of the processes in brain, about 90 %, are unconscious, while we are conscious of approximately 10%. The brain can be compared to today’s computers, which now used parallel computing cores that can process data at the same time to increase computational performance. Similarly handles brain stimuli from our minds in different parallel neuron network which gives a tremendous increased data processing and simultaneous capacity.

The book’s title “The Unconscious Zone” would try to give an understanding of all the unconscious processes that are going on in our brain. In the following Chapters describes many of the things that are going on in our brains there we typically are unaware of its impact on our emotions, behaviors and decisions. In this first chapter gives more general properties of the human brain to be described in order to provide background information regarding basic anatomy, physiology and cognitive properties. If the reader wants to immerse themselves in some of these special topics there are given suggestions to literature in the book’s reference list. The heading of this chapter “the universe of neurons” would point to the importance of the neurons various network whose complexity is comparable with our current knowledge of the universe’s unimaginable size.

Despite that we in our conscious mind as a human experiencing the world as a tridimensional continuous experience (analog), there are many limitations in our senses and in the brain's processing of the incoming stimuli from our surroundings. Our sense of time can for example be affected partly by the emotional content where a certain dull activity can give a perpetual long boring feeling. While the experience of time in childhood, when the most experience is new, due to a summer holiday can be experienced as an eon of time. But in adult age you think that the vacation in the summer just goes too fast. Purely philosophical one can consider what is meant by time and how the causal event processes together in terms of present, future and past (history).

One who pondered deep in these matters is a church father Augustine of Hippo (years 354-430) who in his classic book "Confessions" (book 11, § 17-41, ref. 1.1) in connection with thoughts about how God created the world, gave his views on how we as humans experience time. Augustine notes like Aristotle: that all know what time is, until they will be asked what time is. Augustine's indicates that time is related to events in the past (past tense), things that is ongoing (present) and things that are expected to be in the future. Already there notes Augustine an obvious thing, if time is defined by things that will happen, persist for a short period of time and then disappear the time as an ultimate consequence is undefinable. When Augustine asks the question of how far the present is: year, months, one day, one hour, one minute or one second, he comes to the conclusion that the present moment is only the transition between future and past and thus do not have a degree, but only the line in between. He notes that the present time not taking any space and has no extent, then each duration would instantly become past and future yet not exist. The past (past tense) are not existing but survives as the

pictures in the memory in the present, while the future on the other side gets his existence of predictions based on phenomena that exist in the present.

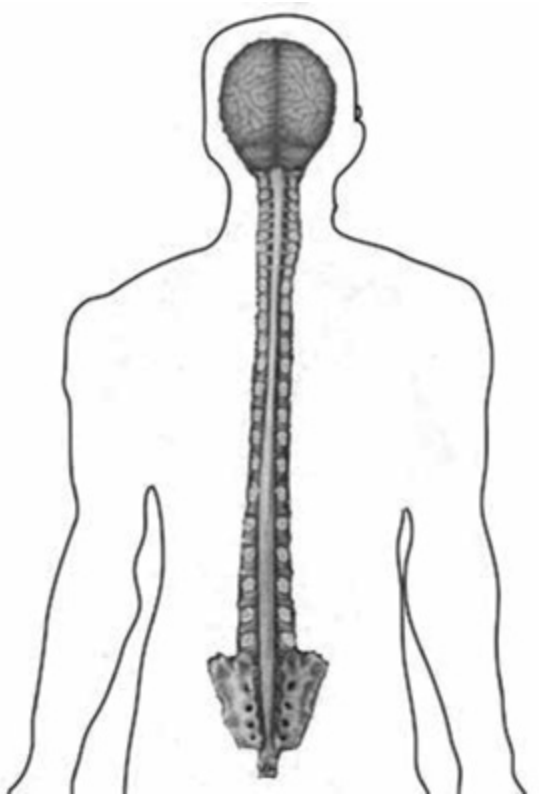
Despite these contradictions is Augustine's willing to accept the usual meaning of past, present and future and reason about how to be able to measure the time which passes the moment now. He indicates that it is possible to measure time with inspiration from astronomy to measure time with the movement of heavy bodies like the Sun, where the Sun's time in a day and a year can define time. When Augustine realizes the undefinable in time concept gives he proposed that it is the soul that would be made up in the eternal present. This issue of time and the experience of the present moment are interesting in the context of how the brain's perception and consciousness sense our perception of "reality". Augustine's exposition on time (present, future and past) is subjective terms that can be linked to the human mental functions like perception (present), anticipation (future) and memory (past).

