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What constitutes a good theory of mind?

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ABSTRACT: Naturalistic solution to the problem of mind is in agreement with the growing number of experimental facts. At the same time fantastic ideas about the mind in general and consciousness in particular abound. A lot of philosophical efforts is devoted to solutions of non-existing problems. In this paper errors in recent discussions and thought experiments in the philosophy of mind are pointed out. Once these errors are recognized identifying mind with global dynamics of the brain leads to simple solutions to many philosophical problems, including the hard problem of consciousness.

1 Understanding the mind and dynamical states of the brain.

What does it mean to understand? It very much depends on the subject and on the person. Understanding of abstract, intellectual facts seems to be quite different than understanding of experiential facts based on sensory experience (question of 'meaning' has been discussed by Putnam [21, 22] but in this paper a different line of reasoning is followed). Understanding of movement was for two thousand years the most challenging problem. Even Kepler still believed in harmony of the spheres and intelligent angels pushing the planets. Newton and many of his followers thought that action at a distance is impossible without treating the space itself as an active substance, God's sensorium. Electromagnetic fields without mechanical substrate were hard to imagine, but since we learn about gravitation and electromagnetic waves at school the feeling that we do not understand is largely gone. Do we understand that water is composed from hydrogen and oxygen? It was hard to believe a few hundred years ago but now we do not seem to have problems with it. That multiplication of two negative numbers gives a positive answer has been pronounced "beyond human understanding" by great mathematicians of the XVII century and yet children at school do not have any problems now.

These are fairly old and rather obvious examples. We do 'understand' them now, or at least we have a feeling that we do understand, since our associations are formed during early school years and our thinking follows these associations in a natural way. The curved space-time concept or the ideas of quantum mechanics are taught too late and are too remote from our daily life experiences to be really understood, although a small number of experts are convinced that they understand. In case of quantum mechanics such claims are still controversial, but there are even more controversial issues: some people "understand" creation of the Universe in the Big-Bang out of nothing (since vacuum is not stable), other people "understand" creation of the Universe as an act of supernatural omnipotent being. Some people understand that the mind is turned off like a bulb when electric processes in the brain stop working, while other people imagine that their body is moved by an immaterial spirit. What some people find convincing others find quite irrelevant. Why so many seemingly normal people suddenly convert to very strange, irrational believes, claiming that there is strong evidence where basic facts are missing? The feeling of 'understanding' may be due to a rationalization of emotional reactions, filtering new ideas depending on their emotional content. Understanding requires new facts to fit, at least partially, to existing internal representations. Perhaps the structure of our world view, once created, admits only those new elements that fit to already existing constructions? Sometimes whole substructures of mind may break or crumble due to the pressure from other substructures that have more weight. Are we able to question ideas deeply ingrained in our minds at an early age? Why did it take 2000 years to discover some obvious errors of Aristotelian physics and solve the problem of movement?

Philosophy of mind has had its share of strange ideas. Many problems related to mind have been solved by cognitive sciences but, in contrast to physics which has discarded the medieval style of thinking, mind is still perceived as something mysterious. On the one hand cognitive, information-processing functions and affective functions, being clearly functions of specific brain structures, are considered to be rather easy to understand. Therefore philosophy of mind has concentrated on more difficult questions, such as consciousness. Is it a problem worth of philosophical considerations or should it be left for neuroscience? Will the new generation, taught at school about brain, behavior and cognitive psychology, be so puzzled with the mind as we are?

Why many people are not satisfied with the idea that mind is a function of the brain? The popularity of simplified models of the brain (left-right or triune brain models for example) seems to point out the need for simplicity. Perhaps the brain is too complex and we believe that mind must arise from something more simple and more fundamental [20]? Some people find the idea of mind as merely a product of the brain undignified [10], other worry about non-existing problems like the non-spatial character of thoughts [16], proposing a total revolution in science. If mind states are understood as global dynamical states of the brain, states that include the influence of the environment (mind is not just in the head, cf. Putnam [23]) as well as the internal dynamics, many thought experiments leading to paradoxical results have simple solutions. No 'hard problems' of consciousness arise [3]. In the next sections some misunderstandings in recent discussions on consciousness are pointed out. The third section explains why many thought experiments in the philosophy of mind do not clarify but rather create artificial problems. In the fourth section I will discuss a theory of mind that seems – at least to me – satisfactory and give me a feeling (no doubt illusory) of "understanding the mind".

