

Phenomenology and Neuroscience

A Comparison of Their Views on Consciousness

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Abstract

In this thesis we take a look at the way phenomenology and neuroscience see consciousness. On the surface they seem to be incompatible, but are both views really that different?

Phenomenology says consciousness is the start of all our knowledge, and examine consciousness from a first person point of view. They look within to find the invariant structures of consciousness and find that consciousness is always about something; consciousness is intentional. The surroundings of something influence how we experiences it; our previous experiences color how we experience something now.

On the other hand, neuroscience and Lamme in particular, takes a different view to consciousness, seeing it as another function of our body that needs to be explained. Lamme uses neurological means to do so, he shows that recurrent processing (a specific kind of neural activity) is necessary for consciousness. Here technology is used to look at brain activity, which makes it a third person view of consciousness. In Lamme's view too, previous experiences influence what we will notice later on, which is a remarkable similarity between two very different views.

Some efforts have been made to combine both views – first and third person – for instance by using a formulaic language, changing the setup of experiments, or training subjects for experiments. These have in common that they take the first person information of a subjects experience and try to make it more objective, for example by verifying it using behavior, or by coming up with an experiment that allows the researchers to measure the difference between two phenomena. These attempts show that although the different views appear to be completely different, they can be made compatible.

Another way to view the differences is from a post-phenomenological perspective, which says that both views constitute each other. The third person view that is technologically mediated needs the first person view of the scientist to exist, the scientist interprets the results the technological instrument gives him or her. The first person view is in turn influenced by the data we get from those technological instruments, giving us terms like 'brain waves' or the brain 'lighting up' which are used when talking about brain activity and consciousness.

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“Het product van de interactie van al die miljarden zenuwcellen is onze 'geest'. Zoals de nier urine produceert, produceert het brein de geest. Met hersenscans kun je niet alleen hersenziekten opsporen, je kunt ook de hersengebieden zien oplichten die we gebruiken om te lezen, denken, rekenen, naar muziek te luisteren, religieuze ervaringen te hebben, en verliefd of seksueel opgewonden te zijn.” - Dick Swaab in *Wij zijn ons Brein*

“The product of the interaction of all those billions of nerve cells is our 'mind'. As the kidney produces urine, the brain produces the mind. Using brain scans, you cannot only detect brain diseases, but you can also see the areas of the brain light up that we use to read, think, do math, listen to music, have religious experiences, and fall in love, or be aroused.”

“Hersenen maken Geest' staat op een lijn met 'Nier schrijft roman'.” - Bert Keizer in *Trouw*

“'Brain creates mind' is on the same level as 'kidney writes novel'.”

“Voor bewustzijn heb je meer nodig dan hersenen alleen. Een lichaam onder andere. [...] De geest zit in het brein zoals de stemming in een feestje, [...]” Bert Keizer in *Filosofie Magazine*

“To have consciousness you need more than just brains. You need a body among other things. [...] The mind is in the brain as the atmosphere is in a party, [...]”

1 Introduction

As illustrated by the quotes above, there is some discussion as to what consciousness is. Is it just the product of our braincells, or is something more needed for consciousness to exist? Intuitively our consciousness is what allows us to interact, sense and be aware of our surroundings, as well as ourselves. In our every day lives, consciousness is connected to our experiences of each other and the world. We know ourselves and others to be conscious by our interactions with each other and our surroundings. On the other hand, there is the view that our consciousness is one of the functions of our brain. Science tries to find which parts of or which type of activity in our brain is responsible for us being conscious.

These two views of consciousness seem to be completely different, even though both have their merits. The idea that we are just a brain running some sort of program as the computer metaphor says seems too simple to explain our everyday experiences of our consciousness. But we do have a drive to find out how our bodies work, including the workings of our brain, and by extension our minds (consciousness).

In everyday life there is no problem, we intuitively know if someone is conscious by interacting with him or her, or by mere observation. We only have trouble ascertaining whether or not someone is conscious when that person is no longer responding in the ways we normally associate with consciousness (for example if someone is in a coma). When this is the case, we need another way to determine consciousness, that does not involve these cues. Science can help there, as it has been

trying to find what activity in the brain is responsible for us having conscious experiences, and has found several candidates to be the neural correlate of consciousness.

So in some cases we do use the 'impersonal' scientific way to determine consciousness, even if normally we might think it strange to reduce ourselves to brain activity and other biological functions. There is a separation between the two ways of seeing consciousness, and the question is if they are really all that different, or if they are compatible.

Neuroscience uses different kinds of technological instruments to measure the activity in our brains, for example EEG¹, and fMRI². These methods allow us to see what is going on inside our heads using graphs or images. The activity that is seen is then related to what the subject was doing while the measurement was being taken.

Another way of examining our consciousness is self reflection, which we can do because our consciousness means we are self-aware. Phenomenology is a method to examine our consciousness methodically, by looking within and focusing on the structures that are present in our consciousness, regardless of the content of the conscious experience. To phenomenology everything we can know about the world (including ourselves) comes from our consciousness, as it is the only access we have to the world.

These are two very different ways of seeing consciousness, but they do try to describe or explain the same thing. They seem to be incompatible, but are they really? This is what I want to take a look at in my thesis. My question: *how can phenomenology and neuroscience interact/help one another/cooperate; are they as incompatible as they seem at first glance?*

In order to answer this question, I will need to analyze how both phenomenology and neuroscience see consciousness. This means looking into their methods, as well as their results to pinpoint both the similarities and the differences.

Already some efforts have been made to use phenomenological insights in neuroscientific research (naturalizing phenomenology). There are several ways in which this has been done, by starting with the empirical results, or by training subjects to report on certain phenomena, or by designing experiments in such a way that phenomenological concerns are taken into account. These are several different ways in which it is attempted to make both disciplines compatible with one another, and I will analyze how these methods of naturalizing phenomenology achieve that, and in the process highlight the (perceived) differences between, as well as find some ways in which both disciplines can cooperate. In this view, both disciplines are seen as different, but not impossible to combine.

A last way of seeing the difference between phenomenology and neuroscience is through post-phenomenological eyes. This means that instead of seeing them as two different things that might be made compatible by some means, they are seen as constituting each other. Our personal ideas of

1 Electroencephalography (EEG) is a way of measuring brain activity using electrodes that are placed on the scalp. The signal of the electrodes is amplified and usually averaged over many trials.

2 Magnetic Resonance Imaging (MRI) uses radio frequency pulses to manipulate the magnetization of the atomic nuclei in tissue, which can be used to get static images. Functional Magnetic Resonance Imaging (fMRI) is a way of measuring brain activity. By measuring differences in oxidation of hemoglobin, the BOLD (Blood Oxygen Level Dependent) signal can be obtained, which can be correlated to neural activity.

what consciousness is, and how we describe it, are influenced by the results of neuroscientific research. On the other hand, the scientist's ideas of what consciousness is, influence how he or she reads the images or graphs that are the results of the neuroscientific experiment, how he or she reads them is subject to interpretation.

To answer my questions, I will be using traditional phenomenology as found in Husserl and Merleau-Ponty to explain how the phenomenological method works. As a more recent source I will use Gallagher and Zahavi's book on philosophy of mind and cognitive science. They also go into the efforts that have already been made to naturalize phenomenology. I will use Don Ihde's book on Expanding Hermeneutics to explain the post-phenomenological view.

Neuroscience is a wide field where a lot of research is being done, and it is impossible to cover everything in this thesis. In order to make a comparison, I will need to look into the methods and results of neuroscience as well, but to make things manageable, I will use a case study, being the research into visual consciousness by Victor Lamme. Lamme holds a reductionist view on (visual) consciousness, describing consciousness completely in terms of brain activity. Not all neuroscience is reductionistic to this extent, but exactly the extremity of his views makes it an interesting comparison, as the differences will be clear, and because it will be a stronger result if both views are found to be compatible.

Another reason for using Lamme's research is that when I was looking at the phenomenological method and Lamme's theory on a neurological approach to consciousness, I noticed that there are some similarities in the process each use. In his research, Lamme looks for what is an essential part of consciousness, and he concludes that the various ways which we use to report on our conscious experience are not part of consciousness, as those are different cognitive processes. He suggests we need to let go of our intuitive idea of what constitutes consciousness and look at the neurological measures as an important indicator of what consciousness is (move from mind to brain as he puts it) (Lamme 2006, pp 499-500). Phenomenology wants to look for the invariant parts of our conscious experience, and to find those by describing the general structures of experience, which we can only find if we let go of our intuitive, natural way of looking at the world.

In Lamme's view both the looking inward and having an internal dialog about what the structures of our conscious experience are and reporting about it to other people in some way, would be a different cognitive process. I think the aim is the same thing, that is to find what defines consciousness, although for the phenomenologist it is our access to the world, and being able to report about that (at least to ourselves) is a part of that. Lamme takes a different view, and he thinks that the invariant part of consciousness is not necessarily reportable by the person having the experience. However, using technology, another person can perceive it.

They have a similar goal: to find what consciousness is by eliminating those things that are not essential to it, and to do so in a way that can be corroborated by others. They do have a completely different view on what is important. For phenomenology, the important part is how the content of consciousness and experience is constituted. For Lamme and neuroscience, the important part is the neurological activity that explains the presence of consciousness, so how consciousness is physiologically possible.

They both do so by taking a critical look at the assumptions that are made, though the nature of the assumptions is different. For phenomenology, the assumptions we have to let go of is our natural attitude. Everything starts with our experience, and that experience is the only thing we have access to, and to understand consciousness, we need to understand how it is that we can have those

experiences. For Lamme, the assumptions are the theoretical assumptions of science, for example that verbal reporting is part of consciousness, and our intuitive view of consciousness as having to do with inner dialog and personal feelings. Because of the way science has shaped the way we look at the world, some of the theoretical assumptions of science have become part of our natural attitude as well. We are so used to the scientific way of looking at things, that we take that approach to things that happen in our daily lives as well, for example we no longer attribute lightning to angry gods, but rather to atmospheric discharges.

Even though they are using a process that is similar in its main structure, as outlined above, there are a lot of differences in what they are trying to find, and what they are doing to find it, making this only a shallow similarity. However, noticing these similarities and differences was what got me looking for other similarities as well as differences, hoping to find areas where both disciplines could contribute to the other.

To find out if both views have more than a shallow similarity, we need to take a closer look at both. First I will go into more detail about how the phenomenological method for looking at our consciousness works. We will take a closer look at the phenomenological reduction and what it tells us about our consciousness. This will be explained in chapter 2.

In chapter 3 I will discuss Lamme's theory of consciousness, which is a reductionist view of consciousness as a (certain type of) brain activity. We will see that the definition of consciousness this yields is quite different from the one that we get from phenomenology. On the other hand, we will also see that there are some remarkably similar results.

These similarities, as well as the differences will be further explored in Chapter 4. There we will also take a look at some suggestions that have already been done on how to use phenomenological insights in neuroscientific experiments (naturalizing phenomenology). I will use post-phenomenology to give another way of looking at the difference between both views, which says that both views need the other to exist. Lastly I will give my conclusions.

Literature

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2 Phenomenology

In order to analyze whether neuroscientific research into consciousness and phenomenology can benefit from each other, we need analyze their respective views on consciousness. In this chapter we will take a look at what phenomenology has to say about consciousness.

According to Husserl, consciousness is that which is merely experienced, the wholeness of all the acts and the utmost reach of its knowledge (Ferrarello 2009). Consciousness corresponds to a system of acts and our perception of the system. The immanent components of consciousness are adequately perceived by an 'inner consciousness'. Every datum is the content of a lived experience of consciousness. Consciousness is the overall understanding of pure lived experience. It involves 'another experience which requires a new percept' and accompanies every perception. Knowledge comes from contact between the living consciousness and the external world.

Consciousness and conscious experience is important in phenomenology, because it is considered to be the only way we have access to the outside world. Phenomenology is not concerned with whether or not the outside world is real, it is simply stated that the only way we have access to it, is through our experiences, and the outside world exists for us in our consciousness. This makes experience and consciousness the most important things to learn more about, and the only way to do so, is to put aside the assumptions we have about reality in everyday life and examine consciousness for what it is.

First we take a look at an important method in phenomenology, the phenomenological reduction. Next we will see what we can find out about consciousness when using that method, and how that allows phenomenology to come up with a specific view of consciousness.

2.1 The Phenomenological Method

A phenomenon is the 'givenness' of an object, how the object appears to us, how it apparently is (Gallagher and Zahavi 2008, p 21). Unlike naturalistic approaches, who think that the appearance is merely subjective and hides the real object like a smoke-screen, phenomenologists say that the reality of an object is not behind its appearance, but that the ways in which objects appear to us are part of the world we live in, it is the only way in which the objects can have any meaning for us. This does not mean that appearances cannot be misleading, so the distinction between appearance and reality needs to be maintained. Because the way objects appear to us is the only way we have access to them, these modes of appearance are very important rather than something to dismiss because of its subjectivity.

The Natural Attitude

Conventional science assumes the existence of a reality that is independent of mind, experience and theory (Gallagher and Zahavi, 2008). Science tries to get objectively valid knowledge about this

given reality. We are used to taking for granted the objective existence of the things that we are aware of and seeking to know more about; it is our natural attitude, which we have even in our daily lives. We accept reality as something that is there in the way it is presented to us. Our natural attitude is not to question the assumptions, presuppositions, and theories that are implicit in our beliefs about reality.

