

ON THE HARD PROBLEM OF CONSCIOUSNESS

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ABSTRACT. In this note a concept explaining aspects of the hard problem of consciousness is proposed. The concept consists of three parts. First, the quale microcode proposes that information in the brain is categorized and this explanation should make the effect of quale plausible. Second, we propose to regard nature as a unified field, and this should explain why there exists consciousness at all. Third, an argument with states of the field should explain localization in terms of intrinsic properties of the field rather than parts of the field of which it is made of.

1. INTRODUCTION

In this paper we propose concepts how the hard problem of consciousness may be solved. It is based on three aspects.

In this note we try to present a better understanding of consciousness. At least for us our approach works. Even for animals, for example, we have now a better understanding what might going on in their mind.

After reading (and believing) our approach, questions like ”‘Why has a simple stone no consciousness and the brain has it?’” should now much simpler to answer. We often use the following method. We design our concept as simple as possible such that the need of unnatural assumptions and contradictions are avoided, and wished aspects come out. For example we claim the field of nature to be one thing such that we get around the problems in explaining consciousness in a pure particle world. Moreover, we often start by trying to create consciousness in thought experiments. Then we better understand what is needed. This is easier than starting with a complex phenomenon like the brain. The concept of quale microcode came out by such an approach.

Our answers to the hard problem of consciousness are essentially simple and could be explained in a couple of sentences. Nevertheless we write here a little bit more, as we believe, without deeper explanations they would not be understandable and convincing. We will try to give the reader a feeling of our concept. Overall we think, an explanation of

consciousness can only be convincing if one can feel the concept. And this convincement can probably not be done in a few sentences.

We decided to present the text in naive and nonscientific way. Anyway, the way we present the text is the way we think. So it is most authentic with our thinking. On other hand we hope, the formal aspects and key points behind our ideas enjoy scientific criteria, driven by logical and plausible thinking, and are not esoteric like.

Many words (or even 50 percent) in the text need to be set under quotation marks. By practical reasons we avoid doing so. The reader may catch the idea also if the text is not always precise and repeatedly metaphorical.

2. PRELIMINARY

Before we start presenting our concept, it should be remarked that consciousness is very likely encoded as information in the neuronal network rather than a kind of physical effect which has not yet discovered. Indeed, we speak about our consciousness. The speech is motor function, which means muscle activity. By the best knowledge, muscle activity is controlled by neurons. So consciousness must be encoded in the neuronal network in the brain. Otherwise, if consciousness were some effect - let us say an unknown physical effect of billions of neurons - then this consciousness effect would have to affect the neurons again, to release muscle activity and so speech, because we speak about our consciousness. Since such a back effect was never observed, and rather the neurons work autarkic and are not influenced by some obscure effect, we will search consciousness in the neuronal network of the brain itself.

Let us also remark that the hard problem of consciousness is not affected by evolution. On the one hand, evolution affects brain function, and this function seems to determine also consciousness, but the hard aspect of consciousness, that means the reason why we are not zombies, does not affect the fitness of organisms, and so does not affect evolution. It does not matter if creatures are zombies or not, only function counts for evolution, and so zombies are evolutionary indistinguishable from real conscious creatures.

Under the view of evolution many aspects of animals are natural. It makes sense that a organism with motor function has a sensor for pain, so has a kind of emotion. It is also clear that it needs to integrate the vast information from the eyes (if it has optical sensors) to come to some motor function. It is even in principle not difficult to vague imagine how all these information processes in the brain work. That

is not (the hard) problem for us. Our problem is that even if we understand how visual data coming from the eye must be processed to have the wished effect in behavior, we feel there is something more in consciousness. We can - and usually tend to - imagine that all these neuronal processes proceed like in a machine, where many single parts like neurons, or even only physical particles, work like individuals and there is no conscious effect at all. But this is not that what we feel to experience by ourselves. We feel we are real, and there exist real complex optical images. Why should they exist when there are only individual single particles? And why is there something like the quale of light? That is our problem, the hard problem of consciousness, and that is what we try to enlighten somewhat here.

3. QUALE MICROCODE

I will here explain my concept of quale. This concept should make quale better understandable and less magical.

I will mainly explain it at the example of red light. But it works for any modality.

Before I begin with, I would like to ask the counter question "‘Why is money valuable?’". Why is a banknote valuable if it is only a printed piece of paper? The answer is because it is treated valuable. Money releases actions like the transfer of goods. Everyone who sees money says "‘Oh, that is money!’" and treats it valuably and accordingly. So, money becomes its value simply because it is treated valuable by people; by all people. This treatment distinguishes a banknote from other printed papers.

The same can be said for quale. How can a simple information of red light received from some cone in the eye become to that red light we experience? In the simplest case this information is so simple that it even allows only two states, light or dark. The simple answer is because it is treated like red light everywhere in the brain.

Let me explain it to you now more detailed. Assume a red cone in the eye receives red lights of intensity x and passes on an activation potential x into the brain. Now assume that this information (an activation potential say) coming from a red cone is marked as red light. Imagine, the cone sends the information (RED, x) rather than x , signaling, that this is the information of red light of intensity x received by a red cone. This signal x is so to say marked with the marker of red light, similarly like an atom in a molecule may be marked by being exchanged with a radioactive isotope. And like such marked molecules which may be used for investigating the metabolism in a body by using

imaging procedures showing the position of the isotopes in the body, in the same way imagine that the information (RED, x) is processed further in the brain and keeps it marker (as long as the output of an information process has still the meaning of red light). (RED, x) is a unique information in the brain by its marker RED . Call (RED, x) the quale microcode of red light.

Instead of saying information of red light of intensity x received by a red cone, or to be even more precise, information content of the event that red light was perceived by a red cone, we shall now often prefer dropping the phrase "information of" and simply saying red light of intensity x received by a red cone, knowing anyway, and self-explanatory, that actually the information content of the event of red light and not red light itself is meant.

Assume (RED, x) floats in the brain between various areas like a piece of information in a computer network. Assume that everywhere in the brain the marker, and code, (RED, x) is understood, and every area in the brain receiving (RED, x) says "Oh, that is red light of intensity x received by a cone", and is treated meaningfully as red light of intensity x received by a red cone. Assume further, no other part of the brain can produce the quale microcode (RED, x) of red light. That is, for example, by thinking about the physics of red light, about waves and functions, the brain is not able to produce the quale microcode (RED, x) of red light of intensity x received by a red cone. Logical thinking may have another quale microcode, say $(LOGIC, y)$, where y stands for information of some logical thoughts. But these codes cannot be mixed. That is, $(LOGIC, y)$ can never produce the quale microcode (RED, x) of received red light by a cone, as this would anyway contradict the definition of (RED, x) , which is defined as red light of intensity x received by a red cone.

