Course 8-15. Elements of logistics

Location

8. Courses from 1996 to 2000

Remark: *This course has been provided with larger spacing than the text of the original course. References in the older version of this text therefore do not correspond to the current pagination of 'Word'. For this reason, the original pagination is displayed each time with the letters 'LOG'. They stand for 'LOGistics' and are followed by the old page number.*

Introduction: *The quintessential axiom of logistics is nominalism.* Applied to mere symbols, to empty shells, there is no problem. To realities of life, however, that becomes a very different story. It becomes a world without spirit, without soul, and breaks with the 'sophia perennis', the eternal philosophy as tradition has known and experienced it for centuries. Logistics knows no ethical norms, but rather societal agreements. In that sense, it is a 'nominalist cultural revolution'.

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LOG1

1. Bookmark (1)

Note: "EO" means "elements of ontology." Ontology teaches, in response to everything, to ask how real it is and how it really is. We attempt to suggest what logistics is in these few pages.

1.-- ***Introduction*** . -- 02/06. -- Purpose. Foundation work. Evolution. Jacoby on the matter. -- Tarski's explanations.

2. -- ***The logistic concept of 'function'*** . -- 06/13. -- Functions (constants - variables). -- propositional functions. -- 07/08. -- Descriptive functions. --8. – Quantification. - 10/12. -- Free and bound variables. -- 13.

3. -- ***Propositional logistics.*** -- The basic language. -- 14/26. -- Logistic constants (and/ or/ if, then, etc.). - Conjunction and disjunction. -- 14

Note: The quintessential axiom of logistics, especially in its development since G. Frege, is nominalism. For this reason, the transition from natural logic to logistics was discussed in detail. This transition illustrates the nominalist method. Applied to mere symbols, there is no problem. But applied to realities, problems arise which we briefly pointed out in the last two pages.

LOG 2

2. Introduction (2/6)

Elements of logistics.

Intention.

No superficial talk about logistics. Nor a hyper-specialized 'system' regarding logistics. Just solid information. – For logistics is gradually becoming the mode of thought par excellence among a growing segment of intellectuals, particularly those at home in the natural sciences and engineering. A mode of thought that displays both high qualities and requires significant reservations.

Therefore for "non-initiates" ("les profanes", as a Christian George says in his psychology of natural thought).

Basic work.

We could truly choose no one better than *Alfred Tarski, *Introduction à la logique* *, Paris, 1971-73. After all, he is one of the prominent figures in logistics.

However, before following his text as closely as possible, we situate him within the evolution of logistics. Otherwise, one fails to understand the rather self-assured tone that his text exudes.

Foreword

With reference to D. Vernant, * *Introduction à la philosophie de la logique *, Brussels 1986, JP Van Bendeghem says* the following in a review of it (in * *De Uil van Minerva *).*

1. *The birth date of modern 'formal'* *(note: formalized)* ***logic*** (*note:* logistics). This is usually placed at 1879. Indeed, it was then that *Gottlieb Frege* (1848/1925) published his * *Begriffsschrift* * (**Eine der arithmetischen nachgebildete Formelsprache des reinen Denkens* *), Halle. The use of precisely agreed-upon symbols and the pursuit of the greatest possible clarity still belong to the basic requirements of logistics today.

2. *Evolution.*

a. For Frege, his logistics was the only true logic.

b. Today, however—according to Van Bendeghem—there exists an immeasurable multitude of mutually different, indeed contradictory, logistics.

Example.

For Frege, the logical principle “a statement and its negation cannot be true at the same time” (contradiction principle) still applied. Today, that linguistic rule of thought is being discarded by the so-called paraconsistent and dialectical logistics.

Which, according to the author, gives rise to profound philosophical questions.

LOG3

The position of G. Jacoby.

G. Jacoby, Die Ansprüche der Logistiker auf die Logik and ihre Geschichtschreibung , Stuttgart, 1962, 9, claims that Br. von Freytag clearly set out the fundamental distinction between natural logic and logistics at the Philosophers' Congress in Bremen (1950) to the logisticians gathered there from many countries.

Note: That is the reason why we consistently use the term 'logistics' (Gr.: logistiké technè, arithmetic skills) in this text.

According to Jacoby, who thoroughly investigated the subject, logic differs from logistics in terms of foundations, questions, construction methods, and techniques. Logic is a single discipline within philosophy, whereas logistics is a type of calculation (calculus) using symbols.

The object of logistics is mathematical connections ('combinatorics') between logical and non-logical symbols, which are characterized by IM Bochenski as "blackened spots on paper"; those without semantic content ("empty shells").

The object of logic, if correctly understood (which is often not the case), are circumstances (data), specifically insofar as they exhibit identities (partial identities but also total identities) that show relationships of similarity (metaphorical) or coherence (metonymic), such that reasoning in the form of "if then" can be derived from them. For that is 'logical': to draw deductions (conclusions) from presupposed assumptions based on mentioned connections or relations.

The position of A. Tarski.

Oc, 100.-- After he has treated variables (functions), propositions (judgments), identity, classes, and relations in a logistic manner, he situates logistics in relation to "other sciences"

1. *Usable.*

The ideal of a unified science dominates Tarski's way of thinking.
Logistics is the basis of all other sciences for a reason. Because:
a. every discussion uses logistic concepts and
b. every correct reasoning follows the laws of logistics.

Note: One senses the self-assured tone Tarski displays: his specialty is the foundation, not of a few, but of all other sciences. Logistics is the lawgiver! It governs not some, but all discussions and all correct reasoning.

LOG4

2.1. *Not always used*

Literally: "This does not imply that a complete familiarity with logistics is a necessary condition for correct thinking. Even professional mathematicians—who generally speaking do not engage in incorrect reasoning—do not know logistics to such an extent that they are aware of all the logistic laws they apply.”

Note: In other words: they do it without. But when one looks closely, not with logistics and its 'rules' or 'laws', but with the natural logic inherent to all people, which they simply apply to mathematical objects.

2.2. *Significant practical importance.*

Nevertheless—according to Tarski—knowledge of logistics is of considerable practical importance for anyone who wishes to think and reason correctly. The reason: it assists innate and acquired abilities in correct thinking and reasoning, and in particularly critical cases, it prevents the commission of errors in reasoning.

Note: Now he is suddenly moderating the scope of logistics.

Position names.

Before commencing the exposition, we mention a few names of the positions. Oc , x/xii.

1. *Aristotelian logic.*

It is not mentioned except in two passages. Moreover, the introduction contains not a single element of Aristotle's logic. Indeed—according to Tarski—this meager space corresponds rather to the limited role to which that type of thinking was reduced in—what he calls—“modern science”. He believes that his opinion on the matter was shared by most logisticians of his time.

Note: Because most logistics professionals, as it were, naively project their logistics onto logic, they simply do not see what it is about and imagine that they can scornfully reduce it to a minuscule part of their own logistics. That is also the reason why they believe that logistics actually—and finally, after centuries and centuries (the typical modern belief in progress)—constitutes the true logic.

As we shall see further on—and have already indicated—: it begins with the concept of 'identity', which in logistics is defined primarily mathematically, whereas in logic it is the concept par excellence (in its two variants, namely total identity and partial identity (analogy)).

2. *Methodology of the special sciences.*

Tarski views logistics primarily as an axiomatic-deductive science. Consequently, his introduction does not address a single problem belonging to the logistics and methodology of the experimental sciences. This is despite the large number of this type of science within the domain of modern sciences.

The reason.

An experimental science is not merely a system of propositions (assertions) ordered according to well-defined rules, but also "human activities". Such activities—even where they are well thought out—do not simply fit into the axiomatic-deductive line of thought of logistics: after all, they proceed "fumbling and failing".

Note: With this, Tarski frankly admits that logistics, with its axiomatic-deductive method borrowed from theoretical mathematics, exhibits very clear limits regarding its applicability. Namely, where people—living people—proceed by thinking while grappling with real-life and laboratory situations.

3. *Logistics and mathematics*

The main purpose of Tarski's introduction is, namely, to demonstrate what follows.

a. Logistical laws govern the entire system of mathematics, in such a way that all mathematical concepts are singular or particular applications of the naturally general logistics.

b. The laws of logistics are always—consciously or unconsciously—applied in mathematical reasoning.

Tarski wants to demonstrate how logistics is at work in the construction of mathematical theories. He mainly refers to the axiomatic-deductive structure of all mathematics, which he briefly outlines in oc, 109/141 (*La méthode déductive*) and oc, 143/209 (*Applications de la logique et de la méthodologie à la construction des théories mathématiques*).

After all, in the beginning, logistics was an attempt to 'foundation' mathematics (to construct it axiomatically-deductively). But over time, it grew into "a coherent apparatus that is the basis – the common foundation – for all forms of human knowledge".

Note: Notwithstanding the admitted limitations, Tarski maintains that logistics can 'foundation' all human knowledge.

Once again: unified science and human knowledge!

LOG6

2. The logistic concept 'function' (6/13)

2.1. Functions (6)

Provisional 'definition'.

Tarski (1902/1983) defines logistics as the study of terms such as 'not', 'and', 'or', 'some', and many others, insofar as such terms are a co-decisive condition in reasoning.

