*Formal and Transcendental Logic*

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*Introduction*

In 1937, less than a year before his death, Husserl wrote in a letter to a friend that he (Husserl himself) should study *Formal and Transcendental Logic* regularly. He explained that he found the work difficult, although overall he claimed to be rather satisfied with it. And he added, “it is my most mature work, even if too concentrated” (Schuhmann 1977, 484-485). Husserl seems to have thought that he had managed to capture something precious that kept slipping away from him, so that he had to keep studying his own text.

Unfortunately, Husserl’s own self-assessment about the value of the work has not been commonly shared among the philosophers, not even the most faithful Husserlians. Suzanne Bachelard is a rare exemption: in her study of Husserl’s *Formal and Transcendental Logic* she writes that the work is “the most revealing book on the method and intent of phenomenology,” and she continues: “Investigations, provisional exposition of the broad lines of phenomenology, meditations, lectures – these are Husserl’s other works. *Formal and Transcendental Logic* is a *book* – *the* book by Husserl” (Bachelard 1968, XXX). I agree and will here try to give at least a glimpse of what an inexhaustible, even if not easily succumbing, gem the work is.

*Formal and Transcendental Logic* was published in 1929, a year following Husserl’s retirement from Freiburg. Previous year Husserl had still lectured on phenomenological psychology (in particular on Dilthey’s views) and then on empathy (Schuhmann 1977, 332, 334, 338). *Formal and Transcendental Logic* was written in few months, essentially between November of 1928 and January 23, 1929 (Husserl 1973, 5; Schuhmann 1977, 339-341). Husserl did not have time to work on it for more than that – immediately after having finished with *Formal and Transcendental Logic*, Husserl started to work on the lectures, “Cartesian Meditations,” to be delivered in Paris in the following February.

Even though written in a short period of time, *Formal and Transcendental Logic* draws from years of thinking about logic and mathematics. It presents Husserl’s view of logic and mathematics within the framework of his mature phenomenology. He had developed its themes in earlier lectures on logic and especially in his analyses on passive synthesis (1918-1926, published in Husserliana volume XI). While it retains much of what is familiar already from *Logical Investigations* (e.g., the structuralist approach to mathematical objects and the conception of grammar), it, in Husserl’s own view, presents four novelties in comparison to his early work. These are: 1) the three-fold stratification of logic that he claims was not yet completely clear in *Logical Investigations*; 2) the radical clarification of the relationship between formal logic and formal mathematics; and with this 3) the definitive clarification of the sense of pure formal mathematics, and connected therewith 4) the genuine sense of formal ontology (1969, 11-12). While these are explained in the first part of the work, the second part on transcendental logic thematizes the “subjective-logical” and provides transcendental criticism for formal logic. Its task is to show how formal logic can be truly understood as an “*ultimate theory of science, an ultimate, deepest, and most universal, theory of the principles and norms of all the sciences*” (1969, 16).

The role of transcendental logic in *Formal and Transcendental Logic* places Husserl’s more formal clarifications of logic into the framework of his mature phenomenology. It sees logic as what guides the scientists who have deep personal vocations to strive for truth. Thus *Formal and Transcendental Logic* witnesses a kind of “personalistic” turn in Husserl’s approach to logic. In so doing, it also offers a detailed example of a historical reflection or sense-investigation [*Besinnung*] of the proper sense of logic and its radical criticism by means of transcendental clarification. These result in a historical and critical approach with which Husserl aims to clarify and revise the used concepts, so that critical reflection can take its leading role with respect to science. All this is, in the end, related to the universal transcendental phenomenological task of clarifying the constitution of a sensuous intersubjective object in the world, hence it grows up “*in the nexus of a transcendental phenomenology*” as Husserl puts it (1969, 13).