That is, information is categorized in the brain and the categories cannot simply jump over from one to another category. At least, only a cone can produce the code (RED, x) and no other category of information in the brain can produce it by processes in the brain.

Now if everywhere in the brain the information (RED, x) is treated like red light, with all its characteristics we know, like how it travels through space, how it is reflected, how it makes shadows, how it is scattered in the air, and so further, then what else should come out than the meaning of red light? The information (RED, x) can only become to that how it is treated.

If the brain is thinking about this information, all it will think is that it is red light of intensity x received by a cone. The brain will not have any other thoughts, because this information is only treated

as red light received by a cone. The person in the brain can only say "‘This is red light of intensity x that I see with my eyes’". That is all. More cannot be said, as this is actually its definition.

Let us sum up this definition again:

(RED, x) is red light of intensity x received by a red cone in the eye.

According to its definition, (RED, x) cannot be produced in the brain by thinking, that is, for example, we cannot explain the quale of red light to another person. By definition, the person needs to experience it by itself. We could communicate $(LOGIC, y)$ but not (RED, x) .

This model of quale is presumably the simplest possible model characterizing and serving four important properties of quale of red light:

1. Quale of red light can only be experienced by seeing. (This is by the definition of (RED, x) .)
2. Quale of red light is unique under all information we experience. (The Quale microcode of red light forms its own category.)
3. Quale of red light cannot be explained or produced by logical thinking. (Information is categorized in the brain. Quale of red light remains in its category.)
4. All one can say about red light is that it is red light. There is no other meaning behind red light. ((RED, x) does not contain much information.)

Conclusion: Red light cannot be explained further as that it is red light perceived by a red cone - this is its definition. Red light is thus unique under the wealth of information in the brain by its marking with the quale microcode of perceived red light by a cone (of the individual).

If you see something red, then you see only the quale microcode of red light received by a red cone. There is no other meaning behind it than this, that a red cone in your eye has received red.

The notion quale microcode is inspired by the microcode in microprocessors. There, the microcode denotes a code below the machine code in which the processor can be programmed in machine language. Every machine code will be translated and split up in a deeper microcode. The same imagination I had for the quale microcode when it came to the word coining. A deep and old code understood by the whole brain. Ever since the brain evolved it was important to strongly distinguish perception from other information in the brain. So it was marked, so to say. And indeed, perception plays an outstanding role in our mind.

The whole process of how the quale microcode (RED, x) is treated in the brain characterizes red light in our mind and becomes to the conscious experience of red light. In this sense, (RED, x) is always a placeholder for the red light received by a red cone in our eye. For

example, it can release a motor function like saying the sentence "I see a red light". But one problem is here in this model: We may expect that the pure information (RED, x) is processed further with other information in the brain to give new information, for example the information, that a seen thing is red, or the information of motor function of muscles. Now we cannot expect that (RED, x) survives in the brain like a piece of information which floats in a computer network without being processed further, computed and modified. The answer is here that any piece of information Z in the brain should still carry the quale microcode of red light as long as there is a strong correlation (say a statistical over many different inputs and situations, or simply a logical connection) between Z and the quale microcode (RED, x) directly coming from the cone. This is even more so allowed for red light as we are quite aware about a red light at some point in our visual field. So this information seems to survive until very late processes in the brain without much modification. On the other hand there will not be such strong boundaries like the question (RED, x) or not (RED, x) . The reader may understand that it is a model about the idea of quale in the brain and this model does not reflect direct biological processes. So it should not be taken word by word, as if the brain was a kind of computer network where the quale microcode is a kind of code like the TCP/IP protocol in computer networks. But it is a good model how to see it.

This model can be compared with a graph where incoming information is computed in nodes which give outputs. This would reflect a neuronal network. The message here is that information and pure values x are categorized in this network. In this way $(LOGIC, y)$ and (RED, x) are in different categories and really differ from each other essentially. Imagine that (RED, x) is really red, and $(LOGIC, y)$ is gray. In this imagination, a red cone in the eye colors its intensity signal x red. This color remains in the brain wherever it is carried further in the brain. And once again I would like to stress that the quale microcode is everywhere understood in the brain. That is why this categorization of information is even so fundamental in the brain.

Let us finally remark that we use the term quale microcode for a concrete coding like (RED, x) for the quale microcode of red light of intensity x , as well as for the whole system and idea of categorized information.

3.1. Other modalities. The quale microcode can of course be applied to any modality. We may imagine a quale microcode for audio data $(AUDIO, x)$ coming from the ear, and a quale microcode

(*INNERVOICE*, x) for the inner voice. It is easy to imagine that if there is a failure with the coding, then inner voice audio data may become remarked as audio data from the ear, and in this case the individual would hear his inner voice from the outside world.

Now what about other colors? Say, blue. I would not say that (*RED*, x) and (*BLUE*, x) are exchangeable. Red light is treated different than blue light in the brain. For example, a cloudless sky at noon is blue. The flames of burning wood are mainly red and yellow, and so on. All the processes in the brain characterize (*RED*, x) and (*BLUE*, x) and make red light and blue light to what they are in our mind. This includes that we may think about the quale of (*RED*, x), asking, what consciously experienced red is. All this is encoded in our neural network. We are made to ask such questions, so to say.

Moreover different colors are strongly connected in the brain. That means they are compared to each other. That is also a reason why red has its own touch. It is compared with blue. Both are completely different as pure information, but they are connected by their similar function. Moreover colors will be mixed to give new colors, showing the strong interconnection between the quales of red, green and blue light. Also information in different categories will be compared, giving red light a touch of absolute value for us.

3.2. Creating quale. Let us illuminate quale microcode once more. A good method to come to the model of quale microcode is trying to create quale. Assume we want to create the quale of light. We could create a machine with an optical lens and sensors and involved image processing for the incoming pictures. We can make the machine and the information process as involved and cleverly make as we want, perhaps human like. The machine could recognize objects, have experiences, knows space and every behavior of light rays, how they reflect and scatter on objects and so on. But still we may ask, is there really quale somewhere? Or is it at the end just black, a running machine, no quale of light at all.

