The Sensorification of the Invisible

Science, Blindness and the Life-world

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Abstract

The very act of scientific perception is constituted by prevalent visual forces. Sciences employ techniques of visualization that make one see what is invisible. Embodied practices are black-boxed. But can invisible things also be comprehended in another way? So, for example, how does blindness deal with invisibility? Its epistemic and perceptual strategies are explored. It is compared to the epistemic strategies of blind variation and care of the self. But it is the care of the self that is viewed to predominate in blindness. Contrary to this, blind variation is found in the sighted everyday life-world.

1 The Visualization of the Invisible

Social and historical studies of science and technology encourage a sociological interest in research processes and the facts they produce, and an understanding of them as instances of social agency. They motivate a sociological interest in how scientific research constitutes objects of study. They have argued against any account that treats published scientific data as no more than a 'rational reflection' of an independent empirical world. Social studies in the history of science have pointed out the very importance that has to be attributed to techniques of visualization and the development of visual tools in the production of scientific knowledge.

Disciplining of the senses and the invention of scientific instruments, both of which were meant to make the invisible visible, went hand in hand. Lorrain Daston (2008) has described eighteenth century Enlightenment naturalists' program of vigilant observation and fastidious attention. This regimen "imposed a strict discipline on the observer that was scarcely compatible with any other activity" (Daston 2008: 109). It formed practical sets of skills that can at best be regarded as very elaborate body techniques. Rene Antoine Ferchault de Reaumur, for example, counted the number of bees leaving a glass-fronted, flattened beehive. He arrived at a sum of over eighty-four thousand departures in fourteen hours which is equal to approximately one hundred per minute. And Jan Swammerdam's researches on bees "began at six in the morning, when the sun provided him with enough light, and continued long into the night, when he recorded his observations" (Daston 2008: 109, 110). Ironically, these naturalists often paid for their strenuous efforts with badly weakened eyesight.

Studying Robert Boyle's air-pump experiments, Steven Shapin and Simon Schaffer (1985) have shown that scientific instruments such as the telescope, the microscope, magnifying glasses and the air-pump imposed both a correction and a discipline upon the senses. The latter alone were inadequate to constitute proper knowledge, but the disciplined senses were far more appropriate for this. The eye witnessing public who alone could guarantee sensory observation as true matters of fact depended on the disciplining of the observers' virtues and eyes: As Robert Hooke put it: "a sincere Hand and a faithful Eye". (Hooke cited in Shapin/Schaffer: 78) The experiments' observers had to be taught by Boyle where and how and what to focus their visual attention on.

In the last decades, which have dealt with the details of the scientific observation process, laboratory studies have explored the material environment of the laboratory. Here, the visual construction of scientific facts and scientific knowledge has been described extensively. This has drawn attention to the visually guided process by which scientists make sense of their observations: practical sets of skills to visualize, to produce images, and to read and write, and their material resources like diagrams, lists, formulae, archives, engineering drawings, files, equations, dictionaries, collections, and so on.

Bruno Latour has termed this assembly of visually available materials "inscription devices". He writes: "It seems that whenever technicians are not actually handling complicated pieces of apparatus, they are filling in blank sheets with long lists of figures; when they are not writing on pieces of paper, they spend considerable time writing numbers on the sides of hundreds of tubes, or pencilling large numbers on the fur of rats. Sometimes they use coloured papertape to mark beakers or to index different rows on the glossy surface of a surgical table". (Latour/Woolgar 1979: 48) "But their end result, no matter the field, was always a small window, through which one could read a very few signs from a rather poor repertoire (diagrams, blots, bands, columns)" (Latour 1990: 22).

But contrary to accounts that regard visual devices as evidence for naturalistic claims about objective entities or relationships which then are largely taken for granted, laboratory studies point to their functioning as evidence of methodical practices which are accomplished by researchers working together in social arrangements. Thus, previously hidden phenomena are transformed into *visual displays for consensual seeing and knowing*. This tendency to naturalize images – as vision is thought to be the noble sense of reason – and the invention of technical instruments that outperformed and replaced sensory bodily functions and the derogatory attitude of important scientists toward the sensory body, have led to a *disembodiment of science*.

But these developments in the realm of science cannot be separated from a broader tendency in society and culture. These methods and materials of visualization build on the historical development of visualization that has taken place in western culture since the Middle Ages. Wiliam Ivins (1973) has convincingly shown how the invention of linear perspective in the fine arts has led to a paradigm of a new consciousness of the physical world attained by Western European intellectuals. The same process of visual rationalization has been described by Samuel Edgerton (1976) for the development of technical drawings.

More than that, dealing with the Dutch "distance point" method for drawing pictures, Svetlana Alpers (1983) provides the notion of "visual culture". This notion elaborates on how a culture sees the world, and how it makes the world visible. A "worldview" defines both what it is to see, and what there is to see. A new visual culture which brings about a revolution in the way of seeing the world simultaneously transforms science, art, theory of vision, organization of crafts and economic powers, and everyday cognition and perception. Thus, letters, mirrors, lenses, painted words, perspectives, inventories, illustrated children's books, microscopes, and telescopes come together in this visual culture.

Alpers illustrates this revolution in visual culture with an advice by Comenius concerning the proper mode in which objects should be presented to the senses. "If the object is to be clearly seen it is necessary: (1) that it be placed before the eyes; (2) not far off, but at a reasonable distance; (3) not on one side, but straight before the eyes; and (4) so that the front of the objects be not turned away from, but directed towards, the observer; (5) that the eyes first take in the object as a whole; (6) and then proceed to distinguish the parts; (7) inspecting these in order from the beginning to the end; (8) that attention be paid to each and every part; (9) until they are all grasped by means of their essential attributes. If these requisites be properly observed, vision takes place successfully; but if one be neglected its success is only partial". (Comenius cited in Alpers 1983: 95)

Barbara Maria Stafford (1993) has examined the radical shift that has taken place since the eighteenth century from a text-based to a visually dependent culture. She demonstrates the persisting value of a cluster of leading body metaphors derived from aesthetic and medical practices. In dealing with such questions as "What is the connection between visible surface and invisible depth?", (Stafford 1993: 1) here, diverse and relentless attempts were undertaken to "break into the obscure secrets of the somatic" in order to visibilize the invisible. (Stafford 1993: 2) She shows that these visual body metaphors exert a major impact on society and culture in general and exposes a tendency to collapse all sensory experience into the visual. "This overturning affects all branches of daily life and even the more arcane reaches of humanistic and scientific research and practice". (Stafford: 1993: xviii)

