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Repeatability and Methodical Actions in Uncertain Situations: Wittgenstein's Philosophy of Technology and Language

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Abstract: In this paper Ludwig Wittgenstein is interpreted as a philosopher of language and technology. Due to current developments, a special focus is on lifeworld practice and technoscientific research. In particular, image-interpretation is used as a concrete methodical example. Whereas in most science- or technology-related Wittgenstein interpretations the focus is on the *Tractatus*, the *Investigations* or *On Certainty*, in this paper the primary source is his very late triune fragment *Bemerkungen über die Farben* ("Remarks about the Colours"). It is argued that Wittgenstein's approach can supplement Don Ihde's concept of material hermeneutics, and that Wittgenstein's constructivist and pragmatist claims relate to current authors in the philosophy of technology like Peter Janich, Carl Mitcham, or Jürgen Mittelstraß. Ludwig Wittgenstein enables a philosophical approach of transcendental grammars, techno-linguistic forms of life and technoscientific language games. In detail, several methodological aspects regarding relations between language and technology are summarized. Here concretely repeatability and methodical actions play major roles in uncertain situations of language and technology practice. It is shown that Wittgenstein is still underestimated in the philosophy of technology—although his thoughtful conceptualizations of language, social practice and technology bear important methodical insights for current technosciences like synthetic biology, robotics and many others.

Key words: Ludwig Wittgenstein, philosophy of technology and language, repeatability, methodical action, knowledge

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Introduction

In philosophical works concerning technology often authors are cited and used as idea generators, who are not philosophers of technology in the genuine sense. One example is Martin Heidegger. Although only one short lecture entitled *Die Frage nach der Technik* ("The Question concerning Technology," ca. 1954, Heidegger 2002) has been published with an explicit conceptual link to technology, many other works of him play a crucial role in current debates (e.g., Corona and Irrgang 1999; Hubig, Luckner, and Mazouz 2007; Luckner 2008; Mitcham 1994, 49–57; Riis 2011). In the case of Don Ihde the same could be noted with respect to Edmund Husserl and Maurice Merleau-Ponty. Both authors are not genuine philosophers of technology, but serve as conceptual roots for Ihde's investigations (Ihde 1991; Ihde 1998). Ernst Cassirer, again, is a well-known philosopher of the twentieth century—without being an explicit philosopher of technology—who inspired philosophy of technology with his 1930 article *Form und Technik* ("Form and Technics," Cassirer 2009; Gutmann 1999; Mitcham 1994, 42, 192, 307). Heidegger, Husserl, Merleau-Ponty, and Cassirer created influential works for current philosophical debates about technologies and sciences.

In contrast to authors like these, Ludwig Wittgenstein still remains underestimated. He is an important author of twentieth-century philosophy as such, and especially for the philosophy of language. But only very few investigations emphasize links between Wittgenstein and philosophy technology (e.g., Coeckelbergh and Funk 2018; Funk 2010; Keicher 2008; Kogge 2015). In most cases—especially when philosophers of technology write about Wittgenstein—the intellectual contention is constricted either to the *Tractatus Logico Philosophicus* (often called 'Wittgenstein I') or to the *Philosophical Investigations* (often labelled as 'Wittgenstein II'), which is sometimes supplemented by *On Certainty* (Coeckelbergh 2017, 1 et passim; Ihde 1991, 14–16; Ihde 2006, 288; Ihde 2007, 33–34; Nordmann 2002; Mitcham 1994, 49, 310; Winner 1986, 12–17). However, Wittgenstein still remains an outsider in the philosophy of technology. At the same time classical Wittgenstein scholars usually do not focus his explicit remarks on technologies in an appropriate way. There is a double forgetting of the relations between Wittgenstein and technologies both in philosophy of technology and Wittgenstein exegesis (Coeckelbergh and Funk 2018).

This paper aims to contribute to a more systematic investigation of Wittgenstein's works in the philosophy of technology. Therefore, the primary focus is on one of his very last writings: the triune fragment *Bemerkungen über die Farben*

("Remarks about the Colours," Wittgenstein 1984a [BF]) which was written in 1950/51 and released after his death. One reason for the choice of this work is to include one not so prominently cited fragment in order to broaden the philological focus of debates about Wittgenstein and philosophy of technology. Another reason is that important insights can be found therein that stand at the end of Wittgenstein's reflections and might also function as some kind of summary of his intellectual trajectory. In particular, it is argued that practically successful repetition, both in performing language and technology, serve as methodical actions of scientific investigations. It is important to note that in this paper Wittgenstein's work is reread in terms of current philosophy of technology. As a consequence Wittgenstein's ideas are analysed and applied without laying claim to a final and exhaustive understanding of Wittgenstein. His works are very multifaceted and this paper provides a concrete and maybe also unusual interpretation, which might stand in contrast to other interpretations that are valuable as well.

The paper is separated into two sequences. Sequence one consists of subchapter two (*Constructing Lifeworlds*) and three (*Technology and Language*). It is mostly about current debates in philosophy of technologies and sciences and aims primarily to illustrate possible current research questions and approaches that can be fruitfully supplemented by Wittgensteinian thoughts. This first sequence is about problematization and should sharpen the focus and questions for the second sequence, which consists of subchapter four (*Ludwig Wittgenstein Concerning Colours*) and has a very specific focus on Wittgenstein's original writing(s). In the first section relations between technologies and sciences are discussed. It is shown that, for instance, Don Ihde develops a prominent approach of material interpretation in context of phenomenological and hermeneutic philosophy of technologies. He uses Husserl, Heidegger, and Merleau-Ponty for developing a bodily concept of interpretation of scientific images. Ihde also underestimates language and Wittgensteinian contributions to the debate. After emphasizing lifeworld foundations of technologies and sciences the third section focuses on the latest debates about the relations between philosophy of technology and language. It is shown that, for example, Mark Coeckelbergh uses Wittgenstein for his conceptualizations by including the *Investigations* and *On Certainty*.

The second sequence is about a differentiated exegesis of Wittgenstein's less prominent work *Bemerkungen über die Farben*, which can provide additional and enhanced impulses for both current debates in philosophy of technologies and sciences, and the conceptualization of links between language and technologies. It is argued that constructivist and pragmatist claims link Wittgenstein's late works to

newer approaches in the philosophy of technology—like Don Ihde, Peter Janich, Carl Mitcham, or Jürgen Mittelstraß. In particular it is shown that Wittgenstein developed a language critical philosophy of linguistic and technical practice. Elements of holistic language games and forms of life are conceptually linked to pragmatic truth, pragmatic idealization and constructivist methodology. Colours are not a priori given and not explainable in scientific terms. Colours are in skilful ways technically and linguistically created. The mastering of technique ("eine Technik beherrschen") plays an important role here. Related to colours, skills play a crucial methodical role when it comes to visual image interpretation—for instance in laboratory research and the application of computer models including the interpretation of technically mediated screen images. In the conclusion the results are summarized in detail.