The nervous system

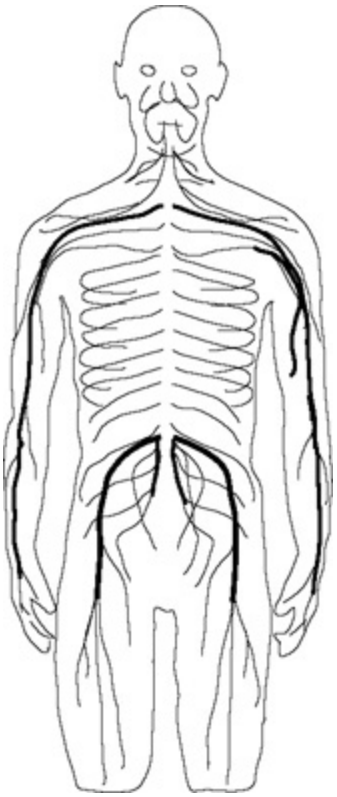
The brain's perception of time is shaped by a number of physiological properties of the human body. First a short simplified examination of the human nervous system's construction. It divides into the central nervous system (CNS, see fig. 1.1) consisting of the large brain (Cerebrum), Cerebellum and spinal cord, which is located in the spine. On the other hand, the peripheral nervous system (PNS) which is made up of all the nerve fibers that run in and out from the brain and spine cord which is associated with, among other things muscles and senses for sight, hearing, touch, smell and taste. The incoming signals from senses goes to the thalamus, which distributes the signals on to the

different senses center of the cerebrum (see figure 1.3). Central nervous system takes the sensory signals from the peripheral nervous system and controls, among other things muscles and inner organ with motor output signals to the peripheral nervous system. The brain may through consciousness control e.g. skeletal muscle (somatic nervous system), while many activities in the body is controlled automatically, as for example heart and lungs via the autonomic nervous system.

The autonomic nervous system is in turn divided into the sympathetic nervous system, which acts in situations in which the body needs to be enabled in e.g. threats and the parasympathetic nervous system, which is activated in rest periods with the reconstruction and recovery of the body. Nervous systems are also linked to the endocrine system in the body that, among other things by the hypothalamus controls the different glands in the body via hormones in the blood system



CNS



PNS

Fig. 1.1 Central and peripheral nerve system.

The brain weighs about 1.4 Kg and is made up of the cerebrum, brainstem and cerebellum, but despite the brain›s small size in the body it consumes ca 20% of the body›s total energy. The brain stem is the brain›s primitive part but takes care of many autonomous vital functions such as heart rate, breathing and even all incoming sensory information from the body›s senses (except the smell) that is distributed to various parts of the cerebrum where further processing continues. The cerebrum is divided into two hemispheres a left and right hemisphere where a deep longitudinal furrow separating them for and in its bottom is Corpus Callosum that connects the two cerebral hemispheres with an extensive networks. Each hemisphere are divided in frontal lobe, parietal lobe, temporal lobe and occipital lobe see figure 1.2.

