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Breathing Experience

The constant experience in a relative 'mattermind'

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Abstract

This thesis makes the claim that there is nothing more *mysterious* about *mind* than *matter*, and vice versa. The introduction starts by explaining that philosophy should follow the scientifically validated experiments in order to understand how the world really *is*, and not how it's *supposed* to be. To appreciate and allow for the full implications and findings of science to interact with our current worldview is a function that the *philosopher* can fulfil.

In order to understand the *relativistic* way of being of our *universe*, there is first an in depth review of the theory of relativity in the second and third chapter. In those chapters there are four points that the reader is asked to remember, in order to comprehend the implications of the relativity theory on the current *metaphysical worldview* discussed in the later chapters. Here it becomes clear that a*bsolute* space and time must make place for *relative spacetime*.

The fourth chapter is where *philosophy* gets its first say in the voice of Parmenides followed by Zeno. *Change and movement* become impossible, until Plato, Aristotle and Aquinas find various *solutions* to allow for change and movement 'to be' once again. Here it becomes clear that *absolute* substance, essence and the subject have to make place for *experiencing relations*.

It is the *Hebrew* concept of *active and dynamic matter* that conquers the concept of matter by the *Greeks*, being at *rest and static*, in chapter five. Here *absolute* space, time, change, movement, substance, essence, and the subject are being dropped. Instead, *constant relations and experiences* are introduced. The *claim* is that like *photons* are *constant*, and space and time become *relative spacetime*, so is *experiencing constant*, and matter and mind become *relative 'mattermind'*.

That the *universe is experiencing* becomes clear in chapter six, and critique after critique is launched on theories that want to allow for experiencing to emerge out of no-thing—*Ex nihilo nihil fit! Higher-order* experiences become possible, but only because the universe is *intrinsically* experiencing, and has the *properties* to allow for new layers of experiencing to *arise*. The *arrow of time* which is known as *entropy* gets a close review, and seems to be almost as *mysterious* as mind.

Chapter seven makes it clear that the *past does become shaped in the constant experiencing of the present*. S*tories* can be told in many *different* ways, and all are true as long as they don't *contradict* each other. The thesis concludes with *zombies*, only in order to question the claim of experiencing being *epiphenomenal*, *floating* above a *non-experiencing reality* like a *lucid dream*. Is there *real experiencing*? And how can it be made clear to an *outsider* who knows nothing about it? To *conclude*: it is *experiencing* that is *constant and certain*; all the other *stuff* is *relative* to it!

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1 Introduction

> If we are right in this, it is a wrong philosophy of matter which has caused many of the difficulties in the philosophy of mind—difficulties which a right philosophy of matter would cause to disappear. [Russell, 1921, P. 307]

I chose to start this thesis with a quote from the philosopher, Bertrand Russell, because he lived in one of the most exciting times of history with regard to the latest changes in physics and the philosophy of matter. As the political theorist, Hannah Arendt, rightly points out; while the philosopher and mathematician, René Descartes, understood and registered the changes—concerning philosophy—in physics established by the Copernican revolution and Galileo's telescope, so did Russell understand and register the changes—concerning philosophy—established in physics from before the year 1920 to after the year 1920 with the discovery of *quantum mechanics*.

Bertrand Russell was not only a brilliant philosopher and metaphysician; he was also a renowned logician and mathematician, and was capable of keeping up with the latest developments in physics. The historian and philosopher, Will Durant, describes Russell best in one paragraph in *The Story of Philosophy*:

> All in all, a very lovable man: capable of the profoundest metaphysics and the subtlest mathematics, and yet speaking always simple, with the clarity which comes only to those who are sincere; a man addicted to fields of thought that usually dry up the springs of feeling, and yet warmed and illumined with pity, full of an almost mystic tenderness for mankind. [1926, pp. 633-4]

Russell had a complete grasp of physics and was able to suggest philosophical paths worth pursuing in the domain of physics. Alas, the days of philosophers of that calibre have long since gone. This has much to do with the fact that every domain has become very specialized, and demands a decade of training before any sensible ideas in those domains can be achieved. This is not a deplorable state as some would suggest, but rather shows how science has advanced. It's becoming almost impossible to fully master two domains simultaneously anymore, which forces many bright scientists to stay focused on one domain. This leaves no single domain in science to have a birds-eye overview of the consequences and ramifications that science has to offer us. Therefore leaving philosophy with the immense task to try and make the best out of all this overwhelming information. The philosopher can achieve this by not necessarily becoming specialized in one specific domain—like physics—but rather by keeping an overview of the conclusions that have to be drawn from each specific domain, onto the understandings of our *current metaphysical worldview*.

1.1 Relativity in mind

It has been over a hundred years since the physicist, Albert Einstein, published his *Special Theory of Relativity* in 1905, and in two years' time it will be a hundred years since Einstein published his *General Theory of Relativity* in 1916. The significance of those findings have not yet been captured and registered in its entirety into philosophy, and doesn't even seem to have had any impact on Philosophy of Mind. Russell is an outstanding exception, but his ideas and suggestions have vanished without a trace from the 'mind' of Philosophy of Mind without any reason whatsoever. Instead of viewing *mind* as something even more relative than matter seems to be, the study of mind has become an objective and exact phenomena that can be explained—even explained away—either by behaviourism, type-identity theory, functionalism, computationalism, epiphenomenalism, reductionism, and even straight out eliminativism.

After Einstein we have socratically understood that we don't understand matter and its nature, only that it does function in mysterious and relativistic ways. But mind for some reason has become 'up for grabs' to exact scientific neuroscience, as for some philosophers and scientists there seems not to be anything particular mysterious about the phenomenon of mind. And if anything does seem mysterious about mind, it can be explained away as an illusion. According to this, science will tell us at some point exactly what the nature of mind is, and then it will become clear that it is not mysterious. Yes, they can agree that matter behaving relatively is mysterious, but this will not be accepted for mind. Matter does not have to be non-mysterious after all; *it can be whatever it is*. But if mind turns out to be mysterious, this can quickly escalate into a spooky situation. Because ultimately, the only way we have any knowledge of matter or mind, *is through our mind*. So if mind turns out to be mysterious, we encounter many epistemological problems; for example, the knowledge that we amass through our minds, would become as mysterious as the *medium* through which we amass our knowledge. This would question the *certainty of science*, which is unacceptable to some.

This thesis will make the case that mind is not more mysterious than matter, or vice versa. This would be especially clear after the many findings of quantum mechanics. These are findings that Russell did not include in his books *The Analysis of Mind* from 1921 and *The Analysis of Matter* from 1927, for the simple reason that those findings were not yet known at the time.

I have decided to write this thesis in a plain day-to-day language without (many) technical terms, in order for everyone to be able to read through it comparatively easily. The intention is to allow the findings of science and philosophy to participate in everyday life, which is better known as *popular philosophy*. Philosophy has also become very specialized and at times unintelligibly

technically specific, so I will spare the reader the fanciful notions that can sound impressive, and rather skip to the heart of the 'matter'. I will permit myself to postulate hypotheses which can seem far-fetched to first-time readers on those subjects, but I am sure that any new hypothesis worth pursuing sounded on the borderline of magic at first. Imagine having a cigarette lighter during the period of the ancient Greeks, chances are that you would have been robbed of it, but the lighter would have been magic to them, at least until they would have figured out how it works. If you had smokes with you, the party would have been complete.

The Nobel laureate and renowned physicist, Richard Feynman, did not have a high regard for philosophers, and at times he even expressed it in his writings. The following example from *Six Easy Pieces* illustrates this:

> …in fact, philosophers have said before that one of the fundamental requisites of science is that whenever you set up the same conditions, the same thing must happen. This is simply *not true*, it is *not* a fundamental condition of science. … Nevertheless, science has not completely collapsed. Philosophers, incidentally, say a great deal about what is *absolutely necessary* for science, and it is always, so far as one can see, rather naïve, and probably wrong. For example, some philosopher or other said it is fundamental to the scientific effort that if an experiment performed in, say, Stockholm, and then the same experiment is done in, say, Quito, the *same results* must occur. That is quite false. It is not necessary that *science* do that; it may be a *fact of experience*, but it is not necessary. [1963, p. 35]

Feynman did not deem all philosophers as charlatans, but he rightly suggested that philosophy should not say how it is "absolutely necessary" for things to be, just because they want this "rather naïve" world conception to be true at all costs. We will follow in Feynman's footsteps in this respect, and have the courage to go beyond the necessity to obtain the "same results" and definitions for all matters and in all circumstances.