This natural attitude does not change because sometimes we can have doubts about the nature of the natural world, or because sometimes the natural world turns out to be different from what we expected. The world is always there as a reality, although it may be different in places from what we were expecting. To know more we need to examine our subjective consciousness of how the things that we refer to appear to us, in order to get “to the things themselves” as Husserl puts it. The “subjective” is not a separate inner world, but is necessarily related to the world we are conscious of.

When engaging in the phenomenological reduction, the first step is to suspend our natural attitude, that is, examine our presuppositions, theories, and assumptions about the existence of a separate reality that exists outside ourselves, and examine how reality appears to us. This process is called *epoché* or *bracketing* and will be explained in more detail in the next section.

Bracketing

If we start with this natural attitude, then the real object is the thing outside of us. We make our statements about it as we stand before it, focus our eyes upon it, and see it. In the same way we make our statements when it comes to values; the thing we see pleases us, or it leads us to take a certain action, we handle, work with, pick up, touch, this thing.

Bracketing or *epoché* is the process of suspending our acceptance of the natural attitude to examine reality as it is given, to examine how it makes its appearance to us in our experience. It is a change of attitude towards reality, without excluding reality, but excluding the naive custom of taking the world for granted, and by doing so ignoring the contribution of consciousness. Phenomenology does not take the objective world as a starting point, taking it for granted, but it asks how objectivity is possible in the first place, how it is constituted. This allows us to focus on the ways or modes in which things appear to us, trying to capture the invariant structures of experience. So instead of being interested in the physical appearance of things, meaning properties like weight, shape, and size, we are interested in how those things appear to us.

To understand perception phenomenologically is to understand how perception actually functions in our relations with the world around us and with other people. It is an attempt to get away from the theoretical constructions of science and philosophy and return to simple descriptions of our pre-reflexive involvement with the world, from which those theoretical constructions themselves derive their meaning. When we relax the ties which bind us to things in our practical dealings with them, the sheer strangeness of the world becomes more apparent. If we temporarily abandon the theoretical structures which we have built up to make our practical and social life manageable, and get back to our immediate, pre-theoretical, experience of the world, we can better understand the meanings of those theoretical structures themselves. The phenomenological reduction aims to do just that, to 'analyze the correlational interdependence between specific structures of subjectivity and specific modes of appearance or givenness' (Gallagher and Zahavi 2008, p25), as will be discussed further in the next section.

The Phenomenological Reduction

When we engage in the phenomenological reduction, we use the suspension of natural attitude to analyze the structures of subjectivity and how they interrelate with the modes of givenness of reality. We are no longer focusing on what things are, but rather on how they are given to us, in what ways or modes they appear. When engaging in the reduction, we examine perceived things as perceived, imagined things as imagined, remembered things as remembered, etc. We focus on how objects consciously appear, becoming aware of our subjective accomplishments and the directedness of our consciousness. Phenomenology is not just a reflexive process, but also a description of the world and how it appears in our experience, it attempts to capture the invariant structures of experience, to understand how it is possible for anyone to experience a world.

When engaging in the phenomenological reduction, everything that is transcendental, mainly that which is in the perception itself, is bracketed and suspended. When we do this, the perception changes into the fundamental acts. We can now examine the judgments of perception, the value-giving based on it, and the value given to it. Even though we bracket the entire natural world and all the general positing which belongs to its essence, that natural world is always there before us and that will always be there as the conscious reality, regardless of the bracketing. This does not mean that we are ignoring or negating the world, as a solipsist would, and neither does it mean that we are doubting whether or not the world actually exists or is, like a skeptic would. We look at the world in a more direct way than we normally do in our whole natural life, we see it as a world that is not the universal source for knowledge progressing in thought and experience.

We do not change our convictions, as they cannot change until we find new ways to judge what we experience, but we turn them off. We put our assumptions out of action, bracket our experience, while it stays itself. We just do not use our convictions, assumptions and other 'normal' ways of looking at things, we use another way of being conscious. So we turn off all sciences that reflect on the natural world, we do not use the things science has taught us, we do not use any of its rules as a basis. Rather we are exercising the 'phenomenological' *epoché*, which means we put out of action all our judgments concerning the actuality of the world, and in doing so we exclude all sciences relating to this natural world no matter how firmly they stand there for us.

We now allow ourselves to see and describe what is given to or in all the perceptions and judgments as the essences they are in themselves. We do not make a judgment that uses in any way the transcendental, or the thesis of the 'real' thing. Instead we look at them, we make them into objects to be examined, as they are part of the phenomenon. They are part of the thesis of perception, and not just its components. We examine perception, experience itself rather than the 'real' thing and the transcendental that are generally taken as given in the natural attitude. The reduction leaves the phenomenological residuum of absolute consciousness. We are thereby opened up to the world of phenomena, the world's mode of givenness which is 'the fundamental field of phenomenology'. The task of phenomenology will be to provide a science of phenomena, and the essential relations that bear between them.

Merleau-Ponty calls phenomenology “a manner or style of thinking”, because it asks us to think about the world in a different way. For him phenomenological reduction is an attitude of 'wonder' towards the world. “Reflection does not withdraw from the world towards the unity of consciousness as the world's basis; it steps back to watch the forms of transcendence fly up like sparks from a fire; it slackens the intentional threads which attach us to the world and thus brings them to our notice; it alone is consciousness of the world because it reveals that world as strange and paradoxical” (Merleau-Ponty 2006, page xv).

Unlike Husserl, Merleau-Ponty claims that it is impossible to withdraw completely from the world,

in other words, he thinks it is not possible to do a complete reduction, because we cannot give a fully transparent account of our experience and the world of ordinary life, for there is an opaque, indeterminate and ambiguous unreflective experience of the world, upon which the determinate and objective world of science is founded. The impossibility of a complete reduction is the impossibility of making this transparent, which is the most important lesson. If we were absolute mind, the reduction would present no problem. But since, on the contrary, we are in the world, since indeed our reflections are carried out in the temporal flux on the which we are trying to seize, there is no thought which embraces all our thought. Merleau-Ponty calls direct, pre-reflexive involvement, perception. Perception is a practical involvement with things.

Eidetic Variation

Eidos is the essence of things. Eidetic variation is the removing of properties of something that are not essential to that something being what it is. It is looking beyond the mere appearance of something to the core properties that cannot be changed without changing the nature of the object that is being studied. Those properties are the essence of the object. This can be done for objects, like my laptop, or for our experiences of those objects, for instance my memory of the laptop. This could be useful to a cognitive scientist to pin down what cognitive acts he or she wants to study.

As an everyday example of eidetic variation we can take a look at a book. Changing the number of pages, the design of the cover, the type of binding, does not change the fact that it is a book. The goal is to find the properties that resist change, that cannot be changed without the book ceasing to be a book. This is called eidetic variation, stripping away the unessential properties of things. It can be used on the cognitive processes as well, to try and find the essence of those, for instance, the essence of remembering the book.

Intersubjective Corroboration

Phenomenology is interested in how it is possible for anyone to experience a world (Gallagher and Zahavi 2008, p26). The final step in the phenomenological method is using intersubjective corroboration, meaning that the phenomenologist does not work alone, she or he can talk to others to compare their findings. This is possible because consciousness is examined to find the structures that are always present and therefore independent on the phenomenologist doing the examining.

It is looking to expose the structures that are intersubjectively accessible and this way the results are also open to examination by other subjects. Next to bracketing, reduction and eidetic variation, intersubjective corroboration is another tool that can be used to examine consciousness in phenomenological way. It means that phenomenologists do not do their analyses alone, they can compare notes with others and in that way weed out descriptions that are not invariant and essential. This is not straightforward, but is not messier than a scientific process, and it is guided by the methodology.

Conclusion

Then phenomenological method consists of letting go of our natural attitude, that is the attitude of assuming that there is an outside world that we are experiencing, and examining how it is possible to have that experience. Using eidetic variation, we can then try to discover the elements that are essential to the experience, and eliminate those that are not. Intersubjective corroboration allows us to compare information with others and gives a basis that is not just subjective. In this,

consciousness is very important, because it is what allows us to have experiences and to analyze them.

2.2 Consciousness

In this section we take a look at what we can discover about our conscious experience if we engage in phenomenological reduction and view consciousness in a phenomenological way.

Intentionality

When we examine consciousness using these steps, we find that consciousness is always consciousness of something, it is consciousness about. This is called intentionality. An intentional object is the answer to the question what an intentional state is about. If it is about a non-existing object, the intentional object does not exist. As something can be an intentional object without existing, it cannot be a cause, because only real things can be causes. If the intentional state is about a real object, the intentional object is that real object. We only perceive things from a certain perspective, from our point of view, in both the literal and the figurative sense. We are conscious of an intentional object under some particular description and not under others. We can say what I am thinking of without reference to what is in fact the case. This means phenomenology differs from the study of how things are 'objectively', in the outside world.

This is related to the phenomenal character of an experience, as what we are aware of and how something appears to us are closely related. When we are conscious of an object, we are conscious of it appearing in a certain way. The object is not hidden by the appearance, but rather the appearance is the only way we have access to the object. Different modes of consciousness relate to their intentional objects in different ways. 'To believe in' differs from 'to be afraid of' even if they have the same intentional object. To give an example using visual consciousness, if I see a rat, the experience is different when I am afraid of rats, compared to when it is my beloved pet rat I am looking at.

Phenomenology is concerned with these differences in the different modes of consciousness; it tries to capture the invariant structures of experience (Gallagher and Zahavi, 2008, p.26), that is, those aspects of our experiences that are always there, their essences, the things that are fundamental to the experience. Intentionality is about meaning, we intend an object by meaning something about it (Gallagher and Zahavi 2008, p116). Not all experiences are object-directed, for instance feelings of pain, or moods like boredom. However these moods and experiences are not without reference to the world, as they are lived through as pervasive atmospheres that deeply influence the way the world is disclosed to us (Gallagher and Zahavi 2008, p116/117).

Intentionality of consciousness is the idea that consciousness is always consciousness-of-something (Gallagher and Zahavi 2008, p107). There are a lot of different views on consciousness. On one end of the spectrum there is the view that consciousness is just a byproduct of cognition and behavior, and in this view consciousness can be reductively explained, this is called epiphenomenalism. On the other end of that spectrum there is the view that all the data processing that happens without our conscious involvement is just background processing and that all meaning comes from consciousness. Phenomenological accounts of intentionality aim to provide a descriptive analysis of the structures of conscious intentionality, and by doing so clarify the relation between mind and

world rather than between mind and brain (Gallagher and Zahavi 2008, p111).

Our consciousness is where we find the world and through it we experience the world. To find intentionality we need to see consciousness as a real property of humans, as real as our having a body. We have different ways of experiencing the world and what comes directly when doing so is what is closest to reflexive self experience, namely taking the experience of consciousness totally without prejudice as that which presents itself directly. If we do this, what we find is nothing other than color data, sound data, and other experiential data, or feeling data, wanting data and nothing of the kind that is taken for granted in traditional psychology as the directly given. We find instead the intentionality that we use to give form to all the things that are real to our environment. What we find is consciousness about. Consciousness in its most broad sense, and to be researched in all its modes and width.

The phenomenal character of an experience is closely related to its intentional content and vice versa. How something appears to us is bound up in what we are aware of. We are never conscious of an object as just the object, but always as appearing in a certain way. This does not mean our access to an object is indirect, or mediated by our awareness of the experience, as the experience is not an object, but instead is what allows us access to the appearing object (Gallagher and Zahavi 2008, p119).

This means that we can have experiences that do not have an object in the sense of something outside of ourselves that the experience is in reference to. The problem of these objectless presentations is that content is presented in the act, whereas the object is presented through (the content of) the act of presenting. Every presentation presents an object whether the object exists or not. An objectless presentation simply is a presentation which might fulfill the subject-function in a true negative existential proposition, and a presentation to which a real object corresponds, might fulfill an affirmative existential proposition. The distinction between intentional and real objects is a distinction between kinds of presentation, in the objective sense of meanings.

Objective content of mental acts is what we normally call the meaning of expressions. The meaning alone is the intrinsic and essential characteristic of presentations, whereas relatedness with the object merely indicates certain connections of truths or judgments of which the meaning can be a part. Objective content of mental act equals meaning. Relatedness of presentation to an object indicates characteristics of meaning.

Solving the problem of objectless presentations implies that intentionality is not a relation but a certain property of the objective content or meaning aspect of mental acts. Phenomenological description should be restricted to mental acts and not take into account the object at all.

Horizons

Our vision is the most vivid way in which we have access to the outside world. When we perceive something it is always against a background of other things. This includes both the physical surroundings of the thing that we are perceiving, as well as the intentional surroundings, the experiences and expectations of the person that is doing the perceiving. We perceive everything against a meaning giving context that is called the horizon.

When we look at something we only see part of the object we are looking at, even though we represent the whole object. The part we are actually perceiving is called the immanent content of the perception. Husserl says that we can be intentionally related to immanent contents in two different ways. He makes a distinction between observation (*Anschauung*) and representation

(*Repraesentation*) which is meant to distinguish between two species of the wider class of presentations of *Vorstellungen*.

