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## **The Unification of Personal Presents: A Dialogue of Different World Views**

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### **1. Introduction**

We want to analyse in this article the process of ontological unification of personal world views to a common world view. The hypothesis that we want to put forward is that this process is badly understood and its misunderstandings are at the origin of some of the deep paradoxes about the nature of reality. The title might suggest that we will concentrate mostly on the process of unification that takes place within the psycho-cognitive regions of reality, namely how the psychological, moral, ethical, etc... aspects of personal world views interact towards the formation of a common world view. This is however not true. We do not underestimate the importance of the process of unification in the psycho-cognitive region, but we will concentrate in this article on a more primitive region of reality, namely the physical region, where the process of unification takes place at early age, and we have mostly forgotten about its nature, which is at the origin of some of the misunderstandings that exist, and the paradoxes that are a consequence of these misunderstandings (Reichenbach 1958, Grünbaum 1973, Jammer 1979, Selleri 1994, Piron 1999).

### **2. Our Personal Penetration and Clothing of Reality**

In this section we analyse the way in which we penetrate, clothe and decorate reality starting from our personal experiences. The main point we want to make is that there is complex and mostly forgotten process at the origin of how we penetrate, clothe and decorate reality, and it is by analysing in detail this process that we will be able to see clear in many of the paradoxical aspects of reality.

Reality is out there. But the way that we know reality is through our experience of it. We order these experiences in a certain way, and are finally left over with a world view, in which what is ‘real’ has its specific place and function. We will see that

physical theories, classical mechanics, quantum mechanics and relativity theory, have a lot of difficulties to recover and restate carefully what reality is, as we have introduced it within our pre-scientific personal world views. We will also see that a lot of the paradoxical aspects of our physical theories are due to a bad and fuzzy, and even sometimes wrong, understanding of this process.

## **2.1 Personal Experiences, Creations and Happenings**

All the data that we gather about reality have come to us through our experiences. We consider an experience to be an interaction between a participator and a piece of the world. When the participator lives his or her experience, we say that this experience is *present*, and we call it the *present experience* of the participator. We remark that we consciously use the word ‘participator’ instead of the word ‘observer’ to indicate that we consider the cognitive receiver to participate creatively in his or her cognitive act. For the situation of a measurement, we consider the experimentalist and his or her experimental apparatus together to constitute the participator, and the physical entity under study is the piece of the world that interacts with the participator. The experiment is part of the experience.

Let us introduce an example, that has been introduced first in Aerts 1981, and also been analysed in Aerts 1982. Consider a piece of wood and two experiences that we can have with the piece of wood. One experience consists of testing whether the piece of wood ‘burns well’. The test consists of putting a sufficiently amount of fire during a sufficiently amount of time to the piece of wood en seeing whether it burns. Let us suppose that indeed the piece of wood burns well, and let us call this experience  $E_1$  (I put fire to the piece of wood and it burns). Another experience that we consider of testing whether the piece of wood floats on water. The test consists of putting the piece of wood on water and seeing whether it floats. Let us suppose that indeed the piece of wood floats on water, and let us call this experience  $E_2$  (I put the piece of wood on water and it floats). We deliberately have chosen these two experiences, because it is clear that we cannot experience them at once. If we would try to make the piece of wood burn and float on water, this would not work out well. So parts of both experience are clearly incompatible, in the sense that they cannot be realised at the same time. Even though this is obvious for everybody that considers our example, there are parts of both experiences that we do consider to be present at the same time. Indeed, we do attribute two ‘properties’ to the piece of wood, one property expressed as follows: ‘The piece of wood has the property of burning well’, and another property expressed as follows: ‘The piece of wood has the property of floating on water’. We believe that this one piece of wood, with which we do not have any of the two experiences  $E_1$  and  $E_2$ , has at the same time the properties of ‘burning well’ and ‘floating on water’.

Let us give a second example, that originally was introduced in Aerts 1996a,b. Consider the following situation: I am inside my house in Brussels. It is night, the windows are shut. I sit in a chair, reading a novel. I have a basket filled with walnuts at my side, and from time to time I take one of them, crack it and eat it. New York exists and is busy. Let us enumerate the experiences that are relevant in this situation:  $E_3$  (I read a novel),  $E_4$  (I experience the inside of my house in Brussels),  $E_5$  (I experience that it is night),  $E_6$  (I take a walnut, crack it and eat it),  $E_7$  (I experience that New York is busy).

As in the case with the piece of wood, where it is impossible to experience  $E_1$  and  $E_2$  at once, also here I do not experience all these experiences at once. On the contrary, in principle, I only experience one experience at once, namely my present experience. Let us suppose that my present experience is  $E_3$  (I read a novel). Then a lot of other things happen while I am living this present experience. These things happen in my present reality. While ‘I am reading the novel’ some of the happenings that happen are the following:  $H_3$  (the novel exists),  $H_4$  (the inside of my house in Brussels exists),  $H_5$  (it is night),  $H_6$  (the basket and the walnuts exist, and are at my side),  $H_7$  (New

York exists and is busy). All the happenings, and much more, happen while I live the present experience  $E_3$  (I read a novel).

