HUSSERL'S CORRELATION BETWEEN FORMAL LOGIC AND FORMAL ONTOLOGY

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ABSTRACT. This lecture was given by Per Martin-Löf in Bern on 17 January 2002 at the invitation of Guido Löhrer and Eduard Marbach. The original transcript was prepared by Guido Löhrer. It was slightly edited and transferred to LaTeX by Ansten Klev.

Husserl introduced the idea of a formal ontology, and at the same time the idea of the correlation between formal ontology and formal logic, in § 67 of the *Prolegomena* to the *Logical Investigations*, although not yet using this term, formal ontology. What he did introduce in this paragraph of the *Prolegomena* was, on the one hand, the meaning categories, Bedeutungskategorien, and on the other hand, reine oder formale gegenständliche Kategorien, which he later called formal-ontological categories. The idea behind this correlation is that formal logic deals with meanings, Bedeutungen, whereas formal ontology deals with objects, objects of the formal-ontological categories, that is, his formale gegenständliche Kategorien. The list of these categories varies a little bit from place to place. There are at least three, maybe more, such lists, but they always start with Gegenstand, Sachverhalt, Eigenschaft, Relation, Anzahl, Menge and in some places Ganzes und Teil, Gattung und Art. What falls in these formal ontological categories are objects, whereas what falls in the meaning categories are meanings, Bedeutungen. Husserl said already then that these two kinds of categories are in correlation with each other, and the meaning categories are first of all the category of sentences and then the various categories of sentence parts, in particular nominale Bedeutungen, which would correspond to Gegenstand on the other side, and sentence, Satz, itself corresponding to Sachverhalt, and similarly with the rest in these two lists of categories. This should suffice about the introduction of the concept in the *Prolegomena*.

To find the very term—this rather forbidding term, I must say, before you get used to it—formal ontology in his published writings, you have to wait for *Ideen* in 1913. There it is introduced in § 10, but, I must say, in a very condensed, or a very indirect way. It is possible to decipher what he meant by formal ontology from those few pages, but no doubt very difficult. Now we are in a better position because it appears that he introduced the term already in his lectures *Einleitung in die Logik und Erkenntnistheorie* in 1906/07. There it appears relatively early, in § 14 of the text, so it should have been in the autumn of 1906, and it is introduced in connection with this correlation. The presentation in these lectures is much fuller, and naturally so, since it was apparently in the course of giving these lectures that he got the idea of introducing the term, so there is quite a full description of the idea behind it. To someone who is acquainted with the sixth logical investigation, where he introduces what he called kategoriale Gegenstände, categorial objects or categorially formed objects, the simplest way, I think, to describe what formal ontology is, is to say that the objects of formal ontology are the categorial forms, or the categorial objects, that he dealt with in the sixth investigation. These forms are treated as objects of the formal-ontological categories and as objects of his formal ontology.

The third logical investigation is Husserl's first sketch of a formal ontology dealing with wholes and parts, whereas the fourth investigation deals with meanings, Bedeutungen. It is clear that he had the correlation thought in mind if you look at how he labelled the first chapter of the third investigation: it is labelled "Der Unterschied der selbständigen und unselbständigen Gegenstände", and then the fourth investigation is labelled "Der Unterschied der selbständigen und unselbständigen Bedeutungen". Later, in the *Ideen*, the correlation thought is mentioned in maybe half a dozen places, approximately. I will try to avoid quoting here, but the last place where he deals with it is in § 148, and again the correlation thought is very visible. In the foregoing paragraph he deals with formal logic, axiology and practice—"practice" would be the English, I guess, in "formale Axiologie und Praktik". That is the preceding paragraph, and then in § 148 he deals precisely with formal ontology, where the correlation thought is expressed in the following way:

> Jedes formal-logische Gesetz ist äquivalent umzuwenden in ein formal-ontologisches. Statt über Urteile wird jetzt über Sachverhalte, statt über Urteilsglieder (z.B. nominale Bedeutungen) über Gegenstände, statt über Prädikatbedeutungen über Merkmale geurteilt usw. Die Rede ist auch nicht mehr von der Wahrheit, Gültigkeit der Urteilssätze, sondern vom Bestande der Sachverhalte, vom Sein der Gegenstände usw.