Let us revisit. We want to make a simple quantity x , the intensity of energy received by a photo receptor, lift to a spectacular new quality, the quale of light with intensity x . How much involved the machine may be, how much objects and situations we associate with x , how much data we overload the value x , for example to distinguish it from any other data or simple number x - or we could overload the value x with all the knowledge we have of light and let the machine do this - we can never be sure if the value x starts to glow and becomes the quale of light.

Now we may understand that we need to declare the value x coming from a photo receptor to have the quale of light. Quale has another quality than a simple number. Then we simply declare x to have that quale. If quale is different, then we need to distinguish it. So we mark the information x and create categories. And in this way we end up with the quale microcode $(LIGHT, x)$, which distinguishes it from the simple data x .

My proposal is, that the brain will do the same. That is why quale of light is so different for us. Of course, this is at first a simple categorization of information in the brain. The real quality of light comes from the way how $(LIGHT, x)$ is treated in the brain. It is treated like light, so it becomes light.

This is true for the processes in the primary visual cortex. But also for about how we think about light. If we think about light only that it is light and it is something special which has the quale of light, well, then only this can come out.

3.3. Quale seems absolute. One may interpose that red light one is perceiving seems to have an absolute quality. But actually that does serve the quale microcode. It distinguishes (RED, x) from any other information we can experience. So if in a thought experiment we forget for a moment about what seen red light means for us, and imagine that we are endowed with the quale microcode for red light. Now then (RED, x) must be different than any other information we experience. So it must have an own, unique characteristic. It will be hard to say what it will be for us. But the information is there. So it will look like something. (More so because it is a visual information.) So the answer is, it looks like the red light we daily experience and know so well. This is the way it looks. Red is (RED, x) , which is perceived red light by a red cone.

In this sense we may remind the reader of point two of the above list of properties of quale of red light handled by the quale microcode:

Red light is unique under all information we experience. (The Quale microcode of red light forms its own category.)

3.4. A simple example. Consider the following experiment set-up. A special microphone with a resonance frequency y . The resonance of this microphone may be very narrow, so that resonance becomes quickly weaker outside of y . The output of this microphone is sent to an oscillograph.

If there is noise in the room where the microphone and the oscillograph rest, then depending on the loudness and the frequency of the noise we shall see some signal at the oscillograph. A strong one if the

noise contains a strong sinus wave around y . The other frequencies farer from y are strongly suppressed in the signal.

This experiment set-up models some hearing (for example of a person). By its setup the signal coming from the microphone will have a kind of quale ($AUDIO, i$), the quale microcode of an auditive resonance at frequency y with intensity i . So we may understand the signal from the microphone to be categorized and marked with the quale microcode of an audio signal at frequency y . We claim that this experiment set-up gives indeed a kind of noise. But isn't the receptor in an eye the same? Such a receptor will also have a resonance frequency. Why should our experiment set-up not simply give some kind of quale of light. The answer is that this experiment set-up is not measuring light but sound. The whole experiment set-up plus the environment defines the quale of the experiment set-up. Obviously it measures sound. The whole environment in which the microphone is embedded, and how it works (it is not a photoreceptor), defines the experience of sound in this experiment set-up. There are not sharp local bounds where the quale of sound is located. I will explain this in more details in the next section. The experiment set-up and the quale of sound are actually properties of one field. Analyzing the meaning of the experiment set-up, we may understand that there is some audio receptor and filter at y , so it is as if this machine is analyzing sound of its environment. So we may regard it as that.

3.5. Pain. One of the most astonishing quales is pain. It is clear by its function that pain must be an extraordinary information, releasing immediate action in many cases. If we burn our fingers on a hot plate, we cannot wait. We need to pull back our hand immediately to save us from harm. It requires immediate action and interruption of all other normal things we are doing in that moment. It is an immediate and exceptional state.

Imagine how a pain receptor sends a quale microcode ($PAIN, x$) for pain of intensity x to the brain. This quale microcode floats in many areas in the brain, and everywhere in the brain the code ($PAIN, x$) is understood and treated accordingly. Depending on the intensity x , running actions may be interrupted. The state is disliked, and actions are released that could one bring out of the state of pain. All these brings us into the state of pain, and the way how ($PAIN, x$) is treated in the brain, makes the simple information ($PAIN, x$) to the quale of pain.

It appears logical, that also nonhuman animals will have the similar experience, if the brain's reaction is similar as by us. It seems to me,

that even an insect will have a quale of pain, because of some similarity of action and the function of pain. The function is to bring the body out of the state of pain. So the meaning and reaction of the pain signal are similar between an insect and a human, and so should result to a similar quale. But I also will not doubt that in an insect's quale of pain will be much more rudimentary when compared with a human.

3.6. Summary. Quale is marked information. Information floating in the brain is categorized (by markers). By definition, red light is red light received by a cone in the eye. The information of red light is marked as red light (quale microcode). No other process in the brain can produce marked red light, making it an extraordinary distinguished and unique information in the brain.

4. FIELD

We have no sensor for our consciousness. For the images we see with our eyes we have the feeling of being conscious images. But we cannot measure this. We can, and usually will, only be astonished about these visuals when we think about them. But actually there is nothing special about them. They are just visual data. Also, a zombie will claim that the images he or she sees feel conscious. The difference between us and a zombie seems to be that our images are unified and form real entities where in a zombie the images are just combinatorial data in the machine zombie.

Since we have no sensor for conscious, as it is not a physical effect like a light that enlightens unconscious data and lifts it to the level of consciousness that could be measured, but rather the images are encoded data in our neural network, the problem shifts from conscious to reality. Why are the images real? Why do they exist at all. Why is nature not only a concert of individual particles in an absolute spacetime?

So the question shifts from consciousness (which we cannot measure, even not in our mind) to reality. Why is this simulation in our head real. Why does it give a real person and real unified images?

It is at the end a believe that the simulation in our brain is real in the sense that it produces real images, say. We simply assume this here.

4.1. Field. When we think of the brain as a collection of interacting particles, molecules, atoms and isotopes, say, then consciousness is not plausible. How should the particles give such a complex phenomenon like consciousness which seems to involve all these particles and their interaction?

As a solution to this problem I would propose not to think of nature as a concert of interacting particles in an absolute spacetime, but to think of a field. Imagine that the physical information of nature is encoded in a function from spacetime to some set. The values the functions may take may be operators on Hilbert space like in quantum field theory. It is however not important to clarify and fix this here. What is important, is, that we think of this field as one thing. Particles and forces (possibly encoded by force particles) are then just a phenomenon of this field.