2 Crazy ideas for no reason at all?

Let's start with neomysterians. Collin McGinn in a recent article [16] writes: "... we stare agape in a vacuum of incomprehension". Why is it that I don't share his feeling? The problem he has addressed is the non-spatial nature of the mind. How can the non-spatial arise from spatial? This very question seems to be based on an outdated, medieval way of looking at the mind, so no wonder that the author of the question stares agape. Mind is not a substance like Descartes, following the scholastic tradition, assumed. Mind is a function, a succession of brains states, arising by consecutive excitations of the brain tissue. These excitations have a certain temporal logic resulting from the structure of the brain. The structure exist in form of memory traces and is actualized by the dynamical processes in the brain. The difficulty with understanding such model is due to the lack of good technical metaphors. Auditory or visual scenes stored on a laser disk are also memory traces (of the camera photocells states) that are actualized by dynamical processes in the electronic equipment, but their temporal structure is fixed, they do not interact with their environment, so the analogy is only partial. Still it makes no sense to describe states of an electronic video player as spatial, although physically the system is contained in a small box. These states are defined in a space of electrical activity of various elements, just as the brain states are defined by neuronal activities.

The computational paradigm provides us with an example of non-spatial relations among abstract objects arising during calculations. Putnam [22] views the relationship between mental and physical states as analogous to that between logical and structural states of Turing Machines – there is no great mystery here. Turing machines are not the best metaphor for brain dynamics, a set of coupled resonators gives a more faithful picture. States of such resonators (microcolumns of the neocortex) may follow a complex temporal logic. If these resonators specialize in analysis of visual inputs and are connected to another, linguistic set of resonators that are able to comment on the contents of their inner states, we get a system that has non-spatial (linguistic) as well as spatial (visual) features. Mental rotation and mental zooming are operations on visual representations. The ability to read the music score imaging hearing the music activates both visual and auditory representations. Solving equations brings us in an abstract, non-spatial realm of representations. Influencing brain structures responsible for these acts, for example by electrical stimulation, shows the "structural coherence" [3] between the mind and the brain states. Brain is localized in space but the contents of mind is not spatial since it is a succession of brain states – not something "viewed from the inner perspective", since apart from the brain states themselves there is no viewer.

All this seems to be a common knowledge in cognitive science and yet McGinn is not the only one who asks such naive questions. Physicists and mathematicians worry about non-locality of the mind. Since mind is non-local and quantum mechanics is non-local perhaps the brain is non-local too (cf. [4])? Such reasoning, based on complete misunderstanding of cognitive science, leads to the grand proposals to “place mind as the key aspect of the universe" [4] or to develop quantum gravity with closed timeloops as a basis for a new mind theory [20]. It will not change our views on such fascinating neuropsychological phenomena as blindsight or the unilateral neglect, nor thousands of other, well defined problems. The only thing it is designed to explain is the non-locality of the mind, something that from the functionalist point of view does not need any explanation. Strange that no-one asks anymore: how can a sound be transmitted through a wire? You cannot compress a sound or a picture to a wire, it must be a category mistake – 150 years ago it could have been a strong argument, but now everybody understands how it is possible. Technical metaphors help to ‘understand’ (cf. [13]), but we do not have good everyday examples of dynamical systems modeling brain functions, therefore some aspects of mind seem hard to understand.

So, in contrast to Collin McGinn and many other philosophers I see no reason to suppose that understanding the mind is beyond our comprehension. After all the progress in cognitive science is quite rapid, we understand already so many details about the mind, so why should we doubt in our ability to understand more? Of course human mind has a finite capacity and is not able to comprehend the details of even the simplest molecule, once we start to dig deeper and deeper (it is sobering to know that the hydrogen atom is still a hot topic in physics), but it does not mean that the overall scheme of things is not understandable.

