Neurobiology, science studies and philosophical anthropology

Neuroscientists have developed a fascinating imaging technique. They produce pictures that, they claim, show which regions of the brain are active when we feel, when we perceive other persons, or when we make decisions. It is the aim of many neuroscientists to explain such mental phenomena by reducing them to neuronal events. The crucial step for fulfilling this objective would be to build an explanatory theory of the brain. Constructing such a theory is therefore a long-term aim of neuroscience, the achievement of which requires specific research strategies. Contemporary approaches in neuroscience deem it necessary to examine the activity of individual cells, of small cell groups, and of the dynamic organization of large neuronal networks. This activity is identified with the brain’s internal processing of signals (and information). According to the self-interpretation of the researchers, “invasive electrophysiology” is the branch of research concerned with how the brain processes signals in detail, and it is this kind of research which will lay the groundwork for an explanatory mechanistic theory of the brain. Other types of signals like fMRI do not have the same reputation of being relevant for an explanatory theory of the brain. Changes in blood oxygen level, for example, are evaluated as an indication that energy-demanding neuronal activities have occurred in corresponding areas, which is why more energy has been used and therefore more oxygen consumed. Assuming that this is the case, such a measurement would offer indications as to where to presume increased neuronal activity, but it could tell us nothing about what has actually occurred in these areas.

During invasive electrophysiology, electrodes are placed into an organism’s brain. These electrodes detect and transmit the electrical signals of individual cells and smaller cell groups. For ethical reasons, such research is not conducted on human subjects for purely scientific purposes, but only on animals. The most frequently used animal subjects include mice, rats,

1 This technique is used on human subjects only when electrodes are introduced into the brain for therapeutic reasons, for example, in treating people with epilepsy. The electrodes are
cats, and macaque monkeys. Macaques are used almost exclusively for the analysis of higher regulatory functions, including complex learning processes. This was also the case at the institutes where I carried out my observations.

According to the scientists’ understanding of their own findings, electrophysiological research provides a mechanistic account of the brain and its functions by using a third-person perspective. An explanatory theory of mental phenomena like attention, memory or decision-making will thereby be achieved.

In this article, I argue that it is impossible to give a valid account of the experimental process, as long as only a third-person perspective is adopted. A close examination of the research process instead reveals that, in practice, neuroscientists adopt a “second-person perspective.” They treat their counterparts as expressive beings that must be understood thoroughly before they can be handled properly.

Understanding the expressivity of others is usually used as a framework for the analysis of social persons. We expect that our counterpart is not only a physically perceived entity, but also a meaningful one. By this we mean that there is a self that expresses itself, its intentions and expectations, through gestures and speech. This can be described as a “second-person perspective,” which is usually restricted to an analysis of interactions among symbol-using beings – like humans (Bohman 2000). Using the approach of Helmuth Plessner (1928), it becomes possible to adopt the second-person perspective also for the analysis of the interactions with beings and among beings, who do not use symbols. It enables us to show that in order to perform their experiments, neuroscientists have to understand their research subjects, but do not need to treat them as self-conscious social actors. In particular, Plessner’s theory allows an understanding of a crucial feature of neurobiological brain research: the epistemic object of such research is the isolated brain as a system. During the experiment’s initial phases, the interaction between the experimenter and the organism is crucial, but in the phase of preparing and analyzing data, it is the brain which becomes then used to stimulate certain areas of the brain electrically. However, these same electrodes can also be used “in reverse,” that is, to record the electrophysiological signals of neurons. The areas of the brain involved here are not determined according to the criteria of scientific research but rather by those of therapeutic treatment. Research and recording based on scientific criteria in the narrower sense of the term can be conducted only on nonhuman organisms.

Wolf Singer, one of the leading neuroscientists, who is also engaged in discussions with philosophers, states this in several publications. See, for example, his essays in Singer 2002.
the system of interest. The epistemic object of neurobiology is treated as if it were a brain in the vat.

I will develop my argument in three steps. After a short description of Plessner’s theory of positionality, I present a description of research practices in monkey labs and finally I offer an interpretation of these practices.