Nature would then be this field plus nature's law, regulating how the field looks like; say, how things evolve in time. When we consider the brain, or when we imagine how it could work, then it may be not too difficult to imagine how it sees things, analyzes visual information, being aware of his position in space, being astonished to see something at all etc. This is not the hard problem. But our problem is that we think of particles which act like individuals in space time. Analyzing the brain we could say "‘Yes, it is as if there were a simulation of a seeing and thinking person who may be puzzled to see something at all and wonders about consciousness’", but this is just a concert of particles. Cold, black, dead and empty. The simulation of the person is just an interpretation of us, the observer, and actually there is nothing like consciousness.

Now make the same thought experiment under the premise of a single field. Now all things (particles) are glued together. Even more: there are not parts or particles at all because there is only one thing, the field. Now we have no problem any more to see scattered particle information as one picture. Analyzing the brain we see this simulation and thanks to the field interpretation we can now say "‘This simulation is real. There are real pictures in the brain’". Even a rock is now a whole three dimensional picture in space. So even this rock is a real picture and therefore conscious in a very rudimentary way.

4.2. Creating a conscious image. Let me illuminate the field interpretation in another way. Assume we want to make a small picture consisting of two times two points conscious. Each pixel may be light or dark. How can we do that? We could arrange four things (atoms, ink or LEDs say) in a two times two array in space. We can even glue the things together with glue. But will it be a conscious picture? Each pixel (atoms say) may be viewed as individuals which are glued together by force fields, which for itself may be interpreted as a collection of particles. So it is not clear how to glue particles together such that they give something unified, a single picture. If we interpret

nature as a field as explained above then we have no problem with particles any more. There are no parts. The pixels and the picture they form are just an phenomenon of the one single field. The pixels are glued together automatically. We, as an observer, could interpret the four pixels as a single picture. So it is one, as a rule of thumb. (A duck which goes like a duck etc.)

4.3. Some metaphysical arguments. Let me give some metaphysical or heuristical arguments for the field interpretation of nature. The strongest argument, of course, is that particle interpretation allows no consciousness, or it is not plausible. And the field interpretation is the simplest way out of this problem. All things are glued together, there is only one thing.

On the other hand, the concept of individual particles in an absolute spacetime is not so plausible as it seems to us at first glance without much thinking. We know that particles interact when they come together. How should two particles know that they have the same space coordinates? In some sense, the absolute space should appear as transmitter and compare the coordinates of both particles. That is, there is an immediate connection between particles and space, and consequently between the particles. Would they be completely separated, there could be never happen interaction between them. Is however interaction possible, so the particle coordinates must be continuously compared. In this case the particles form, together with the absolute space, still a kind of unit.

In the last argument we interpreted force also as force particles. If we think of force not as particles but as a force field, then space is filled with something, namely the force field, and particles are connected among each other by this field.

In any case, it is somehow difficult to imagine individual particles which are not connected to interact. If there is no continuous compare, there will never be an interaction.

4.4. Conscious picture in brain. Of course, the two times two picture in the above example 4.2 is far from our conscious picture. Our images in mind are highly interpreted images. We see objects, configuration in space, light, shadow, and also letters, words and sentences. Let me sketch the field interpretation of nature with the example of our visual system in the brain. Where is the conscious picture at all? Some may argue that it is not in the primary visual cortex (possibly by experiments). But I will argue that every part of the brain involved in visual processing is important and that a narrow localization leads to unnatural assumptions.

My argument goes in the direction that conscious is not localized. It is not self-evident at all that the visuals we see are only localized in the brain. There is no line of consciousness between our body and the outer world, so when we see something in daylight, then our conscious experience starts even at the sun, where a photon is emitted, and even before when this photon is created, and so on. Take the electromagnetic waves in front of our eyes, shortly before they arrive in our eyes. Of course these waves are important in what we see, because we see them and so affect consciousness. So we cannot neglect that these waves are part of our consciousness. The same argument can be taken for any part of the visual processing in the brain starting from the eyes to a final end of a process. Every visual processing part of the brain obviously affects our conscious. We cannot take it away (we would see nothing) or bridge it (it would affect what we see consciously). So every part is important. But, again, this argument starts even before light enters our eyes. Even the electromagnetic waves between the sun and earth are important, if these are the waves which were reflected on things that we see.

Of course you could argue that you put a clock in your visual view, think that you see now a conscious picture, and so measure the point of time of your conscious experience roughly. How could light rays several minutes ago between sun and earth count and be part of this experience? I would answer, that still the light rays between sun and earth define your experience, even if you make a measurement with the clock. But that time measurement is not the whole experience itself. Your experience includes the past, and picking out some information (the clock) is here no contradiction. Similarly, to give an example where it is more obvious, the point of time when a signal from an axon is sent to muscles is not the point of time of the consciousness experience associated to this motor function; there is much more information processing before this signal. But of course, I would also agree that the mass of information of this experience consists of the brain. This is also clear, most relevant information what the picture is that we see is defined by the visual analysis in the brain. But there is no sharp line. When you try to localize you will run into a unnatural impasse which I describe below.

Before I come to the counterargument of localization let me describe what the conscious visuals are that we see with our eyes.

My answer is that our visual consciousness differs from a code or the raw surface information of objects in space because the whole process in the brain counts and defines this consciousness. Physical light becomes to our conscious experienced light because the information coming from

the eyes are treated and processed like light information. The brain knows how light behaves, that it makes shadows, reflects from objects and so on. Accordingly the visual information is processed. The outside world of the body is reconstructed, interpreted and information is combined, also with memory. And all this processing together gives a much larger picture which differs from the electromagnetic waves in front of the eyes. Let me remark that I will call such a complex process and all involved data as the whole visual cortex and image processing a picture; a part of the global field. We prefer it to call large physical processes, their involved fields and data also pictures. They may be imagined as a piece of field in spacetime.

Imagine how raw data come from the eyes, edges are analyzed, then surfaces, then objects in three dimensional space, then faces, then memories of former events are associated and so on. The incoming data from the eye at time 0 and already processed data resulting in object data at time 0, which however are the result of the eye data at -0.2 seconds, say, all this imagine as one picture. Also, this picture is not fixed at time 0, but over some time interval, say from 0 to 0.5 seconds. All the visual processes and the brain tissue in this time interval is meant, when we speak about a picture. And this picture is the picture we think is the conscious picture we experience.