1. Constructing Lifeworlds: Links Between Technologies and Sciences in Philosophy of Technology

In early twentieth-century philosophy, lifeworld has been investigated as a methodological basis for scientific research by Edmund Husserl (*Die Krisis der europäischen Wissenschaften . . .* ; Husserl 2012) and Hugo Dingler (several writings concerning methodology; Dingler 1987). Husserl became an important source for Ihde's works, and Dingler for methodological constructivism and Mittelstraß. Even if the philosophical concept of lifeworld is much younger, the lifeworld as a problem generator and motivation for scientific investigations has been emphasized since Roger Bacon (*Opus maius*, thirteenth century; Bacon 2017; Wöhler 1989, 102–06, 191–96; Wöhler 2015) and Francis Bacon (*Instauratio Magna, Novum Organum,* seventeenth century; Bacon 1999; Bacon 2009; Krohn 2006) at the latest. In current philosophy of technology the manifold interrelations between technologies and sciences have been addressed, for instance, in the concept of technoscience, but also in the approach of instrumental realism. Don Ihde argues that reality is instrumentally mediated—therefore there is no scientific development without technological development and vice versa (Ihde 1991). On the other hand, Carl Mitcham emphasizes the conceptual relations between engineering technologies and sciences—including humanities philosophy of technology and engineering philosophy of technology—(Mitcham 1994); Mittelstraß investigates the practical relations between experimental technical research and aspirations to formulate and proof theoretical knowledge in metaphors of a Leonardo-world (Mittelstraß 2001); and Peter Janich investigates lifeworld-related proto-theories, methodic orders and technical research cultures (Janich 2006).

A certain kind of constructivism seems to link those newer approaches in the philosophy of technology: the ways we access reality are technologically shaped and relate to situational embodied lifeworld practice. With technosciences (material hermeneutics and mediation, Don Ihde), engineering as sciences and sciences as engineering (Carl Mitcham, Jürgen Mittelstraß) and methodic order (Peter Janich), reality is technologically created—an observation that can be found in the writings of Roger Bacon and Francis Bacon as well. The technological construction of reality starting with a lifeworld basis can be conceptually explained further by including pragmatist elements. A technical mediation of scientific phenomena or engineering of a concrete cultural world is a practical issue. Theory becomes an instrument for concrete actions in genuine situations.

It is one aim of this paper to illustrate that similar constructivist and pragmatist claims can also be found in the work of Ludwig Wittgenstein, insofar as Wittgenstein stands in the intellectual trajectory of modern critical thinkers who have been raising questions concerning scientific rationality, methodology and knowledge in contrast to scepticism. A special focus of this paper is on Wittgenstein's late aphoristic sequence *Bemerkungen über die Farben* ("Remarks about the Colours," Wittgenstein 1984a [BF]). Here Wittgenstein reflects in a language-critical way on how we are used to talking about colours and visual perception. In current debates, for instance, Don Ihde's investigations on material hermeneutics cover a technoscientific perspective with a focus on technical mediation and material interpretation. But his progressive motivation is so strong that Ihde links his new material hermeneutics to technical phenomena in contrast to language and texts (Ihde 1998). In this paper it is argued that Wittgenstein's language critical remarks about colours are a methodologically important supplement to the hermeneutical investigations of Ihde. It is emphasized that, e.g., visual phenomena are not only technologically constructed. The way we interpret images and how we ascribe meaning to them is significantly shaped by language games (Wittgenstein). A methodology of philosophy of technology needs to include both aspects: technical mediation and language critics.

Especially claims on pragmatism, constructivism and ordinary language (practice) can be found in Wittgenstein's works, as it is shown in the over next section of this paper. Challenges of technoscientific joint language can also be seen as struggling for successful language games and techno-linguistic forms of life. Therefore, in the next section relations between language and technology in current debates will be further discussed. It will be shown how repeatability of actions

in socially shared situations serves as both methodic and epistemic fundamental in philosophy of technology and language.

2. Technology and Language: The Forgotten Root

Wittgenstein emphasized relations between language and technology that are worth to be further explored, applied and integrated in future philosophy of technology. One example of application is the usages of metaphors (e.g., of 'genetic information' or 'organic machine') in synthetic biology, computer sciences and AI research. Another example is social robots like Yibo or talking devices like Google's Alexa that become market-ready and enter the everyday life of people all over the world. A classical car does not respond to a linguistic signal of the driver, but a self-driving car will do so. It is also time to think about conceptual relations between language and technology, and associated ethical problems in the twenty-first century. There are quite a lot reasons for current philosophers of technology to acquire important impulses from Ludwig Wittgenstein's works at the conceptual level of technology and language.

Ernst Kapp is known as the classical initiator of modern philosophy of technology with his 1877 published book entitled *Grundlinien einer Philosophie der Technik* ("Fundamentals of a Philosophy of Technology," Kapp 2015). What is often overlooked is the fact that Kapp included a chapter regarding language and technology (ibid., chapter XII. "Die Sprache," 247–72). In the context of his argument of organ projection, language is described as a specific tool that abandons differences to artworks. Language is the self-describing and self-reflecting tool (ibid., 248).[1] It is remarkable to realize that in the beginning of modern philosophy of technology, 1877—and even before the linguistic turn in general philosophy with Gottlob Frege and Ludwig Wittgenstein—the relation between tool use and language has been emphasized. Insofar it could be perfectly obvious to conclude that philosophy of technology and philosophy of language went hand-in-hand later on. If this would have happened, then Wittgenstein would have been often cited as philosopher of technology. But this did not happen. One reason is that language has prominently been associated with logics and positivist theoretical emphasis of natural scientific research—e.g., in the several Vienna Circles and Logical Positivism (Moritz Schlick, Otto Neurath, Rudolf Carnap, etc.) (Carnap 1998; Stöltzner and Uebel 2009). In an Auguste Comteian habit language has been interpreted as a means for strict and true description of natural and social processes. In opposition, technology has been diminished to contingent everyday life. However, in the later twentieth century a countermovement has been initialized in the philosophy

of technology by bridging conceptual divides between technologies and sciences, and between engineering and humanities-centered approaches (Ihde 1991; Janich 2006; Mitcham 1994; Mittelstraß 2001).

