

On Becoming Significant

In chapter 2, I describe the method associated with an experiment *explicitly* set up for learning something unknown before. I wanted to better understand learning *processes*, which sensitized me to the need to be aware of not only *what* I was coming to know or the *how* I was coming to know but also the presuppositions in the forms of awareness associated with each new realization. In chapter 6, I analyze – and, thereby, exhibit the methods for doing so – experiences where something seemingly forgotten is recognized, such as a particular Y-fork, a stretch of road through grain fields, and a farmhouse. The sense of familiarity, which is different than when we experience something for a first time, is precisely what allows us to *re-cognize* the phenomenon; in fact, it allows us to cognize the cognition *as* a re-cognition. We experience the phenomenon as apparently the same again. It is a return that appears almost literal despite the fact that things have changed since the previous day. But there are other returns that are even more spectral – such as the image of the girl on the bicycle with her dog when I take the left turn on the Y-fork. She is not actually there, yet in the context of turning on the Y-fork, passing the fields, and seeing the farm, the image of the girl reappears like a ghost. In chapter 6, I also point out that the concept of trace needs to be rethought radically, not as a signifier that denotes some signified currently absent or not otherwise available, that is, an event or an idea. If the trace were thought in terms of a sign, carved into our bodies, then this would require the co-presence of signifier and signified. We may be noticing something vaguely without being aware of it or its signification. We see in chapter 6 that it is better to think of the (memory) trace in terms of erasure that comes with the process of living. But an experience of having seen something before, the experience of *recognition*, allows us to understand that the concept of *trace* must not be thought in terms of co-presence of signifier and signified, sign, or total presence. In the preceding chapter we also see how something we see – the road sign bearing the word ‘Landwehr’, or rather, the word-trace itself – imposes itself to become salient and significant. In this chapter, I deal with the phenomenon when something *becomes* significant. The analysis of the process allows us to understand the erasure of a trace that has not yet completely occurred.

In this chapter I am therefore concerned with an interesting phenomenon, which further questions standard approaches to the psychology of learning. Even when we are vaguely aware of something, it may not enter our full awareness (consciousness) where we then could take it into account in our decision-making. That is, simply having something present on our retina and even noticing the presence of something is insufficient to change our actions. What we see is only in a process of awakening and does not yet have behavioral relevance to the situation at hand.

The Story of the Flat Tire

The following account, which is also the object of the reflections that follow, occurred en route from the *Hanse Institute* to the university in the neighboring city, a distance of about 23 km. As soon as I arrived at the university, I wrote the ‘Story of the Flat Tires’. It became an occasion of repeated instances of reflections. In fact – and readers may take this as an advice about methodical – it was written in a different electronic file first, and then loaded into my working file of the subsequent reflections *as a file*.¹

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Story of the flat tires

I ride a long the road and jump with my bike of the bicycle path onto the road. At this point, my rear tire explodes and is flat faster than it takes me to come to a halt so that I roll on the rim for a while. I take the wheel off, remove the tire, remove the inner tube and inspect it. It has a long tear, about 8 cm. I cannot fix it with my little kit, and I have left my spare inner tube at home. I leave the inner tube in place by not removing the valve. I inspect whether in the region of the tear there are spokes coming through the lining, for the tear seems toward the center, on the inner part of the tube.

I walk back to the town center and get a new inner tube. While placing it back, I vaguely notice that some of the tire wall has detached from the wire that goes under the rim. I wonder whether I should go back to the department store and get a new tire, but decide to buy one in the big specialty store in the nearby city where I might get something that is just as the one I have (for my ‘special’ mountain bike) – and perhaps eventually. I mount the inner tube, inflate it enough by hand to ride comfortably, I ride the 4 km to the next gas station on my way. As I inflate the tire, it explodes. I notice that the tire has a tear. I expect the inner tube to be torn at that place.

‘I put the pieces together’: The inner tube has protruded through the place where the wire has come off the tire and exploded when I jumped off the bicycle path. It has exploded again when I put a lot of air into the inner tube.

In the first part of this narrative, we see a person at work who tends to do a lot of cycling and who is used to not only repairing a flat tire but also to check the

¹ Even today, more than a decade later, I have to click on the story to open up the file that contains the actual text.



