

Kuhn, the Duck, and the Rabbit – Perception, Theory-Ladenness, and Creativity in Science

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9.1 Introduction

Kuhn, in his letter dated November 29, 1962, explained to Edwin B. Boring, a professor of psychology at Harvard University, why he chose the duck-rabbit figure to discuss revolutions and theory-ladenness in SSR. Boring had suggested that Kuhn use the goblets and the young woman/old woman drawings as they are more complicated than the duck-rabbit. Here is Kuhn's reply: "The duck-rabbit has by now become almost a cliché in a great many circles, particularly since Wittgenstein discussed it at such length. That is why . . . I selected the duck-rabbit." Kuhn is referring to Wittgenstein's discussion of the duck-rabbit figure in the context of Wittgenstein's remarks on "seeing" and "seeing as" in what is now called "Philosophy of Psychology – A Fragment, Section xi" (1953/2009 PPF, §118).¹ Let us see first what Kuhn did with the duck-rabbit in SSR and how he profited from Wittgenstein's discussion of it. I will then examine the implications of the use of the duck-rabbit metaphor by Kuhn in his work and I will close with an analysis of Kuhn's account of creativity. My key contention is that Kuhn, influenced by Wittgenstein, rejects a two-tier account of perception, that is, seeing raw data first and interpreting them later, and does not assimilate all "seeing" to "seeing as". The use of the duck-rabbit figure helps Kuhn elucidate how he understands scientific revolutions and world changes; it helps him make the logical point that radical transformation has to be holistic and not piecemeal. It also helps him account for creativity since Kuhn associates novelty with the change of aspect.

¹ In the first three editions of Wittgenstein's *Philosophical Investigations*, the book was divided into two parts: Part I and Part II. In the fourth edition, the editors gave Part II the title "Philosophy of Psychology – A Fragment" and numbered the remarks. I will cite from the fourth edition.

9.2 Kuhn's Use of the Duck-Rabbit

Kuhn makes use of the duck-rabbit metaphor for the first time in Chapter X of SSR, on revolutions as changes of world view.² He says that “what were ducks in the scientist’s world before the revolution are rabbits afterwards” (SSR-4, III–II2). The next sentence, “The man who first saw the exterior of the box from above later sees its interior from below” (SSR-4, II2), alludes to Wittgenstein’s discussion of a schematic drawing that can be seen as an upturned open box (1953/2009 PPF, §116).³ So we have a clear indication that Kuhn’s use of the gestalt figures draws on Wittgenstein’s discussion of them. We will consider later what he borrows from Wittgenstein. For now, let us see what use Kuhn makes of these visual gestalts.

Kuhn says that the gestalt figures are “suggestive” of what goes on in the scientist’s world after a revolution (SSR-4, III). What do they suggest? That the scientist’s worlds before and after a revolution resemble the two different aspects, duck and rabbit, of the gestalt figure. They also suggest that the paradox associated with these figures, namely that the stimulus remains unaltered even though the perception of it changes, also characterizes the perception of scientists. One might say that, in the case of the duck-rabbit, what remains the same are the lines on the paper which may be perceived differently by the subjects who look at them, while in the case of the scientists, what remains unaltered is a “hypothetical fixed nature” (SSR-4, II8) that is perceived differently by them. As Kuhn put it, “though the world does not change with a change of paradigm, the scientist afterward works in a different world . . . What occurs during a scientific revolution is not fully reducible to a reinterpretation of individual and stable data” (SSR-4, I2I).

Kuhn notes that, in order to see just the lines without seeing the figures, one needs to *learn* to concentrate on them. In these particular circumstances, “[the scientist] may then say (what he could not legitimately have said earlier) that it is these lines that he really sees but that he sees them

² Earlier in the book (SSR-4, 85), Kuhn made a reference to visual gestalts used by Hanson (1958), namely to the ambiguous figure that can be seen as either a bird or an antelope.

³ Joseph Weiss, a psychoanalyst, who was Thomas Kuhn’s friend when they were both in California in the late 1950s and 1960s, remembers in an interview (Andresen 1999, S65) that Kuhn was “very interested” in the Necker Cube, a schematic drawing of a cube that can be seen in two different ways: as looking downwards and as looking upwards. The Necker cube was also of interest to Wittgenstein in the *Tractatus* (5.5423), where he said that looking at this drawing we perceive two different facts, and in the *Philosophical Investigations* where it is not mentioned by name but it is discussed as a schematic cube that has various aspects (e.g., Wittgenstein 1953/2009 PPF, 135).

