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ta sus puntos de vista. No me cabe duda de que *Determinism and Freedom in Stoic Philosophy* sea una contribución clave al estudio contemporáneo del pensamiento estoico antiguo y un punto de partida obligado, de ahora en más, para las discusiones filosóficas e históricas sobre el tema.

*Instituto de Investigaciones Filosóficas
Universidad Nacional Autónoma de México*

ZENO'S METRICAL PARADOX OF EXTENSION AND DESCARTES' MIND-BODY-PROBLEM

RAFAEL FERBER

A philosophical problem may be stated as a conflict between two or more propositions which seem to be *prima facie* evident, but cannot all be true together. The mind-body-problem as it did arise with Descartes may be formulated with the following three propositions:¹

- (a) Mental phenomena are non-physical phenomena.
- (b) Mental phenomena interact with physical ones.
- (c) The physical world is causally closed.

These three propositions form together a trilemma, because they all seem *prima facie* evident, although we cannot accept them all together. Two of them imply the falsehood of a third: If (a) mental phenomena are non-physical phenomena and (b) nevertheless interact with non-physical ones, then (c) the physical world is not causally closed. But if (c) the physical world is causally closed and (a) mental phenomena are non-physical, then (b) interaction between physical and mental phenomena is not possible. But if despite of the (c) causal closure of the physical world we have (b) interaction between physical and non-physical phenomena, then (a) mental phenomena are no longer non-physical.

In the following I use Zeno's metrical paradox of extension, or Zeno's Fundamental paradox, as a thought-model for the mind-body-problem. With the help of this the distinction contained in thesis (a) between mental and physical phenomena can be formulated as sharply as possible.² I formulate (I.) the above mentioned paradox and give a sketch of four different answers to it. Then (II.) I construe a mind-body-paradox corresponding to the fundamental paradox. Through that it becomes possible (III.) to copy the solutions to the fundamental paradox on the mind-body-paradox. Three of them fail. But (IV.) one of them – the Aristotelian one – gives us an interesting hint. Finally, (V.) this hint should be pursued somewhat further and (VI.) through the comparison with Zeno's fundamental paradox the impossibility of a solution to the mind-body-problem shall be shown again. The main new point of this article is the comparison of the mind-body-problem with Zeno's fundamental paradox.

¹ I am following here with small modifications the helpful exposition of P. Bieri, *Analytische Philosophie des Geistes*, Königstein 1993, 5-7.

² I am indebted for this idea to lic. phil. J. Kaspar Bächli.

I.

What I call Zeno's metrical paradox of extension or Zeno's Fundamental Paradox is the conjunction of two propositions: (a) A point in space or time is indivisible and without extension. (b) A line in space or time is continuous and extended.

Since, however, an extended line in space or time is supposed to consist of infinitely many unextended points in space or time, the two propositions exclude each other: If (a) is true, then (b) is false. If (b) is true, then (a) is false. This paradox is fundamental because it underlies all the other four paradoxes of motion, the Runner, Achilles and the Tortoise, the Arrow and the Stadium (cf. Ferber, 1995, esp. 50-52).

But the two propositions exclude each other only *prima facie*. In fact, there are at least four answers to this fundamental paradox, which I will outline now in a brief survey (cf. Ferber, 1995, 102-103).

(1) Aristotle solves the paradox by his theory of the continuum, whose nucleus may be sketched for our purpose in the following way: If the presupposed set of points is dense, there is a sense in which the predicate "divisible everywhere" applies to quantities and a sense in which it does not. It belongs not to them insofar as the set of points is not divisible everywhere simultaneously. It belongs to them insofar as it is divisible in any point, but not simultaneously. Only by simultaneous divisibility in all points leads to the fact that a magnitude may be divided into nothing. Divisibility in any point leads only to a division into small and smaller parts (cf. *De gen. et corr.* A 2. 317a2-17). When we presuppose the second sense we do not arrive at a paradox. A line does not consist actually of points because points are only potential cuts in the line (cf. *Phys.* Δ 13. 222a14).

