REPORTS ON MATHEMATICAL LOGIC
38 (2004), 93 - 116

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TOWARDS COMBINATION METAPHYSICS[1]

Abstract. The paper contains an outline of combination ontology and semantics, developed in Perzanowski [1] - [11], with six subsequent applications to combination metaphysics.

1. Ontology is the general theory of the possibility, i. e., the theory of the realm of all possibilities **B** the ontological space. Metaphysics, on the other hand, is the ontology of the world**.**

The world is the realm of existing items. After Wittgenstein's *Tractatus: The world is all what is the case*. In other words, all events taken as existing complexes (facts).

2. If we distinguish (cf. [5]), *inter alia*, between the ontology of the being, including metaphysics (i. e., ontology of the world) on the one hand, and - on the other hand - the ontology of language and the ontology of mind, then we see, by close connection the later two with formal investigations of concepts, that set-theoretical and algebraic ontologies are closely connected with them, but not with the ontology of being.

True philosophy, however, is about the being. Therefore, we are still in need of a metaphysics based on its background combination ontology with appropriate combination semantics. In need, by definition, of combination metaphysics.

3. In what follows, I will first try to outline such a semantics, based on combination ontology, which is a part of a deeply modal version of a general theory of analysis and synthesis. Next, I will try to apply it to the analysis of the most fundamental metaphysical notions.

To this end, I will start with rather general remarks concerning modalities, with particular emphasis put on ontological and metaphysical ones, passing next to a rather general description of a theory of analysis and synthesis.

[1] *Received 26 September 2003*

Basic classification of modalities.

4. Modalities are modifiers. For example, alethic modalities are modifiers of truth components, or **C** more generally **C** semantical, logical and ontological components of a judgment and objects involved in it.

5. Let us consider two conjugate very general classifications of modalities:

A. Based on a grammatical difference:
Noun-like (like possibility, etc.) vs. adjective-like (possible or possibly, etc.)

B. Based on an ontological principle:
Logical modalities vs. superlogical modalities.

5.1 Logical modalities are used for collection and comparison: possibly, necessarily, contingently, etc. They are adjective-like and, in their depth, they are quantifiers, what is made clear in relational semantics.

5.2 Superlogical modalities are used for expression and modification of very general conditions. They can be divided into several groups including:

A priori modalities, concerning what can be thought, used to delineate the realm of reason. Examples are thinkable, understandable, reasonable, and controvertible.

Ontological modalities, kernel for our aim. They are useful for expression of the general and basic conditions for some families of objects or, in particular, of complexes. They are, *inter alia*, used for delineation of the ontological space of all possibilities, the most general field we can deal with. Examples are: possibility, necessity, contingency, and exclusion taken in the sense of a condition; also compossibility, coexistence, and eminent existence in the sense of Leibniz, (formal) possibility in the sense of Wittgenstein' *Tractatus*; combinable, synthetizable and analyzable; and several common philosophical modalities *de re*: by necessity, essentially, by its very nature, etc. And, last but not least, ontological makings: making possible, making impossible, etc.

Metaphysical modalities, concerning facts and existence, what is real or actual: real, existing, actual, factual, true, false, to be a fact, to be true, to be an event, to be a process; whereas metaphysical makings are, among others, the following ones: making true, making fact, making real, making actual, making event, making process etc.

Makings

6. They form a basic and very challenging family of modalities. To outline them let me start with a bit of English grammar.

In English makings are of the form Gerund + Noun: Making *N*, for suitable *N*. The form is very general indeed.

Consider, for example, two basic cases:

Making Possible	x makes y possible	$MP(x, y)$
Making Impossible	x makes y impossible	$MI(x, y)$;

They are basic for there are just four positive - negative connections going from one item to another: one positive (making possible), one negative (making impossible), one ontologically ambivalent (both making possible and making impossible) and, finally, one ontologically neutral or empty, when both items under consideration are not connected at all, which is quite common assumption in the case of combinatorial ontology. Cf. '22 below.

7. Notice that the first argument x **B** is usually named maker (or reason), whereas the second argument y is a result of making.

Consider also the original making introduced by Russell and investigated by his followers:

Making True	x makes y true	$MT(x, y)$;

Other natural examples are following ones:

Making Real	x makes y real	$MR(x, y)$
Making Actual	x makes y actual	$MAc(x, y)$
Making Fact	x makes y to be a fact	$MF(x, y)$
Making Act	x makes y to be an act	$MA(x, y)$.

8. To sum up, English form of makings is very general and formal. It can be done for any noun, without any clear limitation. It is obvious that the most investigated case of making is the case investigated in the theory of action, where maker is considered to be an agent making an action.

