Trivialities and transformative analysis

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Abstract

I argue that Wittgenstein's position on trivialities in the Tractatus is inconsistent, and explore a perspective under which this inconsistency is due to inadequate transformative analysis.

1 Trivialities

1.1 Grammar and logic

Grammar distinguishes between sentences and non-sentences (Chomsky 1955, 1957, 1965, 1986), while logic distinguishes between valid and non-valid arguments.

(1) a. John smokes → sentence
b. smokes smokes → non-sentence

(2) a. $\dfrac{\text{John smokes but Mary doesn't}}{\text{John smokes}}$ → valid argument
b. $\dfrac{\text{Mary doesn't smoke}}{\text{John smokes but Mary doesn't}}$ → invalid argument

Claim made by Wittgenstein (1921): (1) and (2) are one and the same phenomenon.

1.2 The picture theory of language

Sentencehood and validity are to be accounted for by one unified theory which (i) tells us what a sentence is and, consequently, (ii) tells us, for any sentence ϕ, which other sentences are true if ϕ is true.[1]

(3) a. A proposition is a picture of reality (4.01)
b. The configuration of simple signs in a propositional sign corresponds to the configuration of objects in a state of affairs (3.21)

1.3 Illustration of PTL

Suppose the linguistically relevant reality has three basic elements: (i) John, (ii) Mary, and (iii) the property of smoking (Stenius 1960, Hope 1965).

[1] I am using the English translation by Michael Beaney (Wittgenstein 2023).

(4)

	Sentences of L_F	Sentences of L_W	States of affairs described
1	$S(j)$		John smokes
2	$\neg S(m)$		Mary doesn't smoke
3	$S(j) \wedge \neg S(m)$		John smokes but Mary doesn't

(5) a. Basic symbols of L_F: j, m, s, (,), $\neg$, $\wedge$
$\rightarrow$ names and "syncategorematic glue"
b. Basic symbols of L_W: the pebble, the marble, the jar
$\rightarrow$ names only

1.3.1 Accounting for sentencehood

How do we exclude non-sentences such as $j(S)$, $S(S)$, $m(j)$ from L_F? By the syntax of L_F.

(6) Syntax of L_F
a. j, m are nouns, S is an adjective
b. If n is a noun and A is an adjective then $A(n)$ is a sentence
c. If ϕ, ψ are sentences then $\neg\phi$, $\neg\psi$, $\phi \wedge \psi$ are sentences
d. Nothing else is a sentence

Do we need a syntax ("theory of types") to exclude the L_W counterparts of $j(S)$, $S(S)$, etc.? No! The shapes of the symbols themselves determine what can and cannot be a legitimate combination: the pebble cannot be placed inside of itself, for example (Hope 1969, Hintikka 1994, 2000).

1.3.2 Accounting for validity

What guarantees that if L_F-3 entails L_F-1 but not vice versa? The logic of L_F.

(7) Logic of L_F
a. $\neg\phi$ is true iff ϕ is false
b. $\phi \wedge \psi$ is true iff ϕ is true and ψ is true
c. Only inferences based on (a) and (b) are valid

What guarantees that L_W-3 entails L_W-1 but not vice versa? By what is shown.

(8) a. That the truth of one proposition follows from the truth of other propositions can be seen from the structure of the propositions (5.13)
b. Laws of inference [...] would be superfluous (5.132)
c. Logic must take care of itself (5.473)

1.3.3 Dissolving philosophical problems

A problem exists only to the extent that it can be formulated. Given PTL, everything that can be formulated is a picture, i.e. can be compared to reality. This means that every problem can in principle be settled by observation, i.e. by the natural sciences.

(9) Philosophy is not one of the natural sciences (4.111)

It then follows that there are no problems for philosophy to solve.

1.4 PTL and triviality

1.4.1 Prediction of PTL

Can we translate $S(j) \wedge \neg S(j)$ into L_W? No! We cannot place the pebble inside and, at the same time, place it outside of the jar. I make the following conjecture, pending a theory of (pictorial) negation (Hintikka 2000).

(10) If a sentence of L_F does not have a translation in L_W, its negation does not either

This means that $S(j) \vee \neg S(j)$ does not have a L_W translation either. Thus, PTL predicts that contradictions and tautologies are grammatically ineffable, i.e. gibberish.

(11) Prediction of PTL
Trivialities are non-sentences

At several places in the Tractatus, Wittgenstein seems to be aware of this result.

(12) a. Tautology and contradiction are not pictures of reality (4.462)
b. [P]ropositions that are true for every state of affairs cannot be combinations of signs at all (4.466)

1.4.2 A distinction without a difference?

Wittgenstein stops short of considering trivialities non-sentences. He calls non-sentences "non-sensical" ("unsinnig"), and insists that that is not the case with trivialities.