(2) The infinitesimal calculus solves the paradox by the method of approaching a limit; the differential calculus insofar as the transition from an extended line to an unextended point is made possible by the postulation of the limit of a line that becomes infinitely small; the integral calculus insofar as a line is described as the sum of an infinite number of infinitely small summanda. This sum may be described in turn as a limit that can take the value of a positive number.

(3) Cantor's theory of the continuum solves the paradox insofar as a non-denumerable infinite set of extensionless points may be described as a non-denumerable infinite set of degenerate subintervals. Since a finite interval (a, b) is the union of a continuum of degenerate subintervals, "we cannot meaningfully determine its length in our theory by 'adding' the individual zero lengths of the degenerate subintervals" (Grünbaum, 1968, 136). We are here confronted with an instance in which "set-theoretic addition (*i.e.*, forming the union of degenerate subintervals) is meaningful", "while arithmetic addition (of their lengths) is not" (Grünbaum, 1968, 136). Cantor's theory does "not assign any meaning to 'forming the arithmetic sum', when we are attempting to 'sum' a super-denumerable infinity of individual numbers (lengths)" (Grünbaum, 1968, 135).

(4) A dissolution of the paradox goes back to the theory of "indivisible lines" assigned to Plato by Aristotle (cf. *Metaph.* A 9.992a20-22). Whereas, however, attempts (1) to (3) still try to solve Zeno's Fundamental Paradox, the problem does not even appear anymore within the theory of the "indivisible lines": it dissolves "like a piece of sugar in water", to use an expression of L. Wittgenstein made in another context (Wittgenstein, 1989, 192). For unlike the propositions (a) "A point in space or time is indivisible and without extension" and (b) "A line in space or time is continuous and extended" the propositions (a') "A point in space or time is an atomic, finite unity of space and time" and (b') "A line in space or time is an extended discontinuum of space or time" don't exclude each other, but form a biconditional. Instead of "If (a) is true, then (b) is false. If (b) is true, then (a) is false" we get: If (a') is true, then (b') is true. If (b') is true, then (a') is true (cf. Ferber, 1995, 50-74).

This theory of "indivisible lines" has found in a certain sense a surprising rehabilitation in the *hodon-chronon*-theory postulated by quantum physics (*Hodon* from ἡ δόδος, the way; *Chronon* from ὁ χρόνος, time). That theory claims, on the basis of theoretical assumptions, to be able to demonstrate the existence of such "indivisible lengths" on a physical-empirical level. Recent research has now provided evidence that those elementary lengths are even shorter than those that have been assumed empirically so far, namely 10-13 cm and 10-24 sec. (cf. Ferber, 1995, 61). Nevertheless I shall continue to use Zeno's Fundamental Paradox as a model of thought in what follows.

II.

For Descartes, according to the above mentioned trilemma (a) the mind or the *res cogitans* is in contrast to the body as *res extensa* unextended, but nevertheless (b) interacts with the body, despite the fact (c) that for Descartes nature is causally closed or the laws of push are confined to the corporeal world (*Principles of philosophy*, part 2, § 40). Now if we apply Zeno's Fundamental Paradox to proposition (a) of the above mentioned trilemma, we obtain

- (a) An idea, a unit or point of consciousness, is unextended [in space].
- (b) A body is extended [in space].

But, contrary to Zeno's Fundamental Paradox, the unity of brain and consciousness does not consist in the paradoxical unity of interaction between unextended points to an extended line, but in the paradoxical unity of interaction between unextended points of consciousness and an extended body. Whereas the addition of unextended points to an extended line appears to be conceptually impossible, the interaction between unextended points and an extended body is impossible in reality. The apparent conceptual impossibility of the addition can be mastered by

the infinitesimal calculus and Cantor's continuum theory, but the real impossibility cannot be resolved in a similar way. For according to the laws of conservation of matter and energy, the physical world is causally closed. Hence no nonphysical cause such as an unextended point of consciousness can interact with a body, just as something cannot arise from nothing, and vice versa. Therefore the human being that in Descartes' conception is a substantial unity of body and mind, or brain and consciousness, embraces a relation of interaction between two entities which, in terms of law, cannot enter into such a relation. In analogy to Zeno's Fundamental Paradox the two propositions (a) and (b) exclude each other. If (a) is true, then (b) is false. If (b) is true, then (a) is false.

