

Algebra or Grammar of the *To Be* (*Das Sein*, Τὸ εἶναι)? Peano and Heidegger

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Democritus called the fullness “τὸ ὄν (*being*)”,
the void “τὸ μὴ ὄν (*not being*)”.
—Aristotle, *Metaphysics*, I, 4, 985b, 5-10

In this article I argue how in the history of philosophy the meaning of the term “*to be*” was disputed over by two research programmes: the Platonic-Aristotelian one up to Heidegger and the Pythagorean-Parmenidean-Democritean one through Hobbes and Boole up to Peano. I call the first of “grammatical” type, the other of “linguistic algebraic” type. As in the grammatical classifications, in the former, formal or linguistic distinctions are mistaken for distinctions of logical type, or even of real or, as it is said, metaphysical type; hence its *empty philosophical verbalism*. In the latter, the term “*to be*” is taken in its merely linguistic meaning to build the science of reality, which should be known starting from rational principles, the “*ideas*”, as Democritus called them, through an adequate language.

Keywords: *Being, not Being and To be*, formal meaning and real meaning, two traditions of thought or research

Introduction: Two Research Programs on the Meaning of the Terms *Being, Not Being, and to Be*

In the history of philosophy, two research programs have faced each other around the meaning of the term “*to be*”, the Platonic-Aristotelian one and the Pythagorean-Parmenidean-Democritean-Peanian one. The first I call it of “grammatical” type, the second I call it of “algebraic-linguistic” type.

Plato and Aristotle assume formal, linguistic, or grammatical distinctions and interpret them as logical, or even real and metaphysical distinctions (Boscarino, 2016; 2019; 2021)¹. This is also what Heidegger does in his philosophical speculations, in which, after the so-called turning point (*Kehre*), he interprets the history of philosophical thought starting from mere formal, grammatical, or verbal distinctions.

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¹ For a broader discussion of what is discussed in this article, see Giuseppe Boscarino, *Tradizioni di pensiero. La tradizione filosofica italiana della scienza e della realtà*. Aracne, Roma, 2016. Giuseppe Boscarino, *The Logic and Grammatical Metaphysics of Plato and Aristotle*. *Philosophy Study*, May 2021, Vol. 11, No. 5, 343-350. Giuseppe Boscarino, *Aristotle and Democritus: the ways of ontological research*, *International Journal of Mathematics, Game Theory, and Algebra*; Hauppauge Vol. 28, Fasc. 2/3, (2019): 207-225.

In fact, Heidegger interprets the history of metaphysics as the history of *being*, while *to be* has been forgotten. In his opinion, there has been the history of the being (now interpreted as *an idea*, now as *God*, now as *spirit*, now as *The will to power*, etc.), without theming *to be*.

In his *Einführung in die metaphysik* he writes:

Aber wo ist der eigentliche Nihilismus am Werk?

Dort, wo man am gelaugigen **Seienden** klebt und meint, es genüge, **das Seiende** wie bisher als **das Seiende** zu nehmen, das es nun einmal ist.

Damit weist man aber **die Frage nach dem Sein** zurück und behandelt **das Sein** wie ein Nichts (nihil), was es auch in gewisser Weise <ist>, so fern es west.

In der Vergessenheit des Seins nur das **Seiende** betreiben—das ist Nihilism. (original German version). (Heidegger, 1953, p. 155)

But where is true nihilism at work?

There, where one attaches to family *beings* and it is thought that it is enough to take *beings as beings* as they are.

In doing so, however, the question of *to be* is rejected and *to be* is treated as a nothing (nihil), which also “is” in a certain way, insofar as it exists.

In the oblivion of *to be*, only *beings* operate: this is nihilism. (our English version)

And again in *Holzwege* he writes:

Das Wesen des Nihilismus beruht in der Geschichte, der gemäÙes im Erscheinen **des Seienden** als solchen im Ganzen mit **dem Sein** selbst und seiner Wahrheit nichts ist, so zwar, daß **die Wahrheit des Seienden** als solchen für **das Sein** gilt, weil **die Wahrheit des Seins** ausbleibt (original German version) (Heidegger, 1976, p. 264)

The essence of nihilism rests in history, according to which it is nothing in the appearance of beings as such in the whole with *to be* itself and its truth, in such a way that the truth of beings as such counts for *to be*, because the truth of “*to be*” is absent. (our English version)