alternately *as* a duck and *as* a rabbit” (SSR-4, 113). Kuhn’s point is that, normally, one sees either the duck or the rabbit and, only in case one has learned to concentrate on just the lines, can one say that they see the lines as something else, that is, *as* a duck or *as* a rabbit. Kuhn, that is, preserves the use of “seeing as” for special occasions. This is in contradistinction to Hanson who approvingly cites the British philosopher G. N. A. Vesey who said that “all seeing is seeing as . . . if a person sees something at all it must look like something to him” (Hanson 1958, 182). Vesey’s statement appears in a paper that he delivered in 1956 at a Meeting of the Aristotelian Society entitled “Seeing and Seeing As”. In that paper Vesey investigates, in the spirit of ordinary language philosophy, the use and meaning of expressions such as “It looks like a torpedo, a lemon, etc.” and “It is a torpedo, a lemon, etc.” In that context, he also discusses the expression “I see x as . . .” and says that “if a person sees something at all it must look like something to him, even if it only looks like ‘somebody doing something’” (1956, 114). Vesey is interested in whether a judgement is involved in perception and his conclusion is that it is not necessarily involved although “experience and judgment are connected: for what an object looks like to a person is what he would judge that object to be if he had no reason to judge otherwise” (ibid., 124). How a thing looks, he says, “is something phenomenal, not intellectual” (ibid). In the same article, Vesey refers to the reversible figures in psychology and says that they are used in textbooks to indicate that perception “is a function of the receiving organism as well as of the stimulus . . . Perception is a function of both stimulus and receptor throughout” (ibid., 112).

Hanson may approvingly cite Vesey’s “all seeing is seeing as” but he is aware that Wittgenstein, on whose work he relies,⁴ does not share this conviction. He admits that Wittgenstein is reluctant to concede the identification of *seeing* with *seeing as* and claims that he does not understand Wittgenstein’s reasons (1958, 19). Hanson does not take seeing to be a two-stage process⁵ – “Seeing an X-ray tube is not seeing a glass-and-metal

⁴ On Wittgenstein’s influence on Hanson, see Kindi (2016, 594–595).

⁵ Hanson (1958, 16–17) cites from Pierre Duhem’s *La théorie physique* in order to combat the view that the physicist and the layman see the same thing but interpret it differently. The passage he chooses describes what a layman and a physicist see in a laboratory. The layman sees spools and an oscillating iron bar carrying a mirror, and the physicist sees the measuring of the electric resistance of spools. Hanson says that “the visitor must learn some physics before he can see what the physicist sees” (ibid., 17). He also asks whether the physicist is doing more than just seeing, and he answers: “No; he does nothing over and above what the layman does when he sees an X-ray tube” (ibid., 16). So Hanson marshals Duhem as an ally for his thesis that observation is theory-laden and does not involve interpreting bare facts. The problem is that Duhem may not be the right ally. Right after the passage cited by Hanson, Duhem says that any experiment in physics involves two parts: the first part is the observation of facts and the second part is the interpretation of the observed facts (Duhem 1982/1914,

object as an X-ray tube”. But he still insists that “the logic of ‘seeing as’ seems to illuminate the *general* perceptual case” (*ibid.*, my emphasis). It is at this point that Hanson cites Vesey. Wittgenstein does not take seeing to be a two-stage process either but, unlike Vesey or Hanson, does not think that “seeing as” illuminates the general perceptual case. Kuhn was influenced by Hanson (SSR-4, 113; RSS, 311), but on this point he is closer to Wittgenstein. Kuhn says that “scientists do not see something *as* something else; instead, they simply see it” (SSR-4, 85).⁶

9.3 Wittgenstein on *Seeing* and *Seeing As*

In Wittgenstein’s view *seeing as* “is not part of perception. And therefore it is like seeing, and again not like seeing” (1953/2009 PPF, §137). I am reporting my perception if, shown the duck-rabbit picture and asked what it is, I reply “It’s a rabbit”, “It’s a duck” or “It’s a duck-rabbit” (1953/2009 PPF, §128). According to Wittgenstein, in all these answers I describe my perception, although in the first two cases, the ambiguity of the picture escapes me. In the case of “seeing as”, however, although we may find things in favour of saying that “seeing it as” is a sensation, “we have to describe this sensation as though we were describing an interpretation” (Wittgenstein 1988, 332).⁷ Giving an interpretation involves a two-stage process: first, seeing dashes, strokes, shapes, colours and the like, and then making some kind of a hypothesis (1953/2009 PPF, 249) or a comparison to a paradigm, “as if something had been pressed into

145). One may surmise that Duhem is in agreement with Hanson on the theory-ladenness of observation (the observation of facts), reserving theoretical interpretation, as an extra process, for what comes after observation. Unfortunately, this supposition does not seem to be correct. Duhem believes that observation provides us with concrete data that are later replaced by “abstract and symbolic representations” provided by interpretation (*ibid.*, 147). He says that it is not necessary to know physics to observe facts; knowledge of physics is necessary only to interpret facts (*ibid.*, 145). He also says that “an experiment in physics is the precise observation of phenomena accompanied by an interpretation of these phenomena” (*ibid.*, 147). In general, Duhem thinks that theoretical interpretation is essential in the case of physics, but not in the case, for instance, of physiology where it is possible to leave theory outside the laboratory door. In an experiment in physics, he says, “[W]ithout theory it is impossible . . . to interpret a single reading” (*ibid.*, 182). So it seems that for Duhem, observation does not need theory and may be common between laypersons and scientists. Theory is needed in order to proceed to interpretation which is, according to Duhem, indispensable for physics.