Hereafter, I will borrow an expression from J. C. Eccles and name these points of consciousness *psychons*, and the parts of the brain which are linked to them *dendrons*. I further assume with J. C. Eccles, "that each of these *psychons* is reciprocally linked in some unique manner to its *dendron*" (Eccles, 1994, 87; cf. also Eccles, 1994, figure 6.10). Now, just as an extended line cannot be summed up from unextended points, likewise, for the above mentioned physical reasons, the human brain cannot form a unity of unextended *psychons* and extended *dendrons*. Regardless of how many *dendrons* we may discover, they cannot produce a single *psychon*. Regardless of how many *psychons* we may find, they are not able to bring about a single change in a single *dendron*. Of course, as is well known, indefinitely small causes may have indefinitely big effects. The beatings of the wings of a jackdaw may start an avalanche, and those of a butterfly in China may produce a hurricane in Mexico. But according to the above mentioned presupposition, no *psychon* can cause a transmitter to pour a chemical substance into a *dendron*, since a *psychon* is not only infinitely small, but also unextended. But what has zero extension also has zero causality. What has zero causality cannot interact with something extended. Therefore the interaction between brain and consciousness is paradoxical. In analogy to Zeno's Fundamental Paradox, I am calling this paradox the Mind-Body-Paradox. More than Zeno's paradox, this second paradox seems to be unsolvable, so that long before Colin McGinn's thesis of the cognitive closure of the human mind (McGinn, 1991, 2-3)³ we can read in Pascal: "The way in which minds are linked to bodies cannot be understood by human beings, nevertheless this is the human being" (*Thoughts*, § 72-199).⁴

³ For McGinn, 1991, 2-3, we have a mind-body-problem, "because we are cut off by our very cognitive constitution from achieving a conception of that natural property of the brain (or of consciousness) that accounts for the psychophysical link".

⁴ "Modus quo corporibus adhaerent spiritus comprehendit ab hominibus non potest, et hoc tamen homo est." Pascal borrows this statement from Augustine: "quia et iste alius modus, quo corporibus adhaerent spiritus et animalia fiunt, omnino minus est nec comprehendit ab hominibus potest, et hoc ipse homo est" (*City of God*, book 21, section 10). Cf. also Hume's *Enquiry*, Sect. VII, Part II, 74: "The same difficulty occurs in contemplating the operations of mind on body - where we observe the motion of the latter to follow upon the volition of the former, but are not able to observe or conceive

III.

Now Zeno's paradoxes are taking place in our thoughts, not in reality. We all suppose that in reality Achilles overtakes the tortoise. Likewise, we assume that the body and consciousness interact with each other. But how this is possible, it is just the philosophical problem. It is true that the mind-body-paradox contains also a real or physical impossibility. Nevertheless it seems to be methodically useful to test how far we can get with the conceptual tools which were sufficient for mastering Zeno's Fundamental Paradox. Let us therefore copy the four above mentioned answers on the mind-body-paradox.

We begin with the fourth one (4) (cf. p. 141) and assume in the sense of a logical possibility that these "points of consciousness" or *psychons* may be analysed in a future state of neurophysiological research. These points themselves would be measurable by the elementary space and time units of the *hodon* and *chronon*. Then we obtain the following propositions

- (a*) A *psychon* has an extension.
(b*) A *dendron* has an extension.

Herewith the mind-body paradox would disappear. For if the human being forms a unity of brain and consciousness, the two propositions (a*) and (b*) do not exclude each other. Rather, they explain how the interaction between *psychons* and *dendrons* is possible. For these two entities - the *psychon* and the *dendron* - are both of a physicalistic nature. Between them an interaction, on the one hand, is conceptually possible, and on the other hand it does not violate the laws of conservation.