...dann ist die Metaphysik als die Geschichte der **Wahrheit des Seienden** als solchen in ihrem Wesen Nihilismus. Ist vollends die Metaphysik der Geschichtsgrund der abendländischen und europäisch bestimmten Weltgeschichte, dann ist diese in einem ganz anderen Sinne nihilistisch. (original German version)

...then metaphysics as the history of the truth of *beings* as such is essentially nihilism. If metaphysics is the historical basis of the western and European-determined world history, then this is nihilistic in a completely different sense. (our English version)

Aus dem Geschick des Seins gedacht, bedeutet das nihil des Nihilismus, daßes mit dem Sein nichts ist. Das Sein kommt nicht an das Licht seines eigenen Wesens. Im Erscheinen des Seienden als solchen bleibt das Sein selbst aus. Die Wahrheit des Seins entfält. Sie bleibt vergessen. (original German version)

Thought in terms of *the destiny of the To be*, the nihil of nihilism means that there is nothing with *the To be*. *The to be* does not come to the light of its own essence. In the appearance of *beings* as such *the To be* itself is absent. The truth of the *To be* is gone. It remains forgotten. (our English version)

Formal Meaning and Real Meaning Between Grammar, Logic, and Metaphysics: Peano and Heidegger

But *being* and *to be* are grammatical distinctions (one, in grammar, is a present participle, the other is infinite), formal, not logical, not metaphysical unless Heidegger wants to find his own!

The grammar distinguishes the noun “man”, a concrete noun, from the noun “humanity”, an abstract noun, but gives the two terms “concrete” and “abstract” real meanings, that is, as referring to “things” and not to “nouns”. Yet from the logical point of view they are the same, although different from the formal point of view. The formal, grammatical meanings are in fact different, the real meaning is the same.

Man = Humanity

or if you want *Humanity = to be man*.

in which case, among other things, we assume information about the meaning of the term *to be* and the term *being*, which in Heidegger's speculation are assumed to be distinct.

In fact, it is customary to say:

“Your *entity* as a man ... = Your *being* as a man ... = Your *human(ity)* as a man...”

We then have the following semantic identities:

(1) *entity = being = ...ity*

but the following identity “*being = to be*” also holds.

In fact, it is customary to say:

“Man is a *rational to be* = Man is a *rational being* = Man is *rational*.”

Then

(1) *being = to be*

but for (1) it follows:

(2) *entity = being = to be*

Peano in his grammar algebra studied the meaning of the terms *to be* and *being*, so used by philosophers, coming to the conclusion that their meaning is null, or that *being = to be = 0* in the algebra of grammatical suffixes, for which the operations of addition and subtraction are valid as in the algebra of numbers. (The term *to be* in the algebra of classes can be interpreted as the neutral element, with respect to the operation of intersection, or if we want to use the symbolic algebraic language of Boole, like *the universe of discourse*, whose value is *1*).

In this regard Peano writes:

If to the base form of a verb, for example, *studies*, we add the word ending *-ent* we obtain the adjective *student*, present active participle, relative *a studies*.

By equality: *student = who studies*, follows that the word ending *-ent* has the same value of the item *who*, $A-V = who = ent$.

If we add *is* to an adjective derived from a verb with the operation $A - V$, we get back the primitive verb: *is a student = studies*. $is + Adjective = V$, therefore $is = V - A$.

It follows that since $(V - A) + (A - V) = 0$, we have that $is + who = is + ent = 0$, eg: *is who studies = is student = studies*.

Equality “*is who = is ent = 0*” tells us that the present participle of *<is>* has null value. In fact it does not exist in classical Latin.

However, there is in Greek in the form *<ont>* from which *<ontology>*, that Quintilian, in the year 100, turns into body *<being>* word that has remained in Italian, *<ente>*, and in French “*être*”: similarly is constructed the English “*be-ing*”.

This word is commonly used in philosophy. It occurs just its zero value. English: “*man is a rational being = man is rational*”. Italian: “*l'uomo è un ente razionale = l'uomo è irrazionale*”. (our translation from *Interlingua*) (Peano, 1958, pp. 463-464)

Yet Heidegger believes to identify in the two terms *to be* and *being* different meanings, an ontological difference. It is difficult to find in his philosophical production a precise logical distinction, which fixes their meanings in a rigorous way.

