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A NOTE CONCERNING THE PLACE OF CONTRADICTIONS IN THE ONTOLOGIES OF CONSTITUTION

1. Introduction: what is the problem with inconsistencies?

In this first section we start with defining the notions of inconsistency and para-consistency, we give an example of an inconsistency and clarify what according to us is the basic problem with respect to the occurrence of inconsistencies. We are then in a position to state the aim of this paper.

We have a contradiction when both A and $\sim A$ are true.[1] We have negation-incompleteness when neither A nor $\sim A$ are true. We could refer to the first as "knots", and the second as "cracks", because these words convey the fact that a contradiction or an incompleteness encountered in a theory or in everyday life is never apprehended in a detached manner as just another neutral fact.[2] We will give all our attention to the concept of inconsistency. (Apparently knots pose more of a problem for understanding than do cracks, although of course there is the famous Gödel theorem.) In Classical Logic the presence of a contradiction leads to triviality: everything becomes true (logical "explosion" as some logicians call it, in formal language written as $A, \sim A \vdash B$). A paraconsistent logic avoids the principle of explosion: there are contradictions that can be true, without everything becoming true.

Being non-logicians we try to understand what a paraconsistent logic really does. With the help of an example we might get an intuitive grasp. From

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[1] See Priest et al. 1989 and Batens 1998/1999.

[2] The logical content is embellished with a layer of emotional content.

afar physics is the ideal theory. It is the paragon of exactness and clarity, the exemplum of a contradiction free description of the world. Intertheoretic relations within physics convince us of the contrary. According to quantum mechanics, physical entities can be indeterminate in their spatial properties because there is only an amplitude for localization, this amplitude giving rise to a probability.[3] Prima facie this seems to mean that a single quantum entity can be in a state where it is "all over the place", smeared out in space. Remember Feynman's presentation:[4] when a quantum entity travels the distance between two places A and B, it takes *all* the routes between A and B.[5] Suppose there are only two routes between A and B, and x is a place along one route and x' is a place along the second route. Quantum mechanics allows one to derive a proposition like: the electron is both at place x and at place x'. Hence it follows that there is a moment in time where the individual electron is at both places.[6] From a spatio-temporal perspective (classical physics or one of the relativity theories), a physical entity cannot be in two places at the same time. Now general relativity theory and quantum mechanics are arguably the two most fundamental physical theories.[7] Thus physical modelling based on *both* quantum theory and relativity theory will entail inconsistency. We do not want this to bring about that we cannot use our physical theories anymore. An underlying paraconsistent logic seems to be the best option, *if* we want to keep physics *unified* (and our physics seems to be minimally unified since we are using both quantum and space-time elements in many physical models).

There are two ways of understanding this situation: (1) we have an in-

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[3]See for example Redhead 1987, Albert 1992 for philosophical introductions to quantum mechanics.

[4]See Feynman et al. 1965, volume III.

[5]Suppose $\langle \chi \mid \psi \rangle$ is the amplitude for an entity in state $\mid \psi \rangle$ to end up in state $\mid \chi \rangle$. If both state vectors can be written in an orthonormal basis $\{\mid q_i \rangle\}$ then

$$\langle \chi \mid \psi \rangle = \sum_{i=1}^{n} \langle \chi \mid q_i \rangle \langle q_i \mid \psi \rangle = \sum_{ij} d_j^* \langle q_j \mid q_i \rangle c_i = \sum_i d_i^* c_i$$

where $c_i = \langle q_i \mid \psi \rangle$ and $d_i^* = \langle \chi \mid q_i \rangle$. The amplitude $\langle \chi \mid q_i \rangle \langle q_i \mid \psi \rangle$ is one of the possible ways the entity goes from $\mid \psi \rangle$ to end up in state $\mid \chi \rangle$. Feynman calls this "the great law of quantum mechanics". The set $\{\mid q_i \rangle\}$ is the set of all possible ways the physical entity can go from one state to another.

[6]See Aerts et al. 1998 for a detailed analysis of a paraconsistent interpretation of the Rauch-experiment, an experiment with single quantum entities in a superposition state for position, which can be manipulated from two different space-time regions.

[7]See Aerts 1999a, Aerts 1999b and Aerts 1996 for a more detailed discussion of the relation between quantum mechanics and relativity theory.

consistent object: contemporary physics (with its underlying paraconsistent logic) allows the constitution of *contradictory phenomena*; *or* (2) the inconsistency precludes the "closure" of our model (where the closure of a model would normally result in the presentation of a definite object), it forestalls the closure, because there is some future theory that *really* unifies quantum and space-time theories, resolving the inconsistency, and allowing us to constitute a non-contradictory object with our physics (the concept of constitution will be explained in section 3).