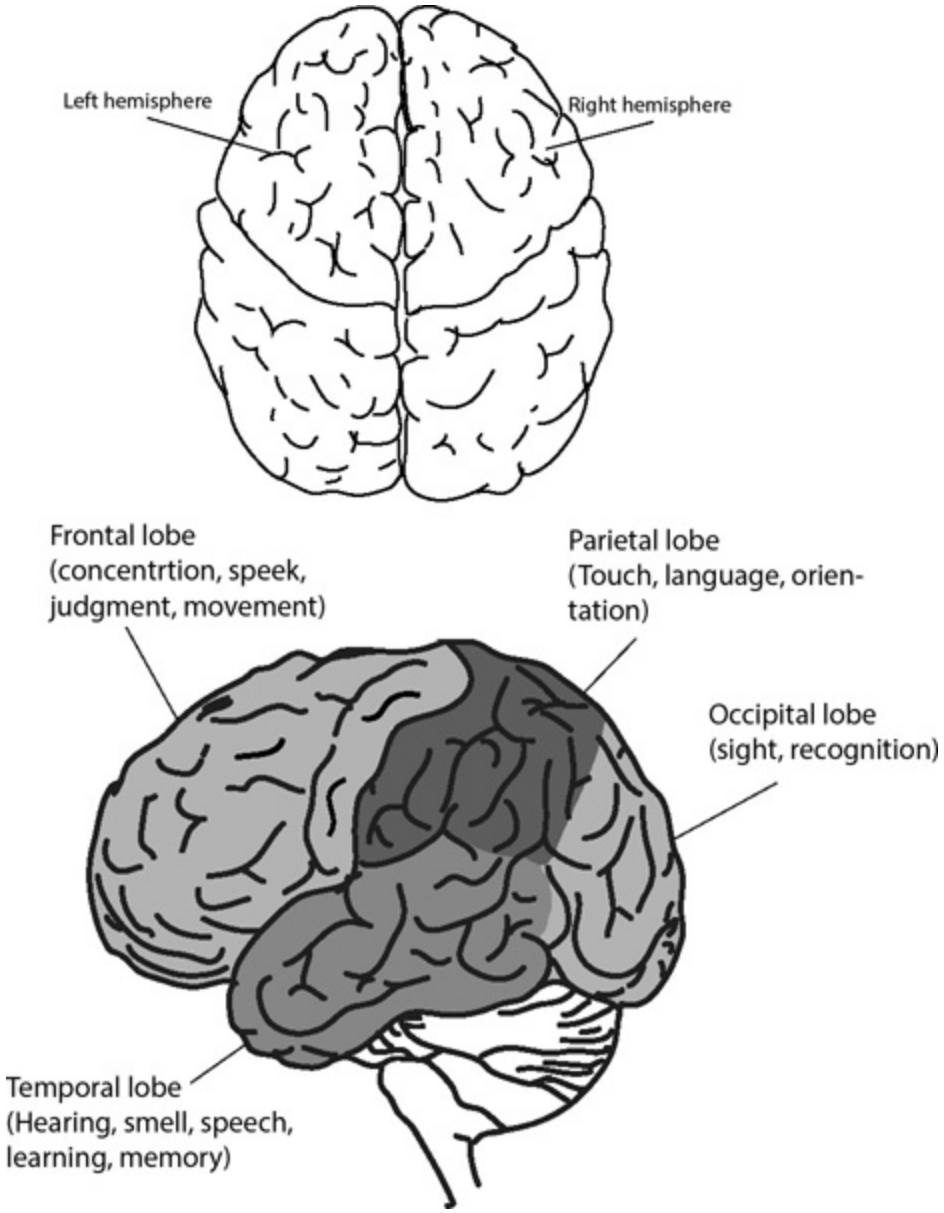


Fig. 1.2 Brain anatomy, lobes

Each of the two cerebral hemispheres have different function than the left part is dominated in language, logic thinking, mathematics and detailed knowledge, while the right hemisphere instead has a better spatial perception, favoring creativity, spontaneity, musicality and gives a more holistic capability. Coordination of impressions in the two cerebral hemispheres is by the Corpus Callosum. The Corpus Callosum is crossed nerve pathways from the brain

to the rest of the body where the left hemisphere controls the right half of the body (arms, legs , etc.) while the right hemisphere in the same way checks left body limbs. The majority of people who are right handed, have the left hemisphere as the dominant brain function and some believe that the mind in the first place is emanating from there.