But it is evident that, in contrast to Zeno's Fundamental Paradox, such a solution does not make the mind-body-paradox disappear, but only contests what it should explain. For in contrast to such elementary physical points, *psychons* are not measurable and qualitative. Hence it makes no sense to say that a *psychon* or a point of consciousness is so and so small, e.g. that it has the length of a *hodon*, 10-13 cm. On the other hand we may with Th. Nagel's well-known question "What is it like to Be a Bat?" (Nagel, 1974, 435-450) inquire what it is like for me to have *psychons*, but not what it is like for me to have *dendrons*. But as long as we do not take these *qualia* into consideration, "we cannot even pose the mind-body problem without sidestepping it" (Nagel, 1974, 450). Besides this quite unavoidable assumption of *qualia*, one could also cite the argument of uncomplete knowledge of F. Jackson in a somewhat modified form. Even if Mary who "investigates the world from a black and white room via a black and white television monitor" (Jackson, 1982, 130), knows everything on the physical par-

the tie which binds together the motion and volition, or the energy by which the mind produces this effect".

files of the *dendrons* of the brain, she still would not know what it means to see colours. Thus she could be in possession "of all the physical information without having all the information there is to have" (Jackson, 1982, 130). She does not have information about *qualia*. These appear for conceptual reasons impossible to be copied in an isomorphic way, neither in the natural nor in an artificial world. Notwithstanding the immense literature on the subject of *qualia* attempts to functionalize them did not lead, to my knowledge, to convincing results (cf. e.g. Block, 1995, 514-519; Metzinger, 1996, 115-175). So we may with Th. Nagel "continue to believe that no purely functionalistic characterisation of a system entails – simply in virtue of our mental concepts – that the system is conscious" (Nagel, 1998, 337). But even if the functionalistic characterization would entail "that the system is conscious", (a) points of consciousness would still have, according to the above mentioned presupposition, the property of being unextended, so that the paradox would be restored. It is a merit of Colin McGinn to have again made clear that *qualia* don't have any spatial dimensionality and to have restored this Cartesian intuition (cf. McGinn, 1995, 220-230).⁵

However, a solution which (2) is based on the differential or integral calculus would save the unextendedness of the *psychons*. It may be logically possible to calculate *psychons* in such a way that they are limiting cases of *dendrons* and as such unextended. Then we obtain the following propositions

- (a'') A *psychon* is the limiting case of the extension of a *dendron*.
 (b'') A *dendron* is extended.

These two propositions too do not contradict each other. But the particular character of the *psychons*, namely the fact that they are given to us from an inner perspective, would disappear. Nobody so far ever saw an unextended point with his bodily eyes or felt it in his inner perception. Rather, it is the (Fregean) sense of the expression "unextended point" which becomes the reference. In this (ordinary) sense unextended points have no real, but only a theoretical or more exactly a semantic existence (cf. Ferber, 1988, 390-391; 1999, 136-142). But if *psychons* have only a semantic existence, then they lose their real character – namely that it is for me in some way to have such *psychons*. In addition to this, the interaction between *psychons* and *dendrons* could no longer be explained, since limiting cases with zero extension have also zero causality.

Something similar is true (3) for Cantor's theory of continuum. According to this, we obtain again in the sense of a logical possibility the following propositions:

- (a''') A *psychon* is the "degenerated subinterval" of the extension of a *dendron*.
 (b''') A *dendron* is extended.

But even if neurophysiologists would be able to copy unextended *psychons* on a mathematical continuum in Cantor's sense, the problem would nevertheless not yet be solved. We can feel *psychons*, but not Cantor's sets. Moreover it is impossible that "degenerated subintervals" can interact with *dendrons*. Therefore also Cantor's solution does not do justice to the phenomenon of *psychons*. For contrary to Zeno's Fundamental Paradox which is based upon an apparent contradiction between the zero dimensionality of points which can only be posited theoretically and the extension of a line which can be experienced empirically, the mind-body-paradox rests on a contradiction between the extension of *dendrons* and the zero dimensionality of *psychons* which are both perceptible, the one through our outer perception, the others through our inner one.

Thus the physicalistic (4) and the nominalistic [(2) and (3)] solutions – nominalistic in the sense of a psychological nominalism –, as we characterise them in the sense of an *exager pour mieux comprendre* in analogy to Zeno's Fundamental Paradox do not lead to a viable solution of the mind-body-paradox. Both positions, the physicalistic and the nominalistic ones, are reductionist in an unsuitable sense, since they deny a part of the problem: for the physicalistic position, there are no (spatially) unextended qualitative "points of consciousness", for the nominalistic positions it is true that there are unextended points, but they would not have real, but only semantic existence.