Maybe I could summarize this in a table,

formal logic	formal ontology
Satz, Urteil	Sachverhalt
Begriff, nominale Bedeutung	Gegenstand
⋮	⋮
Wahrheit	Bestand von Sachverhalten

We have, on the one hand, formal logic dealing with meanings, and, on the other hand, formal ontology dealing with objects. Where in logic we have Satz, Urteil, we have on the right-hand side Sachverhalt, as he says, and where we have Gegenstand on the right, you have on the left Begriff or nominale Bedeutung. The list was longer, but he ended it by saying that whereas, on the left-hand side, we speak about the truth of sentences or propositions, we speak, on the ontological side, rather about the obtaining of states of affairs, Bestand von Sachverhalten.

This is about the clearest expression of the correlation idea that I have found. Now, when Husserl was 70, so it is very late in his life, astonishingly enough, he returned to these logical questions in the *Formal and Trancendental Logic*, which was published in 1929, meaning that there were a few things which he still felt he would try to clear up before it was too late. One of those things is precisely the correlation between formal logic and formal ontology. In fact, the book consists of two parts, two Abschnitte, and the first part is divided into two subparts, A and B, and the second of those, the B part, has the title "Phänomenologische Aufklärung der Doppelseitigkeit der formalen Logik als formale Apophantik und formale Ontologie". Even the first part, the A part, more precisely its second chapter, which is very interesting, is a historical exposition that is meant to lead up to this problem of the correlation between formal logic and formal ontology. The history he gives is the following.

Logic and mathematics were completely separated areas, both in ancient times and during the mediaeval period. I think that is completely correct and is clear from the simple fact that the trivium during the scholastic period included grammar, rhetoric and logic, so logic went together with grammar, whereas the mathematical sciences were in the quadrivium including arithmetic, geometry, astronomy and music. So they were entirely separate. It is clear why logic was grouped together with grammar, since the attitude taken in logic was rather the same as the attitude taken by the grammarians in grammar, in that it dealt with linguistic things, whereas in the mathematical sciences—in arithmetic, you deal with numbers, and in geometry you deal with points and lines and circles and so on: various kinds of mathematical objects.

When Leibniz tried to fuse these two traditions, so that logic and mathematics became—or, he wanted them to become unified into his mathesis universalis—this problem of the correlation between the two became acute, because in mathematics, it is the object-oriented attitude that has always been taken and is still being taken, whereas in the logical tradition up to that time, one had been directed rather towards the linguistic entities, that is, towards the sentence and the various sentence parts and the forms of judgement and the forms of inference. Different attitudes, verschiedene Einstellungen, was Husserl's terminology. It is with Leibniz that this problem becomes acute, and then later with Bolzano something very important happens with respect to logic: Bolzano starts to treat logic in the object-oriented way that is characteristic of a mathematician, of the mathematician that he was. He introduces Vorstellungen an sich and Sätze an sich as abstract objects that he deals with in somewhat the same way as the mathematician deals with his objects, as in set theory one deals with sets, and in arithmetic with numbers and so on. One could say that Bolzano instils the spirit of a mathematician in logic. This is continued by the Boolean tradition, which is essentially the mathematician's way of dealing with Aristotelian logic in the object-oriented way that is characteristic of us mathematicians.

According to Husserl, this is thus how the problem he is dealing with here arose historically. Then, in the B part, he tries to clear up this double-sidedness of formal logic—well, in the title that I quoted, he speaks of the double-sidedness of formal logic as formal apophantics and formal ontology, but I will try to avoid the word apophantics since nobody else except Husserl seems to use it. Apophantics would be just Satzlehre, if you translate it into German: ἀπόφανσις is Satz. So the characteristic of the difference between these two sides, as I have already said, is that in logic you deal with meanings, whereas in ontology you deal with objects. This is connected with a difference in attitude, in Husserl's terminology: he distinguishes between the apophantical and the ontological attitude, or in other places he speaks of Einstellung auf Urteile—or it could be Sätze—and he also says Einstellung auf

Sinne, where we are directed towards meanings, on the one hand, as opposed to directed to objects, on the other.