If your knowledge of relativity theory is thorough, and you consider yourself not in need of a repetition of the theory in order to be able to fully appreciate the possible implications of it on our current metaphysical worldview, then you can skip the following chapter and the beginning of chapter 3, only to pick up again from subchapter 3.3—'Photons perspective'. There will be three points during the following two chapters until subchapter 3.3 that I will ask the reader to remember, but those points should easily be deduced and understood—when they come up in the chapter's thereafter—by readers who have a thorough knowledge of relativity theory, without having read them first in the next two chapters.

2 Matter

What matters will be discussed in this thesis? Well, we will be discussing *matter* itself. So let us first define matter according to physics. All things that exist in *space* and have *mass* are considered as matter. Even space filled with only air is matter, as air has mass and can only exist within space. This makes it clear that all *things* that exist in space have to be matter too. To use another term for matter that exists in space, which was coined by Descartes and also later used by the philosopher Baruch Spinoza: *extended*. The definition of space is to be extended, which means to have a *size*, and all things that exist in space must therefore be extended and have a size. Can something exist in space which is not extended? If something is not extended, then it doesn't need space and it doesn't need to take up space, so what would it mean for something *unextended* to exist in space? We might ask 'So where would something unextended exist?' Well, the answer could simply be, who says anything unextended exists? It might just be an abstract concept which we cannot even imagine concretely. I dare you to close your eyes now and imagine something unextended. If you thought of a *dot*, you might have been on a good path already. So is a dot considered unextended? That depends on how you imagine the dot. If you imagine it as a dot on a paper drawn by a pen, then of course you need space because you would need a paper to mark the dot on, and it would be the paper that could be compared to the extension of all of space. So what kind of dot should you imagine? You should imagine a *point particle* which is a *dot with no-size and no-mass*. This point particle is what—according to the *standard model* in particle physics based on quantum mechanics—can be viewed as an unextended particle.

Now that you know what you are supposed to imagine, I dare you again to close your eyes, this time at your own convenience and when you feel ready, and try to imagine a point particle which is a dot of no-size and no-mass. Did you succeed? Of course not, because we cannot imagine or think an *object*[1] without extension and size. As the philosopher, Immanuel Kant, pointed out very clearly, the categories in the human mind always structure everything into space and time, and this occurs to us *a priori*. A priori means as much as, that it is something which happens automatically in our mind, without having had to *experience* it in the world first.

So how about those point particles? Are they considered to be matter as they are not extended and have no-mass? According to this definition point particles are not considered matter, they can be the building-blocks of matter, which have space and mass, but they themselves are not matter

[1] The term *object* is used to eliminate *numbers*, which according to some are considered *things* without size or mass.

just yet. You can think of them as energy, which has no extension or mass, but which can become the building-blocks of matter.

2.1 Matter revised

We have just claimed that point particles can be thought of as energy, which has no extension or mass, but which can become the building-blocks of matter. But hold on, how can something which has no-size add up to become something with a size? If you add it up, and somehow it does become a size, you must by definition, say that every one of those dots has a size.

Let's use the example of mass which is the second characteristic of matter. If a point particle has no-mass, in other words, it's *mass = 0*, then add up a million dots, how much mass do you get now? If you answered 0, you were correct. Because you can add an infinite 0'-s to each other, you will still get no more than 0. The same with subtracting 0'-s from each other, it will not become less than 0 at any moment.

So how does a dot add up to become matter, which per definition needs size and mass? This troubles philosophers and physicists equally, but for the physicists it doesn't only trouble them because of conceptual problems, but it also doesn't allow them to explain empirical facts and experiments that they have conducted. This is where (*super) string theory* kicks in. In string theory physicists try to resolve the conflicts between general relativity and quantum mechanics. So this is how the physicist, Brian Greene, explains string theory with the *Planck* length in *The Fabric of the Cosmos*:

> In a theory based on zero-sized point particles, such an application of the uncertainty principle is warranted and, as we see in the figure, this leads us to a wild terrain beyond the reach of Einstein's general relativity. A theory based on strings, however, includes a built-in fail-safe. In string theory, strings are the smallest ingredient, so our journey into the ultramicroscopic comes to an end when we reach the Planck length—the size of strings themselves. … Thus, by limiting how small you can get, string theory limits how violent the jitters of the gravitational field become—and the limit is just big enough to avoid the catastrophic clash between quantum mechanics and general relativity. In this way, string theory quells the antagonism between the two frameworks and is able, for the first time, to join them. [2004, pp. 349-50]

In string theory the famous no-size-dot from the standard model has been completely revised: no more point particles which have no size and mass, but instead, Planck strings which are super small, but nevertheless still have a size. So maybe after all, if we couldn't imagine a dot which has no-size nor mass, it was not because our imagination has its limits, but rather because matter has its limits, and it has reached its limit when it hits Planck. So how should we try to imagine this Planck string now? Lucky for us, Greene describes that too:

> By the highest level in the figure, which shows the fabric of space on scales smaller than the *Planck length*—a millionth of a billionth of a billionth of a billionth (10^{-33}) of a centimetre—space becomes a seething, boiling cauldron of frenzied fluctuations. As the illustration[2] makes clear, the usual notions of left/right, back/forth, and up/down become so jumbled by the ultramicroscopic tumult that they lose all meaning. Even the usual notion of before/after, which we've been illustrating by sequential slices in the spacetime loaf, is rendered meaningless by quantum fluctuations on time scales shorter than the *Planck time*, about a tenth of a millionth of a trillionth of a trillionth of a trillionth (10^{-43}) of a second (which is roughly the time it takes light to travel a Planck length). [Ibid., p. 333]

As you can see, matter has become very small; notions of dimensions have lost their meanings, and so has the notion of time, which we will discuss later in the chapters on time. Now you might ask yourself if this is serious stuff you are reading here, as it seems like a lot of speculation and beyond the scope of our perception and imagination. Rest assured, these are the leading theories in physics at the present moment, and this is where physics had to come to in order to make a little sense of the world we live in, even if it seems to be a lot of speculations and pushing the limits of our understanding. Much more is yet to come, this is only an appetizer.

Now that we have this tiny Planck length, how are we to imagine extension and space? Here again I will let Greene have his say:

> One possibility that jibes with the explanation above for how string theory meshes quantum mechanics and general relativity is that the fabric of space on the Planck scale resembles a lattice or a grid, with the "space" between the grid lines being outside the bounds of physical reality. Just as a microscopic ant walking on an ordinary piece of fabric would have to leap from thread to thread, perhaps motion through space on ultramicroscopic scales similarly requires discrete leaps from one "strand" of space to another. Time, too, could have a grainy structure, with individual moments being packed closely together but not melding into a seamless continuum. In this way of thinking, the concepts of ever smaller space and time intervals would sharply come to an end at the Planck scale. … Another possibility is that space and time do not abruptly cease to have meaning on extremely small scales, but instead gradually morph into other, more fundamental concepts. Shrinking smaller than the Planck scale would be off limits not because you run into a fundamental grid, but because the concepts of space and time segue into notions for which "shrinking smaller" is as meaningless as asking whether the number nine is happy. [Ibid., pp. 350-1]

Here we are already entering into the world of possibilities raised by physicists. Greene is offering us two possibilities; the first possibility is that we end up reaching some kind of a *grid* which is like the thread of the *fabric of space* itself. You can imagine (tinier than Planck) ants walking on this Planck length threads and having to leap from one thread to the other. Because between those threads, there is a “space” which is not to be thought of as matter, but is rather “outside the bounds of physical reality”! I want you to keep this *first* possibility in mind as you continue reading this thesis,

[2] To view the illustration, I recommend purchasing the book *The Fabric of the Cosmos* (2004).

and remember, these theories are being proposed by leading physicists, not speculating philosophers.

The second possibility that Greene is offering can be even more interesting for a philosopher. Here “space and time”, “morph into other, more fundamental concepts”! Physicists propose the possibility that beyond what we consider to be the fundamentals of all of our experiences, namely “space and time”, there lay “more fundamental concepts”. So do you remember Kant who said that space and time are a priori categories in our mind, by which we structure all of our reality? Well, physicists say this might be true for categories in our mind, but it does not have to be true for the “more fundamental concepts” of the reality of our universe. I know that I have asked you to keep in mind the first possibility offered by our scientists, but now I will ask you to keep the *second* possibility equally available in your memory as you read on.

3 Time is relative

Until Einstein dropped the bombshell of relativity theory, which ended up rocking the world in 1905, time was seen as something *absolute*. Absolute in the sense that the amount of time ticking away from 6 o'clock here in Antwerp until it is 12 o'clock here in Antwerp, is the same amount of time ticking away from 6 o'clock until it is 12 o'clock in New York. And the amount of time ticking away from 6 o'clock until it is 12 o'clock here on planet earth, is the same amount of time ticking away from 6 o'clock until it is 12 o'clock on the moon, too. This idea of absolute time is plain wrong, not because of different time-zones, but because time is *relative* and not absolute. Let us discuss this notion of relativity in more detail.