The principle of non-contradiction (PNC) says that the conjunction of a proposition and its negation cannot be true.[8] Although both in continental and analytical philosophy there have been contrary tendencies (Derrida and Priest are probably the first names that come to mind for respectively the continental tradition and the analytical tradition), the predominant intellectual culture still believes that thought obeys PNC unconditionally or at least that it should do so. However inconstencies do appear in our theorizing. From the above example it will be clear that the way we see it, the *basic question* for ontology is: (1) do there exist contradictory phenomena, or (2) does the occurrence of inconsistencies only remind us of the fact that we do not have adequate theories? The second interpretation of the presence of inconsistency would be an indication of the necessity of supplying "hidden variables". The debate surrounding quantum mechanics since its inception is the archetypical example.

There is a way of dealing with these questions, which requires injecting a dose of continental thought: the phenomenological approach in philosophy. For some time now phenomenology - even its "worst" cases like Heidegger, Levinas, Sartre and Derrida - are being reconsidered by analytically schooled philosophers (one of which is Dermot Moran, whose 2000 we have consulted in the writing of this paper) as a legitimate source of philosophical insights. Our aim in this paper is to "translate" the problem we formulated in the previous paragraph, which is a typical topic of analytical philosophy of logic, into phenomenology.

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[8]For many people PNC has been a (possibly *the*) necessary condition of rationality in the Western world. The German philosopher Husserl is no exception with respect to this conviction: one of the reasons for his *Logical Investigations* was the fact that mathematicians (e.g. Cauchy when dealing with imaginary numbers) were using conflicting theories to justify insights (Moran 2000, p. 92).

2. Preliminary remarks

Phenomenology is a difficult subject, because contrary to the analytical tradition, there is much more reliance on metaphor and the meaning of certain key concepts have "floating" or multiple definitions (a recurrent complaint in Moran 2000). This was already true of Husserl (and it is certainly true for the French tradition of Sartre, Merleau-Ponty, Levinas and Derrida). We are not able to stay true to Husserl in our account. In analytical philosophy the way we think about the original opinions of the logical positivists, the originators of the analytical traditions, is referred to as the "received view". Clearly it will be difficult to find just one logical positivist that really falls under the heading "received view". Equally difficult will be to agree among analytical philosophers as to what belongs to the received view, and what is still relevant today. Agreement is achieved from a certain distance.[9] Even if it is a distortion, it is still useful, because we can orient ourselves by it. Similarly we could present a kind of "received view" about Husserl, which we will designate as Husserl*.[10] We select some themes and concepts, we cannot deal with everything (for example no mention is made of specific terminology like 'noema' and the noematic structure of consciousness or of the transcendental ego).

3. Phenomenology

In this section we present in a very condensed form our understanding of phenomenology. In section 4 we will use our specific presentation of phenomenology to situate and discus PNC.

3.1. The bracketing of naturalism to uncover the transcendental role of consciousness

The phenomenological approach is opposed to the *naturalistic realist* approach. Naturalist realism says that behind the veil of perception and underlying our mental life, lies the real world: a determinate and ontologically

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[9]See the introduction of Boyd et al. 1991 for example.

[10]The fact that Husserl was constantly developing his own views in new directions and new ways, makes it extra difficult. In fact the only true way to present Husserl's thought would be in the form of a development. That is exactly what happens in De Boer 1978. One is then never in a position to say: about x Husserl's thinks this or that. In analytical philosophy somebody like Hilary Putnam poses a similar problem: we have on occasion heard philosophers refer to "one of the Putnams".

exhaustive domain of physical objects obeying physical laws. An extreme version of naturalist realism would claim the (causal) closure of the physical domain. From the latter it follows that perception, thought, meaning, motivation, etc. are derivable from the physical domain and its laws: everything mental and all meaning is a result of the interaction between the nervous system (mediated by sense organs) and physical objects. The world is a material entity.