Fig. 7.1 This photograph of a tire clearly shows the coiled wire bead on the back part and the way the tire is shaped to fit and hold onto the steel rim. In the episode recounted here, the tear appeared just below the wire.

possible sources for the flat. For those who cycle a lot know that if a pin, nail, or piece of glass is stuck in the tire walls, it will cause a hole in the inner tube as soon as the latter is repaired and inflated again. Other possible causes include a loose spoke that sticks through the rim and punctures the inner tube. These are but fleeting thoughts associated with my hopping off the sidewalk with the bicycle and pouncing on the road, because the tire blew right at the moment when the wheels hit the street. Moreover, we see that the search for a possible cause involves leaving the inner tube partially in place during the checking process by not removing the valve from the whole through which it is pushed toward the center of the wheel. If this is not done it would be difficult to match the problem in the inner tube – puncture or tear – with the region on the tire that need to be checked. The details of this investigation, or rather their exact nature, is not important. What is important in the present context is the fact that there is a very thorough investigation at work not only to find the damage but also to locate its possible source. This investigation reveals that there is a tear, which becomes salient as such because it is too large to be fixed with the patches in my repair kit. The damage stands out because it is not of the kind that cyclists normally find, a little puncture or a valve that no longer holds. Indeed, it is a very long, 8-centimeter tear. It requires me to walk back to the city center, a couple of kilometers, to purchase a new inner tube.

As the narrative continues we then find out that ‘some of the tire wall has detached from the wire that goes under the rim’. This is a statement about what is called, in the proper technical language, ‘the bead’ (Fig. 7.1). This part consists in most cases of a wire², visible in Fig. 7.1, and holds the tire tightly to the rim as soon as there is enough air pressure in the inner tube. At the time, a fleeting thought crosses my mind at the time to return to the store and purchase a new tire. In fact, it is only a flicker of a thought without the gravity to make some significant difference to my decisions. As the narrative shows, I decide to purchase one in the

² It nowadays may also consist of Kevlar.

specialized bicycle store that I tend to pass on my way to the university in the bigger city. At this point, therefore, the narrative shows that something has been noticed *vaguely*. But it is also apparently from the narrative that this something is not a major concern. There is an indeterminate realization that the detached wire requires fixing. But this part of the ‘problem’ can wait for the moment and would be addressed when its time had come. It is not a real problem, or at least, it is not something urgent to be addressed in the here-and-now of the situation.

The problem appears to have been solved: I complete the repair, pump sufficient air into the inner tube to inflate it to the point that I can ride, and I continue on my trip. I know that there will be a gas station where I can fill it with air until reaching the 65-psi pressure that I normally inflate the tire to. I ride the next four kilometers without any problem. At the gas station I use the air hose to inflate the tire to the desired pressure: there is a loud bang. Orienting toward the wheel, I notice a tear next to the bead. It is precisely at this point that I am led to anticipate that the inner tube will be torn at that place as well. It is exactly at that point that the causal relations underlying my problems become salient and evident: The inner tube is damaged precisely at the place where the bead had come of the tire wall.

From the original account and my narrative analysis we can take that there was nothing like a deliberate problem solving process at work. This would have required that ‘the pieces’ *are* ‘together’. The analysis shows that ‘the pieces’ did not exist as such because whatever there is at the time, it is no more than a vague and indeterminate awareness of some situation. But the relation between the bead and tire-wall separation does not yet exist for me. It does not exist while I repair, because at that point it only gives rise to a fleeting thought of purchasing a new tire some time down the road (literally and metaphorically). In fact, while writing this analysis, I realize more than once that the fact of telling the story makes the events appear more salient and determinate than they really have been at the time. The very fact that I put the events in words makes them salient and significant in ways that they have not been in the situation – which points us to the very nature of this phenomenon, which is not well expressed as soon as words are used. Moreover, the subsequent ride from the point of first repair to the gas station does not give rise to doubt the decision: it is unproblematic and I anticipate the exchange of the tire at a later point in time.

‘I make the connection’ between the exploded inner tube and the separated bead only when the event reoccurs. That is, this description explicitly shows that I acknowledge the making of a connection where there has not been a connection before. At this point the separated bead becomes salient precisely at the instant when I look at the tire. It has been noticed before, but not as a salient, event-precipitating fact that would (should) have changed what I am doing at the time. In fact, as the ride between the first repair and the gas station is smooth, I do not even think about the events and my walk back to the town center. We may even surmise that if there had not been a second flat tire, the separation of bead and tire wall would have remained inconspicuous and eventually might have been subject to erasure as everything else.