In recent years most of the philosophical discussions concentrated around qualia, or the problem of the qualitative character of phenomenal experience. This is the hard problem that cognitive science has not addressed, and since it is impossible to imagine consciousness without qualia it became a most debated topic. Chalmers [3] has not only identified the problem but also proposed a solution based on the hypothetical dual aspect of information. He has formulated two principles which are in agreement with cognitive science. The principle of structural coherence says that the structure of conscious experience is based on the content accessible to awareness. This is what most cognitive scientists subscribe to. The principle of organizational invariance is basically the functionalist credo: what matters are the specific patterns of causal interactions between the components.

After defining the problem and the two principles Chalmers proposes a non-reductive solution based on the alleged physical and phenomenal aspects of information (Spinoza formulated similar dual aspect idea in 1677). Physical processing of information brings along the phenomenal aspect as well – a naturalistic dualism, one may say. Why do we need to add this idea to functionalist approach and does it have any consequences? I am afraid that it does not – we still need to have special brain states to explain why sometimes we are not conscious although the brain is busy processing information – actually in situations demanding fast reactions and intensive information processing consciousness seems to be absent while during contemplation of simple objects or ideas the autoreflexive conscious feelings are strongest. Dual aspect of information is an unnecessary extra addition to the dynamical states of the brain, an addition that has no consequences. This is not an explanation, but rather resignation: “phenomenal experience exists because God wanted so". Yet quite a few people took this suggestion seriously, starting to call it a “theory" (cf. the discussion following Chalmers paper [3]).

A common problem with many solutions to the ‘problem of consciousness’ is that they never ask: what type of systems seem to have minds? What architecture is necessary to create it? What are the real questions, besides the phenomenal experience, and is our favorite theory answering them? Is it relevant to color vision research, or maybe understanding of schizophrenia? Is it possible that we have overlooked non-local quantum effects in the brain on such a grand scale that the mind is produced? Or where is the dual aspect of information gone when the brain is under anesthesia and no experience whatsoever is produced?

3 Thought experiments and what’s wrong with them.

The principle of organizational invariance is so often invoked in philosophical discussion that it may be useful to point out that it is basically empty. What does it mean that the functional elements are identical or that

their interactions are identical? Silicon structures and carbon structures are quite different, their chemistry is different, atomic interactions are different, binding to molecules is different. For example, there is no way to create neuronal receptors or propagate neurotransmitters in silicon in the same way as in the biological structures. The problem concerns really the accuracy of approximation: only very rough features of carbon-based patterns of interactions may be represented in other type of structures, whatever they might be. The number of different chemical elements at our disposal is rather limited and no other element can interact in the same way as carbon atoms do. Therefore the functionalist critique of carbon chauvinism is not valid: carbon cannot be replaced by other elements without changing the system in a fundamental way.

This does not mean that intelligence or some form of mind cannot arise due to the interactions of complex forms of matter based on silicon or other non-carbon compounds. However, such minds cannot be identical with our mind, since the problems of accurate approximation of brain functions is very difficult. A change in the level of a single neurotransmitter in our brain is sufficient to change dramatically the content of mind and conscious perception. If in a complex system small structural changes lead to large changes in functions, replacing parts of such system by something else may not be possible and accurate approximation of all its functions by completely different system may be hopeless. Thought experiments in which small neural circuits are replaced by silicon circuits step by step until the whole brain is converted to silicon, have no sense. Even small disturbance of the integrity of the brain has a profound effect on the phenomenal experience.

But what if the replacement had identical functional properties? - one may still insist. Replacing neurons or the biochemical substances of the brain with silicon elements or anything else of this sort has to change all quantum mechanical states and thus interactions of numerous molecules. The modified system will not function exactly in the same way. The only possible replacement with identical functional properties must contain identical molecules in identical quantum states. Arguments based on reasoning that “in principle" it is possible should not be treated seriously. Silicon or other artificial brains may only be rough approximations to what the brain does, but they may not converge to the real thing. Different brain structures lead to different minds.