I found an attempt in this sense in *Introduction to Metaphysics*, a work mainly devoted to the reflection on *the To be*.

Heidegger writes:

Unversehens sprechen wir da vom **Nichtsein** und **Sein des Seienden**, ohne zu sagen, wie sich das so Genannte zum **Seienden selbst** verhält. Ist beides dasselbe? **Das Seiende** und **dessen Sein**? (original German version)

Inadvertently we are speaking here of the not To be and To be of being, without saying how what is so named is related to the being itself. Are both the same? The being and its To be? (our English version)

Die Unterscheidung! Was ist z. B. an diesem Kreidestück **das Seiende**? Schon diese Frage ist zweideutig, weil das Wort <**das Seiende**> nach zwei Hinsichten verstanden werden kann, so wie das griechische τὸ ὄν. (original German version)

The distinction! what is for example on this piece of chalk the being? This question is already ambiguous because the word <the being> can be understood in two ways, like the Greek τὸ ὄν. (our English version)

Das Seiende meint einmal das, **was** jeweils **seiend** ist, im besonderen diese weibgraue, so und so geformte, leichte, zerbrechliche Masse. (original German version)

On the one hand, the being means that which is in each case being, in particular this white-grey, light, fragile mass shaped in such and such a way. (our English version)

Sodann meint <**das Seiende**> jenes, was gleichsam <macht>, daß dies Genannte ein **Seiendes** ist und nicht vielmehr **nichtseiend**, jenes, was am **Seienden**, wenn es ein **Seiendes** ist, **das Sein** ausmacht. (original German version)

Then <being> means that which, as it were, <makes> that what is named is a being and not rather not being, that which in the being, when it is a being, constitutes the to be. (our English version)

Gemaß dieser zweifachen Bedeutung des Wortes <**das Seiende**> meint das griechische τὸ ὄν oft die zweite Bedeutung, also nicht **das Seiende selbst**, was **seiend** ist, sondern <**das Seiend**>, <**die Seiendheit**>, <**das Seiendsein**>, <**das Sein**>. (original German version)

According to this double meaning of the word <being>, the Greek τὸ ὄν often means the second meaning, not the being itself, which is being, but <being>, <beingness>, <the to be of being>, <the to be>. (our English version)

Dagegen nennt <**das Seiende**> in der ersten Bedeutung alle oder einzelne **seienden Dinge selbst**, alles in Rücksicht auf sie und nicht auf ihre **Seiendheit**, τὸ οὐσία. (original German version)

In contrast, <being> in the first meaning names everything or individual being thing themselves, with regard to them and not to their beingness, τὸ οὐσία. (our English version)

Die erste Bedeutung von τὸ ὄν meint **Ta onta**: (entia), die zweite meint to einai(esse). (original German version)

The first meaning of τὸ ὄν means Ta onta: (entia), the second means (τὸ εἶναι) (esse). (our English version) (Heidegger, 1953, p. 155)

It is difficult to extricate ourselves within this murky ontological terminology in search of precise logical or rational meanings. The same term *to be* is defined in very different ways throughout this work, not to mention in all Heidegger's production. Heidegger assumes verbal distinctions either from the German language (*das Seiend*, *die Seiendheit*, *das Seindsein*, *das Sein*) or from the Greek language (τὸ ὄν, τὸ εἶναι) and goes in search of presumed logical or metaphysical distinctions.

The Ways of Logical-Ontological Research: Hobbes, Leibniz, Boole, Peano

Here on the terminology of "logical-ontological" type there are two ways of research or *the Peanian one*, already partially mentioned, for which the use of the term *to be* is sounded out within the universe of discourse, and furthermore we take into consideration, as we will see, the logical meanings that it assumes when it acts as a copula between terms and what relationships it maintains with the other logical operators (e.g. the "not") or otherwise the *Heideggerian* one, of Platonic-Aristotelian matrix, for which one goes in search of arbitrary etymologies, of original, primitive, prelogical meanings, of presumed metaphysical classifications and historical-philosophical periodizations starting from mere grammatical and formal classifications, such as *to be* and *being*.