But even if hermeneutics became a methodology for philosophy of technology (e.g., in Ihde 1998) the notion of language remained underestimated. More attention to language has been paid by methodological constructivism and culturalism in the works of Mittelstraß, Janich and also Mathias Gutmann. However, in the case of Don Ihde the reason might be that he argues for the materiality of technical interpretations against positivist positions and certain conservative forms of phenomenology. He therefore creates something like two conceptual types of binaries which he tries to overcome:

> In what I call the 'H-P Binary'—the contestation between hermeneutics and positivism—hermeneutics first finds itself divorced from the sciences, and then by its own historical proponents made semiautonomous with respect to its interpretive activities in such a way that positivism simply became the standard for framing the understanding of the sciences. What I call the 'P-H tradition'—the phenomenological version of hermeneutics—often itself simply accepted this binary of science praxis and the understanding of same. (Ihde 1998, 3)

By challenging the contestation both between hermeneutics and positivism, and between hermeneutics and scientific practice, Ihde materializes hermeneutics for the price of underestimating the role of language.

In latest developments in the philosophy of technology particular attention has been paid to the links between language and technology in a more straight forward attitude. In his book *Using Words and Things* Mark Coeckelbergh argues that

> just as the use of language becomes crystallized in languages and language games, the use of technologies becomes crystallized in what I will call 'technology games,' and ultimately in forms of life—which in turn shape our lifes and our use of languages and tools. . . . [I]f we consider their use and performance in a social and cultural context, there is a strong similarity between words and things, and that in this sense language can be understood as a technology. (Coeckelbergh 2017, 1)

The late Wittgensteinian writings *Philosophical Investigations* and *On Certainty* are important sources of Coeckelbergh's approach—that's why he talks about "language games" and "technology games." He opens up the field for discussion and further investigations by balancing a conceptual triangle between humans,

technology and language—primarily in terms of use and performance. Coeckelbergh therefore summarizes several conceptual blocks as frameworks and tool boxes for subsequent philosophical investigations on language and technology (Coeckelbergh 2017, 266–77). One of these blocks relates to the underestimation of language in Ihde's approach: the "revision of postphenomenology and mediation theory" (ibid., 268, 154–92). Coeckelbergh argues:

> Thus, in the sense that Ihde's thinking is indeed an 'expanded hermeneutics' . . . , it *could* be interpreted as an attempted synthesis between thinking about language and thinking about technology, albeit one that mainly borrowed the *method* from hermeneutics without borrowing its traditional object of study: It emphasizes technology *at the expense of language*. (Ibid., 155)

His argument could be read as a kind of philosophy of technology Wittgensteinianism as he tries to correlate performance as method with performance as object. It is at this point where technology and language in a Wittgensteinian sense meet. "According to my view, *there is no hermeneutics of things and no hermeneutics of use without a hermeneutics of language* . . . , perception is not only embodied and mediated by material artefacts; it is also at the same time linguistic" (ibid., 167). Coeckelbergh's observation correlates to the claim in the previous part of this paper: A methodology of philosophy of technology needs to include both aspects, technical mediation and language critics.

In the previous section a special focus was on the impact of lifeworld-relations in current philosophy of technology. Thereby constructivist and pragmatist elements play a crucial role. In this section primarily the underestimation of language in the approach of material hermeneutics has been emphasized. Both in the previous and this section of this paper it turns out that language critics in a Wittgensteinian way is an important methodical fundamental among others on philosophy of technology.

3. Ludwig Wittgenstein Concerning Colours

It has to be noted that Wittgenstein's writings about colours are very late fragments in aphoristic form. They have been put together in a triune manuscript (I, II, III), whereas the counting of the single aphorisms starts from 1 in each of the three parts. The text has more the appearance of a thoughtful journey on an unknown path than of a systematic book with headlines and subchapters.

It can be ascertained that Wittgenstein uses several technical examples such as photography, cinema or movies.[2] This shallow observation does not justify a special interest in linking Wittgenstein's late work to philosophy of technology. Further insights are given by a closer look at conceptual claims. For Wittgenstein the notion of technology is closely related to competence and skill: "eine Technik beherrschen" ("to master a technique"). Mastery of a technique—which is always a process of learning—can be part of language games and therefore be embedded in holistic situations of description (forms of life). Here one link between technology and language can be found. The skill-related understanding of technology as technique also supports Coeckelbergh's genuine focus on performance when he writes about "using words and things" in a Wittgensteinian attitude (Coeckelbergh 2017; Coeckelbergh and Funk 2018). Several passages in *Philosophische Untersuchungen* ("Philosophical Investigations," Wittgenstein 2006 [PU][3] and *Bemerkungen über die Farben* ("Remarks about the Colours," Wittgenstein 1984a [BF])[4] approve this observation.

Wittgenstein is in some points close to Kapp (see also the previous chapter). Language is something like a self-reflective tool and material tools can be part of self-reflective language practice. For Kapp—who was influenced by Lamarck and Darwin—both the development of the human body and the usage of technology and language can be described in terms of a natural history (Kapp 2015, 15–39). Wittgenstein is reflecting about a natural history of colours as well.[5] On the one hand there are some Darwinist hints when Wittgenstein interprets the progression of language instruments ("Sprachinstrument") as a process of adaption to environmental circumstances.[6] The difference to Kapp is that Wittgenstein applies a language critical methodology, whereas Kapp remains etymological. For Wittgenstein the grammar of a natural historic sentence regarding colours should be temporal. It is about the appearance of colours in nature, not its essence ("Wesen").[7] The crucial point is not so much the universal essence of a concrete colour or a tint. The important point is the question of how we construct a concrete colour while talking about it. Mathematical or psychological sentences are embedded in language games different than those of natural historic claims. In some cases the comparability of colours is related to temporal sentences while in others it relates to untemporal sentences.[8]

Generally speaking, Wittgenstein's approach includes a lot of temporal elements as its philosophy is about language practice in everyday environments. In recent research this point has been emphasized often. For example, Thomas Rentsch analyses the critical transformation of modern thinking and compares Wittgenstein

with Heidegger. He stresses the point that Wittgenstein follows an anti-dualistic claim when he deconstructs modern ontological and metaphysical assumptions ("Vorhandenheitsontologie," "Verdinglichungskritik"). Wittgenstein's language critical methodology is a form of rationality in terms of everyday life practice (Rentsch 2003). Mark Coeckelbergh—influenced by Wittgenstein—emphasizes performance as basic concept for analysing the relations between technology and language (Coeckelbergh 2017). Peter Keicher claims that Wittgenstein's works can be interpreted both as a philosophical approach of technology and as technical praxis of philosophy itself—so to say philosophy as procedural self-critical technique (Keicher 2008, 193; see also Kogge 2015, 101–03). Friedrich Kambartel argues that Wittgensein provides exercises to the reader, which should lead to philosophical changes of perspectives that show a way the reader practically needs to go. These exercises are not replaceable by looking at a map only (Kambartel 1989, 155–58). Philosophy in the Wittgensteinian sense is a performance itself, it takes time and needs a way to go. It's practice.