IV.

Hence of the four answers to Zeno's Fundamental Paradox only (1) the Aristotelian one remains. To prevent a trivial misunderstanding, let us mention here that Aristotle's solution of Zeno's Fundamental Paradox is not intended by him to be the solution also of the mind-body-problem. We don't want to discuss here Aristotle's solution of this problem and its credibility in the framework of functionalism (cf. Granger, 1990, 27-49; Burnyeat, 1992, 15-26). Since Aristotle did not yet know the laws of conservation of matter (and energy), the mind-body problem did not arise for him with the sharpness with which the problem is raised since Descartes. Here we only want to ask the question whether Aristotle's solution of Zeno's fundamental paradox can be transferred in an illuminating way to the mind-body-paradox as exposed.

Transferring this solution there exist in reality only *dendrons* i.e. extended bodies. In thoughts, however, we can understand unextended *psychons* as limits of *dendrons* which confer a potential existence to the *psychons*. Thus the unextended *psychons* exist no more actually or independently in *dendrons* than the unex-

⁵ E.g. the visual experience of [lightning] seems not to have any of these spatial characteristics: it is not located at any specific place; it takes up no particular volume of space; it has no shape; it is not made up of spatially distributed parts; it has no spatial dimensionality; it is not solid", 120.

tended spatial points in a line exist actually or independently. *Psychons* exist only potentially in *dendrons*, just like unextended points exist only potentially in a line. The ontological status of the *psychons* can be described in the same way as Aristotle characterised the potentiality of the infinite. The specialness of the potential existence of the infinite consists in the fact that it does not presuppose actuality, neither conceptually nor according to time or according to essence (cf. *Metaph.* Θ 8. 1049b4-1051a3). For the infinite "does not exist potentially in the sense that it will ever actually have separate existence; its separateness is only in knowledge" (*Metaph.* Θ 6. 1048b14-15. Tr. Ross/Barnes). Thus unextended points in a line, too, do not exist independently in the line and do not presuppose real points. Rather, they exist only in thought. In order to distinguish between the potentiality which presupposes actuality from the one which does not, we will put the second one into quotation marks.

In an analogous way, *psychons* do not exist actually and independently in *dendrons*, but only "potentially" (or in thoughts). Thus the indivisibility or unextendedness of the *psychons* is not a product of reality, but of cognition. Now, just as the unextended *psychons* exist only in cognition, likewise also their qualitative character. We will characterise this potential existence and the "unique way in which each *psychon* is linked to a *dendron*" (Eccles, 1994, 87) in such a way that *psychons* are the way in which *dendrons* are given to us in immediate awareness. According to this we obtain the following propositions

(a''') A *psychon* is the way in which a *dendron* is given to us in immediate awareness.

(b''') A *dendron* is extended.

These two propositions do not contradict each other. For a *dendron* may very well be extended, but nevertheless be given to us in our cognition in an unextended and qualitative way. Such a hypothesis recognises with (a''') the psychic, and with (b''') the physical side of the mind-body-problem and conforms to proposition (a) "Mental phenomena are non-physical phenomena". Likewise, we also obtain an answer to the question of how the causal role of *psychons* can be explained. On the one hand, as entities which exist only in thoughts, they cannot interact with *dendrons*. This is impossible for the above mentioned conceptual and factual reasons. We thus not only, to quote from K. Popper's dialogue with J. C. Eccles, have to assume that "the first law of thermodynamics can no longer be checked; and there is thus no real reason to say that it has been violated" (Popper, 1977, 563; [Part 3, dialogue 12, September 30]). Rather, a point of zero dimensions also has zero causality. If we may, with D. Hume, characterise the relation of causality between A and B by contiguity, succession and the impression of necessary connection, it is even impossible to understand how an unextended *psychon* can enter into a relation of contiguity: "For to touch and to be touched,