Note: Logic can somewhat support that.

Linguistic turn.

Instead of being oriented towards reality, in ontological terms “being”, logistics is primarily oriented towards language and language use. Anglo-Saxons call this the “linguistic turn” or “linguistic or linguistic perspective” (also known as 'linguisticism'). It is therefore not surprising when, in oc, 49, Tarski says: “The propositional calculus (*note:* theory regarding judgments or sentences) is without a doubt the most fundamental part of logistics”.

In other words: how to form sentences that, although purely syntactic (“empty shells”), nevertheless prove to be fillable (semantically) in a logistically valid manner?

To shed light on this in its mathematical origins, see here how Tarski begins his logistics.

Scientific theory.

Every scientific theory is a system (*note:* a contradiction-free whole) of propositions. These are called 'laws', or even “assertive statements,” or simply 'statements'. This term means—in Kantian usage—pronouncing whether or not an 'event' (a fact) is true, preferably at the very moment of speaking. In short: factually true, but not necessarily true.

Mathematical language.

Statements in mathematics occur in a well-defined order, usually accompanied by a proof that substantiates a theorem.

Constants and variables.

Among the terms and symbols that occur in mathematical theorems and proofs, a distinction is made between 'invariants' (constants) and 'variants' (variables).

Mathematical models.

Here is how Tarski explains both concepts. Once one has understood this section well, one is well on one's way to following the rest of the argument regarding propositions. For propositional calculus follows the mathematical model or exemplum.

LOG7

2.2. Oppositional functions (7/8)

1. *Constants.*

A number, a zero (0), a (1), -- 'sum' (.+.) etc. have a well-defined meaning which remains the same - 'identical' - in the course of the mathematical exposition. Unchangeable. To questions such as “Does zero (0) have a property?” or “Is zero an integer?”, a true or false answer is possible. For example, zero is not an integer. Zero has properties. For example: “1 + 0 = 1”.

In other words: 0 is the absence of adduability or deductibility.

2. *Variables.*

Signs – 'symbols' – such as a, b, c or x, y, z are considered variables in arithmetic (number theory).

Consequence: there is no actual true or false answer to the question “Is x an integer?”, because as a variable x is in fact, as soon as it would become a constant, either a positive or a negative number or zero.

Tarski: “Such entities (*note:* mathematical conditions) are not found in our world, because their existence would be contrary to the fundamental laws of thought.”

Note-- Tarski. -- Variables were already used by mathematicians in antiquity, and also by logicians, at least by the ancient Greeks. This in rare and special cases.

From François Viète (1540/1603) onwards, its use becomes methodical. At the end of the 19th century—thanks to the introduction of the concept of 'quant(ificat)or'—the value of variables is fully recognized. This is largely due to Ch.S. Peirce (1839/1914).

Propositional functions.

With this, Tarski formally introduces logistics. Mathematical expressions involving variables fall into two types: propositional and descriptive (designative) functions. We will first consider the former.

1. *"x is an integer"* exhibits the grammatical form ("empty shell") of a proposition (sentence, assertion, statement, judgment) but is not a proposition and therefore can be neither affirmed nor refuted.

2. *"x is an integer* " can be turned into a proposition by filling the empty shell with a constant (in mathematics, for example, a well-defined number).

Thus: "1 is an integer" is a true proposition.

But like this: "1/2 is a whole number" is an untrue sentence.

An expression that includes variables and becomes a proposition through their completion is a propositional function.

LOG8

Terminological note.

Mathematicians use the term 'function' in a different sense and therefore reject the term "propositional function". Propositional functions and propositions containing only mathematical symbols (without everyday words) – think of "x + y = 5" – are called 'formulas' by mathematicians.

Tarski immediately shortens "propositional function" to 'function', where this does not lead to misunderstanding.

"Empty shells". Variables resemble the gaps to be filled on forms.

Note: In Platonic language—cf. Fr. Viète—they are called 'lemmas', i.e., summarizing and provisional names for unknowns. Thanks to Viète, the lemmatic-analytical method (in short: 'analysis') arose on the basis of them. Think of "analytical geometry".

'***Satisfy***' When identical variables are substituted for identical constants such that propositions are formed, those constants are said to 'satisfy' the propositional function. For example: $x < 3$. The numbers 1, 2, 2,5 satisfy, while 3, 4, 4,5 do not satisfy the syntactic structure of the propositional function, because they lead to false sentences.

2.3. Descriptive (designative) functions (8/9)

This is the second type.

Expressions with variables that, when substituted with constants, become designations (descriptions) of things, are descriptive functions. -- For example: 2x + 1. -- If x is replaced (substituted) by a constant number - e.g. 2 - then 2x + 1 becomes the mathematical description of a number (thing). For example: 2.2 + 1 = 5.

Note: In algebra—a part of number theory—algebraic expressions and equations are applications (types) of descriptive functions.

Expressions . Variables, constants, symbols for the four basic arithmetic operations (+, -, x, :). Like this: xy. Or: (x+1) / (y+2). These are descriptive functions.

Comparisons

Variables, constants, '='. -- Like this: $x^2 + 6 = 5x$. In equations, variables are called 'unknowns' and constants that satisfy the equation are called 'roots'. For example, 2 and 3 are 'roots' in this case because $2^2 + 6 = 5x$. In equations, variables are called 'unknowns' and constants that satisfy the equation are called 'roots'. For example, 2 and 3 are the 'roots' in this case because $2^2 + 6 = 5.2$ and $3^2 + 6 = 5.3$. -- Variables such as x or y in number theory play the role of 'number descriptions'. It is said that the numbers are the 'values' (substitutions) of the variables.

Incidentally: in geometry, variables describe points (things), lines, planes, and figures that are their values.

LOG9

2.4. Descriptive functions (8/9)

Digression: cognitive dissonance.

That one can employ 'functions' (propositional ones, that is) to describe 'things', in this case moral or conscience issues, is evident from what follows.

Library st.: *Xav. Vanmechelen, Akrasia and Self-Deception* (*Irrationality in Analytical Anthropology*), in: *Philosophical Society* (*Communications*), Leuven, 45 (1999): 72ff..

We are paraphrasing.

Rational behavior. 'Rational' here in the broad and somewhat ethical sense. According to Vanmechelen, these rules usually apply in everyday language.

1.1. Cognitive grounds normally determine (with exceptions) what someone believes to be true regarding the respective values of x's and y's.

1.2. Emotive (= axiological) and volitive grounds normally determine (with exceptions) what someone believes to be valuable in the matter.

Note: 'Normal' means "unless circumstances dictate otherwise". Think of the rule, with exceptions. Well, 2. on cognitive and axiological (value-theory) grounds, someone believes that x is better than y. So normally, this person prefers to x.

Note: x and y are empty shells. To a certain extent, they can be filled with actions. For example: x = telling the truth; y = lying.

Cognitive dissonance. 'Dissonance' is 'contradiction' or at least 'opposition'. -- 'Cognitive' (understood together with 'axiological') is "that which rests on grounds of knowledge". Now, knowledge is in fact rarely not accompanied by preference and/or at least value judgments.

Here is how Vanmechelen sees it. We rephrase.

Principles of action (axioms).

1. If someone believes that x is more valuable than y, then he will normally desire to x more than to y.

2. If someone prefers xt to yt, then they will also want to x-, -- at least normally.

3. Despite his belief that his principles of action are true, he is free to x or y.

4. He judges that it is better to x now.

5. Yet he prefers to do the y. If these five are true at the same time, then there is dissonance. Did not St. Paul say, "I see the good but do the evil"? (Akarsia, unable to restrain oneself, unable to control oneself). Or does not the psychiatrist say to the neurotic: "You are deluding yourself" (self-deception).

Note the difference: ordinary language says “the good” (x's) and “the evil” (y's) or 'something' (which is false) instead of using the functional terms that naturally sound more general.

LOG10

Quantification.

Besides filling with constants, there is quantification to move from propositional functions to propositions.

1. *General propositions* . -- “$x + y = y + x$”. This is a propositional function with two variables, x and y. All possible objects (here: numbers) can satisfy it. The result is always a true proposition.

Incidentally: the Commutative Act on Aggregation is applied here.

Note: The most important mathematical theorems are formulated as follows: all general (universal) propositions—theorems—claim that all objects (e.g., numbers) of a well-defined category (type, class) exhibit such and such a property.

2. *Existential (particular) propositions* . -- If it was 'all' above, then it is now one type of “not-all” -- “$x > y+1$”. A propositional function. Not all paired objects (numbers) satisfy.

Like this: if $x = 3$ and $y = 4$ then $3 > 4+1$. False. But if $x = 4$ and $y = 2$, then $4 > 2+1$. True.

In other words: for not all ('some' e.g.) objects (numbers) x and y does $x > y+1$ hold. Name: “existential proposition”.

3. *Singular propositions.* - Not 'all'. Nor “not-all”. But “exactly one”. This is a type of “not-all”.

If there are no variables at all and only individual objects (e.g., numbers) are mentioned, then there is a singular proposition. For example: “$3 + 2 = 2 + 3$”. Exactly one number is described: 5.