In the case of colours this means that a pure theory of the psychology of visual perception or physiology does not explain what a colour is.[9] What Wittgenstein is actually looking for is a logics—that is, something like a grammar of meaningful (not only semantically correct) sentences—of how to use words like "pale yellow," "dark blue," etc.[10] The crucial point regarding philosophy of technology is that the proof or truth-criteria for the usage of a term is a mastered technique by the person that talks.[11] When, e.g., a person talks about intermediate colours ("Zwischenfarben"), how do we make sure that this person knows what he/she is talking about? How do we understand what this person means, when he/she speaks in terms of "more yellow than this colour," or "a bluish shade"? The proof is the ability, the skill, the technique, of tempering such a colour. Not the isolated theoretical scientist but so to say the practical craftsman or artist proofs the temper—even if it is the same person who is artist and scientist in a laboratory at the same time. In other words: colour is not a thing but a skilful competence embedded in a practical performance/action/engagement.[12] Wittgenstein became famous with his claim that language receives and creates its meaning within using words ("Gebrauchstheorie der Bedeutung"). But the same can be said for technique and colours as they are embedded in situations of socially shared language practice as well. It is at this point where it becomes obvious how Wittgenstein includes pragmatist elements into his investigations about colours. As it has been already argued in the second section of this paper (*Constructing Lifeworlds*), this

pragmatist way of thinking is close to current philosophers of technology like Don Ihde, Peter Janich, Carl Mitcham, or Jürgen Mittelstraß.

Another point mentioned in chapter two is the constructivist approach that links those authors with Wittgenstein. For him colour is technically constructed. So, "grey" and "(pale) white" might be the same colour in one sense, but different in another: different words but similar technique. What makes the comparability is the skill and procedure of how to produce it. Wittgenstein talks about how to mix colours on an artist's palette.[13] But what he actually focuses on is more than a simple unscientific handcraft skill and leads to methodological insights of current material hermeneutics. Again, the question is, how do we find a shared common language and how do we compare (visual) perception? Wittgenstein's answer is a pragmatic idealistic and constructivist one: *pragmatically constructing ideal cases of usage*. What does this mean? When an image is interpreted, which colour could serve as a standard gauge (mandatory for everyone in a cross-disciplinary research group)? Maybe white. As a pure white cannot be found in real life (even paper and snow is not perfectly white) the language game of pure white needs to be constructed. This process of construction is a pragmatic idealization: the ideal is not a theory or disembodied mental sphere, but a concrete technical and linguistic creation with a methodological motivation. Wittgenstein talks explicitly about laboratories where a refined notion of colours plays a similar role such as a very precise technology of time measurement. In both cases the issue is more "ideally" constructed than it would be necessary in real life.[14] The circumstances of the construction must be reproducible.[15] That's an important methodological claim. It leads into the conceptual heart of philosophy of technology not only because of the skill aspect of technique but also because of technical and material characterization of the circumstances/situations/contexts (which must be pragmatically repeatable).

In the *Investigations* pragmatic and constructivist claims can be found as well. For instance, when Wittgenstein talks about language and words as instruments he proceeds by comparing several systems of measurement in physics: feet, inch, metre. The *practice* of calculation forces us, that's Wittgensteins pointe, to choose one concrete system. There is a performative reason for it, not an abstract idealization or laziness.[16] In his *Philosophische Bemerkungen* ("Philosophical Remarks," ca. 1930, Wittgenstein 1984c [PB]) Wittgenstein argues in a similar pragmatic and idealist-constructivist manner: The method of how to create a straight ruler includes an ideal. This ideal is not an abstract Platonic idea of a 100 percent straight edge. It is a practical approximation procedure ("Näherungsverfahren")

with unlimited potentiality. There are no theoretical limits of developing better skills in crafting straight rulers. Wittgenstein concludes that the procedure as such (in its performativity) is the ideal.[17]

In the case of colours the challenging point is that an overarching scale or benchmark for comparing colours ("Farbengleicheit") is missing and it remains vague, what colours as such are. That's one of Wittgensteins favourite problems concerning colours.[18] What is the comparison method ("Vergleichsmethode")?[19] If there is something like a scale, then it is a repeatable performance. The generic approved criterion is so to speak always created within a group of people. There is no colour as such, there are always *our* concrete colours.[20] With this claim Wittgenstein includes an intersubjective or transsubjective perspective. There is no subjective colour, it is always shared in language games. This leads to the question of cross-disciplinary language games played while performing visual interpretations of scientific photos or screen images. As mentioned, the circumstances—also the language games of a concrete group of persons—of the construction of an ideal colour must be reproducible. This is one answer to the question of how one could compare colours methodically (within methodical actions). Thereby a language game in the form of an *as-if*-description is played: (in the Wittgensteinian example) describing a photography *as if* it would be the hair of a woman;[21] (or in a current example) describing a computer screen image *as if* it would ideally depict a cosmic or genetic phenomenon.

Colours and words are constructed in shared transsubjective situations of as-if-descriptions. Nobody remains as disembodied or displayed observer. Members of this (methodological) game can say "That are our colours on our screen image relating to our concrete scientific phenomena."[22] But it is hard to compare these colours or images as such to other groups of persons. There is never only one single colour shared, but always also the technique of how to play a linguistic and technological game in reproducible circumstances. In conclusion, when we talk about colours, no Archimedean point or external observer can be found. Wittgenstein was aware of this consequence as some passages in *Bemerkungen über die Farben* illustrate.[23] So what you see is maybe a concrete colour, but you don't see the colours of concrete bodies gleaming into your eyes.[24] You cannot escape your eyes and observe them from the outside. Similarly, you cannot leave your language when you perceive colours. In the *Investigations* Wittgenstein raises the question of how to realize red and ends up with the answer: "I have learned German [language]."[25] The meaning of colour is a form of authentic and

holistic performance. It cannot be isolated from its application and later on being re-embedded as a sterile object into scientific explanations.