9. A bit of onto\logic of makings. Observe first

(1) *Making possible and making impossible are two basic makings.*

It follows from purely apriori considerations sketched previously.

(2) *Making possible is, in a sense, ambiguous.*

9.1 Indeed, we should distinguish at least two extreme variants:
Strong variant: $MP(x, y)$ means x makes y and y is possible, or x makes y to be possible:

(MP\M) $\quad MP(x, y) \leftrightarrow M(x, y) \wedge M(y).$

Weak variant: $MP(x, y)$ means $P(x, y)$: x makes a necessary condition for y, or x excludes a barer for y.

9.2 Hereafter *MP* is the common, general form of *making possible*, and other makings as well. We can consider it to be a combination of both variants mentioned above. As something from the spectrum between these two extremities: $MP = M + P$.

10. The strong variant *M(,)* offers a way to define other makings. For example:

(MF\F) $F(x, y) \leftrightarrow M(x, y) \wedge F(y)$; *x* makes *y* to be a fact, if it makes *y* and *y* is a fact.

(MT\T) $MT(x, y) \leftrightarrow M(x, y) \wedge T(y)$, explained in a similar way: *x* makes *y* true, where y is a proposition, whereas x is its truth- maker, whatever it means.

(MA\A) $MA(x, y) \leftrightarrow M(x, y) \wedge A(y)$; *x* makes *y* an act, if it makes it possible and *y* is an act.

11. Observe next that

(3) *The weak version P(,) is weaker indeed:*

(MP\P) $MP(x, y) \rightarrow P(x, y)$, or more $MP(x, y)$ 6 $P(x, M(y))$
(MF\P) $MF(x, y) \rightarrow P(x, y)$, or more $MF(x, y)$ 6 $P(x, F(y))$
(MT\P) $MT(x, y) \rightarrow P(x, y)$, or more $MT(x, y)$ 6 $P(x, T(y))$ etc.

Making true

12. Up to my knowledge, the only case of makings investigated till now in a rather extensive way is the case of making true, *MT*. It is based upon two clues:

12.1 The Russellian one. Facts are left-side arguments of *MT*. They are truth makers. This implies

(BR) $MT(x, y) \rightarrow F(x)$;

Too much attention put on truth makers is chiefly responsible, I think, for placing in general makings in the shadow of makers, covering thereby the modal character of makings.

12.2 The Fregean and Tarskian one. Making true means verification (satisfaction):

(F\T) $MT(x, y): \leftrightarrow x \models y$,

with the usual compossibility principles. As a matter of fact, Tarski's contribution to the theory of truth can be understood as an axiomatization of making true in the case of the extensional classical language, based on set-theory as background ontology.

It is a logical custom to differentiate between MT-arguments: $MT(\mathbb{N}, A)$, or $MT(X, A)$, where the first is a mode*l* or a set of formulas, whereas the second is a formula.

A conclusion

13. By the above analysis, in particular by (1), the general theory of makings must be based on (and, in fact, is a part of) combination ontology, or general ontology of analysis and synthesis.

Ontology

14. The most general theory of analysis and synthesis is one of two types. It is either combination ontology or transformation ontology:

$$GAS = CO + TO.$$

15. In what follows I will, following Leibniz and Wittgenstein, deal with combination ontology only, leaving investigation of transformation ontology for another occasion.

Three Approaches Towards a General Theory of Analysis and Synthesis.

Order Approach

16. It is natural, abstract and quite common. Let me define first ontological spaces of three kinds and their simples (if any), hence their substance as well.

16.1 Ontological spaces. Let *OB* be the class of all items (*objects*). Assume that the universe of a discourse *U* is included in *OB*. We distinguish at least three natural types of an ontological space of analysis and synthesis. Two uniform:

The space of analysis: <U, < > where < is the relation to be simpler than.
The space of synthesis: <U, f > where f is the relation to be a component of,

And their common extension:

The space of analysis and synthesis: <U, <, f >.

17. Notice the large number of questions concerning connections between the two basic ontological relations: to be simpler than and to be a component of. Are they coextensive? Positive answer seems, however, to be a too far going oversimplification.

Obviously, an analysis passing from "bigger" to "smaller" is down-oriented, whereas a synthesis is up-oriented.

18.. Simples and substance (cf. [10]). The most important offsprings of the first, order, approach are variants of the notion of *simples* and *co-simples* (usually named *possible worlds*). Both are limit notions. Simples are limit-objects of the family of all proper ontological analyses; possible worlds (co-simples), on the other hand, are limits of suitable syntheses.