4. *Unthinkable propositions* . -- Not 'all'. Nor “not-all” (some or just one). But 'none'. Like this: “$x = x+1$”. Upon substitution, it turns out that this proposition is unthinkable (nonsensical, absurd, illogical, impossible).

Note-- “For all objects (e.g. numbers) x and y there exists a number z such that $x = y+z$”. Name: conditional existential proposition”.

In other words: only if there are certain numbers do numbers exhibit a property. This type is a complication of the three previous ones (universal, here: existential, singular). If you like: there is absolutely existential (ad 3) and there is conditionally existential.

Note: In natural logic, this is the "logical square," which consists of all/all not and not all. Thus, some is merely a model of "not all," just as "exactly one" is too.

LOG11

2.5. Quantification (10/12)

Quant(ificat)ors (operators).

Expressions such as "For all x, y it holds that..." or "For some x, y it holds that..." express either general (universal) or existential (particular, singular) quantifiers.

Note: 'Operator' is used in another sense as well, besides 'quantifier'.

Tarski on natural language usage . -- Variables normally do not occur in everyday speech, and quantifiers are therefore unusual. Yet 'some' ('certains') terms are not far removed from logistic quantifiers, such as "every, all, a certain, some".

To be translated. -- "All children grow up in phases" is logistically translated as "For all children (every child), it holds that they (it) grow up (grows up) in phases". Or alternatively: "For all x, if x is a child then x is a being growing up in phases". -- Existentially: "For some x, if x is a child, etc...".

Appropriate symbols. -- "For all objects x, y... " becomes "x, (A) y". And "for some objects xy ..." becomes "x,(E) y".

Returning to "For all or some objects x, y it holds that x = y+z", we translate symbolically into (I) either "x, (A) y", or 'z(E)'. Thus the entire expression becomes; "x, (A) yz (E) (x = y+z): Which naturally becomes mathematically clear.

From propositional function to proposition . -- By introducing with quantifiers, a propositional function becomes a proposition. But such that if not all variables are governed by quantifiers, the propositional function remains what it is: for reasons of indeterminacy.

(I) Thus, "x = y + z" becomes a proposition thanks to the introduction "For all or some objects x, y, z it holds that ...". But "There is an object z such that x = y + z ..." remains a propositional function (x and y are indeterminate).

(II) "z(E) (x = y + z)". If x and y are substituted by constants (see above) or if x and y are determined by a 'quantifier', then becomes a proposition. For example, in the form of "For all objects x, y it holds that" (or more symbolically: " x, (A) y").

In this context, one sees that the concept of 'function' (an expression is a function of variables) predominates, but is to be transformed into a proposition with truth values (true/false).

LOG12

Digression: logical quantification.

Let us begin with Ch. Peirce's bean reasoning.

***Deductive.* --** All beans from this bag are white. Well, these beans are from this bag. Therefore, these beans are white.

***Inductive.* --** These beans are from this bag. Well, these beans are white. Therefore, all beans from this bag are white. A generalizing reasoning.

***Hypothetically.* --** All beans in this bag are white. Well, these beans are white. Therefore, these beans come from this bag. A generalizing reasoning.

Peirce sees the difference regarding quantification.

Plato.

Platon already clearly saw the two types of quantification. *E. Beth, *De wijsbegeerte der wiskunde* *, Antwerp/Nijmegen, 1944, 36ff. cites a text by *Platon* (**Filebos* * 18b/d). In it, Platon first speaks of the letters of the alphabet as specimens of the set (all) and then, clearly delineated, of the same letters as parts of the coherent whole that the alphabet is in its interpretation (whole). Or in modern language: the alphabet as a system. According to Beth, he did not even notice that duality.

Scholasticism

Ch. Lahr, Logique, Paris, 1933-27, 493 and 499, clearly and distinctly states the distinction.

There are distributive and collective concepts (all people, the whole person). There is a “totum logicum” (class, collection of specimens) and a “totum physicum” (system, coherent whole): specimens resemble one another; parts of a system are interconnected.

Thus, there is an induction that reasons from one or more instances to all instances (Peirce: induction), and there is an induction that reasons from one or more parts (subsystems) to the whole (system) (Peirce: hypothesis or abduction). We call the first type 'generalization' and the second 'generalization'. These are two types of quantification, somewhat related but nevertheless fundamentally different.

Tarski does not see that. And *K. Döhmann, *Die sprachliche Darstellung de Quantifikatoren* *, in: * *A.Menne/ G. Frey*, eds., *Logik en Sprache** , Bern/München, 98*, claims that the distributive and collective quantifiers (all/whole) are accurately represented by the logistic conjunction, but this is not evident from anything.

LOG13

2.6. Free (real) and bound (apparent) variables (13).

Within a propositional function, two types of variables occur. We explain this using Tarski.

1. *Free (proper) variables.*

As long as the variables are 'free' or 'real' variables, they make up the function. If they are filled in by constants or introduced by quantifiers, they form part of a proposition.

2. *Bound (improper) variables* . -- Let us take the propositional function (II) z(E) (x = y+z). In this, x and y are free (proper) variables, while z appears twice as a bound (improper) variable. -- But let us take (I)) x (A) yz (E) (x = y+z), then all variables in it are bound.

In other words: the structure determined by the presence or absence and the position of quantifiers (and constants) decides the nature of the variables.

(III) "For all objects (numbers) x, if x = 0 or y =/ 0, then there is (NOTE: existentially) an object (number) z, such that x = yz"

Behold a propositional function. -- We will examine the variables one by one.

- x is apparently a universal, quantifier-bound variable. First as a quantifier part. Then twice as quantifier-bound.

- z resembles x.-- Although the initial quantifier of (III) does not contain z, nevertheless a part of (III) begins from the existential quantifier ("is there") which is a propositional function introduced by the existential quantifier containing z, namely (IV) "There is an object z such that x = yz"

In other words: the two places where z occurs in (III) belong to the partial function (IV). As a bound variable,

- y is in (III) without a quantifier containing y. y therefore appears in (III) as a twice free variable.

This is to clarify the role or function of operators regarding variables (and whether or not they are propositions).

As Tarski says as a logistician (and even simply as a mathematician without logistics), how to make an expression like "For all objects (numbers) x and y, $x^2 - y^2 = (x - y).(x^2 + xy + y^2)$" clear without formulas? That is the power of modern mathematical-logistic thinking.

LOG14

3. Proposition Logistics (14/26)

3.1. Propositional Calculus (negative, conjunction and disjunction) (14/16)

Sometimes—according to Tarski—this section is called "deduction theory". Just as every specialized science has its constants (number theory has its singular numbers, classes of numbers, relations between numbers, operations on numbers, etc.), so logistics has its own constants, which are, moreover, common in natural language and in the sciences: not, no (negate), conjunction (and) and disjunction (or), encompassing ("if, then") etc.

Note: They are also called 'functors'. They either influence the proposition from within or connect propositions. The analysis of them is called 'propositional calculus'.

Negation. -- This monadic functor, together with the affirmation, is the basic constant within the sentence. -

Where natural language usage usually says “The -1 is not a positive integer”, logistics says: “It is not the case that the -1 is a positive integer”. Among the dyadic functors, we consider the following two.

Conjunction (logistic product).

Like this: “3 is a positive integer and 2 < 3”. Something like this consists of two (therefore: dyadic) conjunction members (two product factors).

Disjunction (logistic sum).

The term 'or' in common usage connects the two disjunction members (sum terms). -- But here problems arise with natural language.

Natural speech has two types of 'or'.

1. ***Non-exclusive*** (Lat.: vel), where at least one of the members or both can be true at the same time.

2. ***Exclusive*** (Lat.: aut), where either one member or the other member can be true 'at the same time'. Not both at the same time. Consider: “A or not-A”. Where, in a non-exclusive sense, “A or B” is such that both can be true at the same time.

Logistic. -- Tarski. -- As in mathematics, logistics has only one meaning, the non-exclusive one. Such that a disjunction of two propositions, if both are true or if at least one is true, holds as (logistically) 'true'. Thus, “Every number is positive or less than 3” is (logistically) 'true', even though there exist numbers that are both positive and less than 3.

Note: Here one feels the artificiality of logistics compared to natural language.

LOG15

From logic to logistics.

Let us pause for a moment to consider that curious, indeed, sometimes very bizarre transition. And we will do so based on Tarski's text itself. For he states that logic (natural thinking), in the use of terms such as 'and', 'or' (and what we shall see shortly: “if, then”), relies on “some connection” between the members of the predicate, whereas logistics connects (via such functors) objects (numbers, propositions, etc.) “without connection”.

We specify based on applications.

The lawn.

Standing in front of a normally lit lawn, natural reason says: “It is beautifully green.” As a representation of an experience, of course. -- The logistic 'reason', however:

a. notices that same lawn,

b. strips it of its content (that it is beautiful green), thus making it into an “empty shell” (the “beautiful green” becomes an “empty shell”), fills it with – such is Tarski ’s example.

It is a no-brainer to find at least one member of the disjunction therein that is 'true' (in the ordinary logical, natural sense), and to conclude that the entire predicate is 'true' (in the logistic sense this time).