What Wittgenstein is claiming here is a form of authenticity. Thomas Rentsch argues—related to the history of modern philosophy—that Wittgenstein is criticizing a scientific metaphysics in which the world is downscaled to objects ("Weltverdinglichung"). In context of this critique, that's Rentsch's point, Wittgenstein is bringing back the phenomenal autonomy of colours: colours are colours, neither objects of scientific measurement nor objects of mathematical description (Rentsch 2000, 342–45). That means that there is no 'red' as such, there are always, e.g., 'red apples' in concrete situations of usage. The meaning of colours is their application related to the holism of our actions and life (ibid., 346f.). Colours have their own reality, even before theoretical engagement (ibid., 349). What does this mean for scientific research, e.g., the cross-disciplinary interpretation of images? It means that it is only possible as holistic form of life, not as isolated single act. It can only be successfully performed by people who are willing and struggling for such a shared form of life—wherein language games of image interpretation are played. Sharing theoretical thoughts is not enough. The methodological aspect in this somehow contingent-tasting conclusion is the already mentioned aspect of reproducibility. What does this concretely mean?

For instance in his *Zettel*—an unstructured mix of aphorisms concerning diverse topics—Wittgenstein claims that all metaphysical aspects, like the harmony between thoughts and reality, can be found in grammar.[26] When Wittgenstein levels metaphysics down to grammar, he also gives a hint to the question of reproducibility: grammar is lived reproducibility. Grammar in a Wittgensteinian sense is philosophical logics of how to repeat meaningful sentences and words. It is not a fixed set of linguistic rules. The concept of grammar is more enactive and subtle, it relates to terminological investigations and language critics: how are we used to using words in meaningful ways in concrete social situations?[27] Colour's nature is not a matter of experimentation but can be found so to say inside the term of colour ("Begriff der Farbe").[28] Many relations connote diverse colour-related terms in several ways.[29] With Wittgenstein it can be concluded that both technological and scientific language follow a unique logic/grammar in which meaning and sense for concrete scientists is enacted. There are many grammars and one of them is characteristic for technoscience. Technoscientific grammar is—as already shown—a holistic form of life, but not a specific theory.

Is then a philosophical theory of technologies and sciences possible? For Wittgenstein philosophy is mainly a methodology of how to criticize inadequate

usage of words. It is not so much about the characterisation of an object, but about how to talk about it.[30] In the case of technoscience it means that philosophy is a methodology (not a fixed theory) of how to talk meaningfully in technoscientific situations. Philosophy is a pragmatic toolbox of how to cope with uncertainty—the uncertainty which is left over after the disappearance of theory; and which enables discoveries of new issues.[31] In his reflections *Über Gewißheit* ("On Certainty," Wittgenstein 1984b [ÜG]) Wittgenstein scrutinised scepticism and the possibility of knowledge. He uses the metaphor of a street, where research is moving on: some sentences are not doubted, they don't belong to the traffic.[32] Again, Wittgenstein develops an epistemology of pragmatic truth: a scientist has a lot of doubts, but he does not doubt the existence of his experimental system.[33] In the process of experimentation, when he/she is performing a situation, pragmatically many things are used, but not raised to the level of a question.[34] With philosophy and language it is similar. Philosophers use words in order to doubt several things. What they are not doubting are words used to describe the doubts.[35] Here Wittgenstein ends up with a *non-Cartesian transcendental turn*: not the pure disembodied process of thinking is the fundamentum of philosophy, but the successful application of words in holistic bodily and socially shared circumstances. Both philosophy as such and the methodology of technoscientific research are forms of practical knowledge. This knowledge enables also colour- and image-interpretation, it is non-propositional and not a psychological state.[36]

Wittgenstein differentiates between logical sentences and empirical sentences.[37] The practical grammar esp. of empirical sentences is something that is not expressed within empirical formulations. The practical grammar serves as condition of possibility and has also been characterized by Rentsch as transcendental grammar ("transzendentale Grammatik," Rentsch 2003). So when e.g., a psychologist describes colour blindness, he/she uses words of non-colour-blind persons. That is one language practical condition of how to do it.[38] The grammar becomes transcendental. This issue has also been investigated by Friedrich Kambartel, who concludes that Wittgenstein's pragmatic turn, including language, implies a more radical understanding of "transcendental" and "condition of possibility" than Immanuel Kant did (Kambartel 1989, 148–50). And also Coeckelbergh includes in his critique on Ihde's understanding of material hermeneutics a hint on this transcendental aspect in Wittgenstein's works (Coeckelbergh 2017, 180–90; see also Coeckelbergh and Funk 2018).

Letzte Schriften über die Philosophie der Psychologie ("Last Writings about Philosophy of Psychology," Wittgenstein 2014c [LPP]) is a summary of pre-studies

Wittgenstein did for his *Investigations*. Some parts, that have not been integrated in the *Investigations,* also contain remarks concerning colours. Here Wittgenstein addresses, e.g., questions of the normativity of natural-scientific sentences. The question is: which conclusion—from an everyday life perspective—sounds plausible and not surprising?[39] How does an empirical sentence relate to the grammar of ordinary socially shared life? So, for instance, there are non-physical terms of pure colours or specific shades. In order to understand these terms Wittgenstein separates the method of physical colour description from the method of ordinary colour description. The later one (ordinary language) is a condition for the first one (physical language). In consequence, the evaluation of a mixed colour depends on an epistemic norm. We focus (from an ordinary point of view) on how a colour *should* look like (in physical terms). Transcendental grammars are normative and include expectations and several kinds of pre-understandings of how a result (of a psychological or physical) colour description *should* look like.[40]

Wittgenstein investigates a philosophy of how to methodologically act in uncertain situations (=methodical action). Especially in the case of cross-disciplinary image interpretation the uncertainty and somehow pragmatic openness relates to two conclusions: 1. colours and terms of elementary colours are not a priori given.[41] 2. There is no pure/sheer colour-term ("Farbbegriff").[42] As shown in this paper, colours are technologically (Ihde) and linguistically (Wittgenstein) constructed. Both, technology and language belong together (Kapp, Coeckelbergh). Methodologically, Wittgenstein's approach is valuable for investigations about technosciences, because in lifeworld-oriented research processes there is no unified overarching theoretical umbrella or meta-perspective. Wittgenstein's philosophy pays attention to exactly this missing point. The internal (epistemic) normativity of transcendental grammars prefigures expectations and therefore concrete language-games. On the other hand, these grammars are also dynamic and depend on social as well as material conditions (like handcraft praxis, bodily tool use etc.). It is Wittgenstein's philosophical strength to have started creating a pragmatic-constructivist approach of language-games, in which the openness and the holism of concrete situations can be conceptualized as form of life. Repeatability and methodic actions are central aspects of Wittgenstein's approach, which are also playing a significant role in philosophy of technology.