It is important to recognize that at least six notions of simples can and should be distinguished. Let me state here only four of them, where – denotes hereafter either < or f (read "simpler than"):

Superelements: SE(x) iff ∀y x–y

x is a superelement iff it is simpler than any object in the universe.

Simples: S(x) iff ¬∃y y–x

x is a simple iff there is no object in the universe which is simpler than it.

Atoms: A(x) iff ∀y (y–x → x=y)

x is an atom iff the only one element simpler than it is x itself

Elements: E(x) iff ∀y (y–x → x=ywSE(x))

Elements are weakenings of atoms. The only objects simpler than them are they themselves or superelements.

19. Now, following the long and very distinguished line of thinkers, including Anaximander, Anaxagoras, Democritus, Leibniz, Kant and Wittgenstein substance is defined as the family of all simples of suitable types. Observe that the substance can be not uniform, for it can be built up of various types of simples.

Notice also that in the case of so-called *unfounded* ontologies substance can be empty. In such a case it is, for sure, not so natural and easy to introduce a suitable inductive structure in the universe. Anyway, such alternative ontology must be treated quite seriously.

Finally, let me stress that the order approach offers an external description of synthesis. It does not, however, explain its mechanism.

Operator Approach.

20. It is based on investigation of two operators: analyzer α and synthesizer σ.

Analyzer α produces for a given x the family of all its pieces (parts):

$\alpha(x)$:= {y: y is obtained from x by α};

whereas synthesizer σ collects for any x the family of all objects that *can be synthesized* from x (its substance):

σ(x) := {y: y can be obtained by a combination involving x, or its substance S(x)}.

Operator approach gives, like the order one, an external (or extensional) description of synthesis. It opens, however, a way to its internal description. Cf. [11].

Internal, or Modal, Approach

21. To describe (at least necessary) conditions of a successful synthesis it is convenient to use two basic ontological modalities introduced previously: making possible - MP(,) and making impossible -MI(.).

They can be introduced and supported by means of the following three different considerations.

Consideration a priori

22. Clearly, for given two arbitrary objects *x* and *y* they can be understood as arguments for a basic ontological connection which, in turn, is either positive or negative. *A priori* there exist just four cases: the case of positive connection - MP, the case of negative connection - MI, the case that connection is both positive and negative, hence incoherent, denoted - MPI, and the most popular in combinatorial ontology the case of mutual neutrality - N(,). The first case is taken here to be fundamental.

Explication for σ

23. Now we can offer the following, rather natural explication for a powerful, nearly omnipotent, synthesizer: y is *synthetizable from x iff it is be made possible from x*:

$$\sigma(\mathrm{x}) = \{\mathrm{y}: MP(\mathrm{x}, \mathrm{y})\}$$

Notice that the above explication connects the second approach (operator one) with the third (internal) approach to a general theory of analysis and synthesis.

Wittgenstein's insight

24. Let me quote one of the most mysterious theses of the *Tractatus*:

(2.033) Form is the possibility of structure.

Ask now what *the possibility* means? It has been pointed out by Frank Ramsey in his famous review of the *Tractatus* that it cannot be read as a logical modality (i. e., *form* cannot be treated as an alternative structure), for this reading would immediately make *Tractatus* inconsistent.

My own proposal (cf. [1], [2]) is the following one:

(4) Form of *x* is what *makes* the structure of *y possible*.

Formalization: *MP(Form(x), Str(y))*, hence - through suitable generalization - *MP(x, y)*.

25. Further Wittgensteinian and Leibnizian clues make the nature of MP more clear: form of *x* is determined by its substance, whereas structurality of *y* means that *y* is a complex built up in *such and such* way. Using syntactical categorization of Leśniewski and Ajdukiewicz we obtain therefore that MP has the category of quantifier: *s / n, s* **B** which, as is easy to see, is of higher order and deeply modal.

Therefore MP is a modal quantifier, characterized after Wittgenstein's clue by

(5) $MP(x, y) \leftrightarrow MP(S(x), y)$.

Conceptual framework of Combination Ontology

26. It is extremely rich, enough to define the basic notions of Leibnizian and Wittgensteinian ontologies. Hereafter I will cite only a few notions to illustrate the above claim as well as for further use.

Starting definitions and axioms

$M(x) :\leftrightarrow MP(x, x)$	ontological coherence (to be ontologically possible)
$OF(x) :\leftrightarrow \exists y\, MP(y, x)$	ontological foundation
$G(x) :\leftrightarrow \forall y\, MP(x, y)$	ontological generator (or God-like being of a theory)
(SR) $\forall x \exists y\, MP(y, x)$	ontic principle of sufficient reason

Monotonicity principles with respect to –

MP(D,)	$z – x \wedge MP(x, y) \rightarrow MP(z, y)$	Down oriented with respect to the first argument.
MP(U,)	$x – z \wedge MP(x, y) \rightarrow MP(z, y)$	Up oriented with respect to the first argument.