⁶ Cf. what Joseph Weiss reports about what Kuhn believed in relation to gestalt figures such as the Necker cube: “that a person, inexplicably, just saw things a certain way – one just gets it . . . one just sees it” (Andresen 1999, S65).

⁷ Cf. “The puzzle is that ‘seeing as’ is described on the paradigm of interpretation” (Wittgenstein 1988, 102).

a mould it did not really fit into” (1953/2009 PPF, §164; cf. 1958, 168–169). It is an indirect description (1953/2009 PPF, §117).

Wittgenstein is reluctant to assume that, in the case of ambiguous figures, we interpret differently something common and more basic (1953/2009 PPF, §248). He connects *seeing* and *seeing as* to the broader issue of meaning and experience of meaning. As in the case of seeing, where, without thinking, we immediately perceive something, we immediately perceive meaningful expressions, linguistic or other (for instance, gestures). We do not separately perceive dead, inorganic, signs that later become alive when imbued with meaning (1958, 4). The individuation of the sign itself requires that we treat it as a symbol, that is, as significant (cf. Conant 2020). Seeing an aspect, or seeing X *as* Y, on the other hand, has “a close kinship with ‘experiencing the meaning of a word’” (1953/2009 PPF, §234; cf. §261). We experience meaning when words, even if unaltered, acquire “a different ring” (1953/2009 PPF, §264), when we read them with an intonation or with a certain feeling (*ibid.*). For Wittgenstein, seeing aspects is parasitic upon regular seeing, and experiencing the meaning of words is parasitic upon the common use of words (cf. Cavell 1979, 355; Kindi 2009). Unlike seeing which is ubiquitous, “seeing as” “does not come in ordinary life” (Wittgenstein 1988, 231). We would not say, at the sight of a bottle of wine, “Now I’m seeing this as a bottle” (1982/1990, §534); nor would we normally say it of a knife and fork (1982/1990, §535).

It would have made as little sense for me to say “Now I see it as . . .” as to say at the sight of a knife and fork “Now I see this as a knife and fork”. This utterance would not be understood. Any more than: “Now it is a fork for me” or “It can be a fork too” (1953/2009 PPF, §122).

One doesn’t “take” what one knows to be the cutlery at a meal *for* cutlery, any more than one ordinarily tries to move one’s mouth as one eats, or strives to move it. (1953/2009 PPF, §123)⁸

Wittgenstein is not against interpretation *tout court*. We may interpret words, sentences and texts. Think of what literary critics and philologists do. But this kind of interpretation is a process that takes time, involves hypotheses and depends upon previous immediate recognition and understanding of linguistic items. It is not an activity that breathes meanings into

⁸ Here Wittgenstein is alluding to his view that *seeing as* is subject to the will: “Seeing an aspect and imagining are subject to the will. There is such an order as ‘Imagine *this!*’, and also, ‘Now see the figure like *this!*’; but not ‘Now see this leaf green!’” (Wittgenstein 1953/2009 PPF, 256).

dead signs. It already deals with meaningful units. As Wittgenstein said, “interpreting a sign, adding an interpretation to it, is a process that does take place in some cases but certainly not every time I understand a sign” (Wittgenstein 2005, 16; cf. 1967/1970, §218). The fact that we engage in interpreting texts, or that on certain occasions we need to interpret particular words or phrases, does not mean that an interpretation is a prerequisite to understanding. In the ordinary use of language, we do not interpret physical marks; we simply grasp what they say. “Every sign is capable of interpretation; but the *meaning* mustn’t be capable of interpretation. It is the last interpretation” (Wittgenstein 1958, 35). The same holds for seeing: if someone threatens me with a knife, I do not have to add an interpretation to what I immediately perceive; nor do I need to make inferences. “What if I were to say: It isn’t enough for me to perceive a threatening face – first I have to interpret it. – Someone pulls a knife and I say: ‘I understand this as a threat’ (Wittgenstein 2005, 16).

9.4 The Rejection of the Raw Data + Interpretation Understanding of Perception

Kuhn follows closely Wittgenstein’s take on interpretation. In discussing the transition from one paradigm to the next, he repeatedly argues that scientists do not share raw observations that they then interpret differently. The data scientists receive, Kuhn claims, are not jointly fixed by their physiology and the environment alone; their immediate experience is permeated by the paradigm they have been trained with. Galileo and Aristotle did not see the same thing looking at falling stones. One saw a pendulum, the other saw constrained fall (SSR-4, 125). The scientists’ most elementary experiences are seeing pendulums, planets, oxygen, atoms and electrons. In principle, they cannot have more elementary experiences than these (SSR-4, 127–128). They do not see lines, colour patches and the like *as* pendulums, planets, oxygen, atoms and electrons. Even retinal imprints that are supposed to be captured by a neutral observation-language are, according to Kuhn, “elaborate constructs” (SSR-4, 127).⁹ Equally constructed, and not simply “given”, are operations and measurements in scientific laboratories. The collection of this kind of data requires much effort and expertise and presupposes a paradigm (SSR-4, 125–126).