In observation (*Anschauung*) consciousness is said to be 'intentionally directed' towards an immanent content of consciousness, for example seeing the facade of a building I am looking at. What you see is not what you represent however, for example, a die has all square sides, but if you look at it, you actually see trapezoids or diamonds. In representation however, it is directed, on the basis of such a content, toward something which transcends the content and which is not immanent in the mental act. In the building-example, what we represent is the whole building and not just the facade. In the die example, our mental representation of the die is still a cube, an object with square sides. In visual perception the observed side of a thing is the immanent content of the act of perception, whereas the other sides are said to be merely meant by a representation 'on the basis of the observed side'. Immanent content or impression is a real part of our stream of consciousness in contradiction to the perceived side of the extended object, which is not immanent but extra-mental or intentional.

The sides of the object that we do not perceive, are still given to us by the possible perceptions of others and our own possible perceptions, if we would move. Our perception presupposes that we are able to move our heads and our bodies to change our point of view, and we know that if we would look at the object from another side, that we would see that backside that is now invisible to us. In other words, every object has a horizon of absent profiles, the sides of it that we cannot see at the moment of perception. There is another horizontal structure, namely that which is made up of the other objects around the one that has my attention, that also influence the way we see the perceived object. Our perception presupposes movement of our eyes and head, but also of our whole body.

Every object has a horizon of co-existing profiles, that are accessible to other subjects even if they are not for me at the moment because of my position. The object refers to the other subjects by this means and is therefore intrinsically intersubjective (Gallagher and Zahavi 2008, p101). The world that we perceive is not only physically contextualized, but also socially contextualized (Gallagher and Zahavi 2008, p103), meaning that others are potentially and implicitly involved in my structure of perception.

Perceiving a thing is perceiving a thing in a field of perception. The single thing in perception only has a sense because of an open horizon of 'possible perceptions' because the really perceived refers to a systematic manifold of perceptible representations that could possibly belong to it. In a similar way, the thing has once more a horizon, as a thing in a field of things, which in turn refers to the whole world as a world of perception. The thing is one in the group of things that are simultaneously actually perceived, but that group is not the world to me as far as consciousness is concerned, but it represents the world, to us it always has the character of a sample of the world, of the universe of things of possible perceptions, as a momentary field of perception (Husserl 1962).

Both science and phenomenology say that perception is not built up out of small atoms of sense data, nor it is a collection of separate sense modalities (Gallagher and Zahavi 2008, p94). Perception is likely to be part of a larger whole itself. That is, we hear a door closing, or the bus passing by, and we need to take a step back to hear the actual sounds themselves. We always perceive things against a background of other things. Something else empiricism forgets it that the subject also plays a role in how something is perceived, but like the physical surroundings of the thing that is perceived, the subject that is doing the perceiving also colors the perception by his or her experiences, expectations, etc.

If someone else was to have the same experience that I am having, their experience would have the same set of essential features that I am labeling as that object. In *Ideas*, Husserl names a region of

experience the “total highest generic unity belonging to a concretum” (p.30). Each of these regions of experience has an essence that determines a priori the nature of individual objects within the region. The meaning or individuality of an object does not come from the object itself, but comes from the context, what Husserl calls the horizon. In this view, individuality originates in the horizon of possibilities, not in an internal substance or essence the object has. If objects are given within an horizon, then saying that a subject is intentional is saying that the subject is conscious within an horizon. There cannot be a world (horizon) without a subject anymore than there can be a subject without a world (Thompson 1995).

Temporality

Our experiences are not static, they are dynamic, they are temporally extended, like for example songs or sentences. Our present experiences are shaped by our past experiences as well as our expectations for the future. We are conscious not just of what is right now, but also of what has just been, and what is about to occur. A moment of consciousness does not disappear at the next moment, but it is kept in an “intentional currency”, which allows us to experience temporal duration by constituting a coherency (Gallagher and Zahavi 2008, p. 76). Husserl uses three terms for this structure: firstly there is a primal impression that is directed to the object as it is now. Then there is a retentive aspect that provides a context of moments just past. Third and last there is a protentive aspect, which provides a context of future expectation. This way of looking at things explains why we hear a melody as a melody, and how it is that we can 'predict' what the next notes are likely to be. It provides a temporal horizon. The retention is different from remembering, it is intuitive knowledge of something just past, where remembering is the representation of a completed past event. This structure of retention-impression-protention is also how it is possible that we are aware of our own experiences over time.

The previous explains why our everyday experiences of our own actions and movements are coherent. But we also have memories of past experiences, that also shape our current experiences. These memories can be distorted, sometimes without us realizing this has happened. Our memories provide us with an horizon against which we experience the present and the future.

Intersubjectivity

Behavior of humans and animals needs to be understood in a different way than that of inanimate objects and other living things like plants. Causal explanations can help us understand why something is the way it is, but not what that means to us, what it is like to live with it, etc. Those meanings exist in the space between people, in their interactions.

We are not alone in our perceptions of the world, we have contact with other people. We all have our own perceptions with all that belongs to them, but in living together we can all share in the life of other people. In this way the world is not only there for a single person, but it is there for the community of people, and it is that way because of the communal nature of that what is only perceived. In this communal nature the different perceptions we all have are also compared and corrected.

The world we live in and perceive is a world made of practical references of use of the objects around us. Far and close are phenomenologically different than in geometrical distances, for instance when talking to someone online, I am closer to the pc than to that person, but phenomenologically, it is reverse. What we do is guided by practical and social concerns, and this is

intersubjectively structured, I get the norm from the others around me. Actions that are mechanically the same, can be done for completely different reasons, giving the same mechanical action a completely different context and meaning, intentionally they are different actions.

This intersubjectivity makes for corrections in our perceptions. In the consciousness of one person and also in the shared community consciousness the same world is present, that is in part already experienced and in part still an open horizon; world as a universal, shared by all people, horizon of things that really are. Everyone knows they live in the horizon of our fellow men.

We all have our own way of seeing the 'real' world. We bring to this our own modes of givenness, our own intentionalities. All these, when brought together, constitute the world intersubjectively, when examined thoroughly. Science says this intersubjectivity does not have a place in science as it is not objective, but rather a personal experience, that is not necessarily repeatable.

The intersubjective experience is fundamental to our constitution of ourselves as objectively existing subjects, as well as other experiencing subjects. From a first person point of view, intersubjective experience is empathic experience, occurring when we consciously attribute intentional acts to other subjects, when we put ourselves in the others shoes. We tend to expect that another being that looks and behaves pretty much like myself, will perceive things from an egocentric viewpoint that is similar to my own, thus allowing me to ascribe intentional acts to others immediately, without having to draw on analogy to my own case. If we are able to put ourselves in one another's shoes and see our surrounding world from the other persons perspective, we have to assume that our worlds coincide, at least to a large extent, even though the aspects under which the others represent the world must be different, as they depend on everyones own egocentric point of view. This in turn means that we have to assume that the spatio-temporal objects forming our world exist independently of our subjective perspective and our experiences, and exist as part of an objective reality (Beyer 2008).

The paradox of human subjectivity is that a human is at the same time a subject to the world and an object in the world. The world is taken up front only as a correlate of the subjective appearances in which it has its changeable sense of unity and in which it keeps winning that over and over again. The problem becomes that a human, who is him- or herself part of the world, cannot really construct it as part of their intentional act.

The solution to this paradox is that my *epoché* is only mine even if I do this together with others. In my *epoché* the whole of humanity and the whole ordering of persons and such has become a phenomenon. Every transcendental 'I' of the intersubjectivity is necessary constituted as a human in the world, that is every human carries his or her own transcendental 'I' within him- or herself. That is the self-objectification of the transcendental 'I' that can be formed through phenomenological self reflection.

2.3 Conclusion

To phenomenology consciousness is where we experience things, it is what allows us to have access to the outside world. In our consciousness we find the world, and through it we experience the world. In other words, our conscious experience is our only access to the world, and the way things appear to us is how we have access to those things. Things outside of us appear to us in our

consciousness, and phenomenology examines the different shapes those experiences can take, what different modes of consciousness we can have.

When examining our experiences using the phenomenological method, we find that consciousness is intentional, that is, it is always directed at something. This something is called the intentional object. This is not necessarily an actual object, but it is the answer to the question what the intentional state is about. It is possible to be conscious of an intentional object under certain descriptions, but not under others. Our intentionality is where our actions derive their meaning, when we act, we have reasons that go beyond a cause and effect relation. If we try to explain consciousness in a scientific way, without taking into consideration the intentional nature it has, and looking at observable behavior only, we miss an important part of what consciousness is.

Phenomenology is not about how things are objectively, these different modes of consciousness relate to the same intentional object in different ways. These different modes of consciousness are where things get their meaning, as described before, 'to be afraid of' differs from 'to believe in' even if they refer to the same object, meaning we can have completely different experiences of the same thing.

Another thing we find, when we look at consciousness using the phenomenological method, is that our previous experiences color our current ones. How we experience something depends on the attitude we have towards something, even if the object or situation are the same, the fact that the moment has changed, that we experienced different things in the mean time, or simply how we are feeling today, makes a difference in how we experience this same object or situation. This meaning giving context is called the horizon. What we notice when we look at a scene, how we experience it, and what it means to us, are related to our previous experiences. When we are conscious of an object, it is never the object as just the object, but always as the object appearing in a certain way. If our horizon has changed, so will our conscious experience. Our memories of past experiences help shape our current experiences. Consciousness is temporal, we experience a continuum, not a lot of separate moments without any connections between them. We use our consciousness to link our experiences from the past, to those we are having now, and we expect things for the future based on them too. Our memories provide us with an horizon against which we experience the present and the future.

In our consciousness the whole object is represented, even though we only see part of an object when we observe something, like the facade of a building. Representing a whole thing even when we can only see part of it, presupposes that we can move our bodies and our heads to change our point of view, allowing us to see the parts of the object we are representing that are currently hidden. Also we relate to the things we are conscious about from the point of view of our bodies, something is behind us, before us, we relate to things relative to our own bodies. Consciousness presupposes embodiment as well as movement. Consciousness is where we can tell the difference between being moved and moving ourselves. If I am being shoved, I can tell that I am the one moving, but I am not the one causing the movement. Because of this connection between our consciousness and our bodies, phenomenology does not agree with the Cartesian mind-brain split. We cannot see our consciousness as something separate from our bodies, mind and body are connected.

The way our consciousness works, means that other people experiencing the same scene will not experience it in exactly the same way, as they have their own horizon and intentionality. However we can expect our experiences to be similar if we are experiencing the same thing. This means that we can interact with others to correct our perceptions. Consciousness is intersubjective in this way, it is not just my experiences that determine how I see things, my views are influenced by the

experiences of others as they share them with me. This also means that there is no strict split between first and third person perspective, they influence each other.

In the phenomenological view, consciousness is the only access we have to the world, it is the start of everything we can learn about the world, including brain activity in others via scans.

Phenomenology may be able to contribute to consciousness research, as it offers a way to describe the structures of consciousness in a way other than the neurological activity that neuroscience usually looks at, possibly adding things that neuroscience can look for when doing research.

This view of consciousness that is implicit in the phenomenological method can be compared to the view of consciousness that cognitive science gives us. We will take a look at one such view in chapter 3.

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3 Neuroscience

In the previous chapter the phenomenological method for looking into our consciousness was discussed. Neuroscience has a different method, involving technological means to look inside our brains. This means that neuroscience can look for activity in the brain that corresponds with certain types of behaviors or consciousness. There are different points of view on how much of consciousness can be explained this way. One of the more extreme points of view in this regard is that of Victor Lamme, who has a reductionist view on consciousness, aiming to completely explain consciousness in terms of neural activity. The reason I chose Lamme's theory on consciousness is that his view is on the one hand very different from the phenomenological point of view, but on the other it leads to results that are remarkably similar. In this chapter we take a look at Lamme's view on consciousness and the method he uses to come to his conclusions.

3.1 Neuroscientific Approaches to Consciousness

The received view is that we are not conscious of everything we see, but rather our conscious experiences are selective. If there are unconscious and conscious aspects to the things we perceive, it is plausible to assume that there will be neural activity that corresponds specifically to our consciousness. Because of this, neuroscientific research is done to find any activity that corresponds to consciousness, called the neural correlate of consciousness (NCC). The general way to determine whether or not a subject is conscious of something is to test it behaviorally, or to use some form of reporting, for instance verbal report. This gives an important position to behavioral measures and language, because they are used to decide if a subject is conscious, and therefore what neurological activity would be a candidate for being the NCC.

In neuroscience consciousness is investigated in relation to these NCC's, a subject has a conscious experience if there is neural activity (of sufficient strength) in whatever was determined to be the neural correlate of that consciousness. As of yet there is no consensus about a general NCC, but several suggestions have been made, for example 40Hz oscillations in the cerebral cortex (Crick and Koch, 1990), or certain neurons in the inferior temporal cortex (Sheinberg and Logothetis, 1997). Consciousness in this view can be determined by looking at behavior, having a subject report on his or her own conscious experience, or both. According to Lamme, that puts too much emphasis on those measures and not enough on the neural ones. We should look for consciousness, and not just for the neural correlates of observed behavior that we interpret as conscious. In the following we take a look at Lamme's view on consciousness.

3.2 Lamme's View on Consciousness

Lamme does not use the phenomenological method, but the scientific one, involving the use of technology and repeatable experiments designed to verify or falsify hypotheses. Lamme starts by taking a critical look at how the ideas that are generally held by scientists about what consciousness is, have influenced the way we research it. The usual way to find the neural basis for consciousness, is to either observe the behavior of the subjects, or to rely on the reporting of the subjects about their conscious experience, for instance whether or not there is a conscious experience at all. Whether or not activity in the brain is seen as part of consciousness, can depend on the, sometimes implicit, choices made about what is part of consciousness. For example the role language plays in experiments on consciousness, we need language for verbal report, and it can easily get lumped together with consciousness and be identified with it.