Similarly for the second argument.

MP(,D)	$MP(x, y) \wedge z – y \rightarrow MP(x, z)$
MP(,U)	$MP(x, y) \wedge y – z \rightarrow MP(x, z)$

Also *MP(D, D), MP(U, U), MP(D, U), MP(U, D)* should be taken into account.

Consistency principles

Ontological ones

(OC)	$\neg(MP(x, y)\wedge MI(x,y))$	consistency law
(OEM)	$MP(x, y) W MI(x, y)$	law of the excluded middle
(OBI)	$\neg MP(x, y) \leftrightarrow MI(x, y)$	law of ontological bivalence

Notice that *OBI* simplifies the domain of investigation under consideration in a quite remarkable way: making possible and making impossible are interdefinable.

Onto\logical ones

They hold in the proper domain of logic, where at least the second argument is a proposition (or formula), whereas the negation is classical.

(OLC)	$\neg(MP(x, \neg A)\wedge MP(x, A))$	meta-consistency law
	No proposition is made possible, together with its negation, by the same item.	
(OLEM)	$MP(x, \neg A) W MP(x, A)$	meta-excluded middle law
	Each item makes possible either A or $\neg A$.	
(OLB)	$\neg MP(x, A) \leftrightarrow MP(x, \neg A)$	meta-bivalence law

Notice that the above laws govern usual semantics. They are, in a sense, metalogical.

Compossibility and Compatibility

27. Let us finally consider *compossibility* **B** the most eminent ontological modality, used by Leibniz as the main notion of his great metaphysics. First I will recall Leibniz's original construction, which is metalogical in its depth, passing next to its onto\logical counterpart in combination ontology.

Leibniz's metalogical construction

28. Recall first that Leibniz believed in discovering a suitable logical calculus of concepts enabling its user to solve any rational question. Assuming that it is done he was in power to sketch the full ontological system **B** from monads and qualities to the real world.

Thus let some logical calculus of concepts (names?, predicates?) be given. Cn is its connected consequence operator, whereas - for any *x -Th(x)* is the Cn-theory generated by x.

Leibniz defined modal concepts by the following metalogical conditions:

$M(x) :\leftrightarrow z \not\in Th(x)$	*x* is possible *(its theory is consistent)*
$L(x) :\leftrightarrow z O Th(\neg x)$	*x* is necessary *(its negation is impossible)*
$C(x, y) :\leftrightarrow z \not\in Cn(Th(x)\, c\, Th(y))$	*x* and *y* are compossible *(their common theory is consistent)*.

Immediately we obtain Leibnizian "soundness" conditions:

(6) $C(x, y) \leftrightarrow C(y, x)$ *Compossibility relation is symmetric.*

(7) $M(x) \leftrightarrow C(x, x)$ *Possibility means self-compossibility.*

(8) $C(x, y) \rightarrow M(x) \wedge M(y)$ *Compossibility implies possibility.*

When can the above implication be reversed?

Onto\logical construction

29. Observe that in the framework of combination ontology we have already defined $M(x)$ in a way respecting (7).

On the other hand, the previous question suggests that between $MP(,)$ and $C(,)$ there is another relation, more fundamental than compossibility one. It is so-called *compatibility* relation. Indeed, putting

$CP(x, y) :\leftrightarrow MP(x, y) \wedge MP(y, x)$ B for compatibility, and
$C(x, y) :\leftrightarrow M(x) \wedge M(y) \wedge CP(x, y)$ B for compossibility

we obtain a manageable compossibility relation obeying the above Leibniz's "soundness" conditions.

Wholes are combinations of compossible collections, whereas possible worlds are obtained by maximalization of wholes.

30. Finally, observe that in our approach we start with one basic ontological making: *MP(x, y)* B modality more fundamental than Leibnizian compossibility, for it is definable in two steps from our basic making. Observe also that the above construction can be done for *making impossible* and to both basic ontological modalities as well (producing quite Hegelian output in this case!).

Combination Semantics of Logical Modalities[2]

Definitions

31. Now, an ontological frame ***U*** is the triple $<U, MP, MT>$; where U is any collection, whereas MP and MT are appropriate binary relations on U, respectively *making possible* and *making true.* Without any loss of generality we can split U into the extralanguage domain U' and the language domain FOR: ***U*** $= U'$cFOR, with suitable restrictions of MP and MT to these subdomains: MP, MT f U'HFOR.

