

**From description to reduction:
remarks on the phenomenological role of reflection ***

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Abstract: This article analyses the fundamental relation between Husserl's theory of reflection in the first volume of the *Ideas pertaining to a pure phenomenology* and the two main concepts upon which transcendental phenomenology is grounded: namely, description and reduction. Although the concept of reflection was already used in the *Logical Investigations*, Husserl revised it entirely thanks to his analysis of time-consciousness in the 1905 Lectures. Reflection thus appears as a key-concept in understanding the 'turn' that led Husserl to deeply modify his descriptive method in order to move to transcendental phenomenology.

Reflectivity does not seem at first blush to be a theme somehow likely to shed light on the understanding of the *Ideas*, insofar as Husserl allows very little space in his 1913 book to this concept. Only a few paragraphs are devoted to the analysis of reflection, and the concept itself does neither look new nor original: Husserl already used it in 1901 in his *Logical Investigations* in order to provide some grounds for phenomenological description of lived-experiences. Consequently, reflection does not seem to play a fundamental part within the development of transcendental phenomenology, nor to be a key-concept of the *Ideas*. It must be noted however, that the notion of reflection keeps coming back as an on-going question that runs through the main articulations of the *Ideas*. Moreover, it is worth pointing out that the concept of reflection appears both before and after the transcendental reduction, which seems to indicate that Husserl did not consider it to be only a psychological device that supports phenomenological description and makes it possible. This point raises two questions, regarding the methodological status of reflection on the one hand, and its peculiar role within the process of transcendental reduction on the other hand. I will argue that, far from being a

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secondary theme of phenomenology, reflection is fundamental not only in order to understand the *Ideas*, but also (and more essentially) in order to make sense of the turn that reoriented phenomenology towards a transcendental perspective between the *Logical Investigations* (1901) and the *Ideas* (1913). So the leading thread of my paper is an investigation of the relation between two ways of performing reflective acts: namely psychological and transcendental reflection.

§1. Psychological and phenomenological reflection

The relation between reflection and description is not difficult to understand. Twelve years after he first stressed the importance of reflection with respect to phenomenological method in the introduction to the *Logical Investigations*, Husserl still emphasizes its “universal methodological function” in the *Ideas*: §77 “The phenomenological method operates exclusively in acts of reflection” (Husserl 1983, 174). Indeed, insofar as phenomenology claims to describe the structures of consciousness and its intentional relation to objects, it presupposes that lived-experiences can be somehow given to us in order for us to be able to describe them. Reflection is then characterized as the “essentially necessary condition of possibility” of phenomenology (Husserl 1983, 184), insofar as it provides us with an access to consciousness and makes lived-experiences describable. Reflection, in other words, bestows a certain kind of self-transparency on consciousness, since it guarantees that the ego and its lived-experiences can be reached through intuition and seized upon immanently.

But what specific kind of reflection are we speaking about? The answer to that question is not entirely clear in the *Ideas*. Husserl first introduces the concept of reflection in the second part of the book, where he considers the “psychological reflection” that we can effect “on our ego and its mental living” without “relinquishing the natural attitude” and “without troubling ourselves with any phenomenological *epoché*” (Husserl 1983, 67). However, Husserl stresses later on (in §51) the necessity to bring this psychological form of reflection to a higher level and to perform it as a strictly phenomenological act of reflecting, which can happen only after transcendental reduction has been accomplished. Reflection becomes then in the third part of the book nothing less than a fundamental structure of pure consciousness, and its phenomenological status has changed. Reflection is no longer characterized as a psychological and empirical property of psychic phenomena: it is understood as an essential law of transcendental consciousness. There is a tremendous gap between those two modes of reflection, as big a gap as the one that opposes phenomenology

to psychology, or the transcendental analysis of the essential structures of consciousness to the empirical study of psychic phenomena. Nonetheless, even before reduction has been accomplished, and as we are still supposed to stick to the natural attitude, Husserl anticipates this major phenomenological shift when he writes in §38 that the essence of the cogitatio “involves the essential possibility of a *reflective turning of regard*” so that the cogitatio itself becomes “the object of a so-called ‘internal perception’” (Husserl 1983, 78). The question, then, is whether psychological reflection as such leads to a shift of attitude thanks to which one can effect reflection as a transcendental act of the pure Ego, or whether transcendental reflection requires the transcendental reduction in order to be performed.