Expressivity and expressive realization as an attribute of positionality

In terms of methodology, Plessner generalizes the use of a second-person perspective. Usually, a second-person perspective is adopted in order to understand social phenomena, like symbolic interaction. Plessner extends the use of the second-person perspective by applying it to beings that do not use symbols but are simply alive or are simply conscious. Understanding symbols or understanding interactions mediated by symbols is only one form of understanding. According to Plessner, the most basic event for understanding is the event of being alive.

Plessner uses the term positionality to denote the capacity of living things to realize their own borders, a quality which distinguishes them from inanimate things. A living being delimits itself from its environment and mediates all of its contact with that environment through these self-drawn borders. Living beings regulate contact with their environment and maintain themselves vis-à-vis that environment as self-organizing entities. Plessner thus asserts that biologically observable and experimentally determinable phenomena must also be comprehensible in terms of his theory of positionality. If this is the case, we can, conversely, also regard such biological phenomena as the realization of being alive. Plessner views expressivity coming into play even at this level. Living organisms produce their own borders – a fact that is evident on or in the organism itself and can therefore be observed. The production of one’s own borders is an expressive phenomenon insofar as being alive is not strictly identical to the produced phenomena, which can be observed directly. According to the theory of positionality, the observed phenomena must be treated as indications of the fact that the organism is alive. In other words, the reason to interpret phenomena in such a way is that they are an indication of the activity of life, which appears only indirectly. Being alive is an attribute that has to be concluded from the observed phenomena.

A further complication arises for living things that possess consciousness, or in Plessner’s words, that exist on the level of “centric positionality.”
According to Plessner, conscious living beings are able to relate to the fact of their border realization and can therefore regulate their external appearance independently. We can distinguish here between two dimensions of this relationship of the living being to its environment: 1) perceiving the external field and 2) affecting the external field. Both of these dimensions are realized expressively. The organism appears as a being that perceives and affects. We should not equate expressivity solely with affecting, as perceiving is also realized expressively. Thus, through observation we are able to determine that an organism, first perceives its environment, then affects its environment; and subsequently mediates between the two. How an organism coordinates this perceiving and affecting is left to the organism itself. As part of this process, an organism develops expectations about the future course of events and acts in accordance with these expectations. To the extent that an organism regulates itself in this way, it alters its own appearance according to its inner state and thereby regulates its own expressivity. For Plessner, understanding a conscious organism makes reference to its inner states and to how it regulates itself based on its relation to the environment.

“Eccentric positionality” designates a situation arising from the performance of self-regulation, in which an organism is able to distance itself from this performance and is thus capable of relating to it. On the level of eccentric positionality, an organism is able not only to develop expectations and regulate its behavior accordingly, but also to relate itself to its own performance of self-regulation. In other words, it can comprehend itself as an organism that other organisms develop expectations about. Eccentric organisms adjust their own behavior according to the expectations others have of them. For eccentric organisms, the environment is also populated by other expecting organisms, whose expectations must then be anticipated. When referring to the circumstance of organisms existing in this kind of mutual relationship, I use the term “personale Vergesellschaftung” (Lindemann 2009, chap. 2). It may be translated as “sociation” to social persons.” Thereby I mean that a being becomes a social person within and by the process of sociation. This circumstance must also be realized expressively. There is, however, a further and decisive feature we must consider here. If sociation to social persons is realized expressively, it can only be observed in the relation
of organisms to one another. Eccentric positionality and sociation to social persons cannot be realized by an individual organism alone.

Eccentric positionality and sociation to social persons refer to highly complex relationships which show a structure that is different from the agency of (conscious) living beings. By using Plessner, we can also differentiate these forms of agency from the agency of inanimate artifacts; that is, from entities which cannot die and which are not considered to have expectations. Artifacts are assumed to break down, but they are not assumed to display an autonomous activity which ceases such that it would be meaningful to describe the process as dying. As a result, reference to Plessner allows us to develop a highly differentiated concept of agency, which is neither flat (like Latour’s 2005) nor dichotomous.