Conclusion

In this paper, Ludwig Wittgenstein is interpreted as philosopher of language and technology. Therefore his late writings and primarily *Bemerkungen über die Far-*

ben ("Remarks about the Colours," Wittgenstein 1984a [BF]) have been interpreted in the fourth section (*Ludwig Wittgenstein Concerning Colours*). Part two and three of this paper have been focusing current debates in philosophy of technology and language. The interpretation and application of Wittgenstein's reflections in the previous section led to the following answers/conclusions:

1. A shared and common language in technoscientific working groups cannot be found on the basis of a unified theory, a set of explicit laws or a meta-perspective. Pragmatically successful repetition of actions is the methodic fundamental of linguistic, technical, social or scientific reasoning and knowledge. That's what follows from Wittgenstein's thoughts, such as several methodological consequences:

1. a) Philosophy is a form of *language critique* which emphasizes the meaningful application of words and sentences, it is a form of practical, reflective knowledge and can serve as a (self-)critical technique of how to separate meaningful language from non-sense—it is a way of how to deal practically with uncertainty;

1. b) part of this language critique is the separation between *empirical and logical sentences*, plus the inclusion of *ordinary language*—where language games are performed;

1. c) language practice refers to holistic forms of life which also include technological practice and social practice, socially shared language games create sense on a *transsubjective level*—there is *no disembodied single subject, therefore there is no external observer*;

1. d) within forms of life certain *holistic grammars* are related to logical meaning: grammar here does not refer to linguistic rules of theoretically correct syntax but to the meaning that is created within the usage of words—grammar is a practical term and describes a *transcendental condition of possibility* in a non-Cartesian and non-Kantian pragmatist way;

1. e) *transcendental grammars* pervade ordinary language as a basis of scientific sentences, they include inherent *(epistemic) normativity* as they shape technoscientific expectations (e.g., results of experiments) and prefigure concrete language games—but transcendental grammars are also open, dynamic and depend on social as well as material conditions (like handcraft praxis, bodily tool use etc.);

1. f) a pragmatic idealistic and constructivist methodology describes technoscientific engagement: *ideal use cases are pragmatically constructed* in laboratory environments—performances of construction are seen as pragmatic idealization: the ideal is not a theory or disembodied mental sphere, but a concrete technical and linguistic creation with a methodological motivation;

1. g) with *as-if-descriptions* technoscientific 'objects' are linguistically constructed (additionally to the material construction)—in specific circumstances/situations/contexts;

1. h) repeatable success serves as *pragmatic truth-criteria* for the technical and linguistic constructions and idealizations;

1. i) the circumstances, also the language games and forms of life, of a *successful* pragmatic idealisation must be *reproducible*: grammar is lived reproducibility—which serves as basis for methodical actions.

With Wittgenstein it can be concluded that technoscientific joint language is the process or temporary result of a struggling for successful language games and techno-linguistic forms of life. In terms of 1. a) to 1. i) this process can be methodologically described as methodical actions. It is one challenge for future philosophy of technology to apply and further develop this framework.

2. We can learn from Wittgenstein for the further conceptualization of how to use words and things that both relate to mastered technique ("eine Technik beherrschen"), skilful performance and practical successful performance. Close to conclusion 1. it can be answered that therefore non-propositional knowledge and pragmatic truth-criteria play an important role. Mastered technique means skilful competence and therefore a form of proof. Words and things are co-constituted in socially shared holistic situation, and following a concrete grammar that serves as (non-Kantian) transcendental condition. Pragmatic idealization and constructivism describe how methodologically 'objects' are investigated without an external observer: technical mediation and linguistic construction go hand in hand—both on the basis of tacit knowledge.

3. Following the conclusions 1. and 2. this means concretely e.g., for image interpretation: There are no pure and a priori given absolute colours, because we lack a priori terms for colours. If there would be colours coming out of a Platonic world of abstract ideas, then we would still miss the socially shared language to put them meaningfully into words. Again, here transcendental grammars play a constitutive but also contingent role. Natural sciences do not explain what a colour is. Colour is not a thing but a skilful competence embedded in a holistic practical performance/action/engagement. The meaning of colour is a form of authenticity. In methodological terms: Colours are both technically and linguistically constructed—within methodical actions. Therefore a methodology of cross-disciplinary image interpretation needs to include both aspects: technical mediation and language critics. In performances of pragmatic idealization standard gauges like 'pure white' are constructed. Colours and words are constructed

in shared transsubjective situations of *as-if*-descriptions. Nobody and nothing remains as disembodied or displayed observer or external objective benchmark of comparison. Repeatable performance with words and things is a way of how to compare phenomena like screen images with transsubjective *as-if*-descriptions. So, technoscientific research, including image interpretation, is only possible as holistic techno-linguistic form of life, not as isolated single act. It is a skill of how to methodologically act in uncertain situations.