The Newtonian concept of time was that when an object is positioned in a *three point co-ordinate* in space, it will remain at that same three point co-ordinate until it is moved to another three point co-ordinate. The three point co-ordinates are: 1. Latitude, 2. Longitude, and 3. Altitude. Imagine that I place a banana at latitude 51.223874, longitude 4.413998, and with the altitude being the 2nd floor. The banana will be at that three point co-ordinate location in space no matter what time it is, because space and time are both absolute. And the banana will stay put at that three point co-ordinate location all the time, until I move the banana to another three point co-ordinate location, say the 1st floor. Now that is plain *wrong*, the relativity theory of Einstein made this clear.

So what is the right way to comprehend the position of the banana? The right way would be to think in a *four point co-ordinate*. What is the 4th co-ordinate then? Time! Think of it like this: in order for you to be able to meet with me—let's say to discuss the crazy ideas of this thesis—it is not enough for you to know the three point co-ordinates of where I will be, you also need to know at what *time* I will be there! Otherwise you can wait forever and never run into me. The 4th co-ordinate time, decides together with the first three co-ordinates, not only *when*, but also *where* in space I will be. This is equally true for objects that we consider to *stay put at the same place*, as we will see next.

This means, that if I placed the banana in the above-mentioned location at 12:00:00, at 12:00:01 it will no longer be in the same three point co-ordinate location as it was at 12:00:00. Because the 4th co-ordinate, time, has *moved on* with the banana in *space*. What used to be known as *space and time* has now become *spacetime*. It is like trying to meet me at 12:00:00 at that location, but when you arrive there at 12:00:00, lo and behold, I'm not there. Because I'm running late and will only arrive there at 12:00:01, and you, having such a tight schedule, left that location already before we could ever meet up! We both went to the *supposedly* same three point co-ordinate location, but the 4th co-ordinate was not the same, so we never meet each other. In order

for me to actually meet you, I need to travel 1 second back in spacetime, which means that I need to travel back in *all four co-ordinates of spacetime*, and not only in the *fourth co-ordinate of time*.

Now going back to the banana, in order for you to see the banana of 12:00:00, you need to be there at exactly 12:00:00; if you arrive 1 second late, you are not seeing the banana of 12:00:00, but instead you are seeing the banana of 12:00:01! In order for you to see the banana of 12:00:00, you cannot stay put in the same three co-ordinates, and travel with the 4th co-ordinate 1 second back in time; you actually need to travel back in *all four co-ordinates of spacetime*, and not only in the *fourth co-ordinate of time*. The same is true if you want to see the banana of 12:00:02, you don't stay put in the same three co-ordinates, and travel with the 4th co-ordinate 1 second forward in time; you are actually travelling forward with *all four co-ordinates of spacetime*, and not only in the *fourth co-ordinate of time,* and then you see the banana of 12:00:02. That is if no one has moved the banana in the meantime of course. Travelling forward in spacetime happens all by itself though, not like traveling back 1 second in spacetime. If you just stay put, spacetime will keep on constantly *expanding* a second at a time; and there you are at the *new* 4 point co-ordinates location, seeing the *new* banana of 12:00:02.

We[3] can also understand this better by having Tom function as an out in space observer, who is observing Frank trying to travel to earth from space and eat the banana of 12:00:00. Now Frank was delayed in space-traffic and actually arrives at 12:00:01, but he is still happy. Because Frank sees the banana there, and believes that he is going to get to eat the banana of 12:00:00. Tom, who is observing all this commotion from outside of spacetime, realizes that Frank has no reason to be happy. Because Frank is not eating the banana of 12:00:00, but he is rather eating the banana of 12:00:01! The intended banana of 12:00:00, is a four co-ordinate *time-slice* behind Frank. That space-traffic Frank encountered, made him miss the four co-ordinate time-slice of the banana at 12:00:00, and now he is at the next time-slice of 12:00:01, eating the banana there, *bon appetite*!

3.1 Time-travellers

This means that you are never standing still, you are always travelling with the four co-ordinates through *spacetime*. Space and time have now become entangled with each other in the relativity theory, you are now equally moving through space just by travelling with time, because by travelling with *time* you are actually travelling through *spacetime*, the same as when you travel through *space*, you are also actually traveling through *spacetime*. By being in spacetime, you have become a *(space) time-traveller*; you are constantly travelling through *spacetime*, *bon voyage*!

[3] Example added with recommendation of Karim Zahidi.

So apparently you can stay put in three co-ordinates and yet travel through spacetime with the 4th co-ordinate time, how about staying put in the 4th co-ordinate time, and travel instead with the other three co-ordinates through spacetime, surely that can't possibly be true for our universe? Again this assumption is plain *wrong*; sure it's possible to travel in spacetime without traveling in time, keeping in mind that the spacetime of our universe is relative, so it can do that without any problem what-so-ever. Just travel through spacetime without travelling in time if you so please, the universe says, actually you are constantly seeing 'stuff' travelling in spacetime without travelling in time.

Photons. Photons are packets of light that travel through spacetime at the *constant speed* of light. Remember in the chapter about matter where we discussed what can possibly be unextended and not have mass? Photons would be a good candidate for this even according to the standard model of quantum mechanics. You can think of photons which have *zero-mass*, as energy. Photons would not be defined as matter according to the definition that matter needs both size and mass. Now this photon, which travels at the constant speed of light, which is approximately 300.000 km per *second* (light travels in a vacuum at 299.792.458 km per second to be exact), does not travel through the 4th co-ordinate time, it travels only through the other three co-ordinates of space! How is this possible? The same way as you can travel only through time and not through space, so can you travel through space and not through time, because space and time are relative to each other, and therefore can become spacetime!

Think of it as two cars, a blue car and a red car that start exactly from the same position, but the blue car is driving north, and the red car is driving east, they are both driving for one hour at 100 km/h. While the blue car drove after one hour 100 km north, the red car drove after one hour 100 km east; they are not at the same location anymore even if they started from the same position an hour ago, this is obvious. Now imagine a green car starting from exactly the same location, but driving for one hour at 100 km/h direction north/east, this car would again neither be 100 km north nor 100 km east. It will have lost the distance it could have made north because of the distance it made east, and vice versa.

The same is true with space and time in spacetime, all you have to do is replace north with time and east with space. If you travel one hour in time only—like staying put in one place, you would travel *only in time* and not in space; and if you travel one hour in space only—like photons, you would travel *only in space* and not in time. And if you travel at half the speed of photons, you will travel half through space and half through time, like the green car travelling north-east.

So how do photons travel only through space and not through time? Because the moment you reach the speed of light, you have reached the maximum speed of the universe, and then you are only travelling through space. If you travel a little less than the maximum speed, then the little speed which you are not using to travel through space is being used by time. Because in spacetime, space and time are relative, whatever is not being used up by travelling through space, will be used up by travelling through time. Mindboggling, but confirmed by many experiments throughout the 20th century.

3.2 Relativity of perspective

This is also true for the way your perspective is relative to the perspective of someone else. Imagine you have been offered the chance to travel out to space for your birthday. As you are enjoying the beautiful view of the immense empty space around you, I suddenly approach you at a fast speed and pass you by. When you are being asked if you saw *me pass you* by in space, you say that you did. And when I am being asked if I saw *you pass me* by in space, I say I did.

You say I passed you by, and I say you passed me by, so who passed by who? From my perspective I was at a complete stand still and you were passing me by, while from your perspective you were at a complete stand-still, and I was passing you by, so who is wrong? No one! We are *both right*! Because once again, our perspective is relative to each other and we turn out to both be right. From your perspective I was passing you by, and that is true, and from my perspective you were passing me by, and that is also true. Because as there is no absolute time, there is also *no absolute space*! There is no *point in space* that is absolute from where you could decide if it was me passing you or you passing me, the only point in space that can have this perspective is *you or me*, it is our point of view, or you could call it, our perspectives. Because we are always moving relative to something, you are moving *relative to me*, and I am moving *relative to you*, that is what the theory of relativity made clear to us. Absolute space does absolutely not exist.

The same thing would be true with time, if you are moving close to the speed of light, passed a giant clock hanging in space, the clock would seem to you to move really slow, almost at a standstill. A second on that clock will seem for you to take weeks to pass. For me, who am passing the giant clock at the speed of *Mach's number* (1225 km/h), the clock seems to be running almost exactly the same as here on earth. When you will be asked how fast it took for the clock to tick one second, you will reply that it took a couple of weeks. But when I will be asked how long it took for a second to click on that clock, I will reply that it seemed to me to be similar to a clock ticking on earth. So who is wrong, you or me? Again the answer is no one, we are *both right*! Because like we just made clear that *absolute space does not exist*, the same here, *absolute time does not exist*!