⁹ Kuhn attributes the idea of a pure observational basis that subsequently gets interpreted to an epistemological paradigm associated with Descartes (SSR-4, 121, 126). This paradigm, Kuhn says, has not succeeded in yielding a language of pure percepts. “Philosophical investigation has not yet provided even a hint of what a language able to do that would be like” (SSR-4, 127; cf. SSR-4, 96).

This means that there is no fixed and neutral perceptual basis that is interpreted in different ways. Furthermore, in Kuhn's view, experience is fluid and it does not lend itself to a piecemeal process that imposes an interpretation on isolated articles of perception. That is the reason why the change of paradigms brings about a transformation of the whole bundle of experiences (SSR-4, 123).

The rejection of this two-tier picture of knowledge and perception (raw data + interpretation) does not impel Kuhn, as it did not impel Wittgenstein, to reject interpretation altogether. Kuhn acknowledges that scientists engage in interpreting data. He even says that this task is central to the scientific enterprise. But he warns that these interpretations take place under the guidance of a paradigm and are only carried out in the process of articulating it in the practice of normal science (SSR-4, 122). They do not induce a change of paradigms by supposedly offering the correct appraisal of bare percepts. With the change of paradigms the world changes along with it. There is no recourse to a fixed nature that is interpreted differently.

This was a very provocative claim. Kuhn made it with great caution and many qualifications. But his critics, even his allies, were nevertheless shocked. How could this be? Hempel (1980, 197) expressed this concern humorously: "If adherents of different paradigms did inhabit totally separate worlds, I feel tempted to ask, how can they ever have lunch together and discuss each other's views?" Let us look at the issue more closely.

9.5 World Changes

In the case of ambiguous figures, such as the duck-rabbit, observers know that they are looking at the same drawing while their perception of the figure shifts. They may be holding the book with the drawing in their hands, or they may have been told by an authority that they are looking at an ambiguous figure. This is the reason they can say that they see the figure alternately *as* a duck and *as* a rabbit. If, for whatever reason, the ambiguity of the figure escaped them and they had nobody to tell them that they were, for instance, aspect-blind, then they would not notice a change of aspects; they would simply see a duck or a rabbit while looking at the drawing. In other psychological experiments, such as the one with the anomalous playing cards conducted by Jerome Bruner and Leo Postman and discussed by Kuhn in SSR (SSR-4, 62–64), the stability of the stimulus is guaranteed by the experimenter who acts as the authority the subjects of the

experiment can resort to when they realize that their perception shifted.¹⁰ In the case of paradigm shifts, however, the scientists do not have recourse to a fixed nature that they come to see differently, nor can they be assured by an authority that they are looking at the same world when their perception changes (SSR-4, 118). According to Kuhn, their most elementary perceptions are shaped by different paradigms and, so, scientists cannot have independent access to a bare, neutral, unmediated world. With the change of paradigm, the world changes.

Now, Kuhn is very guarded in making this claim. He says at the beginning that “the historian of science *may be tempted to* exclaim that when paradigms change, the world itself changes with them” (SSR-4, 111, emphasis added). He later says that it is “*as if* the professional community had been suddenly transported to another planet” and that “*we may want to say* that after a revolution scientists are responding to a different world” (ibid., emphases added). He clearly distances himself from categorically asserting these statements. He is not endorsing them; he entertains them to see where they would lead. At the same time, Kuhn is also eager to emphatically declare that scientists are not transported to another planet: “[N]othing of quite that sort does occur: there is no geographical transplantation; outside the laboratory everyday affairs usually continue as before” (ibid.). And later he contends that the changes in tests and measurements after a revolution “are never total”; “the scientist after a revolution is still looking at the same world”; “much of his language and most of his laboratory instruments are still the same as they were before” (SSR-4, 129). Still, Kuhn insists that “we must learn to make sense of statements that at least resemble these”, that is, statements such as this one: “[T]hough the world does not change with a change of paradigm, the scientist afterward works in a different world” (SSR-4, 121). This statement is strictly speaking a contradiction. How should we make sense of that?