Peano in a precise and rigorous way was the first to identify the meaning that the term *to be* assumes when it acts as a copula between terms. It can have the meaning of *belonging* of an individual to the class, indicated by the symbol (\in), of *inclusion* of one class in another, indicated by the symbol (\subset), of *equality* between classes or individuals, indicated by the symbol ($=$), of *existence* of classes, indicated by the symbol (\exists).

Peano also studied the relationship that the copula *to be*, in the two meanings of "belonging and of inclusion", maintains with the other logical operators, such as the "not", ($-$), and the symbol (ι) (= iota, the symbol that passes from the class to its concept or from the individual to its idea), reaching the following conclusions:

(1) $\neg \varepsilon \equiv \varepsilon \neg$

(the symbol ε commutes with the “not”)

(2) $\neg \subset \neq \subset \neg$

(the \subset symbol does not commute with the “not”)

(3) $\varepsilon \cup \iota \stackrel{\text{def.}}{=} =$

(the symbol ε in union with iota becomes “equal” ($=$)). (Peano, 1960)

Attention should be drawn to the fact that Peano’s analysis of the meanings of the term *to be* moves within the universe of languages of Indo-European origin, in which the word *to be* has assumed a central role in their structuring.

Indeed, Hobbes writes:

Now the former name is commonly called the subject, or antecedent, or the contained name and the latter the predicate, consequent, or containing name. The sign of connection amongst most nations is either some word, as the word is in the proposition man is a living creature, or some case or termination of a word, as in this proposition, man walketh (which is equivalent to this, man is walking); the termination by which it is said he walketh, rather than he is walking, signifieth that those two are understood to be copulated, or to be names of the same thing...

...But there are, or certainly may be, some nations that have no word which answers to our verb is, who nevertheless form propositions by the position only of one name after another, as if instead of man is a living creature, it should be said man a living creature; for the very order of the names may sufficiently show their connection; and they are as apt and useful in philosophy, as if they were copulated by the verb is... (Hobbes, 1588-1679, pp. 30-31, pp. 33.34, p. 58)

It’s still:

...And from hence proceed the gross errors of writers of metaphysics; for, because they can consider thought without the consideration of body, they infer there is no need of a thinking-body; and because quantity may be considered without considering body, they think also that quantity may be without body, and body without quantity; and that a body has quantity by the addition of quantity to it. From the same fountain spring those insignificant words, abstract substance, separated essence, and the like; as also that confusion of words derived from the Latin verb est as essence, essentiality, entity, entitative; besides reality, aliquidity, quiddity; which could never have been heard of among such nations as do not copulate their names by the verb is, but by adjective verbs, as runneth, readeth, etc. by the mere placing of one name after another; and yet seeing such nations compute and reason, it is evident that philosophy has no need of those words essence, entity, and other the like barbarous terms... (Hobbes, 1588-1679, pp. 30-31, pp. 33.34, p. 58)

and finally

...Propositions are false, when abstract names are copulated with concrete names; as (in Latin and Greek) esse est ens, essentia est ens, τὸ τί ἦν εἶναι (i.) **the something was to be** (our translation, The English translation is incorrect in this case), and many the like, which are found in Aristotle’s *Metaphysics*... (Hobbes, 1839, pp. 30-31, pp. 33.34, p. 58)

In Boole’s algebra of logic, in the wake of Hobbes’s and Leibniz’s program of wanting to construct a logical calculus, the symbol of “equal” ($=$) is used as the only relationship between the terms of the propositions in place of the copulative symbol of *to be* (Boole, 1854).

The Ancient Sources of the Two Ways of Research: Plato-Aristotle, Heidegger, Democritus-Lucretius, Peano

In short, the term *to be* has a purely linguistic, formal meaning, it concerns the use of signs, not their real meaning.

Platonic-Aristotelian-Heideggerian metaphysics instead assumes the ontological lexicon as a projection from real things, from real meanings to linguistic signs.

Indeed, it mistakes formal meanings for real meanings, linguistic forms for real forms. Hence *his grammaticalism or philosophical verbalism!*

In Peano's metaphysics, as in that of Democritus, Hobbes, Boole, the "ontological" lexicon has a purely linguistic, formal meaning.