Let us stress that we mean that consciousness is this picture. So the conscious image we experience is not another physical effect of these physical processes but the conscious image is the brain tissue and the physical processes over some time interval.

In compare, the physical electromagnetic waves are only a small picture. Actually this small picture is part of the whole processed picture, which should be understood to be a larger part in spacetime. Again, say around the area where all the visual processing in the brain takes place, and approximately a half second in time. So the visual consciousness could be viewed as a rather large part of the single field of nature (as proposed above) involving large parts of the brain over some period of time, the material functional data of the brain tissue plus the current data like signals and current electrochemical state of the brain together with the law of physics.

It is important here to note that we need to take also the law of physics because only then we can interpret this process really as a process where a visual stimulus from the eyes is analyzed and processed. If we saw the field only as any raw data field then it would not be clear why interpreting it in this way and not seeing it just as any statical raw data. So it must be clear that we speak really about the field of nature. Of course it is not necessary that anyone observes this from

outside. But I think it is a good and necessary rule of thumb that an observer analyzing the field and knowing the laws of physics should come to the same conclusion that one could interpret this part of the field as if there were visual pictures processed.

4.5. Counter arguments to localization. By the field interpretation of nature, as nature as one thing, things are connected. We should not see any problem in viewing events which are far from each other in spacetime as connected.

But let us assume, to the contrary, that visuals would become conscious only late in the brain, say somewhere after the primary visual cortex. Let us assume the visual input from the eyes were be analyzed somewhere, objects were recognized, human faces were analyzed, and so on, and then this information were encoded and sent to some higher brain structures where it becomes conscious. This conscious code would then be rather compact and I wonder how this information differs from raw data, say information on a data storage. Where are all the characteristics gone that make light to the conscious experience of light? Where is all the information about space?

To deepen our arguments further, let us come back to the assumption that the conscious images were located late in the processing somewhere in a higher brain structure. My argument is that there would be no longer visual processing and so the characteristic of light would be lost. These are then data which are processed in another way. It is necessary to analyze raw data as reflected electromagnetic waves from surfaces of objects to create a much larger picture than compact raw data would supply. A complex analysis how light behaves in nature makes light to light (in the brain). Either this touch is lost in the higher brain structures (under our assumption) or it must reprocessed again; but why should the brain repeat something. So it makes no sense to localize the conscious picture in a higher brain area. Every part of the visual processing in the brain is important and contributes to the consciousness. It is not important here that you can understand and speak about how this process works as an individual. One is usually not aware of this processes, and this may lead someone to argue that it is unconscious. But it is not. It is an essential contribution and definition what the conscious images are. The primary visual cortex defines light, so to say. If you try to localize conscious data you will run into contradictions and problems. Why should these data be conscious and others not. Why should these data encode light whereas others do not, or encode another modality like sound. With localizing you will loose all the information. Only the whole visual process defines light

and distinguishes it from sound, say, which has a complete different data processing. The data processing of sound defines the sound we hear. Gives it the unique touch of sound.

Let us still assume the conscious picture were located somewhere in a higher brain structure. Then we could, in a thought experiment, cut off the primary visual cortex and feed the higher brain structure with the results of the primary visual cortex. For a short period of time there should be no effect on consciousness. We try to localize the conscious part of the brain and feed it from outside with statical but meaningful recorded data like playing a movie. Then I would ask again, where is the relevant information in the conscious area that makes it conscious? Where is all the information characterizing light? In my opinion, this thought experiment results in a complete different consciousness which is poorer than that of the whole brain. Anyway, in this experiment there is no longer the real action of a person in a real world. So the localized part would sooner or later understand that the world does not react anymore to its motor functions. So this is a different situation which cannot be compared with the whole brain. If, however, one would substitute the primary visual cortex with another machine having the same function I could believe that the consciousness is close or similar to the normal brain, because here we have all the relevant information of image processing again.

In the extreme case consciousness would reduce to a few physical numbers. But then we may ask, where does the information come from? How is consciousness distinguished from a couple of raw data? Then it might be completely easy to create consciousness in a simple apparatus by generating the few physical numbers. All this seems so unnatural, that we think that consciousness is not strictly localized.

A similar argument holds for the following. Consider electromagnetic waves which are reflected by objects and travel through space. The brain tries to reconstruct this outer world in the brain again. Isn't then the real world as conscious as the inner world in the brain. Of course not, because the brain highly analyzes the data from the eyes, sees objects and so on. All information which does not exist outside. In this way the whole processing together with the data from the eyes give a different picture than the picture of the electromagnetic waves and the surfaces of the objects in space outside. (Let me remark that under the first picture I mean the whole imaging processing together with the whole involved brain tissue including all information like quantum electrodynamic fields.) But there is no conscious effect. Both pictures are conscious or unconscious, as you like to see it. The pictures are just different. That is the only difference.

4.6. Self consciousness. How works self consciousness? I will give some remarks how I see it.

As often, I will consider an example. Where in the brain is it where I as a person see the visuals coming from the eyes? My answer is as follows: Images from the eyes are processed. On the other hand there is a brain structure in the brain which is responsible to simulate my self. Let me call it the I-simulation. It is aware of my body and my position in space. Then, somewhere in the brain, it is defined that the I (simulated in the I-simulator) sees the visuals coming from the visual cortex. This is the rough idea. At this point, or by this definition, it happens that I see the visuals. It is just a definition in the brain, naively spoken. Of course it means, that both areas, I-simulation and visual cortex, are connected and the brain works meaningfully in the way that the simulated I sees the visuals.

One message is here that the visuals do not become conscious at some place in the brain. The visual process in the primary visual cortex and so on is the conscious image itself. It will not become conscious somewhere. If we cut off the I-simulation then the visual remain conscious images as we know them for themselves. But there is no I, no observer, who sees them. (With one exception: even the visuals itself include already an ideally observer by the position of the eyes from where the visuals are seen. The position of the eyes in space build already an observer and in this sense a rudimentary I.)

Let me underpin this point of view by an example situation. Assume that you watch some music video. You hear the music and see the visuals. Your mind may drift away and you do not recognize the visuals so strongly any more. (Another typical example: driving a car where you do something else and you loose the focus on the street.) Then the consciousness of these images still remains. It does not matter that you shift your attention to some thoughts, say. The pictures do not become conscious because you focus your attention to them. They are conscious for themselves. But the connection, the definition, that you, your simulated I, sees the pictures is weakened. Because your I-simulator is more busy with other brain structures.