Notes

1. Original passage: "In der Sprache hört der Unterschied von Kunstwerk und Werkzeug, der sonst durchweg feststeht, ganz auf. Indem sie erklärt, was sie selbst ist, übt sie gerade das | aus, was sie erklären will. Mithin ist sie das Werkzeug, sich als ihr eigenes Werkzeug zu begreifen, also ein vergeistigtes Werkzeug, Spitze und Vermittlung zugleich der absoluten Selbstproduktion des Menschen" (Kapp 2015, 248).
2. BF III 117, 63f.; BF III 184, 80
3. PU 150, 315; PU 199, 344; PU 262, 363; PU 337, 386; PU 520, 437f.; PU 557, 448; PU 626, 468f.; PU 630, 469f.; PU 692, 485
4. BF III 119, 64; BF III 164, 75; BF III 296, 101; BF III 320, 107
5. BF I 1, 13; BF III 8, 42; BF III 9, 42; BF III 10, 42; BF III 130, 67; BF III 131, 67; BF III 135, 68
6. Original passage: "130. Und wie wäre es mit den Menschen, die nur Farb-Form-Begriffe hätten? Soll ich von ihnen sagen, sie *sähen* nicht, daß ein grünes Blatt und ein grüner Tisch, wenn ich ihnen dies zeige, die gleiche Farbe haben oder: daß sie etwas gemein heben? Wie, wenn sie ›darauf nicht verfallen sind‹, verschieden geformte gleichfärbige Gegenstände miteinander zu vergleichen? Dieser Vergleich hatte, in Folge ihrer besonderen Umgebung, keine Wichtigkeit für sie oder nur ganz ausnahmsweise Wichtigkeit, so daß es zur Bildung eines Sprachinstruments nicht kam" (BF III 130, 67).
7. Original passage: "135. Eine *Naturgeschichte* der Farben müßte über ihr Vorkommen in der Natur berichten, nicht über ihr *Wesen*. Ihre Sätze müßten zeitliche Sätze sein" (BF III 135, p. 68).
8. Original passage: "8. Gibt es eine ›Naturgeschichte der Farben‹, und wieweit ist sie analog einer Naturgeschichte der Pflanzen? Ist diese nicht zeitlich, jene unzeitlich?" (BF III 8, 42) "9. Wenn wir sagen, daß »Sattes Gelb ist heller als sattes Blau« kein Satz der Psychologie ist (denn nur so könnte er Naturgeschichte sein)—so heißt das: wir *verwenden* ihn nicht als naturgeschichtlichen Satz, und die Frage ist dann: wie sieht die andere, unzeitliche, *Verwendung* aus?" (BF III 9, 42) "10. Denn nur

so ließe sich der ›farbmathematische‹ Satz vom naturgeschichtlichen unterscheiden" (BF III 10, 42).

9. BF I 22, 18; BF I 70, 27; BF III 124, 65; BF III 188, 80; BF III 206, 84

10. Original passage: "22. Wir wollen keine Theorie der Farben finden (weder eine physiologische noch eine psychologische), sondern die Logik der Farbbegriffe. Und diese leistet, was man sich oft mit Unrecht von einer Theorie erwartet hat" (BF I 22, 18; see also BF III 188, 80).

11. See the references in endnotes 3 and 4.

12. Original passage: "162. Wer den Begriff der Zwischenfarben erhalten hat, seine Technik beherrscht, wer also zu gegebenen Farbtönen weißlichere, gelblichere, bläulichere finden oder mischen kann, u.s.f., den fordere man nun auf, ein rötliches Grün zu wählen oder zu mischen" (BF II 162, 74).

13. Original passage: "244. Grau und schwach erleuchtetes oder leuchtendes Weiß kann in *einem* Sinne die gleiche Farbe sein, denn wenn ich dieses *male*, muß ich vielleicht auf der Palette jenes mischen" (BF III 244, 90).

14. Original passage: "3. Lichtenberg sagt, nur wenige Menschen hätten je reines Weiß gesehen. So verwenden also die meisten das Wort falsch? Und wie hat *er* den richtigen Gebrauch gelernt?—Er hat nach dem gewöhnlichen Gebrauch einen idealen konstruiert. Und das heißt nicht, einen bessern, sondern einen in gewisser Richtung verfeinerten, worin etwas auf die Spitze getrieben wird" (BF I 3, 13). "4. Und freilich kann ein so konstruierter uns wieder über den tatsächlichen Gebrauch belehren" (BF I 4, 13). "5. . . . Es könnte sein, daß ich, im Laboratorium etwa, einen verfeinerten Begriff von Weiß verwendete (wie z.B. auch einen verfeinerten Begriff der genauen Zeitbestimmung)" (BF I 5, 14). See also in alternate formulation BF III 35, 48; BF III 36, 48; BF III 160, 74.

15. Original passage: "262. Ich möchte sagen »An *dieser* Stelle in meinem Gesichtsfeld ist *diese* Farbe (ganz abgesehen von jeder Deutung)«. Aber | wozu gebrauche ich diesen Satz? *»Diese«* Farbe muß ja eine sein, die ich reproduzieren kann. Und es muß bestimmt sein, unter welchen Umständen ich von etwas sage, es habe diese Farbe" (BF III 262, 93f.).

16. Original passage: "569. Die Sprache ist ein Instrument. Ihre Begriffe sind Instrumente. . . . Wie man schließlich mit Fuß und Zoll Physik treiben kann, sowie mit m und cm; der Unterschied sei doch nur einer der Bequemlichkeit. Aber auch das ist nicht wahr, wenn, z.B., Rechnungen in einem Maßsystem mehr Zeit und Mühe erfordern, als wir aufwenden können" (PU, 452).

17. Original passage: "178. . . . Es gibt offenbar eine Methode, ein gerades Lineal anzufertigen. Diese Methode schließt ein Ideal ein, ich meine, ein Näherungsverfahren mit unbegrenzter Möglichkeit, denn eben dieses Verfahren ist das Ideal" (PB, 218).

18. BF I 56, 24; BF III 108, 61f.; BF III 127, 66; BF III 251, 91; BF III 264, 94; BF III 265, 94

19. Original passage: “78. Die Unbestimmtheit im Begriff der Farbe liegt vor allem in der Unbestimmtheit des Begriffs der Farbengleicheit, also der Methode des Vergleichens der Farben” (BF III 78, 56). “259. . . . Wie bestimmte ich nun, daß eine Oberfläche (z.B.) diese Farbe habe? Alles kommt auf die Vergleichsmethode an” (BF III 259, 93).

20. Original passage: “42. . . . Es gibt ja kein allgemein anerkanntes Kriterium dafür, was eine Farbe sei, es sei denn, daß es eine unsrer Farben ist” (BF III 42, p. 49).

21. Original passage: “224. . . . Daß aber etwas ›leuchtend aussehen‹ kann, das macht die Verteilung der Helligkeiten im Gesehenen, aber es gibt auch ein ›etwas *als* leuchtend sehen‹, man kann unter gewissen Umständen reflektiertes Licht für das Licht eines leuchtenden Körpers halten” (BF III 224, 87). “276. . . . So würde ich die *Photographie* beschreiben, und wenn einer sagte, das beschreibe nicht sie, sondern die Objekte, die wahrscheinlich photographiert wurden, so könnte ich nur sagen, das Bild sieht so aus *als wären* die Haare von dieser Farbe gewesen” (BF III 276, 96f.).