We describe the phenomenological setting. There is no easy or obvious way to introduce a phenomenological perspective in philosophy. Let us initially proceed by comparison: the main contrast between basic tendencies of continental philosophy and analytical philosophy.[11] Usually when talking about language, one distinguishes *sign, reference* and *meaning*.[12] In formal philosophical logic a proposition is made up of individuals, n-ary predicates and logical connectives. For example the meaning (also called intension) of the one place predicate red is the color red, its reference, all red individuals. We can now contrast the two kinds of philosophy. Analytical philosophy is characterized by the fact that reference is primary. For nominalists meaning is even exhausted by reference. (Of course this is only a tendency. There are and have been quite a few analytical philosophers that believe in universals, but this does not change the fact that a lot of weight is given to reference and verification.) From a naturalist perspective the meaning of the property red can be reduced to the collection of red things, the property red in its intensional sense can be construed as a consequence of the causal interaction between a red thing and our perceptual and nervous system. Continental philosophy is characterized by the fact that meaning is primary and reference is 'bracketed'.[13] To emphasize the perspectival switch towards pure meaning and the constitution of meaning the word *eidetic* is used (from the word eidos). If asked to characterize phenomenology in one sentence, we would say it is the "liberation" of meaning. An explosive amount of essences comes into view. In his early work *Logische Untersuchungen* Husserl gives the following examples of 'ideale Gegenstände': the number 2, the quality red, PNC, ... (Husserl 1992, p. 130). The essences are not a loosely con-

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[11]We will give no macro-historical characterization of analytical philosophy and continental philosophy and their differences.

[12]The word meaning can be associated with the idea of propositional content, signification and also intension.

[13]In fact Husserl* even goes further. Derrida writes: "... chaque fois que Husserl voudra marquer le sens de l'intuition originaire, il rappelera qu'elle est l'expérience de l'absence et de l'inutilité du signe" (Derrida 1967, p. 67). Husserl* believes intuition provides a referentially (and inferentially) unmediated view of pure meaning.

nected aggregate: there are laws and relations between them, themselves essences. For example, suppose one notices that the stairs are red in a house one visits, then 'red stairs', disconnected from its extension, is an essence, subsumed under the essences 'red' and 'stairs'. In the domain of physics, the notion 'electron' is an essence subsumed under the essence 'physical entity'. Essences are the objects of *intuition*. We will assume Husserl* says that one can be wrong about intuitions (for example the eidetic nature of 'red'), the same way one can be mistaken about empirical perceptions (for example: 'The coat of that girl is red').

For Husserl* the awareness of both naive realism about everyday objects (the realism of tables, chairs, coffee cups, ...) and scientific realism about the objects of science (electrons, H_2O, ...) as (an outgrowth of) a particular attitude, *the natural attitude*, must lead to: (1) bracketing the natural attitude, (2) the discovery of *intentionality as constitution*. We will refer to this as *reduction*.[14] Intentionality is initially the idea that all consciousness is always the consciousness *of* something.[15] We soon realize this being-directed-towards-something is an *act*. When we direct our attention to conscious experience itself, we find it is activity and directionality, in all its actual and possible richness. Phenomenology is an attempt to describe the essential structure of consciousness (i.e., the eidetic elements and eidetic structures involved in intentionality) founded in the intuition of essences of these structures. A phenomenologist "withdraws" himself from the natural world, only to discover that there is a pure activity of constitution of objectivity: intentionality. When we say the phenomenologist withdraws himself, we do not mean that the world is not there for him anymore; we mean only that the world does not play its typical role in his attempts to describe consciousness. It is by becoming temporarily superfluous with respect to reference, that we realize the constitutive activity underlying all objects and phenomena with which we are presented, be they scientific theoretical entities, everyday objects, one's body, or even one's psychological traits and character.[16]

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[14]Actually this is only the first in a number of reductions. See Moran 2000, p. 124-164. Talk about reduction or reductionism in analytical philosophy of science generally refers to reducing the non-material levels of reality - for example consciousness - to the material level of reality. In continental philosophy it means freeing consciousness of the physical-material views.

[15]This has the notorious consequence that there is an object, even when there is no real physical object present.

[16]Consequently phenomenology refuses to take the scientific description as a starting point or basis for its analysis of conscious, *even if* it would turn out that consciousness is