We assume the well-known Fregean Tarski's conditions characterizing MT, with additional

[2] Cf. [8], [9].

use of MP:

($\neg$)	$MT(x, \neg A)$	*iff*	*not* $MT(x, A)$
($\wedge$)	$MT(x, A \wedge B)$	*iff*	$MT(x, A)$ *and* $MT(x, B)$
($\vee$)	$MT(x, A \vee B)$	*iff*	$MT(x, A)$ *or* $MT(x, B)$
($\rightarrow$)	$MT(x, A \rightarrow B)$	*iff*	$MT(x, A)$ *implies* $MT(x, B)$
($\Diamond$)	$MT(x, \Diamond A)$	*iff*	$MP(x, A)$

Observe

($\sim$)	$MT(x, \sim A)$	*iff*	*not* $MP(x, \neg A)$.

Metafunctors "not", "and", "or", implies" used in the above definition are govern by the rules of classical logic, hence hereafter they are replaced by appropriate functors of classical logic.

For any ontological frame we put as usual:

$$\mathbf{U} \models A \text{ iff } \forall x \in U' \, MT(x, A).$$

Notice that the above receipt works, *mutatis mutandis*, for any intensional logic!!

Correspondence

32. It is easy to check the following correspondence list for modal and onto\logical formulas:

Axiom of Gödel - Feys - von Wright

(T) $A \rightarrow \Diamond A$

It is characterized by the implication $MT(x, A) \rightarrow MP(x, A)$, i. e., by the inequality MT#MP: *Making truth implies (or is included in) making possible.* In short: *Truth implies possibility*.

It is, in fact, the original Aristotelian explication of the axiom, obviously more transparent and clear than the alternative explication offered by relational semantics: *xRx*, i. e., the alternativity relation between possible worlds is reflexive.

Axiom of noncontingency
(for its nonsymmetric case)
(TV) $A \to \sim A$, or $\Diamond A \to A$

It is characterized by the reverse inclusion: MP#MT. Its ontological characterization is thus given by the implication: MP(x, A) $\to$ MT(x, A), reverse to the previous one. Thus noncontingency means that *making possible implies making truth,* in short: *possibility implies truth.*

Finally, the conjunction of both axioms, i. e.,

Triviality axiom
(TR) $\Diamond A \leftrightarrow A$

corresponds to the equality: MP = MT, saying that *making possible* is simply *making truth.* In short: *possibility* means *truth*.

To conclude, the above three closely connected axioms are explained in our semantics in a rather clear, natural and intuitive way.

33. Let us proceed now to three well-known axioms connected with ontological rationalism.

33.1 Consider first the axiom of ontological rationalism of Leibnizian type, saying that *nothing is contingent (in a symmetric version of contingency)*

$$\text{(R)}\quad \Diamond A \to \sim A$$

It is characterized by the implication MP(x, $\neg$A) $\to$ $\neg$MP(x, A), which is equivalent to the ontological consistency law (in its metalogical version, cf. ' 26): $\neg$(MP(x, $\neg$A)$\wedge$MP(x, A)).

It is indeed the soundest explication of Leibnizian axiom, for everybody knows (or at least should know) that ontological rationalism is based on the law of noncontradiction. Recall that in the case of relational semantics the axiom is connected with the condition of functionality for alternativity relation, which is also very rationalistic in spirit.

33.2 Its dual version is the famous axiom of standard deontic logic of Aristotle - von Wright - Makinson:

$$\text{(D)}\quad \sim A \to \Diamond A$$

It corresponds with the implication $\neg$MP(x, A) $\to$ MP(x, $\neg$A), which is equivalent to the metalogical version of the ontological excluded middle law: MP(x, A)$\vee$MP(x, $\neg$A) **B** *x makes possible A or its negation.*

33.3 Joining both axioms together we obtain the axiom of strong rationalism

$$\text{(DR)}\quad \sim A \leftrightarrow \Diamond A$$

which corresponds to the principle of metalogical bivalence: ¬MP(x, A) ↔ MP(x, ¬A) : *x makes possible either A or ¬A.*

Recall that the relational semantics shows another side of strong rationality: (DR) corresponds to the restriction of the alternative relations to functions. As a matter of fact, rationalistic description of the universe is often purely mathematical, hence it is done chiefly in terms of functions.

34. Anyway, at least in the above cases (but not only in them) combination semantics demonstrated in a fairly clear way its power of intuitive philosophical characterization of an important family of modal axioms.

