

## The Brain and the Mind

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### Introduction

The skull contains two entities: A physical brain and a non-physical mind. Being physical means it lends itself to examination by, say, a microscope, and it is a suitable subject for scientific study. Being non-physical means you cannot examine it by any physical instrument, and it has been considered beyond the scope of science. An entity of the mind like consciousness, has therefore been dismissed by the scientific community, and scientific studies related to the operation of a mind has been limited to observing physical reactions to various physical influences, behaviorism for short. Unfortunately, the scientific examination of the brain, neuroscience and the mapping of the brain circuitry, is incapable of analyzing or saying anything about the mind.

Physically, the brain is jellylike mass of fat and protein, consisting of some 100 billion nerve cells called neurons. The neurons do little more than transmit electrochemical signals which are forwarded via a network of axon nerve fibers to millions of other neurons. There are no physical signs of a «mind».

But the mind makes itself strongly perceived by the presence and existence of feelings and thoughts, and it deserves, as a matter of course, our full attention. What cannot be achieved by «exterospection» must be obtained by the tool of introspection. But when you explore the mind by introspection, you of course make use of what you learn of neuroscience, about sensory signals and about brain areas devoted to certain functions.

One important feature of the mind you do not learn from using a microscope, but from a stereoscope. When you put two flat, two-dimensional photographs before the stereoscope lenses, you may at first see a confusing mixture of the two, but by slightly adjusting the photographs you suddenly see *one* picture with the quality, or qualia if you like, of having *depth*.

The only explanation of this phenomenon is that the two brain areas receiving the respective images of the photographs, somehow integrate the two and by synergy produce to the mind one *higher level* image of the two separate, constituent images. An effect of a phenomenon I call synergistic integration of neuron assemblies. This article tries to illuminate this in more detail.

### Brain Signals and Synergistic Integration.

You definitely know you have a brain, and you perceive a mind inside the brain. It is your mind that

observes a putative outer world through your eyes, as if your eyes are two holes in your skull and your mind harbors some sort of a homunculus staring out through the holes. But the world you see is not the real outer world. What is out there affecting your eyes is a mixture of electromagnetic waves of a large specter of wavelengths, being reflected by the surfaces of colorless objects out there. Waves of a narrow band of wavelengths enter the retina of your eyes and, according to scientific findings, produce colorless signals of electrical and chemical nature. These signals are filtered by so-called tuning circuit cells in your brain and analyzed according to simple elements of the image, like orientation of edges between light and dark portions of the images on your retina.

The ensuing new signals are raw visual data and flow further into your brain and activate groups of neurons (neuronal assemblies) in the visual regions of your brain. These regions are connected to other regions in your brain via neuronal axons. The activation of all these affected neuron groups integrate synergistically and result in a conscious experience of the world and objects outside your eyes. Seemingly making a good representation of the outer world. Certainly a very useful one. But the objects you see are not an accurate representation of the real world outside, but have, among other things, attained colors, like red or yellow, which don't exist in the outside world having these characteristics.

These conscious experiences are happenings in what we term a mind, our mind, in contrast to the neurons themselves, mediating these experiences, which reside in a physical brain, our brain, which are part of the outside real world.

Some of the interconnected neuron groups have nothing to do with the signals coming from the eyes. They aid the conscious vision by filling in information to the the raw data from the eyes. It is known that persons born blind, and having gotten their sight in later years, they become conscious to a bewildering mass of light, colors and shapes, unable at first to making out what they see. It takes months of moving around, touching objects and associate the skin receptor inputs with the images they see, before they can make sense of what they are observing. During this time the interconnecting neuron groups are being trained to associate the raw details from the eyes with the associated sensory feelings of touch and moving around. Newborn babies see the same mass of bewildering details from the time they are born and automatically go through much of the same training as they grow up.