The I-simulator and the visual cortex are connected automatically. Firstly because they are part (or properties) of the one field of nature. Secondly, because they are connected by brain function which may be summarized by the definition that the simulated I sees the visual from the visual cortex.

In more concrete terms (I will try to lay out this again in more details again in the last paragraph of this subsection), if the simulated I needs information from the visual cortex, it will get it and processes

the information further to create thinking data like words, or to come to some decision and motor function, say. In this way the simulated I is connected with the visual cortex.

A typical model-like example could be that visual data come from the visual cortex, and the I-simulator declares the data to be seen by the simulated I. This could be realized by marking the information to be seen by the simulated I, say that visual data x are getting marked in the form (*SeenBySimulatedI*, x), similarly as red light was marked in the qualia microcode section. Now everywhere in the brain it is understood by this marker that x is seen by the simulated I. These data may go further to an area of speech, where the sentence "I see x " is sent to the motor functions of speech.

All the involved brain areas are automatically connected by the field. Different brain areas are glued together automatically, so to say. In a more abstract sense, different data or events in spacetime are glued together.

In other words, the visual analysis in the brain, the I-simulation, the definition that the I sees the visuals, all that we can think about from outside of the brain as an observer in a mechanical and mathematical way, all this becomes real by the field as one thing.

To summarize the interplay between I-simulation and visual cortex, or rephrase it somewhat, and hopefully not misunderstood: There are two parts: The visual processing, and the I-simulator. Both are separated in a first approach, but they automatically connected because both are part of one field of nature. In the brain (or mainly in the I-simulator) exists the definition, that the simulated I sees the visuals from the visual processing brain parts. This is the first functional connection between both brain parts. Even when the I-simulator does not process further visual data, it thinks that the simulated I sees them, and so the simulated I sees them even if there is actually no connection between I and visual data. Whenever the I-simulator needs more information, say that it thinks about its position in space, or for cognitive functions which need analyzed visual data, then the I-simulator gets this information from the visual cortex. This may be image details from sooner parts of the visual processing, or object information from later parts of the visual processing. In this way the I-simulator, as well as other brain areas, have the visual data available to process it further to create new (non-visual) data, like space coordinates of the body. But visual consciousness is encoded in the visual cortex, where the workload of visual analysis takes place. These images are for themselves the conscious images and remain conscious also without the I-simulator. Only, without I-simulator, no simulated I has the convincement to see

them, but they exist in their form as we know them. By the unifying character of the field, we are the visuals as well as the I-simulation. Even if they are separated, we are both, because both are parts of one field.

4.7. Unconsciousness. Usually we regard processes in our brain as unconscious if they affect our behavior but we cannot speak about these processes. An example would be forming sentences which we then hear as inner voice. We do not know as an individual how these sentences are created. Or recognizing an visual object. We are not aware of this process.

I believe however that there are not conscious and unconscious parts in the brain. Even not in world. The reason why processes are seemingly unconscious lies in the function of these structures. Take recognizing an visual object. There is no information transfer from the process of analyzing images for recognizing objects to brain structures where sentences are formed. The result of object recognition is sent to area of speech, but intermediate steps of object recognition do not. So object recognition affects our speaking consciousness but much information is hidden. That is why it seems unconscious. However, object recognition is an essential part of our speaking consciousness. It affects our speaking consciousness so we cannot neglect it. Actually it also defines consciousness. See the arguments above I gave why consciousness is not localized. Also, why should there be parts of the brain with the magic of consciousness and other parts with having it not. Our assumption is that the field explains reality.

Similar things can be said for the process of forming sentences. The sentences we hear as inner voice or that we speak. We cannot cut off these brain parts and play recorded sentences to cheat a thought localized consciousness in the brain. The consciousness would not be as before. All these seemingly unconsciousness parts define our consciousness. Otherwise it would not be clear how a compact code for speech would have its meaning. Only the process how such codes are formed explain there meaning and distinct them from any other raw data.

In the same way the intestinal brain is not more conscious or less conscious as our speaking conscious. It is only different, presumably less complex. The reason why it seems unconscious is that there is no or only little data transfer to our speaking consciousness. That is why we cannot speak about it. The intestinal brain is autarkic. So the difference in these structures for our awareness is not an essential physical quality but comes from the structures that are involved.

A good example is the consciousness of another person than ourselves. We are complete unaware about the other persons thoughts if it does not give us signals or speak with us. But we do not doubt that the other person is conscious. It is only unconscious for us by reasons of function. We do not get information from the person. And the same can be said for the intestinal brain. That is why it seems unconscious.

4.8. Computers. I have invested some time in clarifying if a computer (or Turing machine) can be conscious like a human. I did not come to a conclusion. Let me remind you what it is about. One may simulate the brain in a computer, at least the relevant information of the brain of which we think it is responsible for data processing and consciousness. In a serially working computer the process which is done parallel in a brain is now done serially, by a single CPU say. Most of the information is held statically in a memory, and the CPU works only very locally through the memory. So the CPU needs to make many steps to bring a current state of a brain to the next state in time. Like a scanner the CPU focuses only a very local part of the brain (encoded in memory) and modifies it locally. So such simulated brain in a computer is topologically a rather unnatural and big transformation of a brain. Will it be conscious like a human?

In former times I would have said "‘of course’". After developing the field interpretation of nature I tended not to believe in this anymore, because I viewed the field as a field in space which involves in time. (So field states of different point of times may not be glued together.) So the difference to a real brain might be significant, because the state of the brain is only held statically in the memory and there is no longer the field of forces and particles we find in the real brain. So it would be something completely different. The connections between one state and another state in time of the brain would no longer be physically be real in the simulation as in the real brain. It is simply something different, even though the simulation would behave like a real brain. But this is not the point. Important is what is inside. One should need to know all the information of the brain, only then one is able to decide what is going on.

But later I focused less on the field as thing in space which involves in time but rather to view it as one thing in space time. Now the simulation may make not such a different any more. Even if the computer works somewhat different, because serially, over many CPU steps and over a longer period of time the connections between the states of the brain for different points of time are the same as in the real brain. So one may indeed interpret the simulated brain as equally to the real

brain, because things are glued together in time anyway by the single spacetime field interpretation. In other words, in this interpretation every event in spacetime is connected with another event in spacetime (to another time for example).