2. The problem of skepticism

In order to understand how we can answer to that question, we need to make a detour and to examine a possible objection that Husserl himself raises against his own theory, naming it the problem of ‘methodological skepticism’ (Husserl 1983, 181). Interestingly, this objection comes from H.J. Watt who used it against the psychological use of introspection defended by Theodor Lipps (Watt 1907). Husserl extends it to his own theory, claiming that it might as well threaten the possibility of phenomenology as such. Watt points out the *temporal gap* that separates the presence of a lived-experience from the later act of reflection that takes this past experience as its object. As he states, “the actuality of the present Ego and the present consciousness-processes” is “merely lived, not ‘known’, i.e. not seized upon reflectively” (quoted in Husserl 1983, 182). To be living an experience and to reflect on it are two essentially different modes of consciousness: while the former is characterized by its openness to the world and is intentionally directed towards it, the latter is on the contrary turned towards a previous lived-experience that has to be already past/over in order to be intended as the object of a new act of reflection. Emphasizing the gap between the experience “merely lived” and reflected upon (or between what Sartre calls unreflected and reflected consciousness), Watt’s objection raises a doubt about the possibility to know reflectively any of our conscious life and contests the epistemic legitimacy of reflection: “Each of us lives mentally. Only he does not *know* it. And if he were to know it, how can he know that his mental living is in actuality absolutely thus as he thinks it is?” (Husserl 1983, 183). Husserl does not underestimate the extent of this objection, which is according to him likely to weaken the very principles of phenomenology: “What could be made of phenomenology if it could make statements about the essence of “known”, reflectionally modified mental processes but not about mental processes pure and simple? What should it be if “one can

scarcely even inquire into the likelihood of how one arrives at cognition of immediate mental living?” (Husserl 1983, 184).

§3. Introspection and reflection

However, this skeptical objection is not new to Husserl. One might assume that the reason why Husserl takes Watt’s remarks so seriously is precisely that they echo his own discussion of Brentano’s psychology in the *Logical Investigations* and bring out his earlier attempt to extract phenomenology from the shortcomings of empirical psychology. Reacting against Wundt’s experimental psychology, which focused exclusively on the external/physical conditions of inner phenomena (Wundt 1874), Brentano set the basis of a strictly descriptive method in psychology that emphasizes first-person access to one’s own mental states. Following the British empiricist tradition from Locke to Stuart Mill, and in opposition to Auguste Comte’s positivism, Brentano restores the role of inner experience in psychology, denying that physical laws can apply to mental phenomena and provide a satisfactory account of them: contrary to physical phenomena, psychic phenomena are specifically given to inner perception. According to such theory, inner experience is then not only the mode of givenness of mental phenomena, but also the epistemic basis of psychological knowledge. Psychic phenomena are such that they always seize upon themselves immediately with absolute evidence (Brentano 1995, 70).

However, Brentano needs to make a distinction between the way a psychic phenomena seizes upon itself and its relation to an object. If, for instance, I hear a specific sound, this sound is the primary object of my act of hearing while the hearing itself must be characterized as the secondary object of the very same act: “In the same mental phenomenon in which the sound is present to our minds we simultaneously apprehend the mental phenomenon itself” (Brentano 1995, 98). Only the primary object is the intentional target towards which this psychic phenomenon is directed, whereas the act of hearing is not properly intended as such. Consequently, this distinction urges Brentano to distinguish strictly between inner perception (*innere Wahrnehmung*) and “inner observation” (*innere Beobachtung*): whereas inner observation is intentionnally turned towards mental phenomena and takes them as primary objects, inner perception is described as a direct and immediate consciousness that does not require any objectification of the mental phenomena (Brentano 1995, 22). This is very clear for instance with a phenomenon like anger, which is experienced as it is lived through but is lost whenever it becomes observed, and then taken as a primary object: “if someone is in a state in which he wants to observe his own anger raging within him, the anger

must already be somewhat diminished, and so his original object of observation would have disappeared” (Brentano 1995, 22).

Brentano thus concurs that inner observation misses the specificity of living mental phenomena, without needing to draw the conclusion that psychic phenomena are inaccessible to inner perception: “no simultaneous observation of ... one’s own mental acts is possible at all. We can observe the sounds we hear (*the primary object of the mental phenomenon*) but we cannot observe our hearing of the sounds (*the secondary object*), for the hearing itself is only apprehended concomitantly in the hearing of sounds” (Brentano 1995, 99). Consequently, Brentano holds that although we do perceive inwardly our present mental phenomena while we are living them, we can only observe and analyse them retrospectively, thanks to memory, as past phenomena (Brentano 1995, 26). So this is why descriptive psychology is necessarily empirical and retrospective, according to Brentano. But the point is that we can still bring back the memory of the phenomenon as it was inwardly perceived, and not only as the intentional object of an act of observing.