So, it is the neuron groups in the visual brain regions activated by the signals from the eyes, which together with the interconnected supporting neuron groups elsewhere, make us conscious of a three-dimensional space and the colored objects. The experience of directly observing the real world through our eyes, is an illusion. The input signals from the real world reaching our eyes, activate all the relevant neuron groups in our brain, and when they are activated they somehow *synergistically combine or integrate* to give us the illusion in our mind of e.g. sitting in a room and seeing little colored objects around us, and that in *three dimensions*.

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The effect of three-dimensionality, or depth, is also an illusion. When we look at an object we receive inputs to both our eyes, each of which is an upsidedown, two-dimensional, flat image forwarding signals to two separate neuron groups. These groups somehow integrate synergistically to give us a perception of three-dimensional depth. We can see this dramatically in a stereoviewer, when we carefully adjust two two-dimensional photographs placed in front of the stereoviewer lenses and suddenly see the objects on the photographs appear in depth, that is, seeing objects at apparent different distances. There is no doubt that we are dealing with an illusion. A little displacement of the photographs and the illusionary experience of depth is gone.

There are three different cones on the retina of the eye, sensitive to wavelengths respectively associated with the experience of red, blue and green colors, and they send signals to respective groups of neurons in the brain. But there are no cones for the color of e.g. yellow. On the other hand, the cones for e.g. red or green, are not sharply tuned for one particular wavelength. The cone is sensitive to wavelengths on each side of the primary wavelength, including wavelengths into the yellow region. Thus, a yellow light will result in producing brain signals, of a lesser amplitude, going to the red groups of neurons, and as well as brain signals going to the green groups of neurons. Experience-wise, the net effect is not a mixture of red and green colors, but of a distinct yellow color. One might assume that the experience of a yellow color also is a result of a synergistical integration of associate, interconnected neuron groups pertaining to red and green.

In general, It looks as if conscious experiences always result from a supposedly synergistically integration of a multitude of interconnected groups or assemblies of neurons, never from a single neuron or even a single group of neurons. This phenomenon can explain many of the occurring phenomena of the mind, as will be shown later on.

All creatures having two eyes must experience the real world as we humans do. But the quality of the conscious experience must be different, because we have far more groups of neurons than most other creatures have, with the potential of integrating synergistically far more brain regions than they can. and having a far wider conscious experience. Furthermore, one important aspect in that respect is our ability to *reflect* on what we see, and not depend on instincts to take actions on what we see. In order to reflect on things, you have to be able to *think*, which brings us to the subject of *thinking*. That is, thoughtful *reflection* rather than automatic *reflexion*.

Today you can dissect the brain, study neurons and axons with microscopes, and monitor certain brain activities with a brain scanner. But you have no scientific instruments with which to explore the mind or prove the existence of conscious experiences. In order to do so, you have to resort to introspection, by probing your mind, observe all feelings and sensations that you experience, and reflect on everything you observe in your mind, by the act of thinking.

I happen to know at least two languages, and when I think, I can do so in either the one or the other language. When I do think I observe that thinking is like to inaudibly *hearing words*, it either be in one language or another. I conclude that thinking is a process of constellating sounds, seemingly inaudible sounds. Spoken words are stored as sounds, the sound of a word having been pronounced and then stored in assemblies of neurons dedicated to sounds. The meaning of a word results from interconnecting and synergistically integrating the sound group of neurons to other remote groups of neurons representing various aspects of what the word is supposed to express. If the word is «apple», aspects include the appearance of apples, the taste of an apple, the spelling of the word apple, the word for apple in other languages, etc. etc. Experiments with brain scanners have shown that a person thinking of one particular word can activate 80.000 or more neuron groups throughout the brain.

Every word we think of, may involve that many neuron groups, any number to at least 80.000. With each word we become conscious of a particular associated entity. The accompanying feeling we have of consciousness in each case must vary accordingly, and must depend on the particular neuron groups involved in each case. A general seat of consciousness somewhere is therefore not likely. (It may be so that certain areas in the brain are instrumental in mediating conscious experiences, but only as an instrument, as a part of the brain circuitry, not storing whatever we are conscious of).