There is no point in time that is absolute from where you could measure the time that it takes for the giant clock to tick one second, it is relative to our points of view, or you can call it our perspectives. You are travelling near the speed of light, so you are using up all the spacetime in travelling through space, and little spacetime is left to move one second in time. I'm travelling much slower and using much less of spacetime to travel through space, so I have a lot of spacetime left which is being used to travel through time. That is why the giant clock moves much faster for me than for you, while we are both still right. Because *time is relative*!

We have just seen that neither space nor time is absolute, in other words, *spacetime is relative*. It is the speed of light that is *constant*, we are travelling either through space or through time relatively, as long as the travelling through spacetime, either in space or in time, adds up to the constant speed of light. Whatever speed is left that is not being used in travelling through space, will be used for time, and vice versa. These are some aspects of the relativity theory of Einstein, which we should keep in mind while reading this thesis. This theory has been verified throughout the 20th century with empirical experiments, and has so far been proven to be true. I will ask you now to also keep this *third* point in mind, besides the two points you are already keeping in mind from the previous chapter.

3.3 Photons perspective

All that has been written until now is widely accepted and well verified by physicists and experiments. Now I will venture onwards to some consequences that have to be taken from the discussed above. I will start with discussing a possible *photons perspective*. As you remember, spacetime is relative and each one of us, what we call *subjects*, has his own perspective which is equally as right as the other. So what would be the perspective of a photon? From a photon's point of view or perspective, time is completely at a standstill, as the photon is using up its whole speed to travel through space, and so time has no speed left to use, and must therefore be at a complete standstill. Russell mentions this point but takes it even a step further:

> If we could imagine a homunculus floating on the crest of a light-wave, he would have no means of discovering that anything periodic was occurring, since he could not "see" the other parts of the wave. The different parts of a light-wave cannot, in a word, interact causally in any way, because no causal action can travel faster than light. [1927, p. 352]

So if a homunculus would sit on a photon, for him time would stand still, his psychological time might maybe still tick on, but on any giant clock hanging outside in space the seconds would not tick on according to his perspective. Russell also points out that our homunculus would not "see" anything around him, as the photons bouncing off from objects around him would not be able to reach

the homunculus, as no photon can travel faster than the photon he is sitting on, and catch up with the homunculus in order for him to "see" that other photon. Here we can conclude not only that time would stand completely still for that homunculus, but also that space would be non-existent. As we have discussed above, travelling through space is always only relative to something else, but here our homunculus can never "see" any-thing else, and therefore out of his point of view, he is not travelling relative to some-thing else, and concludes that he is at a complete standstill.

Another way of understanding the photons perspective would be the following. The speed of light does not increase or decrease its speed, it is always constant. So for example, if a photon is travelling away from a moving spaceship, it will not travel faster or slower than 300.000 km per second, adding or subtracting to it, the speed of the spaceship it is being released from. The photon will still travel at its constant speed of 300.000 km per second. So let's for the sake of an argument assume, that the photon does "see" all the objects rush past it, but from the photon's perspective, the objects would not be rushing past it faster or slower if they were moving towards it or away from it. Because for the photon, *every-thing* would be passing it by at the constant speed of 300.000 km per second, both if those objects are moving or at a complete standstill. From the photon's perspective, only *it* is at a complete standstill, and all the rest is passing it by at the speed of light. Even if the perspective of all the other objects is, that the photon is moving at the constant speed of 300.000 km per second, and that they are all at a complete standstill. And once again, they will *both be right*! Because both are only moving relative to each other, as there is no absolute space or time.

This is of course exactly how we perceive a photon, we see it travelling towards us at 300.000 km per second, whether we are at a complete standstill or going really fast. But for the photon, the opposite is true, it is us who are travelling at the speed of light relative to it, whether we are at a standstill or going really fast. Except that for a photon as we have said before, nothing can reach it as nothing can travel faster than it, so nothing can catch up with it. Of course you can protest to this last statement, and claim that no photon can catch up with it from behind, but another photon on the same path of a frontal collision as our photon, surely our photon must see at some point the photon coming straight at it? Well it does not, because even if it is on the three co-ordinates location just one point particle or Planck next to our photon, it can already not "see" it, because it cannot catch up with it from this point particle or Planck, to the point particle or Planck of our photon.

Now you can press on and ask the question of how all photons actually "see", or rather are being *seen*. In order for us to see any object out there in the external world, we need a photon to bounce of that object and penetrate our retina. This is the only way how we get to see any object in the external world, through a direct collision of a photon with an object, bouncing of it, and then

going straight for our eyes and hitting our retina. It can of course also reflect on its way off a mirror or a clear lake, but it still needs to collide directly with our eyes while retaining the right oscillation of the object it allows you to perceive. So in order for two photons to "see" each other, all they need to do is to collide head on with each other, like the photon needs to collide with your retina for you to see it.

But that won't work either I'm afraid, because a photon can hit your retina because *you are not travelling at the speed of light in spacetime*. Another photon, however, is, and would therefore always be on another set of co-ordinates. Russell also alludes to this when he discusses periodicity of electrons (photons were not yet discovered in 1927):

> With the coming of relativity, it has become necessary to modify this account somewhat. In space-time, every point has a date, and cannot be occupied twice; neither the earth nor an electron can describe again the orbit it described on a former occasion. And periodicity will be relative to a given system of co-ordinates: if, in one system, a co-ordinate runs through a given range of values repeatedly, and always in equal times, it may happen that, in another system, even if there is an oscillating co-ordinate, its periods are not all equal. [Ibid., p. 344]

A photon is always on another co-ordinate than another photon, they can never collide. Even one and the same photon cannot describe the same orbit it described on a former occasion, because as we have mentioned before, it also travels with the 4 co-ordinates in spacetime. So two photons can never be at the same location and on the same time there, every photon can only be where it is, another photon cannot be at that exact same location and time there too! Therefore they will never collide, and will never be able to "see" each other, as they are always at least one point particle or Planck away from each other. So from the photon's perspective, time is at a complete standstill and thus, space is non-existent for it. It occupies its own unique 4 co-ordinates which, from its perspective, never seems to change either in time or in space. You are already remembering the three points made above, now I will ask you to also remember this *fourth* point with *two aspects—each photon occupies its own position and nothing seems to change for it*—as you read on the next chapter.

4 Parmenides

Following *Parmenides* who founded the *School of Elea* in the 5th c. BCE, his most famous pupil *Zeno of Elea* devised paradoxes to prove Parmenides's theory to be rather true. These paradoxes seemed to have been solved already by Aristotle, but that is questionable as we will see pretty soon. I will first shortly explain Parmenides theory, and then we will see how Zeno tried to defend it.

Parmenides claimed that all 'that is', 'is', and no-thing can be 'that it not-is', because there is no such thing as 'not-is'. He also concluded that change and movement are impossible, and all that is, is *eternal here*. *Past and future* are not possible therefore, as change and movement are not possible, and all is always and altogether in an *eternal* 'now'. This is the true reality, *alêtheia,* of what is. And all that seems to be changing and moving is an illusion or opinion of our mortal mind, a *doxa*. Russell summarises Parmenides' theory in *A History of Western Philosophy* in the following way:

> Parmenides divides his teaching into two parts, called respectively "the way of truth" and "the way of opinion." We need not concern ourselves with the latter. What he says about the way of truth, so far as it has survived, is, in its essential points, as follows:
> "Thou canst not know what is not—that is impossible—nor utter it; for it is the same thing that can be thought and that can be."
> "How, then, can what is be going to be in the future? Or how could it come into being? If it came into being, it is not; nor is it if it is going to be in the future. Thus is *becoming* extinguished and *passing away* not to be heard of."
> "The thing that can be thought and that for the sake of which the thought exists is the same; for you cannot find thought without something that is, as to which it is uttered."
> The essence of this argument is: When you think, you think *of* something; when you use a name, it must be the name *of* something. Therefore both thought and language require objects outside themselves. And since you can think of a thing or speak of it at one time as well as at another, whatever can be thought of or spoken of must exist at all times. Consequently there can be no change, since change consists in things coming into being or ceasing to be. [1945, p. 49]

Now we will see how Zeno of Elea tries to defend his teacher's theories through his own devised paradoxes.