§4. Reflection and inner perception in Husserl’s Logical Investigations

So in a way, Brentano was not that far from Watt’s objection against the role of reflection and introspection in psychology, even if the former admits inner perception while the latter explicitly rejects it. It is still true, for both Brentano and Watt, that an ‘absolute description’ of mental phenomena as such is impossible, since reflection can be nothing but a kind of retrospective observation of our mental states. Yet, far from denying such analysis, Husserl attempted to radicalize it in his *Logical Investigations* in order to set the strictly phenomenological concept of description. However, as we will see, such radicalization led Husserl to somehow restore the role of reflection within phenomenology, although Brentano’s psychology urges us to get rid of it.

In the appendix to the *Logical Investigations*, Husserl contests the legitimacy of inner perception on behalf of the intentionality thesis. Husserl sees a contradiction in the fact that mental phenomena, though intentional, can be directly seized upon through inner perception: according to Brentano, “psychic phenomena are not only conscious but at the same time contents of consciousness, and also in this case, objects of consciousness in the narrower sense of perception” (Hua XIX/2, 758). Husserl then denies that an intentional mental phenomenon can be at the same time lived through and apprehended as its own secondary object. If mental phenomena are intentional, they need to be experienced as directed towards an object that is constituted as such through this very consciousness process,

although natural attitude prevents us to be aware of this constitution process. Accordingly, there is no possible exception to the intentionality thesis in the *Logical Investigations*: a mental act that sizes upon itself necessarily seizes upon itself *as an object*, while on the other hand, a mental phenomenon that would not be intentionally directed towards an object, as for instance a pure sensation, could not be properly experienced as such: being an experience of *nothing*, it is purely and simply not an experience at all (Hua XIX/1, 378-379). If all mental phenomena are intentional, as Brentano claims, then our access to mental phenomena needs to be intentional as well, which means that one's own lived-experiences can only be seized upon through an intentional objectification, and as the primary object of another lived-experience.

This is the reason why his radicalization of Brentano's intentionality thesis leads Husserl to emphasize the role of reflection within phenomenological description. Reflection needs precisely to be understood as the only access one has to her own lived-experience in order to describe it. Nonetheless, reflection is characterized as a new intentional mode of consciousness rather than a direct and immediate access to one's own mental phenomena: it is an act that takes a previous lived-experience as its intentional or primary object.

§5. The reflective distance

Consequently, according to Husserl, we are forced to admit that we only access to our own lived-experiences through a reflective modification that objectifies them, making mental phenomena its objects. The *Logical Investigations* here express a view that seems very close to one of the fundamental thesis defended later in the *Ideas*, where Husserl stresses that reflection adds an intentional modification to the lived-experience reflected upon: “‘reflection’ of any kind has the characteristic of being a *modification of a consciousness* and, moreover, a modification which essentially *any consciousness* can undergo. We speak here of modification because any reflection is, according to its essence, the consequence of changes in attitude whereby an already given mental process or really immanent Datum thereof (one not modified reflectively) undergoes a certain transmutation precisely into the mode of consciousness (or object of consciousness) reflectively modified” (Husserl 1983, 178). However, although Husserl kept maintaining that reflection entails a necessary modification of the lived-experiences reflected upon, the conclusions that he drew on this basis are not at all the same in the *Logical Investigations* and in the *Ideas*, so before and after the transcendental turn. I will quickly attempt to show why.

Since reflection appears to be in the *Logical Investigations* the only access to one's mental phenomena that is left once inner perception has been discarded, Husserl keeps

emphasizing the irreducible temporal gap between living through a mental phenomena and reflecting upon it: the lived-experiences need to be objectified through reflection before they can be described. Accordingly, the reflective modification is not only understood as a shift of attitude, but more radically as an alteration of the mental phenomenon itself (Hua XIX/1, 6-7). The lived-experience loses its living and unreflected character when it is made an object by reflection, and the unreflected experience as such is never directly accessible. “We perform description on the basis of an objectifying act of reflection (...). Plainly an essential descriptive change has occurred. The original act is no longer simply there, we no longer live in it, but *we attend to it and pass judgment on it.*” (Hua XIX/1, 391) Phenomenological description is still based in the *Logical Investigations* on the empirical mental processes, retrospectively given through reflection[†]. Such reflection is then to be understood as a temporal part of our flow of consciousness, which is logically independent from the previous part of the flow that has become its object. Those two different modes of consciousness, living through an experience and reflecting upon an experience, are thus temporally incompatible. Reflection comes always too late, since there is an irreducible delay between a lived-experience and the reflection that necessarily has to follow it. The living-present of the experience as such is evasive and logically indescribable.