Paul Hoyningen-Huene (1993, 31–63) tried to make sense by distinguishing between two worlds: the noumenal world (“the world-in-itself”) that does not change with the revolution and the phenomenal world that does change with it. With this distinction the statement is not

¹⁰ The subjects of Bruner and Postman’s experiment were shown anomalous playing cards, such as a black four of hearts, and they were asked to identify them. When the exposure to the cards was short, the subjects of the experiment tended to assimilate what they saw to already familiar categories; for instance they would call the card either a black four of spades or a red four of hearts. As the exposure increased, they began to realize the problem and, finally, most of them succeeded in identifying the cards as anomalous. They realized that their perception had changed because the experimenter assured them that all along they were looking at the same cards.

contradictory anymore. Rephrased, the statement would read as follows: though the noumenal world does not change with a change of paradigm, the scientist afterward works in a different phenomenal world. This is a philosophical solution to the problem. By devising, or following a philosophical theory, Kant's in this case, the problem disappears. To be sure, Hoyningen-Huene did not simply come up with this theory to fix the problem. He traced Kuhn's use of the relevant terms and found confirmatory evidence that allowed him to attribute the theory to Kuhn.

Kuhn, however, did not want to simply get rid of the problem. On the contrary, he wanted to highlight the difficulty of giving up what he called the old Cartesian epistemological paradigm, which has shaped both our understanding of things and the language we speak for centuries and at the same time embrace an approach that had yet to be formed.¹¹ As he put it, “*In a sense that I am unable to explicate further, the proponents of competing paradigms practice their trades in different worlds*” (SSR-4, 149, emphasis added). Kuhn is at a loss for words: he has come to see that the perception of scientists is never that of pure data, as the received epistemological paradigm prescribed, and tries with great difficulty to accommodate this new insight within the received framework. So Kuhn would not be happy, I think, to make the problem disappear; his aim was to deepen our appreciation of the problem. Besides, as Hoyningen-Huene correctly acknowledges (Hoyningen-Huene 1993, 60), Kuhn himself explicitly rejects the Kantian world-in-itself. “The view toward which I grope would also be Kantian, but without ‘things in themselves’ and with categories of the mind which could change with time”¹² (RSS, 207). Although Kuhn again expresses his bafflement by saying that he *gropes* to formulate his view, it is clear that his Kantianism is restricted to acknowledging the contribution of the categories of the mind, even if moveable, to

¹¹ “In the absence of a developed alternative, I find it impossible to relinquish entirely that viewpoint [the epistemological viewpoint that understands theories as interpretations of data]” (SSR-4, 125).

¹² It should be noted, however, that in his paper “The Road since *Structure*”, delivered in 1990 as a presidential address to the biennial meeting of the Philosophy of Science Association, and I suppose in response to relentless criticism that he is endorsing different kinds of idealism and to his own worries that he may be sliding in that direction, he recognizes the need for “something permanent, fixed, and stable” to serve as a source of stability in view of all differentiation and change (RSS, 104). He compares it to Kant's *Ding an sich* and says that, as such, “it is ineffable, undescribable, undiscussible” (*ibid.*). He even gives it an un-Kantian genetic dimension saying that it is “the whole from which have been fabricated both creatures and their niches, both the ‘internal’ and the ‘external’ worlds” (*ibid.*). As the editors of RSS observe in their introduction, Kuhn wavered on the Kantian “*Ding an sich*”. It seems, though, that his considered position, intimated to the same editors before his death, was to repudiate “both that notion and the reasons he had put forward for it” (RSS, 7).

knowledge and experience. He finds the idea that there is a world out there that science is zeroing in on meaningless (RSS, 243). The positing of such an unknown and unknowable “world-in-itself” seems only to serve to appease our ontological worries. Kuhn wants to be a realist (RSS, 206). But he is not ready to concede realism’s emblematic claim. His world is not an external, mind-independent world plain and bare, but one that is populated by the entities science approves.¹³ But what science approves changes, not simply by accumulation, that is, by discovering more entities or learning more about them. Successive scientific theories transform our conception of the world. And our conception of the world is not just an interpretation of a given reality (RSS, 95). Kuhn’s world is one and pliable. He finds the contrast between mind-independent and mind-dependent misleading and opts for the view that “it is groups and group practices that constitute worlds (and are constituted by them)”¹⁴ (RSS, 103). That is why he speaks of “cultural ontology” (RSS, 246) and shows such an interest in niches, that is, the habitats that creatures and environments build together in interaction. “A niche is the world of the group which inhabits it, thus constituting it a niche” (RSS, 103; cf. 120, 250). Kuhn is struggling with language, with the metaphors it forms, and with the distinctions it makes in order to express his new way of seeing things. What he tries to say turns out to be contradictory or ungrammatical or simply contrary to what we expect or are used to hear. But this is how things are when a revolution is in the offing. Kuhn described the phenomenon in relation to science: “Violation or distortion of a previously unproblematic language is the touchstone of revolutionary change” (RSS, 31). Kuhn is not trying to revolutionize science, but philosophy of science. He finds it “impossible to relinquish entirely” the old epistemological paradigm traced back to Descartes (SSR-4, 125), which pits language against a mind-independent, external world and takes theories to be interpretations of given data. And he is eager, at the same time, to embrace and express a new revisionary alternative that is still not yet developed.