What Lamme does is take a critical look at how our ideas about what consciousness is, have influenced the way we analyze it. He takes a critical look at assumptions, such as something is a conscious experience for a person, when that person can report verbally about it. He argues that language production and reporting differ from consciousness, as all use different cognitive functions. This means that the inability to report about a perceived entity does not mean we cannot be conscious of something. He eliminates the cognitive processes that, even though they are present when there is a conscious experience, are not responsible for that experience, as candidates for (the neural correlate of) consciousness. He strips away what he sees as the non-essential parts of our views on consciousness, and what he is left with is the recurrent processing, that is, neurons forming connections between different layers in the hierarchy of the visual cortex, which will be explained in more detail below. He finds that this recurrent processing is crucial for changing the strength of the connections between neurons (synaptic plasticity). From this he concludes that we need consciousness to learn, as recurrent processing is needed for both the presence of consciousness and synaptic plasticity.

In order to find what processes in the brain are important for consciousness, Lamme examines what processes are responsible for our ability to learn and how attention and awareness work neurologically. In order to do so he distinguishes between different types of activity, namely the feedforward sweep and recurrent processing, which will be discussed further in the next section.

Feedforward Sweep and Recurrent Processing

In order to find the neural correlate of (visual) consciousness, Lamme separates the contribution of the feedforward sweep and recurrent processing to conscious perception. The fast feedforward sweep (FFS) is mainly determined by the feedforward connections, that relay information to areas in the visual cortex from lower to higher in the hierarchy (Lamme 2000, p.571). The FFS starts directly after the presentation of an image. It proceeds rapidly, reaching the highest levels of the hierarchy in the visual cortex - the inferior temporal lobule and the parietal cortex - in about 100ms. The FFS is defined as the earliest activation of cells in successive areas of the cortical hierarchy (Lamme 2003, p. 16). As soon as the FFS has reached a certain area, recurrent processing can start between neurons in that area and neurons that have been activated earlier at lower levels.

Recurrent processing occurs after the feedforward sweep, when the visual cortical neurons that have participated are still active, and able to form feedback or horizontal connections. The activity in

these horizontal connections differs from the activity seen during the feedforward sweep in several ways. First of all, recurrent connections cause a change in the tuning of a neuron³ over the course of its response (Lamme 2000, p.574). Another difference is that a cell's response can be modulated by contextual information occurring outside the part of visual space that the cell would get information from by means of feedforward connections (its classical receptive field (cRF)). A third difference can be derived from processing times; as the feedforward sweep is completed in approximately 100ms, recurrent connections have to be involved in those visual tasks in which longer delays are obtained (Lamme 2000, p.575).

When looking for the neural correlate of (visual) consciousness, it becomes important to link the different kinds of activations to the absence or presence of consciousness. There are several reasons to assume that recurrent interactions are necessary for visual awareness and that the feedforward sweep is not accompanied by awareness, which will be explained in the next section.

Consciousness

Neural and behavioral measures should be put on an equal footing when it comes to understanding consciousness neurologically according to Lamme. Neuroscience is expected to find an answer to the question of what is needed for a conscious experience by finding the neural correlate of consciousness (NCC). In trying to find the NCC, experiments are done in which the presence or absence of conscious experience is tested using behavioral measures, with which there are several issues. The problem with this is firstly that a decision has to be made as to what behavioral measures are relevant as evidence for conscious experience, and secondly it is hard to separate conscious experience and the cognitive functions, like language, that are used to report the experience when using these measures (Lamme 2006, p.494).

There is no reason to doubt what the subjects are reporting of their experience if there is no overlapping of conscious experience with other cognitive functions. There is a middle ground, between the clear presence of conscious experience when a subject reports a clearly visible event, and the clear absence of conscious experience in cases such as blindsight or deeply masked stimuli, where neural arguments become of value in addition to behavioral ones.

There are several reasons to believe that recurrent interactions between neurons are the crucial feature of visual consciousness. We want to find the crucial features, because those allow us to find the (neural correlate of) consciousness we are looking for. When a subject is exposed to different stimuli, it can be seen that the ones that evoke recurrent processing change the brain, whereas stimuli that only evoke the feedforward sweep have no lasting impact. As explained before, when a visual stimulus is shown it is first processed through successive levels of the hierarchy of the visual cortex in the feedforward sweep, which enables us to quickly extract the complicated and meaningful features from the visual scene. There are several studies on both humans and monkeys that show that this feedforward sweep does not generate conscious experience, but rather there needs to be recurrent processing between neurons in high- and low-level areas (Lamme 2006, p. 497). Conscious experience is reportable when recurrent processing is present between neurons in the visual and both the frontoparietal and inferior temporal areas. It can be shown by masking experiments⁴ that just the involvement of the frontoparietal neurons is not enough for

3 The tuning of a neuron is the phenomenon that a neuron selectively represents a particular kind of cognitive information. An example in the visual system would be neurons specifically tuned to edges, shapes and colors.

4 A masking experiment is an experiment in which a subject is shown two stimuli, the main one, and one that is shown in short proximity to the main one, aimed to mask the main stimulus.

consciousness, which means that recurrent processing is likely to be the most important ingredient (Lamme 2006, p. 499).

The fact that subjects do not report a stimulus cannot be taken as a basis for saying that more than recurrent processing is needed for consciousness. It can be argued that instead of the subject not being conscious of the stimulus, he or she was conscious at the time of the presentation of the stimulus, but forgot about it, unless we want to say that consciousness and episodic memory are the same thing. But if we decide to do so, we are equating the cognitive functions of attention, working memory, and language, that are involved in conscious report, with consciousness and should be studying those and not be looking for the NCC (Lamme 2006, p.498/499). In other words, we need to study consciousness as something separate from other cognitive functions, and we can take recurrent processing to be the neural correlate of visual experience, even when no conscious reporting is possible. The problem is that this is hard to verify, as you cannot know about your conscious experience without resorting to cognitive functions like memory or inner speech.

Lamme proposes that we define consciousness as the presence of (sufficiently strong) recurrent interactions, after finding those interactions to be the activity that is always present when there is consciousness, making it a strong candidate for providing the neurological explanation for consciousness as indicated above⁵. As the recurrent processing can also be present in cases where the subject reports not being conscious, this means we lose our intuitive definition of consciousness as having to do with private access and personal feeling. But, according to Lamme (2006, p. 500), we gain firstly by having a neural definition of the conscious-unconscious dichotomy that we get a more fundamental understanding of what consciousness is or does: people need it to learn. Secondly, it allows us to dissociate consciousness from other cognitive functions, like attention, working memory and reportability. Thirdly, it yields testable predictions for behavioral experiments. And lastly, it will allow us to measure the presence or absence of consciousness without having to rely solely on behavioral measures, which can be helpful especially in cases where there is a conflation of conscious experience with other cognitive functions (Lamme 2006, p.499).

Because we lose the intuitive definition of consciousness, it is theoretically possible to be conscious of something without being able to report on it in any way. The decision of whether or not something was conscious will have to be made by a 3rd person who will have access to the information through technology (direct cell recordings that can reveal the recurrent processing taking place, it is not (yet) possible to assess this via scanning). One explanation Lamme gives for it being possible to be conscious about something, yet not being able to report about it, is that we are conscious of something briefly, but it does not stay in our consciousness long enough to get stored in our memory. To explain this, he makes a distinction between phenomenal awareness and access awareness, which we will take a look at in the next section.

Phenomenal and Access Awareness

The distinction between the feedforward sweep and recurrent processing, makes it possible to distinguish between two kinds of awareness: phenomenal awareness and access awareness. If a subject is given a visual input with a lot of different stimuli, it can be seen that multiple stimuli are all present at the early stages of the feedforward sweep, but in visual areas that are successively

5 The idea that recurrent processing is involved in visual consciousness is not controversial. How important it is, and if there are other processes involved is not clear at the moment. Not all of Lamme's conclusions are widely accepted, but that is not relevant to what I am trying to do in my thesis, and I will not go into it.

higher in the hierarchy (extrastriate areas⁶) competition between multiple stimuli starts to arise. This happens because the receptive fields are growing in size, which means that not all stimuli can be fully processed by those receptive fields. Eventually, only a few stimuli reach the highest levels of the hierarchy, up to and including areas in executive space⁷ (Lamme 2003, p.16). Meanwhile the visual areas that were reached the earliest, have started to engage in recurrent processing. It is this interaction between neural correlates of awareness and attentional selection makes it possible to distinguish between phenomenal and access awareness.

Phenomenal awareness arises when the visual areas that were reached the earliest start to engage in recurrent interactions, which allow for visual features to be related to one another, the occurrence of binding and segregation, and the evolution of perceptual organization. Because there is relatively little competition between stimuli at low levels, as the receptive fields are still relatively small, groups of recurrent interactions representing multiple stimuli are possible. This means that we can have phenomenal awareness of many things in a scene. In other words: we can have the basic experience of things like movement, forms, sounds, and feelings of a lot of things at once. It is a fleeting knowledge that is gone with the next stimulus. We are unable to report on things that only reach our phenomenal awareness, but with appropriate experiments (directing attention to a feature after the stimulus but before the next one) it can be seen that we are conscious of all the things we have phenomenal awareness of, even if only for a short time.

Access awareness is produced “when these recurrent interactions grow more and more widespread, and eventually include areas in executive or mnemonic space⁸” (Lamme 2003, p. 16), and the current needs, goals and full history of the system give the visual information its context. Access awareness is limited to only a couple of items in a scene, because of the increase in competition at this level. The receptive fields are getting larger and can no longer all exist at the same time. This kind of awareness can influence our behavior and we can (verbally) report about those things that we have access awareness of. This is the kind of awareness we have of things that we know we are conscious about, as can be seen from the fact that we are able to report about it, and have behavioral patterns that reflect it.

Phenomenal experience originates from the recurrent interaction between groups of neurons. Awareness can evolve from phenomenal to access awareness depending on the extent to which recurrent interactions between visual areas also include interactions with action or memory related areas. Conscious stimuli have reached a higher level of processing that goes beyond feature detection, which achieves at least an initial coherent perceptual interpretation (Lamme 2003, p17). There is a clear difference from the unconscious stages, where even individual features that are never perceived are represented. Attentional selection is responsible for the modification of sensorimotor processing by the current state of the neural network, as shaped by genetics, experience, and memory.

Visual Attention and Visual Awareness

Masking experiments provide support for the idea that the conscious-unconscious dichotomy can be usefully related to the distinction between feedforward and recurrent processing (Lamme 2000, p.

6 Extrastriate areas are the areas outside the primary visual cortex. In these areas the visual information is broken down into various features, for example motion and color. This is different from V1 which has a layout that is mostly similar to the retina (retinoptically organized).

7 Executive space is the area responsible for controlling other cognitive functions.

8 Mnemonic space is a term that is used to denote memory functions, which are responsible for making associations and connections. Lamme uses the word 'areas' to denote a space that is only a space in a figurative sense.

577). The data acquired suggest that in at least some situations, recurrent processing in early visual areas is necessary for visual awareness. This means that the feedforward sweep of information processing is mainly involved in pre-attentive, unconscious vision, whereas recurrent processing is required for attentive vision and visual awareness (Lamme 2000, p. 577).

It can be argued that visual attention is not the same as visual awareness even though they are often equated (Lamme 2003, p.12). Studies on change blindness, which means subjects do not see a masked change of an item like position, color, or identity, and inattention blindness, which arises when subjects are focused on some task and do not notice an unexpected stimulus, can be used to illustrate that the process of attentive selection is what makes some sensory inputs reach a conscious state and allows us to report on them. There is also evidence that there are some stimuli, or properties of stimuli, that will not reach consciousness even when attended, for example masked stimuli (Lamme 2003, p. 12).

A theoretical solution to the incorrect equation of visual awareness with visual attention, which separates awareness from attention, can be given as follows. The first separation is between conscious and unconscious inputs, and then the conscious inputs are separated into those that are unattended, and those that are attended. The last are the stimuli that we are able to give conscious reports about. '[W]e are 'conscious' of many inputs but, without attention, this conscious experience cannot be reported and is quickly erased and forgotten.' (Lamme 2003, p. 13)

Neurologically, attention is a process where some inputs are selected to be processed in ways that give them a better chance of being memorized or producing a behavioral response, and other inputs are not processed as deeply, quickly, or thoroughly. Stimuli that are simply processed more efficiently than other are called salient, and this saliency is the result of genetics and visual experience shaping and modifying the processing network of an adult (Lamme 2003, p.14/15). This combination of how effective stimuli are processed and the role memory plays, explains why a particular brain at a particular moment in time is inclined to favor one stimulus over another, it is not directly related to whether or not we are paying attention to the stimulus. In other words: attention is not a priori associated with visual awareness (Lamme 2003, p. 14).

Conclusion

To Lamme, consciousness is brain activity, and specifically the presence of (sufficiently strong) recurrent processing. Consciousness can be present in his theory without the subject being able to report about it.

When we are perceiving something we can be conscious of many things in the scene, but unless we pay attention to them, we forget about them before we can report about them. Which things attract our attention is determined by our predispositions and experiences modifying our processing network. In other words: our memory of past experiences makes us prone to favor certain stimuli over others, which is not directly related to whether or not we are paying attention to the stimulus. Visual awareness is not a priori related to visual attention.