In this episode, we therefore see a shift or rather a transition from normal everyday coping in and with the world to the theoretical gaze upon it. Normally something like a bicycle tire does not even enter our conscious deliberations while we

ride the bicycle; we do not look at a bicycle tire with a theoretical gaze. It is part of the bicycle, which is but a tool for me to go about my everyday life. There are no particular concerns that arise from its operation. It is almost transparent to what I do, like the eyeglasses I wear but do not notice – unless there is some trouble, such as when these are dirty or otherwise protrude into my consciousness (e.g., when they are absent). Ordinary everyday taking care of business is grounded in our familiarity with the world; and, pertaining to riding a bicycle, I do not attend specifically to the vehicle as I go about doing what I have to do – just as I do not attend to the shoes I wear while going for a walk. In a way, I am lost into this familiarity with the world. This is normal everyday coping in the pursuit of mundane concerns.

The situation changes when something that I use turns out to be broken. It then changes its modality from being literally ready-to-hand to becoming an object that is present *at hand*. The adverbial *present-at-hand* is a translation of the German ‘vorhanden’, which literally means ‘being before the hand’, an *object*, something thrown before and outside the subject. It is the object of conscious intention, the theoretical gaze, present not only as such, but also present in the representations I use to think about the situation. There is a problem with the tire and I attend to it. We notice in this description an initial change to deliberate coping. In the situation, I then go about the ‘normal’ business of fixing a flat tire, vaguely noticing as I go along that there is a situation different than normal – the 8-cm tear – and I also vaguely notice the stretch of tire where bead and tire wall are separated. But my gaze is not a theoretical gaze that would have represented and analyzed the situation fully. There is a presence of the situation that is not represented in a determinate manner. But there are deliberate actions such as going to town to purchase an inner tube, replacing it, and an anticipation of the purchase of a new tire sometime in the near future. This, however, does not lead, as we see in the description of the episode, to a theoretical understanding. Such theoretical understanding, the point when ‘I put the pieces together’ follow a total breakdown, the renewed and violent explosion of the inner tube, which, as repeat event, prevents me from continuing my journey to the university and therefore requires my full attention.

In this changeover from everyday coping in the world to full attention directed toward some aspect in it, the status of the separation between bead and tire wall also changes. Initially it is noticed, but only barely, vaguely, and indeterminately and, therefore, determinatively. When something can no longer be used in the normal way it becomes apparent, noticeable, and remarkable; it comes to stand out, stick out; and it attracts attention (‘fällt . . . auf’) (Heidegger 1927/1977). The noun *Auffallen* tends to be used in this case, a term that translators render in English as ‘conspicuousness’. But this English noun corresponds to the adjective ‘conspicuous’, clearly visible, easy to be seen, obvious, striking to the perception, obvious, plainly evident, eminent, noteworthy, and remarkable. It is evident that the English translation is much stronger than what the semantics of the German implies, which appears to be suitable to describe the situation in which the separation between bead and tire wall is noticed, but is not experienced as something ‘striking’, ‘plainly evident’, ‘clearly visible’, or eminent.

The next stage in the modes that a tool may appear is *Aufdringlichkeit*, which appears in one Heidegger translation as ‘obstinacy’, but which, in the present con-

text, should at least include the standard dictionary translation of ‘obtrusiveness’. In this manner, then, the term captures an essential dimension of the experience with the separation between bead and tire wall. The transition of the manner in which this part of the bicycle appears in the episode and relates to me includes: inconspicuity → vague noticing → conspicuousness → obtrusiveness. Whereas the twin silos (chapter 2) became obtrusive, the separation of bead and tire wall do not initially; moreover, whereas the process of phenomenalization become accessible to me then and there, the phenomenalization of the vague appearance of the tear becomes salient to me only *after* the second explosion of the inner tube. It is only in this very latest stage that the bead–wall separation *qua* separation is obvious and plainly evident as a fact that it can enter and be taken into account by theoretical reflection: it has become determinant. In the present instance, this reflection does not take a long time following the explosion at the gas station, as ‘the pieces’ are more ‘falling into the right place’ than having been ‘deliberately put together’. But this initial sense of the causal relation between the flat tire and the tear between bead and tire wall is immediately replaced by full theoretical reflection