§6. The temporal analysis of reflection

Such conclusion is, again, strikingly close to Watt’s objection against reflection and to his rejection of ‘absolute description’, which is probably the true reason why Husserl is so concerned by Watt’s remarks in the *Ideas*. Although the latter target specifically the role of reflection in psychology, they echo perfectly a theoretical issue that Husserl himself met at the time he was setting the methodological basis of phenomenology: reflective modification *a priori* forbids any comparison between the reflected and unreflected lived-experiences, which means that there is no way to verify or to guarantee the adequacy between the phenomenological description and the lived-experience it is supposed to describe. However, Husserl’s conclusions in the *Ideas* were totally different, although he keeps stressing the necessary modification that reflection entails. Indeed, in 1913, Husserl holds that such a modification does not alter the lived-experiences as much as he first thought in 1901: “we see

[†] This is also the reason why Husserl, in the 8th section of the 5th *Logical Investigation* takes on Hume’s critique of the cartesian cogito, against Natorp’s claim regarding the « pure I »: we can only describe our empirical I, and not our so-called transcendental ego. By making the me its object, reflection necessarily deprives the I of its purely subjective dimension and is unable to grasp it as a transcendental ego.

with the most perfect clarity and with the consciousness of unconditioned validity that it would be countersensical ... to doubt whether mental processes which become the object of a regard are not, as a consequence, converted *toto coelo* into something different” (Husserl 1983, 181). Something definitely shifted between the *Logical Investigations* and the *Ideas*: Husserl’s analysis of the temporal dimension of consciousness in the famous lectures he gave in 1905 allowed him to solve the issues he was dealing with in his first phenomenological work, and to engage phenomenology in a major turn that would later be called ‘transcendental’. Whereas his logical analysis of the mental processes led Husserl to emphasize the irreducible gap between the living present of the lived-experience and its objectification through reflection, the discovery of the essentially temporal structure of consciousness opened a new route towards a resolution of this problem.

Indeed, as the 1905 lectures have shown, the relation between consciousness and time is not contingent or secondary: it belongs to the very essence of consciousness as such. “The essential property, which the term temporality expresses for any mental process whatever, not only designates something universally belonging to every single mental process, but also a *necessary form combining mental processes with mental processes*. Each actual mental process ... is necessarily an enduring one” (Husserl 1983, 194). Consequently, the temporal gap that separates the living present from the past lived-experience I can retrospectively reflect upon should not be understood as a shortcoming of my consciousness, since it displays on the contrary the very law of its existence. Insofar as consciousness is intrinsically temporal, it is an essential feature of lived-experiences that they can only be given through different temporal modalities without being altered by temporal modifications. The same mental process can be either lived through in the living-present or seized upon as past through reflection; the modification that is here in question is nothing but an ‘ideal possibility’ (Husserl 1983, 174) of consciousness that does not turn the lived-experience reflected upon into another one. Husserl manages in this way to incorporate the temporal constraint that reflection implies to the essence of consciousness as such. As he writes in §45:

“The kind of being belonging to mental processes is such that a seeing regard of perception can be directed quite immediately to any actual mental process as an originary living present. This occurs in the form of ‘*reflection*’, which has the remarkable property that what is seized upon perceptually in reflection is characterized fundamentally not only as something which exists and endures while it is being regarded perceptually but also as something which *already existed before* this regard was turned to it. ... *The sort of being which belongs to the mental process is such that the latter is essentially capable of being*

perceived in reflection” (Husserl 1983, 98). Reflectivity is a fundamental and not accidental property of lived-experiences, whose temporality is intrinsically modifiable. Such a modification is then one “which essentially *any consciousness* can undergo” (Husserl 1983, 178). Husserl meets here a fundamental point he brought out in his 1905 lectures: as fluent, lived-experiences are constantly undergoing some temporal modifications that do not alter them as such, since they are essential to them: “Each living present of consciousness is subjected to the law of modification” (Hua X, 29).