Why is the structure of reality such that what I am just saying is evident for everybody? Certainly it is not because I experience also these other happenings. My only *present* experience is the experience of reading the novel. But, and this is the origin of the specific structure of reality as it appears in my world view, I could have chosen to live an experience including one of the other happenings *in replacement* of my present experience. Let me recapitulate the list of the experiences that I could have chosen to experience in replacement of my present experience:  $E_4$  (I observe that I am inside my house in Brussels),  $E_5$  (I see that it is night),  $E_6$  (I take a walnut, crack it and eat it),  $E_7$  (I take the plane to New York and see that it is busy). The same is true for the example of the piece of wood. While I live the experience  $E_1$  (I put fire on the wood and it burns), I could have lived in replacement of this experience the other experience  $E_2$  (I put the wood on water and it floats), but I would have had to take another decision in my past, before I decided to start putting fire on the piece of wood.

These examples indicate how reality is structured within my world view. First of all we have to identify two main aspects of an experience. The aspect that is controlled and created by me, and the aspect that just happens to me and can only be known by me. Let us introduce this important distinction in a formal way.

To see what I mean, let us consider the experience  $E_6$  (I take a walnut, crack it and eat it). In this experience, there is an aspect that is an action of me, the taking and the cracking, and the eating. There is also an aspect that is an observation of me, the walnut and the basket. By studying how our senses work, I can indeed say that it is the light reflected on the walnut, and on the basket, that gives me the experience of walnut and the experience of basket. This is an explanation that only now can be given; it is, however, not what was known in earlier days when the first world views of humanity were constructed. But without knowing the explanation delivered now by a detailed analysis, we could see very easily that an experience contains always two aspects, a *creation* aspect, and an *observation* aspect, simply because our will can only control part of the experience. This is the creation aspect.

For example, in  $E_3$  (I read a novel) the reading is created by me, but the novel is not created by me. In general we can indicate for an experience the aspect that is created by me and the aspect that is not created by me. The aspect not created by me lends itself to my creation. We can reformulate an experience in the following way:  $E_6$  (I take a walnut, crack it and eat it) becomes  $E_6$  (The walnut is taken by me, and lends itself to my cracking and eating) and  $E_3$  (I read a novel) becomes  $E_3$  (The novel lends itself to my reading). The taking, cracking, eating, and reading will be called *creations* or actions and will be denoted by  $C_6$  (I take, crack and eat) and  $C_3$  (I read). The walnut and the novel will be called *happenings* and will be denoted by  $H_6$  (The walnut) and  $H_3$  (The novel).

*A creation is that aspect of an experience created, controlled, and acted upon by me, and a happening is that aspect of an experience lending itself to my creation, control and action.*

An experience is determined by a description of the creation and a description of the happening. Creations are often expressed by verbs: to take, to crack, to eat, and to read, are the verbs that describe my creations in the examples. The walnut and the novel are happenings that have the additional property of being objects, which means happening with a great stability. Often happenings are expressed by a substantive.

*Every one of my experiences  $E$  consists of one of my creations  $C$  and one of my happenings  $H$ , so we can write  $E = (C,H)$*

A beautiful image that can be used as a metaphor for our model of the world is the image of the skier. A skier skis downhill. At every instant he or she has to be in complete harmony with the form of the mountain underneath. The mountain is the happening. The actions of the skier are the creation. The skier's creation, in harmony fused with the skier's happening, is his or her experience.

## **2.2 How We Penetrate and Clothe Reality**

Let us again consider the collection of experiences:  $E_3$  (I read a novel),  $E_4$  (I observe that I am inside my house in Brussels),  $E_5$  (I see that it is night),  $E_6$  (I take a walnut, crack it and eat it) and  $E_7$  (I take the plane to New York and see that it is busy). Let us now represent in which way we penetrate and clothe reality that is made out of this small collection of experiences.

$E_3$  (I read a novel) is my present experience. In my past I could, however, at several moments have chosen to do something else and this choice would have led me to have another present experience than  $E_3$  (I read a novel). For example: One minute ago I could have decided to stop reading and observe that I am inside the house. Then  $E_4$  (I observe that I am inside my house in Brussels) would have been my present experience. Two minutes ago I could have decided to stop reading and open the windows and see that it is night. Then  $E_5$  (I see that it is night) would have been my present experience. Three minutes ago I could have decided to stop reading, take a walnut from the basket, crack it, and eat it. Then  $E_6$  (I take a walnut, crack it and eat it) would have been my present experience. Ten hours ago I could have decided to take a plane and fly to New York and see how busy it was. Then  $E_7$  (I go to New York and see that it is busy) would have been my present experience.

*Even when they are not the happening aspect of my present experience, happenings 'happen' at present if they are the happening aspect of an experience that I could have lived in replacement of my present experience, if I had so decided in my past.*

The fact that a certain experience  $E$  consisting of a creation  $C$  and an happening  $H$  is for me a possible present experience depends on two factors: (1) I have to be able to perform the creation, (2) the happening has to be available. For example, the experience  $E_4$  (I observe that I am inside my house in Brussels) is a possible experience for me, if: (1) I can perform the creation that consists in observing the inside of my house in Brussels. In other words, if this creation is in my personal power. (2) The happening 'the inside of my house in Brussels' has to be available to me. In other words, this happening has to be contained in my personal reality.