nothing but a body can do this".⁶ On the other hand, the physical activity of *dendrons* is nevertheless, in our direct cognition, phenomenally given to us in such a way that, probably due to long accustomed, we experience it as causal effectiveness. As we may suppose since D. Hume's analysis of causality, the causal relation between two events is not given in *rerum natura*, but is a connection merely in our cognition: "When we say therefore that one object is connected with another, we mean only that they have acquired a connexion in our thought and give rise to this inference" (Hume, *Enquiry*, Section 7, Part 2, 76). Likewise, the relation of causality between *psychons* and *dendrons* is a connection merely in our thought. But only the *dendrons* can do the job of "selecting by means of the quantal probability field, a vesicle for exocytosis" (cf. the hypothetical model of Eccles, 1994, chap. 5). But the relation of causality does not lie in the *dendrons* themselves, but is given phenomenally in the form of *psychons*, even if without *dendrons psychons* cannot become effective. So in the mind-body-paradox we maintain the propositions (a) "Mental phenomena are non-physical phenomena" and (c) "The physical world is causally closed", but we must give up (b) "Mental phenomena interact with physical ones". This interaction is neither possible physically nor logically, but an inevitable illusion.

V.

Let us now go back to Zeno's paradoxes. It is evident that Achilles overtakes the tortoise. But when we start to philosophise, the question arises how this is possible. Yet, it is only in thought that the tortoise has a lead. Likewise, only in our thoughts the mind is a step in advance of our conception. In practical life there is no problem concerning the interaction of *psychons* and *dendrons*, mind and body. As long as we are not paralysed, we can move an arm in accordance with our will. Only when we start to philosophise does the question arise how such an interaction is possible despite the conservation laws.

But it is a product of our thought that there is an interaction between *psychons* and *dendrons*. By conceiving *psychons* as the way in which *dendrons* are given in immediate cognition, we see how an interaction is possible without violating the laws of conservation. For it is not *psychons* that are producing some effect in some mysterious way, it is *dendrons* that are unmysteriously producing it. But *dendrons* are given to us in direct cognition only under the aspect of *psychons*. Hence the real causality of *dendrons* is given to us as the spurious causality of *psychons*. In an analogous way a line is extended in reality and cannot be composed of unextended parts. Only by our analysis we are reconstructing the line in such a manner that it is made up of unextended points and therewith create the problem of how an extended line can be composed of unextended points.

⁶ Lucretius, *De rerum natura*, I, 304: "tangere enim et tangi, nisi corpus, nulla potest res".

This theory is an aspect-dualism. Instead of conceiving mind and body as things whose reciprocal relation then becomes problematic, mind and body are only two different aspects of the same thing, as Spinoza formulated it: "Mind and body are one and the same individual, which now is conceived under the attribute of thought, now under the one of extension" (*Ethics*, Part 2, theorem 21, Annotation).⁷ By means of G. Frege's distinction between sense and reference aspect-dualism may be formulated in such a way that the expressions *dendron* and *psychon* have different "senses" or "modes of presentation", but the same reference. According to this, *psychons* are *dendrons*, but our mentalistic language describes them in a way which cannot be copied isomorphically in a physiological and physicalistic terminology. Only in this sense mental phenomena are according to thesis (a) of the mind-body-paradox non-physical phenomena.

VI.

Nevertheless this must be made more precise. A line does not have the double "mode of presentation" of being on the one hand extended and on the other hand composed of an infinite number of points without extension. An unextended line would no longer be a line. It only has the double aspect of being extended on the one hand, and on the other of possessing in thought as many "potential" cuts or "limits" as you like. Likewise, the *dendron* does not have the double aspect of being extended and of being an unextended *psychon*. A *dendron* has only the double aspect of being given as an extended entity in indirect cognition, and as an unextended *psychon* in immediate awareness. Now just as a line is indeed extended on the one hand, but unextended only in a "potential" sense, so the *dendron* is indeed extended on the one hand, but an unextended *psychon* in the "potential" sense. In direct outer perception sound waves appear to us as sounds and electromagnetic waves as colours, so in the inner perception *dendrons* appear to us as unextended *psychons*, e.g. as some elementary sensations. Insofar aspect-dualism is no more mysterious than that an extended line has in the "potential" sense unextended parts.