When physician especially during the 1950’s were performing operations on patients with severe epileptic seizures by cutting the nerve connections Corpus Callosum in the brain between the cerebral hemispheres they could remove or reduce the symptoms of patients (“split brain” procedures). As a side effect the patients got problem with the coordination of sensory input in the two brains hemispheres as in some cases could give the patient a sense of conflict between sense signals in the two hemispheres. The American neuro researcher Roger W Sperry (1913-1994) received the Nobel Prize in medicine in 1981 for his discoveries on the brains different features of left and right brain. Sperry had earlier in 1940 and 1950 s researched with animal testing on frogs with their vision nerves and partly on “split brain” surgery on cats and dogs.

Sperry got in the beginning of 1960’s ability to make tests of the cognitive/mental ability of patients who undergone split brain surgery for curing severe epileptic seizures. One of the patients was a man who daily over a ten-year period suffered from severe seizures from injured in the earlier world war. Sperry designed test methods to identify how “split brain” the operation had an impact on the patient’s consciousness and cognitive ability. Tests showed that the patient had a division of consciousness in the left and right hemisphere because that the information channel between the cerebral hemispheres had been cut.

In a first test series carried out early after surgery the patient was given a visual test where the subject had to fix his gaze on a midpoint on a monitor and then was shown various images on the left and right part of the screen for a short time. When the eye nerves partially crossover saw the left brain right and left eyes retinas right field of vision while the right hemisphere saw the right and left eyes retinas left field of vision. It was also in the test that the patient would pick up a similar object behind a screen with his right hand or left hand that had been displayed on the monitor (see Ref. 1.2, 1.3).

The result was that in the eye right field of vision could subject only perceived by the left hand and/or verbally, while in the eye left field of vision could object only be perceived with the right hand but not verbally. If both hands were left free to point out objects was chosen right hand for eye left field of view and the left hand in the eye right field of vision. Similar results had been at the tactile impact with a toothpick on right leg where the right arm could point out the contact point, while the left arm only had random designation. On the opposite side was the reverse to stimuli of the left leg could only single out with his left hand. The patient's location of tactile stimulation in the face, head and back of the head with both hands worked and could also be expressed verbally, which showed that these neural pathways follow the cranial nerve to this region. Sperry summarized the results as follows:

- Visual information was only available in the hemisphere that each eye right or left field of vision was linked to and only the same body's arm could point out the right items from the field of view

- Activities involving speech and writing worked only in the left hemisphere.

- Tactile influence followed the same pattern for left and right hemisphere that the visual information above, but tactile stimulation in the head region were intact and this could both sides point out stimuli sites and also provide verbal information.

- The result support earlier theory about the two hemispheres specialization there left hemisphere work better in talk, writing and logic while the right half is for spatial and artistic styles creativity.

- The Corpus Callosum in a normal brain Exchange information so that the necessary coordination of information between left and right hemisphere are available to consciousness.

It is a time delay of approximately 20 mS when stimuli are sent between the cerebral hemispheres through the Corpus Callosum.

The brain's higher mental functions are localized in the cerebral cortex which is the pleated layer which is surface on the cerebrum and is about 3-5 mm thick and contain very complex neural networks. Surface layer is grey and contains neurons links in different complex networks while matter in inside are white depending on the axon connection outputs from the neurons which is surrounded by myelin coat that has a white color. In addition to the approximately 100 billion neurons in the brain there are 10 times more different types of support cells that are referred to as glial cells. These cells support the second neurons with nutrition, immune system, form myelin coat, etc. The cerebral cortex contains a number of centers for, among other thing sense of touch, movement, language and higher mental functions including association areas for decision-making, logical reasoning and planning. This in order to

process and combine all the information into an overall picture, which is why many believe that the human consciousness is shaped in the cerebral cortex.

The cerebellum (see fig. 1.3) sits at the bottom under the cerebrum in the back of the brain and is like the cerebrum divided into two hemispheres with pleated layers. The cerebellum will communicate with the cerebrum and spine-cord through the brainstem and the bridge (pons) with the help of numerous neural networks. You can see the cerebellum, among other things as a coordinator of the body's coordination movement, balance and control of the body posture. Fine motoric movements are monitored and rehearsed movement programs such as cycling, swimming or a somersault are stored in motion memories. When they have been practiced in is they left over long times as when you a time learned to ride a bike it last for the rest of the life. In a later chapter on body consciousness concerned cerebellar function in pursuit of budo-sports.