Insofar as a lived-experience temporally stretches, it is such that its unity cannot be seized upon as something static and a-temporal: “it is the case of a lived-experience that it is never perceived completely, that it cannot be adequately seized upon in its full unity. A lived-experience is, with respect to its essence, in flux which we, directing the reflective regard to it, can swim along after it starting from the Now-point” (Husserl 1983, 97). Consequently, the living-present itself can only make sense in relation with a past background on the basis of which it occurs, and that is somehow retained in the present itself so that we can essentially go back to this past dimension of the lived-experience through a reflective modification: “in itself every mental process is a flux of becoming...; it is a continuous flow of retentions and protentions mediated by a flowing phase or originarity itself in which there is consciousness of the living now of the mental process in contradistinction to its “before” and “after”” (Husserl 1983, 179). The living present is constantly retained as it flows in what Husserl calls a “retentional consciousness”: it is not only a consciousness *of the past*, but a living present consciousness of the just passed experience as retained in the enduring present of this new consciousness. Husserl draws on the distinction between primary and secondary memories that he established in 1905: while the primary memory of a melody just heard retains it within the living-present of one’s consciousness as a “presence in flesh and blood”, the secondary memory loses the living character of the experience and provides a new representation that reproduces this past experience *as past*. Consciousness of the just passed experiences is as well a “presentative consciousness” as consciousness of the now.

Consequently, one must distinguish several levels of reflectivity: I can direct my regard towards my past feeling of joy as a secondary memory, but I can also intend my just passed feeling of joy that is enduring and still present in my living experience as a primary memory. In the second case, the reflective modification does not reject the lived-experience into the past as if it was a secondary but brings it on the contrary to the living-present. Thus, instead of creating a temporal gap between the act of reflection and the lived-experience reflected upon, reflection guarantees the unity of consciousness in spite of the modification

that it entails. This thesis allows Husserl to resolve Watt's objection against reflection: "However thorough the alteration which the mental processes of actional consciousness undergo in consequence of their going over into non-actionality, the modified mental processes still continue to have a significant community of essence with the original ones. The modified cogitatio is also consciousness, and consciousness of the same thing as that intended to in the corresponding unmodified consciousness" (Husserl 1983, 73). The reflective modification as such can even be seized upon thanks to a new act of a reflection that discloses the relation between modified and unmodified consciousness: "on the other hand, there exists the possibility of paying attention to the rejoicing advertence to it and, by contrast, to seize upon the lack of a regard adverted to it in the phenomenon which has run its course. But also with respect to the rejoicing which as subsequently become an object, we have the possibility of effecting a reflection on the reflection which objectivates the latter and of thus making even more effectively clear the difference between a rejoicing which is *lived*, but not regarded, and a *regarded* rejoicing; likewise the modifications which are introduced by the acts of seizing-upon, explicating, etc., which start with the advertence of regard" (Husserl 1983, 176). Reflection is not only a modification of consciousness but a modification that is likely to seize upon itself and to know itself *as a modification*. Modification can then be understood as a way for consciousness to access to itself rather than a transformation of the lived-experience that loses its living character.

§6. The epistemic thesis on reflection

Accordingly, Husserl is able to affirm in §78 that "in generical eidetic universality" we seize upon "*the absolute legitimacy of reflection on perceiving something immanent*" (Husserl 1983, 180). The epistemic status of reflection is then totally revisited, since reflection can then no longer be suspected to objectify mental phenomena and to miss the unreflected character of lived-experiences. Reflection seizes upon one's own lived-experiences as an absolute givenness which existence cannot be doubted upon: "If reflective seizing-upon is directed to a lived-experience of mine, I have seized upon something absolute itself, the factual being of which is essentially incapable of being negated... It would be a countersense to believe it possible that a mental process *given in that manner* does *not* in truth exist." (Husserl 1983, 100) In conclusion, I want to draw two major consequences of this epistemic thesis on reflection:

1/ The first consequence concerns the relation between the *Ideas* and the *Logical Investigations*. Whereas his analysis of reflection prevented Husserl from extending the scope

of phenomenological investigation to the “pure Ego” in 1901, it is no longer the case in 1913. Understanding reflection as a psychological process, Husserl considers in the *Logical Investigations* that phenomenology has to borrow the object of its descriptions to psychology. Consequently, he claims with Hume and against the Cartesian cogito that only the empirical Ego can be given through reflection, which created troubles when he attempted to rewrite these paragraphs in 1913. However, in the *Ideas*, the absolute evidence of reflection permits access to the “pure Ego” as such, and opens the field of transcendental egology. Insofar as it provides us with absolute data, reflection discloses the lived-experiences *as ours* and enables us to apprehend ourselves as “pure subjects” of these lives. Reflection reveals the transcendental egological structure of all consciousness and provides the highest possible evidence about oneself, according to which “I say unqualifiedly and necessarily that I am, this life is, I am living, cogito” (Husserl 1983, 100). Contrary to the *Logical Investigations*, Husserl is now on Descartes’ side, and against Hume. Although he already used reflection as methodological device of phenomenology, reflection occupies a fundamental function in the process that is supposed to lead us from an empirical description of our psychic phenomena to the disclosure of the transcendental ego.

2/ Second: since the phenomenological use of reflection enables us to seize upon our lived-experience “as something absolute itself”, it brings out the distinction between immanence and transcendence and reveals the fundamental asymmetry between being as consciousness and being as reality. “A veritable abyss yawns between consciousness and reality. Here, an adumbrated being, not capable of ever becoming given absolutely, merely accidental and relative; there, a necessary and absolute being, essentially incapable of becoming given by virtue of adumbration and appearance” (Husserl 1983, 111). The relation between consciousness and reality must then be spectacularly reversed as follows: “The being which is first for us is second in itself; i.e., it is what it is, only in “relation” to the first”. Since reflection allows us to “direct our seizing and theoretically inquiring regard to *pure consciousness in its own absolute being*” (Husserl 1983, 113), it constitutes the necessary ground for the radical shift that occurs in the §50 of the *Ideas*. Reflection is at the core of transcendental attitude, which Husserl describes as follows: “we *prevent the effecting* of all ... cogitative positings, i.e., we “parenthesize” the positings effected... Instead of living in them, instead of effecting them, we effect acts of reflection directed to them; and we seize upon them themselves as the *absolute being* which they are” (Husserl 1983, 114). Insofar as reflection seizes upon consciousness as an absolute being, it allows us to move from the mere *epochè* to the proper phenomenological reduction, which “does not mean a mere restriction of

judgement to a connective part of actual being as a whole” (Husserl 1983, 115). Reflection urges us to acknowledge “that there is such thing as the field of pure consciousness ... which is not a component part of Nature” (Husserl 1983, 114-115). Consciousness is no longer understood as a “phenomenological *residuum*” and can be analysed as the primal constituent region (*Ur-Region*).

Reflection, from this point of view, seems to be purely and simply identical to transcendental reduction, since the latter is nothing but the result of the former. Reflection can then be understood as the key methodological concept that opens the gate of transcendental phenomenology: starting within natural attitude as a psychological reflection, it enables us to enter the “infinite field of absolute lived-experiences” and to effect transcendental reduction (Husserl 1983, 114). From this point of view, it seems that, anticipating Husserl’s claim in the last part of the *Krisis*, the *Ideas* already open a psychological way towards reduction.

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The phenomenological reduction is at once a description and prescription of a technique that allows one to voluntarily sustain the awakening force of astonishment so that conceptual cognition can be carried throughout intentional analysis, thus bringing the "knowing" of astonishment into our everyday experience. The section on the historical background of the phenomenological reduction will serve to show that this procedure does not arrive as "a bolt out of the blue," as it were; rather, it appears as the logically required solution to a specific problem. The problem that it addresses is the problem of the adequacy of the foundations of scientific inquiry.

@article{Koenderink1998PhenomenologicalDO, title={Phenomenological description of bidirectional surface reflection}, author={J. Koenderink and A. Doorn}, journal={Journal of The Optical Society of America A-optics Image Science and Vision}, year={1998}, volume={15}, pages={2903-2912} }. J. Koenderink, A. Doorn. Published 1998. Physics. Journal of The Optical Society of America A-optics Image Science and Vision. General surface scattering is characterized through the bidirectional reflection distribution function (BRDF). For isotropic surfaces the BRDF depends only on the absolute value of the difference between the azimuths of the

CONTINUE READING. View PDF. Save to Library. Create Alert. Cite. In this paper I investigate the phenomenological approach to foundations of mathematics. Phenomenological reflection plays the certain role in extension of mathematical knowledge by clarification of meanings. The phenomenological technique pays our attention to our own acts in the use of the abstract concepts. Mathematical constructions must not be considered as passive objects, but as categories are given in theoretical acts, in categorical experiences and in our senses. Phenomenology moves like a category theory from formal components of knowledge to the dynamics of constitutive process.