The functionalist idea of replacing the carbon with silicon or some other stuff is not the only thought experiment that is fundamentally wrong. One of the favorite arguments of philosophers is based on the **inverted qualia**, or at least on their possibility. Let us replace the brain wiring in such a way that connections with green and red cones are reversed and all reactive dispositions are also reversed. Than the experience of green and red is reversed – a case of inverted qualia. The bad news is that there is no such possibility. Brain is still understood by many people as a kind of mechanical device. There is no reason to suppose that mind content, identical with the global state of the brain, stays unchanged after such manipulations. If all memory associations to the green and red color are removed will the experience of green and red still differ? What makes qualia different? In case of colors several factors are important: retinal signals, activation of V4 visual area, coupling of the visual cortex with the limbic system. All these things together, and many other components of the global brain states, create differences. There is no way to separate phenomenal experience from information processing. Any change in local information processing must influence the global brain states. Either dynamical states of the brain are identical and thus the experiences are identical or they are changed and thus experiences are changed.

Thought experiments with inverted qualia or absent qualia [14] – zombies – assume mechanistic, modular construction of mind. Mind is not a product of a mechanical system with wires and cogs. There is no way to manipulate the brain tissue replacing small circuits here and there without changing the dynamical states of the brain – these circuits are not essential part of this state. Our phenomenal experience does not result from excitations of pineal gland or frontal lobes alone, but from the state of the whole brain. Replacing even a small part of the brain, changing sensory information or even making changes in familiar environment changes brain/mind states. There is no sense in discussions involving such thought experiments. It takes time to learn the meaning of modified brain states: the limbic structures must assign them new values and the neocortex must assign them new cognitive categories.

What is it like to be someone else? There seems to be a deep-rooted misconception here. Understanding may have at least two meanings. Intellectual understanding, in which mostly frontal and temporal lobes are involved allows us to create models of the world and communicate with each other on that basis. Experiential understanding, engaging mostly the limbic system, allows us to share the feelings of our children and our friends.

Experiential understanding of other mind requires resonance or brain states which are of similar structure to the states of the mind of the brain that gives rise to that mind. The brain states do not have to be identical but the structure of the attractors in the neurodynamics behind them should be similar. We are able to share such mind states to a high degree with our family members, with other members of the same culture, to a somehow lesser degree with members of different cultures and to even lesser degree with animals, since not only their minds are formed by very different environment but their brains and their senses are physically different. I fail to see any deeper mystery in the celebrated question of Thomas Nagel “how is it like to be a bat" [18].

Another famous thought experiment concerns **Mary, the colorblind neuroscientist**, who gains color vision and learns about red [15]. There are inner facts that are over and above the physical facts but the conclusion that physicalism is false because knowing everything about neuroscience does not imply knowledge about qualia is premature. Dennett’s solution [7] is to deny the problem by claiming that to know everything means to be able to correlate the qualia with brain states. In his version Mary is presented with bright blue banana and immediately recognizes the fact (perhaps with access to the maps of activity of the V4 visual area it could be done even today). Dennett concludes that the story does not prove that Mary has learned anything new. She has not learned anything new only in the sense of verbal, intellectual learning, but certainly her brain, stimulated for the first time by a color light, assumed new dynamical states, so she must have felt it as a new experience. Her previous knowledge was abstract, symbolic, engaging temporal and frontal lobes only, not occipital cortex. There is no great mystery in the fact that new brain states are experienced as mind events having new qualities. People that were born blind and gain their sight after they are grown-up certainly learn quite a lot, and it helps them little if they have great intellectual knowledge of geometry. Inner facts are real, although they are only shadows of neurodynamics.

The **Chinese Room experiment** of John Searle [27] is designed to show that mere computations are not sufficient to bring real understanding. Since a person locked in the room and shuffling symbols to correlate incoming Chinese signs with the outgoing Chinese signs does not understand neither questions nor answers, therefore formal systems based on rules and symbols are incapable of real understanding. Could such a person find anything in our brain, turning into a demon observing neural processes? Already Leibnitz in his *Monadology* understood that it is impossible. He asks us to enter the thinking, feeling and perceiving machine just to find there mechanisms rather than floating thoughts. We can understand only the systems that have minds of similar structure to ours, by ‘resonating’ with such minds, trying to assume similar dynamical states. One way of creating such resonance state is through language and observation of behavior. The Chinese Room experiment does not try to discover the mind of a system by bringing our mind in resonance with it, and thus it does not teach us anything about the mind of artificial system. The Chinese interlocutor may have an impression that there is an understanding mind in the room, but it is not the mind of a men shuffling symbols, but rather minds of experts who created the program. It is very easy for humans to loose understanding if their brain processes are not properly synchronized, if the dynamical states with all the background references do not arise. There is no way to represent accurately the states of a dynamical system by rules, therefore approximations to ‘understanding’ based on experts systems will always have serious problems with convergence. An artificial dynamical system capable of assuming brain-like states could ‘resonate’ with our mind and could achieve real understanding, but construction of such a system is much more difficult than construction of rule-based expert system.