This while natural logic:

a. that it is green, where finds and

b. that it is blue, superfluous nonsense (because it is not perceptible). After all, there is only a real connection between the lawn and the beautiful green color, -- lawn, however, not between that same lawn and the blue color.

Tomorrow or the day after tomorrow.

You ask a friend when he leaves. Answer: “Tomorrow or the day after tomorrow”.

If it turns out afterwards that the friend already clearly knew at that moment, natural logic will form the impression that, for example, a lie was involved.

Such a thing strips logistics of its substance, turns it into an empty shell, and fills it with its own 'fillings', if necessary without any connection whatsoever.

“2.2 = 5 or New York is a big city”.

According to natural logic, the first member is pure nonsense and the second member is naturally true (in the natural-logical sense), but the whole "... or ..." is nonsense because one sees no real connection between "2.2 = 5" and "New York is a big city".

It is evident that the use of the 'and' (conjunction as logistics interprets it) is already logically questionable. For that 'and' represents itself in the (logistic) 'or'.

LOG16

For logistics, "2.2 = 5 or New York is a big city" is semantically (substantively) meaningful and 'true' (apparently in the logistic sense of 'true'), because, although the first member of the disjunction is pure nonsense, the second member is nevertheless "materially testable" true (in the natural-logical sense). Despite the pleonasm ("2.2 = 5" is too much), logistics is still satisfied with the 'little' ("New York is a big city").

Once again: "Tomorrow or the day after tomorrow".
For the logistician, the terms become "empty shells" and fillable according to logistic axioms. Thus, if it turns out (= naturally-logically true) that either 'tomorrow' or 'the day after tomorrow'—at least one of the two—is 'true', then the entire expression is logistically 'true'.

Digression.
*Chr. George, *Polymorphisme du raisonnement humain* *, Paris, 1997, 67 and 70, states that—logistically—the quantifier 'some', stripped of its natural-logical content, is filled with "at least one and perhaps all". One sees that the empty shell proves fillable to the point of logical nonsensicality, for—naturally-logically—'some' is certainly not 'all'. 'Some' is, however, at least one and almost, except for one, all. But never 'all', as George states. But that is logistical.

Combinatorics.
Actually, the true name of logistics is 'combinatorics' of objects (numbers, propositions, for example).

Library st.:
-- *C. Berge Principes de combinatoire* , Paris, 1968;
-- *J. Lagasse et al., Logique combinatoire* , Paris, 1976 (a computer work).

Briefly outlined: a set of 'places' (in logistics: empty shells) in which, according to axioms, objects can be placed; studying is combining studying. Think of a wardrobe in which a set of places can be 'filled' with linen. Think of Noah's ark in which the animal pairs can be 'filled'. Whether or not there is any connection between them is of no importance, unless very minor (although it is important for the relevant axioms).

Logically.

Logically, prioritizing axioms and drawing consequences from them—as logistics does—is perfectly acceptable. But to the extent that this is confused with logic (albeit applied logic), it is ontological and purely logistic, not logic.

LOG17

3.2. Implication (17/23)

From formal to formalized implication.

The encompassion or implication takes the linguistic form “if, then”.

K. Döhmann, Die sprachliche Darstellung logicer Funktoren , in: *A. Menne/ G. Frey, Logik und Sprache* , Bern/München, 1974, 46ff., distinguishes what follows in natural logical language.

Exclusive: if p, then q. Conditio quacum semper. p = sufficient (total) condition (no other condition necessary).	Inclusive: if p, then q. Conditio sine qua non. p = necessary (partial) condition.

1. ***Formal logic.***

Note: 'Formal' comes from the Latin 'forma', form of being, i.e. the essence (of something), i.e. what it is. This is grasped in a corresponding concept in the human mind, for example. Aristotelian (natural) logic is conceptual logic because it is logic of the essence. That is its ontological foundation.

Formal implication.

“If it rains, then things get wet.” The form of 'to rain' and that of “to get wet” partially overlap. G. Jacoby calls this 'partial identity' (= analogy). Here it is coherence identity: rain causes (coherence “cause/effect”) dampness. It is a metonymic partial identity.

In other words: both forms partially overlap, and thus one can be expressed in relation to the other. In an “if then” sentence.

On Oc 22, Tarski admits that in natural language usage “if, then” is only uttered “lorsque it ya quelque connexion”, if there is any coherence (connection) between given realities.

'Logically'.

As *G. Jacoby* states in *Die Ansprüche der Logistiker auf die Logik and ihre Geschichtschreibung*, Stuttgart, 1962, 10 (and in many places elsewhere in the work), 'logisch', the core of natural logic, is 'folgerecht', that which follows from the other on the basis of connection (similarity/coherence) .

Well, logistics takes that term, strips it of its logical content, turns it into an empty shell, and fills it with a product of its own. The method of combinatorics that is logistics. So much so that Tarski, for example, admits that the logical connection is “difficult to characterize.” Of course: he does not even know that partial identity (distributive/collective) is the essential core of 'logical'.

LOG18

2. *Logistics.*

Let us first consider Tarski's psychologism regarding natural logic.

Oc, 21. -- The logisticians who founded logistics wanted to simplify the meaning of the term 'or' and make it clearer and independent of “every psychological factor”. To this end, they broadened the usage of 'or' to include unrelated members on either side of it.

Note: The reader will judge for themselves whether the logistic language is so much 'clearer'. And also: natural logic is much more and radically different from 'psychology'! It is a matter of (partial) identity, for example, a clearly defined concept.

Oc, 22. -- Besides regarding 'or', Tarski also applies psychology regarding “if, then”. “Usually we only formulate and confirm an implication when we do not know exactly whether or not the antecedent (preface clause) and the consequent (consecutive clause) are 'true'”.

Note: Whether that is a true representation of logical language usage is highly questionable. Logically, we use an “if, then” clause when we conclude a subsequent clause based on (partial) identity. That psychology plays a direct role in this has not been proven anywhere.

Note: This is reminiscent of the mocking remarks by contemporary cognitivists regarding “folk psychology,” in which they so often situate natural logic.

Note: Reference should be made here to Chaim Perelman (1912/1984), the man behind the “nouvelle rhétorique”.

Has neo-rhetoric not strongly pointed out the artificial and alien nature of logistics, and immediately the fact that natural logic has its 'akribeia', logically rigorous precision, in the sense that within communication between people, for example (or when they reflect to themselves), the entire situation, with its particulars (information), emphatically contributes to the precision of reasoning?

In court, for example, or elsewhere in everyday life, people argue on psychological grounds, among others, but not solely or even primarily on psychological grounds.

So far, a very painful gap in Tarski's understanding of natural logic. Wouldn't this be yet another instance where a logistician projects his logistics onto what he perceives as 'logic' instead of studying logic from within itself?

LOG19

Material implication.
“From the formal to the material implication.” -- Romantic irony, hovering superiorly above the given—in this case 'and', 'or', and now “if, then”—characterizes the transformation we are now specifying. -- Logistics takes the structure “if, then”—already present in natural logic—hollows it out into an empty shell so that only the (otherwise hollow) name—in Latin, nomen—remains. Then it fills that with its product.

Conditional proposition. That is the product. -- As Tarski claims, a (logical) connection is not necessary between what is being 'connected'. Here is how that works.

Philon of Megara (4th century BC). Perhaps this thinker was the first to introduce material implication ('sunemmenon', conditional shell).

Note— again, pay attention to the twofold meaning exhibited by the term 'true', the logical and the logistic.

o.-- Antecedent true (logical), consequent false (logical). -- False distraction (in the logistical sense). --WOW.

a. Antecedent true, consequent true. - True conditional proposition. Philon: "If it is day, then there is sunlight." -- WW.

b.-- Antecedent false, consequent true. -- True conditional sentence. - Philon: : "If the earth flies, then it exists"-- OWW.

c.-- Antecedent, false, consistently false. - True conditional sentence. Philon: "If the earth flies, then it has wings." -- OWOW.

In Tarski's terms: "By the assertion that is the (material) implication, one states that it does not occur that the antecedent is true and the consequent is true". In all other cases (in the list above: a, b, and c), the material implication is true.

Thus the natural-logical implication (the formal one) is radically purified of 'psychology' according to Tarski – and the material implication is "in any case broader" than the otherwise "not entirely clear formal implication of logic" (oc, 24).

Put differently: every formal implication, if true and sensible (meaningful), is a material implication (corresponds to it logistically). Not the other way around.

Behold the logistic revolution regarding "if, then". One sees that combining in this way becomes possible, but logical reasoning is compromised.

LOG20

Let us now consider Tarski's exemplary model.

For in it the scope of Philon's revolution (as opposed to Platonic-Aristotelian logic) becomes more clearly apparent.

o.-- "If 2.2 = 4, then New York is a small city". -- W.OW = OW.

a.-- "If 2.2 = 4, then New York is a big city" -- WW = W.

b.-- “If 2.2 = 5, then New York is a big city”. -- OW.W = W.
c.-- “If 2.2 = 5, then New York is a small city”. -- OW.OW =W.