By this argument I now tend more in believing that a simulated brain in a serially working computer becomes also consciousness. But actually, I could not decide this. (That is, I have no strong believe in any direction.)

4.9. Animals. What about consciousness in nonhuman animals? Having the field interpretation of nature at hand it is now much easier to understand what is going in an animal's mind. Take a jumping spider. It is a quite optical being. Visual stimulus from eyes is processed, analyzed and interpreted. All these data in the spider's mind are automatically unified by the field. (Actually they are properties of the field.) So these images form real conscious images. Of course, these pictures differs from our conscious pictures. But they are also entities and real. The more complex and vaster the spider's analysis is, the bigger these pictures become and the more they differ from raw data pictures like photographs or surfaces of material things.

Similar things like a human brain and a tiger brain have a similar consciousness, as (mainly) the brain is the consciousness. Since consciousness is not localized in the brain but is a global phenomenon we may guess that similar functioning brains define a similar reality, as the tiger's brain is in its rough structure and function quite similar to the human's brain.

When the visual processing cortex areas are similar between different mammals these cortices and their processes in action will define similar conscious images.

The same can be said for quales. The quale is a result of physics of a system. So roughly, it is defined by the function in a neural network if we speak about brains. So when animals and humans have similar functions in their brain, similar things will come out, for example the quale represented by these functions.

4.10. Inanimate world. Let me give an example how to see our brain in action. Compare it with a flag in the wind. The flag symbols the field character of the brain. The wind the input the brain receives. And the movements of the flag the motor functions sent by the brain. We are that flag. We perceive information like the flag receives the wind. We act by the laws of physics like the flag moves by the laws of physics. And determine the outer world like the flag moves the air.

Our conscious is one like the flag is one. Our state changes with time like the flag moves in time. We are that flag.

On the other hand, a real flag in the wind has a conscious, as it is a state of the field of nature. The flag is one literally, and forms an image within the field. So it is a real image, changing in time.

Every thing in nature forms an image, simply by the the material configuration in space. These are real images. If our configurations in the brain form real images, why should other things do not so. There is no reason for a distinction. We are a thing like other things. The difference is the structure and function. We are a different image. We, that is our consciousness, as there is no difference between our conscious and our brain. The brain IS the consciousness. All our bloody neurons and electric fields ARE the consciousness. Our consciousness is another property of the field like seeing a neuron through a microscope is a property of the field, of our brain. One thing, many properties.

It is a fallacy that our brain is the collection of neurons. The brain is a property of the field of nature, and the neurons are states of nature. The brain is not the combinatorial information of neurons. This would give an incomplete picture, destroying the unifying property of the field. More on this in the next section.

How can we imagine the consciousness of an unanimate thing? This may be hard or impossible, but maybe a first approach may be done by imagining it by white noise. Remember the white noise you see on an old tube television not receiving an antenna signal. I choose this picture as we have no interpretation in such an image. We see no objects. But all the knowledge of space, the quale of light, and so on remains. Even for completely black screen we are aware of the absence of light. All this cannot be removed in our mind. Imagining a raw image as a field of data is also insufficient. The unifying property of the field can only be done in our thoughts, by regarding this field as one, but actually we tend to regard it as individual data arranged in an array in space. This is also the problem when we think about consciousness, how we experience it, and about particles and how they form the brain and our knowledge about the brain. Usually we tend to regard things as an arrangement of smaller pieces. This we should forget when we try to imagine the consciousness of things.

4.11. Dream. One may object that we experience also in a dream sound and visuals, so why should even the environment of a brain be part of consciousness. The answer is that not the physics itself counts but any model that emulates the physics of sound. Or aspects of it. Something that has these characteristics. Everything what is, counts

- in this case in the brain. So in dream everything is modeled in the brain. And of course, the reality in dream is not as real and intense than in the wake state.

4.12. Duality between field and quale microcode. It may be interesting to observe that field and quale microcode are almost dual to each other. The field is absolutely global whereas the quale microcode is ultimately local. We claim that conscious experienced red light requires a great aral of the field of nature. On the other hand, we reduce its intrinsic information to a simple marked number (RED, x) , the quale microcode of red light of intensity x . This is like a measurement in a classical physical sense.

Field and quale microcode might remind one of wave function and measurement in quantum physics. The field of nature would be the wave function whereas the quale microcode would stand for a measurement of the wave function.

4.13. Example: hearing sound. The usual imagination of hearing a sound is as follows. Sound comes to the ear, is receipt, and then, somewhere by a process which it is not known, it becomes conscious.

My idea is as follows. The hole data process of audio analysis in the brain is the sound. Even more so, there is no beginning. Also the sound in the air is part of this consciousness experience, makes, or better, is this experience. The brain and processing and the states involved are the sound. There is no difference. Localization like measuring an electric potential somewhere in the brain is a state of the field. Or measuring the configuration or the weight of neurons.

When I-simulation and sound comes together, the sound data coming from auditive processing do not become conscious in a certain place in the brain. It is all one. I simulation and sound processing are linked by some physics (interacting neurons) and so form one part automatically. Of course, there may and will be parts which are significant for speaking about the sound the person hears, for the motor function of speech. But there is no localization of the reality of consciousness (recall that we have no sensor for consciousness), because all parts are important and define sound.

4.14. Two persons. Let us consider two commuting persons. Similarly as areas in the brain form a brain, the two brains may form a double brain. They are not separated as they are two properties of one field, and so are glued together automatically. If the persons commute, this link becomes closer by function.

One may explain the change of consciousness when people interact by a change of the single brain itself. However, why should it be so? If you listen another person then you will get information from its brain. Why should the reality of your consciousness stop at the boundaries of your brain? The conscious experience could also be the physics involving both brains. Actually, there is no doubt, that measurable information of the other person's consciousness becomes also part of your consciousness, say by listening words.

So we regard different consciousness only as different properties of one field, where everything is connected; between time and space. If two brains communicate the interconnection is intensified by function, and they form a kind of two-brains. The same we usually claim as completely normal for interacting neurons in a single central nervous system.