This essay presents Husserl’s *Formal and Transcendental Logic* in three main sections following the layout of the work itself. The first section will focus on Husserl’s introduction where he explains the method and the aim of the essay. The method used in FTL is radical *Besinnung* and with it an intentional explication of proper sense of formal logic is sought for (Husserl 1969, 10). The second section will be on formal logic. I will focus on clarifying the novelties listed above. The third section focuses on Husserl’s “transcendental logic,” which is needed to make Husserl’s conception complete, i.e., to understand what makes *Besinnung* *radical*, how the *proper* sense of formal logic has been reached and how all this relates to transcendental constitution of an object in the world. I will try to do this by connecting Husserl’s work to his context (in exact sciences) and also by suggesting the relevance of his views for the contemporary approaches.

*I Husserl’s method*

Husserl begins the introduction to FTL with a reference to Plato, claiming that the origin of logic is in Plato’s philosophy. Since the origin of logic in terms of syllogisms is in Aristotle’s work, the opening already suggests that, for Husserl, logic is something other than the theory of syllogisms, or any theory of deduction for that matter. Indeed, as Husserl puts it, for Plato, logic was “a place for exploring the essential requirements of ‘genuine’ knowledge and ‘genuine’ science and thus discovering norms, in conformity with which a science … consciously justifying its method and theory by norms, might be built” (Husserl 1969, 1). Logic for Husserl is about scientific knowledge, and especially of its norms. The reference to Plato suggests further that science should not be naïve activity, but something that is continually critically reflected and renewed. Echoing his later lamentation in *Crisis*, Husserl complains that in modern times sciences have grown to be independent of the critical self-justification as logic has lost its guiding role. Logic as discussed in FTL thus has the role of philosophical reflection of sciences that Husserl calls for in *Crisis*.

The critical reflection and renewal demands a new method. Husserl explicitly claims that the method used in the essay is radical *Besinnung* (‘sense-investigation’ as translated by Dorion Cairns) – a term that frequents Husserl’s texts from 1923-1924 onwards. The term captures, for the first time in a publication, Husserl’s attempts at investigating historically and intersubjectively developed practices in the third person plural. *Besinnung*, he claims, is used to investigate the historically developed goals of the practices (of exact sciences).

Sense-investigation [*Besinnung*] signifies nothing but the attempt actually to produce the sense “itself,” which, in the mere meaning, is a meant, a presupposed, sense; or equivalently, it is the attempt to convert the “intentive sense” …, the sense “vaguely floating before us” in our unclear aiming, into the fulfilled, the clear, sense, and thus to procure for it the evidence of its clear possibility. (Husserl 1969, 9.)

*Besinnung* means giving a functional explication for a practice in terms of its goals or purpose, or, as Husserl puts it, sense. In other words, it demands making explicit the goals of the given practice that are typically only “vaguely floating before us”. Later in the book it becomes obvious that pursuing these goals (in mathematics for example, abstract and complete theories) is the way to strive for certain values such as truth and/or non-contradictoriness. This goal-directedness makes the practices purposeful, and thus it gives the practices their sense.

In *Formal and Transcendental Logic* Husserl has already developed his notion of historicity sometimes ascribed to *Crisis*: these goals were first established by the first scientists in the antiquity and then passed on and refined by the subsequent generations. They emerge as enduring unified aims in the intergenerational practices of individual scientists.

The investigation of the sense of logic takes place in a “community of empathy” with the scientists – thus Husserl claims that “standing in, or entering, a community of empathy with the scientists, we can follow and understand – and carry on ‘sense-investigation’” (1969, 9). This suggests that the starting point of *Besinnung* of the intentional explication of logic is in existing practices of the scientists. Another starting point for the investigation is given by the preliminary study of the significations of the word logos in the section called “Preparatory considerations” (1969, 18-47), yet a third as the consideration of the traditional view of logic in Part I of the book. As Husserl puts it in *Crisis*, the investigation proceeds zig -zag, while it necessarily starts from the present situation, this cannot be understood without understanding its tradition, which in turn cannot be understood without the present state (Husserl 1970, 58; Husserl 1973, 12-13). In any case, it is notable that Husserl does not start with an a priori normative construal of what logic, or a scientific theory should look like, as what classical philosophers of science from logical positivists to Kuhn have tried to do, or the defenders of the so-called “philosophy-first” approach in philosophy of mathematics but he emphasizes scientific practice in the spirit of many philosophers of science and mathematics of the 21st century.