Plessner’s theory provides a fresh perspective in another respect as well. Hans-Joerg Rheinberger (1992a, 80ff.) has offered an intricate analysis of representation in science. He shows that far from representation being a means of portraying a pre-existing reality, the experimental process produces the represented reality. In these terms, brain activity as it occurs in neuroscience would be conceived of as an epistemic object which is not external to representation. To the contrary, the experimental system would be the condition of existence of brain activity as an epistemic object. The brain as an epistemic object is represented by traces produced by recording devices, but these traces do not represent nature. Instead, it is the experimental system which produces brain activity as an epistemic object by representing it as traces.4 Applying Rheinberger’s framework, the process of representation refers above all to the activities of neuroscientists and artifacts. But there is another actor in the field: the monkey organism. Plessner’s theory demands that we always ask ourselves the following questions: What is the role of the living organism in the experiment? What is the significance of its expressivity? Is there anything indicating that its expressivity has to be understood?

My data suggests that in many fields of neurobiology, the living organism cannot be transformed completely into a technical and/or epistemic object. The experiment is persistently concerned with the present activities of the living organism. It is only during the final stage of data analysis that neurobiological experimenters can create an epistemic object.

4 For an analysis of visualization techniques, see also Don Ihde (2006) and his concept of revolutionary visualizing techniques.
Experimental practices

In neurobiology, the whole experimental process, from designing the experiment to data analysis and publication, can typically take up to 5 years. An experiment is conducted in four stages:
1. Designing the experiment
2. Integration of the subject into the experimental setup; in the case of monkey subjects, this includes teaching them the desired task
3. Recording neuronal activities while a subject performs the task
4. Collecting and analyzing the data

In the next paragraphs, I will give a brief overview of the specific tasks and challenges a researcher must face in each of the four stages.

Stage 1: Designing the experiment and preliminary procedures

Based on existing knowledge, a research question is somewhat precisely defined and a target area is identified, e.g.: Which brain region's neuronal activity is relevant for short-term memory, motor control or visual perception (or even more specifically: for perception of color or shape)? Often the target area is called the “region of interest.” With reference to Rheinberger's distinction between technical and epistemic objects, a region of interest shows properties of both. Based on certain postulates about how neuronal signals are processed, electrodes of a certain shape and sensitivity must be used. A technically stable connection must be established between the cells of the region of interest and the measuring and storing devices. This connection has to function in the same way reliably and repeatedly. In this sense, the region of interest has the characteristics of a technical object (see Rheinberger 1992b). At the same time, it is unknown which events will occur, and which pattern of neuronal activities will be detected in the region of interest. The brain, particularly the region of interest, will be transformed into an epistemic object when the recorded data is analyzed.

Stage 2: Integration of the subject into the experimental setup

Integrating a monkey subject into the experimental arrangement is a complicated interactive process. In particular, two aspects are important here: First, during this phase, the monkey is recognized as a conscious organism which has to be motivated to participate actively in an experiment. Second,
the monkey exists not only as an organism, but also as a technical object which can be connected to several technical devices in order to perform the experiment. Both aspects are of crucial relevance for an understanding of the integration process.

The monkey in the chair

The first step in a subject’s integration into the experimental setup is to get him/her into a so-called “restraint chair.” According to the necessities of the experimental design, a monkey chair restricts the subject’s movements. To limit mobility, a very common device is a metal collar around the neck of the monkey, which can be connected to the chair. However, some experimenters do not use a collar and prefer instead for their subject’s body to be enclosed in a Plexiglas box with only its head protruding from the top. The initial steps of familiarizing the monkey subject with the experimental setting are done either by a lab technician or by an experimenter – usually a PhD student.

It is a long, step-by-step process in which a subject learns to leave the cage, being moved into a chair, being brought from the monkey room to the lab where the experiment will take place, and finally learn and perform the task for hours at a time. It should always be the same person who handles the monkey, and there should never be more than three persons involved. In every step of this learning process he will be rewarded, by being given fruits, nuts, raisins, water, juice, etc. The first lesson the subject must learn is that it is the experimenter (or the lab technician) who provides these fluids and delicacies.