4.1 Zeno's paradox

I will state one paradox known as the *Achilles and the Tortoise* paradox, it goes as follows: Achilles and a tortoise decide to race against each other for one kilometre, Achilles being so fast, allows the tortoise a half of a kilometre head start. By the time Achilles has run the half kilometre, the tortoise has moved on another 50 metres. And by the time Achilles has run the next 50 metres, the tortoise has moved on another 5 metres. Then after Achilles has run the next 5 metres, the tortoise has moved on another 0,5 metre, and this *infinite regress* can go on and on. You can already understand the paradox; Achilles seems never to be able to catch up with the tortoise, *like one photon seems*

never to be able to catch up with another photon! So for Achilles to catch up with the tortoise becomes impossible concludes Zeno, and if it does seem to happen, it is an illusion or opinion, a *doxa*. According to Zeno, if you abstract and universalize these findings, you must conclude that change and movement is not possible, *all is always and altogether in an eternal 'now'*!

This sort of paradox had a shocking and choking grip on the ancient Greeks, until Aristotle came along with a solution for this infinite regress, and the seemingly impossibility for change and movement. His ingenious introduction into the physical world of *potential and act* was the solution to all paradoxes of this genre. Aristotle realised that *every-thing has a substance with an inner* potential that *becomes* actual. So the substance of a flower bud has an inner potential to become a flower, and once it's *fully actualized*, thus having become a flower, there remains nothing more to actualize; then the flower starts decaying into its original state where it originated from. The same is true with infinity, infinity is only in potential, it is never in act. So yes, Aristotle would agree that Achilles cannot catch up with the tortoise in a *potential infinity*, but this infinity is not actualized, and therefore Achilles *will* actually end up reaching the tortoise. Once again movement and change has become possible for the ancient Greeks, Aristotle allowed the world to breathe again in relief.

But this is not satisfactory as an answer, at least also according to the priest and an immensely influential philosopher and theologian, Thomas of Aquinas, in the 13th c. CE. Because what does it mean that a flower bud has an inner potential to become a flower? What part exactly of the flower bud has the potential to become a flower? Whatever part of the flower bud you might be examining, it is right now whatever it 'is', so how does it become something it 'not-is', in order to become something else in the next moments, and eventually to become a full actualized flower? Where and when does change take place?[4] So when the flower bud changes from being in, let's call it 'state 1', to being in 'state 2', it first has to let go of 'state 1', before it can become 'state 2'. But if it let go of 'state 1', before it became 'state 2', it is in 'no-state' anymore, it completely disappears, and how can it then become 'state 2' out of 'no-state'? So once again we had to hold our breath, at least until Aquinas answered right away his own question.

In *De Ente et Essentia* Aquinas adds to the two variables of Aristotle, potency and act, a third variable into the equation, namely existence[5] or 'to be'*, esse*. Now you have the flower bud which has 1. an existence, *esse*, and 2. an essence, *essentia*, and it is *essentia* which has the potency to

[4] Can we think of it as the first point I asked you to keep in mind: "the "space" between the grid lines being outside the bounds of physical reality? Just as a microscopic ant walking on an ordinary piece of fabric would have to leap from thread to thread, perhaps motion through space on ultramicroscopic scales similarly requires discrete leaps from one "strand" of space to another." And that the change happens then during the jump in the "space" that is "outside the bounds of physical reality"? Back to Aquinas now.

[5] Aquinas learned about *existence* from the writings of *Pseudo-Dionysius*, *Avicenna* and *Solomon Ibn Gabirol* (*Avicebron*).

undergo change into 3. the flower, which is the *actualized being*, *ens*, of the *potential essentia* in the flower bud. Now the *potency* of the flower bud doesn't have to disappear anymore into 'no-state' when it is undergoing change, the third variable *esse*, forces it 'to be' in 'existence-state' while the *essentia* can undergo changes between 'state 1' to 'state 2' and become *ens*, an actualized blossoming flower.

So did Aquinas solve the problem of movement and change once and for all? That depends on what you understand *esse, essentia* and *ens* 'to be'. For Aquinas there is a God which is *pure existence*, *esse*, and any-thing else takes its *particular esse* from this pure *esse* of God. But can we actually speak today of a pure *esse* or God? How do our objects get their particular *esse* then? And let's also have a closer look at this potential *essentia* that Aquinas mentions, what exactly is this *essentia* and where exactly is it to be found in an object? It seems to be another way of naming it the objects *substance*, but then more specific as the objects *particular substance*, which is referred to by Aquinas as its *essentia*. But can you say that every object has its particular substance, an *essentia*? If I take any object and zoom in with a microscope, at what point would I see a substance or an *essentia* for that matter? What parts of the object have the potency to change? Aren't the ultimate elements of matter, *electrons* and the *subatomic particles protons and neutrons*[6], *unchangeable*?

4.2 Subject and Substance

There does not seem to be any place left for a *subject* and *substance* or *essentia* in the current physical understanding of matter. Every object seems to be made out of subatomic particles which do not leave any place for any subject or substance 'to be'. All the objects seem to be only made out of ultimate elements that can form *different relations* between them, but they themselves *never change*. *There does not seem to be any subject or substance that has to undergo change, it is only the relations between the ultimate elements that can change.* With this last sentence you have apparently said already a lot about change, movement, subjects, objects and matter. So remember this sentence as the *fifth* point when reading on, besides the four points you are already remembering until now.

Movement is only possible from one point particle or Planck, to the next point particle or Planck, with the 4 co-ordinates of spacetime. So any object that stays put in space but moves in time is in our *perspective* only moving with the 4th co-ordinate of time through spacetime. *You* can keep on referring to that object with the same 3 co-ordinates as before, but *you* have to update the 4th co-ordinate with one second every time a second has elapsed. But what is *actually* meant by movement

[6] We will leave quarks, anti-particles and plenum out of the scope of this thesis.

and updating the 4th co-ordinate of the object is the following: the object jumps every second from all the point particles or Planck's it is currently occupying in spacetime, to the next point particles or Planck's it will occupy a second later in spacetime. Just like the microscopic ant from above, which I asked you to remember as the first point, is jumping from one point particle or Planck to the next one. Here the object is jumping with its ultimate elements spread over a certain amount of point particles or Planck's, from one to the next moment in the 4 co-ordinates of spacetime. But as you surely can understand by now, no subject or substance is jumping along with the object, which is only made out of a certain relation between its ultimate elements. I am portraying this image of a jumping object only in order to temporarily make some necessary ideas clear. Later we will re-evaluate this image, and adjust our understanding instead of using the image of a jumping object.

We can find an interesting passage about substance by the renowned physicist and philosopher, Ernst Mach, in *The Analysis of Sensations* which goes as follows:

> Let us now consider the results of mental adaptation.
> Thoughts can adapt themselves only to what is constant in the facts; it is only the mental reconstruction of constant elements that can yield advantage in point of economy. Herein is contained the ultimate ground of our effort for continuity in thought, that is, for the preservation of the greatest possible constancy, and in this way, too, the results of the adaptation are rendered intelligible. *Continuity, economy, and constancy mutually condition one another they are really only different aspects of one and the same property of all sound thinking.*
> *The unconditionally constant we term substance.* I see a body upon turning my eyes in its direction. I can see it without touching it, I can touch it without seeing it. Although the actual appearance of the component elements of the complex is determined in this way by certain conditions, I yet have these conditions too absolutely in my power to appreciate or notice them markedly. I regard the body, or the complex of elements, or the nucleus of this complex, as always present, whether, for the moment, it is the object of my senses or not. Having always ready the thought of this complex, or, symbolically, the thought of its nucleus, I gain the advantage of being able to predict, and avoid the disadvantage of being surprised. My behaviour is the same with regard to the chemical elements, which also appear to me unconditionally constant. Although here my mere willing it is not sufficient to make of the complexes in question sensational facts, and although in the present case external aids (for instance, bodies exterior to my own body) also are necessary, I yet leave these aids out of account as soon as they have become familiar to me, and look upon the chemical elements as simply constant. *The man who believes in atoms treats them in an analogous way*. [1914, pp. 328-9, *my emphasis*]

According to Mach we use the term substance for elements which we consider to have "continuity, economy and constant". Even "the man who believes in atoms treats them" as having "continuity, economy and constant", and therefore considers atoms to actually have a substance. However, it is only our "mental reconstruction" which makes this "unconditionally constant which we term substance" possible for us. But further on Mach also states the following about our "vulgar conception of matter":