In Husserl’s picture, the scientists are the carriers of the teleology that is realized in the scientific progress, that goes on *ad infinitum*. Later on (in the same work) Husserl explains that the scientists work with one another, criticize each other’s results, and the results of one investigator are taken over as works that pave the way for others. Exact scientists are assumed to be personally committed to their goals, and these goals are ultimately subservient to hypertheoretical goals, namely the all-embracing ethical life (1969, 32-33). It has been suggested that Husserl’s view of ethics takes a “personal turn” in the 1920s. Husserl’s discussion of scientists’ vocations shows that the turn can also be found in his view of logic, which is thereby subservient to the “highest practical idea” (ibdi., 33). In any case, Husserl wants to glean the sense of logic from the goal directed practices of scientists from antiquity onwards to the present day.

Imagine then, that Husserl wants to engage with scientific practice. Whom would he engage with in the 1920s when he lived in Freiburg? The markings in Husserl’s books suggest that among the mathematicians and the exact scientists most important ones would be David Hilbert and Hermann Weyl (Hartimo 2018b). His student and later assistant Oskar Becker is also undoubtedly a central source for Husserl’s knowledge about exact sciences. It is not known what the role of the set theorist Ernst Zermelo is, who likewise was at the time in Freiburg. In any case, using *Besinnung* as his method, Husserl then engages in intentional explication of formal logic by studying the aims and goals of at least these people with respect to the tradition they are part of. [[1]](#footnote-1)

*II Formal logic vs. Mathematics*

One of the main novelties of the FTL – number 2 in Husserl’s above list - is that in fact the development of the exact sciences bifurcates – while mathematicians construct pure, abstract theories and aim at non-contradiction, the logicians strive for a theory of truth, and hence they strive for theories that could be fulfilled by an engagement with the world. In Husserl’s historical examination of the exact sciences, the development of mathematics culminates in the abstract structural theories of Riemann and Hilbert. According to him, the goal, continually guiding mathematics from within, is the Euclidean ideal, which he claims to have clarified with his notion of definite manifold already in his Double Lecture held in two lectures of Mathematical Society of Göttingen in 1901 (1969, §31). The notion, tantamount to what Hilbert attempted to capture with his axiom of completeness, is conceived as an ideal striven at by mathematicians.[[2]](#footnote-2)

In contrast, Husserl’s *Besinnung* of the final sense of formal logic shows it to aim at applicability. As opposed to pure mathematics, logic aims at truth that is acquired by verification by an experience of a state of affairs in the world. As Husserl states in the introduction, he was led to this distinction by examining the evidence of those disciplines that make up formal mathematics:

It struck me that the evidence of truths comprised in formal mathematics (and also of truths comprised in syllogistics) is entirely different from that of other apriori truths, in that the former do not need any intuition of objects or predicatively formed affair-complexes as concrete examples, even though they do relate to these, albeit with the universality of empty forms. (1969, 12.)

Looking at the history of logic, or what Husserl calls apophantic analytics, in turn, Husserl found it to be guided by three different kinds of evidences. This results in Husserl’s three-fold stratification of logic (number 1 on Husserl’s list) that importantly deviates from the three tasks of logic that he identified earlier in *Prolegomena*. In FTL Husserl points out that logic is divided into grammar, logic of non-contradiction, and logic of truth and corresponding to these three strata there are three different kinds of evidences at stake in logic: evidence related to grammaticality, distinctness, and clarity. In other words, as Husserl’s discussion of logic is ultimately about the norms striven for in exact sciences the three-fold stratification can be phrased as the scientists aiming at theories that would be simultaneously 1) grammatically perspicuous, 2) coherent and unified, and 3) confirmed by perception. [[3]](#footnote-3)