4 Approximating mind and consciousness.

A fruitful point of view in mind philosophy starts with the question: what kind of systems seem to have minds? The answer is rather obvious: mind functions and brain complexity are closely connected. Sophisticated behavior requires sophisticated brain. If panpsychisms had any sense psychopharmacology could not work and people in coma or under deep anesthesia should be conscious. Active brains are the only systems that are undoubtedly associated with minds. How should we understand brains? Understanding always requires simple models but oversimplification or wrong metaphors leads to insurmountable problems. Mechanical metaphors are quite inappropriate for the brain.

A good way to look at the problem of understanding the brain dynamics is to treat it as an approximation

problem [8]. At the lowest level genetic and molecular processes influence the biochemistry of the brain; neurotransmitters are distributed around the brain from several brain stem nuclei, influencing the activity of single neurons, forming microcolumns and small groups of neurons, forming in turn whole subsystems and finally creating a global dynamics of the brain's electrochemical processes. Is it possible that another physical realization will give rise to identical dynamical states with the same functional relations? The more complex the system and its functions the more difficult it is to implement it in an alternative way. As far as the brain functions are concerned only very rough models of human sensory systems have been made and models of various types of human memory are still quite primitive. The more we know about the brain the more accurate models are made. The modeling process seems to converge slowly to a detailed functional approximation. For example, many visual illusion are well understood, and inspirations based on understanding of color vision and object recognition lead to practical applications. Even simple models of distributed connectionist memory exhibit a number of properties (such as content addressability, noise resistance or independence of retrieval times from the number of items stored) that makes them more like human rather than computer memory [17]. Better approximations of brain functions lead to better approximations of mind functions.

Understanding of neuropsychological syndromes is possible on the level of information processing by different brain modules. Even Capgras syndrome, in which sufferer is absolutely convinced that a family member, a friend, an item of personal value or even one's own self has been replaced by alien imposter, is understandable. Cognitive (neocortical) and affective (limbic system) functions become dissociated and despite a perfect recognition there is no emotional feeling associated with the person or object that is recognized. Psychiatric problems require either understanding of the effects of neurotransmitters on the overall brain dynamics (ex. in depression) or understanding of synchronization of different brain areas (in schizophrenia). Hallucinations are understood as breakdown of associative memory and come quite naturally in computer associative memory models [25]. More detailed approximations to the models of the brain will certainly lead to more precise explanations of all features of our behavior and inner states of mind. Computational power of the brain is still on a factor of 10^4 or more larger than that provided by the most powerful supercomputers today, but even this meager computer speed and memory is sufficient to beat humans in such intellectual pursuits as chess playing or theorem proving. Algorithmic processes seem to have sufficient power to explain abstract thinking (cf. Penrose claims to the contrary [20] and Putnam's rebuttal [24]). Why than so many philosophers are not satisfied with our present understanding of mind as a function of the brain?

The only serious problem left in the philosophy of mind is the problem of phenomenal experience. I have already discussed some ideas showing how hopeless the problem seems to be to many people. Proposals to abandon all science and start anew have a curious appeal to many intelligent people [12]. Other people do not see any problem at all, hoping that the qualia problem will somehow vanish in the same way as the problem of life has already vanished. Dennett [7] writes about 'cuteness' as another example of artificial hard problem. However, such concepts as 'life' or 'cuteness' are abstract and qualia are experiential, independent of any intellectual concepts. Animals and small children, even before they are able to form concepts, seem to be able to experience qualia. Therefore the problem should not be dismissed so lightly, although the progress in cognitive science may lead also to the solution of the hard problem.