Recent developments in visual studies have shifted their attention from an

isolated visuality to an embodied vision that means something "sensorially integrated, embodied and experienced". (Edwards 2008: 3) Visual studies are concerned with how the visual is felt – emotionally and physically as well as intellectually at the interface "between vision and language, vision and audition, and vision and the invisible, between the seen and the overlooked". (Mitchell 2003: 250) In the field of the anthropology of the senses, building on the increasing critique of the supremacy of vision, a growing cross-cultural body of work on the senses has destabilized the Western five-sense model. "In this model, sight in particular, along with hearing, has been understood as representing the rational and 'nonsensual', according with an objective reality". (Edwards 2008: 5)

This shift to embodied vision has also been reflected on within social studies of science. Karin Knorr Cetina (1999) has described the body of the scientist within molecular biology as a "black-boxed" information processing tool. Analytically, she divides the scientist's body into the sensory, the acting and the experienced body (Knorr Cetina 1999: 93-107). The sensory body refers to the use of sensory organs as instruments of inquiry. Because, firstly, being able to see is a prerequisite for laboratory work and, secondly, experimental work – to a high degree – is manual work, the sensory body comes into the picture not as a primary research tool but in secondary ways as a silently presupposed support mechanism. Often this is done in a holistic way. When, for example, some participants were said to have a "golden touch" or to be "excellent experimentalists".

The acting body "is an information-processing machinery that learns and works without conscious reflection or codified instructions". (Knorr Cetina 1999: 97) A scientist, for example, might insist on meeting a phenomenon face-to-face in order to understand its properties and procedural implications. In a certain situation of

research the body picks up and processes what the mind cannot anticipate. But in eye witnessing and manipulating the body remains silent.

The experienced body focuses on the temporal and biographical dimension of embodied work. It entails a silent corporeal memory of competences (tacit knowledge), a bodily archive of manual and instrumental knowledge of how to process sensory information. It is not written down and hardly expressed.

So, to resume, in molecular biology – like in most sciences – the visualization of the invisible builds on embodied practices that are left in the invisible. But the outward appearance of science is a visual one. Here, science is in accordance with the mainstream in modern western society.

2 Blind Sensorifications of the Invisible

I will now explore another strategy that deals with an invisible world. Drawing on my own audio-based studies (Saerberg 2006) I will describe the many strategies by which a blind person solves some navigational tasks and the various ways he makes sense of the environment. As Bruno Latour (1979) in his laboratory studies and John Law and Michael Lynch (1990) in their article on bird-watching as a lay observational activity have stated, the thought process employed by scientists is not strikingly different from those techniques employed in daily life encounters. The divide between pre-scientific and scientific culture is a boundary that is enforced arbitrarily. I would like to suggest that a blind person is a sophisticated lay scientist whose indigenous practices raise some relevant lessons for ethnographers interested in studying the conduct with invisible things for social research.

We will take two glances on blindness: in the first place, blindness is an everyday mode of existence that dwells on a taken-for-granted knowledge of the

life-world and that deals with unproblematic situations. It reveals blindness' immediate access to the world of phenomenal experience. An invisible world is experienced sensorially and through immediate perception. This world is blind and it is experienced by way of sensorification. I will start with giving some holistic impressions of these lived experiences. For purposes of clarity, I will then divide the immediate unity of lived experience by way of phenomenological description to reconstruct the sensorial construction of blind mundane facts and mundane blind knowledge.

Later, in chapter four, I will describe blindness' strategies to handle situations that are problematic. These epistemic strategies are comparable to the care of the self employed by high energy physics. They have nothing to do with blind variation. This raises the paradox that blindness is an attribute of sight and attentive insightful care of one's own self has to do with blindness.

Now I will start with the description of three different basic or grounding sounds, partly from memory, partly from listening to a voluminous body of digital audio recordings that I gathered for the "Ruhr Museum" in Essen in the years 1999 and 2000. (Saerberg 2000a, 2000b and 2004) First of all, I have approached the auditory event "Ruhrgebiet" without any preconditions: everyone and everything, who and that was singing, seething, simmering, seeking, sandpapering, sounding, resounding, ringing, rippling, riding, roasting, roaring, running, rustling, rushing, rumbling, rattling, rapping, tapping, trickling, tickling, tinkling, twittering, tripping, trembling, trotting, trumpeting, humming, howling, heehawing, hissing, hitting, hooting, booing, booming, bawling, boiling, blowing, blustering, bursting, bleating, beating, bumping, bubbling, buzzing, barking, breaking, belling, bellowing, lowing, droning, drumming, drifting, drizzling, sniffling, sniffing, smouldering, snooping, snorting, snarling, snapping, pattering, punching, pinging, mincing, miaowing, murmuring, moaning, yawning, yelling, swelling, swallowing, slamming, slapping, slipping, sliding, gliding, glugging, gurgling, gabbling, gushing, grumbling, grating, grinding, growling, shouting, shooting, shrieking, nibbling, neighing, gnawing, knocking, cooking, quacking, cutting, coughing, cackling, creaking, croaking, crowing, crying, crashing, crackling, cracking, crunching, crisping, clinking, clanking, clicking, clacking, clucking, clattering, chattering, chuckling, chewing, chirping, scraping, scratching, screeching, squeaking, squealing, screaming, sweeping, splitting, spitting, stepping, striking, skidding, thundering, throbbing, frothing, foaming, flapping, fluttering, fizzing, vibrating, whistling, whispering, waving, wafting, wobbling, exploding, erupting, unloading and emptying itself in manifold ways – in short – in thousands of audible events and conditions were the topic of my interest. Here, everything merges into each other. In any case, it is actually peculiar for sounds to mingle with one another and not to hold on to the side by side or one behind the other of visual appearances.

When, for example, I am standing in the "Hardt", a huge woodland on the outskirts of the "Ruhrgebiet", I can hear the twittering of the birds and a softly blowing wind roaming through the leaves of the trees. Their echoes make this area sound like a forest. And a forest conveys a totally different basic or grounding sound than a field, a river, a heath, a village, a town, a city or even a highway. And that you are at the edge of a conurbation, maybe searching for a classical idyll traversed in silence by the sound of birds, insects and the rustling of leaves on a sunny afternoon in spring, you can notice from the fact that you are struck by noise, mainly by the vehicles of amateur pilots who prowl around this area. And depending on which direction the wind blows and which season it is, whether the trees are fully cov-

ered by sound-absorbing leaves or whether they stand leafless like skeletons, you can even hear the flow of traffic in and out of the "Ruhrgebiet".