The activity of most of these up to 80.000 neuron groups is subconscious. It seems the conscious feelings we get, rather has something to do with the phenomenon of the synergistic integration of all the pertinent neuron groups, *as in the case of perceiving depth*. And is in each case concerned with, and limited to, whatever subject we are focusing on. Say, we are focusing on the subject of fruit. We become conscious of fruit as a class of fleshy plant seeds, not very conscious of the associated examples of fruit, and not conscious of, say, the spelling of the word fruit. The interconnections and the various neuron groups that contribute to give, by synergistic integration, the conscious feeling of the general subject of fruit, are active, but unconscious.

If we now focus on the subject of cars, the accompanying conscious feeling on that subject, will be separate from the conscious feeling we had for the subject of fruit. In other words, there is no general consciousness at play, only a temporary, fleeting consciousness in conjunction with whatever we at a particular moment are focusing on, on which neural assemblies that are activated.

What we focus on, is determined by whatever we receive sensory input signals about, which activates neuron groups related to the present input signals. Hunger signals, say, make us focus on food, think of food, look for food, which in turn may make us think of finding food in the refrigerator, then checking it and perhaps finding it empty. Then go to the supermarket and get a cart and head for, say, the bread department.

The focus may suddenly shift. Upon seeing an attractive girl/boy for example, you will focus on that as long as the associated input sensory signals are active. Most likely, the hunger input signals will eventually restore your focus on the purpose of your presence in the supermarket.

For each step, the previous step will signal you to take the next step. Each step will activate the necessary neuron groups and make you move on, more or less unconsciously.

Birds have eyes and also receive raw visual data through their eyes just as we do. Their visual brain regions are trained and supported by interconnected neuron groups just like ours. As they fly through the woods and avoid collisions with twigs and branches they are to a degree conscious of what they see, like we are. But it must be a type of consciousness that is more or less unconscious. That is, they see, but don't reflect on what they see, and react automatically or mechanically to the obstacles that come in their way. Much like a pianist, not very conscious of which keys to hit next. Personally, I have experienced unconsciously driving a car in a slow rushhour traffic, maneuvering the car, and then, at last, sort of waking up from a deep thought and suddenly realizing that the car in front of me is not the car I had in front of me a some minutes ago. I must somehow have seen the car unconsciously, or subconsciously, and automatically having slowed down to let it enter into my lane (as with blindsight, when a blind person can act on unconscious, sensory aspects of objects in front of him).

A bird doesn't have a brain large enough to able to think and to reflect on what it sees. The brains of most animals are not much more advanced than those of flies, or for that matter, than garden grass cutting robots. To reflect on what one senses, one must have the ability to think. And without the ability to think, creatures don't have consciousness, or are conscious of anything like we do. When they act they do so instinctively, that is, they act according to remote neural assemblies which are activated by being interconnected to the present sensory neural assemblies, and by the process of synergistically integrating these assemblies.

As stated above, we think by using words, which are neuronal assemblies of sounds which in turn are interconnected to other neuronal assemblies giving the words meaning. There are interconnections, not only to our auditory neuronal assemblies, but also to our visual neuronal assemblies. So that when we become aware of an orange, the word and concept of an orange comes to our mind. Since this includes the taste of an orange and the pleasure of eating one, we may reach out for the orange with an intention of eating it. Becoming aware of the orange is no more than saying that we are receiving visual signals representing the orange, or simply, that we are seeing an orange. It is not necessary to establish *awareness* as some special entity or faculty, enabling us to focus on something.

In general, sensory input signals will activate pertinent neuronal assemblies, which in turn will activate associated neuronal assemblies, one after the other, more or less experienced as being

conscious, depending on extent of signal strengths and extent of synergistic integration. The more being conscious of observed inputs, the more being felt as focusing on something.

In addition to sensory input signals starting a sequence of activating neural assemblies, a sequence may also be started by a thought coming to mind, the thought having been triggered by something observed through one of the interconnected sensory neural assemblies, say, the title of a magazine article. This will be the start of a process of thinking, involving neural assemblies pertaining to words and their meanings related to that title.