Communication via spinal cord contains information from receptors in muscles, joints and tendons on their mutual positions of control of movement and posture. From the brainstem are signals from balance cores and motor skills. By nuclei in pons are signaling from the brain-cortex sensory and motor cortex received. Research has also indicated that movement programs probably created in an "internal model" of trained operating projects in the cerebellum. Incoming perception from the body's sensors are compared with the internal model's status to be able to continuously correct the deviation. If reported deviations are too large for normal correction is called movement center in the cerebral cortex for intervention. Normally releases the cerebellum cerebrum from routine work with micro-management by body motions' as in for example normal driving by a skilled driver offloads much brain work. Later time research

showing that in addition to regulation of motor body movements, processes in our thinking and our emotions are managed in the cerebellum that dealing with numbers, speaking and writing on an ongoing basis with the fluency of movements.

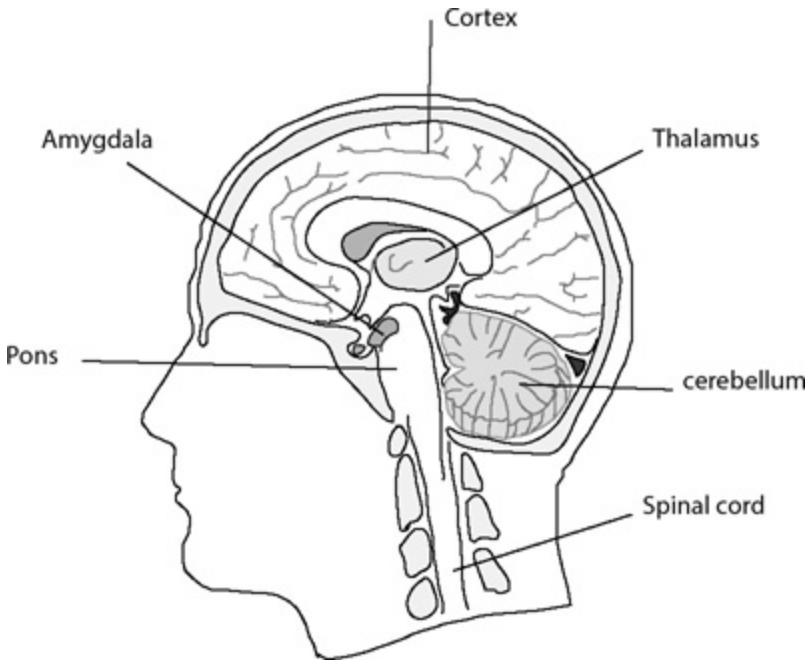


Fig. 1.3 The brains anatomy

The nerve cell

A neuron cell which is the basis of the brain and nervous system have in detail a very complex composition, which is outside this book detail level, but it provides a rough description of the most important parts of a neurons. In figure 1.4 shows a simplified picture of the neuron structure. Like all cells in the body is deep down a nucleus which contain the genetic code for the cell's biology. The surfaces of the cell are the membrane that forms the boundary for the area. Some important protrusions from the cell membrane is on one hand, they often many short spiky protrusions called dendrites which is the port for the signals

from the environment and secondly the only long protrusion called axon, which is the cell's output as connected to the next neuron.

Inside the neuron is signaling by nerve impulses through electricity and between a cell axon and the next cells dendrite is a structural unit which is called the synapse and which give signal through the release of chemical neurotransmitters. These signal substances (neurotransmitters) such as acetylcholine is a signal substance usually seen in central nerve system synapses. The signal path is: electrical-chemical-electrical...;. The electrical signal is generated chemically in the neuron cell and gives a voltage of around -70 mV between in and outside of the cell membrane in the rest. Activation of a nerve cell by a dendrite is made through a chemical reaction the exchange of sodium ions Na + and potassium ions K + in the cell through ports in cell membrane whereby voltage is approximately + 30 mV on the inside (see figure 1.5). After that there are made a reset to the cell's rest voltage -70 mV, through a new gear ratio of sodium ions and potassium ions through the gates in the cell membrane.