(13) Tautology and contradiction [...] are not nonsensical; they are part of the symbolism [...] (4.4611)

It is clear, however, that trivialities are defective. The term Wittgentein comes up with to describe them is "senseless" ("sinnlos").

(14) Tautology and contradiction are senseless (4.461)

Non-sensicality and senselessness both implies non-interpretability, but only non-sensicality implies non-sentencehood (von Wright 2006, Biletzki and Matar 2021, Proops to appear).

1.4.3 A conjecture

Wittgenstein's position on trivialities is inconsistent, as it consists in the following claims.

(A) Sentences are pictures
(B) Trivialities are not pictures
(C) Trivialities are sentences

PTL entails (A) and (B). Why does Wittgenstein commit to (C), which contradicts the theory he proposes? The reason, in my view, has a phenomenological and a logical component.

Phenomenological component: Wittgenstein experiences (15a) and (15b) as grammatical.

(15) a. It's raining and it's not raining
b. It's raining or it's not raining

Logical component: Wittgenstein analyzes (15a) and (15b) as (16a) and (16b).

(16) a. $\phi \wedge \neg\phi$
b. $\phi \vee \neg\phi$

The experience and the analysis, together, lead to Wittgenstein's conclusion that trivialities are sentences, which is inconsistent with the rest of his theory.

1.5 Logicality

Logicality is the hypothesis that universal grammar interfaces with a natural deductive system and filters out sentences expressing trivialities, i.e. contradictions and tautologies (Chierchia 2006, Del Pinal 2019, 2022).

1.5.1 Contradiction: exceptive constructions

A fact about exceptive constructions, i.e. sentences of the form D(P except E)(Q), is that they are well-formed if D is universal and ill-formed when D is existential.[2]

(17) a. every student except John came
b. #a student except John came

The most well-known account of the contrast in (17) is proposed by von Fintel (1993).[3]

(18) D(P except E)(Q) = 1 if and only if
a. D(P−E)(Q) = 1
b. If D(P−C)(Q) = 1 then E $\subseteq$ C, for any C

For (17a), the analysis in (18) predicts the truth condition in (19) and the entailment in (20).

(19) every(student except John)(came) = 1 iff
a. every student who is not John came
b. for any C which does not contain John, it is not the case that every student who is not in C came

(20) Every student who is not John came and it is not the case that every student came.

For (17b), the analysis in (18) predicts the truth condition in (21) and the entailment in (22).

(21) a(student except John)(came) = 1 iff
a. a student who is not John came
b. for any C which does not contain John it is not the case that a student who is not in C came

(22) A student who is not John came and it is not the case that a student came.

Thus, (17a) is contingent and (17b) is contradictory. von Fintel (1993) takes this logical contrast to be the cause of the contrast in well-formedness between (17a) and (17b).[4]

1.5.2 Tautology: existential constructions

It has been observed that existential *there* tolerates *a* but not *every* (Milsark 1977).

[2] I assume the standard semantics for quantifiers (Barwise and Cooper 1981, Heim and Kratzer 1998).

(i) a. every(P)(Q) = 1 iff P $\subseteq$ Q
b. a(P)(Q) = 1 iff P $\cap$ Q $\neq \emptyset$

Peters and Westerståhl (2023) notes that the contrast in (17) is made in the 14th century by William Ockham (*Summa Logicae* Part II:18, translated by Alfred J. Freddoso and Henry Schuurman).

[3] I assume that *student* denotes the set of students, i.e. the set $\{x \mid x \text{ is a student}\}$, and the name *John* can be "type-shifted" to denote the singleton set containing John, i.e. the set {John} (Partee 1986).

[4] Cf. also Moltmann (1995), Gajewski (2008, 2013), Hirsch (2016), Crnič (2021), Vostrikova (2021).

(23) a. there is a fly in my soup
b. #there is every fly in my soup

The standard account for (23) is Barwise and Cooper (1981).

(24) there(D(P)) = 1 iff D(P)(U) = 1

This analysis predicts (25a) and (25b) as truth condition for (23a) and (23b), respectively.

(25) a. there(a(fly in my soup)) = 1 iff $\{x \mid x \text{ is a fly in my soup}\} \cap \mathrm{U} \neq \emptyset$
b. there(every(fly in my soup)) = 1 iff $\{x \mid x \text{ is a fly in my soup}\} \subseteq \mathrm{U}$

Thus, (23a) comes out as contingent and (23b) as tautological. And this, according to Barwise and Cooper (1981), is what causes the contrast in (23).

1.5.3 A (Tractarian) problem for Logicality

We describe trivial consequences of sentences which, we claim, make them ungrammatical, but our descriptions are not ungrammatical.