*The collection of all creations that I can perform at the present I will call my present personal power. The collection of all happenings that are available to me at the present I will call my present personal reality.*

I define as my present personal reality the collection of these happenings, the collection of happenings that are available to one of my creations if I had used my personal power in such a way that at the present I fuse one of these creations with one of these happenings.

*My present personal reality consists of all happenings that are available to me at present. My past reality consists of all happenings that were available*

*to me in the past. My future reality consists of all happenings that will be available to me in the future. My present personal power consists of all creations that I can perform at present. My past personal power consists of all the creations that I could perform in the past. My future personal power consists of all creations I shall be able to perform in the future.*

Happenings can happen ‘together and at once’, because to happen a happening does not have to be part of my present experience. It is sufficient that it is available, and things can be available simultaneously. Therefore, although my present experience is only one, my present personal reality consists of an enormous amount of happenings all happening simultaneously.

This concept of reality is not clearly understood in present physical theories. Physical theories know how to treat past, present and future. But reality is a construction about the possible. It is a construction about the experiences I could have lived but probably will never live.

### **2.3 Material Time and Material Happenings**

From ancient times humanity has been fascinated by happenings going on in the sky, the motion of the sun, the changes of the moon, the motions of the planets and the stars. These happenings in the sky are *periodic*. By means of these periodic happenings humans started to *coordinate* the other experiences. They introduced the counting of the years, the months and the days. Later on watches were invented to be able to coordinate experiences of the same day. And in this sense *material* time was introduced in the reality of the human species. Again we want to analyse the way in which this material time was introduced, to be able to use it operationally if later on we analyse the paradoxes of time and space.

My present experience is seldom a material time experience. But in replacement of my present experience, I always could have consulted my watch, and in this way live a material time experience  $\mathbf{E}_8$  (I consult my watch and read the time). In this way, although my present experience is seldom a material time experience, my present reality always contains a material time happening, namely the happening  $\mathbf{H}_8$  (The time indicated by my watch), which is the happening to which the creation  $\mathbf{C}_8$  (I consult) is fused to form the experience  $\mathbf{E}_8$ . It is in this way that time coordination is introduced into my personal reality.

*The collection of all creations that I can perform at time t, I will call my personal power at time t. The collection of all happenings that are available to me at time t, I will call my personal reality at time t.*

Of course, as we mentioned already, at time t, only one of my creations will be fused with one of the happenings available, that will lead to one experience that I live at time t.

### **2.3 Penetration in Depth and Width, Entity and Space**

The two examples that we have considered give rise to seemingly different aspects of reality. We consider two happenings of the piece of wood,  $\mathbf{H}_1$  (the piece of wood entails the property of burning well) and  $\mathbf{H}_2$  (the piece of wood entails the property of floating on water), and two creations connected to this piece of wood,  $\mathbf{C}_1$  (I put fire on the piece of wood) and  $\mathbf{C}_2$  (I put the piece of wood on water). Then the two experiences that we have considered are  $\mathbf{E}_1 = (\mathbf{C}_1, \mathbf{H}_1)$  and  $\mathbf{E}_2 = (\mathbf{C}_2, \mathbf{H}_2)$ . The reason that we attribute the two properties ‘the piece of wood burns well’ and ‘the piece of wood floats

on water' to the piece of wood, is because we know that the two happenings  $H_1$  and  $H_2$  are available at once for one of the two creations  $C_1$  or  $C_2$  that I would choose to fuse to give rise to one of the experiences  $E_1$  or  $E_2$ . The example of the piece of wood shows us how we penetrate reality in depth, attributing properties to entities. Of course, we have to be aware that a more profound way of seeing this process of penetration in depth is the following. Certain happenings, as for example  $H_1$  and  $H_2$  cluster together, and the entity 'piece of wood' is the collection of all these happenings. We call this way of clustering happenings together into an entity, our 'penetration in depth' of reality. All other properties of the piece of wood are linked to happenings that we have classified within the process of penetration in depth. For example the weight of the piece of wood, the fact that it is constituted of cells, of molecules etc... The fact that the piece of wood constitutes an entity, is due to the fact that all these happenings indeed cluster together. Of course, as we know, this clustering together is not absolute. We can break the piece of wood into two pieces of wood, and this act destroys the clustering.

Our other example is a typical example of what we will call 'penetration in width'. The happenings  $H_3, H_4, H_5, H_6$  and  $H_7$  are not clustered together, and we will indeed not consider them as part of an entity. At first sight we could say that these happenings are situated in 'space'. But again we have to correct ourselves. It is indeed the other way around that we should proceed. Exactly as we have ordered the happenings that we collect by penetration in depth into an entity, because they are clustered together, we have ordered the happenings that we find by penetration in width into space. That is the way that we finally arrive at an image of my present reality existing of space being filled up with different entities, where each entity is a cluster of happenings ordered by penetration in depth, and the different entities are spread over space, in this way attributing to the ordering of the happenings that we have collected by penetration in width.