This is the novelty that he contributes here in comparison with what he had already said in the *Logical Investigations* and in the *Ideen*. The essential thing is the difference in attitude that you have between these two sides. The natural attitude, to use his term from *Ideen*, is of course the object-oriented attitude. Normally, when we talk about things, we are object-oriented, that is, we are oriented towards what we are talking about, das, wovon wir sprechen, in Frege's terminology, die Gegenstände worüber, in Husserl's terminology. It requires a change of attitude, instead of being directed towards what we are talking about, to direct our attention to our talk, that is, to the linguistic entities that we are producing: that is the change from the ontological attitude to the apophantical attitude. According to Husserl, this is the fundamental difference between formal logic and formal ontology, that you have a difference in attitude, otherwise they are in complete correlation with each other.

This will have to suffice for the moment about Husserl's problem and his attempted solution to the problem in the *Formal and Transcendental Logic*. During the rest of this talk, I want to throw some light on this problem by my own work on type theory. That means that I will have to give a very short presentation of type theory to begin with.

As any logical system, type theory is specified by displaying the forms of judgement on which it is based, first, and then the forms of inference of the system. I will not show any forms of inference, but the forms of judgement I will have to display. They look as follows.

The first form of judgement says that A is a set which may depend on certain variables ranging over other sets,

$$A : \text{set} \quad (x_1 : A_1, \ldots, x_n : A_n) \tag{1}$$

I use the colon here that has become standard practice. It was professor De Bruijn at Eindhoven who introduced that notation. One might just as well have used the epsilon—for ἐστί in Greek—that was introduced by Peano, but the colon has won, and so I will use the colon. The second form of judgement says that A is the same set as B, depending on variables of the same kind that you have in the first form,

$$A = B : \text{set} \quad (x_1 : A_1, \ldots, x_n : A_n) \tag{2}$$

Then you have the third form that a is an element of the set A in such a context,

$$a : A \quad (x_1 : A_1, \ldots, x_n : A_n), \tag{3}$$

and finally that a and b are identical elements of A, again in such a context,

$$a = b : A \quad (x_1 : A_1, \ldots, x_n : A_n). \tag{4}$$

There is a certain presupposition structure here which I will tell you about briefly. In order for a judgement of the form (1) to be meaningful, A_1 has to be a set in the empty context already, A_2 will have to be a set depending on the previous variable x_1, and so on up to A_n, which must be a set depending on the previous variables, $x_1, \ldots, x_{n-1}$. These are all presuppositions for a judgement of this form.

Similarly, in judgements of form (2), if we say that A and B are identical sets depending on these variables, it is clear that we presuppose that both A and B are sets depending on those variables, that is, we presuppose two judgements of the first form.

In the third form here, if I say that a is an element of the set A depending on these variables, then of course A must be a set depending on these variables, which means that we have (1) as a presupposition of this judgement.

Similarly, when we say that a and b are identical elements of the set A, we are clearly presupposing that a is indeed an element of A, and the same with respect to b.

The second thing I must say, and this is an important point, is that, as I have written them up here, it seems as if this is a pure set theory—but it is simultaneously a logic because of a second possible reading. Instead of set here we read (1) as saying that A is a proposition,

$$A : \text{prop} \quad (x_1 : A_1, \ldots, x_n : A_n)$$

and (2) as saying that A and B are identical propositions,

$$A = B : \text{prop} \quad (x_1 : A_1, \ldots, x_n : A_n)$$

We read

$$a : A \quad (x_1 : A_1, \ldots, x_n : A_n)$$

as saying that a is a proof of the proposition A, and

$$a = b : A \quad (x_1 : A_1, \ldots, x_n : A_n)$$

as saying that a and b are identical proofs of the proposition A.