It is not certain that we are able to report on being conscious about something, we can only report about those things we have access awareness of. When we perceive something we first gain phenomenal awareness of it, which allows us to extract features, that is, have a basic experience of things like movement, form, sound and feelings of a lot of things in the scene at the same time. This awareness only lasts until the next stimulus, but experiments of directing attention to a feature after the stimulus but before the next one, it can be shown that we are conscious of all the things we have phenomenal awareness of, even if only for a short time. We cannot report about them though, as

most of those things never reach our access awareness.

Access awareness arises when the information gained by the perception is put into the context of our memories and past experiences. It is limited to only a couple of things in a scene, and it can influence our behavior. We are also able to report about those things that we have access awareness of, this is the awareness we have about things that we know we are conscious about, it is the kind of consciousness we can detect using the 'traditional' measures Lamme criticizes.

Lamme's theory of consciousness encompasses the commonly used definition of consciousness, which determines consciousness by using behavioral measures and reporting. In addition to that, we are also (fleetingly) conscious of a lot of other things that never make it to our memory, and therefore cannot be reported about. His theory says that we can detect these unreportable forms of consciousness by using a technological means of measuring (at the moment direct cell recordings in mainly monkeys). This technological way of determining consciousness works for cases where there is reportable consciousness as well, but there is no reason to use it in those cases.

3.3 Discussion

It is interesting to look at neural arguments and measures for consciousness in those cases where there is a possibility of conflating consciousness with another cognitive function, for example the ability to use language. It is in those cases that neural arguments can add to the discussion. Lamme discusses some cases where there clearly is no problem (Lamme 2006, p499). First of all the reporting of a clearly visible event, which is obviously a conscious experience, and secondly the absence of consciousness in cases of blindsight or deeply masked stimuli. In these cases he accepts the behavioral measures or the reporting as correctly identifying consciousness.

Use of 1st Person Information

Lamme excludes all forms of reporting from consciousness, saying the processes used for reporting are not the ones used for consciousness. But the basis of the theory is that the research that is generally done, using the common definitions of consciousness, is using behavioral measures where it should not be. In that definition consciousness is thought to be related to localized or global activity in the brain, that corresponds to some behavior that it thought to indicate consciousness (the neural correlate of consciousness). Depending on whether a certain type of behavior is thought to be an indication of consciousness or not, this can give different results for what the neural correlate of consciousness is, possibly contradicting or at least not agreeing with other findings. This happens because there are differences in what is seen as part of consciousness, sometimes verbal reporting is thought to be a necessary part of consciousness, sometimes it is not (Lamme 2006, p.494). Lamme uses the research that is generally done and that he criticizes for putting too much stock in behavioral measures and reporting as a starting point for his theory, he looks at cases where there is no confusion and separates them from the cases where there is confusion about whether or not other cognitive functions are part of consciousness. He uses the results coming from reporting and first person experience as a basis for what must be part of consciousness. He also states that there are no reasons to doubt very obvious cases of absence of consciousness (as reported by people) and very obvious cases of presence of consciousness (again, as reported by people). He says that there is a

gray area where it is not clear whether there is consciousness or not and where the reporting or the behavioral measures do not give a clear answer, for which his idea has the most to offer. However, all of that still uses the measures (that is, behavior and reporting) he does not want to be too important (for example Lamme 2006, p. 495 table 1, and p. 498 figure 3).

Definition of Consciousness

The definition of consciousness generally used in neuroscience is that consciousness is activity in the brain correlating with certain behaviors that are believed to indicate the presence of consciousness. To Lamme, consciousness is brain activity, specifically recurrent processing. If there is sufficiently strong recurrent processing, there is consciousness, regardless of whether or not the subject can report on the consciousness, or behaves in a way that indicates consciousness. This view can help the analysis in cases where there is a conflation of consciousness with other cognitive functions, for instance those functions that are needed for reporting.

When changing our definition of consciousness to the one Lamme suggests (identifying recurrent processing of sufficient strength with the presence of consciousness as discussed before) we do not lose our idea of what consciousness is as he claims, but we gain some extra cases where there is consciousness even when we would not say so on the basis of our intuitive idea of consciousness. Rather than us needing to let go of our intuitive idea of what consciousness is completely, as he claims (Lamme 2006, p.494), he adds something to it. The clear cases are still clear on the basis of his theory, and there would be no reason to look any further, or to change our idea of what consciousness is. Only in some borderline cases more measures are needed, and then his theory becomes interesting, because it adds another way of determining the presence or absence of consciousness to the ones we already had, that do not appear to work very well in those particular situations. The cases he mentions as clearly conscious or unconscious are generally (also) found to be such on the grounds of 'traditional' behavioral measures. When these function properly Lamme's view does not change the outcome, as it should not, since it would be strange that something that is deemed obviously true or false does not fit the theory. However there are some extra cases that in the 'traditional' view cause (potential) problems, where Lamme's theory still gives the same answer for what consciousness is (recurrent processing), where other approaches disagree. According to Lamme, this is because in those cases other cognitive functions are (mistakenly) taken to be an indication of consciousness, and there is some disagreement on what behavioral measures or reports to use, causing different view(s) to get varying results for what the NCC should be.

Also, if we were to accept Lamme's definition of consciousness, we will need technology to be able to assess consciousness, as he claims that if we follow his theory of consciousness (consciousness is the presence of sufficiently strong recurrent processing), we lose our intuitive idea of what consciousness is (private access and personal feeling). He gives a few arguments as to why we should use his definition, firstly “recurrent processing is crucial for the induction of synaptic plasticity” (Lamme 2006, p500), which means that using Lamme's definition, we can understand consciousness to be needed for learning. Also his definition separates consciousness from other cognitive functions, like attention, working memory, and reportability, which all need their own neural definition in order to separate them from the neurally defined consciousness. Next, if we adopt that recurrent processing (RP) means conscious and fast forward sweep (FFS) means unconscious testable predictions can be made for behavioral experiments, it can for instance be predicted that learning will follow the phenomenal aspects of stimuli (like color) rather than their physical features (like wavelength) (Lamme 2006, p500). Lastly, it gives us a way of judging consciousness without resorting to behavioral measures, making it possible to determine

consciousness in several cases where it is impossible to use such measures (like locked-in-syndrome).

Measuring

The difference between the feedforward sweep and recurrent processing is that in those cases where subjects can report on having a conscious experience recurrent processing is always measured. The reverse is not true, it is possible that there is recurrent processing without the subject reporting a conscious experience, meaning that the recurrent processing is not responsible for the reporting.

The ability to report is not part of consciousness in Lamme's view, his point is that consciousness and reporting are different cognitive processes that should be treated as something separate. If consciousness is not about things being reportable, how do you know the FFS is not part of consciousness after all?

When talking about consciousness and memory, Lamme makes the point that it could be that we have known certain things consciously at one point, but have forgotten them later. This is not something that you can ever prove, since if we are only conscious of something at the moment of presentation, how can you measure that? Also, the moment of presentation is the feedforward process and that is said to not be part of consciousness. If it is possible to have a conscious experience without being able to report on it, what criteria are there to say that the neural activity really is part of a conscious experience and not just some other thing happening?

Though Lamme shows that recurrent processing is always there when we have a conscious experience, he does not show that it is the only thing that is needed for that experience. In other words, he shows that recurrent processing is a necessary condition for consciousness, but not that it is sufficient. It is possible that there are other processes that are needed also before we can conclude that something is conscious.

There needs to be a sufficiently strong recurrent interaction in the brain. How do you decide what is 'sufficiently strong' in this regard, if you cannot use reporting as a measure, because the definition of consciousness Lamme uses excludes that? It is possible to quantify the strength of the recurrent interactions, but without some sort of indication of differences in the subject, there is no basis for it, and it would be an arbitrary scale. If this is going to be useful, we would need to find a way to qualify the strength of the interactions as well as quantify it.

If we use Lamme's idea of consciousness we will need imaging techniques to judge consciousness, and in some cases this could lead to different results than our everyday way of judging it. It gives us another way of judging consciousness, besides reporting and behavioral measures. The problem is that you would need some very good measures, or you might make a wrong decision about whether or not someone (e.g. in a coma) is still conscious, with all the ethical problems that come with it. The technology takes away the direct human to human way in which we normally ascertain consciousness, we normally judge consciousness in others intersubjectively. By putting technology in between, we lose this connection to the other person, reducing the other to brainwaves. On the other hand, the use of technology may enable us to judge consciousness successfully in subjects where it was previously problematic to tell if they still have some level of consciousness, enhancing our options in that area.

When comparing Lamme's view of consciousness as something to be measured, to the phenomenological view of consciousness, we see a completely different role for experience. Where

phenomenology takes first person experience as the start of all knowledge, Lamme's view says that our own experience of consciousness is not a reliable indication of that state at all. It is entirely possible to be conscious and not be able to report about it, or remember it. This means that my consciousness becomes something for a third person to judge. In the next chapter we will take a closer look at how these different views on consciousness compare and if and how they could be used to complement each other.

Literature

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4 Comparison and Discussion

In this chapter the phenomenological view of consciousness and Lamme's theory on consciousness described in the previous chapters will be compared and their similarities and differences discussed.

As we have seen in the previous chapters, neuroscience, and Lamme in particular, has a third person view of consciousness, where consciousness is ascertained in a subject by a third party that can objectively determine consciousness by using technological means; consciousness is one of the functions of our brain that needs explaining. Phenomenology has a first person view of consciousness, it is our personal experiences that allow us to learn about the world. In the next section we take a closer look at these different ways of viewing consciousness.

4.1 1st and 3rd Person Views of Consciousness

Phenomenology looks from within, taking consciousness and experience to be the basis for all knowledge about the world; it gives us a first person view of what consciousness is like, using reflection to find the structures of our consciousness. It focuses on the relation between our mind and the world. Science looks from the outside, trying to find an objective way to describe what is observed to be happening in the outside world, using technology to make visible what is going on in our brains; it focuses on the relationship between our mind and our brain, and gives us a third person view of consciousness. Both use experiences to gain knowledge, but where phenomenology takes our experiences to be our only access to the world, science seeks to find the rules of physics that explain why something happens, which can often be expressed in a formula or equation.

Phenomenology

Phenomenology takes our experiences as the start, we find the world in our consciousness; it is seen as the start of everything we can know. These experiences are not necessarily object-directed, but can be feelings or moods. Knowledge comes from contact between the living consciousness and the external world (Ferrarello 2009). When we want to know what consciousness is, we should look at our own experiences, and try to find the structures of consciousness and experience that are constant, that resist change. Because phenomenology tries to find the structures that are always present, this is not just introspection. Phenomenology is trying to find a description of how consciousness works, using the phenomenological method of putting our judgments out of action (bracketing) and examining what happens if you do. The phenomenologist is reflecting on his or her personal experience, making this a completely first person perspective. Even though the structures that are looked for are present in everyone's consciousness, they are found by reflection, by using our consciousness to examine itself and its structures. The way to test if the structures that are found apply to others as well, is to talk to others and discuss everyone's personal experiences of engaging in the phenomenological reduction, but this happens after the process of reduction has revealed those structures to the phenomenologists involved in the discussion.

What is found is that consciousness is about something, it is directed, and it is what gives meaning to our actions. Our actions have reasons behind them; we do things because we hope to achieve some goal, not just because of the action. This is a very personal way of looking at consciousness, that focuses not just on the outward signs of consciousness like behavior, but also on the reasons we have for displaying that behavior. The same object can have a different meaning, or even represent something completely different, in our mind, our consciousness, depending on our relationship with it. We can even be conscious of something under one description, and unconscious of it under another. Consciousness is internalized, it is personal and even though we can know consciousness in others and assume they are conscious in much the same way as we are, our experiences will never be exactly the same, because other people have other memories, prior experiences, lives, etc. than we have.

Neuroscience

Science uses technology to look at the activity in a subject's brain, while that subject is performing a task. They look to find the brain activity that correlates with the act that is being performed. The same thing can be done for consciousness, in that for example a subject is asked to press a button when she or he sees something, and the neuroscientists look at the brain activity that corresponds with the conscious perception of that something. In this way, science uses first person reporting of consciousness, but objectifies it by having a third person judge what is consciousness by looking at the brain activity, in combination with the behavior exhibited by the subject of the test. It is not the first person experience of consciousness that interests them directly, but the objective signs of it that their technology can show. They hope to use the results to find an objective way of describing what consciousness is. This is more about finding a brain activity that corresponds to consciousness, and not so much about what the conscious experience means to the test subject. It is also a lot harder to make tests about someone's experience, as it is hard to have a third person judge that part of our consciousness, so it makes sense that they would not focus on that, when they have not conclusively found the neural correlate of consciousness so far.

Science objectifies consciousness in order to study it, focusing on outward signs of it, rather than our own experience of what it is to be conscious. It is a third person view of consciousness, and this objective, outside view is considered the most important one, but there is room for first person information and experience as part of experiments, they are trying to explain neurologically the behavior they see and consider to be an indication of consciousness.