According to natural logic, there is no logical connection between all the preceding clauses (antecedents) and the subsequent clauses (consequents). According to that same logic, the preceding clause in b and c is nonsense, but the subsequent clause is indeed 'true' (in the sense plausible to logic), but without logical validity.

Natural logic says of an “if, then” sentence that it is valid (or not or probably valid),-- not that it is true unless in the sense of 'justified' (or not or probably justified).

Logistics constantly discusses truth values. And specifically within the empty but fillable shells. 'Truth' in two senses: the epistemological (acceptable in natural logic) and the typically logistic (unknown in natural logic).

That is the difference between formal logic and logistics.

A law of physics.
Tarski briefly develops the law “All metals are malleable”. -- We provide what he says in doing so.

Logistically, this is an implication with variables: “If x is a metal, then x is malleable”. Or again: “For all x (it holds that), if x (is) metal, then x (is) malleable”.

The truth of this universal law immediately entails the truth of all particular (understand: particular and singular) applications constructed by replacing ("filling in") x with the 'names' of any materials whatsoever (e.g. iron, clay, wood).

It never occurs that the antecedent is true and the consequent false (ad o: W.OW = OW, above). Moreover: in all those implications, there is a close connection (*note:* which makes it plausible for natural logic) between the antecedent and the consequent. This is evident from the fact that the subjects coincide: “If x is metal, then x is flexible”.

LOG21

Tarski's explanation.

He goes through the entries one by one.

1. *If x is entered by iron,*
then the preceding and concluding clauses are unnuancedly true. Instead of stating an implication, we replace it with a sentence providing a reason: “Since iron is a metal, it is malleable”.

Note: In traditional grammar, 'realis' was referred to as a conditional sentence.

2. *If x is filled in by clay,*
Then we are faced with an implication where the leading clause is false and the concluding clause is true. Then, always using natural language, we can replace the implication with “Although clay is not a metal, clay is nevertheless pliable.” This is a concessive sentence.

3. *If we replace x with wood,*
then we create an implication in which both the opening and closing clauses are false. If, nevertheless, we wish to retain the conditional formulation, then we must formulate it 'contra. factueel' (purely hypothetically): “If wood were metal, then it would be pliable”.

Note: In traditional grammar, this is an 'irrealis' as a conditional clause.

Once again: material implication.
After these transformations from logistic to ordinary natural-logical language usage, Tarski explains: -- Logisticians take the natural formulations (whose validity they acknowledge), empty their content until an empty shell emerges called “logistic implication.” -- Why? For reasons of form simplification (uniformity), clarification, and depsychologization (*note:* Tarski is partially mistaken here regarding psychology, as indicated above).

Result.
A “if p, then q” arises that remains 'meaningful' even though there is no connection whatsoever between the conceptual content of p and of q. Only the factually verifiable truth (in the two senses, as mentioned above) of p and q 'counts'. In other words: the implication of 'formal' becomes 'material'.

Nevertheless, there are logisticians who wish to approximate the natural way of speaking. For example, *C.L. Lewis* (1883/1954), founder of modal logistics in his *Survey of Symbolic Logic* (1918), who introduces “strict implication." One need only read his *La logique et ma méthode mathématique,* in: *Rev. d. Métaphysique et de Morale* 29 (1922): 4 (oct.), 455/474. He seeks to justify deductive derivations ("necessarily derivable") in this way.

LOG22

Implication within mathematics.
Logistical reservations.

There was once an ancient mathematics for modern logistics. It functioned perfectly. It served repeatedly as exemplary thinking for philosophy (e.g. Platonic), the empirical sciences, and even for a certain rhetoric. -- Tarski, regarding the mentality of the logisticians, feels compelled to formulate the following reservations.

Numerical theorems.

Tarski gives an example. -- "If x is a positive number, then 2x is a positive number". Tarski: the opening clause is called 'hypothesis'; the closing clause 'conclusion'.

Tarski. - Mathematics also exhibits other formulations.

"From "x is a positive number" it follows that "2x is a positive number"". "The hypothesis "x is a positive number" implies the conclusion "2x is a positive number". "The condition "x is a positive number" is sufficient for "2x is a positive number": Conversely: "The condition "2x is a positive number" is necessary for "x is a positive number". -- "For x to be a positive number, it is necessary that 2x is a positive number".

Note: One can add: "It is inherent to "x is a positive number" that "2x is a positive number":

Tarski generalizes.

Instead of the conditional proposition, one can just as well state: "The hypothesis implies the conclusion" or "The hypothesis is a sufficient condition for the conclusion." Or even: "The conclusion is a necessary condition for the hypothesis." -- Although some expressions are subject to logistic criticism, they are nevertheless commonly used in mathematics.

I.-- Problems.

We are following Tarski closely. -- Objections target terms such as 'hypothesis', 'conclusion', 'derivation', 'follows from', 'implies!'

The difference.

1.-- In ordinary mathematical terminology, one speaks of 'numbers,' 'properties of numbers,' 'operations on numbers,' etc. In other words: of mathematical objects.

2.-- Logistics speaks in terms of 'hypothesis', 'conclusion', ' conditions', etc. In other words: in terms of propositions or propositional functions insofar as these occur in mathematics. Tarski wants to introduce logistic terms instead of naturally logical terms (which have always been customary).

LOG23

Thus, Tarski defines equations and inequalities as a special type of propositional functions and polynomials or algebraic fractions as descriptive functions.

Standard math textbooks don't look at that and ... Tarski acknowledges that "there is no danger involved at all".

Note: And does not even mention that natural logic is the reason why "there is no danger involved whatsoever". Yet he wants, for example, "$x^2 + ax + b = 0$ has at most two roots" converted into "There are at most two numbers x such that $x^2 + ax + b = 0$".

II.-- ***From natural logic to logistics.***

When we say: "From the antecedent follows the consequent", we assume in natural logic that the truth of the second proposition 'in a manner' ("pour ainsi dire" (oc, 28)) necessarily follows from the truth of the first; -- indeed, that we might perhaps derive the second from the first.

Time and again, the logistic convention. -- but the scope of the logistic implication does not depend on any connection (*note:* in natural logic: total, partial, or absent identity) between the antecedent and consequent clauses.

If someone – according to Tarski – (*note* : in his natural-logical thinking) is already annoyed by the expression "If 2.2 = 4, then New York is a big city"; then he/she will be even more annoyed by a different interpretation such as "The hypothesis that 2.2 = 4 implies that New York is a big city".

Comments.

One cannot shake the impression that logisticians like Tarski are flirting with their paradoxical expressions instead of warning that it is not even about logic, but about combinatorics.

The process.

'Hypothesis' or 'inference' are torn from the natural-logical context , stripped of their content, while retaining the mere name ('nomen'), transformed into an empty shell and filled with a logistic product, the purely material implication: “The conclusion follows materially from the hypothesis.

But, once logistics is confronted with, for example, the axiomatic-deductive sciences, it is forced to return to the implication “which approaches the natural-logical much more closely,” as Tarski himself admits, oc, 29 (cf. Lewis' strict implication).

LOG24

3.3. Equivalence (equivalence) (24)

W	-W	-W	This is a form of identity.
W	W	W	Equivalence (LK) exhibits a left side (LK)
-W	W	-W	and a right side (RK).
-W	-W	W	If LK is true and RK is false, and if LK is false and RK is true, then false equivalence.

If LK and RK are true, then true equivalence. If LK and RK are false, then likewise true equivalence. Agreed!

Conversion of contingent proposition.

If LK is exchanged with RK (= conversion), a converse equivalence arises.

True proposition. -- If x is a positive number, then 2x is a positive number.
-
True converse. -- If 2x is a positive number, then x is a positive number.

When replacing 2x with x^2.

(I) True proposition. -- If x is a positive number, then x^2 is a positive number.

(II) False converse. -- If x^2 is a positive number, then x is a positive number.

If and only if.

This entails 'both or neither'.

The two implications above (I) and (II) can thus be reduced to the same proportion . -- “x is a positive number if and only if 2x is a positive number”.

LK and RK can be swapped without selling falsehoods.

In other words.

The same can also be expressed differently. -- "From "x is a positive number" it follows "2x is a positive number"." And vice versa. In other words: the rules for conversion work.

Or "The conditions for x to be a positive number and 2x to be a positive number are mutually equivalent". Or "For x to be a positive number, it is necessary and sufficient (*note:* if and only if) that 2x is a positive number".

Define

Here the (total) identity becomes clear. -- "If and only if" is often used when introducing a definition (new expression).-- Suppose: > (greater than) is already known (given). To introduce < = (less than or equal to), one uses what is known. "For all x and y, it holds that x > = y if and only if not." "x > y" and "it is not the case that x > y" are equivalent propositional functions in this context. Thus: "3 + 2 < = 5" is equivalent to: "It is not the case that 3 + 2 > 5".

LOG25

Laws of propositional calculus.

1. *Simplification Act.*

"If 1 is a positive number and 1 < 2, then 1 is a positive number." -- Clear proposition: only logistic constants (if, then) or mathematical constants (1, 2, <, positive number). Does not appear in mathematics textbooks as a mathematical theorem, because it is not mathematically enriching. And its truth depends solely on the logistic constants (and, if - then): "If today is Sunday and sunshine, then today is Sunday," as another interpretation of the structure, proves that.