We have a correspondence here between logic and set theory which we now refer to as the Curry–Howard correspondence or isomorphism and which broke through in the late 1960s. It is a very important idea, which is also easy to explain, as is so often the case with important ideas.

logic	set theory
proposition	set
A is true	A is inhabited
$A \wedge B$	$A \times B$
$A \supset B$	B^A
$A \vee B$	$A + B$
$(\forall x : A)B(x)$	$(\Pi x : A)B(x)$
$\vdots$	$\vdots$

We have a correspondence between the notion of set and the notion of proposition, and we have a correspondence between saying that a set A is nonempty—or, as constructivists like to say, inhabited, that is, it has an element, there is an element in it—and saying that a proposition is true, and we have a correspondence between logical operations and set-theoretical operations. For instance, conjunction corresponds to the set-theoretical operation of the taking Cartesian product of two sets, which consists of all ordered pairs of elements from the first set and the second set.

Implication corresponds to the set of functions from a set A to another set B, disjunction, the logical operation, corresponds to the operation of forming the disjoint union of two sets, and this list can be continued, for instance with the quantifiers, so the universal quantifier corresponds to the Cartesian product of a family of sets, and the existential quantifier would also be included here.

There is thus such a correspondence here, which means that we have a double reading of the forms of judgement (1)–(4). This already has a bearing on Husserl's problem. There was never any doubt for Husserl that arithmetic and set theory were parts of formal ontology. Indeed, set theory was the prime example of a formal ontology. If, however, the right column here belongs to formal ontology, and you have a complete isomorphism between the two sides, there seems to be something strange in saying that, in logic, you are dealing with meanings as opposed to set theory, where you are dealing with objects. I already said that Bolzano was the one who took the step of changing the attitude in logic from the noematic attitude, the meaning attitude, to the object-oriented attitude instead. Once logic is taken in that way, then logic deals with objects just as much as set theory does: objects such as propositions and proofs—proofs are also treated as objects. This already makes it somewhat doubtful with the correlation thought that Husserl had. It seems wrong, since there is, not only a correlation, but there is an identification, or an isomorphism, between the two sides.

Maybe I should say something historically about the origin of this idea. What does it go back to? Well, in the first place, it goes back to the Brouwer–Heyting–Kolmogorov interpretation of the logical operations. One can say that this is almost implicit in the Brouwer–Heyting–Kolmogorov interpretation from around 1930, but the earliest trace of this idea is really in Bolzano. Bolzano always made a parallel between the truth of a proposition, on the one hand, and the objectuality of a representation—it sounds bad in English, so better is zwischen der Wahrheit eines Satzes und der Gegenständlichkeit einer Vorstellung, eines Satzes an sich und einer Vorstellung an sich. That seems to me to be the real origin of this idea.

To begin with I thought that, well, this is a happy coincidence, that Bolzano had this idea and that it had to be rediscovered many, many years later, just as with the concept of logical consequence that in modern logic was introduced in the 1930s, but that Bolzano had already a hundred years earlier. Actually, however, there is a thin thread from Bolzano to Heyting, who is one third of the Brouwer–Heyting–Kolmogorov interpretation. Heyting was explicitly inspired by Husserl's notion of Bedeutungsintention und Bedeutungserfüllung, which he learned about through Oskar Becker, who was a Husserl pupil in the 1920s, and this correlation between Wahrheit eines Satzes and Gegenständlichkeit einer Vorstellung appears all over the place in Husserl's writings, in the *Logical Investigations*, for instance. Husserl, of course, had it from Bolzano. Husserl was perhaps the first who appreciated the greatness of Bolzano as a logician and studied him in great detail. There is thus this thin line of connection between Bolzano and Heyting.