> *Really unconditioned constancy does not exist*, as will be evident from the preceding considerations. We attain to the idea of absolute constancy only as we overlook or underrate conditions, or as we regard them as always given, or as we deliberately disregard them. There is only one sort of constancy which embraces all the cases that occur, namely, constancy of connexion or of relation. *Substance, again, or matter, is not anything unconditionally constant. What we call matter is a combination of the elements or sensations according to certain laws.*[7] The sensations connected with the different sense-organs of a particular man are dependent on one another according to laws, as are the sensations of different men. It is in this that matter consists. The older generation, especially the physicists and chemists, will be alarmed by this proposal not to treat matter as something absolutely constant, but to take as constant, instead, a fixed law of connexion among elements which in themselves seem extremely unstable. Even younger minds may find this conception difficult; but the view is inevitable, though I myself at one time went through a great struggle in order to arrive at it. We shall have to make up our minds to some such radical change in the method of our thought, if we want to escape the alternative of perpetually recurring helplessness in the face of these questions.
> *There can be no question of abolishing from ordinary everyday use the vulgar conception of matter which has been instinctively developed for this purpose.* Moreover, all our concepts of physical measurement can be maintained, only receiving such critical elucidation as I have tried to carry out for mechanics, heat, electricity, etc. Purely empirical concepts here take the place of metaphysical. *But science suffers no loss when a "matter," which is a rigid, sterile, constant, unknown Something, is replaced by a constant law, of which the details are still capable of further explanation by means of physico-physiological research.* In doing this our object is not to create a new philosophy or metaphysics, but to promote the efforts, which the positive sciences are at this moment making, towards mutual accommodation. [Ibid., pp. 331-2, *my emphasis*]

Mach wants to get rid of the "vulgar conception of matter", "which is a rigid, sterile, constant, unknown Something", and have it replaced by matter which "is a combination of the elements or sensations according to certain laws." Because, "Really unconditioned constancy does not exist", even if "the physicists and chemists, will be alarmed by this proposal not to treat matter as something absolutely constant", we still have to let go of thinking some-things to be "absolutely constant". Absolute substance undergoes the same fate as when we had to let go of thinking that there is "absolute" space or time, which was the third point that I have asked you to keep in mind while reading this thesis.

And Russell, who was strongly inspired by Mach, then wrote about substance in *The Analysis of Mind* in the following way:

> I attempted to show that what we call a material object is not itself a substance, but is a system of particulars analogous in their nature to sensations, and in fact often including actual sensations among their number. In this way the stuff of which physical objects are composed is brought into relation with the stuff of which part, at least, of our mental life is composed. [1921, p. 108]

According to Russell, "what we call a material object is not itself a substance", but "physical objects are composed" in "part, at least, of our mental life" too. And Russell has the same to say about "the

[7] Mach calls it "certain laws" and not "*eternal* law", the way Heraclitus quoted later does.

subject": "If we are to avoid a perfectly gratuitous assumption, we must dispense with the subject as one of the actual ingredients of the world." (Ibid., p. 142) Here the language becomes very clear, "the subject" becomes "a perfectly gratuitous assumption, we must dispense with", "as one of the actual ingredients of the world". No longer does a person have a 'self' who is "the subject", a person is rather also "composed" out of various elements, and thus "the subject" is another absolute 'thing' which "we must dispense with". Of course the great philosopher, David Hume, in *A Treatise of Human Nature* has already long dispensed with the notion of a 'self' or a subject:

> THERE are some philosophers, who imagine we are every moment intimately conscious of what we call our SELF; that we feel its existence and its continuance in existence; and are certain, beyond the evidence of a demonstration, both of its perfect identity and simplicity. … For from what impression cou'd this idea be derived? This question 'tis impossible to answer without a manifest contradiction and absurdity; and yet 'tis a question, which must necessarily be answer'd, if we wou'd have the idea of self pass for clear and intelligible. It must be some one impression,—that gives rise to every real idea. But self or person is not any one impression, but that to which our several impressions and ideas are suppos'd to have a reference. If any impression gives rise to the idea of self, that impression must continue invariably the same, thro' the whole course of our lives; since self is suppos'd to exist after that manner. But there is no impression constant and invariable. … He may, perhaps, perceive something simple and continu'd, which he calls *himself*; tho' I am certain there is no such principle in me. [1739, pp. 251-2]

Hume is "certain there is no such principle in" him as "*himself*", because Hume cannot "perceive something simple and continu'd" to exist. Hume realised as the first Western philosopher "that we" might maybe "*feel* its existence and its continuance in existence [*my emphasis*]", but that "from what" actual *one* "*impression* cou'd this idea be derived? [*my emphasis*]". Because Hume realized that "self or person is not any *one impression*, but that to which our *several impressions* [*my emphasis*]" are *combined* into this *feeling of a continuous self*. So now that we have disposed of the *subject* or *self*, as well as from *substance* and the notion of an unconditioned constancy, it is time that we re-revise matter!

5 Matter re-revised

We have seen that in the Western world, at least since the time of the ancient Greeks, there was the firm belief that every object had a substance. For philosophers like Parmenides and Zeno this made it impossible to allow movement or change to occur, even if our senses showed us that there was change and movement all around us. The concepts of an absolute substance, *being* what 'it is', and change or movement cannot coincide, so Parmenides and Zeno dropped the notion of change and movement contrary to their daily *beliefs* and *sensations*. Like Hume dropped the *feeling* of selfhood, by the realization that there is no-thing that can possibly be a *continuous self*.

Plato[8], who revered Parmenides as one of the greatest Greek thinkers, was desperately looking for a solution to this impossibility of change and movement, and he did. The *solution* that Plato offered the Western world stayed with us until this very day, and it lives on in our minds as an *unchanged Idea*. Plato devised for us a *dualistic cosmos*, the *real world of Ideas* where nothing ever changes, and the *erroneous world of appearances of our senses*, where everything is only a *shadow* from the real world of Ideas. In our erroneous world of appearances every-thing is constantly changing, as every-thing is in constant decay from the perfect real world of Ideas. This Platonic dualism has been picked up again by Descartes, and is still dominant today with divisions like: mind/body, subject/object, internal/external, relation/substance and experiencing/subject.

Aristotle was not very impressed with Plato's dualism and his real world of Ideas, and he allowed for change to be once again possible in our *real world of the senses*, with the concepts of *potency and act*. But Aristotle was already entangled in the *Ideas* of Plato, objects still had substances and were a combination of *matter and form*. According to Aristotle, every object was made out of *prime matter* (potency) and *pure form* (act). It was this prime matter that had the potency to become its form, which is its act. The prime matter is eternal according to Aristotle, and the pure form is God, or the *unmoved mover*. Here we encounter Aristotle's grip of the Western mind, an *eternal inert matter* which has the potency to change into its act, through a pure form in an equally *inert unmoved mover*. It is remarkable, that for Aristotle the purest act is unchangeable, like the real world of Ideas are to Plato. With this way of thinking by Aristotle and the whole Western world who followed suit, *God himself has become immobilized and unchangeable*; God can only think itself but does not have any interaction with the *outside world of change*. The whole system is

[8] As pointed out to me by Joachim Leilich, before Plato there were already the various Ancient Greek Atomist views, but they don't differ at their essence in their views from the other Greeks. Except that for the Atomists it was the *unchanging*, determined moving atoms that were *inert, static and at rest—in themselves—in space*. The only exception that had un-Greek views is Heraclitus, who will be mentioned later on in Boman's quote.

inert and immobilized, everything is deterministic and necessary, and has no experiencing or dynamic existence, except for a substance-potency in inert matter that can act out its form.

This has been the faith of God in the Western world until Aquinas woke up the sleeping and static God in the Western world. Aquinas allowed himself to be inspired by the *dynamic Israelite* way of thinking in the *Hebrew Bible*. God became not *pure act* by the merit of it being pure form, but rather by the merit of it being *pure existence, esse*! Every-thing became active and existent in this *great chain of being*, and every-thing has now not only a substance, but *a particular esse and a particular essentia which each particular being acts out, actus essendi!* Every-thing has finally ceased to be at *rest and static* and can now become *active and dynamic*.

5.1 Hebrew vs Greek

In the Hebrew Bible God names himself as: אהיה אשר אהיה, "*Eheyeh asher Eheyeh*"—I shall be whatever I shall become (Exodus 3:14, my translation[9]). In the Hebrew Bible God gives himself a very active and dynamic name indeed, which is all about a *becoming*. The theologian, Thorleif Boman, writes this difference between the Hebrew, and the Greek and Western thought very distinctly in *Hebrew Thought Compared with Greek*:

> The *hayah* designates existence; … it is not at rest but is dynamic. … As previously pointed out, this practical atheism actually emphasizes God's *being active*. … The Israelite knows that above all others Jahveh *is*; he is the sum of all dynamic existence and the source and creator of it. This lies in the embattled verse: *'eheyeh 'asher 'eheyeh*—I am who I am [10] (Ex. 3.14). [1954, pp. 48-9]

Boman first makes clear how to better understand the Hebrew thinking of "*The 'being' of the verb* hayah" (Ibid., p. 38):

> The verb *hayah*: … The most important meanings and uses of our verb 'to be' (and its equivalents in other Indo-European languages) are: (I) to express being or existence; (2) to serve as a copula. Now, as we have shown above, Hebrew and the other Semitic languages do not need a copula because of the noun clause. [Ibid.]