Propositional variables.

To generalize. -- p, q, edm do not necessarily refer to numbers, Sunday, the sun is shining, and so on, but are the empty shell of a complete proposition. --

Regarding the proposition. **-** if a positive number" = p. "1<2" = q. -- Propositional function: "If p and q, then p". No matter how it is filled in, the formula yields only true sentences: "For all p and q, if p and q, then p". Note the quantifier "all". That is a first law of propositional calculus: the law of simplification.

Another model.

Thus, “2.3 = 3.2” is a single instance of the universal numerical mathematical theorem that is in its generality a law, of “For all numbers x and y, xy = yx”. One may also substitute that formula as one wishes: it is always true and therefore a law.

2. *Other laws.*

In an analogous manner, one can derive other laws of propositional calculus. In the formulation, the universal quantifier “For all it holds that ” is omitted—for reasons of self-evidence.

Logistic Identity Act. -- “If p, then p”.

Logistic Simplification Act on Logistic Sum. -- “If p, then p or q”. Note: (1) was the simplification law on logistic multiplication.

Logistic equivalence law. -- “If pq implies and q implies p, then p if and only if q”

Logistic law of hypothetical syllogism. -- “If p, q implies and q implies r, then pr implies”.

Because only variables occur in these formulas, they are universal. They thus express regularity regarding thought processes. That is the power of propositional combinatorics.

LOG26

Truth functions and truth tables.

Symbols.

Not: -. And: ^ . Or: Q. If, then : --> If and only if : <--> So : -p. p^q. pv q. p --> q. p <--> q. Variables and constants, parentheses allow all propositions to be written down in propositional calculus.-- Like this : “(pvq)--> (p ^ r). That is “If p or q, then p and r”. Or the law of the hypothetical syllogism ((p--> q) ^ (q--> r)) --> (p--> r).-- One sees the clarity of the method.

Truth functions.

Every propositional function within propositional arithmetic is a truth function. In other words: the (un)truth of the propositions arising from the substitution of variables is radically dependent on those substitution propositions.

Thus: “(pvq)--- (p ^ r)”. If one fills in that structure, one obtains an implication. The truth of the disjunctive antecedent depends solely on the truth of the filling propositions. The same applies to the conjunctive consequent.

Truth tables (truth matrices).

Initiator Ch. Peirce (1839/1914). It is used as a method of testing regarding truth.

1. *Fundamental tables.*

-- p and -p, w and -w give p / -p, with w and -w and -w and w below as the table for the function '-p' (the negate of p).

The other elementary functions and, or, if then, if and only if are depicted below.

pq	p ^ q	pvq	p ---> q	p <--> q
w - w	-w	w	-w	-w
ww	w	w	w	w
-ww	-w	w	w	-w
-w -w	-w	-w	w	w

Note: One should of course recall what was said above regarding the logistic meanings!

2. *Derivative tables.*

Based on the fundamental tables, derived tables can be constructed for composite propositional functions. We will not dwell on that here.

Note-- The law of contradiction: “- (P ^ -p)”. Cf. “pv -g”.

Two laws of tautology (multiplication and sum): “p ^ p) > <--> p”. Cf. with “(pvp) <--> p”. Tautological theorems in logistics assert nothing other than what is already in the

LOG27

4. Parable (27/28)

presuppositions are implicitly present. Cf. Kant's 'analytical' judgments. Thus, logistics makes mechanical reasoning possible and, according to Tarski, governs almost all reasoning in all sciences that rests either expressly or, above all, implicitly on the laws of propositional calculus (oc, 44).

Similarity. The logistics regarding similarity is "probably a part of logistics that is of the highest importance". Another name for similarity: 'identity'.

Formulas. "x = y". -- "x is equal to y". Tarski also says: "x is the same as y" or "x is identical to y".

Note: It is immediately clear that the language of logistics regarding 'identity' differs fundamentally from that of logic. For the latter prioritizes:

a. total identity of something with itself (total coincidence);

b. partial identity of something with something else (= analogy);

c. non-identity of something with something else.

'Similarity' is merely one form—alongside coherence, incidentally—of partial identity. One should keep this distinction firmly in mind.

Opposite. -- "x =/ y". -- "x is not equal to y".

Laws.

The law of similarity of G. Leibniz (1646/1716). -- "x is equal to y if and only if x shares every property of y and y shares every property of x:-- In other words: it concerns shared properties of more than exactly one given. Incidentally, Leibniz considered "x = y" as a definition of the similarity symbol '='. Hence the equivalence formula. About which above,

Derivative laws.

I. Reflexivity. "Every thing (object, symbol, proposition, for example) is equal to itself". Formula: "x=x"

Note: The total identity of logic is once again **a.** taken, **b.** emptied of its actual meaning, **c.** transformed into a mere name and empty shell, and **d.** filled with the logistically specific product, namely resemblance (which is logically merely partial identity). One sees it: something is imaginarily split into two 'entities' (of a purely logistic nature), namely the thing and 'itself'. That is then called relation. As if it concerned two entities existing in themselves. No : every thing, insofar as it is totally identical with itself, is indivisible. That indivisibility is precisely the total identity or coincidence with itself.

II. Symmetry. Reciprocity. -- "If x = y, then y = x".

***Note**--* Once again, only similarity is evident! —

III. Transitivity . -- Transitivity . -- "If x = y and y = z, then x = z". Or : "If x = z and y = z, then x = y.

LOG28

Logical remarks.

At least two interpretations are mentioned here

1. ***Phenomenological.***

Confronted with a given as a given, phenomenology states: "What is so, is so." Whatever changes, or whatever is a combination of symbols, is what it is. This stems from a sense of the total identity of something with itself, insofar as it presents itself as such.

2. ***Discursive.***

HJ Hampel, Variabilität und Disziplinierung des Denkens , Munich/Basel, 1967, offers a rather scattered interpretation.

He interprets from an axiom, namely "A is A" or "A will always be A". He calls this "the axiom of unambiguousness regarding terms and their meaning." Within the same discursus, or explanation, the meaning of a term does not change without explicit notification.

Note: It is a means of understanding. Nothing more. But it is not the phenomenological interpretation of natural logic.

Incidentally: many make that mistake because they do not know ontological language usage (sufficiently).

Logical valuation of logistics.

Hampel sees the requirement of unambiguousness of logic clearly and unmistakably at work in logistics. – "A = A" proves what was just mentioned. For him, logic is fixist: neither thought nor data existing outside of thought changes.

Formal logic.

Hampel forgets that 'formal' means saying "what has the form, the essence, or mode of being as its object". Now, there are both changing formae, forms of essence, and immutable ones. Logically, that is of no importance whatsoever. Hampel remains stuck in a pre-ontological logical usage of language.

Hampel therefore believes that logic can only appreciate logistics as a deviation from its way of thinking. - No: logic fully accepts the introduction of axioms—such as those of logistics—and of the deductive systems derived from them. It views these systems as axiomatically delimited subfields of applied logic. But certainly not as formal logic.

That is precisely why we have attached so much importance to the axiomatics of logistics in the foregoing: it **a.** takes what is, **b.** strips it of its content and thus reduces it to a pure name ('nomen') to fill it with its own products. Logically acceptable, but no logic.

LOG29

5. Class and relations logistics (29/35)

5.1. Logic in this regard (29/32)

Tarski's handbook suddenly changes point of view.

Classes.

Or sets. -- Besides objects or events (e.g. numbers, facts of physics) separated from one another—which for brevity are called 'individuals' by Tarski—classes or sets of objects or events are now discussed. Apart from the striking fact that the objects or events are interpreted as strongly isolated, they are nevertheless taken by logistics as they are taken in natural thought. They are, however, formulated within the straitjacket of propositional logistics.

Relations.

In previous chapters, we as logistics professionals learned about several types of relationships.

Note-- Which indicates that without the concept of 'relationship', previous chapters are unformulated.

Thus the relation 'equality' (between two objects or events, respectively, there is similarity or the opposite difference: “x = y” and “x =/ y”). Likewise, relations between classes that partially coincide (subset) or are completely apart. Such that class theory, too, proves to be unformulateable without the very fundamental concept of 'relationship'.

Apart from being radically—logistically—distinguished from the concept of 'property' (class), 'relation' is taken as in natural logic. Admittedly, also expressed in the propositional language of logistics.

Result: For the naturally thinking person, both chapters are without much difficulty (provided the axioms of logistification are observed).

Logic regarding relations.

To this day, one hears logisticians claim that natural logic is unsuitable for accurately articulating both the concept of 'relation' itself, the judgment that expresses a relation, and especially the reasoning that applies to relations.

It is evident from the outset that the projection of the logisticians plays a leading role here once again: they interpret the logic in question as if it were logistics.

Consequence: confusion, e.g., between 'term' and 'word' (in natural logic, a term can encompass many words).

LOG30

That negative judgment of the logisticians is very surprising, because the basis of the theory concerning classes in natural logic is precisely relation! Logisticians do, however, recognize that natural logic regarding classes is “an admittedly ultra-small but true part” of logistics (oc, 70).