Whereas the sensory type of sequence may consist of more or less unconscious steps, the steps of a thinking sequence will be mostly conscious. That is, for the neural thought assemblies that are the primary activated ones. Remotely associated assemblies will be less conscious, but will be the ones which may bring the thought process in a new direction, the next primary step. It may be the synergistic integration of the involved neural assemblies which brings about this next step. The new thought may put the subject in question into a new light, even as a moment of «Eureka», becoming the solution to a problem.

Since each step may be accompanied by a feeling of being conscious, the accumulation of these feelings may, by way of synergistic integration, give an illusionary, higher level impression of having a consciousness. The feeling of having a consciousness can in turn give rise to a feeling of having a soul. A soul which is somehow independent of your body, capable of existing, even after the brain by virtue of dying has disintegrated, incapable of any longer sustaining a mind.

You cannot prove that the various conscious experiences, or consciousness as a separate entity, is real. That is, that they cannot be detected by scientific instruments or be observed by anybody but yourself. They must therefore be concluded to be illusions. epiphenomena. And like the rainbow, serving no purpose. When you see a traffic light change from green to red light, you have what we call a conscious experience of it, but the consciousness of it is no more important for you than this change of colors will be for a robot which is constructed to detect the change and to mechanically act upon the change.

Evolution have resulted in creating neurons and axons, by having survival value, but the subjective, passive appearances of illusionary conscious experiences accompanying neuron activity, have never been important for survival. No more than the shadows inevitably accompanying you in the sun. Shadows have no evolutionary history. What creatures observe more or less consciously, leads to appropriate actions by instincts, that is, by synergistically integrating their observations with stored neural assemblies for appropriate actions. For humans, becoming consciously aware of their actions, this awareness may occur several milliseconds later, as it does for becoming aware of a decision. That is, because of the delay, the actions in question have begun to take place before any conscious experience have had a chance to affect the initiation of the action. The present

conscious experience cannot cause a subconscious initiation of an action that occurred several milliseconds in advance.

We may thus be forced to realize that all of our feelings and experiences are illusions created by the interaction and synergistic integration of neural assemblies or groups of neurons, all of which themselves being vulnerable substances of perishable organic materials. This is possibly a frightening realization of what we are or who we are. But it is nevertheless in accordance with what we otherwise have learned about ourselves and the outer world through our senses and scientific inquiry. We know we are beings consisting of perishable organic matter, we know we live in a cosmos governed by strict physical and chemical laws, cosmos of merciless powers, full of huge galaxies, having planets which ruthlessly follow the laws of nature, capable of creating life out of virtually nothing, with creatures doomed to forage and fight for food and survival, programmed to cease an existence by a miserable death, and to procreate a progeny to make possible an automatic extension of the species, while all the while suffering from diseases, wars and being hit by natural disasters. All occurring with inevitable lack of mercy. All taking place with no apparent plan, no apparent purpose. All ending with annihilation, the sun bursting, the earth disintegrating. If not tomorrow, then in so many billions of years.

It is terrible to think of the fate of so many millions of creatures in our world, suffering and dying from hunger, from being eaten, from diseases, from natural catastrophes like floods, tsunamis, volcano eruptions, falling asteroids, from wars, torture, fighting and abuse. All through millions of years, with no divine intervention.

Fortunately, it is not difficult to accept this fate, if we don't inflate our ego, if we learn to appreciate the beauty around us, and learn to love and give more than we get. And knowing that our mind consist of illusions, that the mind itself actually is an illusion, that should make us take ourselves less seriously. Any need to feeling superior to less advanced animals than ourselves is pure vanity. Learning that we in fact are robots, does not make us zombies. And the realization of that, need not make us feel differently from how we always or so far have felt.

Personally, I don't feel any different than before I came to the realization that I am an advanced animal and robot. Luckily, I still enjoy living, eating good food, listening to music, hiking in the nature, loving my family, reading books and lots of everything. Good luck It is. I accept that free will is an illusion. As long as it feels as if I have a free will, it makes no difference. When illusions feel like they are real, it makes no difference that they in reality are created by involuntary synergistic integrations of neural assemblies in my brain. There is nothing I can do about it anyway.