Lamme uses visual stimuli in his research, which means his definition of consciousness involves consciousness about objects. He takes things a step further than mainstream neuroscience and dismisses the use of reporting by subjects as a viable way to find consciousness. He thinks we are too likely to mistake other cognitive functions, like language, for consciousness, as it is those functions that we need for reporting. He wants to look at brain function only and not limit consciousness to something we can experience and report about. Instead he extends the definition of consciousness to include certain states that we cannot report about, and do not know ourselves to be conscious of. Those states are conscious in his definition, we are just unable to access the information in a way that lets us memorize and report about it. Lamme's way of looking at consciousness is purely third person, there is no reason for him to look at first person experience of consciousness, as that experience can be mistaken in his point of view.

Both views take consciousness to be consciousness about something, but in Lamme's view this is always about objects (visual stimuli), while in the phenomenological view it does not have to be the case. Both take a very different approach to researching consciousness, but as we can see from the previous two chapters, they can come to remarkably similar results, as will be explained more in the next section.

4.2 Horizons Compared to Attention and Awareness

If we look at the theories explained in the previous two chapters, there is a similarity between both views. It can be found in the way they describe how our previous experiences and our interests influence our current experiences. As an example, when my partner and I bought a different car, suddenly I saw a lot of other cars driving around of the same make and model, that I had not noticed before, even though they must have been there. Phenomenologically this is described by the horizontal structure of consciousness, whereas Lamme's theory describes it with the idea of attention and awareness.

In phenomenology, our experience of the world is colored by our previous experiences and the intentional and physical surroundings of the thing we are experiencing. What we perceive and how we perceive it depends on our (intentional) relationship with the objects in the scene. This horizontal structure influences how we see things, and which things in a scene we are likely to notice. So in my example, because I was excited about having a new car, I started to notice similar ones, because my relationship with cars of that model had changed, they reminded me of the one we just bought that I was happy with. Instead of just seeing a car I needed to walk around or let pass before crossing the street, I see something more. Consciousness is about something, which is called intentionality. This intentionality is the directedness of consciousness, as is explained in section 2.2, and our intentionality is where our actions and perceptions get their meaning.

In Lamme's research, he finds that our awareness is directed by our memories, which connect to our previous experiences, and what we see of surrounding elements is connected to the way those elements connect to the object of interest. These connections determine where our attention is focused and what objects in a scene stand out the most or get noticed consciously. In my example, getting a new car got me more focused on cars in general, and our make and model would stand out most, as those would remind me of the one we had just bought. This is similar to the intentional surroundings of the object in the horizon theory that phenomenology uses, it could be the neurological explanation for why we experience perception the way we do.

This gives us a way in which phenomenology could contribute to neuroscience; the structured descriptions of how our consciousness functions in our own experience could be used to inform neurological research into consciousness by having them look for the neurological activity that coincides with our experiences, even if those do not necessarily have an observable part to them. The structured description could give neuroscience something to look for in those cases where there are no other (objectively observable) indications of those experiences.

Even though both approaches use very different methods to look at consciousness, this example shows that they can come to similar results. I think this can be seen as an indication that they could benefit from each other. For this to happen, we need to address the problem that neuroscience may have in using information coming from someone who used the phenomenological reduction to learn more about his or her consciousness, because it can be seen as subjective because of the personal nature of the information, where the aim of science is to give an impersonal, objective account of how the world works. If we want to use the information phenomenology gives about our experience in some way in neuroscientific research, we need a way to make the phenomenological view acceptable to neuroscience. The first person information needs to be translated in a way that can be used by science without giving the impression of being subjective. There are several suggestions of how that could be done, which we will take a look at in the next section.

4.3 Naturalizing Phenomenology

It is not a given that we can use insights from phenomenology to aid science and vice versa, as they have very different views on the world as we have seen in the previous sections. Some efforts have been made to naturalize phenomenology, that is, find a way to use phenomenological results or insights in scientific research into consciousness (for example: Gallagher and Zahavi 2008, pp28-40; Zahavi 2004; Varela 1996). These approaches can start from the empirical results, the training of subjects, or the design of experiments. In the following we take a look at these different approaches and how they aim to overcome the difference between the two ways of approaching consciousness.

Heterophenomenology

This approach says that we need to use a strictly third person method when studying consciousness. The way to access the phenomenological realm is by observation and interpretation of observable data. The focus is on the mental life of others, by interviewing subjects and recording what they say, as well as their behavior. What is studied are reports about conscious phenomena; other people's reports of their experiences are used as data that needs to be interpreted (see figure 1). Heterophenomenology is a way of interpreting behavior.

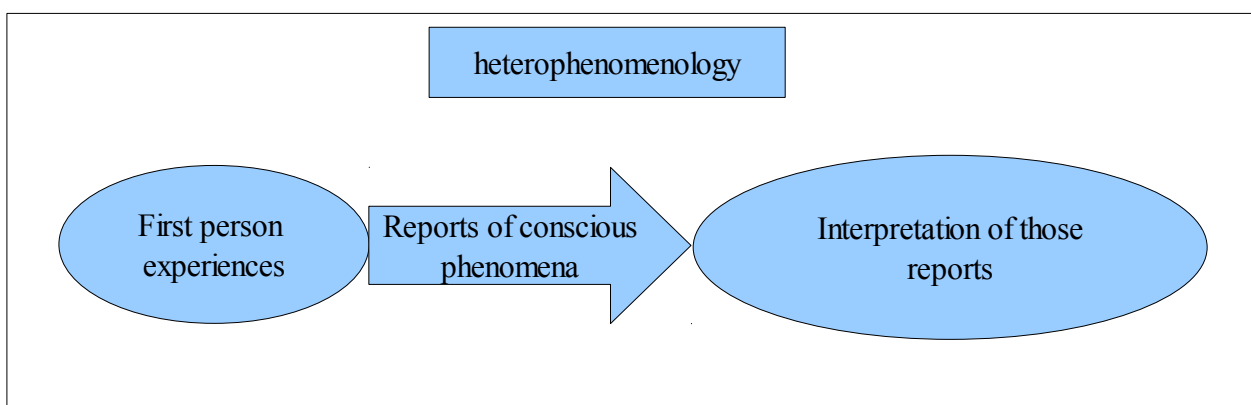


Figure 1: a schematic depiction of the heterophenomenological process.

This focuses on first person experiences as mainstream phenomenology does, but it does not accept all first person information as viable for research. The first person verbal information is checked against behavioral clues that are observed by the researcher to see if they match the reported data, and only those that do match are considered. It is a behavioral way of looking at consciousness with the addition that they also ask the subjects about their experiences, but need them to match with behavior, so some things would be excluded, namely those where there is no behavior to (reliably) indicate certain experiences. There is a check on any first person information that is used, by using behavior as clues. It is more of a corroboration with observable data that is used, than an actual translation from 1st person to 3rd person information, as the only first person information that is accepted is verified by behavioral information.

This approach does the least to bridge any gap between phenomenology and neuroscience, there is a focus on experience, but in such a way that it adapts the phenomenon completely to behavior and clues that can be objectively found by a third person observer. The focus is on experience, but only the kind that can be verified third person, so what this approach contributes is in giving a way for neuroscientists to include experiences in their research.

The first person information is only used if there is a third person verification of it, so except for putting the focus on (verifiable) experience, there is no 'real' first person component here. Phenomenology is very much on the sidelines here, it is only used to come up with an area of interest, but because of the requirement of complete third person corroboration, there is no 'translation' from first to third person point of view as is the case in the other ways of naturalizing phenomenology that we have discussed. Nobody involved really needs to know about phenomenology, they just need an interest in explaining our experiences.

Using Formulas

Another possible way of naturalizing phenomenology is translating the results of phenomenological analysis into equation-like terms because this is similar to mathematics, which is a language used by science. In this case we start from empirical results from both approaches and 'translate' them into a common language similar to mathematics. The way this is done, is by formalizing phenomenological descriptions in such a way that they can be used to solve problems, as is done when solving mathematical equations. Once this is done, what we have gained is a formalized language that can be used to express the phenomenological findings. This language can then be used to express the structures of our experiences, rather than the content of them. The notation could show the complexity of consciousness, as well as suggest other structures that could be present in our experiences and consciousness. Neuroscientific data would then need to be translated into a similar notation describing our cognitive functions. This is illustrated in figure 2. The idea is that with a high enough level of abstraction both will be consistent with each other.

Using sufficiently complex models are thought to be able to help make it possible to translate data from both phenomenology and neuroscience into a common language. This kind of translation should be possible in the realm of mental experience, and we can extend this to include phenomenological data (Gallagher and Zahavi 2008, p. 32). This involves a degree of abstraction from the natural psychophysical dimension of individual embodied lived experience. The starting point in phenomenology needs to be lived experience and not some intellectualized version of that experience. This means that the computational models of traditional cognitive science are not enough, but rather we would need to use the recent dynamical models of the brain, involving

different scales of duration that together explain how we experience time (Gallagher and Zahavi 2008, pp. 80-82).

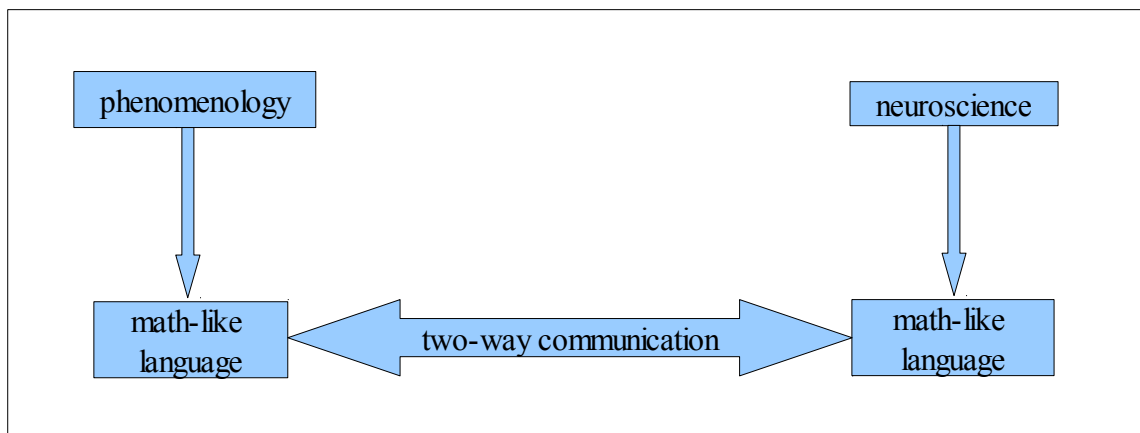


Figure 2: using formulas to translate both fields into a common language

The attempt to bridge the gap here is to use a universal language to make it possible for both ways of looking at consciousness to talk to each other and understand each other. The goal of the formalization is to give phenomenology a way to contribute to cognitive science by giving them a way to talk to the scientists in a language similar to one they already speak. However, this could be a completely two-sided interaction, as both are equally able to contribute to the other through this common language. Either side could use the notation to come up with expectations and predictions for further testing and research in either domain as the boundaries between the domains disappear because of the common language.

The translation or abstraction happens in both the first and the third person side here. The translation from first to third person is made in the abstraction to a mathematics-like language in a way, as this is what makes the communication between both views possible. A restriction would be that only those things that can be put into mathematical rules or laws can be translated into a language that uses equations and formulas. Knowledge of phenomenology (or neuroscience) is needed for the ones that make the translations, but after that, anyone who understands the common language can use it. Translations back to either domain would require knowledge of the appropriate field again.

Neurophenomenology (Varela 1996)

Neurophenomenology is a way of introducing phenomenology into neuroscience by means of training subjects to report on their experience of the experiment. Varela's working hypothesis is that "phenomenological accounts of the structure of experience and their counter parts in cognitive science relate to each other through reciprocal constraints." (Varela 1996, section III.2) He wants to give both the scientific and the phenomenological domain equal status in this. Phenomenological accounts can provide a way of keeping the first hand nature of experience, which can vanish or become a riddle in neuroscience. Also, it can provide constraints on empirical observations by providing a structural account. It could be useful in the research of attention, present-time consciousness, body image and voluntary motion, as all of these have an experiential side, which

can be categorized using phenomenological accounts of experience.

The goal of neurophenomenology is to design neuroscientific experiments that are guided by what we experience, and what is looked for in the experiments is the brain activity that explains our experiences. The idea is to have the structure of human experience as provided by phenomenology play a central role in how we explain consciousness scientifically, by using the phenomenological account of experience as a way of categorizing experiences, as can be seen in figure 3.