Let us take stock. Kuhn used the duck-rabbit figure as a metaphor for revolutionary change in science. The two aspects of the drawing stand for the two ways of perceiving the world, before and after a revolution. The drawing itself stands for the common stimulus that is seen differently or for the common world that is transformed. The two aspects are not two interpretations of common raw data and perception is not normally

¹³ “What is the world, I ask, if it does not include most of the sorts of things to which the *actual* language spoken at a given time refers?” (RSS, 206).

¹⁴ Cf. “In much of language learning these two sorts of knowledge – knowledge of words and knowledge of nature – are acquired together, not really two sorts of knowledge at all, but two faces of the single coinage that a language provides” (RSS, 31).

a matter of seeing as. People who observe ambiguous figures and scientists who have been trained under different paradigms collect different data (SSR-4, 121). Kuhn was influenced by both Hanson and Wittgenstein in his views on seeing. All three of them rejected the view that perception is a two-stage process and were more inclined to hold that observation is theory or concept-laden¹⁵. Kuhn, however, siding with Wittgenstein, differed from Hanson in rejecting the claim that all *seeing* is *seeing as*, despite the assimilation of their views by critics.¹⁶

Now, it was mentioned earlier that the duck-rabbit metaphor was *only suggestive* of what goes on in science in revolutionary periods (SSR-4, III).¹⁷ This means that the analogy is not perfect. Apart from the similarities that were already discussed, there are also differences. These differences were highlighted by Kuhn's critics, in order to avoid the undesirable consequences of the analogy for science, but were anticipated by Kuhn himself already in SSR. For instance, Kuhn noted that, in scientific change, there is no external authority to assure the scientists that they are dealing with the same world and the same stimuli when they come to see things differently. This is the reason that scientists do not see things *as* X or Y but simply see them (SSR-4, 85). By contrast, the subjects of the psychological experiments, who either know that they are looking at ambiguous figures or are assured that they are looking at the same cards despite their different perceptions, see the figures *as* ducks or rabbits and the cards *as* anomalous or not. Another difference is that the scientists cannot switch back and forth as the subjects of the gestalt experiments can (SSR-4, 114–115). Once they embrace the new paradigm, they usually do not go back.¹⁸ Also, scientists only rarely give voice to their experience of shifting vision, as it

¹⁵ To be sure, Wittgenstein never used such expressions. But if we try to translate Wittgenstein's thoughts as regards perception into Hanson's terminology, we may be allowed to say that he was in favour of concept-laden observation, given that, in his view, in normal circumstances, we immediately make sense of what we observe – we do not apprehend unintelligible marks or colour patches that we later put an interpretation on. Cf. "Here we must be careful not to think in traditional psychological categories. Such as simply dividing experience into seeing and thinking; or doing anything like that" (Wittgenstein 1982/1990, § 542).

¹⁶ Raftopoulos (2009, 312), for example, says that both Hanson and Kuhn "rendered the distinction between *seeing* and *seeing as* obsolete." That is certainly not true of Kuhn.

¹⁷ "Though psychological experiments are suggestive, they cannot, in the nature of the case, be more than that" (SSR-4, 113–14). Cf. "We need not insist on so full a parallelism" (SSR-4, 117).

¹⁸ One may think, however, that "bilingual" scientists, e.g., scientists familiar with two consecutive paradigms, the one they were originally trained with and the one they eventually endorse, would be able to alternate and to converse in both languages. Yet the idea, I think, is that once a paradigm is adopted in the sciences, all previous ones become obsolete. As Cavell (1979, 371) put it: "Once convinced of Continental drift, there is no competing picture of the formation of continents to which one is liable to revert. One sees here something of what scientific progress means."

may take time to acquire a new way of perceiving things. This means that the experience of instantaneous conversion is also rare in science and, therefore, unlike what goes on with the gestalt figures. So, despite sporadic references to Pauline experiences of illumination, Kuhn does not think that the scientific community converts to the new way of seeing collectively, as a group. What happens, in his view, is “an increasing shift in the distribution of professional allegiances” (SSR-4, 157).¹⁹

Apart from the similarities and differences that have already been noted between the ambiguous figures and radical change in science, the duck-rabbit metaphor is also thought to be suggestive in another sense: It hints at similarities between the so-called lighting up of an aspect in the case of ambiguous figures and the advent of novelty. Just as one sees something new and unexpected in aspect perception, scientists break new ground and become creative by seeing things in the world differently. In the last part of this [chapter](#), I will show the implications this comparison had on Kuhn’s views about creativity and innovative thinking.

9.6 Creativity

Creativity implies novelty, and revolutions in science, together with artistic innovation, are considered prime examples of creative practice.²⁰ Kuhnian revolutions, in particular, which usher in a new way of seeing the world, are supposed to mark deep ruptures with the way the world was previously experienced. In that sense they are compared to the dawning of an aspect which brings to light a novel way of perceiving the same stimuli. One implication of this comparison is that, for Kuhn, advances in science do not come from without as additions to the already available pile of beliefs, but are the result of reassembling and reconfiguring old material.