A lab technician describes how he gets a monkey into a restraint chair:

The first step is to go into the room, so the monkey gets used to the presence of someone new. I feed him fruits, candies and treats. The animal becomes accustomed to the presence of the new person. Once the monkey has grown familiar with the new situation, he is anesthetized and fitted with a collar. The next step is to hold a pole into the cage and latch the pole to the collar. When the monkey becomes anxious, he again receives fruits, candies and treats. When he comes to tolerate it, he5 is taken out of the cage. [...] When a monkey is taken out of the cage, all the other monkeys will look at him. The monkey becomes anxious. To calm the monkey and make him ‘confident in the process,’ I offer fruits, candies

5 At most of the institutes I observed, the Macaque monkeys were referred to as a “he” or a “she” and not as an “it.”
and treats to all the monkeys in the room. [...] Then the fruits are placed in the chair. One has to pull the monkey into the chair ‘gently but firmly.’ Usually we are stronger than a monkey. [...] It takes 5-10 minutes. Once the animal is in the chair, it gets something special, again fruits or something (Field notes, G.L.).

The lab technician understands the monkey explicitly as a being who perceives his environment, experiences his own states (e.g. he may be anxious), and acts in response to his perceptions. Furthermore, the monkey is treated as a being with expectations. The subject is used to a routine, i.e. he or she has developed concrete expectations concerning the course of events. Even the occurrence of a new person in his environment is considered a breach of his expectation pattern. In such cases, the subject has to learn that the new situation is not harmful, and then gradually develop new patterns of expectations.

I interpret this account as an indication of the lab tech recognizing the monkey as a conscious being. It is not an ascription which can be withdrawn voluntarily. For all practical purposes, the monkey must be recognized as a conscious subject by the lab technician and/or by the experimenter. The methods adopted by other lab technicians or by experimenters differ in detail. I found no evidence, however, to suggest that for practical purposes a lab technician or experimenter does not recognize a macaque subject as a conscious being – expecting a certain course of events and regulating his/her own relationship to the environment.

The second aspect of the monkey being treated as a technical object becomes obvious by looking at the surgical preparations of the monkey’s head. Determining the region of interest in an individual monkey brain means determining where a so-called “recording chamber” will be implanted on the skull. A piece of the cranium must be removed under sterile conditions equivalent to those in neurosurgical operations on human beings, leaving an opening approximately 1.5-2.0 cm in diameter. The recording chamber is then placed through this opening. An electrode matrix can be attached to the chamber and rendered immovable. Usually the matrix is only placed on the chamber during recording sessions and removed after recording. The recording chamber is implanted in such a way that the regions of interest are easily accessible by perpendicular entry of the electrodes into the brain.

6 Only sometimes electrodes are implanted chronically.
In order to ensure that the activities of the same cells or cell groups are recorded consistently, the electrodes must firmly stay precisely in the same position all throughout the procedure. Presumably, an organism would not sit as still as is required. The recording chamber must be placed on the skull such that a head post can additionally be attached to the monkey’s head. The post serves to mechanically fix the head during the experiment. The head post is the first indication of the necessity of persistently transforming the organism into a techno-epistemic object.

The monkey in the chair facing a task
The next steps are concerned with familiarizing the monkey with the lab itself and to get him/her to learn the task. The latter consists of two parts: First, the chair is placed in a box, which serves as a faraday cage, in front of a monitor. Now the subject must learn to treat the events displayed on the screen as a problem, the solution to which requires him/her to take action. Second, the subject has to learn to work for an extended period (3 to 4 hours). This learning process is called “training.” A monkey who is being trained is “working.” A monkey who performs many consecutive trials without a break is “a good worker.” To illustrate these terms, I will describe a task in more detail.

The “delayed match-to-sample” task is a variable experimental design frequently employed in monkey labs worldwide. This experiment involves presenting a subject with two visual stimuli in short succession. The first of these is the “sample stimulus,” for instance the image of a banana. The second, the “test stimulus,” presents either the same image – a banana again – or another image, for example, a cherry or an umbrella. If the same image appears, there is a match, or correspondence, between the test and sample stimulus. If a different test stimulus is presented, there is a non-match, or non-correspondence. The monkey’s task is to indicate through his/her behavior whether s/he has comprehended the difference between a match and a non-match. The macaque is presented with various options, depending on the experimental design. The subject can press two different buttons (for example, the left one for a match and the right one for a non-match). Each of the individual sequences lasts only a few seconds and is repeated hundreds of times in every session. Well-trained laboratory monkeys are even capable of engaging in up to two thousand individual trials per session. For each correct answer, the subject receives a reward in the form of a drop of water or juice. The sequence within each individual trial as well as the succession of individual trials in a session is timed in milliseconds. The reason for this is that signal processing in the brain is assumed to occur at a comparable or even faster velocity.
The monkey in the chair working for a reward

Learning a particular task can often be a complicated interactive process in which the reward serves two separate functions. 1) It is through the reward that the subject is induced to participate in the experiment at all. 2) However, the reward also has a cognitive-interactive function.