As figure 1.5 shows a voltage pulse that propagates through axon to next nerve cells synapse and releases signal and this voltage pulse called the action potential. The receiving nerve cell receptors at the synapse that is susceptible to the current signal substance (neurotransmitter) and if the cell is stimulated with sufficient amount of signal substance occurs also in this cell an action potential which via its axon is sent to the next nerve cell. The impulse can then go through many nerve cells before it e.g. provides a response in a muscle. There are also neurotransmitters which instead can inhibit a cell in to bring a nerve impulse in nerve chain.

The cell can therefore only deal with one nerve impulse at time before a new one can be generated, which means that if a nerve fiber is activated during a certain period of time it sent pulsing with nerve signals that the interval between pulses determines the intensity of such as a muscle activation. An increased frequency of pulses gives greater activity in the muscle cell, see fig. 1.6. When the signal of stimuli by the nerve fiber is a combination of electrical signals and chemical transfer between neurons in a nerve chain will signals to be delayed various long upon arrival to the brain's sensing center. This is depending by how long the signal path a nerve fiber has for example from a toe or from the nose.

Back in the 1840's, the German scientist Hermann Holmberg measurements on a frog leg for measuring the nerve signal propagation speed and came up to about 30 m/s in a frog. When it comes to a person's nerve the out signal delay from the nerve cell's axon depends on wing of diameter on the axon and if it have a surrounding body cote called myelin. One can roughly divide the nerve fibers in three categories:

- A-fiber: Fast, up to 150 m/s, (rough, myelin) is included in e.g. motor neurons.
- B-fiber: Half speed, about 15 m/s, (medium pile, easy myelin) included in e.g. sensor from the skin.
- C-fiber: Slow, about 1 m/s, (thin, not myelin) according to previous.

Generally, we say that the rough of quick nerve fibers connecting the nerve pathways from for example feet and legs (for example. sciatic nerve) which provides faster transmission on the relatively long pathway to the brain.