While the relationship plays a fundamental role in logistics, in logic, for example, one sees not only relations between classes but first and foremost relations within classes. After all, class is logically defined as a relationship.

Explanation. -- Class is unthinkable without the relationship called similarity (partial identity or (metaphorical) analogy): how can one view the instances of a set as instances without seeing the similarity to all other instances? These are interconnected, brought into a unity, by the common property. Class exists only if there is a relationship!

Note-- What Tarski forgets.

Besides distributive concepts (classes), natural logic, since Platon, also and simultaneously views systems. In these, the parts, portions, subsystems—call them what you will—are interconnected and brought into a single essence thanks to coherence as a common property.

The head, thorax, body, legs, and wing of an insect do not resemble one another (unless by chance) but are interconnected. That is their partial identity or (metonymic) analogy.

Note.-- In Platon “all and whole” in the scholasticism “totum logicum vel physicum”, now “class and system. These are the two main relations of natural logic.

Mind you. -- Precisely that is what one finds in
a. distributive and collective concepts,
b . commensurate judgments and commensurate reasoning.

Judgments. -- “This is a bird” (distributive). “This is the feather of a bird” (collective). The feather does not resemble the bird but is connected to it (is part of a system with it). Such are all judgments in logic.

Arguments. -- One need only recall the syllogisms of Peirce, who clearly recognized the distributive nature of the collective type of reasoning (although he confused causal system with system per se).

This can be explained much better in a detailed logic. We refer to the first-year course 'Logic'.

LOG31

Summary. -- Or 'summering'. -- This amounts to a “complete enumeration”.

Library st.: *Ch. Lahr, Logigue* , Paris, 1933-27, 591; 499; 567.--

1. ***Inductive summering.***
Two types:
a. ***Distributive. --*** If one has known water to boil at 100°C at least once (= summative induction), then one can hypothesize that all water will boil at 100°C (= amplifying or knowledge-expanding induction). Generalization in the strict sense.

b. ***Collective. --*** If one has explored at least one part of a school (= summative induction), then one gains insight (information) into the school as a whole or system (= amplificative induction). -- Generalization.

Note: This can also be done diachronically. A valid algorithm in the computer is an example (complete list).

R. Weverbergh, Postgraduate Integral Product Development , in: *Campuskrant* (Kul) 11 02 99, 12 states that such studies examine a mechanical product from the beginning to the finishing (full list).

Incidentally: *O. Willmann, Abriss der Philosophie* , Wien, 1959-5, 409/433, this is called the genetic method (in Platon and Aristotle).

2. *Deductive summing.*

D. Nauta, Logica en model , Bussum, 1970, 64v., gives an example (mathematical induction).

The definition of all numbers greater than zero and integers.

0 is the first number. 0 + 1 = 1 is the successor. 1 is both an integer and greater than 0. -- 1 + 1 = 2. 2 is an integer and greater than 0.

The testing of the definition with its two characteristics (integer and greater than 0) recurs individually each time (recursive definition).

From all collectively (the definition), one reasons for each case individually. This is tested by examining them one by one.

One sees immediately that summative induction does the reverse: from a few individual samples with a common characteristic, one reasons to all of them collectively. -- That governs the entirety of natural logic, which thinks summatively.

Incidentally: one should not underestimate the summative (also: Aristotelian) induction or deduction: it is the established core of amplificative summation, which aims at ascertainable cases. In that sense, Aristotle hit the bullseye with his summative induction. Even though some seem to underestimate that.

LOG32

One logic, but many logistics.

Why is there no separate logic of, for example, classes or relations? The reason is that it starts from a universal axiom, which is, moreover, ontological (based on the doctrine of reality). The objects, respectively events, are situated first and foremost within the concept of 'reality' (in traditional language: 'being'). Now, reality is governed by the idea of 'identity' (and its variants or absence).

We will illustrate this with an example.

1. *One's own total identity.*

Thus, just like all possible realities, logistics has its own total identity or essence that separates it through difference and gap from all that is not it.

Incidentally: it is that identity that we attempt to clarify in this text (especially by emphasizing the distinction from logic).

2.1. *Partial identities.*

Also called 'analogies'. -- Logistics exhibits similarities and connections with what it is not, -- For example, traditional logic (which it claims, for instance, it can subordinate as an insignificant little part within its class logistics). In that sense—as a part—there is a metonymic or coherence analogy between logistics and logic.

Take mathematics, for example. All that precedes is a lengthy proof of how mathematical logistics is and how it is mathematical. Mathematics, too—at least in an interpretation—is a part of logistics (again: coherence analogy).

2.2. *Non-identity.*

Not even a partial identity (at least at first glance). -- Like this, for example—chosen at random—with this apple here and now! Here, neither resemblance nor coherence is to be seen. That is the third form of identity: the absent identity, even the absent analogy.

Ontology

How is it that we can compare logistics to anything at all? For example, with this apple here and now? Because they are both 'something' (being, reality). This is not-nothing.

The comparative method, the lifeblood of natural logic (and ontology)—not to be confused with “equating everything with everything” (concordism), for comparing is not equating—the comparative method stands or falls with identity (and its variants or absences).

This is the fundamental difference between logic and logistics.

LOG33

5.2. Classroom Logistics (33/34)

This began with G. Boole (1815/1864; strongly algebraic). G. Cantor (1845/1918; Mengenlehre) elaborated on it. -- Some basic concepts.

Individuals/ classes (sets).

Objects and events, respectively, can be classified into classes of individuals ('elements' of sets). In number mathematics, classes of numbers are often discussed, and in spatial mathematics (geometry), the 'positions' of points.

Order(s).

Classes of individuals are first-order classes. Classes of classes are second-order classes. And so on.

Formulas

"The object x is an element (member) of the class K". "The object x belongs to (s) the class K". "The class K contains the object x as an element or member". In short: "x EK".

Application.

"If the set I is that of all integers, then 1, 2, 3, are elements of it"-- Formula: "1 EI". "2 EI". These are true propositions, whereas, for example, "1/2 EI" is a false proposition.

Classes and propositional functions with free variables. Mathematically

1.1. ***The proportionate function with free variable (I): "x > 0",***

di, "The set of all numbers x such that x > 0". Expresses the class of all positive numbers. As elements or individuals, it has those numbers and only those numbers (// if and only if) that satisfy the function .

Let us call that set 'P'. Then that function becomes equivalent to "x EP". ('E' stands for: "belongs to"). Namely, everything that is x belongs to P".

1.2. ***This method is applicable to any other propositional function.***

Arithmetic . "x < 0" means "all negative numbers". Or "x > 2 and x < 5" means "all numbers between 2 and 5".

Spatial mathematics: The surface of a sphere, for example, is describable as “the class (set) of all points in space that are located at a well-defined distance from a given point (*note:* the center of the sphere)”. As is often stated in geometry: “The locus of all points in space at a well-defined distance from a given point”.

In other words: 'place' is a set. In this way, one can define spatial-mathematical configurations (points, lines, planes, solids) in propositional functions.

LOG34

2. *Non-mathematical.*

“For every propositional function with one variable x, there is exactly one class C that contains as elements those objects (*note:* also non-mathematical) and only those objects that satisfy the given function”. Or: “The class of all objects x such that...” Or again: “x EC”. -- Generalized: “x EK”, where C is a class belonging to class K.

Rewriting

(I) “The set of all numbers x such that ...”

(II) “The class of all objects x such that ...”

If C is the class to which x belongs, one can rewrite x(C) .

In such language usage, for example, “1 belongs to the set of all numbers x such that x > 0” becomes, which follows: “1 E x (C) (x > 0)”.

This expression is a proposition, and a true one at that, because it contains no free variable (x is bound). -- Admittedly, it is the complicated idiom for “1 > 0”.

Quantification.

(I) and (II) seemingly show no quantifiers. And yet: just like quantifiers, they bind variables. -- The quantification is shown more clearly in the propositional function with - besides x other variables. Thus: “The set of all numbers x such that x > y”.

Such expressions do not indicate a well-defined class, but if one substitutes the free variables (not x that is bound) with appropriate constants—e.g. y with 0—then they turn out to be descriptive functions (formulas that describe things like, for example, “2x+1”, substituted with 2.3+1 which describes 7).

Class as a trait.

Leibniz's law contains the term 'property'. -- Many logisticians state that 'property' is substitutable for 'class'. This gives: "x = y, if and only if every class (property) that contains either x or y as an element as objects, also contains the other object as an element"

In other words: many logistics professionals no longer distinguish between classes and properties.

Note: The chapter further addresses the question of whether the class containing all possible objects exists (Russell's antinomy and his theory of types).

For example, concepts such as "universal class" and "null class", relations between classes, operations on classes, equipotent classes, finite and infinite classes, etc., are also discussed.

LOG35

5.3. Relations logistics (35).

Just like for the classes, a short suggestive sketch.

A. De Morgan (1806/1871) and Ch. Peirce (1839/194) introduced a theory of relations in this regard, which E. Schröder (1841/1902) completed.

Formula.