Let me continue by treating all these different attitudes, Einstellungen, in connection with type theory. I will use the following device. When I have a linguistic expression, and think of it, as we nowadays say, completely formally or syntactically, that is, disregard its meaning completely, then I will use double quotes,

$$\text{“}a\text{”}$$

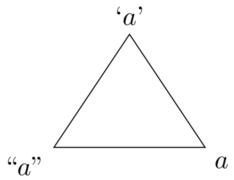
whereas if I think of it as standing for its meaning, I will use single quotes,

$$\text{‘}a\text{’}$$

Finally, if I think of it as standing for its reference, as it normally does when we are talking about things, then I will not use any special marking whatsoever,

$$a$$

The trichotomy that we have here is completely correlated with the semantic triangle, where you have the word or the expression in the lower left corner, and you have the meaning in the upper corner, and you have the reference, the object referred to, in the third corner,



Husserl's notion of Einstellung is nothing but the mediaeval notion of supposition generalised beyond language, also to perception. It is therefore quite appropriate to use the word supposition for Einstellung, attitude, and ask, In the type-theoretical forms of judgement, what suppositions do we have in the various places indicated by the schematic variables? The outcome of that analysis is that, on the right side of the copula, you have referential supposition, object-oriented supposition, whereas on the left-hand side you have meaning supposition. If I am using this notation device, I may indicate where we have meaning supposition and where we have referential supposition as follows:

$$\begin{aligned} \text{‘}A\text{’} &: \text{set} \\ \text{‘}A\text{’} = \text{‘}B\text{’} &: \text{set} \\ \text{‘}a\text{’} &: A \\ \text{‘}a\text{’} = \text{‘}b\text{’} &: A \end{aligned}$$

I will not give all the detailed arguments for this. That belongs to another talk, but let me say that the fact that we have referential supposition on the right-hand side here is just another way of saying that, in those positions, we may always replace what stands there by something which is equal to it with respect to this equality relation. As a particular case, we have the rule in type theory that if a is an element of A, and A and B are equal sets, then a is also an element of B,

$$\frac{a : A \qquad A = B : \text{set}}{a : B}$$

That rule says precisely that the right-hand position is referentially transparent, so that we can replace A by B, whereas there is no corresponding rule, it is even impossible to formulate a rule, which tries to say the same with respect to the left-hand position. This is one of the reasons why this position is referentially opaque.

Now I should go back one step. I have forgotten to say that, in the form of judgement (3), there is included as a special case the standard form of judgement expressing the relation of consequence. It says that one proposition is true, provided certain other propositions are true, and they may all depend possibly on certain variables,

$$(3') \qquad A \text{ true} \quad (x_1 : A_1, \ldots, x_m : A_m, A_{m+1} \text{ true}, \ldots, A_n \text{ true})$$

A judgement of this form is clearly not one of the four forms above, but it is considered as an abbreviated way of making a judgement of the form (3), namely, it is just an abbreviated way of saying that we have a proof a of the proposition A, which proof may depend, first of all, on the variables x_1 up to x_m, and on the assumptions that we have a proof x_{m+1} of A_{m+1}, and so on up to a proof x_n of A_n,

$$a : A \quad (x_1 : A_1, \ldots, x_m : A_m, x_{m+1} : A_{m+1}, \ldots, x_n : A_n)$$

This is a judgement of the third form above, so $(3')$ is nothing but an abbreviated way of making a judgement which in full looks like this. I refer to the passage from the full, or complete, judgement (3) to the incomplete judgement $(3')$ here as suppressing the proof object. You see now that something crucial happens when we do that, namely that we suppress the intensional part, the referentially opaque part, so that in $(3')$, everything is referentially transparent.

The fact that the left-hand position is referentially opaque means that the reading that I gave before, namely A is a set, A and B are identical sets, a is an element of A, and analogously for the fourth form, that those readings are strictly speaking not correct. I would not like to suggest that we should not express ourselves that way—certainly, we should continue to do that—but, properly speaking, since these positions are intensional, we ought to say, in (1), that what is displayed on the left there refers to a set, in (2), that the meanings 'A' and 'B' are co-referential, that is, refer to the same set, in (3), that the meaning 'a' refers to an element of A, and in (4), that the two meanings 'a' and 'b' are co-referential.