A very different grounding sound I have heard at the "Hengsteysee" near Bochum and at the "Walsumer Aue" near Duisburg: vastness as a deep humming undertone that spreads out over the wide surface of the water, borrowing from the sound of factories and ships that is modulated across the vast fields of water. The materiality of the landscape is incorporated in this listening. It is an eavesdropping for something hidden that remembers orientation in visually inaccessible grounds like a jungle or a savannah, overgrown with tall grasses; a sensitiveness for deep frequency like elephant steps from a distance. Above this vastness – half disappearing and half slightly decorating it – you hear the singing of larks and the cries of gulls. It is a vigilance for high frequency signals like the orientation towards the calls of birds in the visually inaccessible jungle. In addition to this, the wind blows and plays with a different sort of animal of the air, the kites which are flown in need of a rest by the inhabitants of the "Ruhrgebiet".

Or – home at last – an idyll, not in the classical but in a modern civilized way, at the shores of a water resort in the triangle between Essen, Bochum and Gelsenkirchen, where perhaps I have heard the heartbeat of nature in the "Ruhrgebiet". On this sunny afternoon in early summer that has been conjured up so many times, filled with the croaking of frogs, flown through by a multitude of insects, that encourages all ducks to fish, that lures a pack of dog owners, partly housewives, partly pensioners, to chirpily interrupt the yapping of their pets with conversation, cheered on by ecstatic barking from the animal shelter, and that sounds in between the background of low rushing traffic noise, a weekendly sluggishness rests on all bones.

Here, the notion of *basic or grounding sound* is very important: it spreads out

around the listener, who stands in the middle of it and is not positioned in front of it as in the case of an object of sight. Hearing functions as a guard that attends on the regularity and maintenance of sound-patterns, startled by sudden changes in this pattern that serve as signalling sounds. So you can hear the ringing of the door bell, not matter where you are in your flat. He who cannot hear the bell ringing, like deaf people, has to look for an optical signal, which he must not turn his back on. She, who is walking in a park or in a fallow industrial estate, is always in the middle of her sounding steps which, by their grating, scratching, snapping or soft gliding on grass, ring on the carboniferous soil of rubble and renaturalization. This is due to the materiality of the acoustic sense.

So, the incorporated and habitualized attention to and the acting treatment of audible appearances can be divided into three dimensions: the communicative function of speech, the vigilant attention of exchange with the environment, and the eavesdropping concentration one summons out of the invisible. They are epistemic and perceptual master strategies in blind orientation. They afford a high degree in disciplining the acoustic sense. Together with perceptual contents such as basic or grounding sounds and typical soundscapes, highly characteristic, even unique echoes, acoustic positions of individual objects, courses of acoustic flows, topographical qualities, smells, tactile sensations and draughts, they constitute the blind style of perception.

Employing the Schützian notions of "standpoint", "system of orientation", "reach" and "schemes of interpretation" (Schütz 1962; 1964; 1966 and 1989) a short and formal description of the immediate and actual perception can be given as follows:

My own body is the centre of spatial orientation. From it a basic system of orientation starts: I move from "here" to "there". I divide the world into "close and distant" "left and right"

"above and below" and into "front and back". I accomplish orientation and produce movement by building up a multimodal space of sensory perception in a sensed unity of the world within my felt, tactile, acoustic, and olfactory reach. I position myself at a certain standpoint by feeling and hearing what is under my feet: a stone platform, metal escalator steps, or asphalt. In this context, different material properties of the instrument of perception deliver different information: hard shoe soles produce more sound, soft shoe soles are more appropriate for tactile sensations and naked feet are very sensitive to heat and cold. It is the nearest part of the world around me, very close indeed to my body. I then elongate this tactile world with my cane. Its tip marks the boundary between the world within my potential and within my actual reach. For a short moment of time an obstacle has invaded the world of my actual reach. But at the next moment I exclude it.

Maurice Merleau-Ponty (1962) has described the relation between the navigating subject and his or her instrument of perception as a unity. He writes: "To get used to a hat, a car or a cane is to be transplanted into them, or conversely, to incorporate them into the bulk of our own body". (Merleau-Ponty 1962: 143) Thus, properties of the material – like the cane or the shoes – have to be taken into account by the navigating subject. And the material properties of the instruments of perception must, in size, weight and stability, be adequate to the materiality of the environment and the sensorially performing body: It has to be a cane, a rope won't do the job.

The ups and downs of a street create a kinesthetically felt structure. Similarly, holes in the ground render orientation. Skin sensations also provide guidance. Cold air on my face, for example, indicates that I am coming close to a stairway leading up to a platform. As described above, sounds serve as concrete schemes of interpretation. They amplify the world within my potential reach by indicating directions. The blind style of perception uses the materiality of the hearing body through directing vigilance and watchfulness into the spatial structure of the environment where all directions are present at the same time and by discovering rhythmic patterns which reveal the temporal structures of the sounds. It reveals practical sets of skills to sensorify, to produce sonic images (poems for memory), to read and write recordings, and some of their artifacts as material resources.

The detailed phenomenological description provides us with a notion of the complexity that governs the interactivity (Rammert 2006) between the sensorial materiality of the body, its standardized and habitualized routines in the stock of knowledge (skills, useful knowledge, knowledge of recipes in the words of Alfred Schütz), material properties of the artefacts of action and the instruments of perception, and the spatial materiality of the environment. Social studies of science and technology might get some inspirations for their analysis of the interactivity between human actors and technological actants out of this that often is foreshadowed by the taken-for-granted knowledge of the life-world from which sociology springs. It might also show how vision can be embodied to an even higher degree as has yet been discovered into the shift to embodied vision in visual studies and social studies of science.

3 Blind Variation and Care of the Self

In the following chapters I will draw a parallel between two different epistemic cultures of science as described by Karin Knorr Cetina (1999) and the blind style of perception which I have briefly began to outline in the last chapter. Karin Knorr Cetina distinguishes between the epistemic cultures of molecular biologists and high energy physics.

In the face of open problems molecular biologists adopt the master strategy of *blind variation* and *natural selection* (Knorr Cetina 1999: 88-93). They vary the procedure that produced the problem and leave its success to the outcome of the experimental reaction. Variation is blind because it is not based on very extensive procedures of scientific investigation and understanding of the problem. They will not embark on an investigative journey in order to understand the problem and why it arose or to explain obscure data. Instead, they will try several variations as for example longer exposure time to increase the strength of the image, using different filter material, including RNA extracted at other time points or the use of a shortened DNA probe in order to reduce the possibility that similar sequences were picked up from other homeotic genes. Moreover, variations rarely involve just one variable.