Regarding 1: By and large, macaque subjects are not motivated to take part in the experiment on their own accord. Their interest in participation must be induced indirectly. During the work period, they are given no fluids as part of their daily diet. In the researchers’ jargon, the macaques have to “earn” their fluids through participation in the experiment. In the eyes of the experimenters, deprivation of fluids does not constitute a negative sanction, but instead increases their receptivity for positive reinforcement. The experimenters strictly reject negative reinforcement in the form of punishment. Although deprivation of fluids may be seen as a drastic measure, it does not have a conditioning effect that could unambiguously alter behavior. It is left up to the monkey subjects whether and to what degree they are motivated by this measure to participate in the experiment.

Occasionally, a subject sits in a chair in front of a stimulus and does not work. When discussing possible solutions, scientists and lab technicians take into account the fact that a subject does not react only to the stimulus in the lab. In order to understand why a subject is not motivated to participate in the experiment, scientists and lab technicians always refer to the situation of the subject as a whole. As a starting point, they take the behavior exhibited by the monkey. Lack of motivation could be caused by restraining devices. If that is suspected, the experimenter will examine them and check whether they could make the subject feel too uncomfortable, and whether adjusting them helps to increase the monkey’s motivation. If the subject does not display any signs of distress, s/he will be suspected to have fallen back on other sources of liquid. This opportunity may be offered by the housing conditions. Some monkeys live in groups in spatial cages which are cleaned with water. Finally, a subject can try to drink as little as possible.

Although the monkey is made thirsty by rather rigorous methods, no one believes that his/her behavior is simply externally determined. To the contrary, the monkey is supposed to have a choice in how to react to the situation. This becomes more obvious when other reasons are discussed. If a subject not only works poorly but is anxious or somehow agitated, it is an indication that the monkey is having trouble with cage-mates. Researchers discuss, in accordance with their interpretation of the monkey’s situation, how s/he can be efficiently motivated to resume participation in the training or the experiment. If the social situation is believed to be the problem,
it is exhaustively discussed: Which individuals are compatible with which others? Which individuals would fight with each other, etc.? Especially in the case of group housing, falsely estimating relationships among macaques can have severe consequences, since their fights can lead to serious injuries.

If an organism is treated in this way, s/he is recognized as a conscious being. As such, the macaque subject cannot be controlled directly, but her/himself steers how s/he is controlled by external means. It therefore seems appropriate to assume that the macaque subject is expected to follow a motive. It is up to the macaque to decide whether s/he allows him/herself to be motivated.

Regarding 2: Beyond this function, the controlled administration of fluids also works to permit a clear interactive understanding on the behavioral level between subject and scientist. Scientists expect that, within an extremely controlled situation, the macaque subject will regard a sequence of images on a monitor as a task to be accomplished. It is impossible to explain this to the subject verbally, but must be demonstrated by giving or withholding a reward. Since the macaque subject is almost certainly thirsty, s/he is supposed to be interested in fluids and in anything that will result in him/her receiving them. Whether the subject is able to perform the cognitive task can then be inferred by his/her behavior. Pressing a button or releasing a lever indicates the subject’s response to the image sequences. If subjects react randomly, their behavior is evaluated as non-comprehensive. For example, one experimenter assessed the situation as follows: “He doesn’t understand yet.” If, in contrast, the subject does not press the buttons randomly but in the desired manner, the monkey has demonstrated that s/he understands what is happening. Conversely, administering the reward demonstrates to the monkey that s/he has performed correctly. “I ask Ms. Miller (laboratory technician), ‘Why don’t you wait until the monkey has answered correctly four or five times? Then he could receive more water at once instead of a small drop for each correct answer.’ Ms. Miller, ‘That’s not possible. How would the monkey know that he has answered correctly?” (Field notes, G.L.).