For theoretical reflection to occur, the ‘pieces’ need to stand out as such. They need to be present as entities that can be ‘put together’ and related in an explicit way. Theoretical reflection requires abstraction of properties from the situation, which are then deliberately manipulated in and by theoretical reflection. It is only when the separation becomes a represented thing in itself that it may serve as a signifier for something else. In fact, the separation as a signifier – i.e., an entity that stands for something else – also means that it is a thing in itself. In this episode we observe precisely the emergence of a circumstance into becoming a sign in the context of other signs that explain, from a theoretical perspective, the exploded inner tube.

From this episode and its analysis we learn that one may notice things, even orient our behavior, without these things having to stand out as signs in theoretical consciousness. For example, we do not have to reflect and interpret the red lights lighting up at the rear of the car ahead of ourselves but we simply push the break pedal. We do not ‘interpret’ the red light at the pedestrian crossing but upon noticing it, we simply stop. We walk when a green color lights up below it even without paying special attention to the red and green while we continue in a conversation with the person next to us. These are indicating things in a relation; but they are not *references*. The separation between bead and tire wall points to something – here, an anticipated exchange of the tire – without being a reference, a sign for the causal relation that led to the explosion of the inner tube. We see here references and relations that *are not* pointing. This is so because ‘every reference is a relation, but not every relation is a reference. Every “pointing” is a reference, but not every reference is a pointing. This implies: every “pointing” is a relation, but not every relation is a pointing’ (Heidegger 1927/1977: 77). We can most easily and clearly express the relation between the three terms relation, reference, and pointing by means of a Venn diagram (Fig. 7.2). This diagram makes it very clear why the above-articulated relations, even though they use the auxiliary verb ‘is’ that also expresses equality, are *asymmetrical*. This asymmetry is brought about by the different quantifiers ‘every’ and ‘not every’. Thus, there are some relations, represented by the white area, that are not references; but all references, represented

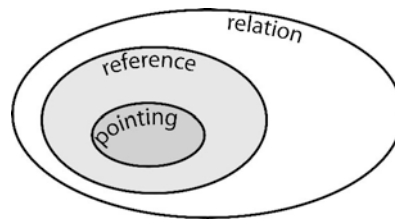


Fig. 7.2 This Venn diagram affords understanding the inclusive relations between ‘relation’, ‘reference’, and ‘pointing’ that lead to statements such as ‘every reference is a relation but not every relation is a reference (e.g., there are white parts that are not included in the slightly grey-shaded reference set).

here by the lightly grey-shaded area, are included in relations. This therefore justifies the statement that ‘every reference is a relation’, because it is included the larger set, while ‘not every relation is a reference’, because some of the latter are not included in the former.

Applied to my instance, we observe a *relation* in that I notice the separation between bead and tire wall, but this separation, is neither a reference to something else – e.g., the exploded inner tube – nor a pointing – e.g., to the causal relations between the separation and the exploded tire.

What we discover in such a moment of breakdown and the sequence of modalities from inconspicuousness to obtrusiveness are not so much the properties of the thing – here the bicycle tire and the way it is constructed including its walls and the bead – than the nature of the normal ways in which we use something. I do not normally think about tires other than before I depart for a trip, at which point I inflate the tires to the desired and manufacturer-recommended pressure. The tire becomes an object of attention only when there is trouble, a flat, or when, for this or that reason, the pressure itself emerges as issue. For example, my road bike uses very high pressure (120 psi), which may make the ride less comfortable when the road becomes uneven. The high pressure then protrudes into consciousness as ‘hardness of the ride’. On the mountain bike, the maximum recommended pressure (65 psi) is ideal for riding on the road, but may become a nuisance off-road, where a more moderate pressure leads to greater traction.