The master strategy in high energy physics is *self-analysis* and *self-understanding*. Measurements are not to be taken at face value. "Experimental numbers are dependent upon a particular detector configuration and on the criteria applied in extracting information from the detector. Another detector, another set of criteria, yields other measurements" (Knorr Cetina 1999: 53). The theoretical ratio has to be related to the experimental ratio for a given detector configuration. Reconstructions are based on the premise that one knows the detector and all other components of the measurement machinery, most of all by their imperfections and shortcomings. In short, high energy physicists substitute the care of objects with the care of the self. Therefore, if physicists turn to variation they do this systematically in a step-by-step, equal-change sense in order to learn the effect of a variable. They do this by self-understanding, self-observation and self-description.

Self-understanding seeks to comprehend "what happens in every relevant part of the material, what happens over time, and why these things happen" (Knorr Cetina 1999: 57). Self-observation involves vigilance and surveillance, most clearly specified by online and offline monitoring. Self-description contains backtracking in error searches and memory- and history keeping.

In doing that, high energy physics creates negative knowledge or knowledge of the limits of knowing. Physics build on disturbances, distortions, imperfections, errors, uncertainties and limits of research. But they do not put the blame on these components. Rather, they draw distinctions between them, elaborate on them and create a discourse about them. "High energy experimental physics has forged a coalition with the evil that bars knowledge, by turning these barriers into a principle of knowing" (Knorr Cetina 1999: 64).

Corrections, errors and uncertainties are of paramount importance in this regard. Correction includes the limits of knowing into the calculation of positive knowledge. Statistical errors are distinguished from theoretical and experimental systematic errors.

Unfolding, framing and convoluting are ethnomethods, practical strategies that physicists employ to work with liminal knowledge. Unfolding means "the continuing unraveling of the features of physical and technical objects, of their details, composition, hidden sequences, and behavioral implications, through the reflexive redeployment of the approach to the data points generated" (Knorr Cetina 1999: 71). Framing relates different components of an experiment or of the field by checking, controlling, extending or compensating them in comparison with each other. Convolution, perhaps a special case of framing, is a term used for describing "the general strategy of mixing together resources and quantities that come from very different origins in an attempt to come to grips with the limitations of specific data or approaches" (Knorr Cetina 1999: 76).

4 Problematic Interpretations of Space within the Blind Style of Perception

After having described these two distinct epistemic cultures, I will now compare them to the blind style of perception and its epistemic strategies. My thesis is that the blind style of perception is much closer to self-analysis and self-understanding – the master strategy of high energy physics – than to that of blind variation applied by molecular biology. More than that, blind variation seems to be a strategy that is employed by sighted people when, for example, they try to give route descriptions. Being sighted in a world that is culturally and socially visualized in this regard gives opportunity to use an epistemic strategy that dwells on the similarity to the object which it works upon – the everyday life-world. Finally, I will address questions of the configuration of reality.

What do high energy physicists and the blind navigator have in common?

First of all, let me assume that the body of the blind subject is the detector, the navigation is the experiment, and the object of investigation is the environment. Measurements, data and signals are the different perceptions that come alive in the blind style of perception described above.

At centre stage in the blind style of perception is the care of the self. Only by taking the self as the point of departure can the world of objects and the environment be understood.

Because the world immediately springs from the feet that touch the ground and from the hand that is elongated with the cane, the world of objects emerges out of a monitoring of the self by employing vigilance that is directed to one's own body and the environment at the same time. In the second chapter we have already heard that the constitution of basic sounds affords a high degree of vigilance. In this regard, a disciplining of the body becomes relevant: One has to move carefully in order to not overwrite the sounds of the environment by one's own footsteps. More than that, if a cane should produce much noise, it also destroys watchfulness. Also, detecting the qualities of the ground below by feet calls for attentive movement. Thus, the blind subject is involved in self-observation.

In my reconstruction of the blind style of perception I have – up until now – focussed on the well-running process of navigation and spatial orientation in a unity of perceptually and cognitively based schemes of experience. Based on the description of a crisis of navigation, I would now like to come to the farther-reaching cognitive structures inherent in the construction of a total space used in the process of orientation and to the procedural project of action of a progression in time through said imagined space.

4.1 A Crisis of Navigation

To this end I will quote from the transcript of an audiogram dictated into a dictaphone I carried along. It is the self-observation, self-description and self-commentary of my own actions and perceptions while walking through a part of Cologne's main railway station. This means of description changes the reality of the situation far less than minutes from memory. The latter alter the current and subjective interpretation of meaning – because in every moment the world of daily life is an interpreted world, having sense and meaning for us. This is because the reconstructing interpretation and description of a moment x always start from its conclusion, i.e. moments x_1, x_2 to x_n. This structure of description is completely different when commented on and described directly during the succession of experience. The audiogram records as closely as possible within the immediate and currently experienced succession of moments, because it registers the way I interpret a moment – as though only from the past – in a situation of stasis, moment x_2 from x_1 or x, but not from x_n, as I do

not know these moments yet. I conceptualise them and create hypotheses about their occurrence or their nature, while not actually knowing their nature. The audiogram shows meaningful cognition and perception close to the actual moment. This structure becomes especially acute in the construction of knowledge in a situation of crisis, when the safe shores of orientation become shrouded in the fog of uncertainty, when the present is no longer woven into the well-ordered course of past and future. When, due to a crisis, not the next moment but one of the following moments brings on one which was unexpected, one that confirms the crisis or resolves it when foggy enlightenment finally sets in.

"I am now in a more confined situation, to the left something seems to have piled up, maybe a stall or something. So, the gap between left and right wall has grown smaller. This I can feel and hear. I continue on. The sound of the cane does not echo as much as before, is drier. I sense that something has approached me from the right, I touch it with the cane, then with my hand – a windowpane, I would guess. On the right the sound of music, a store, a kind of coffee shop probably or something like that. I carry on. I feel that to the right the wall is closer, another draught, sounds of a locomotive, another way up.

Once more I continue on. Here, the path seems to widen again, the echo is back. By the way, I am walking relatively slow, of course, children's voices behind me. In front of me the sound of the hall has somehow faded. Maybe I have chosen a wrong turnoff now. Um, because here, quite suddenly, it is relatively quiet. Another draught from the right. I'll go and see what's there. There is a slight incline… I am… yes, here is a way up. I go back, feel the wall to the right and follow the curve, the sound of the hall behind me now, in front of me it is rather quiet. Voices behind me, it is almost too quiet, I think. My guess is that I am in a side corridor. Suddenly there is an obstacle before me, a round pillar which I walk around on the left. I believe I have reached the end of the corridor. I hear a woman turn to the left, follow her. Okay. The hypothesis is: I am in a side corridor, I have to turn further left than anticipated to reach the underground." (Protocol "Way through Cologne's main railway station")

The blind protagonist's assumption in this situation was that he was walking down the main corridor of Cologne's central station. He has to take note of the fact, though, that he meets fewer and fewer passersby, a fact which – from its basic sound – simply cannot be consistent with the assumed space: If he had really followed the main corridor, he should by then have been close to the entrance area, the spot which has the most accurate basic sound with a strong echo and a lot of voices.