For a macaque subject to be admitted for an actual experiment, three conditions must be satisfied: 1. The subject must demonstrate that s/he has understood that the sequence of images or other stimuli is a task that needs to be accomplished. 2. The subject must demonstrate through his/her answers that s/he understands what is happening and what is expected of him/her. 3. The subject must demonstrate a continuous readiness to participate in the experiment. If any of these three criteria is not met, the subject is not admitted to the experiment.
Stage 3: The experiment

The actual experiment begins – like the training before – with the subject being fixed in the chair. Then, the electrode matrix has to be placed on the recording chamber. The subject is presented with the stimuli and performs as it has been trained to do. During an experimental session, a subject performs up to 2000 single trials. While the monkey is performing, the experimenter lowers electrodes into the subject’s brain; s/he does not notice this, as the brain tissue is not sensitive to pain. Neuronal activity is represented through both visual and auditory means. Visually, the neuronal activity of several cells – the local field potentials – appears as an irregular curve that flickers on a monitor – a so called oscillator. The activity of individual cells is represented as a succession of discontinuously illuminated dots, which can also be depicted through sounds. The auditory representation of neuronal expressivity is similar to the static on old shellac records. In this way, the organism acquires a new technically mediated expressive surface: It exhibits behavior (eye movements, pressing buttons, moving levers) and neuronal activity (spikes, local field potentials).

In order to prepare this data for further analysis, measuring devices specifically designed produce traces which are electronically stored. Certain curves indicate eye movements of the subject. Other curves indicate the local field potentials and discrete dots indicate the rates of spikes. In the neuronal data, the onset of stimulus and the time of the subject’s response (pressing a button, releasing a lever, etc.) are recorded.

Stage 4: Data analysis

The process of data analysis consists of four steps: first, sorting out the remaining artifacts and evaluating the data’s quality; second, organizing the data in sets7; third, transferring the data into an artificial multidimensional space and analyzing it; fourth, writing, discussing and publishing a paper.

Well-organized datasets are malleable, so that they can be readily tailored towards the specificities of the analysis. As such, they are a prerequisite for the next step. The acquired data is then transferred into an artificial multi-dimensional space in which the gestalt of the curves is analyzed, as well as their relationship to perceptual and behavioral events: Onset of stimulus, eye movements, performing a correct or incorrect response – all of these events may or may not be correlated with a particular pattern of neuronal activity.

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7 For a more detailed description, see Lindemann 2009b.
During the training and the experimental session, researchers are dependent on monkeys as organisms developing and regulating their own relationship to their environment. In contrast to this, every operation in the artificial space is under strict control of the scientist. Of course, technical problems might come up at times. Sometimes an analysis requires more computer power than is available, and the analysis has to be split up, which in turn can cause further technical problems. Perhaps a computational cluster does not function or an analysis is not properly constructed. But there is no need to establish a trustful relationship with computers and analytical tools. They are not wilful beings with their own interpretation of their environment. To the contrary, the elements of the artificial space can be constructed and reconstructed only by paying close attention to mathematical logic and technical restrictions. There are no needs of living beings to be paid attention to.

With reference to the distinction between technical and epistemic objects and their relationship to the organism, it makes sense to describe the brain as it is malleably represented in the artificial multidimensional space as the epistemic object of neuroscience. It is no longer the brain as an organ of the organism that is of interest here. Instead, it is the brain as a mechanical system, which perceives the stimulus and responds to it appropriately. Not the organism as a whole, but the brain itself is attentive and memorizes a stimulus.

Interpretation

For all practical purposes, the experimenter recognizes the monkey as an actor who treats the experiment as an element of his/her daily routine in a multi-interaction setting and not as an isolated episode. The scientist assumes that the subject (made thirsty through deprivation of liquids) will participate in the experiment only because s/he expects to be rewarded with water or juice. Since the direct reaction to a series of images or stimuli results in the macaque subject receiving this reward, the scientist further assumes that the subject will respond directly many hundreds of times to the sequences of stimuli as a problem presented to him/her.