4.15. Relativizing the field picture. To consider the whole nature as one thing might be regarded as very extreme. Perhaps only special fields like the quantum electrical field may be connected. Or they may be connected only to some extended in spacetime depending on the energy in an area, say. Or the area of connection depends on the wavelength of a certain wave-like physical process like the electromagnetical waves. Since it seems impossible to decide this easily I decided to take the extreme stand point: everything is connected. The whole nature over time and space is one thing. In this way things can be viewed unified and I avoid unnatural arbitrary speculations and assumptions about nature and avoid complications and problems. I will not completely exclude that it may happen that only special fields are unified, say.

However, if this may be the case, we then still will face the problem of explaining the hard problem of consciousness for this field. My proposal anticipates that the answer lies in viewing a field as one thing, at least over some bigger part in space time. Anyway, if only special physics allows consciousness, the problem of understanding how things are unified will remain.

In this sense I found it natural, legitimate and comfortable to view the whole nature as one thing in this consequent and universal way. Knowing, that it might need some adaption.

All attempts in trying to localize the one-thing-theory to a larger local area in spacetime felt unnatural. That everything is part of one thing and in this way connected felt most aesthetical and handsome to work with and so right. A good first approximation, at least. If not even completely true.

4.16. Summary. The field picture is justified and deduced from the following considerations. If we try to create consciousness then we need to unify several data to a new entity. An example would be to unify pixels to a single picture. We have no chance to do this naturally in a pure particle interpreted nature. We need to postulate a physics in which many data are unified by nature itself. So we come to the field. The second argument is that particles and localization are unnatural and insufficient in explaining consciousness. The field picture, that things are glued together by nature automatically, is the simplest way out of this problem.

5. STATES

I came only recently to the idea of states of the field. So I will not have to say so much here, as I have not followed these thoughts so long. It grew out from the localization and globalization problem.

On the one hand we regard nature as one field and so as one thing. On the other hand we have local effects like measurements or particles. Also we consider parts of the field like the visual processing of a human. Moreover, we could also consider only a neuron of the visual process. If the field is unified, how can we speak of parts of the field at all as if they would form own entities?

I propose the following. We regard local parts as properties of the field, rather than of parts of the field of which the field is made of. These properties are like measurements of the field. A property could be that there exists a neuron in a particular point in spacetime, and the neuron is in this or that state. Or it could be only a particle, or the complete image processing in a human brain over some period of time with all its physical data and states over time.

If we measure the field in every point of spacetime then the combinatorial collection of all these data will not give the field itself. If we viewed it in this way, we would split the field in parts again and the unifying of the field would be destroyed. So the following is not true: Consider the field as a function from spacetime to some set. Mathematically spoken this function f is the collection of all pair $(x, f(x))$ where x runs through spacetime. That means, if we know all these pairs, so if measure the function in every point x to get the value $f(x)$ then we can reassemble the function f completely. The message is now that this can not be done with *the* field of nature. Even if you collect all relevant data of the field in this way, the combinatorial product of all these data will not give the field again. Because then you had

destroyed the unifying property of the field. The field is not a combinatorial product of data, rather, measurements and local events of the field are properties of the field which characterize it (possibly not completely, even if you knew all measurable properties).

If you have a function then you can consider subfunctions which restrict the function to a local area. The subfunction is then a subset of whole function, if we regard the function as a set. Such considerations are wrong for the field of nature. A brain is not a subset of the field. And a neuron in this brain is not a subset of the brain. It is wrong that a brain forms a unit which encapsulates it from the rest of the world. Because then you had localization and this would destroy the unifying character of the field. In this way we may consider parts like the brain or a neuron in the brain, but these units never contradict each other, but rather are only properties of the field, like the property of an object to have some color. There are no parts and boundaries in or within the field encapsulating things.

More concrete than mathematical functions are images. Consider an image consisting of a matrix of pixels. We may consider subimages, the whole image, or only single pixels. If we compare this image with the field of nature then it is not such an arrangement of pixels. Rather the whole image is a property (or state) of the image, as well as the subimages are properties, and the pixels are properties of the image. But the image is not itself the arrangement of these pixels.

These properties of the field will also be called states of the field. The field may be in the state that I hear a sound at a particular place and point of time. The consciousness of this sound involves mainly large parts of my brain with all its physical states over a longer period of time. But actually these parts are only an approximation. To understand the sound completely I would need to consider the whole field, as there are no sharp boundaries. Also parts of my environment where the sound was created and waves in the air are part of this experience. So in saying I hear this sound, I describe and characterize a property of the field. In the same way I could speak only about a neuron in this auditive process. This would be another property of the field, with some overlapping information with the sound hearing process. But these two properties do not contradict each other. Neither the complete process of hearing the sound, nor the single neuron build a unit. They are just properties of the field.

Let us illuminate the consciousness and relatively local effects like neurons again under the light of states of the field. That a concert of neurons forms a real conscious picture is a property of the field like the torsion of a curve. Consider a real-valued function. In every point it

has some torsion, and other higher derivatives. These are all intrinsic properties of the curve. But the torsion is not an own object that is separated from the curve. In the same way we should regard the reality of the visual cortex as an intrinsic property of the field like the torsion of a surface in some local area, and not as an own physical effect. Also the reality of a single neuron may be regarded as a property of the field like another higher derivative of a curve. Both, the reality of a neuron, and that of the whole brain are intrinsic properties of the field, and form no contradiction.

It should here be remarked that these complex properties like hearing a sound are not physical measurements. We should not understand consciousness as a physical effect, as it would then not be clear how it influences neuronal activity. Rather consciousness or hearing a sound are properties of the field like torsion of a surface. A torsion is also an intrinsic property of a surface which is local and global at the same time. The same can be said for the consciousness of sound; it has some rough locality, but is not completely local. But the torsion is not an effect outside of the surface, like the consciousness of sound is not a physical effect or physical measurand. In the same way, higher derivatives of a surface are properties. Higher derivatives could then be compared with the reality of a single neuron. All these properties describe the surface but do not resemble the surface (at least if we view it as the field). (In mathematics it may be the case, but not for the field, as already stressed above.) In the same way we should regard the reality of the visual cortex as an intrinsic property of the field like the torsion of a surface in some local area, and not as an own physical effect.

5.1. Summary. We should understand consciousness as a global phenomenon existing everywhere in nature. But how can we speak about the consciousness of a single neuron and of the consciousness of billions of interacting neurons at the same time? The answer is we need to understand both forms of consciousness as intrinsic properties of the field. The consciousness of billions of neurons is not the combination of their single neurons but both forms of consciousness (single neurons and interacting neurons) are just properties of the field characterizing it.