In order to identify the nature and degree of his divergence, he leaves the corridor and examines an area which, in his assumption and based on a draught, has a stairway. As he finds it, a gross aberrance as for example a divergence into a side corridor used for commercial purposes or into another wing of the building, can therefore be ruled out. The only possible interpretation, which may factor in the far-too-quiet basic sound of the main corridor as well as the existence of a way up, is the new hypothesis "side corridor" – something that, based on the formal perception of space, defines a corridor which runs parallel to the main corridor and is connected to it via a passageway. As a perceptive structure the side corridor resembles the main corridor in length and basic sound: e.g. during less busy times the main corridor closely resembles the side corridor during peak hours.

This shows how strongly knowledge channels wayfinding. This only becomes apparent, though, when the unit of actual perception, project of perceptual action and perception of space can no longer be implemented routinely. Spatial orientation functions properly based on an outline which includes perception of the formal structure of space, one's own position in it, as well as the time needed to travel a certain route.

But the formal, abstract structure of space is supplemented with a richness – let us call it data – whose content is perceived in lively fashion. Both are

part of the conceptual-sensual project of action and space. For example, it is only possible to notice an aberration by way of an assumed use of a space, according to which, at a certain spot, one may expect a situation in which a large amount of steps and voices can be heard. This way, the image of a spatial structure and the anticipated project of motion through this spatial structure join content-wise in time, for example based on the knowledge of a route's sequence of sounds. Should the actual situation deviate from the perceptive surroundings, it is followed first by a problematic interpretation of the current situation of space in the course of which the blind protagonist conducts a closer examination. He collects further information related to the reality of the space, mostly by tactile means.

This interpretation defines the current location against the background of special and general typical topological knowledge pertaining to the space on the one hand, and the route already travelled in time on the other hand. Starting from this new interpretation, a new way of dealing with the spatial situation and of reaching the spatial destination is developed.

If, in the case of severe divergences close to the current location's relative vicinity, no sufficient information may be gleaned, longer return journeys or sideways explorations of a larger degree can be detected.

4.2 The Care of the Self

Example from the year 2004: Twice a year I visit the parent conference day at my eldest daughter's primary school. Due to the rare nature of this on-site visit I have no characteristic feature sedimented in my stock of knowledge, which would tell me when to cross the rather long curve of the road leading to my target, i.e. the school's side entrance. Thus it remains unclear whether I am still in front of or have already passed the entrance after I have crossed the road. As I have been unable to find individual characteris-

tics that might help in identifying the entrance, it has already happened three times that I was indeed in the right place but did not recognise it as such.

In these situations and in order to ascertain my location I then entered a side street. After approximately 300 metres (through no-man's-land) I would find a feature I was familiar with – a left-hand curve with a road sign positioned close to the curb/roadside and a bus shelter which should protrude into my path about one and a half metres onwards. If I were able to find this place, I would be close to the kindergarten whose position in relation to the primary school I was accustomed to, due to numerous visits with my younger daughter. Here now, I would find an Archimedic point of orientation from which an approach to the primary school would prove correct in retrospect and beforehand, as I would have to walk back the way I had come.

Should I not find all of this, though, the resulting interpretation of reality would then tell me that I have gone too far past the school. In both cases I would start to walk back, now equipped with definite instructions.

At this point it becomes clear to which degree this data-collecting spatial orientation is theory-led. In the case of doubt, the data of perception are ambiguous and cannot be easily interpreted. Measurements are not to be taken as they are. In short, in situations like these, the blind navigator dwells on a world of signs. Yet he is perfectly capable of deriving truth effects from sign-processing operations. How is this done? By comparing the signs which appear in different locations. But they are only taken at hypothetical value ("if this were this then that would be that..."). So the blind navigator is going back and forth between different interpretations. To locate a way out of the maze, he identifies and compares audible and tactile clues, points out where paths might

continue, follows some and recalls the design of the maze to evaluate leads.

There is no environment into which a theoretical description is integrated. Much rather, the environment only results from its theoretical description. It would also be possible to say: space results first of all from the theoretical description which runs in time. This does not mean, though, that space is first constructed by way of a theoretical description – no, and up to now this can only be formulated in a metaphorical way, it exists in a blurred form, only gains certain contours through the theoretical description in time. Thus von Senden's (1932) thesis that blindness synthesises space in a temporal fashion is partly correct, but space has to exist as a spatial system in order to result from the temporal synthesis.

But how can the epistemic structure of the acquisition of spatial knowledge be described? Which tactics and strategies are used in this task? Here is another example.

I will now quote further minutes from memory which I jotted down immediately on my return home. As such, they disregard the plethora of perception of the immediate sensual constitution, but adequately stress the theory-constructing and theory-led summary and interpretation on the way to an explicit knowledge-saturated overall interpretation:

"I'm walking back home, using my old way from the kindergarten. I'm contemplating something that has captured my thoughts. This is why I miscalculate the distance I have already covered: I believe to be at the beginning of the village but in reality I am somewhere else. I cross the street because I could reach the expected turn in the road from the other side of the road if I would follow the curb to the left. This way I leave the country road and cross the village street, as I want to follow its assumed course again on the other, the right side in the right direction. Here I continue on until I reach the end of the road where I learn from a passerby who has addressed me that I cannot go any further. I decide to walk back the way I have come until I reach the junction from the country road, where I can then correct the mistake. Thus

I move down the same village road towards the country road. Here, something strange happens: I get lost, cross the road and suddenly and totally unexpectedly find myself on a new, unexpected street. This isn't the country road, as there are hardly any cars. I hear that more cars are driving down another street, which has to be the country road. Therefore I head there and try to decide which direction to take. Because now I am doubtful, as the direction depends on the question which side of the road I am on. That something is wrong I realize because I can feel a kind of ground under my feet which should by rights not be here: there is a raised sidewalk whose edge is not covered by flagstones but soil. A place like this should not be here. But at the moment I am unable to interpret this observation.

So I carry on, following the assumed course of the road: I assume that I am on the right side of the country road and walk in the direction I expect the village to be in. I keep walking and walking but the course of the road is not in keeping with my expectations, there should be a junction leading left and up. This is not the case, though. For caution's sake I continue on for a good while in order not to miss anything. Then it becomes clear that I have gone astray, or rather: my hypothesis concerning the route is not correct.

I pause and rethink the situation. It is clear that I am on the country road, this much I can tell from the rate of traffic. What I am not sure of is the direction and which side of the road I'm on.

How can I figure out where I made my mistake?