Being for Democritus is "the full", the *not being* is "the void", the not full. Aristotle testifies in this regard:

Empedocle had this conception about the principles (**archai**) and their number. Instead, Leucippus and his disciple Democritus posit that fullness (τὸ πλήρες) and emptiness (τὸ κενόν) are elements (**stoicheia**), calling one being (τὸ ὄν) and the other not being (τὸ μὲ ὄν), and precisely they call being the full and the solid, not being the empty and the rare (whence they affirm that being is not at all more real than not being, because not even the void is "less real" than the body) and they posit these <elements> as material causes of beings (τὸ ὄντων). (Aristotle, 1985, pp. 1-10)

Interpreting this testimony, what are *being* and *not being* for Democritus?

Being is the *name* of fullness, *not being* is the *name* of emptiness.

Being is therefore a mere noun, or if you want it is the *proper noun* of "full", as *not being* is the *proper noun* of "empty". Their meaning is purely nominal, linguistic, to which Democritus however associates a rational meaning.

Of them, of *the being*, and of the *not being*, according to Democritus it can be said that they exist, or that they are *ideas* or, otherwise, that they are not words without meaning. According to the testimonies, Democritus called the principles (*archai*), the full and the empty, *ideas*. They are then *ideas*, they indicate existing things, even if of a rational nature. It can therefore be said that "full and empty" are (= *exist* = *are being* = *belong to be*). They, fullness and emptiness, are *not-contradictory ideas*, and for this reason it can be said that they exist.

Lucretius, of the Democritean tradition, demonstrates, for example, the existence of the void starting from the contradiction of the hypothesis of the not existence of the void.

The demonstration of the existence of the void (*Est in rebus inane*, verse 330) is given by Lucretius in verses 329-369, of *De rerum natura*, book I. For Lucretius, the following nominal definition of *inane* applies: "*Est in rebus inane...Locus est (=) intactus inane vacansque* = The intangible exists in things... It is a place that cannot be touched and it is empty of matter." (I, 330, 334).

Proof of the existence of the void is given by contradiction. If the thesis is denied, namely that "there is no void", it would follow that everything could not move, because it was crammed to stay where it is by all the other things.

Latin text: *Quod si non esset, nulla ratione moveri resposset*, transl.: in fact, if it were not, things could not be moved by any cause (*ratione*) and therefore: *Nulla res daret principium cedendi*, transl.: *nothing would give a start of displacement or yielding*.

Now we see that things move by *maria et terras*, etc., therefore in order that there is not the contradiction of denying the movement and at the same time admitting it, because witnessed by the senses, the void must exist, since there would be neither movement nor birth, as the matter would be all crammed.

The concept of void is then not contradictory, therefore it can be said that it exists. The denial of the void instead leads to contradiction. Lucretius' argumentative structure is of the Parmenidean type (*of what is contradictory one cannot say that it exists*), but beyond Parmenides he wants to "save the phenomena", not to reduce them to mere appearance, illusion. The void, as a purely rational not contradictory being, explains the

phenomenon of movement and birth. Of it, although one has no experience of it, one can say that it exists. Furthermore Lucretius says

in order to be able to explain how water flows in the rocks and drips from them, how trees grow thanks to the sap that rises from the roots to the trunk and branches, how voices creep between the walls, we must admit the existence of the void. (Lucretius, *De rerum natura*, 1. 329-369)

And again: how is the fact explained that two bodies of equal volume one has a greater weight than the other? This can only be explained by admitting the fact that there is less emptiness in the former than the latter. If there were no void, the two bodies of equal volume should have the same weight, but this does not appear to our senses, therefore the void must exist, which explains the diversity of weights, given the equal volumes.

Lucretius' conclusion is: "There certainly exists what we seek with acute reasoning, mixed with things, which I call emptiness" (In Latin: "Est igitur id quod ratione sargaci quaerimus, admixtum rebus, quod inane vocamus") (Lucretius, *ibid*).

After this brief digression on Lucretius and the existence of the void we can then say that for Democritus, as for Lucretius himself, the following equality holds:

To exist = to be = not contradictory

The world of beings and not beings, as a not contradictory world, it is the world of the to be. If we write this in the algebra of classes and its operations, then we can write:

To be = Physis = (Being \cup Not Being)

The *to be*, which Democritus calls "Physis", is *the common name* of being and not being. *The meaning of Physis* of Democritus and Lucretius is the meaning of *Parmenides' To be*, which, as *the principle* of existences or *idea*, has the fullness and the emptiness as *elements*.