The transition from a paradigm in crisis to a new one from which a new tradition of normal science can emerge is far from a cumulative process, one achieved by an articulation or extension of the old paradigm. Rather it is a reconstruction of the field from new fundamentals . . . One perceptive historian, viewing a classic case of a science’s reorientation by paradigm change, recently described it as . . . a process that involves “handling the same bundle of data as before, but placing them in a new system of

¹⁹ In “Reflections on My Critics” (RSS, 123–170), Kuhn elaborates on the differences between the change of perspective in the gestalt figures and conceptual change in science and clarifies his view. Cf. RSS, 56–57.

²⁰ For a comparison between science and art as regards novelty and revolution in relation to Kuhn, see [Kindi \(2010\)](#).

relations with one another by giving them a different framework.” Others who have noted this aspect of scientific advance have emphasized its similarity to a change in visual gestalt: the marks on paper that were first seen as a bird are now seen as an antelope, or vice versa. (SSR-4, 85; cf. ET 226–227)²¹

The other implication of the comparison between the gestalt switch and creativity in science is that there is something inexplicable in the creative process, that is, in the process that induces a change of perspective. The transition from the old to the new is not seen as a piecemeal operation dictated by logic and empirical evidence but as brought about by conversion. As [Arthur Koestler \(1981/1985, 15\)](#) put it in relation to creativity in general, “the creative act itself is for the scientist, as it is for the artist, a leap into the dark”.²² Creativity has certainly been associated, especially in the Romantic model, with the mystical powers of a genius, with intuitionist strokes of illumination and with inspired flashes of insight ([Runco & Albert 2010](#); [Nickles 1994](#)). It is misleading, however, to attribute this mystical and irrational understanding of creativity in science to Kuhn, despite his use of the gestalt switch metaphor to account for scientific advances. Kuhn did in fact refer to expressions such as “scales falling from the eyes” and “lightning flash”, used by scientists when they suddenly saw a solution to the puzzle that troubled them. And he repeatedly told the story of his own “Aristotle experience”, that is, the experience of suddenly making sense of Aristotle’s *Physics* which he previously could not understand (ET, xi–xii; RSS, 15–17, 292–293; [Sigurðsson 1990/2016, 21](#)). “This sort of experience”, he said,

the pieces suddenly sorting themselves out and coming together in a new way – is the first general characteristic of revolutionary change . . . Though scientific revolutions leave much piecemeal mopping up to do, the central change cannot be experienced piecemeal, one step at a time. Instead, it involves some relatively sudden and unstructured transformation in which some part of the flux of experience sorts itself out differently and displays patterns that were not visible before. (ET, 17)

²¹ The references are to the historian Herbert Butterfield and the philosopher N. R. Hanson who used the bird-antelope figure in his work.

²² Cf. “There are always large chunks of irrationality embedded in the creative process, not only in art (where we are ready to accept it) but in the exact sciences as well” ([Koestler 1985, 14](#)). Cf. [MacIntyre \(1977\)](#) for criticizing Kuhn’s revolutions as leaps in the dark and as introducing irrationality in scientific development.

Still, I believe that these references and statements are not supposed to underwrite the irrationality of scientific development. Kuhn was taken aback by this kind of criticism and was totally opposed to the idea: “It is emphatically *not* my view that ‘adoption of a new scientific theory is an intuitive or mystical affair’” (RSS, 157).²³ Sudden illumination was not for him a matter of mystical inspiration but the result of extensive practice and familiarization with the problems and the superseded frameworks.²⁴ The point Kuhn wanted to make by the gestalt switch metaphor and the references to conversion was that scientific advance is not a matter of theoretical proof, but a matter of changing allegiance. Theoretical proof presupposes agreement in the premises and Kuhn thought that this agreement was not there because of, among other things, meaning variance across the revolutionary divide. So, when the line of argument reached deadlock, adherents of different paradigms had to be persuaded to endorse a different way of seeing things. The transformation had to be holistic since scientific frameworks were for Kuhn holistic structures built around hinge exemplars and not sets of logically related independent statements. However, it did not have to be instantaneous. Conversion could take years to be effected by means of persuasive argumentation (SSR-4, 86, 94, 150, 157).²⁵ As mentioned earlier, the instantaneous gestalt switch was only an analogy that captured some, and surely not all, aspects of revolutionary change.²⁶ Kuhn used it because he had empirical evidence from historians and scientists who had reported such episodes. But, most importantly, he used it because it served him, on the logical level, as the opposite of a step-by-step proof.²⁷ If science were to advance by accumulation, making inferences from experience, a gestalt switch would be completely out of place in that picture. In Kuhn’s model, however, where transition from one paradigm to the next is not a piecemeal enterprise controlled by experiment and logic, but a reconfiguration of a holistic structure, the metaphor of an instantaneous gestalt switch served him

²³ Here Kuhn refers to Israel Scheffler’s criticism. Cf. “[T]he notion that I was showing the irrationality of science absolutely blew my mind” (Sigurðsson 1990/2016, 22).