Then Boman continues to explain various meanings for the verb *hayah*, and it is this meaning that interests us here most:

> The formal character of being: As a result of his arduous investigations Ratschow establishes that the meaning of *hayah* is as much 'become' as 'be', sometimes one and sometimes the other. Sometimes it fluctuates between them, and at other times it encompasses both 'becoming' and 'being' and contains yet a third active motif; in this motif of *effecting* is apparently to be sought the arch that spans the gap between 'becoming' and 'being'. … From

[9] As quoted at the bottom of this page: "that the meaning of *hayah* [*Eheyeh*] is as much 'become' as 'be'".
[10] Boman translates this different than I do, but he most probably uses the accepted English translation.

> *hayah* we can understand what 'being' was consciously or unconsciously for the Israelite; 'being' is not something objective as it is for us and particularly for the Greeks, a datum at rest in itself. It is, however, quite erroneous to conclude from this that 'being' is something subjective, evanescent and dependent upon us. The Israelites like all other ancient peoples were 'outer-directed' and did not dissect their psychic life as modern man does. In that sense, even to the Hebrew, 'being' was something objective which existed independently of him and stood fast. The 'being' of things and of the world as the totality of things was to him something living, active, and effective, a notion which, however, has nothing at all to do with primitive pan-psychism. [Ibid., p. 45]

Boman also explains how "*The dynamic character of the world*" differs from the point of views that the Hebrews had and "us":

> From this viewpoint we can also better understand one side of the Israelite conception of the world. Things do not have an immovable fixity and inflexibility that they have for us, but they are changeable and in motion. … we shall elucidate the Hebraic dynamic-personal conception of the world and of 'being' by comparison with the diametrically opposite Greek conception of 'being', particularly in its Platonic form. [Ibid., pp. 49-51]

Now Boman has arrived at the point where he can elucidate the Hebrew conception "of 'being' by comparison with the diametrically opposite Greek conception of 'being'":

> While, as we have seen, the Hebraic kind of thinking was in the main dynamic, the kind of thinking employed by the Eleatic school of philosophers was not only diametrically opposite but contradictorily so. … they flatly denied the reality of motion and change. Only what is immovable and immutable exists; all becoming and passing away is mere appearance and is equivalent to what is not, about which nothing positive can be said. Our sense-impressions are deceptive. … Yet in Heraclitus of Ephesus, Greek philosophy had an advocate of the significance of change; his thinking is governed by the impression of the changeableness of all things: 'Everything changes; war is the father of all things, and a man cannot step into the same stream twice' (cf. Plato *Cratylus*, p. 402). This high estimate of change and motion is un-Greek; Heraclitus stands alone among Greek philosophers with his doctrine. … Heraclitus' thinking is, however, influenced, and in part, determined by Greek thought-forms and ways of posing problems. He too seeks the *eternal* law[11] in the flux of all things and the *harmony* that reconciles all antitheses. … but we must consider him as an exception who still had a provocative and fruitful effect upon Greek philosophy. … It is not accidental that during the first five foundation-laying centuries of the Christian Church, Plato was its philosophical authority, and that the mental decline which clearly sets in at the beginning of the Middle Ages coincides with the rising authority of Aristotle. … Plato means to say that what we call the spirit (mind) and the spiritual (mental) world is not an appendage to the certain and everlasting material world, but quite to the contrary, the visible world is an appendage to the totally certain, everlasting, real, and eternal spiritual (mental) world. … All being is therefore at rest and in harmony, and all higher being is unalterable and indestructible; … but the world of appearance, which consists partly of images of the Ideas and partly of images of the images, is perishable and transitory, and it possesses less reality, power, and value the farther removed it is from that which eternally is. It is evident that the antithesis, *static-dynamic*, does not express clearly enough the real distinction between Greek and Hebrew thinking … The distinction lies rather in the antithesis between rest and movement. [Ibid., p. 51-5]

[11] Heraclitus "seeks the *eternal* law" and not "certain laws" like Mach quoted above does.

Boman has come to the same conclusion as we have so far, the "*static-dynamic*" antithesis between the Greeks and the Hebrews is only one side of the story, the "antithesis between rest and movement" is where the crux of the matter lies. Matter according to the Greeks is at *rest*, while for the Hebrews it is in constant *movement*. This allows, according to the Hebrew thinking, for change to actually occur in *time*, while for the Greeks change seems only to be an *appearance*, or the *potency of a substance*, but this substance is itself at rest in *space*. It is this Greek thinking that still holds the imagination and concepts of the Western world until this very day. Matter has to be released from this *static* and at *rest* way of conceiving it.

5.2 From matter to "neutral stuff"

Now that we are ready to conceive matter in a new way, we will start by asking the following question. *Can we consider anything as not being matter?* In the second chapter we have used the physicist's description of matter as having size and mass, but how should we call any-thing without size or mass then? Descartes offers a solution for this; his solution is to name it *mind*. Mind is what does not have to abide to the *laws of space*, but for Descartes it still abides to the *laws of time*. Even *thoughts* which according to Descartes' definition happen only in mind, cannot escape from having to happen in time. But we know already by now that there is no absolute time, something which Descartes, despite how ingenious and imaginative he might have been, could never have imagined in the 17th century. We know there is only spacetime, so what can it still mean today for mind to only abide to time and not space? Is there still any reason to hold on to Descartes' *dualism*?

According to the title of Greene's book we even have to view *The Fabric of the Cosmos* as a *fabric*, for sure in the sense that it is not mind, and even in the sense that it is not some empty no-thing, but that it is an actual some-thing, namely a fabric, which is already matter. Maybe it will not be considered matter according to the physicist's description in chapter two, but it is not non-matter in the sense of being *non-material*. So when we are discussing 'thoughts' or more general 'mind', can we consider it as being some-thing non-matter?

It is time to let go of a dualism between matter and mind, and allow for them to *entangle* as one. According to physicists, absolute space and time have become: relative spacetime; *I want to propose that absolute matter and mind should now also become: relative 'mattermind'.* Physicists claim that the speed of light is constant, and space and time are relative; *I want to claim that experiencing is constant, and matter and mind are relative!* From now on, you should read this thesis with this claim firmly in your mind.

After the above has been said, we can also finally recall the second point which I asked you to remember, where Greene already offers us the possibility "…that space and time do not abruptly cease to have meaning on extremely small scales, but instead gradually morph into other, more *fundamental concepts*." (2004, p. 351, *my emphasis*) We can now also think of matter and mind which "gradually morph into other, more fundamental concepts." According to Greene this theory regarding space and time is not merely speculation, he "strongly suspect[s]" that this theory "actually happens" in our universe, in his words:

> Many string theorists, including me, strongly suspect that something along these lines actually happens, but to go further we need to figure out the more fundamental concepts into which space and time transform. [Ibid.]

Yes, both physicists and philosophers first "need to figure out" more about these fundamental concepts. But philosophers too can already "strongly suspect that something along these lines actually happens", and that there are "more fundamental concepts" where matter and mind "gradually morph into". Of course Mach already "strongly suspect[ed] that something along these lines actually happens" back in 1914:

> The fundamental views of mankind are formed by a natural process of adaptation to a narrower or wider sphere of experience and thought. It may be that the physicist is still satisfied with the notion of a *rigid matter*, of which the only changes are movements, or changes of place. Of such a thing as this the physiologist or psychologist can make nothing at all. But any one who has in mind the *gathering up of the sciences into a single whole*, has to look for a conception to which he can hold in every department of science. Now if we resolve the whole material world into elements which at the same time are also elements of the psychical world and, as such, are commonly called sensations; if, further, we regard it as the sole task of science to inquire into the connexion and combination of these elements, which are of the same nature in all departments, and into their mutual dependence on one another; we may then reasonably expect *to build a unified monistic structure* upon this conception, and thus to *get rid of the distressing confusions of dualism*. Indeed, *it is by regarding matter as something absolutely stable and immutable* that we actually destroy the connexion between *physics* and *physiology*. [p. 312, *my emphasis*]

Mach has already understood that we have "to get rid of the distressing confusions of dualism" all too well, and proposes "to build a unified monistic structure" instead. For "it is by regarding matter as something absolutely stable and immutable", that we cannot allow for matter ("physics") and mind ("physiology") to gradually morph into more fundamental concepts. Russell, in the preface of his most recommended book, *The Analysis of Mind*, already states this same goal as Mach did, very clearly from the outset:

> THIS book has grown out of an attempt to harmonize two different tendencies, one in psychology, the other in physics, with both of which I find myself in, sympathy, although at first sight they might seem inconsistent. On the one hand, many psychologists, especially those of the behaviourist school, tend to adopt what is essentially a materialistic position, as