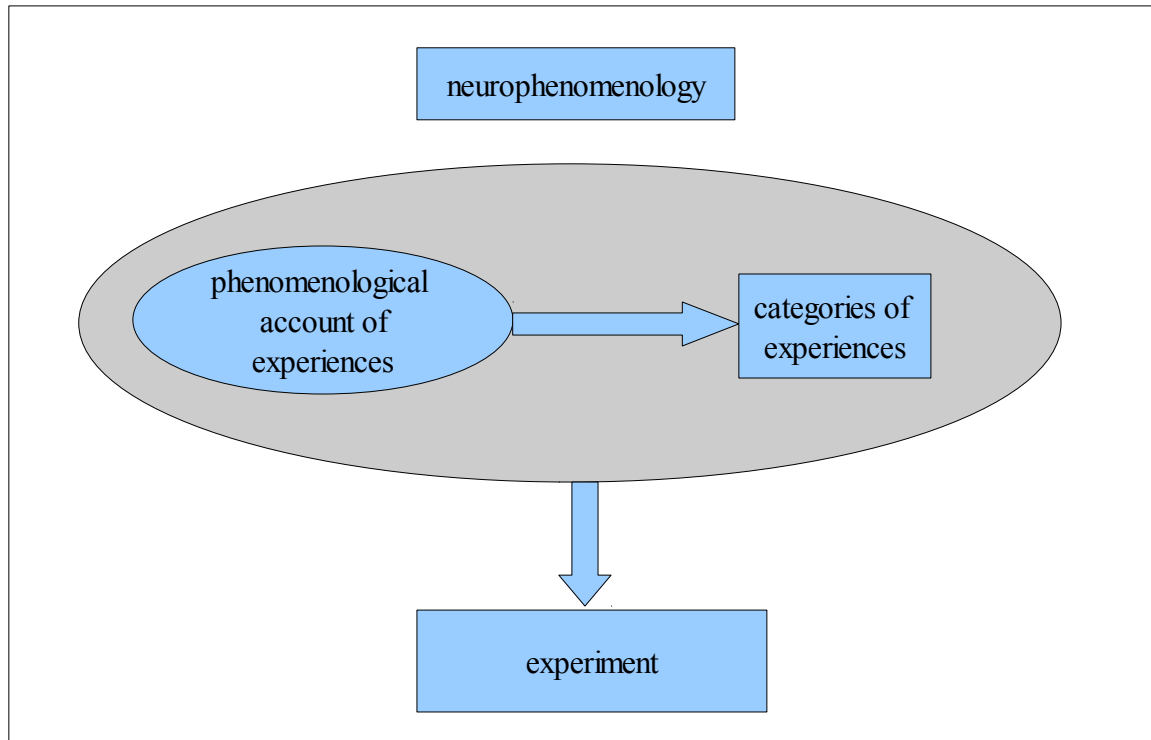


Figure 3: neurophenomenology broken down into separate steps.

An example of a phenomenological part of an experiment (Gallagher and Zahavi 2008, p 35-38) is one in which subjects were shown a autostereogram (3-D illusion of a geometric shape) and asked to push a button when the shape had completely emerged, after which they were asked to give a verbal report of the experience. The subjects were trained in order to make categories that correspond to the mental states of interest. They were also trained to report on whether or not there were distractions, inattentive moments, or cognitive strategies. The phenomenological categories the subjects formed were used to divide the tests in clusters based on a phenomenological criterion (e.g. readiness). The subjects could then use the categories as a sort of shorthand during the main trials, where the experimenters recorded both the subjects' reports and the brain activity for each trial. The first person data was then correlated with reaction times and 'dynamic descriptions of the transient patterns of local and long-distance synchrony occurring between oscillating neural populations, specified as a dynamic neural signature (DNS)' (Gallagher and Zahavi 2008, p. 37).

Neurophenomenology tries to bridge the gap between first and third person ways of looking at consciousness by having first person experiences inform the experiments of neuroscience. Varela thinks that first hand experience is irreducible and needs to be taken into account. What the neuroscientist would be looking for is still the brain activity, but instead of only looking for correspondence of neurological activity with certain behavior, an effort is made to catalog types of experience, and look for brain activity that corresponds with those. This means the view of consciousness is still a third person one, but used to explain the how and why of our first person perception of consciousness. First person experience is the subject of the research, not just something that can be used as a tool for gathering data, as it is when using it in the form of reporting. In Lamme's research first person data is not used at all, as it is seen as unreliable and incomplete when it comes to being an indication of the (neural correlate of) consciousness.

The first person point of view is used both in the training of subjects, in the setup of the experiment, and in the experiment itself. The translation of first to third person information is done in the categorization of phenomenological experiences into terms that can be used for easy reference in the final experiment. There is a level of abstraction in the categorization of those experiences, reducing them to a number of keywords that denote a certain experience in the training stage. These keywords are then used during the actual experiment to give the subjects an easy and quick way to indicate the nature of their experience. Both the researchers and the people taking part in the experiment need some knowledge of phenomenology for this way of integrating both ways of looking at consciousness to work.

Front-loaded Phenomenology

Front-loaded phenomenology starts by using phenomenological insights to inform the design of experiments, influencing how they are set up, see figure 4. In this method, subjects do not need to be trained in the phenomenological method, as is the case with neurophenomenology, which can be useful if the subject should not be aware, or cannot be aware of what is being tested, which is often the case. Like neurophenomenology, the aim is to make our lived experience part of the consciousness research.

An example of this (Gallagher and Zahavi 2008, p39) is the phenomenological analysis of the distinction between the sense of agency for an action and the sense of ownership for it. What was considered is the phenomenology of an involuntary movement, where I feel that I am the one moving, but I do not experience agency for the movement as I was not the one to cause it. In most (normal) cases of movement, I would feel I am both the one moving and the one causing the movement. This phenomenological distinction can then be tested to see what neurological processes are responsible for generating these differences in our first person experience of the movement.

Here the first person information is used as the object of the test; it is what needs to be correlated with neurological activity. What is being tried is to find a third person explanation for the first person difference in experience, namely in the brain activity corresponding with either option, that is, my movement, caused by me versus my movement, caused by some other force or person.

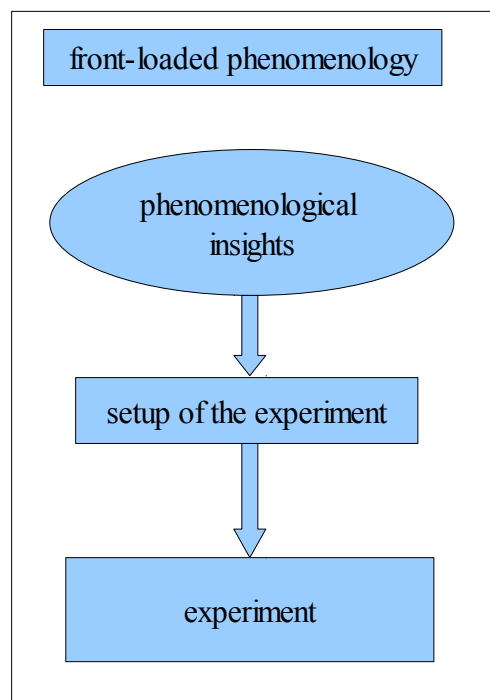


Figure 4: front-loaded phenomenology

The translation of first person information comes at the point of thinking up the experiment. Researchers choose an interesting phenomenon and come up with a test to look for the neural activity that corresponds to that phenomenon. The first person experience is the object of the research, but the bulk of the experiment would be done the same way any neurological research is being done, that is, using measuring equipment and third person observations. The difference with mainstream neuroscience would be that the starting point is our experience and the method yields a way to measure the phenomena that go with the experience (as explained in the example). The people thinking up the tests need to know about phenomenology, the subjects of the test need not worry about it, as no such knowledge is needed there.

Comparison

All of the methods to naturalize phenomenology aim to contribute to neuroscience by giving first person experience a place in the research. This can be done in different ways, by influencing how experiments are set up, by looking at the data in a different way, or by training the subjects of a test in giving phenomenological feedback. Whatever method is used, neuroscience is still trying to find the neural activity that corresponds with the structures of first person experience and consciousness that we find when we use the phenomenological method to examine our consciousness. It is using the first person information in some way to inform the third person research being done. This is needed because the subjects generally need to be ignorant of the phenomenon that is being studied, as the data could be influenced otherwise. The use of technological instruments to look at the brain activity makes it practical as well to have one person (or animal) undergo the tests and another person interpret the results.

The more phenomenological knowledge is needed, the more problematic it will be to actually use a method, as that means people need to learn about two fields. For the translation into math-like language, this language needs to be developed and learned by the researchers, which seems unlikely to work until there are enough people that would want to use the possibilities it gives.

Heterophenomenology is the easiest to implement, as that does not really require a lot of knowledge of phenomenology, just an interest in explaining our experiences and behaviors neurologically.

Neurophenomenology and front-loaded phenomenology can work, but have restrictions on the kind of research that can be done using those methods. The first trains subjects before the test, so it cannot be used in situations where the subjects cannot be aware of what is being tested, and it will be difficult to use on animals. The second needs a well-defined phenomenon that can be translated into a testable situation of two different experiences that only differ in that experience, because otherwise you would not know what you are measuring. In figure 5 an overview of the different methods with regards to the 1st versus 3rd person spectrum is given.

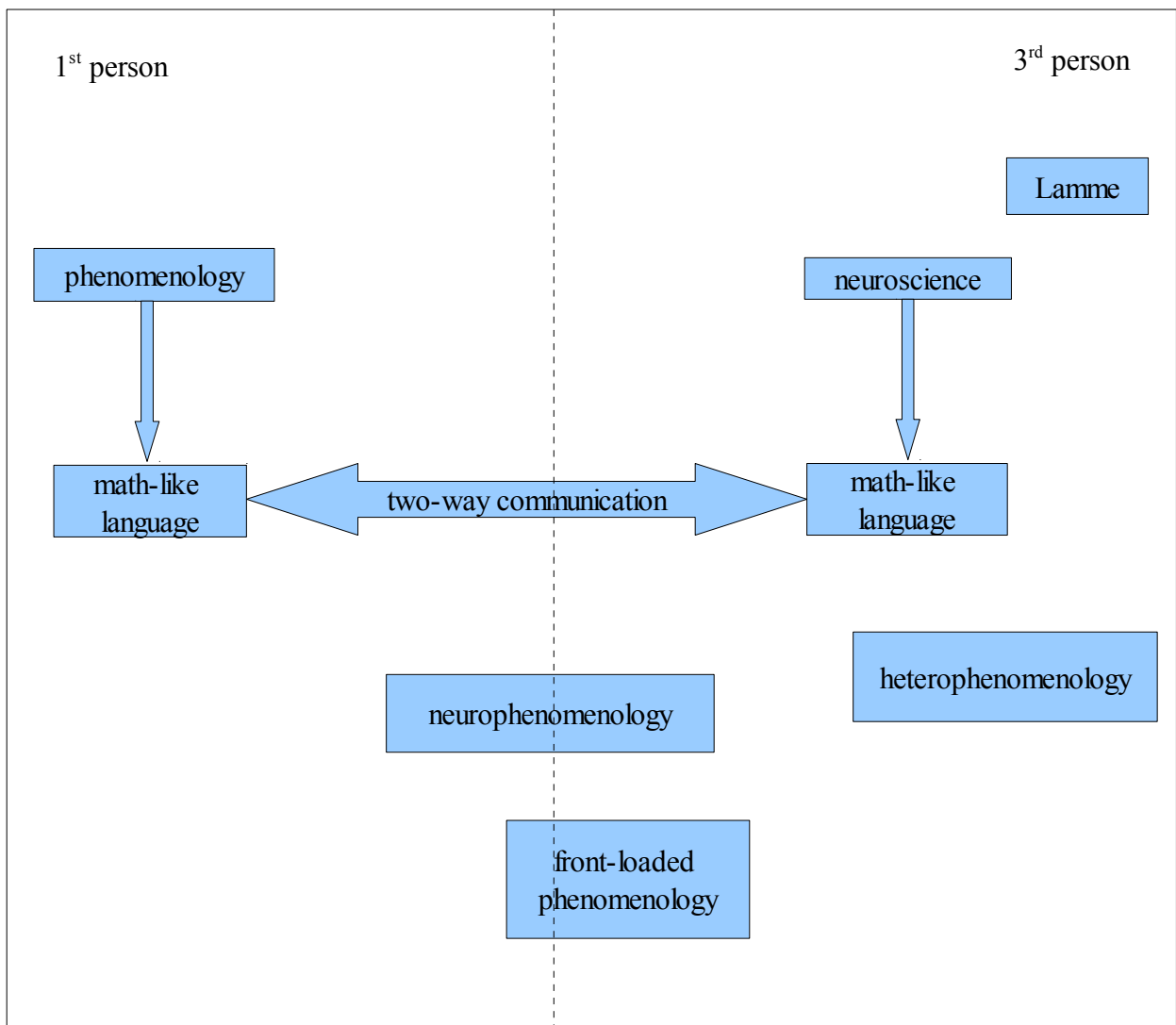


Figure 5: all methods of naturalizing phenomenology that were discussed above pictured in a 1st person versus 3rd person field.

As we have seen there are several different approaches for the introduction of phenomenological insights into neurological research into consciousness. There are several studies already done where experiences are used to find neural correlates for certain experiences, as mentioned above. There are limits to the areas where phenomenology can contribute, it cannot say anything about things that are unconscious, but it should be able to say something about different levels of awareness, if only about those that are still within our ability to report about. Phenomenology cannot say anything about those levels of consciousness that do not reach our memory as Lamme discusses. As an example of different levels of awareness within the range of levels we can report about, there is research (Gallagher and Zahavi 2008, pp. 35-38) on the amount of noise in a scan relating to the level of concentration people report having, the less concentrated they are, the more noise there was in the scans. Phenomenology may be able to help in finding measures for levels of consciousness, for example by using front-loaded phenomenology when doing experiments related to levels of consciousness. As an example, you could ask people what they were taking notice of and how much they focused on a certain object in a scene when doing a change blindness experiment, to assess the level of consciousness of certain things in the scene and how directing their consciousness towards something else in the scene changes the result of the experiment, such as noticing or not noticing the change.

This split in views between first and third person perspective explains why there is a communication problem between both ways of describing consciousness. If a way can be found to solve these communication problems, they could contribute to each other. One thing these ways of bridging the gap have shown, is that phenomenological insights into consciousness can be used to inform tests (as can be seen from the examples in the neurophenomenology and front-loading phenomenology parts).