It would be very fruitful to perform an analysis of reality where the division in penetration in depth and penetration in width would be explicitly seen as two specific processes of penetration. In future work we want to engage in such an analysis, because we believe that it will reveal us deep and new insights into the nature of reality. In this paper we want to analyse some other aspects of this penetration. In our penetration in width a something remarkable occurs. We find entities, our fellow human beings, that occupy different places in space than the one we occupy ourselves. And we call these entities 'fellow human beings' because we believe that they also penetrate their personal reality in a similar way then we penetrate our own personal reality. The big adventure of communication and dialogue starts here. Remark that we do experience something similar in our personal penetration in depth.

### **3. The Nature of the Present**

Before being able to analyse in which way we fuse personal realities into an encompassing inter subjective reality, we have to analyse in a detailed way, what is the nature of space within our approach. To do so we have to take into account the results of relativity theory.

#### ***3.1 Relativity Theory and My Personal Present***

Let us suppose that I am here and now in my house in Brussels, and it is October 1, 2001, 3 PM exactly. I want to find out 'what is the material reality for me now?'. Let us use the definition of reality given in the foregoing section and consider a place in New York, for example at the entrance of the Empire State building, and let us denote, the centre of this place by  $(x_1, x_2, x_3)$ . I also choose now a certain time, for example October 1, 2001, 3 PM exactly, and let me denote this time by  $x_0$ . I denote the happening that corresponds with the spot  $(x_1, x_2, x_3)$  located at the entrance of the Empire State building, at time  $x_0$  by  $H_9$ . I can now try to investigate whether this

happening  $H_0$  is part of my personal present. The question I have to answer is, can I find a creation of localisation  $l$ , in this case this creation is just the observation of the spot  $(x_1, x_2, x_3)$  at the entrance of the Empire State building, at time  $x_0$ , that can be fused with this happening  $m$ . The answer to this question can only be investigated if we take into account the fact that I, who want to try to fuse a creation of localisation to this happening, am bound to my body, which is also a material entity. I must specify the question introducing the material time coordinate that I coordinate by my watch. So suppose that I coordinate my body by the four numbers  $(y_0, y_1, y_2, y_3)$ , where  $y_0$  is my material time, and  $(y_1, y_2, y_3)$  is the centre of mass of my body. We apply now our operational definition of reality. At this moment, October 1, 2001 at 3 PM exactly, my body is in my house in Brussels, which means that  $(y_0, y_1, y_2, y_3)$  is a point such that  $y_0$  equals October 1, 2001, 3 PM, and  $(y_1, y_2, y_3)$  is a point, the centre of mass of my body, somewhere in my house in Brussels. This shows that  $(x_0, x_1, x_2, x_3)$  is different from  $(y_0, y_1, y_2, y_3)$ , in the sense that  $(x_1, x_2, x_3)$  is different from  $(y_1, y_2, y_3)$  while  $x_0 = y_0$ .

The question is now whether  $(x_0, x_1, x_2, x_3)$  is a point of my personal present, hence whether it makes sense to me to claim that now, October 1, 2001, 3 PM, the entrance of the Empire State building ‘exists’. If our theoretical framework corresponds in some way to our pre scientific construction of reality, the answer to the foregoing question should be affirmative. Indeed, we all believe that ‘now’ the entrance of the Empire State building exists. Let us try to investigate in a rigorous way this question in our framework. We have to verify whether it was possible for me to decide somewhere in my past, hence before October 1, 2001, 3 PM, to change some of my plans of action, such that I would decide to travel to New York, and arrive exactly at October 1, 2001, 3 PM at the entrance of the Empire State building, and observe the spot  $(x_1, x_2, x_3)$ . There are many ways to realise this experiment, and we will not here go into details, because we shall come back later to the tricky parts of the realisation of this experiment. I could thus have experienced the spot  $(x_1, x_2, x_3)$  at October 1, 2001, 3 PM, if I had decided to travel to New York at some time in my past. Hence  $(x_0, x_1, x_2, x_3)$  is part of my reality. It is sound to claim that the entrance of the Empire State building exists right now. And we note that this does not mean that I have to be able to experience this spot at the entrance of the Empire State building now, October 1, 2001, 3 PM, while I am inside my house of Brussels. I repeat again, reality is a construction about the possible happenings that I could have fused with my actual creation. And since I could have decided so in my past, I could have been at the entrance of the Empire State building, now, October 1, 2001, 3 PM.

Until this moment one could think that our framework only confirms our intuitive notion of reality, but our next example shows that this is certainly not the case. Let us consider the same problem as above, but for another point of time-space. We consider the point  $(z_0, z_1, z_2, z_3)$ , where  $(z_1, z_2, z_3) = (x_1, x_2, x_3)$ , hence the spot we envisage is again the entrance of the Empire State building, and  $z_0$  is October 2, 2001, 3 PM exactly, hence the time that we consider is, tomorrow 3 PM. If I ask now first, before checking rigorously by means of our operational definition of reality, whether this point  $(z_0, z_1, z_2, z_3)$  is part of my personal present, the intuitive answer here would be ‘no’. Indeed, tomorrow at the same time, 3 PM, is in the future and not in the present, and hence it is not real, and hence no part of my personal present (this is the intuitive reasoning). If we go now to the formal reasoning in our framework, then we can see that the answer to this question depends on relativity theory. Indeed, let us first analyse the question in a Newtonian conception of the world to make things clear. Remark that in a Newtonian conception of the world (which has been proved experimentally wrong, so here we are just considering it for the sake of clarity), my personal present just falls together with ‘the present’, namely all the points of space that have the same time coordinate October 1, 2001, 3 PM. This means that the entrance of the Empire State building tomorrow ‘is not part of my personal present’. The answer is here clear and in this Newtonian conception, my present personal reality is just the collection of all  $(u_0, u_1, u_2, u_3)$  where  $u_0 = y_0$  and  $(u_1, u_2, u_3)$  are arbitrary. The world is not Newtonian, this we now know experimentally; but if we put forward an ether theory interpretation of relativity theory (let us refer to such an interpretation as a