In the Aristotelian language, like that of the doxographers, degraded from the point of view of a rigorous philosophical-scientific language, the distinction between the element (*stoicheion*) and the principle (*archē*), or between the element and its idea, is lost. This is why Democritus called the principles *archē*²

Democritus moves within the thought tradition of Parmenides, for whom sensible or apparent things are not being. In fact, for Democritus sensible or apparent things are not "being and not being", the full and the void are instead "being and not being", which are Physis, *To be*. They are the Physis, the *To be*, which can be thought and said, according to the indications of Parmenides.

The full and the void have the properties of Parmenides' *To be* (Τὸ εἶναι): they are *one*, both the full, like all, and the void, its complement, are *indivisible*, since one cannot divide the void (the term of *atom*= *indivisible* referring to the "full" is only in the flat and vulgar nomenclature of the Aristotelians and doxography), just as the full cannot be divided, as *element*, together with the void of the idea of *To be* or of Physis, they are therefore "continuous", "limited" one by the other, "immutable" (one cannot pass into the other), and therefore "eternal".

To be, as a union of "being and not being", of what as "all" (the *omne* of Lucretius) is not contradictory, is rational.

Conclusion: The Loss of the Path of Rational Research: Aristotle-Heidegger, Parmenides-Democritus

If we want to stick to the indications of Democritus according to which *the To be is the World of the rationally compatible*, we can therefore say that with the Aristotelian tradition *the path of the to be* has been lost

² See *Presocratics, Democritus, B, 57*.

in order to follow *the path of the being*, but, to remain with the Heideggerian language, of the sensitive, apparent being!

For Aristotle, the *being* is said in many ways: *as a category, as a substance, as a power and an act, as true or false, as an accident.*

But this is flat empiricism, since these are properties of the sensible being, indeed idioms of common language.

Of these Parmenides would write:

But you distance your thought from this path of research
nor the habit born of multiple experiences force you along this path to use
the eye that does not see and the hearing that resounds with illusory sounds and the tongue, but judge with reason the
pugnacious examination
that I expose to you ...
It is the same thing the to think and the think that it is because without the to be, in what is said, you will not find
thinking
...
So it will all be just words,
what mortals established, convinced it was true
the birth and the perish, to being or not to being,
change of place and change of bright color.³

The Aristotelian to be, insofar as it reflects ways of speaking, conforming to mere sensible knowledge, cannot be reality, which can only be rationally constructed. Heidegger thinks of going beyond Plato and Aristotle, to return to Parmenides. In reality he remains an Aristotelian, precisely because he wants to understand the *to be* (*das sein*) starting from language, while the *to be* is comprehensible starting from *the idea*, from the *rational element*, to which however an adequate language must be associated.

At least this is the indication of Democritus, expression of a tradition of thought that Heidegger neglects, is silent in all of his production, only taking into account the Platonic-Aristotelian tradition, wanting to get away from it, but actually remaining entangled in it.

But already in his time Peano observed:

According to Max Müller, **The science of thought, London, 1887**, the grammatical categories derive from Aristotle, which classifies the Greek words into ten classes. The Latin translation of the names of the categories according to the scholastic philosophers is: «1 substantia, 2 quantum, 3 quale, 4 ad aliquid, 5 ubi, 6 quando, 7 situm esse, 8 se habere, 9 agere, 10 pati». M. Müller says that they respond to the nomenclature current: 1 noun, 2 adjective of quantity, 3 adjective qualifier, 4 adjective relative, 5 adverb local, 6 adverb temporal, 7 and 8 verb intransitive, 9 verb transitive active, 10 verb passive. Examples of Aristotle: 1 man, horse, 2 of two meters, 3 white, 4 double, major, 5 at home, 6 yesterday, 7 lies, stands, 8 is hot, 9 cuts, 10 is cut. Müller notes that this classification is relative to the Greek; the classification of the words of the Semitic or Chinese language is different. And in the Neolatin language the translation of the examples 2 5 8 10 is made for sentences not for a word. The categories of Aristotle, modified, merged and subdivided, generate the ten subsequent grammatical categories; only the number remains constant. (Our translation from Interlingua) (Peano, n.d., pp. 458-459)

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³ See *Presocratics, Parmenides*, 28. 8.

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