3.2. Semantic reversal of the concepts of immanence and transcendence

Phenomenological is any philosophical account of knowledge which, after purifying consciousness of all kinds of scientific and metaphysical beliefs that would predetermine our ideas about meanings and acts, remains faithful to the fundamental aspects of experience: (1) on the one hand, *immanence*: a non-inferential immediacy of acquaintance with pre-reflexive (non-predicative) or reflexive (predicative) acts of thought, perception, recollection, fantasy, etc., i.e., the sphere of 'cogitationes';[17] (2) on the other hand *transcendence*: all objects we are conscious off through acts of perception, thought, volition, affection, ... All empirical objects - the tables, chairs, coffee cups ... of common sense, and the electrons, H_2O ... of science - are transcendent. (In fact, the lawful entities of physics are perfect examples of transcendent objects.) In the naturalistic attitude (and especially in scientific realism) we view matter as immanent, spirit as "transcendent" (in the sense of emergent or supervenient or reducible to matter). In the phenomenological attitude it is the other way around: spirit is immanent, material things - the objective facts of physics in particular - are transcendent. To realize the drastic nature of this philosophical stance, we must realize that also my psychological ego, with my psychological traits and character, is a transcendent object as a result of phenomenological reduction.[18]

Realism and objectivity are disconnected from a phenomenological perspective. Mathematical entities are probably as objective as any entity could ever be, but none of them are real (if we follow the usual naturalist realist view). However, saying they are not real, is in itself a metaphysical claim with respect to the objects. Husserl* just says: my concern is not their reality, but how they are objectified, how they become objects. Moran defines *constitution* as "the immanent genesis of transcendent objectivities" (Moran 2000, p. 139). Subjectivity is easily misunderstood. It is nothing like what we usually mean with subjectivity (i.e., idiosyncratically arbitrary, contingently individual, ...), because it has to be understood from a *transcendental*

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a product of the brain.

[17]It is called absolute, because it is the only thing that makes sense of the world, literally: every transcendent "given" is made into an object, is made sense of. In Husserl 1973 another meaning of immanence is discussed we will make no use of in this paper. See Husserl 1950 for the concepts of immanence and transcendence.

[18]And this explains why phenomenology even resists psychologism: its descriptions of experience do not draw on the empirical findings of psychology, nor are they part of psychology.

perspective. The transcendental pertains to *the genesis-through-constitution of knowledge (and more generally all objects of consciousness)*, the coming about of objects: the formation of certain given material, the empirical "data", into an object. Each transcendent object of consciousness that belongs to the empirical world (e.g., each entity of physics) is constituted, and this comprises two given elements: empirical perception and intuition. Any phenomenon has an element of the given, and an element of ideality.

4. Ontology and logic

The constitution of something into an object is not arbitrary. There are certain minimal principles that have to be "obeyed". Ontology is the foundation of that normativity. Constitution of objects - be they things, events, processes, etc. of a natural, psychic, cultural or social kind - is determined by ontologies.[19] Ontologies are structured fields of essences.[20] Husserl* distinguishes between *formal* ontologies and *regional* ontologies. Classical logic belongs to formal ontology: all objects are constituted in accordance with logical principles. (The notion of object itself, belongs to formal ontology.) An example of a regional ontology is the ontology of physics, which used to be particularism.

Particularism is part of materialism, a difficult issue. Let us give a brief aperçu. Particularism says: there are things and events and there is space-time; things and events happen *in* space-time.[21] Both things and events are particulars. A *particular* has four characteristics: P(i) it necessarily occurs at unique points in space-time, P(ii) it is countable by means of its spatio-temporal extent, P(iii) its identity criteria and individuation depend on spatio-temporal location, and P(iv) particulars constitute final reality. (This definition is adapted from Seibt 2001. In Seibt 2002 a fine-grained analysis is undertaken of the notion of particular. Both papers belong to

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[19]Husserl* uses the concept of ontology in a specific sense: because of the reduction these ontologies are not realist. The whole question of reference is put on hold.

[20]Phenomenology has been accused of being platonistic. Essences can be reduced to their instances, they do not exist independently from the acts in which they "inhere": "Son être [of the ideal object] s'épuise et transparaît de part en part dans sa phénoménalité. Absolument objectif, c'est-à-dire totalement délivré de la subjectivité empirique, il n'est pourtant que ce qu'il apparaît. Il est donc toujours déjà *réduit* à son sens phénoménal et son être est d'entrée de jeu être-objet pour une conscience pure" (Derrida 1962, p.6). We have at the same time the normative ideality of for example mathematical objects like numbers, and the foundation of these essences in and by the lived act of production.

[21]I does not matter if one has a relationalist instead of a substantivalist view of space-time. Both philosophies believe all things and events are spatio-temporal in their existence.

analytical ontology.) P(iv) means that on the final level of reality, when all the hidden variables which are supposed to be there, have come to light, we will find that the world is nothing more than the arrangement of particulars in space-time. We could call it the billiard-ball-ontology. In the naturalistic attitude space-time serves two functions: (1) what is real is spatio-temporal, which implies that space-time serves to distinguish reality from what is not real; (2) if all individuals are particulars then space-time also serves to *individuate* entities: to be implies to exist at a unique and determinate location in space-time.