Well, first of all I have walked in the wrong direction. Consequently I need to walk back into the same direction I have come from. In my mind I follow my route: from a spatial point of view, the direction and side of the road I have taken were correct until I crossed the country road. Then I took the wrong street. I assume that I turned off to early. Am I on the right side of the road? I guess I am, as I know from conversations with my wife that only one side of the country road is bordered by a sidewalk. Thus I walk back on the same side of the road.

After a while I return to the very distinctive part of the sidewalk, hitherto unknown to me, which is surrounded by natural ground. I walk a ways into this street – it leads downwards, which is strange again as I expected it to lead upwards.

As I'm in a state of confusion I walk back a couple of metres, return to the country road and cross it. There I continue on for another couple of metres into the direction

I have now taken, i.e. in the opposite direction I have chosen before. Here, I come to a road and enter it. It leads upwards. That would be correct! I cross this small street and search for anything familiar on the other side of the road or for something that will give me a clue where I might be. Another hypothesis dashes forward: What if I were at the point where the last junction in the village leads upwards and to the left? Then I should be only one or two metres away from a very distinctive spot at which a footpath turns uphill, small, overgrown with bushes. I continue to walk, explore and realise that the hypothesis is correct. The route is the one I suspected, I carry on walking, further singular landmarks appear in the right sequence – a manhole cover, a turn-off to the left, a small stairway. Now I am in a very well-known area and find my way home without any doubts.

Now everything has become clear: Where was I when I lost my way?

In exactly the same road I just turned into and on whose left side the small path branched off. But because I was walking on its right side I stepped into the old familiar cul-de-sac, a place locally known as "Dreiort". And because I walked back on the same side of the road I didn't realize where the road would have led on straight ahead. And now all the following errors ensue from this realization: Namely, that I crossed the country road again without realizing it, that the strangely distinctive spot was a turn in the road which I didn't know before and which led in the other direction. A direction I had never walked in before, precisely because it led straight into no-man's land."

The blind style of perception does not only orientate itself but has to know when not to do it, i.e. the trick is to lose one's way and then be able to identify the right route, starting from the divergence. Thus, the ability to control and understand errors leads to knowledge regarding space and one"s own position in it. In other words, it is not only necessary to commit positive singular characteristics and landmarks to memory but to generate and master spatial structures as well as topological structures and progressions in a theory-led manner. Also, one has to learn strategies of how to find one's way out of errors in reasoning.

The success of the experiment heavily depends on knowledge about one's own position – the body in relation to the environment – as the latter springs from the further and the latter gives hints to specify the position of the further. Therefore it is fatal to lose attention as at the beginning of the protocol. And more than that. As the direction depends on the question which side of the road the lay scientist is on, the monitoring of one's own position, memory- and history keeping is necessary. Also backtracking in error searches is a usual strategy that the blind navigator employs: Going all the way back in order to understand the error, what has happened and why this has happened and then being able to correct it, is the typical strategy of his choice. Observations that are not expected to occur must be interpreted and cannot be left aside. A new experiment must be started to find a solution for the problem. Pauses and rethinking are usual strategies in this process. Following the route in the mind is another strategy to do this.

Looking for a new way "in a state of confusion" might at first glance sound like blind variation. But it is not because the results gathered by this attempt do not speak for themselves or through natural selection. They must be understood and only become interpretable with the help of hypothesis derived from a solidified stock of knowledge. And in the end, when the navigational crisis is overcome, all the errors have to be understood in order to create new positive knowledge out of them.

All this is analogous to the care of the self applied by high energy physicists. In sum, it would not be overstated to conclude that self-observation, self-understanding and self-description are strategies which the blind subject uses to achieve spatial orientation. He tries to create positive knowledge out of the understanding of the limits of research.

But by building on disturbances, distortions, imperfections, errors, uncertainties and limits of research the blind style of perception depends to an even higher degree on the principle of limi-

nal knowledge. For example, it turns the anti forces of the experiment into a resource of knowing. The background – competing processes and classes of events that fake the signal – are not taken as disturbances or distortions but are integrated into the picture as basic and grounding sounds and echoes. Smearing – a distortion of physical distributions in space that makes these distributions wider so that no distinguishable responses to two separate objects can be given – is also integrated into the whole of a grounding sound where singular locations that cannot be detected merge with one another. In a similar way it deals with noise – signals in a detector and in the electronics of the apparatus that mask the desired information. One's own footsteps or the clicking of the cane, for example, produce noise that is used to elicit echoes and sound reflections which reveal information about the size and the character of the place. In this case, even different categories of distortion work together: The noise of the footsteps creates a sound that evokes an echo that illuminates the background, and by doing this renders it sensible.

5   Convoluting

Now I will address a new start, namely the conquering of a new and unknown space. In this case, knowledge concerning individual topological features does not exist. Rather, a new and singular knowledge concerning the space is gradually acquired around a stock of knowledge pertaining to general structures of space. The ethnomethods of unfolding, framing and convoluting, which help to produce liminal knowledge, become easily evident in terra incognita. This terra incognita is the Cologne University's Faculty of Orthopaedagogy.

Slowly, the room begins to fill with texture, sense and stories: On the ground floor I open a door. Down there, where I expected a corridor leading to a staircase up to the first floor, I feel wind and also hear it. What's that?

I walk back and a female student addresses me, asks whether she can help me. Irritable as I am, I say that no, not really, I wouldn't be able to describe where I wanted to go.

Me: "But I have a question: Where does that door lead?"

Student: "Well, there is this kind of open area."

Me: "An atrium?"

S: "Yes, yes."

Sometime before, in a story I had picked up, I had heard about such a fabulous atrium-thingy and here, now – by way of framing it into my research – the story suddenly makes sense.

Then, on the first floor. Another student, who notices the fact that I have lost my way, looks after me and leads me a couple of steps across the first floor:

"Here is the daycare centre. On the parallel corridor are two classrooms, the mass in between is occupied by the daycare centre and there, to the back, is the children's dormitory."

From an earlier visit I know that on the opposite end of the staircase there is a corridor where the professor's office is located. I put this information into the same frame. One of these classrooms in the parallel corridor then has to be the one that I will have to teach in. The first names and spatial conditions come up.

Here comes an interesting unfolding experiment by touching, walking back and forth, and by cognitive structuring of different elements of knowledge:

Luckily the staircase is not integrated into the building in any symmetrical fashion. Thus it is possible to orient myself with the help of the following facts I have felt out: The staircase is attached to a connecting wall. Its wood merges perfectly with the wall made of glass. On the other side is a wooden lagging that serves as a guardrail to the stairwell. Next to it is a corridor. I mean a broad gap. There are two accesses to the staircase, facing away from each other. The first is not directly attached to the wall, it is close to the open corridor. What is attached to the wall, though, is the guardrail above the staircase access.