I will suggest here a simple solution that to some degree is similar to Dennett's eliminative approach [7]. I do believe that qualia are an illusion, as Dennett does, but only in the sense that there is nothing mysterious, requiring new fundamental properties of the universe, psychic probability fields [10] or some kind of homunculus that experiences qualia. To claim that the qualia problem is just a matter of dispositions, as Dennett does, also misses the point. A simple computer program may be disposed to say 'ouch' whenever the computer screen is touched but I do not suppose that the program feels anything. Such solution may be satisfactory to behaviorists but not to cognitive scientists. The problem lies largely in the lack of precise language to speak about mind states. I have tried to define such language, connecting psychology and neurosciences, elsewhere [9, 8].

The brain is composed of tightly coupled elements and modules. There is nothing like the brain state without reference to the memory and reactive dispositions. Even if we are not aware of all the background context forming the brain state, since the information about this context is not sufficiently salient, it is still there. Being conscious of something means to have the ability to report this fact, even if this ability lasts for a brief moment. Whatever dominates in the global dynamics of the brain appears as a content of our mind. Why? At the

highest level of control this information may influence the brain states leading to verbal comments or to other non-verbal states. The information is not only accessible, it is also experienced.

I can see the red color and associate a particular feeling with its hue, but this is not just a matter of dispositions, but a real process in which the neurophysiological state of my visual cortex, my associative cortex and limbic system, all contribute to the global state of mind. This process involves constant non-verbal updating. At each moment the state of visual system, modified or 'colored' by the background processes, gets into the central dynamics of the brain. Qualia are not epiphenomena but the ability to discriminate between different states of the brain, states that differ not only by the information coming from the primary sensory areas but also include the background processes. Because of the tight coupling of all these processes in the brain even the states of a low-level visual cortex (V1) and the intermediate nuclei (LGN) are modified by higher level processes. The up-going and the down-going streams of information self-organize to form the dynamical state of the brain [11]. Primary consciousness results from this constant updating of the global dynamics.

Thus although 'reactive dispositions', as Dennett calls it [7], are of primary importance, the qualia are real modifications of brain states, since the dispositions or memory traces influence the global dynamics, i.e. the mind state. Qualia do have functional role: recognizing this particular color as the one that gives me a particular pleasure to look at I make some decisions. Recognizing sweet or bitter taste I eat or spit. The spitting reaction is frequently automatic, but the memory of bitter taste, allowing to avoid unpleasant experiences later, is kept. Why does it feel like something instead of being processed automatically "in the dark"? Why do qualia exist?

One reason for existence of qualia is due to the disproportion of the small working memory based on the dynamical, short-lived states of the brain dynamics, and the large-scale unconscious information processing. The taste information cannot be compared with all the memory traces in our brain directly in fraction of a second. Working memory implemented by dynamical processes in the brain is used to broadcast this information [2] around the brain, activating similar memory traces in the neocortex and using associations stored there. Discrimination of information into different types makes this process easier. Nonverbal labeling helps in this process by assigning different 'feeling' for the quality of the information. Both 'feeling' and discrimination are two sides of the same dynamical process. Qualia are non-verbal labeling of information. We are able to report different feelings because mind state, or the global brain dynamics, is modified in a different way by stimuli of different sensory and internal modalities. There *is something it is like to be* in different states of mind, but the only way to learn about it is not to pay attention to information processing by neurons or computational modules – it is necessary to 'resonate' or be in similar states with the other system. Associations between attractor states of brain dynamics gives structural properties to experience.

Qualia are real brain/mind states, but their special status among other information processing states is just a self-deception. It should be possible to construct a brain simulator – let's call it an artilect (artificial intellect) – approximating the dynamical states precisely enough to create such self-deceptive states. Artilect will be absolutely convinced that it feels the qualities of its dynamical states and will report about it, not only verbally to the outside world, but nonverbally, to its 'self'. How would we know that such artilect has different mind states than we have? Because simulated neurons lack mysterious properties of biological neurons, as John Searle believes [27], or because such system will not be able to answer Gödelian questions related to its design ([20]; can we do it even for a very much simplified model of our brain)? Artilect has to accept the states of its mind as real, although for us they may look like virtual reality. Is the difference between our reality and virtual reality only a matter of the quality of approximation? Temporal and spatial resolution abilities of our conscious experiences do not allow us to have an insight into the neurodynamics behind the scenes. We deceive ourselves thinking that behind the qualia there is something more than nonverbal reporting and discrimination.