I don't expect the reader to feel the same way as I do. The thought of being a thing, without a soul, like any other object in the world, will for most people be unacceptable, even horrifying. Will be so even for people otherwise accepting that the world is governed by universal, physical laws.

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Human beings are considered to somehow be exceptions to these laws. Lots of people swear to the bible for proof that the earth was created in 7 days, and they do not accept Darwins otherwise convincing teachings on the evolution. Our putative descent from apes, and even fish, they find revolting and humiliating. Many academic, otherwise intelligent people insist on believing they have a free will, despite having received proof that the brain circuits make a decision several milliseconds before it becomes a conscious experience.

There are, of course, many alternative theories of consciousness. One of the more recent ones, in 2017, is presented by professor Beichler. In an 83-page article, he argues (not convincingly) that consciousness is not an epiphenomenon, that it even can exist after death, and that it may involve fourth dimensional spacetime effects, entanglements and quantum mechanical fields. (Note 4: *Consciousness Manifesto (Beichler 2017)*). What a soul is doing after death, is beyond the scope of the article.

Then there are the more theoretical, and typical philosophical papers, like the one by Mog Stapleton on enactive philosophy of mind (Note 5: *The enactive philosophy of embodiment: from biological foundations of agency to the phenomenology of subjectivity (Stapleton 2017)*).

So, I don't expect any consensus on what I am presenting in this article. Only hope somebody may find it enlightening. And I leave it at that.

The feeling of having a free will is a synergistic integration of all the neural assemblies involved in making a decision. Illusions or not, you can know that all the elements of the decision, the knowledge and experiences you store in your neural assemblies, which have led to the decision, are yours. So the decision is definitely yours, nobody else's. It makes no practical difference if the decision becomes conscious a little while after your neural assemblies have been at work making the decision. That's just how your brain happens to operate.

Incidentally, it does not seem as if the brain is some kind of computer, having algorithms, subroutines, and the likes (The Computational Theory of Mind). It is more like a continuous stream of signals flowing between neural assemblies and groups of neurons via interconnecting axons, and acting in concert in integrating synergistically to create illusions of perceiving higher levels of conscious experiences. Such as e.g. is shown in the case of perceiving depth from combining two lower level two-dimensional images in a stereoviewer. It is hard to conceive of an algorithm being able to generate a qualia like that.

The mind is almost like a TV screen, the neural assemblies being like the screen pixels, each one being affected by interconnections behind the screen, all acting in concert to instantaneously present a picture on the mental screen of your inner world.

The vivid concept of a *self* or an «I» is obviously a synergistic integration of neural assemblies

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dealing with the various aspects of personal experiences, from getting a name, being called by that name, seeing oneself in a mirror, hearing one's own voice, feeling one's body movements, one's accomplishments, one's place in the environment etc. People who are asking themselves who they are, need only consider these various aspects of themselves.. That ought to do.

All the other various conscious and subconscious phenomena of the brain can likewise be explained by synergistic integration of interconnected neural assemblies. The various phenomena are activated by synergy of related subconscious neural assemblies. These include optical illusions like Schroeders reversible staircase, colors like yellow or purple, hallucinations, dreams, deja vu, intuition, or the fascination of music. Exsamples are given in Note 1. (Note 1: *The Synergistic Integration Theory of Brain Phenomena (Reichborn-Kjennerud (March 2017))*).

They include emotions. Emotions have their base in the various instinctive action patterns that have been developed during evolution, reaction patterns for survival and procreation. Perception of danger has lead to bodily preparations, like stiffening to keep a low profile, or increasing heart beat to manage the efforts of flight or fight. Perception of sexual pheromones has lead to the pursuit of mates, to socializing and to love. From the body there has been hunger signals to the brain from the stomach, feeling of coldness from th skin, or sexual arousal from the genitals. Various experiences in these situations have been stored in various neural areas of the brain, and synergistic Integration of these areas have given feelings of fear, anger, hatred, jealousy, empathy or love, and furthermore, given emotional feelings to music and the arts.