This description of the experimenter’s interpretation of the monkey is based on an understanding of the monkey subject as an organism having expectations and acting accordingly. These are the features of centric positionality. The organism reacts directly to the stimulus, regardless of whether this occurs through cognitive learning or merely out of habit, i.e. without
any cognitive exertion. In assuming this, the experiment also systematically excludes a level of self-regulation that would make it impossible for us to classify the organism's behavior. Scientists assume that when an organism acts within the experimental setting, it regulates its behavior according to the stimuli presented to it. In this way, an organism's behavior can be understood as a response to a specific stimulus.
If the organism, in contrast, were to relate to itself as part of the experimental setting, it would regulate its behavior according to its own incorporation in the experiment. In other words, it would no longer react spontaneously as an organism, but instead as an organism that understands itself as part of an experimental setup, within which expectations have been placed on it. If this were correct, an experimenter could no longer unambiguously attribute the subject’s behavior to the organism; rather, s/he would always also have to understand this behavior as that of an organism relating to itself as a being that has expectations placed on it. Such an organism would no longer be characterized merely as a consciousness aware of its surroundings and acting accordingly; rather, it would also have to be understood as a self-consciousness, that is, as a self-conscious being in relation to another self-conscious being.

Understanding an organism solely as a conscious self renders that organism unambiguously. For if a subject reacts not only to the stimulus in the experiment, but always also relates to itself as part of the overall experimental setting, it would give rise to a specific kind of doubling. When the subject responds correctly, this can mean that it has understood what is going on and has answered accordingly. However, it can also mean that it has correctly responded because it wishes to present itself as a good or virtuous subject that does not want to disappoint the experimenter. And if the subject answers incorrectly, this may mean that it has not understood the task (stimulus-related), that it is no longer motivated to take part in the experiment, or it has lost its concentration (stimulus-related, spontaneous reaction to the situation). However, it may also mean that it has understood the task correctly, but has answered incorrectly because it wants to show annoyance with the experiment or wants to annoy the experimenter, that is, to disappoint the latter’s expectations. Such behavior can no longer be understood in the sense of a spontaneous self-regulation, but rather as the behavior of a social person, an eccentric being, relating to itself as the performance of self-regulation.

The consequences of this are the following: If we assume that spontaneous behavior does not appear in pure form here, but rather that, in the sense of eccentric positionality, a spontaneous consciousness is accompanied by a distance to itself, we are unable to unambiguously correlate the organism’s behavior to its regulating function (which cannot be directly observed), or to correlate these to neuronal activity. It is then impossible for us to identify unambiguous neuronal patterns. While we could indeed identify neuronal patterns, we would no longer be able to clearly determine what circumstances we should correlate these neuronal patterns to. It might be
a correlate for a direct reaction to the stimulus or a direct reaction to the situation. However, it might also be a correlate for how the subject related to itself as a component of the situation in which it was presented with a task.

I use the phrase “the necessity of the organism’s centric positionality in the experiment” to describe the circumstance in which the experimental interaction is constructed such that a subject reacts in an experimental situation, but does not relate to this situation as such. A centric organism can develop expectations with regard to the course of the experiment. This can certainly include a subject habitually reacting to particular stimuli only in a particular situation, but outside of the habitual setting, it no longer reacts to the stimuli in this way. What is essential here is that the subject in no way relates to the expectations of the researcher implicit in the experimental setup. The centric positionality of the organism incorporates the organism into the experimental order and allows the researcher to control it. The centric organism is a rational actor who displays his/her order of preferences and acts accordingly in a calculable way. The intricate relationship between monkey subject and experimenter is always managed in terms of the monkey being a centric organism. It is essential for an experimenter that s/he not be compelled to pose such questions as: Will the subject annoy me? Does the subject alter its behavior arbitrarily when dealing with other experimenters? Does the subject give incorrect responses at times, even though it is attentive and has understood what is going on?

The necessity of the organism’s centric positionality exists also in experiments performed with human subjects, although incorporation of human subjects in parallel experimental arrangements occurs in a different manner. The actual experiment is framed by a communicative process in which the subject is thoroughly informed in advance what is about to happen to him during the experiment, and the subject has to communicate that s/he has understood the message about what is to take place in the experiment. Only after informed consent has been obtained does the human subject actually participate in the experiment. The subject expects that the experimenter does not make some nice sounds but that the experimenter expects the subject to understand the given information. Such a chain of communications includes mutual expectations and can thus be identified as the relationship of eccentric beings. Rather than using thirst and reward, the experimenter has to trust that the subject, in answering the “questions,” responds solely to the stimuli of the experiment. Therewith, the experimenter assumes that for all practical purposes of analysis, the experimental subject exists as a centric

8 For a more detailed description of performing such agreement, see Roepstorff 2001, 76ff.
organism, which responds directly to stimuli. Paradoxically, this holds true, although experimenters have to rely on a particular form of how subjects understand themselves as a part of the experimental situation as a whole: The experimenter trusts the subject as a subject, who always understands him/herself as a cooperative subject. Experimenter and human subject constitute communicatively, i.e. as eccentric beings, the experimental framework. Once they move into that framework, the experimental subject has to be treated as a centric being for the same reasons as the monkey subject.