Completeness

35. Now, it would be fine to prove that the above conditions fully characterize logics in question. The above semantics is indeed quite general and broad.

36. Let **P** be a modal logic, C **C** the classical consequence operator based on detachment and the classical logic **CL**.

L(**P**) denotes the family of all Lindenbaum oversystems of **P**.

The <u>canonical frame</u> *<L(**P**) cFOR, MT, MP>* is defined now by putting the following definitions of both makings:

MT(X, A) *iff* *A 0X*
MP(X, A) *iff* *C(X, ◊A) is consistent*

Immediately from the definition we see that the making true relation MT(,) is closely connected with the characteristic function of the Lindenbaum system *X*.

37. By quite standard argument (cf. [8]) we have

(9) THE COMPLETENESS THEOREM (Cf. Perzanowski [2], [8])).
*For any modal logic **P**, **P** is characterized by the class of all ontological **P** - frames.*

38. Many corollaries follow immediately, including

(10) ***CL** is complete with respect to all ontological frames.*

(11) ***KT** is complete with respect to all **KT** - frames.*

(12) ***DR** is complete with respect to all **DR** - frames.*

Conclusions

39. Makings form an uniform family of meta-modalities, with the classical making true MT as the paradigmatic case. It is, however, not the basic one, for the basic making is the onto\logical making MP.

40. Notice that the combination ontological semantics works for all intensional logics. Indeed, combination of makings produces adequate semantics for intensional logics in general. The semantics is, in a sense, a combination of matrix semantics **B** because of MT, and relational semantics - by MP (and other makings, if necessary); what explains its power. In result, our semantics has the generality of matrix semantics, and the power of explication characteristic for relational semantics!

41. To be not purely formal and artificial the ontological combination semantics has to be based on real ontology. Its explanatory power depends on the previous onto\logical theory of suitable superlogical modalities, like the theory of MP offers an explanation for logical modalities ◊ and ~.

42. In combination semantics for a given family of modalities difficulty with the place of semantical analysis is where it really is **C** not on rather artificial problems connected with proving suitable completeness theorem, but in looking for an appropriate ontological analysis of modalities under consideration, for discovering their fundamental metatheory.

Six Easy Pieces of Combination Metaphysics

Recall that metaphysics is the ontology of the world. It is therefore the ontology of facts, events, processes, the ontology of causality and similar topics.

Facts as Contingent Existing Objects

43. Let some basic algebra of objects with complementation "¬" be given. By definition, all items with respect to a given analysis are either complexes or simples:

(13) $S(x) \vee CX(x)$

Our basic conviction is that *only complexes can exist*. To exist, E(x), means here that x is what is a case, or event; hence what can be destroyed and thereby cease to exist.

(14) $E(x) \rightarrow CX(x)$

On the other hand, "possible - M( )" can be understood either logically, or - what we prefer - ontologically, as coherence in the spirit of '28 above. Now, *to be contingent* means that both x and ¬x are possible:

$K(x) :\leftrightarrow M(x) \wedge M(\neg x)$.

44. Facts are existing contingencies, whereas counterfacts are contingencies which does not exist:

$F(x) :\leftrightarrow K(x) \wedge E(x)$
$CF(x) :\leftrightarrow K(x) \wedge \neg E(x)$.

Thus the realm of contingencies is divided into the family of all facts (the world) and the family of all counterfacts (situations):

(15) $F(x) \vee CF(x) \leftrightarrow K(x)$.

Clearly

(16) $F(x) \rightarrow K(x), M(x), M(\neg x), E(x), CX(x)$
$CF(x) \rightarrow K(x), M(x), M(\neg x), \neg E(x), CX(x)$.

45. Observe that for contingencies compatibility is equivalent to compossibility:

(17) $K(x), K(y) \rightarrow C(x, y) \leftrightarrow CP(x, y), C(\neg x, \neg y) \leftrightarrow CP(\neg x, \neg y),$
$C(x, \neg y) \leftrightarrow CP(x, \neg y), C(\neg x, y) \leftrightarrow CP(\neg x, y)$

Facts Through Making Fact

46. Facts are considered here as products of making them. According to the strong version of '10 we have the following soundness or correctness principle:

(S) $MF(x, y) \rightarrow F(y)$.

Obviously, *making fact implies making possible*:

(18) $MF(x, y) \rightarrow MP(x, y)$.

47. As the metaphysical counterpart of the ontological principle of sufficient reason we have the principle of metaphysical foundation:

(MSR) $\forall y \exists x\, MF(x, y)$.