22. Wittgenstein formulates a similar thought in the following formulation: “14. . . . Es gibt ja kein allgemein anerkanntes Kriterium dafür, was eine Farbe sei, es sei denn, daß es eine unserer Farben ist” (BF I 14, 6).

23. BF III 323, 107f.; BF III 325, 108; BF III 326, 108; BF III 327, 108

24. Original passage: “20. Ich *sehe* nicht, daß die Farben der Körper Licht in mein Auge reflektieren” (BF II 20, 38).

25. Original passage: “381. Wie erkenne ich, daß diese Farbe Rot ist?—Eine Antwort wäre: »Ich habe Deutsch gelernt.«” (PU, 400).

26. Original passage: “55. Wie alles Metaphysische ist die Harmonie zwischen Gedanken und der Wirklichkeit in der Grammatik der Sprache aufzufinden” (Zettel 55, 280).

27. BF I 51, 23; BF I 72, 28; BF I 73, 28; BF I 82, 30; BF III 61, 53; BF III 71, 55; BF III 72, 55; BF III 112, 63; BF III 122, 65; BF III 173, 77f.; BF III 213, 85; BF III 301, 102; BF III 302, 102; BF III 303, 102; BF III 317, 105f.; BF III 335, 110; BF III 336, 110

28. Original passage: “71. Wer mit Goethe übereinstimmt, findet, Goethe habe die *Natur* der Farbe richtig erkannt. Und Natur ist hier nicht, was aus Experimenten hervorgeht, sondern liegt im Begriff der Farbe” (BF I 71, 28; see also in alternate formulation BF III 125, 65).

29. BF I 54, 23; BF III 50, 50; BF III 75, 56; BF III 190, 81; BF III 239, 89; BF III 241, 89f.; BF III 255, 92

30. Original passage: “43. Man muß in der Philosophie nicht nur in jedem Fall lernen, *was* über einen Gegenstand zu sagen ist, sondern *wie* man über ihn zu reden hat. Man muß immer wieder erst die Methode lernen, wie er anzugehen ist” (BF III 43, 50); see also BF II 11, 36; BF III 33, 47).

31. Original passage: "15. In jedem ernsteren philosophischen Problem reicht die Unsicherheit bis an die Wurzel hinab. Man muß immer darauf gefaßt sein, etwas *ganz* Neues zu lernen" (BF I 15, 16); see also in similar formulation BF III 44, 50; BF III 45, 50; and in different formulation BF III 63, 54.

32. Original passage: "88. Es kann z.B. sein, daß *unser ganzes Forschen* so eingestellt ist, daß dadurch gewisse Sätze, wenn sie ja ausgesprochen werden, abseits allen Zweifels stehen. Sie liegen abseits von der Straße, auf der sich das Forschen bewegt" (ÜG 88, 137).

33. Original passage: "337. . . . Wenn ich experimentiere, so zweifle ich nicht an der Existenz des Apparates, den ich vor Augen habe. Ich habe eine Menge Zweifel, aber nicht *den*. Wenn ich eine Rechnung mache, so glaube ich, ohne Zweifel, daß sich die Ziffern auf dem Papier nicht von selbst vertauschen, auch vertraue ich fortwährend meinem Gedächtnis und vertraue ihm unbedingt" (ÜG 337, 185).

34. ÜG 341, 186; ÜG 342, 186; ÜG 343, 187

35. E.g., BF III 348, 112

36. BF III 308.–312, 103f.; BF III 350, 112; see also, e.g., PU 75, 282f.; PU 78, 284; PU 150.–151, 315f. For Wittgensteins remarks about psychology as empirical science in which human behavior is observed and described—including his critiques—see BF I 79, 30; BF I 80, 30; BF I 88, 31; BF III 230, 88; BF III 319, 106; BF III 337, 110; BF III 338, 110

37. BF I 32, 20; BF I 69, 27; BF I 84, 30; BF III 3, 41; BF III 4, 41; BF III 19, 44; BF III 211, 84f.; BF III 221, 86; BF III 229, 87f.; BF III 315, p. 105

38. Original passage: "55. Die Beschreibung der *Phänomene* der Farbenblindheit gehört zur Psychologie. Also auch die der Phänomene des normalen Farbsehens? Gewiß,—aber was setzt so eine Beschreibung voraus, und für wen ist es eine Beschreibung, oder besser: welcher Hilfsmittel bedient sie sich? Wenn ich sage, »Was setzt sie voraus?« so heißt das, »Wie muß einer auf *sie* schon reagieren, | um sie zu *verstehen*?« Wer in einem Buch die Phänomene der Farbenblindheit beschreibt, beschreibt sie mit den Begriffen der Sehenden" (BF III 55, 51f.).

39. Original passage: "207. Wenn die Farben in der Welt des Menschen eine andere Rolle spielten, als in der unsern, welche Folgen hätte das für die Farbbegriffe? Das ist eigentlich eine naturwissenschaftliche Frage, und eine solche will ich nicht stellen. Eher die: Welche Folgen kämen uns plausibel vor? Welche Folgen würden uns nicht überraschen?" (LPP 39, 381).

40. Original passage: "215. Es scheint uns einen Begriff der Farbenmischung zu geben, der über dem aller physikalischen Methoden der Farbenmischung steht. So daß wir also von so einer Methode sagen können: sie bewirkt noch am ehesten die 'reine' Farbenmischung, z.B, 216. Wir beurteilen also, ob nach unserem Begriff die beiden Farben a und b wirklich die Farbe c geben *sollen*" (LPP 215–16, 382).

41. Original passage: "69. . . . Ich will damit eigentlich zeigen, daß es gar nicht a priori klar ist, welches die *einfachen* Farbbegriffe sind" (BF III 69, 55).

42. Original passage: "73. Es gibt nicht den reinen Farbbegriff" (BF III 73, 56).

Abbreviations

BF	"Bemerkungen über die Farben" (Wittgenstein 1984a).
LPP	"Letzte Schriften über die Philosophie der Psychologie" (Wittgenstein 2014).
PB	*Philosophische Bemerkungen* (Wittgenstein 1984c).
PU, *Investigations*	"Philosophische Untersuchungen" (Wittgenstein 2006).
ÜG, *On Certainty*	"Über Gewißheit" (Wittgenstein 1984b).
Zettel	"Zettel" (Wittgenstein 1984d).

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