Lorentz interpretation) the answer again remains the same. In a Lorentz interpretation, my present personal reality coincides with the present reality of the ether, namely all arbitrary points of the ether that are at time  $y_0$ , October 1, 2001, 3 PM, and again tomorrow the entrance of the Empire State building is not part of my personal present.

For an Einsteinian interpretation of relativity theory the answer is different. To investigate this I have to ask again the question of whether it would have been possible for me to have made a decision in my past such that I would have been able to make coincide  $(y_0, y_1, y_2, y_3)$  with  $(z_0, z_1, z_2, z_3)$ . The answer here is that this is very easy to do, because of the well known, and experimentally verified, effect of ‘time dilatation’. Indeed, it would for example be sufficient that I go back some weeks in my past, let us say September 1, 2001, 3 PM, and then decide to step inside a space ship that can move with almost the speed of light, so that the time when I am inside this space ship slows down in such a way, that when I return with the space ship to planet earth, still flying with a speed close to the velocity of light, I arrive in New York at the entrance of the Empire State building with my personal material watch indicating October 1, 2001, 3 PM, while the watch that remained at the entrance of the Empire State building indicates October 2, 2001, 3 PM. Hence in this way I make coincide  $(y_0, y_1, y_2, y_3)$  with  $(z_0, z_1, z_2, z_3)$ , which proves that  $(z_0, z_1, z_2, z_3)$  is part of my personal present. First I could remark that in practice it is not yet possible to make such a flight with a space ship. But this point is not crucial for our reasoning. It is sufficient that we can do it in principle. We have not yet made this explicit remark, but obviously if we have introduced in our framework an operational definition for reality, then we do not have to interpret such an operational definition in the sense that only operations are allowed that actually, taking into account the present technical possibilities of humanity, can be performed. If we were to advocate such a narrow interpretation, then even in a Newtonian conception of the world, the star Sirius would not exist, because we cannot yet travel to it. What we mean with operational is much wider. It must be possible, taking into account the actual physical knowledge of the world, to conceive of a creation that can be fused with the happening in question, and then this happening pertains to our personal reality.

### **3.2 Einstein versus Lorentz**

We can come now to one of the points that we want to make, clarifying the time paradox that distinguishes an ether interpretation of relativity (Lorentz) from an Einsteinian interpretation. To see clearly in this question, we must return to the essential aspect of the construction of reality in our framework, namely, the difference between a creation and a happening. We have to give first another example to be able to make clear what we mean.

Suppose that I am a painter and I consider again my personal present, at October 1, 2001, 3 PM, as indicated on my personal material watch. I am in my house in Brussels and let us further specify: the room where I am is my workshop, surrounded by paintings, of which some are finished, and others I am still working on. Clearly all these paintings exist in my presents reality, October 1, 2001, 3 PM. Some weeks ago, when I was still working on a painting that now is finished, I could certainly have decided to start to work on another painting, a completely different one, that now does not exist. Even if I could have decided this some weeks ago, everyone will agree that this other painting, that I never started to work on, does not exist now, October 1, 2001, 3 PM. The reason for this conclusion is that the making of a painting is a ‘creation’ and not a happening. It is not so that there is some ‘hidden’ space of possible paintings such that my choice of some weeks ago to realise this other painting would have made me to detect it. If this were to be the situation with paintings, then indeed also this painting would exist now, in this hidden space. But with paintings this is not the case. Paintings that are not realised by the painter are potential paintings, but they do not exist.

With this example of the paintings we can explain very well the difference between Lorentz and Einstein. For an ether interpretation of relativity the fact that my



watch is slowing down while I decide to fly with the space ship nearly at the speed of light and return to the entrance of the Empire State building when my watch is indicating October 1, 2001, 3 PM while the watch that remained at the Empire State building indicates October 2, 2001, 3 PM, is interpreted as a 'creation'. It is seen as if there is a real physical effect of creation on the material functioning of my watch while I travel with the space ship, and this effect of creation is generated by the movement of the space ship through the ether. Hence the fact that I can observe the entrance of the Empire State building tomorrow October 2, 2001, 3 PM, if had decided some weeks ago to start travelling with the space ship, only proves that the entrance of the Empire State building tomorrow is a potentiality. Just like the fact that this painting that I never started to paint could have been here in my workshop in Brussels is a potentiality. This means that as a consequence the spot at the entrance of the Empire State building tomorrow is not part of my present reality, just as the possible painting that I did not start to paint is not part of my present reality. If we however put forward an Einsteinian interpretation of relativity, then the effect on my watch during the space ship travel is interpreted in a completely different way. There is no physical effect on the material functioning of the watch - remember that most of the time dilatation takes place not during the accelerations that the space ship undergoes during the trip, but during the long periods of flight with constant velocity nearly at the speed of light - but the flight at a velocity close to the speed of light 'moves' my space ship in the time-space continuum in such a way that time coordinates and space coordinates get mixed. This means that the effect of the space-ship travel is an effect of a voyage through the time-space continuum, which brings me at my personal time of October 1, 2001, 3 PM at the entrance of the Empire State building, where the time is October 2, 2001, 3 PM. And hence the entrance of the Empire State building is a happening, an actuality and not just a potentiality, and it can be fused with my present creation. This means that the happening  $(z_0, z_1, z_2, z_3)$  of October 2, 2001, 3 PM, entrance of the Empire State building, is an happening that can be fused with my creation of observation of the spot around me at October 1, 2001, 3 PM. Hence it is part of my personal present. The entrance of the Empire State building at October 2, 2001, 3 PM exists for me today, October 1, 2001, 3 PM.