Husserl then realizes that ultimately the first two levels, grammatical perspicuity and coherence, are shared by both traditions. So formal theories, whether logical or mathematical, are undistinguishable on the level of non-contradiction. If the formal theories are developed purely, “with mathematicians’ interest,” they are solely characterized by the norm of evidence of distinctness and grammaticality then they belong to logic of non-contradiction (which presupposes the grammatical correctness) within Husserl’s three-fold division. For mathematicians the applicability of their theories does not matter at all – mathematicians only care about the non-contradictoriness of their theories.[[4]](#footnote-4) But, if the formal theories are constructed with the possible application in mind, the scientists have been striving for truth, and hence for evidence of clarity.[[5]](#footnote-5) With the proper “logical” intention in mind, the researchers however also seek for empirical applicability. The aim of logic (of truth) is thus to obtain a critically verified judgment, which has no role for mathematics (except for applied mathematics, which belongs to logic of truth, too). In other words, in order to determine whether a given formal theory counts as logic or as mathematics in Husserl’s view, one has to find out the attitude of the theorist who has developed it.

As expected from Husserl’s attempt at deriving the goals of logic in community of empathy with the exact scientists, this result follows the more general development of the formal sciences (cf. Maddy 2008). Whereas in Göttingen, the mathematicians believed in the “pre-established harmony” between mathematics and exact sciences in the early decades of the 20th century, especially after the invention of general theory of relativity pure mathematics started to be separated from applied mathematics. The notion of “pre-established harmony” was a term used by many Göttingen mathematicians (Minkowski, Klein, and Hilbert) to refer to the view that the structure of the world is mathematical, and hence the primary method of physics is mathematics rather than empirical experimentation (Pyenson 1982).[[6]](#footnote-6) Husserl’s distinction between mathematics and logic, or applied mathematics, can be viewed as a criticism of Göttingen mathematicians’ idea of “pre-established harmony” in demarcating between pure mathematics and applied mathematics. From Husserl’s perspective Göttingen mathematicians were amalgamating two goals that should be separated from each other.

The distinction between pure, formal mathematics and logic (of truth) enables Husserl to definitively clarify the sense of pure formal mathematics (number 3 on Husserl’s list of the novelties of FTL). Pure formal mathematics, in Husserl’s view, is a theory of pure structures, in which the mathematical objects are defined solely by means of the theories. As in *Prolegomena*, in FTL Husserl characterizes modern structuralist view of mathematics and existence of mathematical objects. (For this reason, Charles Parsons has claimed that Husserl’s characterization is the most developed and clearest statement of structuralist view of mathematical objects before World War II, cf. Parsons 2008, 41). The new element is that the structuralist mathematics is clearly distinguished from applied mathematics. Husserl also isolates a new kind of evidence that is striven for in structuralist mathematics. The evidence is evidence of distinctness, and the later parts of the FTL suggest that an existence of a model for a theory gives rise to this type of evidence.[[7]](#footnote-7) In any case, Husserl’s approach to pure mathematics at the time was very much state-of-the-art.

Oskar Becker credits Husserl in his *Mathematische Existenz* (1927) for the distinction between logic of non-contradiction and truth and uses it to distinguish the notions of mathematical existence in Hilbertian formalism as opposed to that in Brouwer’s intuitionism (Becker 1973, p. 69 onwards). While Husserl’s discussion of truth-logic emphasizes the empirical applicability of the exact sciences, it is possible to read the evidence of clarity to result from perceiving, not a physical object, but an ideal object. This opens the door for intuitionistic interpretations of the logic of truth (cf. van Atten 2015). To be sure, Husserl never mentions intuitionism in the book, even though he is aware of it through Oskar Becker’s and Hermann Weyl’s work. He had also met Brouwer in Amsterdam in the year prior to writing it (Hartimo 2018b, Schuhmann 1977, 330).