(26) a. #a student except John came
b. A student who is not John came and it is not the case that a student came.

(27) a. #there is every fly in my soup
b. The set of flies in my soup is a subset of the set of entities.

The problem, in fact, can be illustrated more simply, and more dramatically, by the sentences in (15), repeated below, both of which are clearly grammatical.

(28) a. it's raining and it's not raining
b. it's raining or it's not raining

The problem for Logicality, then, is that it excludes more sentences than it should. It predicts all trivialities to be ungrammatical, when in fact only some are.

1.5.4 Solution: contextualism

The solution I am going to present is one proposed by Del Pinal (2019), Pistoia-Reda and Sauerland (2021), Del Pinal (2022), among others. It is sometimes refered to as "contextualism".[5] What it says is that natural language grammar contains a covert, context-sensitive "rescaling" operator, $\mathrm{R_c}$, which attaches to non-logical expressions and modulates their meaning. The logical form of (28a) is then not (29a) but (29b).

(29) a. raining $\wedge$ ¬raining → incorrect analysis of (28a)
b. $\mathrm{R_c}$(raining) $\wedge$ $\neg\mathrm{R_{c'}}$(raining) → correct analysis of (28a)

Similarly, the logical form of (28b) is not (30a) but (30b).

(30) a. raining $\vee$ ¬raining → incorrect analysis of (28b)
b. $\mathrm{R_c}$(raining) $\vee$ $\neg\mathrm{R_{c'}}$(raining) → correct analysis of (28b)

Thus, we allow non-logical terms to shift their meaning within the same sentence. Under this analysis, (28a) and (28b) come out as contingent, and are therefore predicted to be grammatical.

[5] Gajewski (2003) proposes another solution which is in the same spirit but differ in technical implementation. The difference turns out to be an empirical disadvantage. For arguments that contextualism is a better solution see Sauerland (2017), Pistoia-Reda and Sauerland (2021), Del Pinal (2022).

Why does the same rescaling process not kick in and rescue (26a) and (27a) from being trivial? Because even if it does kick in, it still cannot rescue these sentences from being trivial. Recall a condition on the rescaling operator: it can only attach to non-logical terms. Thus, it would not attach to *except*, *every*, *a*, and *there*, which are logical constants.

(31) a. a R_c(student) except $R_{c'}$(John) $R_{c''}$(came) → logical form of (26a)
b. there is every R_c(fly in my soup) → logical form of (27a)

Both (31a) and (31b) are still trivial. Rescaling does not help in these cases.

1.5.5 An open question

An issue which the proponents of Logicality must address and which is also raised by Wittgenstein in the Tractatus is how to distinguish between logical and non-logical constants?

(32) My fundamental thought is that the 'logical constants' do not represent (4.0312)

This description more or less captures our intution about such words as *every*, *a*, *except*, and *there*. But it is too vague: It is not clear what would prevent me from saying, for example, that *every* represent the relation $\lambda P.\ \lambda Q.\ P \subseteq Q$.

Gajewski (2003), based on ideas from previous works, suggests to define logical constants in terms of "permutation invariance". Logical constants, then, would be those expressions whose denotation remains constant across permutations of individuals in the domain (Mautner 1946, Mostowski 1957, Tarski 1986, van Benthem 1989, McGee 1996).[6]

Gajewski's suggestion is widely known and cited. However, it clearly cannot be the whole story, as it classifies predicates like *exists* or *is self-identical*, which supposedly denote the universe of discourse U, as logical, even though these do not incur ill-formedness as we would expect (Abrusán 2019, Del Pinal 2022).

(33) a. every man exists
b. every student is self-idential

The jury is still out.

2 Transformative analysis

2.1 The analytic revolution in philosophy

Analytic philosophy began with the insight that the "logical form" of a sentence, i.e. one which captures its semantic properties, might be quite different from its "surface form", i.e. one which captures its syntactic, morphological and phonological properties (Frege 1879, 1884).

(34) John saw every boy
a. $[_S$ John $[_{VP}$ saw $[_{DP}$ every boy $]\ ]\ ]$
b. $[_\alpha\ \forall x\ [_\beta\ [_\gamma\ boy(x)\ ] \rightarrow [_\delta\ saw(john, x)\ ]\ ]\ ]$

The idea that (34b) could in principle be how (34) looks at some level of description constitutes a "revolution" in the way we think about natural language sentences: semantic analysis must be carried out on a structure different from one which inputs pronunciation or writing. Beaney

6 For an overview of attempts at characterizing the notion of a "logical constant" see MacFarlane (2017).

(2016: 235) puts it succinctly: "[T]here is no decomposition without interpretation" (cf. also Beaney 2000, 2002, 2003, 2016, 2017).[7]

It is at the step of transformative analysis, I submit, that Wittgenstein commits an error with sentences such as those in (28). He takes it for granted that the two instances of *rain* are one and the same symbol. It never occured to him to see this as a case of homophony, i.e. a case of two different symbols, $R_c(rain)$ and $R_{c'}(rain)$, having one and the same pronunciation. Curiously, Wittgenstein does discuss homophony in the Tractatus.