Investigations such as the present one are important in my work concerned with understanding and theorizing how people learn mathematics and science anywhere along the human life span. This particular investigation raises serious questions, for example, about a common practice in the teaching of science: demonstrations. In chapter 2, I point to an investigation in an Australian high school revealed that students from the same class were divided about just what could be seen in a demonstration – a majority ($n = 18$) saw movement whereas a minority ($n = 5$) did not see movement in the same demonstration. The present inquiry suggests that even if the students had been aware of something in the demonstration, this does not also imply that it was significant, pointing them to some theoretically relevant connection between a ‘fact’, the relevant ‘concepts’, and the theory that pulls them together. What the students noticed in the situation may have had the status of a relation but constituted neither a reference nor a pointing. In the same manner, one of the professor present in this Australian high school class while the students were

writing down their observations and explanations did a ‘thumbs up’ to the students. Many students noticed it and smiled without realizing that this same hand gesture actually was a hint to the ‘right-hand rule’ that physicists use to explain the phenomenon that the students were supposed to see. But this thumbs-up gesture, while constituting an explanation to the physicist, a pointer to the correct response, was just a thumbs-up without any implications from the student perspective – just as the separation between bead and tire wall had been noticed without any behavioral (thought) consequences.³

The present investigation has been necessary because I am able to observe in it precisely what is required to understand the process of becoming significant, the different modes of the ‘fact’, which, *in fact*, is not a ‘fact’ but some contexture. I am convinced that asking the students in the Australian classroom would not have allowed me to come to this realization and understanding. Indeed, I know this to be the case because at the time when I gathered the first-person data, I also analyzed tenth-grade students in a physics course. What I can see on the videotapes differs from what is revealed in the interviews with the students. The interviews do not provide the data that

I require precisely because the situations of interest tend to slip before ever reaching the level of conscious awareness and representation. This investigation therefore also shows that in everyday coping we do not represent the world to make it present again – we relate to it in the present. Thus, even if my intent is not to publish a first-person investigation, it constitutes an important means for better understanding the phenomena I am interested in and the questions they raise but that cannot be answered through third-person methods.

Methodical Note At the time I made the original notes and wrote first analyses thereof, I produced copious notes intended not as recordings of ‘fact’ or newfound knowledge but as a device for arriving at new understandings. For me, *writing* is a productive, knowledge-producing rather than knowledge-reproducing effort. I tend to recommend to my students to keep their ‘private notes’, where they can write anything, make the most inane statements, for the purpose of learning. If this writing occurs in electronic form, they can then always make use of some text they have already written. But I may never make use of a particular text because my new understanding does not require it, allowing me to write better texts once I decide to use something for an article or chapter. In the next section, I present some of the notes that immediately followed the writing of the ‘Story of the Flat Tire’, initially at the university and later on after I have returned to my residence. In this situation, I understand ‘writing’ precisely in the way that I use this category in chapter 6, as writing the new while erasing the old: New understanding (birth) is replacing (death of) the old.

³ Readers should have noticed the analogous relation between the two situations, one arising from my first-person investigation and the other deriving from a third-person investigation of students learning physics. In fact, readers may have been vaguely aware of such a relation without making it the central aspect of their thought. In this case, the phenomenon I describe and the experience of the reader are of the same kind.

From First-Person Method to Third-Person Method

Working up the notes and moving on to use an experience and its analysis to understand a phenomenon of interest is a way of doing research consistent with the idea of *writing*. This initial writing is unedited and uncontrolled, that is, originally not intended for an audience other than myself – or not for an audience prior to being carefully edited. Hereby I am less concerned with ‘appearing dumb’ than I am with the responsibility that comes with putting text ‘out there’, where these are no longer mine but, in finding counter-signatories, produce effects. As an act, therefore, my writing has effects that I am answerable for – in the same way that I am answerable for any other act (Bakhtin 1993). The following notes therefore should be read with all the required caution, because these correspond to initial ‘gut level’ reactions that were not ‘censored’ by reflective, theoretical consciousness. These notes constitute a form of finding my way in the thickets of things, a form of finding the ‘animal in the foliage’. I do share them here as an example for what such ‘raw’ notes might look like before they make it, in more or less edited form, into a research account.

There is a second reason for presenting these notes here: They exemplify my method as a whole, which uses first-person experiences and their analysis to inform third-person observations. This is especially important in those contexts where there are many pre-constructions that prevent access to the underlying relations that could explain the phenomenon of interest – for example, why students do not learn from ‘hands-on’ investigations or why students do not learn from demonstrations.