For a long time people used to think that something along the lines of particularism was the correct ontology for the whole of nature. We now know that the particularist ontology is a regional ontology, because of arguments like the one in section 1: particularism is confined to the domain of space-time theories. The quantum mechanical part of physics is much better served by either a modified particularism or a completely different ontology.[22] So the ontology of physical nature (in itself a regional ontology) is composed of two regional ontologies: particularism and a 'quantum-ontology'. How does this work? For example, in constituting physical objects the fact that we obtain either a classical object or a quantum objects depends on the given: a Newtonian equation would not work for quantum phenomena, only a Schrödinger-equation will do; the fact that we obtain a *deterministic* equation (written in the language of calculus) depends on the general ontology of physics (that is, the deterministic nature of the equation is invariant across regional ontologies within the regional ontology of nature). This example does not have to be true. As it happens, in the quantum domain there is indeterminism. We just wanted to show how it would work: one cannot abstain from using ontologies.

Formal ontology is supposed to contain a lot of fundamental mathematical theories. There are supposed to be regional ontologies for all scientific domains. For reasons of simplicity we will suppose that (1) formal ontology contains only logic, (2) and that the regional ontologies reduce to just two: the ontology of quantum theories (quantum mechanics and quantum field theory) and the ontology of space-time theories (classical physics and special and general relativity theory), both part of the ontology of nature.

The way regional ontologies and formal ontology fit together as a hierarchic system. For Husserl* the regional levels are subsumed under the formal level, and the formal level contains classical logic. PNC should be true for all domains. Classical logic underlies all reflexive-predicative consciousness

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[22]We argue for the latter in Christiaens 200+.

for Husserl*, which means that any constitution should result in objects without knots.[23] However, if we are honest, if we do not lure ourselves into thinking along a particular path, because it is the least disconcerting, then we realize there are several possible underlying eidetic systems. The fact that the formal ontology allows for knots (i.e., the fact that it is paraconsistent), does not necessarily mean that there automatically are knots on the regional level also. It just means that the appearance of an inconsistency in a region will not lead to triviality.

From the perspective of phenomenology the question we formulated in section 1 becomes: if we encounter an irreducible inconsistency, *do we then have an object-constitution that did not work out, or do we have a contradictory object?* In other words, do contradictions resist any kind of closure of object-constitution (the closure resulting in an object is postponed, it is postponed until the cracks can be filled in, the knots can be untied), or does the paraconsistency of formal ontology allow us to constitute contradictory objects?

5. Conclusion

Of course, the "translation" of the basic question with respect to the appearance of inconsistencies into phenomenology needs a good deal more work. Much more detail and discussion is necessary than what we were able to provide.

We want to add a final remark. Husserl* was a contemporary of the logical positivists and was heavily influenced by the idea of knowledge of that time, an idea of knowledge which did not allow for inconsistency (just as it did not allow for contextuality). It seemed natural to suppose that formal ontology would be a classical logic. But one can be mistaken in one's intuitions the same way one can be mistaken about perceptions in the empirical world. We try to keep the world watertight, but there are breeches everywhere. Should we give up on classicality given the evidence, i.e. given our experience in the world - everyday life, actual science research, economy, politics, etc. *and* current theoretical physics. Is it not probable that from a consistent situation inconsistencies will follow; is it not probable that if you look close enough at something consistent (if you take a more fine grained

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[23]In the second logical investigation (chapter 2, section 8) Husserl writes about the "Widersinnigen": "kategorisch kann im eigentlichen Sinne von ihm nichts ausgesagt werden; und wenn wir doch so sprechen, als wäre es, als hätte es seine eigene Seinsweise, die "bloßintentionale", so erweist sich die Rede bei genauerere Betrachtung als eine uneigentliche." See Husserl 1992, p. 129-130.

model) knots will appear? Would we really feel at home in a world where we can make an exception every time we run into an inconsistency? There is a beauty to classical logic in its mathematical version given to us by Russel, Whitehead and the logical positivists, for which there is no substitution. It reflects a deep felt need to marginalize any agitation brought about by the presence of contradictions: they are knots that need to be untied.

We will attempt an answer to these questions in a future publication.

References

[1] AERTS, D., 1996, 'Framework for possible unification of quantum and relativity theories', *International Journal for Theorical Physics* 35 (1996), 2399–2416.