This was actually realised, albeit in a somewhat confused way, by Wittgenstein in the *Tractatus* and by Carnap in the *Logical Syntax of Language*. In Carnap's terminology, a statement—a sentence, I should say—such as

5 is a number

is not a real proposition. It is rather a grammatical proposition, in Wittgenstein's terminology, which does not say anything about the number 5. It says that 5 is a number, but it does not say anything about the number 5. Carnap called such a—judgement, in my terminology, but sentence, in his terminology—first a quasi-syntactical sentence of the material mode of speech in one terminology, and later a pseudo-object-sentence. That is a better terminology to my mind, which suggests that we are not saying anything about an object here. Rather, Carnap thought, this is a hidden grammatical statement, which means that, when properly written, it is really this:

"5" is a number.

So he was indeed grappling with what I am now talking about, but the trouble was that Carnap at that time, which is 1934, had nothing but objects and expressions, expressions in the sense of expressions divested of sense, so there was for him only the choice between either this,

5 is a number

or taking the visual image "5", the acoustical or visual image, in Saussurian terminology, in that position. The supposition that you really have in this position, however, is meaning supposition, in my notation,

'5' is a number

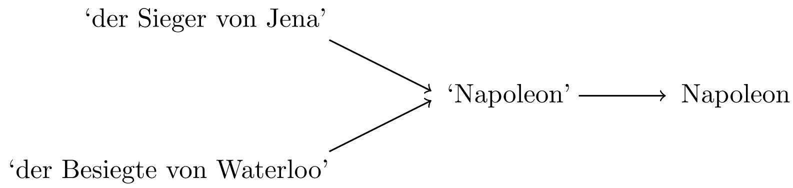
In such a judgement, a certain meaning is referred to its meaning category, in this case of numbers.

Let us go back to Husserl's correlation between the meaning categories, Bedeutungskategorien, and the formal-ontological categories. The first are categories of meanings, and the second are categories of objects. Now you see that there is no difference, no conflict between these two. The objects are objects of the formal-ontological categories, which in the case of type theory are the categories that are expressed on the right-hand sides of these judgements. But if the objects of these categories are intensional objects, which is the outcome of the analysis here, according to which the left-hand positions are intensional positions, then they are the same sort of entities as meanings, for what are intensional objects except meanings? There is therefore no difference between the meaning categories and the formal-ontological categories, because the objects of the formal-ontological categories are intensional objects, and therefore meanings. Nor is there then any difference between the objects of formal logic and the objects of formal ontology: the objects of formal logic are meanings, Bedeutungen, but if the objects of formal ontology are intensional objects, then they might just as well also be called meanings.

You see now that we get rather an equation between formal logic and formal ontology, and an equation between meaning categories and formal-ontological categories. There is, however, also the other side of this correlation, namely the difference between the two kinds of attitudes, Husserl's two kinds of Einstellungen. These two kinds of attitude are not correlated with logic, on the one hand, that is the noematic attitude, and ontology, on the other hand, the objectual attitude. Rather, whether you call your system a formal logic or a formal ontology, in both cases you have the two attitudes involved, namely in certain positions, the single-quoted positions, you are directed towards the meaning, whereas in the unquoted position, you have the other attitude, the objectual attitude. Saying that this difference between the attitudes cuts exactly the same way as the difference between formal ontology and formal logic is therefore not correct. We can identify formal logic and formal ontology, but we certainly have a difference between these attitudes, and the difference is that in certain positions you have the one attitude, and in other positions you have the other attitude.

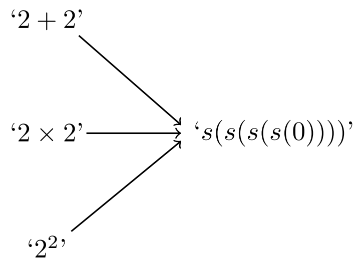
I have said that the objects of formal ontology are intensional objects. You may wonder: do we not have reference also in abstract mathematics—in set theory, in number theory, and so on? Are we not talking about things? Clearly, the spontaneous answer is, Yes, of course we are talking about things, we are proving properties of some big number, and so on, proving properties that certain sets are isomorphic, and so on. But how is this compatible? Well, it is compatible because we still have reference, the phenomenon of reference, in formal ontology, although we are not referring to anything in the real world.