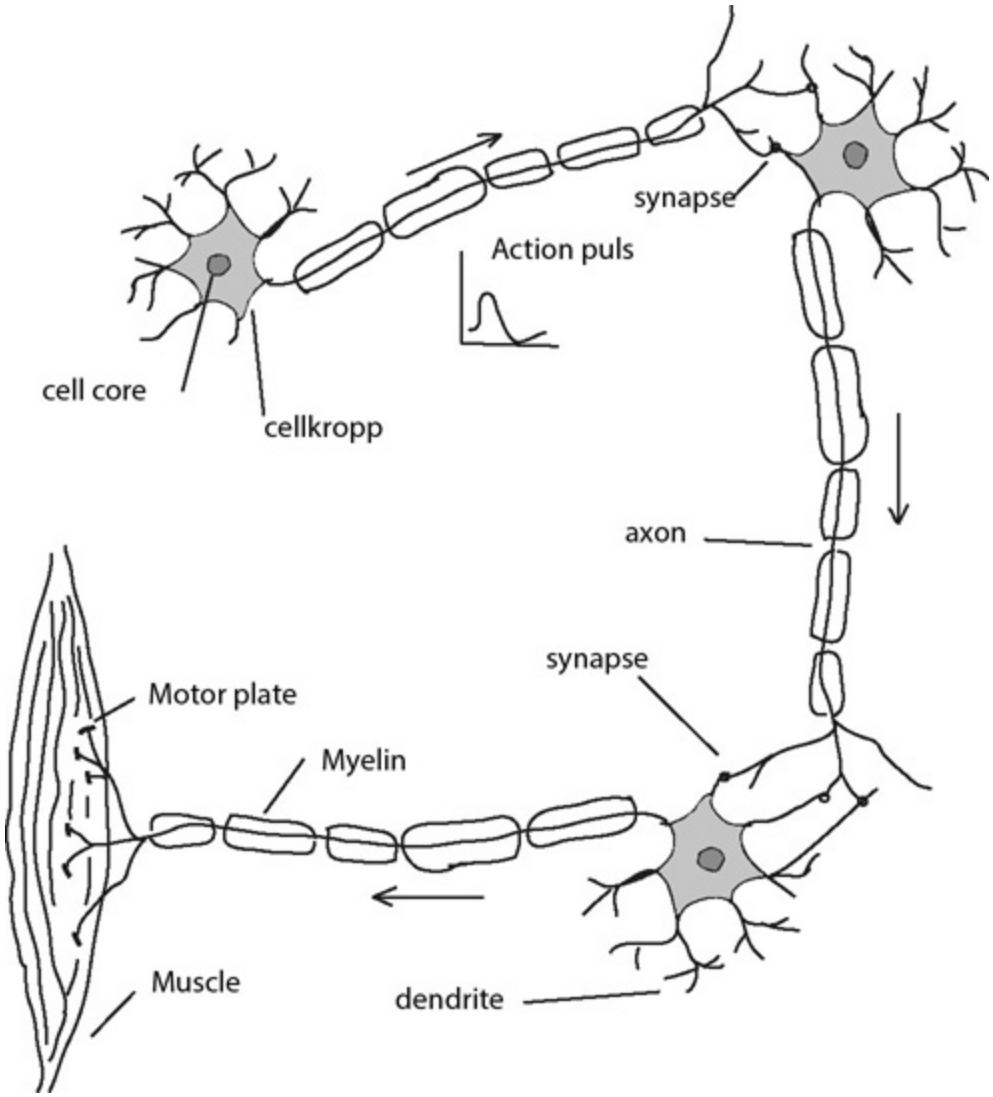


Fig. 1.4 Nerve cell anatomy and function

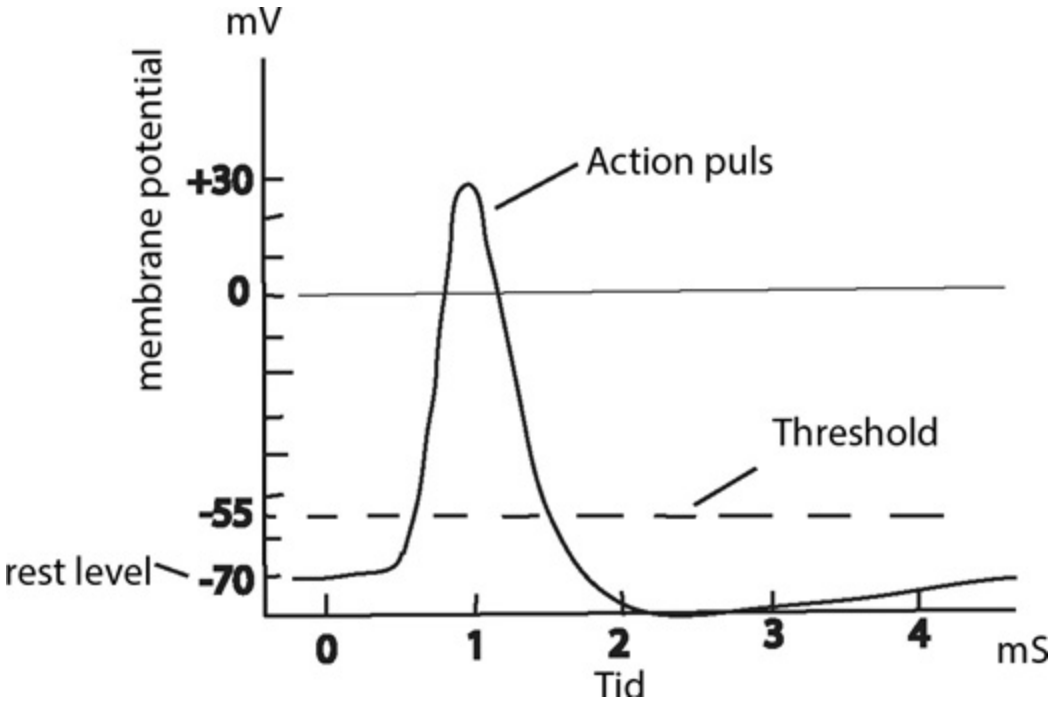


Fig. 1.5 Neuron action potential.