In the instance of the ‘Story of the Flat Tire’, the notes were numbered alphabetically, collecting a series of free-writing samples. The first three numbered entries clearly are attempts to articulate that there was indeed something noticed but only barely so, without significance. This may also be taken from the fact that I have no recollection of the woman mentioned in the analytic narrative, yet the original event, the first blow out of the inner tube, still is so vivid that I can see in my mind the train tracks that I had just crossed prior to its occurrence. The image is so vivid in fact that I am able to locate the precise place where the event took place on a Google map and the associated satellite image – even though it dates back more than 12 years.⁴ On the map, I also find the gas station and the store, a little off my trajectory, where I bought the new inner tube and tire after having had to walk quite a distance.

- a. When I inspected the tire, I had a thought that the tire had been poked by the spokes. I did not pursue the idea, for the lining was nicely in place.
- b. When I replaced the inner tube, I did notice vaguely that the tire had come loose from the wire that forms its rim. Yet this was not salient in my

⁴ In fact, as I am looking at the satellite image, I not only find the route I used to take more than a dozen years ago but also recognize very specific places along the route and begin to remember other locations and contexts very much in the manner described in chapter 6. One place in particular turns out to be interesting: a roundabout where I got hit by a car. The map version does not show this roundabout, which is clearly recognizable on the satellite image, which shows that the roundabout is partially hidden by an overpass that crosses through its diameter.



Fig. 7.3 This schematic image of a glow lamp clearly shows a gap between the two electrodes. Yet Birgit notices it for a first time, with surprise, only after having tried for a long time to make the experiment work – though it was not because of the gap, which is a constituent and necessary feature of this device.

thinking about the incident. I simply decided to buy a new tire in a good bicycle shop in the big city. I noticed the detached piece, but it had no significance. It was a little noticed structure from the background noise of experience. No more noticed than the woman next to me who had left her hand bag on her bike and having walked away, or the older lady with a traditional bike that had metal fenders over her chain in the way bikes used to be made.

c. So there are instances where we notice something from the background as something – without nevertheless relating it to other things currently salient or without making inferences. In this case, after the fact I was able to put together a perfect explanatory framework for both exploded tires. The first one in fact became understood in a new way, and integrated with the second way.

d. After the first incident, I did not expect another one like it. Thus, the experience did not prepare me for the next one just minutes of bicycle ride later (though an hour in real time given that I had to walk back to town to fix my bike).

e. After the second incident, I attributed a different meaning to the first one. I wrote, ‘I put the pieces together’. In a sense, this is what happened that the different patterns that in fact emerged into my consciousness now came together into a coherent story rather than being disconnected moments salient in my perceptual window.

The notes that follow show that after writing several entries about the changing nature of my relation to the tear, I then began to relate the story and the primary analysis to an episode I had observed on the videotapes from a tenth-grade physics course where students studied static electricity. The videotapes show a group of students attempting to charge different substances with electricity by rubbing them against other substances, just as the teacher has demonstrated it to them. The teacher then has taken a little glow lamp (Fig. 7.3), which lights up when there is static electricity. (The lighting up is taken as evidence for the presence of static electricity.) However much this group of students tries rubbing two substances, the lamp lights up only rarely and sporadically. Eventually one of the students, Birgit, takes the glow lamp into her hand, brings it closer to her face, stares at it for a while, and then notes, ‘The filament is broken’. It is precisely in her search for a cause of the failing experiment that the gap between the two electrodes of the filament becomes apparent, allowing her to notice it *for a first time*. She then uses this fact to explain why she cannot get the experiment to work: the tool, here denoted by ‘filament’, is broken. It is the breakdown that provides the context for the gap to emerge as a salient and relevant fact. My notes relate the two events, my mishap

with the damaged tire and cognizing the significance of the separation between bead and tire wall, on the one hand, and the emergence into consciousness of the gap between the electrodes of the glow lamp, on the other hand. *That is, I am analogizing, making or evolving correspondences between the results of the first-person inquiry and those of the third-person inquiry.* In the subsequent paragraph in my research notes, I then address an issue that I often face in discussions with my colleagues, who tend to argue that the students ‘should have known’. I use the episode and my analysis to show that I could not have known unless the entire theoretical framework had been in place and were known to me – or, in this context, to the students. My colleagues easily brush aside students’ experiences and observations. It is much more difficult for them to maintain their argument when the case involves a mature scientist such as myself – even though a considerable number of them, especially those with psychological training, still brush off such first-person descriptions because ‘these are too subjective’.