If we advocate an Einsteinian interpretation of relativity theory we have to conclude from the foregoing section that my personal reality is four dimensional. This conclusion will perhaps not amaze those who always have considered the time-space continuum of relativity as representing the new reality. Now that we have however defined very clearly what this means, we can start investigating the seemingly paradoxical conclusions that are often brought forward in relation with this insight.

### ***3.3 The Process View and the Geometric View***

The paradoxical situation that we can now try to resolve is the confrontation of the process view of reality with the geometric view. It is often claimed that an interpretation where reality is considered to be related to the four-dimensional time-space continuum contradicts another view of reality, namely the one where it is considered to be of a process-like nature. By means of our framework we can now understand exactly what these two views imply and see that there is no contradiction. Let us repeat now what in our framework is the meaning of the conclusion that my personal reality is four dimensional. It means that, at a certain specific moment, that I call my 'present', the collection of places that exist, and that I could have observed if I had decided to do so in my past, has a four-dimensional structure, well represented mathematically by the four dimensional time-space continuum. This is indeed my personal present. This does not imply however that this reality is not constantly changing. Indeed it is constantly changing. New entities are created in it and other entities disappear, while others are very stable and remain into existence. This in fact is the case in all of the four dimensions of this reality. Again I have to give an example to explain what I mean. We came to the conclusion that now, at October 1, 2001, 3 PM the entrance of the Empire

State building exists for me while I am in my house in Brussels. But this is not a statement of deterministic certainty. Indeed, it is quite possible that by some extraordinary chain of events, and without me knowing of these events, that the Empire State building had been destroyed; thus my statement about the existence of the entrance of the Empire State building 'now', although almost certainly true, is not deterministically certain. The reason is again the same, namely that reality is a construction of what I would have been able to experience, if I had decided differently in my past. The knowledge that I have about this reality is complex and depends on the changes that go on continuously in it. What I know from experience is that there do exist material objects, and the Empire State building is one of them, that are rather stable, which means that they remain in existence without changing too much. To these stable objects, material objects but also energetic fields, I can attach the places from where I can observe them. The set of these places has the structure of a four-dimensional continuum. At the same time all these objects are continuously changing and moving in this four-dimensional scenery. Most of the objects that I have used to shape my intuitive model of reality are the material objects that surround us here on the surface of the earth. They are all firmly fixed in the fourth dimension (the dimension indicated by the 0 index, and we should not call it the time dimension) while they move easily in the other three dimensions (those indicated by the 1, 2, and 3 index). Other objects, for example the electromagnetic fields, have a completely different manner of being and changing in this four-dimensional scenery. This means that in our framework there is no contradiction between the four-dimensionality of the set of places and the process-like nature of the world. When we come to the conclusion that the entrance of the Empire State building, tomorrow, October 2, 2001, 3 PM also exists for me now, then our intuition reacts more strongly to this statement, because intuitively we think that this implies that the future exists, and hence is determined and hence no change is possible. This is a wrong conclusion which comes from the fact that during a long period of time we have had the intuitive image of a Newtonian present, as being completely determined. We have to be aware of the fact that it is the present, even in the Newtonian sense, which is not determined at all. We can only say that the more stable entities in our present reality are more strongly determined to be there, while the places where they can be are always there, because these places are stable with certainty.

### ***3.4 The Singularity of My Personal Present***

We now come back to the construction of reality in our framework which we have confronted here with the Einsteinian interpretation of relativity theory. Instead of wondering about the existence of the entrance of the Empire State building tomorrow, October 2, 2001, 3 PM, I can also question the existence of my own house at the same place of the time-space continuum. Clearly I can make an analogous reasoning and come then to the conclusion that my own house, and the chair where I am sitting while reading the novel, and the novel itself, and the basket of wall nuts beside me, etc..., all exist in my present reality at October 2, 2001, 3 PM, hence tomorrow. If we put it like that, we are even more sharply confronted with a counter-intuitive aspect of the Einsteinian interpretation of relativity theory. But in our framework, it is a correct statement. We have to add however that all these objects that are very close to me now October 1, 2001, 3 PM, indeed also exist in my present reality at October 2, 2001, 3 PM, but the place in reality where I can observe them is of course much further away for me. Indeed, to be able to get there, I have to fly away with a space ship at nearly the velocity of light. We now come to a very peculiar question that will confront us with the singularity of our reality construction. Where do I myself exist? Do I also exist tomorrow October 2, 2001, 3 PM? If the answer to this question is affirmative, we would be confronted with a very paradoxical situation. Because indeed I, and this counts for all of you also, cannot imagine myself to exist at different instants of time. But our framework clarifies this question very easily. It is impossible for me to make some action in my past such that I would be able to observe myself tomorrow October