If the metaphysical foundation we define by:

(MFD) $MFD(y) :\leftrightarrow \exists x\, MF(x, y)$

then the principle of metaphysical foundation says that *any object is metaphysically founded*.

Facts, after Russell, as truth makers

48. According to this view, facts are left-hand arguments of making true:

(BR) $F(x) :\leftrightarrow \exists y\, MT(x, y)$.

In Russellian theory of truth-makers it can be taken for granted that *making true implies making possible*:

(19) $MT(x, y) \rightarrow MP(x, y)$,

as well as the soundness condition

(20) $MT(x, y) \rightarrow F(x) \wedge Prop(y)$;

Left-hand argument of MT is a fact, whereas the right-hand argument is truth-bearer, i. e., as stoic tradition says **B** some proposition.

49. Observe that two above approaches to the notion of a fact are, in fact, complementary. Indeed, facts being, by the soundness condition S, the right-hand argument of MF are also, by Russellian insight BR, the left-hand argument in MT. Therefore we can take superposition of both relations

(MFT) $MFT(x, y) :\leftrightarrow \exists z(MF(x, z) \wedge MT(z, y))$

obtaining making relation which seems to define facts implicitly.

Is above complementary characterization of facts, given in ''46-48, characteristic for them or not?

On Propositions

50. They are not facts, but (possible) situations, hence counterfacts. However, they are closely connected with suitable facts: *If a sentence x is true or false, then it is connected with a proposition.*

(21) $T(x) \vee Fls(x) \rightarrow \exists CF(y)\, Prop(x) = y$

51. Then x is true means that x is a proposition and it is a picture of some fact. Picture is also a fact.

Let MPC(,) means *making picture*. Remember that picturing holds only between facts:

(22) $MPC(x, y) \rightarrow F(x) \wedge F(y)$.

That x is a picture of y means that there is a homomorphism between x and y. Using it we obtain

(23) $T(x) \leftrightarrow h(Prop(x))) = y$, for some $F(y)$.

Now, we can define a bivalent valuation in an obvious way:

(24)
$$\begin{array}{lll} v(x) = 1 & \text{iff} & \exists F(y)\, h(Prop(x)) = y, \\ v(x) = 0 & \text{iff} & \text{otherwise} \end{array}$$

Processes B Events B Facts

52. A process, which is the basic item of any ontology of processes and events, is a series of reconfigurations of some family of basic complexes and their products. Processes are done by MPR(,) B making processes relation, i. e., some relation of making change. Processes have their duration, history and time (change measure).

Now, an event is any phase, or happening, of a given process; whereas facts are moments[3] of events B their existence (or being observable).

Thus, following suitable principle of foundation (sufficient reason), each process is made by something:

(25) $PR(x) \rightarrow \exists y\, MPR(y, x)$,

or if we use making acts instead of making process

(26) $PR(x) \rightarrow \exists y\, MA(y, x)$.

53. Events are obtained by suitable division of processes. This division is the kernel of making event, ME(,).

(27) $PR(x) \wedge ME(x, z) \rightarrow E(z)$

On the other hand, facts are common results of making process and making event:

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[3]In Husserlian sense.

(28) $\quad MPR(x, z) \wedge ME(z, y) \rightarrow MF(x, \text{that } y)$

54. To sum up, we have the following correspondence between procesual makings and making true:

(29) $\quad MT(x, PR(y)) \rightarrow MPR(x, y)$
$MT(x, E(y)) \rightarrow ME(x, y)$
$MT(x, F(y)) \rightarrow MF(x, y)$

Suitable onto\logic of procesual ontologies is now implicitly in hand, waiting for development.

Causal Network of the World

55. It is done by means of MF(,). The weakest (?) conditions on causality, as described in my Graal-Müritz address [7], are as follows:

(IR) $\quad \neg\exists x\, MF(x, x)$ Irreflexivity
Nothing causes itself.

(TRANS) $\quad MF(x, y) \wedge MF(y, z) \square\ MF(x, z)$ Transitivity
If one causes the second and the second the third then the first causes the third: Causality relation B expressed by MF B *is transitive.*

(NE) $\quad \exists x, y\, MF(x, y)$ Nonemptiness
` *Some items are causally connected.*

56. Next, let's consider two closure principles saying that the world is causally connected in both directions. To be more exact:

The soundness principle of '46:

(S) $\quad MF(x, y) \rightarrow F(y)$

and the Proper Principle of Causal Closure of the World or the Principle of Determinism:

(D) $\quad \forall y(F(y) \rightarrow \exists x(F(x) \wedge MF(x, y)))$
Facts are made by facts!