But it is also true to say with T. Nagel: "To talk about a dual aspect theory is largely hand waving. It is only to say roughly where the truth might be located, not what it is" (Nagel, 1986, 31). Nevertheless it is a typical misunderstanding of T. Nagel to say "that the brain has nonphysical properties" (*ibid.*), just as it is a misunderstanding of J. R. Searle's "biological materialism" to assert that "consciousness" is "itself a feature of the brain" in the sense of an "emergent property", like the liquidity of water is an emergent property of a system of molecules (Searle, 1997, 17-18). The brain as a physical organ cannot possess nonphysical or

mental features, just as an extended line cannot have unextended points – except "potentially". But the comparison with the line illustrates a formulation of the mind-body-problem in which the problem becomes unsolvable, as has been asserted in various ways from Augustine through Pascal up to Th. Nagel and C. McGinn. Indeed, it is impossible for us to understand "how minds cling to bodies" (Pascal) or to achieve "a conception of that natural property of the brain (or of consciousness) that accounts for the psychophysical link" (McGinn, 1991, 2). But if "nonphysical features of the brain" are only the immediate "modes of representation" or the "senses" of *dendrons*, then they are like points in the line thoughts. They "cling to bodies" or become "nonphysical features of the brain" only when we make the sense the reference, i.e. if we reify their "mode of representation" to "nonphysical features of the brain". Similarly, unextended points in a line are only mental "cuts" which are reified. As soon as we forget this reification the apparently unsolvable problem arises how an extended line can consist of unextended points. But as soon as we disregard this reification of *psychons*, the really unsolvable problem arises how an extended brain can produce such unextended mental points and how such unextended mental points can exert an effect on the extended brain.

T. Nagel is therefore right when he continues "[that] one must be careful to recognise that it [to talk about a dual aspect theory] doesn't by itself increase our understanding any more than the postulation of a nonphysical substance does. The main question, how anything in the world can have a subjective point of view remains unanswered" (Nagel, 1986, 57). But probably this question also is asked in a misleading way. Nothing in the material world can have *per se* a subjective point of view, just as the star Venus by herself doesn't have the property to be the morning or the evening star, to use Frege's well-known example. Likewise, a *dendron* by itself doesn't have the property of being a *psychon*. A subjective point of view is only characteristic of the way in which *dendrons* are experienced by us in immediate awareness and reified to *psychons*.

But unfortunately this is not the end of the story. Also the proposition "A subjective point of view is the way in which the brain is given to us in immediate awareness" has a circular structure. For in principle it means nothing else than: A subjective point of view is the way in which a brain is given to us from a subjective point of view. Yet here we come, on a higher level of reflection, to a point where one can only state circular propositions, since, to remain in the image of the line, we are ourselves the points in the line which we produce. But where do these "points of consciousness" which we produce ourselves come from?

They too are facts of our immediate awareness which we have reified. But where do these new facts come from? The question may be repeated *ad indefinitum*. But without this potentially infinite intramental autopoleisis it seems that there is also no extramental autopoleisis of points of consciousness through something physical and therewith also no mind-body-paradox for us. Here, at this indefinite intramental autopoleisis of "points of consciousness" or indefinite capaci-

⁷ "[...] Mentem et corpus unum, et idem esse individuum, quod jam sub Cogitationis, jam sub Extensionis attributo concipiatur."

ty of reflection consciousness is again and again somewhat in advance of our conceptual grasp. It is in fact impossible to achieve "a conception of that natural property of the brain (or of consciousness) that accounts for the psychophysical link" (McGinn, 1991, 2-3) between an extended body and an infinite intramental autopoiesis of "points of consciousness". Just as an unextended "point of consciousness" cannot be naturalized, so its indefinite intramental autopoiesis cannot. Rather, it appears that due to our biologically conditioned limits of cognition (cf. McGinn, 1993, esp. chapt. 2) we must simply accept this double aspect of reality as the primitive psychophysical phenomenon and a mystery. Every attempt to dig further here would make us meet not with "hard rock", but with psychons where "the spade of our thinking is turning back on itself" to modify an image of L. Wittgenstein's (*Philosophical Investigations*, § 217) in the context of the mind-body-problem or -paradox.⁸

University of Cologne

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⁸ An earlier german version of this paper did appear in: *Allgemeine Zeitschrift für Philosophie* 23 (1998) 231-246. Thanks are due to some anonymous referees for some stylistic improvements.