Relating it all to physics learning

f. If we follow students who do something, such as Birgit who notices the gap in the wire inside the bulb. Why should it be relevant? And yet she notices it in the way I had noticed the wire detached from the remainder of the mantel. But this ‘fact’ was not significant enough to have an effect on my decisions. I noticed it in the way I notice many things. It was not even a strong noticing, it was more like an awareness, ‘Oh, there is something that has come loose. I should replace it eventually’. In the same way, Birgit noticed the gap in the electrodes of the lamp. It was only after the experiment did not work in her attempt (after the many attempts of her peers) that she considered it as a possibility for the failure to produce an effect where they expected effects.

‘Considering as’, a relative of ‘seeing as’? The as-structure of knowing and acting? (check Heidegger)

g. It is easy to say after the fact that it should have made a difference in my actions. I did not, for I did not have the urgency that I would have had had I known what I knew after. That is, the urgency and signification of that what I had noticed was possible only after the fact, at least in my case. Someone with more experiences relating to bicycle tires might have known right away. But in this sense, I am more like the physics students. And how should they know the relevance of some noticing from the many novel noticings that protrude from the background noise of experiences as they engage in the activities they are asked to engage in.

h. Finding relevance from experiences in a first-time through seems impossible. But students often find themselves in situation where they deal with ‘phenomena’ (noticings) that have a first-time-through nature. How are they to know whether and how some noticing is significant in the physics world of relations and not just a piece of noise, a coincidental event? A random noticing as there are many in our everyday experience. To notice some event as significant, we need to know the network of significance: we need to know what we are supposed to learn. If we do not know the other things that make a network of significant relations, how are we to know whether some noticing is in fact relevant? But we cannot test every little noticing in every net-

work of significance with which we are familiar. (In my own case, even though I am a handyperson, even though I have considerable life experiences, the detached wire was not salient enough to change my decision and immediately purchase a tire and put it on. Even though someone might say afterward, or even at the same time had they observed me, that I should have known, in my world the tear was not a sign bound up with other signs, with the possibility to let me infer that the first blown inner tube was already due to this tear.)

Paragraph h articulates what is necessary for a fact to gain its weight – it has to be part of an entire network not just of significant relations but also of signifying, that is, of pointing relations. Only what the theoretical gaze views and pieces together is important to understand the true impact of a ‘fact’ as fact. The initial analysis unfolds further dimensions, including that similar experiences have had behavioral consequences in my own life. I also attempt to understand the event in terms of ‘ontology’ (paragraph l), that is, the entire set of *salient* things – i.e., represented things – and processes that are perceived as such and enter the conscious deliberation.

i. The second time around, and particularly as I had seen that the inner tube blew at the place of the tear, every thing came together. Now I constructed a story in which the first event and the second became related. They had the same causal explanations. I constructed a network of significant events that explained the first part and the second part of the story. Now the tear was significant and I will likely re/member it for some time to come.

j. One question of course is whether the same inferences, the same network of significance would have come together for me had I not been aware of the relationship between the blown inner tube and the tear. Thus, we cannot infer a causal relationship between my second and my first experience. I was fortunate in the sense that the second time happened when I was in a position to see the tear while the tire blew up. Whether I would have created the same relations of significance is open and cannot be answered.

k. Because of my experience with tires, I now always check for the holes before removing the inner tube in order to find possible glass, nails, etc. that might still be in the tire and would therefore cause subsequent damage to my inner tube. I check particularly given that I just have had a case like this where, despite my checking with the inner tube removed, I did not find the piece of glass that caused the first flat with the consequence of having two flats within a day. I could not sense the piece of glass by touching the tire, but only upon searching after the second time that it had burrowed into one of the thick knobs of the mountain bike tires and protruded to the inside only with highly pressurized inner tubes and with someone sitting on it.

l. When we talk about networks of significance, does this mean that the ‘nodes’ of this network have to be thematized events and objects? In my bicycle incident, this seems to be the case. What was significant was also thematized. The following ontology obtains: $\Omega_2 = \{\text{inner tube, tire, wire bead, mantle, wire bead and wall detached, blow-up}_1, \text{blow-up}_2\}$. The story goes: The tire blew up because the inner tube protruded through the tear and

thereby was able to blow up. In this story, the elements of the ontology are in a particular relation to allow particular causal relationships. After the first time, this ontology obtained: $\Omega_1 = \{\text{inner tube, tire, wire bead, tire wall, wire bead and tire wall detached, blow-up}_1\}$. This ontology is almost the same as the second one. But, I added the wire and tire wall detached now, after the fact, whereas after the first time, it was only one of the many noticings.