57. Consider also some additional principles:

(C) $\quad MF(x, y) \rightarrow F(x)$ The closure principle reverse to S

(MR) $F(y) \rightarrow \exists x\, MF(x, y)$ Metaphysical Rationalism Principle
Facts are not without reason.

Let us consider, instead of the world which is a rather complex whole, its universe FACTS **B** the family of all facts.

58. Now let me repeat some observations of [7]:

(30) If S and NE, then FACTS $\neq \emptyset$

(31) S, MR, C iff FACTS $\neq \emptyset$

(32) S, C imply $MF(x, y) \rightarrow F(x) \wedge F(y)$

(33) MSR implies MR, D

59. Let me point out that the main theorem of [7] was stated in too weak form. Using the same, well-known Schütte type argument, we can prove Leibniz's theorem on Nature:

(34) *There no true atoms of the (deterministic) nature*.

In more exact terms:

(35) Assume NE, S, IR, T and D. Then $\forall y(F(y) \rightarrow \exists x(F(x) \wedge MF(x,y) \wedge x \neq y))$.

Hence, the universe FACTS (the World) is fully unfounded. There are no simples between facts.

(36) FACTS is an infinite family which is fully unfounded.

Some Surprising Consequences

60. The following consequences of the combination metaphysics outlined above for rationalistic thinkers from the classical school of Aristotelian scholars are, for sure, surprising.
Not for Leibnizian scholars, however!

60.1 Observe first, that there is no reason for facts in the domain of facts. In short, no reason for the world inside it. RATIO, if any, is outside the world. In such a case it preexists, it is outside the world: $\forall y\, (F(y) \rightarrow MP(x,y)) \rightarrow \neg F(x))$.
Either there is no ratio at all.

60.2 Notice next difficulties with two first ways of St. Thomas. Indeed, there is no first mover inside the world. First Mover, if any, must be outside the world and move it, together with all its pieces (facts).

Acknowledgments

The paper summarizes three my talks given at the following Baltic logico - philosophical workshops: in Graal-Müritz (1993), in Osieki Koszalińskie (1997) and in Copenhagen (1999). I like to thank Jan Faye, Uwe Schefler and Max Urchs for invitations and their kind hospitality.

Support obtained from Polish Committee for Scientific Research (KBN) by means of the grant 1 H01A 006 18 and indirectly by the Flemish Minister responsible for Science and Technology (Contract Bill 2002/41) is also thankfully acknowledged.

References

[1] Perzanowski J., Some Ontological and Semantical Puzzles of Wittgenstein's *Tractatus*, in: R. Haller ed. *Aesthetics, Proceedings of the 8th International Wittgenstein Symposium, 15 - 21 August 1983, Kirchberg am Wechsel*, Hölder-Pichler-Tempsky Vlg., Wien, 1984, 224-230

[2] Perzanowski J., *Logiki modalne a filozofia*, Wyd. Uniwersytetu Jagiellońskiego, Kraków, 1989, pp. 159. Slightly modified version reprinted in [3], pp. 262 - 346.

[3] Perzanowski J., ed., *Jak filozofować?*, PWN, Warszawa, 1989, pp. 400.

[4] Perzanowski J., Towards Post-Tractatus Ontology, in: J. Brandl & R. Haller eds.: *Wittgenstein - Towards a Re-evaluation. Proceedings of the 14th International Wittgenstein Symposium, 13 - 20 August, 1989, Kirchberg am Wechsel*, Hölder-Pichler- Tempsky Vlg., Wien, 1990, 185 - 199

[5] Perzanowski J., Ontologies and Ontologics, in: E. Żarnecka-Biały ed.: Logic Counts, Kluwer Academic Publishers, Dordrecht-Boston-London, 1990, 23- 42

[6] Perzanowski J., Combination Semantics: An Outline, [in:] M. Balat and J. Deledalle- Rhodes, eds., *Signs of Humanity*, Mouton de Gruyter, 1992, pp. 437 - 442

[7] Perzanowski J., Reasons and Causes, [in:] J. Faye et al. *Logic and Causal Reasoning*, Akademie Verlag, Berlin, 1994, 169 - 189

[8] Perzanowski J., Combination Semantics for Intensional Logics I. Makings and Their Use in Making Combination Semantics. Logique et Analyse, 165-166 (1999), 181 - 203

[9] Perzanowski J., Combination Semantics for Intensional Logics II. Variants and Comparisons. (In preparation)

[10] Perzanowski J., Components of the Substance. (In preparation)

[11] Perzanowski J., A Profile of Masonic Synthesis, Logic and Logical Philosophy, 11/12, 2003/2004, 167 - 189.

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