The distinction between pure, formal (i.e., structural) mathematics and logic also gives rise to the fourth novelty mentioned by Husserl, namely that Husserl’s earlier view of formal ontology had to be revised. Whereas in *Logical Investigations* he held that formal ontology is obtained from mathematicians’ structural theories (cf. Smith 1989), in FTL he realizes that this cannot be viewed as formal ontology in the proper sense of the term – for pure abstract theories of mathematics do not necessarily apply to the world at all. “*The aforesaid pure mathematics of non-contradiction*, in its detachment from logic as theory of science, *does not deserve to be called a formal ontology*,” he writes (Husserl 1969, 144). Instead, Husserl takes formal logic and especially the theory of judgments as portraying the formal structure of the *world*.

To connect the logic of non-contradiction to truth, Husserl devises a “transitional link,” a judgment theory, which has a property that its complex forms of judgments can be mechanically reduced to elementary judgments (this property is called “normalizability” in logic, see Hartimo 2019a for details). The transitional link gives “the clue of sense genesis” that brings us to (primitive) judgments about individual objects, and consequently to the evidences of the experiential judgments, “judgments about data of possible perception and memory, which give norms for the correctness of categorical judicial meanings at the lowest level concerning individuals” (Husserl 1969, 208-209). Husserl’s judgment theory uses Aristotelian account of judgements as subject – predicate formations, thus his new formal ontology bears resemblance to Aristotelian accounts of metaphysics. In Husserl’s view, the basic categories of the world are the objects, states of affairs, predicates, relations, etc., in accordance to his theory of judgments.

*III Transcendental Logic*

Husserl claims that he came up with these novelties thanks to his transcendental clarifications of the evidences involved in mathematics. Such clarifications are the topic of the second part of FTL, which concerns “a criticism *turned in a different direction*.” (1969, 170). It concerns the constituting subjectivity corresponding to each domain of investigation and the research practices related to them – “transcendental criticism of cognition” for short (1969, 171). This is not a relapse to psychology, for

[t]heory of cardinal numbers ... has to do, not with mental processes of collecting and counting, but with numbers; the theory of ordered sets and ordinal numbers has to do, not with mental processes of ordering, but with ordered sets themselves and their forms; and, in like manner, syllogistics does not have to do with the psychic processes of judging and inferring. (1969, 151-152).

Transcendental logic does *not* turn to the constituting subjectivity to seek out the subjective building blocks from which to construct formal logic. On the contrary, formal logic remains objective, and the task of transcendental logic is to examine the conditions of possibility of its objectivity, that is, it examines how it has been constituted in its objectivity. Whereas formal logic thematized logicians’ naïve actions, transcendental logician now turns to reflect on it:

Turning reflectively from the only themes given straightforwardly (which may become importantly shifted) to the activity of constituting them with its aiming and fulfilment – the activity that is hidden (or, as we may also say, ‘anonymous’) throughout the naïve doing and only now becomes a theme in its own right – we examine that activity after the fact. That is to say *we examine the evidence* awakened by our reflection, *we ask it what it was aiming at and what it acquired*; and, in the evidence belonging to a higher level, we identify and fix, or we trace, the possible variations owing to vacillations of theme that had previously gone unnoticed, and distinguish the corresponding aimings and actualizations, - in other words, the shifting processes of forming concepts that pertain to logic. (1969, 177)

Transcendental reflection completes Husserl’s functional analysis of exact sciences (i.e., the historical analysis in terms of the sought for goals) and evaluates whether the activity in question was able to reach its goals. It makes *Besinnung* of logicians’ activities radical by uncovering the evidences and the confusions, possible shifts and emptyings of meaning. These shiftings are a matter of internal shiftings of intentionality (such as, say, the way Göttingen mathematicians seemed to confuse mathematics and applied mathematics), and they lead to verbal equivocations (1969, 177). The logicians’ incompetence to distinguish between the three different evidences guiding logic is a case in point (1969, 178).