Continuos nonverbal internal reporting is inseparable from attentional mechanisms. Even if the information about the taste of an ice cream reaches the brain if it does not influence the global dynamics, because attention is directed at thoughts or visual experiences, we suddenly notice that the ice cream is finished but our experience of taste was gone much earlier - in fact it is very difficult to experience something like a taste for a longer time. Most people do not even remember how their last meal tasted. 'Directing attention' is just a figure of speech since in reality this is a part of a dynamical process and there is no homunculus to 'direct'.

Our general feeling of personal identity seems to be strongly coupled with proprioception. Proprioceptive information is constantly provided by the spindles, one of the two types of the skeletal muscles. The brain has developed to control the movements of the body and to analyze the sensory feedback information about the outcomes of movements. Rodney Cotterill [5] discusses the merits of anticipation of such outcomes and the need for an internal model of the body to solve 'what if' problems of motor control. Such model will be an important step towards construction of the self. Even simplest body acts require massive information processing. Simulation of abstract reasoning (for example in chess or mathematics) is more advanced than simulation of autonomous robot movement control (artificial rat is still rather far off).

In contrast to many philosophers claiming that qualia have no functional role I am convinced that they do have a subtle influence on behavior. How can one claim that experience has no functional role? Can we separate 'pure experience' from the real, total experience? Pain and pleasure have certainly functional roles and perception of colors has of course an evolutionary advantage. Neurophysiological experiments in which the stream of information going from higher to lower visual areas is blocked are possible on monkeys and seem to indicate that the lower areas (even V1) simply are not able to form the same activations as in the normal case. Although there are no experiments with humans one may guess that without the help from memory and higher information processing areas qualia will be quite different, more subdued or even perhaps vanishing together with the recognition of the sensory experience. An example of vanishing qualia accompanied by greatly reduced behavioral competence is given by blindsight – information processing is greatly impaired, global brain states are drastically changed. This is just what one should expect if mind is identical to the global brain state. Although some information from the eyes reaches the brain and is used to select responses it has no influence on the global brain dynamics. The type of this information is not discriminated against other types of information since in the normal brain there was no reason to do it – hence there are no visual experiences.

Why do we loose taste when the sense of smell is blocked? The taste buds provide all the information, the brain processes it but the qualia are gone. This simple problem seems to be very hard for quantum mind, dual aspect of information or disposition theory. Smell is the necessary background for the taste in the global dynamics.

5 Conclusions.

It remains to be seen that there is something more about the experience to explain. The illusion that 'someone' inside us is the real subject of experience is very strong, but it is possible to go beyond it. Scientific discussions on consciousness should be based on careful observations and critical evaluation of these observations. This is usually not the case, since almost everybody makes casual observations on his/hers state of mind (a few recent exceptions include the neurophenomenology of Varela [29] and articles of Shanon [26], Novak [19] and Shear [28]). Ancient Indian philosophy, especially Buddhist philosophy, was based on introspection and critical reflection (cf. [19]). When the mind learns how to focus attention "all skandhas are empty", as one may read in the *Heart Sutra* [6]. Five skandhas, or mutually conditioning factors, include physical body, sensations, perceptions, impulses (dispositional tendencies) and consciousness. All these are called 'empty' because they do not have permanent, independent existence. "Feeling, perception, volition, even consciousness itself", all are empty. If we look deeply enough everything has the same taste, the taste of impermanence and mutual dependence. In Buddhist Theravada philosophy mind and body were on equal footing. Reduction of mind states to physical brain states cannot be perceived by introspection. Psychological processes admit more fruitful analysis if mind is considered to be primary. Mind contents and events may in reality be shadows of neurodynamics, but such understanding requires elaborate mathematical models that cannot provide natural language for their description.

The special status of qualia is just a self-deception. They are real states of the brain and there is nothing mysterious about them. It should be possible to construct artificial minds that will also claim qualia. Since these minds will not be identical to ours, because only a rough functional approximation of the brain states is possible, their qualia will be different. But does it really matter? The real questions will be of ethical nature. Something matching the complexity of human mind and adapting to its environment will have high value to its creators and partners, regardless of its ability to really feel the pleasure and pain or just to deceive itself and

others that it does.