2, 2001, 3 PM. But if I had chosen to fly away and come back with the space-ship, it would be quite possible for me to observe now, on October 1, 2001, at 3 PM on my personal watch, the inside of my house tomorrow October 2, 2001, 3 PM. As we remarked previously, this proves that the inside of my house tomorrow is part of my personal reality today. But I will not find myself in it. Because to be able to observe my house tomorrow October 2, 2001, 3 PM, I have had to leave it. Hence, in this situation I will enter my house, being myself still at October 1, 2001, 3 PM, but with my house and all the things in it, being at October 2, 2001, 3 PM. This shows that there is no contradiction. In fact, if it comes to a much more common happening, the existence of the Empire State building at October 1, 2001, 3 PM, nobody would even make the confusion, and think that since to experience this existence I would have to take the plane and fly to New York 10 hours before, that this would imply that I would be at two places at once, in my house and in New York.

We can conclude this analysis of the nature of our personal present with the following observation. The nature of the present does not correspond very well to our intuitive idea of what this nature is. Indeed, intuitively we think of the present - our intuition being guided by a Newtonian world view - as the collection of all entities and their interactions that are inside space, 'now', simultaneously with our personal 'now'. This is a wrong conception. First of all the present has a four dimensional structure and not a three dimensional one as would follow from a Newtonian world view, but let us remark that this is mainly a consequence of the exactness of relativity theory. But secondly, and this is more important, and also not understood by scientists that are aware of relativity theory, the present is more like we intuitively think about the future. It is not determinate in the simple way that we imagine. It is the collection of all happenings that I could have fused with one of my present creations, if I would have decided to do something different in my personal past. This collection is determined in some way, but in a rather complicated way, which is equivalent with how we intuitively feel the future to be determined in some complicated way. Let us try to see more clear what is the nature of this determination.

### 3.5 The Structure of My Personal Present

The basic structure of my personal present is demonstrated in Figure 1. I live the experience  $\mathbf{E}_3$  at time  $t_5$ , and this is my only present experience. But at respectively times  $t_4$ ,  $t_3$ ,  $t_2$ , and  $t_1$ , I could have chosen another action than the one that lead to experience  $\mathbf{E}_3$ , and that would lead me then respectively to experience  $\mathbf{E}_4$ ,  $\mathbf{E}_5$ ,  $\mathbf{E}_6$ , or  $\mathbf{E}_7$ . That is the reason why happenings  $\mathbf{H}_4$ ,  $\mathbf{H}_5$ ,  $\mathbf{H}_6$ , and  $\mathbf{H}_7$ , exist at time  $t_5$  in my personal present.

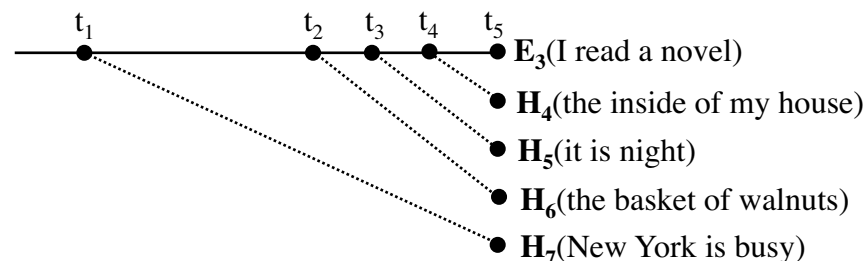


Figure 1: A representation of my personal present. I experience the experience  $\mathbf{E}_3$  at time  $t_5$ . At time  $t_5$  also happenings  $\mathbf{H}_4$ ,  $\mathbf{H}_5$ ,  $\mathbf{H}_6$ , and  $\mathbf{H}_7$  happen, because I could have decided, respectively at times  $t_4$ ,  $t_3$ ,  $t_2$ , and  $t_1$ , to take another action than the one that leads me to experience  $\mathbf{E}_3$  at time  $t_5$ .

Let us represent the situation that we have analysed in section 3.1 and 3.2 in Figure 2.

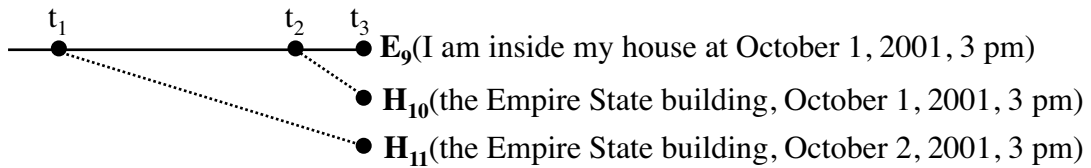


Figure 2: A representation of my personal present. I experience the experience  $E_9$  at time  $t_3$ . At time  $t_3$  also happenings  $H_{10}$  and  $H_{11}$  happen, because I could have decided, respectively at time  $t_2$  and time  $t_1$ , to take another action than the one that leads me to experience  $E_9$  at time  $t_3$ .