Beginning at the first access to the staircase there is an easy description to find my room of choice: You have to keep walking about one and a half metres straight on, then turn right into the corridor. In its wall the last door to the left leads to my seminar room.

If you follow the opposite direction out of the corridor, pass the staircase, walk down

the corridor and further on into another one, you will have reached a corridor on whose left side and a few metres further on – important – you will find the toilet. This is where I got lost on my search for the bathroom. Despite the fact that my new theory about the orthopaedagogic building is correct, I have still not been able to orientate myself because I did not look for a sufficient amount of data:

Two female students who had been sitting there seem to have distracted me, so that I did not find the toilet. I asked them both where I was. They did not know. Instead they asked me where I wanted to go. I declined to answer the question and insisted to know where I was.

They described: "You are in a corridor. On the way you have just passed a door. There is room 120."

A mixture of gestures pointing at nothing, observations of the obvious which did not contain information, and a number without context. Afterwards I clarified everything and told them that I was looking for the toilet.

They replied: "Why didn't you say so? It would've been much easier. All you would've had to do was walk straight ahead."

I answered in the affirmative but pointed out the insight we had gained through my silence. They responded with an amused and cheerful laugh.

Fundamental to this situation of acquiring knowledge is that two very heterogeneous strategies are entangled: self-understanding and gathering information from others. And what complicates the situation is that these others come from another planet. So the whole endeavor is ruled by the ethnomethod of convoluting. Note that this strategy sometimes works, as in the case of the second student, and sometimes fails, as in the last example. But even here a single information has been gathered (room number 120) and who knows when it will be of use?

6 Reality

Whereas blindness acts like high energy physics, sighted people tend to behave more like molecular biologists. Let me begin with a short citation from Karin Knorr Cetina's admirable book: "In dissecting the object, molecular

biologists rarely argued but preferred to point. By referring to the image, they pointed back to the phenomena and the real-time processes of laboratory work". (Knorr Cetina 1999: 101)

Now compare this strategy to the way in which sighted people give route descriptions (cf. Kita 2003; Jarvella/Klein 1982). Pointing, a visual gesture, is constantly used in route descriptions by sighted people. Deictic expressions depending on visualization accompany the gesture ("This way" "there"). All other gestures they employ are unattainable without a visual script. They even immediately follow this strategy when they try to indicate the route or the direction to a blind pedestrian. Any landmarks given to them are inappropriate (cf. Saerberg 2006 and 2010). The last observation shows that these practices belong to the realm of knowledge taken for granted.

Sighted people will argue that their ability to understand a human being besides the typifications of common sense quickly reaches its limits. What fosters understanding for them is not the care of the self – and reciprocally the more or less emphatic care of another self – as it is in blindness, but being sighted in a world that is culturally and socially visualized. This gives opportunity for an epistemic strategy that dwells on the similarity to the object which it works upon – the everyday life-world. In this regard, the epistemic strategy of sightedness can again best be described as blind variation. To cite Knorr Cetina again: "Since the machinery used in molecular biology is largely the life machinery of the cell and of organism reproduction, attempts at self-understanding the tools and components of the experiment are jeopardized by the same limitations as investigations of the subject matter of molecular biology" (Knorr Cetina 1999: 93).

But we are not allowed to stop here. Because if we did, this would mean that blindness only had to deal with

signs and that it had no immediate access to the world of phenomenal experience. But we have heard that this is always the case in situations that are unproblematic. But what makes reality spring from unproblematic situations?

In order to look for an answer, I would like to compare this quiet room of ortopedagogy to two different rooms – and here we have come full circle. I will try to isolate their similarities by contrasting them.

The train station is frequented by a lot more people, shows more activity and is louder: With my white cane I feel my way along an unknown platform, looking for a place to sit. After searching about for some time I discover something that is built in such a manner that it could be a seating accommodation. It is a mesh of lacquered – most likely metallic – bars in a horizontal position, not unlike a latticework or netting. Its edges are reinforced and there is a more or less adequate area to seat oneself. Consequently it is a seat, as it seems to be shaped for just that purpose. I sit down and suddenly the object rolls away, a cart.

Thus the things in our outside world – which we think we know and which make up our so-called reality – are not things at all in our relation to them. Things are visual schemes, pictures that look like a chair, room, staircase, train or door …

Pictures are of a certain size, shape, contour, limitation. But this is only one, albeit privileged form. The room whose number I had intentionally not committed to memory and which, as the last anchor, could turn into 124, is not the picture of a room off a corridor, it is a space relation: I climb the stairs, test the spatial structure and then know how to get there. More is not relevant and I do not generate any more knowledge. A solid object-shape, solidified into a visual picture, does not exist.

The same is true for the chair or the seating accommodation. It possesses a material structure which suggests that it is a seat, but in this social context it does not have to be one. Due to its material structure it may be used as one, alienated in one sense, appropriate in another.

Passerby: "And how do you know which train is coming?"

Me: "By asking you."

Of course I could also check my watch and listen for an approaching train at its time of arrival and, when it has stopped, draw closer and check with my cane whether its

entrance has lowered. Should this be the case it is my train, as it is the only one which is designed like this.

Socially standardised signs and names are shortened pictures, smoothed and reduced to a couple of allowed lines. Pictures, on the other hand, are bloated signs, colourful and with complicated contours. Thirdly, things are sprawling pictures but behind them we find complex relations whose traces are the pictures.

Thus it is not things or objects we find on the bottom of reality but *relations and arrangements*: positions relative to space and objects – even human ones – floating in relation to each other on other things towards even more other things – things that are only perceived as traces of objects but which are unknown in their entirety. The train in its entirety remains un-present, only the eye imagines to have seen the whole train, gliding by or squashed in perspectivity. But images are conventions, social or psychological. It makes no difference. They only represent the whole.

This is the privilege of constructivism: nothing exists without a constructive portion. But this is also the privilege of realism: one construction may be used for purposes other than intended, another one may not, at least not to this end – but maybe to another one. Nexus and idea meet, walk a ways together.

All this has actual parallels to the epistemic culture of high energy physics, as the latter also understands the research process as a construction originating from self-understanding and dealing with liminal knowledge where out of errors, background, noise and smearing constructions of relative validity are produced, which are only visualised as auxiliary means (cf. Benz 2001; Krug 2001) but which could also be paraphrased acoustically or tangibly. In reality, complex relations, numerical sequences, etc. are behind all that, but no colourful space partitionings or objects with contours, sizes and dimensions. As the drone I hear

that signifies the trail of a locomotive, that also hints at a certain power and size, but which does not possess a cast mould.