²⁴ Cf. Blackburn (2014, 151): “But even the anecdotes [about ‘aha’ experiences and ‘eureka’ moments] point out that the illumination requires a thoroughly prepared mind.”

²⁵ Kuhn never meant to exclude rational argumentation during periods of revolutionary change. His view was that arguments are not by themselves logically compelling.

²⁶ Kuhn said that he modelled revolutionary change on his experience as a historian (RSS, 87). A historian, or individual scientist, can have these “aha experiences”, but not a scientific community as a group. “Communities do not have experiences, much less gestalt switches” (RSS, 88).

²⁷ See SSR-4, 122n13 for the empirical evidence Kuhn cites and RSS, 57, for the distinction between having empirical evidence and making a logical point.

perfectly. It symbolized the logical point Kuhn wanted to make, that is, that successive paradigms are logically incongruous – what was anomalous before a revolution is normalized in a different logical structure afterwards, and one cannot move logically from the one to the other. What is more, by prioritizing the logical level, Kuhn distanced himself from an individualistic understanding of creativity that emphasizes psychological characteristics. Instead of talking of geniuses, of individual talent and individual experiences, he focused on communities, on institutional practice and logic.

Kuhn's most explicitly stated view on creativity appears in his paper "The Essential Tension: Tradition and Innovation in Scientific Research" (ET, 225–239). This paper is based on a talk Kuhn gave at a conference of psychologists on the identification of creative scientific talent. Psychologists and educators then, and now,²⁸ insist that creativity is enhanced by divergent thinking. Kuhn stressed in that article the significance of convergent thinking as well for scientific advancement. He said that it is vital, or essential as the article's title has it, for scientific research to support the tension between these two conflicting modes of thought which ought to characterize both the scientific community and the individual scientists (ET, 226, 227–228n2). "The productive scientist must be a traditionalist who enjoys playing intricate games by pre-established rules in order to be a successful innovator who discovers new rules and new pieces with which to play them" (ET, 237). Why is convergent thinking so important for innovation in science? Because "novel discoveries in the mature sciences are not born *de novo*," they emerge when a well-trodden field is transformed by new patterns of organization (ET, 234). This is similar to the way a new aspect emerges from the same data. Innovative thinking in science is made possible by the previously held beliefs within a matrix of expectations. Scientific education and institutional research practices define the area that scientists work in and prepare them to deal with the difficulties they may encounter. "In the mature sciences the prelude to much discovery and to all novel theory is not ignorance, but the recognition that something has gone wrong with existing knowledge and beliefs" (ET, 235). The same thought is expressed more rigorously in SSR:

Novelty emerges only for the man who, knowing *with precision* what he should expect, is able to recognize that something has gone wrong. Anomaly

²⁸ For a review of the literature on divergent thinking, see [Runco \(2010\)](#). Cf. Sir Ken Robinson's talk (2010) on the significance of divergent thinking in education.

appears only against the background provided by the paradigm. The more precise and far reaching that paradigm is, the more sensitive an indicator it provides of anomaly and hence of an occasion for paradigm change. (SSR-4, 65)

Anomaly literally means deviation from normalcy.²⁹ Only those acquainted with what is normal, in all its rigor and detail, through education and professional practice, can recognize concrete trouble and offer remedies that are apt and relevant. As Kuhn says in “The Function of Dogma in Scientific Research” (1963, 349), commitment to received scientific tradition “provides the individual scientist with an immensely sensitive detector of the trouble spots from which significant innovations of fact and theory are almost inevitably educed.” If scientists do not know the field and are willing to simply try new ideas, they will return their science “to its preconsensus or natural history phase” (ET, 234; cf.), where there is rampant disagreement over fundamentals and no development. Kuhn subscribes to the Baconian methodological dictum that “[t]ruth emerges more readily from error than from confusion” (SSR-4, 18).

Creativity has been standardly associated with freedom, imagination, spontaneity and natural talent – all of them attributes of individuals. But, in contrast, Kuhn insisted on the institutional framework that inculcated and promoted a culture of discipline and commitment. What others took to be inevitable human limitations of individual scientists, he considered institutional preconditions of success (Kuhn 1963, 348–349). Creativity for Kuhn required a balance between deep, even dogmatic, commitment to the status quo and the professional ideology of innovation and freedom of exploration (ibid., 368–369).

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²⁹ Anomaly comes from the Greek word “anōmalia” which is the noun of “anōmalos”, formed by the privative prefix *an* and *homalos* which means even, regular. So Hacking wrongly states, in his introduction to the fiftieth anniversary edition of SSR-4 (xxvi), that “anomaly” is formed by the privative prefix *a* plus *nom* which comes from the Greek word for “law” (he means the word “nomos”).