Now we can describe more concretely what is meant by adopting a second-person perspective in understanding biological phenomena. The starting point is sociation to social persons: At least two or three actors (Lindemann 2005) relate to each other such that they anticipate the expectations of the other and behave accordingly. These organisms must not only have minds, but also be mind-reading organisms. By keeping the subject in the state of centric positionality, the research interaction is dissocialized. The researcher recognizes the subject as someone who expects something concerning the course of events in a certain situation. But the experimenter does not recognize the subject as expecting that the experimenter expects the (monkey) subject to do something. Since I have extended, following Plessner, the second-person perspective, it becomes obvious: The monkey subject is nonetheless understood and recognized as a conscious being (centric positionality), but not as a self-conscious social person (eccentric positionality). So far, such differentiations have been overlooked in the analysis of laboratory life. Adopting a new conceptual framework has made the analysis sensitive enough to see them.

Nevertheless, formulating an unambiguous regulatory phenomenon will not suffice on its own. The brain itself must be conceived in a particular way. It must not be understood as an organ of the organism, but instead it has to be transformed into an epistemic object beyond the organism. What is the difference between the brain as the epistemic object and the brain as an organ of the organism? If one were to assume that the brain itself did not react to its environment, but the organism reacted using its brain as a means of steering its response, the analysis would be confronted with a new degree of freedom. The brain as an epistemic object of neuroscience is not easy to analyze, because “plasticity” is one of its crucial features. A brain adapts to an environment; and as such it does not always react in exactly the same way. The brain, as the organ of an organism, would be even more difficult to analyze. It would be the plastic organ as used by the organism that formed the reaction. As such an organ, the brain could even be used differently in solving the same experimental task.
I think that understanding the brain as the organ of self-regulation would result in two problems. The first of these is experimental in nature and easy to solve. There might not be only one pattern signifying a certain state – like being attentive or memorizing something or reacting – but instead a variety of patterns or a certain type of pattern. The second problem is of conceptual nature. In order to identify a pattern or a type of pattern, it is necessary to construct an unambiguous relationship between, first, neuronal patterns and how these patterns are related to the functioning principles of the brain, and, second, the state the pattern is considered to signify (working memory, for example). If it is assumed that the brain is the organ of self-regulation, the neuronal pattern can signify the state in two ways. First, the brain can be considered as the (mechanical) system in question, in which case only its internal functional principles are relevant. Second, the brain is seen as a system which serves as an organ of the organism, therefore its functional principles are of relevance only with reference to its relation to the organism as a whole.

My conclusion is that in order to make unambiguous sense of a detected pattern, it seems necessary to make a decision about the assumed positionality of the research subject. Experimentally detected patterns are only related to the brain as the system in question, and not to the brain as a means by which an organism steers itself. This seems to be an implicit precondition for identifying patterns of correct/incorrect answers. If the decision were not made, the way in which the actual documented traces of brain activity should be read would become an open question: as an indication of the brain as a system or of the brain as an organ in the service of the organism? The discussion on the brain in the vat, inspired by Hilary Putnam (Gere and Gere 2002), echoes philosophically the research perspective adopted by neurobiological research, which isolates the brain from the living organism and treats the brain itself as the system in question. In fact, it seems that the epistemic object of neurobiology is the brain in the vat and not the brain functioning as an organ of the organism.
Figure 19.2 is part of a PowerPoint presentation of a neurobiologist. It illustrates perfectly the steps from the behaving organism in front of the stimulus (upper left side) and the target area (upper right side) to the signal traces of the brain (lower left side) and, after the transformation of the signal into frequency space, the traces of the brain as an epistemic object (lower right side). The story starts with the organism and ends with the brain in the vat.

Bibliography