Recent discussion in philosophy of mind shows that various people find various theories about mind satisfactory. Since many of these theories – based on dual aspects of information or quantum mechanics – do not answer any empirical questions at all I do not considered them to be good theories of mind. A good theory should provide a good approximation of brain functions and a connection with psychological states. Cognitive science is on a good track to construct good theory and good brain/mind models.

References

[1] Block, N, What is Dennett's theory a theory of? *Philosophical Topics* 22 (1995) 23-40.

[2] Baars B.J, *A Cognitive Theory of Consciousness*. Cambridge University Press, Cambridge, MA 1988; Newman J, Baars B.J, Neural Global Workspace Model. *Concepts in Neuroscience* 4 (1993) 255-290

[3] Chalmers D.J, Facing up to the problem of consciousness. *J. of Consciousness Studies* 2 (1995) 200-219

[4] Clarke C.J.S, The non-locality of mind. *J. of Consciousness Studies* 2 (1995) 231-240

[5] Cotterill R, Prediction of internal feedback in conscious perception. *J. of Consciousness Studies* 3 (1996) 245-266

[6] Conze, E, *Selected sayings from the Perfection of Wisdom.* Prajna Press, Boulder 1978

[7] Dennett, D. C, *Consciousness explained.* Little-Brown 1991

[8] Duch W, *Platonic model of mind as an approximation to neurodynamics*. In: Brain-like computing and intelligent information systems, ed. S-i. Amari, N. Kasabov (Springer, Singapore 1997), chap. 20, pp. 491-512

[9] Duch W, *From brain to mind to consciousness without hard problems*. Sympozjum Kognitywne '96: Świadomość a Percepcja. Instytut Filozofii UAM, Poznań, 6-7 Dec. 1996; Duch W, *A solution to the fundamental problems of cognitive sciences*. International Philosophical Preprint Exchange (1994), http://cogsci.l.chiba-u.ac.jp/IPPE.html

[10] Eccles, J, *The Brain and the unity of conscious experience*. Cambridge University Press 1985

[11] Ullman S, *High level vision: Object recognition and visual cognition*. MIT Press 1996

[12] Gardner M, Computers near the threshold. *J. of Consciousness Studies* 3 (1996) 89-94

[13] Gregory R.L, *Mind in Science: A History of Explanations in Psychology and Physics*. Penguin Books 1981

[14] Hardcastle V, Functionalism's response to the problem of absent qualia. *J. of Consciousness Studies* 3 (1996) 357-373

[15] Jackson, F, Epiphenomenal qualia. *Philosophical Quarterly* 32 (1982) 127-136.

[16] McGinn, C, Consciousness and Space. *J. of Consciousness Studies* 2 (1995) 220-230

[17] McClelland J.L, Rumelhart D.E, *Parallel distributed processing.* The MIT Press, Cambridge 1987

[18] Nagel, T, What is it like to be a bat? *Philosophical Review* 4 (1974) 435-50

[19] Novak, P, Buddhist meditation and the consciousness of time. *J. of Consciousness Studies* 3 (1996) 267-277

[20] Penrose R, *Shadows of the mind*, Oxford University Press 1994

[21] Putnam, H, The meaning of ‘meaning’. *Minnesota Studies in the Philosophy of Science* 7 (1975) 131-193

[22] Putnam H, *Mind, language and reality*. Cambridge University Press 1975

[23] Putnam, H, *Representation and Reality*. MIT Press 1987

[24] Putnam H, Review of *Shadows of the mind*, by Roger Penrose. *AMS Bulletin* 32 (1995) 370-373

[25] Ruppin E, Neural modeling of psychiatric disorders, *Network* 6 (1995) 636-656

[26] Shanon, B, What is the function of consciousness? *J. of Consciousness Studies* 5 (1998) 295-308

[27] Searle J, Minds, Brains and programs. *Behavioral and Brain Sciences* 3 (1980) 417-458

[28] Shear J, The hard problem: closing the empirical gap. *J. of Consciousness Studies* 3 (1996) 54-68

[29] Varela, F, Neurophenomenology: A methodological remedy for the hard problem. *J. of Consciousness Studies* 3 (1996) 330-349