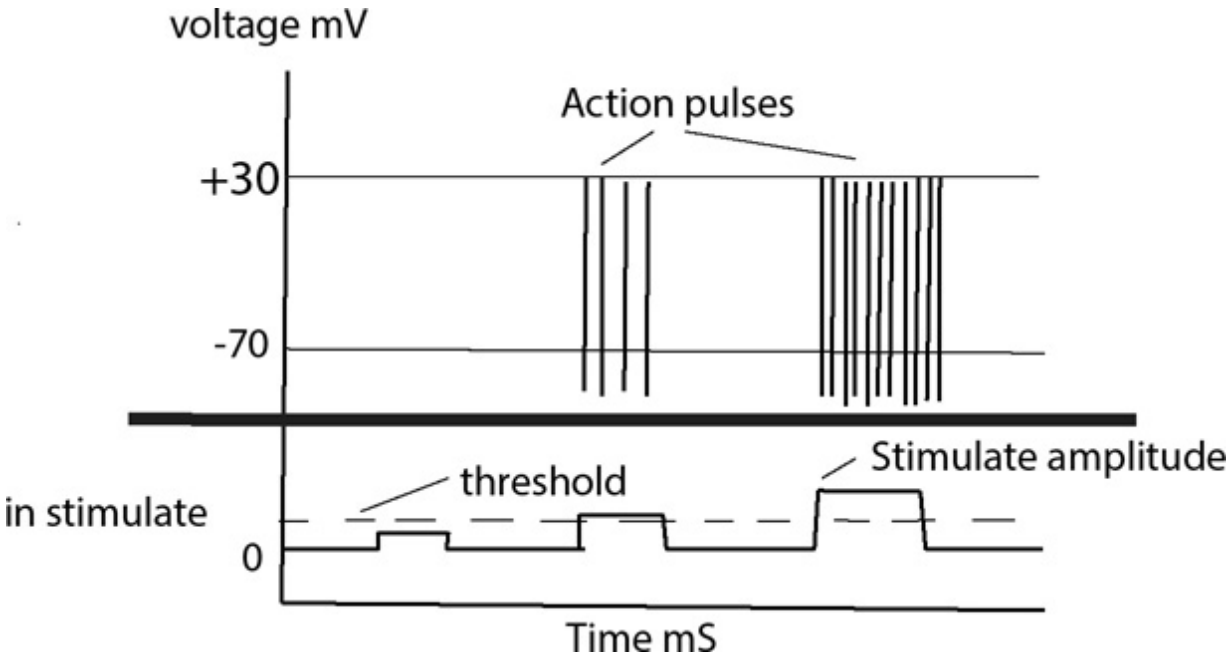


Fig. 1.6 Propagation of nerve signals

The image of a neuron in figure 1.4 is just a general basic picture of motor neuron, while it in the body is a number of different types of nerve cells which are structurally and

functionally different. When it comes to so-called afferenta nerve fibers, which results in nerve impulses to the brain by spinal cord, there are a number of different types this result in nerve impulses for control of the body's external environment, the body's internal environment, body movement and body posture. Below is reported some important types of these nerve cells.

- Mechanoreceptors: React on squeeze, vibration or strain, during sound, body position, blood pressure or touch.

- Heatreceptors: react to temperature changes in the skin and the hypothalamus. Some register cooling other heat.

- Chemoreceptors: react to change in the chemical environment including the blood's content of oxygen and carbon dioxide, while others respond to odors or flavors

- Photo receptors: reacting to the incident visible light with cones and rods in the fundus (electromagnetic waves).

- Nociceptor: Pain receptors, reacts on tissue damage in the skin, articular capsule, periosteum or blood vessels.

The skin's nerve pathways for tactile areas (dermatomes) led by spine cord to special areas in the large cerebral cortex (somatosensory cortex). Where can you locate areas for each nerve connections that form a map of the body's different skin area. Level of details depends on e.g. that a finger have many neural pathways for sensitive motor skills, while other areas of skin give coarser information (see figure 1.7).