The purpose of transcendental logic is to be critical and suggest revisions: “evidence of every sort - should be reflectively considered, reshaped, analyzed, purified, and improved; and that afterwards it can be, and ought to be, taken as an exemplary pattern, a norm” (1969, 176). It thus helps Husserl to engage in, in contemporary terms, conceptual engineering. Without such clarification and criticism, Husserl writes, sciences are not genuine sciences. Transcendental logic is thus examination of the presuppositions and the evidences of the formal logic for the purposes of criticism. Uncovering these takes Husserl gradually, in Chapter 7, back to full-fledged transcendental phenomenology and to such issues such as intersubjectivity.

The criticism of logic makes us conscious of a number of idealizing presuppositions at work in logic. The first one that Husserl points out is the presupposition of the ideal identity of the judgments of logic – the same judgment can be made time and again. This presupposes an identity that endures from the time of its first constitution. Such abiding formations can be reactivated and identified again and again (1969, 185). Thus, for example, the judgment made in the earlier course of a proof is expected to be the same later on in the same proof (1969, 186). Obviously there can be shiftings and confoundings of meaning in recalling the judgments, which is a possibility that is not traditionally recognized (1969, 186). Indeed, the constitution of objective identity is ultimately a normative ideal provided by logic (1969, 188).

Another interesting presupposition is the fundamental form “and so forth”, “the form of reiterational ‘infinity’”. According to Husserl, “[t]his is plainly an idealization, since de fact no one can always again” (1969, 188). Yet, it is assumed, for example, that one can always add one to an existing number and thus form an infinite series of cardinal numbers. The way in which the method “and so forth”, in its various senses, becomes evident is thematized in transcendental logic (1969, 188-189).

Husserl moves on to discuss logical principles (e.g., law of non-contradiction, and law of excluded middle) and the idealizing presuppositions contained in them, for logic of non-contradiction and logic of truth separately. The space does not permit me to discuss them individually, but let me point out that Husserl discusses these as idealizing presuppositions that should be examined separately regarding the sought for evidence in question. The difference to, say Frege’s view is drastic – logical laws are not necessarily universally applicable, but are, in Husserl’s words, “in need of the intentional criticism that prescribes the sense and limits of their fruitful application” (1969, 200). However, somewhat frustratingly he only points to the need of such criticism without concluding whether the applicability of logical laws should be limited or not. One way of taking this is to think that the conclusion depends on the situation and domain of application and cannot be decreed in advance. This suggests openness to pluralism about logical laws.

In a similar vain, later in the essay, Husserl criticizes Kant for having not raised transcendental questions about logic, but ascribing it an extraordinary a priority (1969, 258, 260 I have discussed Husserl’s criticism of Kant in detail in 2019b). This kind of apriority has then been defended most famously by Frege. Indeed, Kant and Frege have been called “exceptionalists”, because they thought that logic has a kind of priority that sets it apart from other sciences. In the recent debates about philosophy of logic, increasingly many defend “anti-exceptionalism” about logic (e.g., Hjortland 2017, following Williamson’s 2007 use of the term “anti-exceptionalism”). Husserl’s position in this debate and the related one about normativity of logic, is extremely interesting – instead of claiming that logic should be revisable according to some external or empirical evidence (like Quine), Husserl’s claim is that the revisions should be based on transcendental examination of the intentional aims of the logicians.[[8]](#footnote-8)

Husserl’s transcendental examination ultimately leads deeper to the “universal constitutional Apriori, embracing all intentionalities” (1969, 246), and ultimately to the presuppositions of the inquiring transcendental reason. “All criticism of logical cognition … is … *a self-explication on the part of subjectivity, as it investigates the sense of its own transcendental functions*” (1969 274), Husserl writes. At this point, the radical *Besinnung* transforms itself into transcendental *Besinnung* and turns from the third person plural to the first person singular. On this level, the aim of questioning is not revision, but clarification:

The transcendent world; human beings; their intercourse with one another, and with me, as human beings; their experiencing, thinking, doing, and making, with one another: these are not annulled by my phenomenological reflection, not devalued, not altered, but only understood. And, in the same manner, positive science, as having also been achieved by such labors, a phenomenology that finally understands itself as a reflective functional activity in transcendental intersubjectivity. (1969, 275)