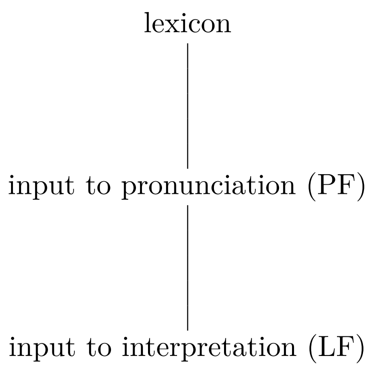
(35) In everyday language it occurs extremely often that the same word signifies in different ways – that is, belongs to different symbols [...] In the proposition 'Green is green' – where the first word is a person's name, the last an adjective – these words [...] involve different symbols" (3.323).

Beaney's dictum, that there is no decomposition without interpretation, implies that a sentence is associated with at least one structure which inputs pronunciation and one other structure which inputs interpretation. Transformative analysis is the step that relates the two.

2.2 The generative revolution in linguistics

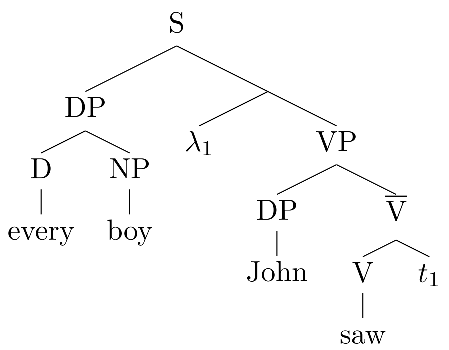
The idea that a sentence is associated with more than one structure brought about the "generative revolution" in the 1950's (cf. Chomsky 1988). In the current "minimalist" version of generative grammar which has established itself more or less as cannonical (Chomsky 1991, 1995, Radford 2004), a sentence is associated with two structures: a "phonological form" (PF) and a "logical form" (LF).

(36)



The LF of a sentence, just like the logical form which results from transformative analysis, can differ drastically from how we hear the sentence or see it written on paper. For example, the LF of (34) is (37) (Heim and Kratzer 1998, Fox 2000, 2003).

(37)



[7] Other terms Beaney uses for transformative analysis are "explicatory analysis" and "interpretive analysis" (Beaney 2007, 2016).

2.3 Philosophy & linguistics

We can thus witness an interesting parallel between the "analytic revolution" in philosophy and the "generative revolution" in linguistics. A notable fact is that the former came much earlier. Its beginning can be dated to Frege's 1879 debut, Begriffsschrift, wherein he proposes quantificational predicate logic (Beaney 2016: 228). The beginning of generative grammar, in contrast, came with Chomsky's (1955) magnum opus The Logical Structure of Linguistic Theory, wherein he proposes transformations. And it would take the linguists about 20 years more to come up with the idea of LF as a structure which disambiguates scopal relations between quantificational elements in the sentence (May 1977, Chomsky 1981, Huang 1982, May 1985).[8] What is the reason for this delay?

Here is my tentative answer: Analytic philosophers seem to think that there is no theory of transformative analysis, while generative grammarians are all about constructing a theory of transformative analysis!

Consider the contrast in (38).

(38) a. (i) every boy loves his mother
(ii) $= \forall x\ [\ boy(x) \rightarrow love(x, x's\ mother)\ ]$
b. (i) his mother loves every boy
(ii) $\neq \forall x\ [\ boy(x) \rightarrow love(x's\ mother, x)\ ]$

Analytic philosophers, I surmise, would take this contrast to be a testimony to the fact that natural language is a mess. Generative grammarians, on the other hand, have proposed several accounts of it (Koopman and Sportiche 1983, Reinhart 1983, May 1985), which relate it to the contrast in (39).

(39) a. (i) who loves his mother
(ii) = for which x: x loves x's mother
b. (i) who does his mother love?
(ii) $\neq$ for which x: x's mother loves x

Is there any missing link in generative grammar which is provided by analytic philosophy? The answer, I believe, is yes. Specifically, philosophers could help linguists make sense of Logicality.

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[8] In the beginning of generative grammar, semantic interpretation was read off of the so-called "deep structure" (Chomsky 1957, 1965), which is different from what is latter called LF.

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