[2] AERTS, D., 1999a, 'The Stuff the World is Made off: Physics and Reality', in: D. Aerts, J. Broeckaert, and E. Mathijs (eds.), *Science, Nature, Human Action and Society, the 'White Book' of 'Einstein Meets Magritte'*, Kluwer Academic, Dordrecht, Boston, London, 1999.

[3] AERTS, D., 1999b, 'Quantum Mechanics: Structures, Axioms and Paradoxes', in: D. Aerts and J. Pyckacz (eds.), *Quantum Mechanics and the Nature of Reality, the 'Indigo Book' of 'Einstein Meets Magritte'*, Kluwer Academic, Dordrecht, Boston, London, 1999.

[4] AERTS, D., J. BROEKAERT, and S. SMETS, 1998, 'Inconsistencies in constituent theories of world views: quantum mechanical examples', *Foundations of Science* 3, No. 2 (1998/1999), 313–340.

[5] ALBERT, D., 1992, *Quantum Mechanics and Experience*, Harvard University Press, Cambridge Massachusets, 1992.

[6] BATENS, D., 1998/1999, 'Paraconsistency and its relation to worldviews', *Foundations of Science* 3, No. 2 (1998/1999), 259–283.

[7] BOYD, R., PHILIP GASPER and J. D. TROUT (eds.), 1991, *The Philosophy of Science, A Bradford Book*, The MIT Press, Cambridge, 1991.

[8] DE BOER, T., 1978, *The Development of Husserl's Thought*, Martinus Nijhoff, The Hague, 1978.

[9] CHRISTIAENS, W., 200+, 'Analytical ontology and its discontents. A definite choice looming in the EPR-Bell debate', forthcoming in *Foundations of Science*.

[10] DERRIDA, J., 1962, *Introduction to: 'L'Origine de la géométrie'*, Presses Universitaires de France, Paris, 1962, reprinted 1974, (Transl. of pp. 365-386 of the 1954 ed. of Husserl's Die Krisis der europischen Wissenschaften und die transzendentale Phnomenologie, edited by Walter Biemel and published by Martin Nijhoff as vol. 6 of the Husserliana series.)

[11] Derrida, J., 1967, 'La voix et le phénomè, Introduction au problème du signe dans la phénoménologie de Husserl', *Presses Universitaires de France*, Paris, 1967, (2. ed. 1972 - Epiméthée: Essais philosophiques, 4. ed. 1983).

[12] Feynman, Leighton en Sands, 1965, *The Feynman Lectures on Physics*, 3 delen, Addison-Wesley Publishing Company, Reading: Massachusetts, 1965.

[13] Husserl, E., 1950, *Ideen zu einer reinen Phänomenologie und phänomenologischen Philosophie. Erstes Buch: Allgemeine Einführung in die reine Phänomenologie*, Edited by Walter Biemel, Martinus Nijhoff Publishers, The Hague, Netherlands, 1950.

[14] Husserl, E., 1973, *Die Idee der Phänomenologie. Fünf Vorlesungen*, Edited by Walter Biemel, Martinus Nijhoff Publishers, The Hague, Netherlands, 1973.

[15] Husserl, E., 1992, Logische Untersuchungen, Zweiter Band, I. Teil, *Untersuchungen zur Phänomenologie und theorie der Erkenntnis*, Text nach Husserliana XIX/1, Felix Meiner Verlag, Hamburg, 1992.

[16] Moran, D., 2000, *Introduction to Phenomenology*, Routledge, London and New York, 2000.

[17] Priest, G., R. Routley and J. N. Norman (eds.), 1989, *Paraconsistent Logic. Essays on the Inconsistent*, Philosophia Verlag, Munchen, 1989.

[18] Redhead, M., 1987, *Incompleteness, Nonlocality and Realism. A Prolegomenon to the Philosophy of Quantum Mechanics*, Oxford University Press, Oxford, 1987.

[19] Seibt, J., 2001, 'Formal Process Ontology', *Proceedings of the FOIS '01 Conference*, ACM Digital Library, http://www.hum.au.dk/filosofi/filseibt, 2001.

[20] Seibt, J., 2002, 'Quanta, Tropes, or Processes: On Ontologies for QFT beyond the Myth of Substance', in: Meinard Kuhlmann, Holger Lyre and Andrew Wayne (eds.), *Ontological Aspects of Quantum Field Theory*, World Scientific, Singapore, 2002.

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