"The object x exhibits the relation R to the object y". "The object x does not exhibit the relation R to the object y". -- In short: "xRy " and "-(xRy)". -- x stands for all objects that exhibit the relation R to y as 'predecessors' and Y stands for all objects that exhibit the relation R to x as 'successors'. -- The class of all predecessors within the relation R is called 'domain' and that of all successors within R is called "converse domain" or 'counterdomain' or 'codomain'.

Applications.

"x is the father of y". -- Is an example. -- In the equality relation "x = y" ("x exhibits the equality relation with y"), every individual (object) is simultaneously predecessor and successor. Such that domain and codomain are both the universal class in question. -- Something similar occurs with "x =/ y" (the equality relation between xey is false).

Note: "KCL" (K is enclosed by L) expresses a relationship between classes. Likewise: "KUL" or "K+L", which express the 'sum' relationship of the classes K and L.

Order(s).

Relations resemble classes in terms of calculus. -- First-order relations relate to individuals among themselves. Second-order relations relate to classes or relations of the first order.

Mixed relationships.

Occur frequently. For example: the predecessors are individuals, the successors classes. Or: the predecessors are second-order classes and the successors first-order classes. -- Top model: "x EK" (x is a member of class K), i.e. the position "member / class".

Note-- Numerical.-- The propositional function "x+y" can be expressed as "x+y = 0". Two free variables – x and y – are involved in an antidepressant such that "x 0 y". Substituted, for example, with +3 and -3, this gives "+3 - 3 = 0". Or: "x 0 y" or "x 0 y is equivalent to x+y=0".

Note: Tarski further discusses the theory of relations (calculus: properties, reflexivity, symmetry, transitivity, unambiguity or ambiguity, etc.). As you can see, Tarski's introduction is strongly mathematically oriented.

LOG36

6. The Liar's Paradox (36/37)

IM Bochenski, *Wijsgerigemethoden in de moderne wetenschap* ; *Utr./Antw.*, 1961, 72v., says: "From Plato until the beginning of this century, this paradox has troubled all logicians." - The text reads: "What I am saying now is untrue."

1. *Logistical.*

Reduced to the absurd, the response reads: "If the liar tells the truth, he tells falsehood. If he does not tell it, then what he is saying now is true."

Bochenski. -- The statement says something about itself. Well, that is insoluble with syntax alone. There is only a solution based on meta-language. For it is not speech at all, and is therefore "semantic nonsense".

2. *Logical.*

a. For the lying person himself inwardly, the statement is semantically meaningful: he knows what he is saying now, -- perhaps out of humor or purely to speak eristically.

b . To the fellow man, however, two strangers appear.

2.1 . The content of "what I am saying now"

A sentence like "what I am saying now" says nothing! The 'what' is an unknown. For one could just as easily replace "what I am saying now" with a variable such as "z is false". Whereby z can be substituted for anything that the liar labels as false regarding assertions.

In other words: the sentence has no content. It is therefore not verifiable. And it is undecidable regarding truth or falsehood.

2.2 . The content of "is false".

If the intention—e.g., whether or not to lie—in the sentence "is untrue" (its content) was known, then fundamentally there was no problem.

But according to the folk psychological rule "The liar lies," there is suspicion but no certainty. For unlike a law of nature, the law of folk psychology knows exceptions (logistically: non-monotonous reasoning). Therefore, "is false" counts as a second unknown: one can merely guess at the honesty of the liar at that moment.

Conclusion

Due to the two unknowns, only a suspension of judgment is possible. "One does not know." Behold—without logistic theory—what one can assert in this regard using natural logic.

Incidentally : 'eristics' is the tendency to track down the logically weak points in the conversation partner.

LOG37

In summary. The content of "what I am saying now" is unknown (due to a lack of content), and the content of "is false" is likewise unknown (intention unknown). The untestability—provisionally—of both propositions makes a judgment regarding them undecidable.

What exactly is reduced to the absurd? E. Beth discusses this in **De* *wijsbegeerte der wiskunde** , *Antw./Nijmeg.*, 1944, 78/86 (Eristiek).

According to the proposer, the paradox would invalidate the Platonic and Aristotelian definitions of truth by applying the rule: "If you, Platon and Aristotle, assert this regarding the definition of truth, then what you refute follows." That is "reductio ad absurdum."

Aristotle, Metaph. theta 10.

He speaks the truth who believes that the separated is separated and the joined together, and falsehood he who holds an opinion contrary to the things

Two aspects.

a. As Beth herself says: a confrontation of the assertion (proposition) with reality (testability).

Note: The comparative method plays the decisive role here.

b. The ontological-logical axiom of identity; "What is (so), is (so)". shown in the expressions "the separated is separated" and "the joined is joined".

All that is separated and all that is joined together are examples (applications) of what is called "the things" in the formulation.

It would therefore be this view regarding truth and falsehood that leads to something absurd via an implausible dilemmatic deduction. In other words: it is not a valid definition.

What is the current status of the two-part requirement?

Did the liar lie in "what I am saying now" or not? Given that we do not know the content and cannot conduct a confrontation with the reality intended by it (testing), this leads to a suspension of judgment. Given that we do not know the content of "is false" and cannot test it against the reality of the liar's intention (testing impossible), this leads to a suspension of judgment. Where exactly has the error in the definition been proven? The only thing is that it cannot be applied due to two unknowns. Not that it is invalid!

Beth is full of praise for the logistics involved. But a logical analysis has its doubts about that praiseworthiness.

LOG38

7. Nominalism (38/39)

"Social engineering" (j. Dewey).

John Dewey (1859/1952), "the foremost educator of the 20th century" (Time), was a naturalist: a materialist, a determinist, and naturally an atheist. "There is no spirit. There is no soul."

Instrumentalism.

All information (except his ideas, of course), all behavioral ideals are not norms but instruments to modify (possibly adapt) the experience that is life.

In his **Human Nature and Conduct ** (*An Introduction to Social Psychology*), New York, 1922, he advocates "social engineering; societal change."

Note: Parallel to K. Lewin (1890/1947) with his group dynamics and Human Change movement (1956+), for whom norms were merely conventions.

In other words: these high-ranking American intellectuals want to change.

Here-and-now experience.

All authority, all tradition—indeed, all acquired knowledge—must be cast off to become modifiable in a purely here-and-now situation, like a naked man who has taken off all his clothes.

Note: This explains why Dewey chose B. Russell (1872/1970) when the latter was forced to give up his professorship in New York City in 1940 under pressure from "a coalition for the safeguarding of public morality" due to his 'immoral' views.

Democratization

Dewey wanted a society without class distinctions and the like, and was left-leaning: he therefore chose Lev Trotsky (1871/1940), initially a fellow revolutionary with Lenin and Stalin, later expelled and murdered as a 'deviant' within the Soviet system. -- Left-wing democracy was the positive side of Dewey's worldview.

Nominalism.

One sees it: the concrete human being with his contribution of ideas, values, and ideals.

a. is taken as deprived of any objective essence of its own (content) (in any case deprivable),

b. thus reduced to an empty shell and pure name (here-and-now experience) and filled with Dewey's products. Whereby the method is called: "social engineering".

Incidentally : for Dewey and his ilk, the school is essentially the place where social engineering is the main task. It is an 'instrument' for democratization (whereby actual education is second-rate (sciences, literature, history, geography)).

Behold a nominalist cultural revolution.

LOG39

Everything that exists is malleable.

Library st.:

-- *Role. Van Zandt, The Metaphysical Foundations of American History* , The Hague, 1959 (frl. oc, 125/156 (*Realism versus Nominalism*));

-- *J. Largeault, Enquête sur le nominalisme* , Paris/Louvain, 1971.

Incidentally : the “nominalism/realism” pairing recurs in the “constructivism/essentialism” pairing. -- What is it about?

Modernity.

For modern man, insofar as he is typically modern and nominalistic, “all that is, is malleable.” We explain. And we do so using a striking example.

1. *Conceptually realistic.*

Common sense, with its natural ontology (conception regarding all that is real) and, following that line, with its natural logic and use of language, posits that a child—say: a girl or a boy of eight years—possesses a ' being' of its own (in Greek: eidos; in Latin: forma) which, through experience and reasoning, penetrates our mind as the concept of 'child' (here: of eight years).

Common rational ontology and logic allow that being (die forma) to come into its own with its content (i.e., its being or essence). The fundamental attitude is thoroughly phenomenological, i.e., it allows the phenomenon, as it directly reveals itself, to be what it is in itself, objectively.

2. *Nominalistic.*

The same child is taken from the 'naive' order of things, the phenomena—critically stripped of its content, that is, its objective being or essence (forma), reduced to mere name (Lat.: nomen), so that this empty shell is made fillable (the child is essentially malleable because it lacks its own essential content) with a content that may be foreign to that child, a distinct product of the autonomous modern, nominalist self or subject.

That is the ontology that shocked our population to its very core a few years ago in the Dutroux scandal.

Let one twist and turn it critically however one wishes: that type of 'making' of the given reality with its inherent contents (formae) was at work in Dutroux and his like-minded and enjoyable associates. Does this not bear a striking resemblance to what logistics does to everything that is real and, in particular, logical?