That could be my final point here, that if you take an example, and I will take one of Husserl's favourite examples, der Sieger von Jena and der Besiegte von Waterloo, then you have different meanings here, but they both refer to Napoleon. Since we have meanings here, I should use my device to show that I am dealing with meanings,



‚Napoleon' is also a meaning, and that meaning refers to the man himself, which is no longer a linguistic entity like the others, but a man.

As a mathematical example, let me take the one from Frege, with '$2+2$', '2×2' and '2^2'. Again these are different meanings, and they all refer to one and the same number, which if we use the unary notation is '$s(s(s(s(0))))$', which is again an intensional object,



You see the difference between the two cases here. In the first case we have something real, namely the man himself, and the linguistic entities we use to refer to him. In the second case here, we lack the last step. There is nothing real that the number is referring to. What stands here is the number itself, as Husserl himself says in the sixth logical investigation, in an example of this kind. (There was a different number in that example.) He said: Das ist die Zahl selbst. It is the number itself that you have in front of you, which is displayed. It is not that that in turn refers to anything beyond that.

The reference relation that you have when you refer to something in the real world, or to something real, to a city or to a country or to a person or whatever it is, might thus consist of two parts. In the first part, you pass to the—in a terminology that we use in connection with type theory—canonical name of that object, and the second part is the passage from that canonical name to the man himself or the city or the country or whatever it is. So it consists of those two parts. And if you ask a question, say, Who was the victor at Jena?, the correct answer is Napoleon, of course, and similarly in this case, just as when you ask, What is the value of $2 + 2$ or 2×2 or 2^2? The correct answer is 4, or in unary notation it is $s(s(s(s(0))))$ which is the correct answer. So there is a complete analogy between these two cases, the real case and the ideal case, the concrete case and the abstract case, up to this point. It is only the second part which is lacking in the abstract case.

In any event, even in the abstract case, where the objects, as I have said, are intensional objects, we have reference, we have the phenomenon of reference: the reference corresponding to a certain meaning is nothing but the computational value which you reach by performing the appropriate computation.

My final comment will be that we have seen a collapse between the meaning categories and the formal-ontological categories, and that the difference that Husserl had in mind becomes rather the difference between, in the terminology that I just used, a canonical meaning, or object, and a noncanonical one. Whereas Husserl had a split between Bedeutung und Gegenstand and Bedeutungskategorien und gegenständliche Kategorien, we have no such split between two kinds of categories. On the other hand, within the categories, we have a difference between the objects which are presented canonically and those which are presented noncanonically. It is that which takes over the duality that he had.

On the other hand, we do have a correlation in modern logic, namely a correlation between syntactical categories and semantical, or meaning, categories. The syntactical categories arise from the semantical categories simply by making a change of attitude from what is indicated by the single quotes to using the double quotes instead. We have numbers and numerical expressions, we have sets and set expressions, we have propositions and propositional expressions, which we normally call sentences, and so on, and we can always switch from one to the other by a change of attitude, from the attitude indicated by the single quotes to the attitude indicated by the double quotes. This notion of syntactical category is, however, not something that Husserl had. It was he who introduced the term syntactical category, syntaktische Kategorie, in § 11 of *Ideen*, but he meant something entirely different with it from what we—following Carnap—do nowadays. In general, one may say that, taking this syntactical attitude, that is, looking at the linguistic expressions divested of sense, looking at their pure form, they are all syntactical, as we say nowadays, but that was something entirely alien to Husserl. He was even unwilling to speak of an expression which did not express anything, which is to say, which is not meaningful. The correlation that we now have between syntactical categories and semantical categories is therefore indeed a correlation—Husserl's term here is very appropriate—but it is not the correlation that Husserl had between meaning categories and objectual categories.