The variety of phenomena illustrate the variety of types of conscious experiences, to the exclusion of assuming some general consciousness at work. Present theories of consciousness fail to present a concrete theory of how the brain creates a consciousness or conscious experiences. (Note 3: *The Nature of Consciousness (Reichborn-Kjennerud (February 2016))*).

As mentioned, a spoken word may activate up to 80.000 or more neural groups throughout the brain. For some, the number of activated neuron groups may be far less. Obviously, the more neuron groups activated, the more diversified the conscious experiences will be. Intelligence and imagination will necessarily be a function of the extent neuron groups or neural assemblies are activated. This in turn will depend on the number of neurons and axons in the brain, and how much the interconnections have been trained or configured by experience, reading, studies and thinking. A Science of Imagination must stress the importance of acquiring knowledge of all sorts of mechanisms, principles and phenomena on which synergistic integration of the greater variety of neural assemblies can take place.

For the development of the mind from babyhood and up, these properties play an important role in interpreting and managing the multitude of inputs and experiences one is being exposed to. Early on, to take an example, an object, being observed disappearing behind a screen, will be

perceived as ceasing to exist, The object, reappearing on the other side of the screen, will be perceived as a new object, having no relation to the previous object. Only after this scenario has been repeated several times will the objects be perceived as being the same object. In general, much of what has been learned has been learned by repetition of similar observations. From then on, this type of association will be part of the mind's way of thinking, possibly to the hinder for, in given situations, for being able to discriminate and to discern exceptions to this acquired habit.

Listening to what people say, or reading about something, will usually be believed to be true, if most of the time it has proven to be true, or if the source previously has given the impression of being reliable. This type of associations also becomes the mind's way of thinking, possibly to the unfortunate acquisition of misapprehensions, falsehoods and delusions.

It is these various ways of thinking that form the mind, and leads to knowledge and wisdom as well as prejudices and superstitions. By introspection of one's mind one may be able to sort out basic facts from more or less false assumptions. In my experience, the mind turns out to be full of assumptions. (Note 2: *The Development of Mind* (Reichborn-Kjennerud (June 2016))). The final, important assumption I consider, concerns the question of reality: Is the outer world an illusion of our mind? Or, is our mind an illusion in our brain, which, in turn is part of an outer physical world?

I found the answer to that to be a matter of probability.

## **Conclusion**

I no longer see there is a Mind-Brain problem, or any Mind-Body problem.

Gunnar Reichborn-Kjennerud

Note 1: Reichborn-Kjennerud, Gunnar (March 2017) **The Synergistic Integration Theory of Brain Phenomena** *The International Journal of Research in Economics and Social Sciences (IJRESS) Volume 7 (Issue 3) pp. 138-142 ISSN 2249-7382, The International Journal of Research in Engineering and Applied Science (IJREAS) Volume 7 (Issue 3) pp. 71-76 ISSN 2249-3905.* Uploaded to Academia.edu.

Note 2: Reichborn-Kjennerud, Gunnar (June 2016) **The Development of Mind** *The International Journal of Research in Economics and Social Sciences (IJRESS) Volume 6 (Issue 6) ISSN 2249-7382.* Uploaded to Academia.edu.

Note 3: Reichborn-Kjennerud, Gunnar (February 2016) **The Nature of Consciousness** *The International Journal of Research in Economics and Social Sciences (IJRESS) Volume 6 (Issue2) ISSN 2249-7382.* Uploaded to Academia.edu.

Note 4: Beichler, Jim (2017) **Consciousness Manifesto: Physical origins of consciousness through evolution and revolution**, SSE ASCSI 2017. Uploaded to Academia.edu.

Note 5: Stapleton, Mog (2017) **The enactive philosophy of embodiment: from biological foundations of agency to the phenomenology of subjectivity**, Paper uploaded to Academia.edu.