Science produces and processes visualisations. "Viscourses" (Knorr Cetina 2001) and digital visualisations adjust a certain relationship to the eye. Visual practices, described as paperwork by Latour, shape science's material. Digitalisation, though, has transcended this visual stage: All data are de-visualised, they can be made tangible for the blind by using a braille-display.

Reality seems to be a relational term that is vague and infinite and only becomes a full reality insofar as it is incarnated in things or persons. But incarnation depends heavily on a society's taken-for-granted knowledge about perceivable and conceivable persons, things and objects which is realized through their subjective and interactional practices in the everyday life-world.

And in the case of the train another similarity between blindness and high energy physics reveals itself. The object of interest is far too much out of scale ever to be perceived in any other mode than an indirect one, too fast to be captured and too dangerous to be handled directly. The vigilance directed at the roaring sound of the train or the careful touch of a little part of it searches for traces of its presence. It is analogous to handling beds of clay which have preserved the steps of dinosaurs. All three techniques of rendering their object perceivable deal with its dangerous materiality. So paradoxically, blindness is an attribute of sight, and attentive care of one's own self has to do with blindness.

7 Conclusion

In blind navigation it is, in essence, not that important whether one does not see from a physical point of view, but rather whether one is able to move naturally in a familiar space without having to look – in "blind faith" so to speak. In other words it is more im-portant to be able to act without having to check first whether one's own definition of a situation corresponds with the actual situation. Chapter 2 described the self-conscious blind style of perception in which the blind person is allowed to be blind, in which blind variation does work, in which the life-world is sensorised, and which differs from the problematic interpretation presented in Chapters 4 and 5, in which blindness becomes acute and which deals with overcoming blindness via one's own interpretation. In this case, blindness means that the formerly familiar suddenly proves unfamiliar, one has taken a well known way and – behold – has gone astray. One is dazzled. Experiences a crisis. The eyes have to be opened again and the problem has to be analysed until it has been understood and solved and until it has become familiar again – and one is allowed to be blind again. This process is an endless spiral movement. Blind navigation in the unknown and high energy physics now move in the midsection of the spiral, because they move in the unfamiliar – one could also call it the "disembodied". Both try to understand the unfamiliar with the help of abstract theories and, subsequently, by giving it a body again – here a sensorised one, there a visualised one. This also means that everyday life on the one hand, and science and blindness on the other hand always exist in a relationship of embodiment and disembodiment. The latter ones construct extremely abstract interpretations, which they then, step by step, try to incorporate into their life-world via embodying visualisations or sensorifications.

Compared to the blind style of perception, however, the visual style of perception has the advantage of being dominant in everyday life. Correspondingly, it has also manifested itself in a far larger number of artefacts. There are Latour's inscription devices and material resources like diagrams, lists, formulae, archives, engineering drawings, files, equations, dictionaries, col-

lections. Here, I plead for the use of a further term of embodiment, though – one which does not only include tools or the inscriptions of the Actor-Network Theory but one which also includes the materialization of numbers in curves. Graphics may be schematic but they are still visual embodiments – a curve follows the corporeal manifestation of a mountain or a valley. Or bear in mind the numerous visualisations of perfect numerical series as described in astrophysics by Arnold Benz (2001), used to perceive contours and structures more easily. In those visualisations we are dealing with an artificial body, which nevertheless shows the traces of a body. And here, again, is an inverted parallel to the blind style of perception: when a radio journalist edits a feature on his PC with an editing programme, he navigates the mouse through a multi-coloured landscape of curves and spikes. To the same end, a blind friend of sounds "simply" enters length specifications, "Edit out between min. 22.42.1242 and min. 23.31.1532". With this phenomenology, the retrospective dependence of such artefacts on a physically and sensorially minted acquisition of knowledge can succeed and the sociology of science and technology can turn the interplay of disembodiment and embodiment in sciences into a topic beyond the black box.

If this is reversed to everyday life in a radical disassociation, the whole visual thing with all its seeming self-evidence appears to be a visual manifestation of an underlying network which remains invisible. By way of such self-evidence, something strange may become routine and has always done so. Because, just as a blind person's soundscapes very often constitute exactly the same strange abstract and unsettling networks for a sighted person, they are, for the blind everyday listener (in the double sense of the word), completely familiar things with skin, hair and a face, i.e. familiar manifest flesh of the world from one's own flesh.

Thus it is of course possible to talk about the dominance of the visual, but that is not manifest in an anthropological determination of the apparatus of awareness for predetermined purposes. Also, in my opinion, there is no hierarchy of the senses in which Vision is predestinated for the achievement of knowledge.

Rather, the interaction between sensorial corporeality, material artefacts, more or less routinised habitualisations, material circumstances of the environment and their social standardisations (e.g. the social creation of the "self-evidence" of the visual or other senses) has to be described as accurate as possible from a phenomenological point of view. Thus it may not be claimed that the differences between the styles of perception are contingent on the visibility or invisibility of an object. Rather, the strategies of visualisation and sensorification are dependent on a very complex set of factors.

Consequently, we are dealing with levels of familiarity, or the unfamiliarity of a style of perception and the corresponding epistemic strategies in a particular environment, life-world or an area of material reality. The greater the familiarity, the greater the blindness – of the sighted everyday person in his/her visualised life-world, of the blind everyday person in his/her sensorified life-world, of microbiologists in their organism-manipulating laboratories. The greater the unfamiliarity of the everyday person in general in view of crumbling clarities in the face of globalisation, technological progress, cultural change, etc., of the sociologist examining this, of the blind navigator in an unfamiliar, visually signposted city, of the physicist looking at his nanoparticles, though, the greater the compulsion to observe oneself, to see and to monitor oneself sensorially, so to speak. Hence the paradox: the sighted everyday person is blind, the blind everyday person at home is blind as well, but often, in problematic situations, he has to see.

The epistemic strategies of social sciences, too, have to fight systematically with the loss of familiarities – i.e. the origin of blindness. According to Hegel, the owls of Minerva first fly in the fading light of early evening. And only with the onset of dusk, when socially constructed life-world self-evidences and obviousnesses are analysed and crumble, does sociology become certain of its blindness – has to first use visual aids, become an owl, but suffers chronically from difficulties of sight as it is unable to follow the constant change of the life-world, which is why its visual aids will never be adequate. Hence it has to invent epistemic and perceptual strategies, has to specify methodically and methodologically in order to visualise and sensorify what is happening. This is why sociology will always generate knowledge when crossing the border between the familiar and the unfamiliar, which is not based on visual matters of course, but has to be closer to uncertain occurrences. Therefore, it will rather be necessary to develop different degrees of embodied and sensorially differentiated knowledge than to increase visual distance.

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