In *Formal and Transcendental Logic* Husserl thus follows the so-called scientific path to the reduction, the one that starts from the exact sciences and leads back to the subjectivity constituting them. While the so-called Cartesian way (familiar from *Ideas I* and *Cartesian Meditations*) proceeds through epoche and phenomenological reduction, here Husserl starts from the idea of logic, then, examining its evidences and presuppositions he eventually reaches full-fledged transcendental phenomenology. He does not perform the reduction at once, at one fell swoop, like in the Cartesian way, but more gradually, step by step. The result is transcendentally examined logic that then “should take the lead” for the sake of philosophers’ scientific responsibility. Ultimately *Formal and Transcendental Logic* shows how Husserl’s critical-historical approach and the call for self-responsibility lies on a contemplative basis and an attempt to understand constitution of one’s self in the world among the others.

Conclusion

I have here tried to show how *Formal and Transcendental Logic* offered several perceptive insights to the then state of exact sciences. It also reveals several idealizing presuppositions of logic and science, many of which are only now beginning to be investigated also in the mainstream philosophy of mathematics, logic, and science. However, its most valuable contribution in my view is in its rigorous formulation and application of the historical critical method with which to evaluate the exact sciences. Thus, on its basis, one should be able to formulate a phenomenological view of the sciences as they exist today. Presumably the method could be generalized to critical examination of any social practices. Finally, in *Formal and Transcendental Logic* all this is portrayed in the framework of full-fledged transcendental phenomenology, thus showing how Husserl’s various, more specialized, investigations hang together. Indeed, as Suzanne Bachelard had it, *Formal and Transcendental Logic* is *the* book by Husserl.

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1. For a more detailed account of Husserl’s method of *Besinnung*, see Hartimo 2018a. [↑](#footnote-ref-1)
2. The exact nature of Husserl’s notion of definiteness has been debated in the secondary literature. See Hartimo 2018c and 2017 and van Atten 2019 for the most recent contributions. In 1931 Gödel published a proof of the so called Incompleteness theorem according to which in any (adequately rich) theory one can construct sentences so that they or their negations are not provable in the theory. To be sure, Gödel’s incompleteness theorem (which Husserl eventually knew of) do not undercut Husserl’s view, primarily because Husserl does not specify what he means by deduction (or proof). This leaves it open to construe it as non-mechanical inference, and in this case Gödel’s result would not apply to his view. Furthermore, it is unclear whether the notion, held as an ideal, even has to be realizable. For discussion of this matter see Bachelard 1968, 52-53. [↑](#footnote-ref-2)
3. In Prolegomena, Husserl likewise distinguished between three tasks of logic: grammar, non-contradiction, and theories of theories. The difference is that in *Prolegomena* the theory of theories forms the third task of logic, not to truth-logic. In *Prolegomena* Husserl thus confuses the evidence of distinctness and evidence of clarity. [↑](#footnote-ref-3)
4. Husserl claims, e.g., that “the mathematician as such need not be at all concerned with the fact that there actually are multiplicities in concrete ‘actuality’” (1969, 138). [↑](#footnote-ref-4)
5. For further details of Husserl’s rather intricate argument, see Bachelard 1968, esp. 80-89; Lohmar 2000, esp. 104-112; Sokolowski 1974, 271-288. [↑](#footnote-ref-5)
6. Husserl’s discussion of Galileo in *Crisis* embodies this ”Göttingen pre-established harmony”; Husserl notoriously does not present Galileo as an experimenter or even the developer of the telescope. For him, Galileo’s primary achievement is the mathematization of nature. [↑](#footnote-ref-6)
7. This is how I read Husserl’s discussion of systematic unities of possible experiences in §89b and §98 - admittedly Husserl is not chrystal clear on this matter [↑](#footnote-ref-7)
8. Thus Husserl defends a critical view of logic (for more details, see Hartimo 2019b). [↑](#footnote-ref-8)