m. When students find themselves in science classes (and probably any others they attend), there are possibly flares of [many] noticings that they make. Whereas some of these might be such that the observer would put them together into a net of significant relations, for the agent-in-her-world this does not have to be the case. The individual noticings (when they in fact are made) do not have to fit together into a scientific or science-relevant narrative. It would therefore be an error to observe students (in real time or on video) and complain about their ‘inability’ to notice that which is salient for the observer, from the outside.

n. Trouble (disappointments) probably arises when we expect students to make particular noticings. Such, we would make more realistic if we knew how to see the world through the eyes of the students rather than through our own which are pre-disposed by what we already know to be significant. Thus, from the perspective of the knowing teacher, we can evaluate whether a particular preparation will make some scientific effect possible, and we know how to detect it within the background noise of all the other experiences that we have as part of our being-in-the-world.

o. Narrative, salient narrative. Significance is related to narratives, that is, the possibility to link nodes (objects, events) into a more encompassing whole. Rather than having individual disconnected noticings, these come together being linked into a narrative where some events e_1 at some time t_1 are related to other events e_2 at time t_2 . Narration is related to thematization, to objectification, the say-able, the said. If it is not said, does not exist in a propositional way, it does not fit into a narrative, and therefore does not make a network. We have to have nodes that are connected. Each node being something that is salient in itself, or at least something that is being noted so that it is part of a proposition.

p. A narrative can still have different propositions which are not linked by the reader, but that could be, especially when we employ an inferential engine. Detective stories are such that they ‘come together’ once one knows propositions from later parts of the narrative, but the facts already mentioned in the beginning could be used to piece networks. Though often the ones that appear are such that particular events are made salient which are not salient in the explanatory story. So there is always the possibility that we see nodes as salient which do not take part of the explanatory.

q. If students see something that they consider salient, which protrudes, but which is not part of the scientific network of significance, but that they wish to make part of a narrative, this can considerably hamper any attempt, take a lot of time without the possibility to arrive at some coherent story.

Although I have not directly made use of these notes in my subsequent writing, they have allowed me to write myself into an understanding that has erased any

previous forms of thoughts that I might have brought to issues of learning generally and learning in ‘hands-on’ and demonstration settings in particular. It took half a decade before I actually come to write the book on learning, which uses many of the data collected during that period not only on student learning but also on first-person perspectives on learning derived from experiences of learning.

Readers should take note particularly of the fact that I am using the first-person investigation as a means to interrogate the presuppositions that many (science) educators bring to the study of learning. By taking note of the processes of phenomenalization, I learn about learning something new and, here, about how we come to notice something as something as compared to being vaguely aware of a slight disturbance in the world as it normally is.

Coda

In this chapter, I exemplify the first-person approach by analyzing how something moves from being vaguely to being fully present in awareness. This trajectory is part of a more comprehensive phenomenon: the transition of things that are ready-to-hand to the state of being present-at-hand. When things – objects or tools – are ready-to-hand, they are not made present again in consciousness but rather they are present. It is because things are present that they can be used as *pragmata*. It is only when these same things are *represented* that they (can) function as part of the theoretical gaze. In fact, the theoretical gaze takes its character from the use of *representations*, which also points us to the remove that theory takes over praxis. This chapter, therefore, also exemplifies why praxis is not a simple application of theory. The latter would require a bringing into contact the theoretical concept and the practical situation, which is the way Kant thinks about the relation of thought to the world. The present investigation shows, however, that in praxis, we do not *represent* the world, make it present again, but rather we are immersed in the world, which is present as such and without representations.

From a methodical perspective, the events described and analyzed here show a particular attention to the process of becoming aware. This is a period that we generally do not attend to. In fact, in everyday pursuits we may be unhappy with ourselves for not having sufficiently paid attention and therefore for not having realized the nature of the problem. But, as the analysis in this chapter shows, we cannot attend to the problem when there is no reason to capture the situation in theoretical terms. The situation shares similarity with the story of the girl on the bicycle, whom I do not remember after the trip and therefore do not write about in my research notes. However, I do remember her on the second day just as I do remember the first instance when the tire blows up again.