The gap seems to be experienced as more pronounced from the side of neuroscience, as they are the ones that have a problem with the perceived subjectivity of first person phenomenological insights. The attempts to bridge the gap that we have examined in this chapter, all try to do so by changing the phenomenological input in such a way that it becomes more like third person information. This is most pronounced in the heterophenomenology case, but it is also the case in the other forms of bridging the gap, as I explained in the relevant sections. Only the translation into mathematical language has a translation step at both sides, but still the form of language is one that science is already comfortable with (math-like formulas), which we can interpret as a step towards (neuro)science as well.

If we take into account that to phenomenology all our knowledge starts with our experiences, this makes sense. Phenomenology does not see a gap between first and third person data in the way that science sees it. The call to return 'to the things themselves' can be seen as a call for a return to the perceptual world that is prior to and a needed for any scientific way of viewing the world (Gallagher and Zahavi 2008, p89).

This idea is in contrast to the western tradition of philosophy, which says that the highest human attribute is pure, impersonal reason. We need to give an account of things, not as they appear to us from where we happen to be, but as they really are in themselves: the kind of account which would be given by a being who did not have any particular position in space or time. Science expects its knowledge to be independent of the place and time where an experiment was done, it should be possible for anyone, anywhere to replicate the experiment and get the same results. This objectivist view runs through most of traditional western philosophy, and gave rise eventually to the acceptance in modern western culture of the mathematical natural sciences as providing the most

reliable account of what reality is fundamentally. Descriptions in objective, scientific terms are seen as more respectable, and coming closer to representing reality of the situation, than one using qualitative language, which is seen as subjective.

Phenomenology (Merleau-Ponty) says that sciences are human accomplishments, particular forms of human activity we engage in for particular human purposes; there is no reason to think that the theoretical way of understanding is the only, or the most fundamental, way of understanding the world and ourselves. We give meaning to the concepts used in sciences, as abstractions from the concrete experience of ourselves and others. This does not mean that the scientific ways of describing the world are invalid. They are a more universal way of talking about the world, that we can only use by starting from our own engagement with the world. Science is empirical, based on human experience, and human experience is always that of particular human beings who engage with the world in the course of living in it, rather than theorizing about it. All knowledge of the world, even my scientific knowledge, is gained from my own particular point of view, or from some experience of the world without which the symbols of science would be meaningless.

Science assumes the surroundings that we live in (*Lebenswelt*), as the world that the scientist lives in, works in, and is part of with all his actions and all his theoretical thoughts. The questions science asks are grounded in this world. Phenomenology does not just study the objects that are out there in the world, but also what is meant by thinking, perceiving, imagining, those objects, and in that way phenomenology is concerned with a more primitive kind of involvement with our relations to objects, on which our cognitive relations depend. Living in the world comes first, knowing about it comes later. In Merleau-Ponty's phenomenology perception is not a collection of separate sense-data but of things and situations as wholes in which each part was affected by its place in the whole. Rejecting the objectivist framework means that we have to accept that science itself must be situated, that we perceive from some perspective.

According to Merleau-Ponty, the view we end up with in science is a view from everywhere, not a view from nowhere. All competent observers can agree on the results, and in that way science is interpersonal, not impersonal. The scientific point of view is only right in its proper context, it becomes misleading when taken out of it. To “have a world” is to see the objects around one as having a meaning for oneself, not simply as objects with spatial and physical relationships to oneself considered as simply another object. The world is not an object such that I have in my possession the law of its making; it is the natural setting of, and field for, all my thoughts and all my explicit perceptions.

This means that to phenomenology there is not really a gap between a first and third person perspective, as those are not as clearly separated as they are to science. All scientific knowledge still comes from someone's experience, namely the scientist's. Another way to bridge the perceived gap would be to examine how a scientist comes to his or her knowledge, and examine if this third person perspective really leads to objective information, or if there is a first person component there as well. In the next section we take a look at that way of interpreting scientific knowledge.

4.4 Use of Technology

Science uses technology in many cases to gather information, for example in cases where the phenomenon scientists are trying to observe is not visible to the naked eye. In this way, technology helps to disclose the world to us, it influences the way things are present to people (Verbeek, 2005). Technology is generally used in order to do something, and as such it becomes part of us, of our intentionality. We do not really notice it until the technology malfunctions and draws attention to itself, becoming the focus of our intentionality. Technology mediates our view of the world, it mediates our experiences, and in doing so it can both amplify and reduce our experience.

When looking at the theories in the previous chapter, an important difference between the two can be found in the method they use to examine consciousness. In phenomenology the only thing needed to do so, is your own consciousness, which is used to examine the structures of said consciousness. One person can do this on his or her own, without using any tools other than his or her own mind. To science, the endeavor appears subjective and unreliable because of this. Lamme -and neuroscience in general- on the other hand, uses technological instruments to look into the brain functions of another person. This means the scientist needs a subject whose brain he or she can study, as well as a range of technological instruments to do so. This view sees consciousness as an object to be studied by an objective observer of the data coming from the instruments. This is a positivist (empirical analytical) way of understanding the world, where the goal is to reveal reality 'as it really is' (Idhe, 1998). On the other hand, the humanities have a hermeneutic (interpretative) way of understanding the world, they give interpretations of reality (Idhe 1998). Hermeneutics is the philosophical analysis of interpretations, the ways in which reality can be present for people. Perception has hermeneutical dimension because it constitutes a relation between human and the world, which is the basis for reality being present in specific ways. Science needs perceptions, and in a lot of cases those perceptions are mediated by technological instruments. It uses those technological instruments to provide knowledge about the world we live in. Technologically mediated experiences make for mediated forms of intentionality.

If we look at the moon through a telescope the result is an 'instrumentally mediated realism' of the moon through the telescope, there is a change of context, a change in relation to the previous field or horizon. There is also a change at the position of embodied observer, she or he is now closer to the moon because it appears closer to him or her through telescope; phenomenologically the distance has changed, even though the distance in physics has not changed. Phenomenological distance is reflexive, there is no god's eye view, or ideal observer. This new experience also implicates a sense of body. The magnification of the moon also magnifies my body's movement as my wavering becomes noticeable. When something is used to compensate for my body movements it means that the realistic bodily seeing is replaced by the technological construction that allows the vision to be mechanically stabilized. After we started to look at the moon through a telescope and learned new things about it, like the presence of craters on the surface, this influenced the way we see the moon with the naked eye as well. We can now no longer see the moon as having a mirror smooth surface as was common belief before the use of telescopes.

Modern science is what it is because it has found ways to enhance, magnify and modify its perceptions. Science is a way of 'seeing', seeing is believing and seeing is done through, with, and by means of instruments. Modern science uses a lot of imaging technologies that make non-visual sources into visual ones. Some forms of visualization use isomorphism, for example photographs, x-rays, microscopes, and telescopes. Other forms of visualization depend on someone reading the information, for example graphs, charts, or models, the information is translated into another form

that can be read back. Perception is always in a field of things, if the information is made vision only, it is a reduction, an abstraction from the lived experience of active perception within a world.

Visualization in science is another way by which understanding or interpretative activity is embodied. The structure of figure against a (back)ground is not something simply 'given' but is constituted by its context and field of significations. Figures 'stand out' relative to interest, attention and even history of perceivability, which includes cultural or macroperceptual features as well. In order to be seen by technological instrumentation things often need to be prepared for the specific means of viewing used, for instance when using a dye to make cells visible under a microscope. Instrumentation needs to withdraw to make thing of interest clear, though it cannot disappear completely. Examples are the transformation of distance by use of a telescope, and the transformation of time by means of a photograph.

The technology used to perceive something has an influence on what you see, and how you see it. Using a different instrument to measure means what you can find changes as the instrument is also part of what you can find. Using different methods to look at something means we are able to see different things, or different aspects of the same thing. Using several ways of measuring the same thing can give confirmation of the data (e.g. dating of archeological finds).

Modern science thinks things are invisible for only so long as it takes us to come up with a way, usually technological, to see them. It has proof focused around things seen, but things have to be prepared or made readable to be seen. Science is things mediated by instruments and proof is often a depiction or image. 'Truth' is taken to be some kind of isomorphism between depiction and object. To interpret science in terms of a visual hermeneutics, embodied within an instrumentally realistic (but critical) framework in which instruments mediate perceptions, we need to learn to see (Idhe 1998). There are patterns, first we need to get a 'clear and distinct' image. We need to learn to recognize instrumental artifacts, eliminate bugs, but also we can make images clearer for example by reconstruction techniques. Translations can be used to make something visible, for example translation of infrared or ultraviolet to visible light. Something is real if the effects which will not go away that are detected by the instruments are imageable. But they are made visible through the technological constructions with mediate them. Also, we can use computers to construct images (e.g. MRI). The computer is a black box that mediates perception by producing images. This can be useful for taking into account the medium through which the image is attained, adjusting for noise from certain sources. Computers can also be used to produce images from non-optical sources, for instance by using composites of data acquired by different techniques to make a whole picture. Things are prepared to be seen, to be 'read' within the complex set of instrumentally delivered visibilities of scientific imaging.

In this view, the imaging done by technological means does not show us a picture of what the object of our interest is really like, but rather it gives a scientist something to interpret. In the case of neuroscience, this means that the images on the MRI or the graphs of the EEG are not merely a representation of reality, but they need to be interpreted by someone who knows how to read the outputs of those machines. The interpretation makes the reading of the results subjective (first person) rather than objective in the phenomenological view. The interpretation of the data given by the neuroscientific research is not objective, but the scientists' interpretation of technological data.

Also, the images and graphs of our brain activity change the way we interpret consciousness in everyday life as well. Like it is now impossible to see the moon as having a smooth surface even when looking at it with the naked eye, our idea of consciousness as brain activity is influenced by the fact that we can measure such activity. Our technological advances influence how we see the

brain, changing the image used as a metaphor from clockwork to computer hardware for example. Neuroscience tries to find consciousness in the graphs and pictures that they can get from the technology they have to look inside the brain. Being able to see the different areas of the brain 'light up' when a test subject is doing a certain task, makes the step to look for an area that is responsible for consciousness a logical one, which we would not be taking if those pictures did not exist. Also the way we can talk about what areas of the brain 'light up' is an indication of how the use of technology has an influence of how we see consciousness. It is not unusual to use the phrase in everyday conversation (for instance when discussing my thesis with family or friends), which is another indication of the influence the technology has on our conception of consciousness and brain activity. We link it to a certain picture, a certain visualization of what is happening. Another example of this is my own use of the term 'brain waves' in this thesis. The term comes from the graphs that are obtained with an EEG, but can be (and is often) used as a synonym for brain activity. Without the technological equipment to produce those pictures and graphs, those images would not exist in our collective minds. The third person view that is technologically mediated needs the first person view of the scientist to exist. The first person view is in turn influenced by the data we get from those technological instruments. Both views constitute each other.

4.5 Conclusions

When comparing the neuroscientific view of consciousness to the phenomenological one, we see that they approach consciousness in very different ways. To phenomenology consciousness is the source of our knowledge, without consciousness we cannot know anything. On the other hand, to neuroscience (and Lamme) it is another function of our body that needs explaining, so they look for the brain activity that corresponds to consciousness. In order to find that activity, they take a third person view, whereas phenomenology looks inward, taking a first person view. Both Lamme and phenomenology take the view that consciousness is always about something, with the difference that for Lamme this something is always an object because he looks at visual consciousness only. In phenomenology this does not have to be the case. There is also a remarkable similarity in the phenomenological account of horizons, explaining how our previous experiences influence our relationship to with objects in a scene, and Lamme's account of how attention and awareness are directed by our memories.

From a phenomenological point of view looking at consciousness using technological means or using the phenomenological reduction are not all that different, they only use a different perspective to look at the same thing. So it is possible to have them help each other. Both views use experience in some measure, but in different ways, and they give it different levels of importance. In phenomenology, the focus is on personal experience and its structures, whereas in neuroscience first person experience is not the aim of the research, but finding an objective measure for consciousness is. The first person experience can be used to help find this measure, but the nature and structures of the experience are not the goal of the research. This difference in focus may come from science perceiving first person information as subjective, and third person information as objective. Phenomenology does not make that distinction in that way, as discussed above. But this difference in focus also means that phenomenology can help neuroscience to pinpoint what structures in our experience need explaining, and what to look for. As we have seen from the examples of naturalizing phenomenology (section 4.3), there has been some research that combines the two

views, it is possible to map the one view onto the other.

Moreover, from a post-phenomenological perspective, the different views are not separate at all, but rather they constitute each other. Our every day's ideas about consciousness are influenced by the results of science, as can be seen from casual remarks about 'areas of the brain lighting up' when discussing consciousness casually. Another example is my own use of 'brain waves' when talking about brain activity. Also, technological images or graphs of brain activity need to be interpreted by a scientist. This means that the scientist's ideas about consciousness will influence the way he or she interprets the results.

So to come back to my question: *how can phenomenology and neuroscience interact/help one another/cooperate; are they as incompatible as they seem at first glance?*

Depending on which view we take, both views of consciousness are either interdependent if we take a post-phenomenological view, or two different ways of looking at the same thing, that can be linked if we take the right steps to overcome the differences. There are several ways to do that, we can translate the results on both sides into formulaic language, or design experiments in such a way that they use phenomenological insights. By doing this it can be made easier for neuroscience to incorporate experiences in its research.

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