We have shown in section 3.4 that the situation related to the fact that also happenings that in my intuitive view on the present I would classify in the future are in my present does not lead to a paradox of ‘being able to meet myself’. In the next chapter we will see that our intuitive view on the structure of the present has its roots in a further development of my personal present, namely the development connected with joining different personal presents into one inter subjective present.

#### 4. Fusing of Different Personal Realities

In the foregoing we have analysed in which way I penetrate and clothe reality. Now an extra hypothesis comes into play. We know that the world is populated with other people, that also penetrate and clothe reality in this way, by forming their personal reality. Let us analyse some of the fundamental problems that appear when two such personal realities are attempted to be fused together to one encompassing reality.

A first remark that we have to make is the following. If we consider Figure 2, we see that the Empire State Building at October 1, 2001, 3 PM, as well as the Empire State building at October 2, 2001, 3 PM, are both happenings that are part of my personal present at October 2, 2001, 3 PM. What is the problem with this. I, myself, I am only present ‘now’, living my present experience. And a moment later, this present experience has become one of my past experiences, and I am into a new present experience. My stream of experiences is hence a stream that moves from past to present, and what I have called my personal material time takes track of this stream of experiences. If we now believe that the Empire State building is also an entity, as I am, then we have to make the hypothesis that the Empire State building exists only at one moment within its personal reality, namely its present. This means that there is a difference between ‘exist’ for the Empire State Building, within my personal present, and ‘exist’ for the Empire State Building within its own personal present. We remark that we have used even already the personal presents of the Empire State Building by indicating its times, October 2, 2001, 3 PM and October 1, 2001, 3 PM, which are, within the personal reality of the Empire State Building two happenings that are not in the same reality.

The problem become more obvious when we consider another person involved. So suppose that I consider my student Bart D’Hooghe, with whom I have discussed some of the problems treated in this article. Then in my personal present Bart exists at all ‘future’ times that are indicated by his watch. In Bart’s personal present, I exist at all future times that are indicated by my watch as is shown in Figure 3.

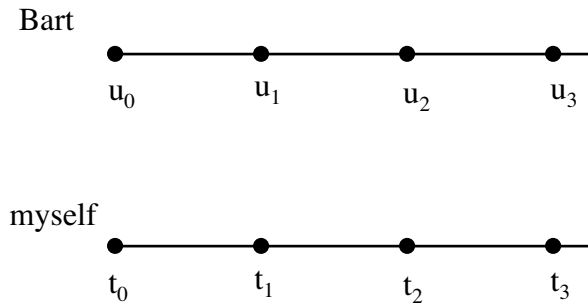


Figure 3: A presentation of the personal present of myself and of Bart.

We indicate the personal presents of myself, as they run through time, with a parameter  $t$ , that indicates the time of my personal watch, and in a similar way, we indicate the personal presents of Bart, as they run through time, with a parameter  $u$ , that indicates the time at Bart's personal watch. Then, Bart, at all times  $u_0, u_1, u_2, u_3$ , is part of my personal present at time  $t_0$ , while myself, at all times  $t_0, t_1, t_2, t_3$ , I am part of Bart's personal present at time  $u_0$ .

When time would be Newtonian the two types of existence can be fused together without problems. Indeed, in a Newtonian time frame, it will be the case that, for example,  $t_0$  and  $u_0$  can be said to be simultaneous, as well as  $t_1$  and  $u_1$ ,  $t_2$  and  $u_2$ , and  $t_3$  and  $u_3$ . And, if this is the case, we make a special slice within - for example - my personal present at time  $t_2$ , namely the slice that contains exactly Bart personal present at time  $u_2$  (and in a similar way  $t_0, t_1$ , and  $t_3$ , are identified with  $u_0, u_1$ , and  $u_3$ ). Due to relativity theory, such a simple synchronisation of the two watches, my watch and the one of Bart, cannot be made. Even though we have the deep intuition that it should be possible, suppose that I am at my personal present at time  $t_1$ , to elect 'one' and 'only one' personal present moment of Bart (hence one of the  $u$ 's) to make it coincide with the  $t_1$  of my personal present. We have to be aware however that this deep intuition is not correct taken into account the analysis about the way we penetrate reality. My personal present is the collection of all the happenings that I could have lived if I would have decided something different in my past, something that would lead me to experience the specific happening that I am considering. The only way in which a sub collection of this collection of happenings could stand out, and form a special sub collection, each of the happenings of the sub collection being in a certain sense more specifically related to my personal experience, is when it would be possible to classify the things that I could have done in my past, such that certain things stand out above the others. In the general scheme that we consider this is not possible.

We can put forward the image that the personal presence of Bart, moment of personal time of Bart after following moment of personal time of Bart, runs through the set of happenings that are connected with Bart in my personal present. And in a similar way, I run through the collection of happenings that are connected with me in the personal present of Bart. It is till now an unresolved problem, linked to the problem of synchronisation in relativity theory (Goy and Selleri, 1997, Selleri 1994, Sjödin 1979), whether this view can be upheld. We believe that this problem should be analysed taking into account the two subtle and different notions of reality that we consider in this paper. We want to make extra steps ahead in this analysis in future work.

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