> a matter of method if not of metaphysics. They make psychology increasingly dependent on physiology and external observation, and tend to think of matter as something much more solid and indubitable than mind. Meanwhile the physicists, especially Einstein and other exponents of the theory of relativity, have been making "matter" less and less material. Their world consists of "events," from which “matter" is derived by a logical construction. Whoever reads, for example, Professor Eddington's *Space, Time and Gravitation* (Cambridge University Press, 1920), will see that an old-fashioned materialism can receive no support from modern physics. I think that what has permanent value in the outlook of the behaviourists is the feeling that physics is the most fundamental science at present in existence. But this position cannot be called materialistic, if, as seems to be the case, physics does not assume the existence of matter.
>
> The view that seems to me to reconcile the materialistic tendency of psychology with the anti-materialistic tendency of physics is the view of William James and the American new realists, according to which the "stuff" of the world is neither mental nor material, but a "neutral stuff," out of which both are constructed. I have endeavoured in this work to develop this view in some detail as regards the phenomena with which psychology is concerned. [1921, pp. 5-6]

Once again we see that also according to Russell, we need to harmonize between the “tend[ency] to think of matter as something much more solid and indubitable than mind”, and the tendency to “see that an old-fashioned materialism can receive no support from modern physics.” We can reconcile these two tendencies by envisioning that “the "stuff" of the world is neither mental nor material, but a "neutral stuff," out of which both are constructed.” So we have Ernst Mach and William James, who will be discussed shortly, as well as Bertrand Russell and Brian Greene, who all see the need to allow for matter and mind to morph into more fundamental concepts; the same as absolute space and time became relative spacetime, but still need to morph into a yet unknown “neutral stuff”.

5.3 ‘I breathe’

> But a last cry of *non possumus* will probably go up from many readers. "All very pretty as a piece of ingenuity," they will say, "but our consciousness itself intuitively contradicts you. We, for our part, *know* that we are conscious. We *feel* our thought, flowing as a life within us, in absolute contrast with the objects which it so unremittingly escorts. We can not be faithless to this immediate intuition. The dualism is a fundamental *datum*: Let no man join what God has put asunder."
>
> My reply to this is my last word, and I greatly grieve that to many it will sound materialistic. I can not help that, however, for I, too, have my intuitions and I must obey them. Let the case be what it may in others, I am as confident as I am of anything that, in myself, the stream of thinking (which I recognize emphatically as a phenomenon) is only a careless name for what, when scrutinized, reveals itself to consist chiefly of the stream of my breathing. The 'I think' which Kant said must be able to accompany all my objects, is the 'I breathe' which actually does accompany them. There are other internal facts besides breathing (intracephalic muscular adjustments, etc., of which I have said a word in my larger Psychology), and these increase the assets of 'consciousness,' so far as the latter is subject to immediate perception; but breath, which was ever the original of 'spirit,' breath moving outwards, between the glottis and the nostrils, is, I am persuaded, the essence out of which philosophers have constructed the entity known to them as consciousness. *That entity is fictitious, while thoughts in the concrete are fully real. But thoughts in the concrete are made of the same stuff as things are.*

> I wish I might believe myself to have made that plausible in this article. In another article I shall try to make the general notion of a world composed of pure experiences still more clear. [James, 1904a, pp. 490-1]

It is with this beautiful and daring passage in *Does 'Consciousness' Exist?* from 1904 that I wish to introduce the philosopher and psychologist, William James, into my thesis. James, who is the founding-father of American psychology, was among the first who spoke out against that *fictitious entity* known as *consciousness,* and "this immediate intuition" of a "dualism [that] is a fundamental *datum*". James points out sharply that "The 'I think' which Kant said must be able to accompany all my objects, is the 'I breathe' which actually does accompany them." The 'I' or 'self' which Kant was trying to hang on to, has been taken apart into ultimate elements already mentioned above in chapter 4.2, and now also James offers to revise it into an 'I breathe'. James realises "that to many it will sound materialistic", but James has revised also how "*stuff*" should be perceived, and therefore is not actually a *materialistic reductionist*.

It is traceable how James slowly grew into this idea that "*thoughts in the concrete are made of the same stuff as things are.*" This can, for example, already be found twenty years earlier in his article *What is an Emotion?* from 1884. In this article James is able to reverse the way we perceive *bodily expressions* following the *mental affection*, and rather sees *(mental) feelings* and *bodily changes* being one and the same thing.

> Our natural way of thinking about these standard emotions is that the mental perception of some fact excites the mental affection called the emotion, and that this latter state of mind gives rise to the bodily expression. *My thesis on the contrary is that the bodily changes follow directly the* PERCEPTION *of the exciting fact, and that our feeling of the same changes as they occur is the emotion*. Common sense says, we lose our fortune, are sorry and weep; we meet a bear, are frightened and run; we are insulted by a rival, are angry and strike. The hypothesis here to be defended says that this order of sequence is incorrect, that the one mental state is not immediately induced by the other, that the bodily manifestations must first be interposed between, and that the more rational statement is that we feel sorry because we cry, angry because we strike, afraid because we tremble, and not that we cry, strike, or tremble, because we are sorry, angry, or fearful, as the case may be. Without the bodily states following on the perception, the latter would be purely cognitive in form, pale, colourless, destitute of emotional warmth. We might then see the bear, and judge it best to run, receive the insult and deem it right to strike, but we could not actually *feel* afraid or angry. [1884, pp. 189-90]

Here the 'I breathe' comes beautifully to the front when expressed as an emotion, because a Kantian 'I think' cannot "*feel*" sorry and then cry. It is only an 'I breathe' that can "*feel*" sorry, and even sharply stated, it can only "feel sorry because we cry". According to James, "Without the bodily states … we could not actually *feel* afraid or angry." The body which "breath [is] moving outwards, between the glottis and the nostrils," is what gives rise to feelings. Because what we call matter, is for James actually "*stuff*" which can "breath, which was ever the original of 'spirit'" and has

"*feeling*", or more general, it *experiences*! Here we made a full circle; 'm*attermind' has morphed into more relative fundamental concepts; into a stuff that has as constancy: experiencing!*

5.4 The philosopher of constant certainty

With the *philosopher of constant certainty,* I am referring to the man who has wrongly become known as the *philosopher of doubt: Descartes*. Descartes famously said: '*Cogito, ergo sum!'*—I think, therefore I am! So how did Descartes come to this conclusion? Well, he performed a thought experiment. 'What do *I know* with certainty?' Descartes asked himself, and he came up with an ingenious response to this. 'Doubt is certain' he responded, because I cannot doubt that I doubt without actually doubting, so it is certain that I doubt was Descartes' conclusion! This earned him the title *philosopher of doubt*, but this is only part of the story, I propose to call him the *philosopher of constant certainty*!

Here is why. Descartes did not only realize that he cannot doubt that he doubts without actually doubting, but that 'I': *doubt, and that is certain*. Every *content* that could have been mistaken, or taken out of the 'I': *(fill in)*, did not allow him to know that 'I': *am*. But the moment he filled in the content with: 'doubt', he felt the certainty of the 'I' kick in. The content 'doubt' couldn't be mistaken or taken out of the 'I': *doubt*, and therefore Descartes *experienced the certainty* of 'I': *am*! He became for the first time aware that he is *certainly experiencing* content, which was in this case 'doubt'. It could have been the content 'feeling', Descartes would also have realized that it is with certainty that he is experiencing 'feeling', but it happened so to be that the first content he experienced with certainty was 'doubt'. '*Sentiant, ergo sum!'*—I feel, therefore I am! is equally valid as '*Cogito, ergo sum!'*. Descartes stumbled upon James' 'I breathe', *he felt the certainty of his experience*. But unfortunately Descartes got confused thinking that the certainty he *felt: 'I',* was actually in the certainty of the content he *thought*: 'doubt'; and stuck to the 'I think', which Kant then uncritically took over. *This can now be corrected with the introduction of James' 'I breathe'!*

We 'breathe-out' into our surrounding and 'breathe-in' from our surrounding, or as Plato allows the *Sophist* to dialogue: 'The power to either act, or to be acted upon'. If any-thing cannot act or be acted upon, how can you know that it exists? The same here; if you can't 'breathe-out' or 'breathe-in', how can you *know* or *feel* that you or the surrounding exists? And of course 'breathe' being the original term for 'spirit', or what we shall call now *experience*. You *must experience* your surrounding in order for you to *know* or *feel* it to be there. If you don't experience infrared light, it is not there for you. 'So how do we know there is infrared light?' you might ask, well, because we have the apparatus to measure it. 'So we don't need to *experience* infrared light, it is enough that we have apparatus that can measure it!' Can then be said next, but here again we might trick ourselves,

because it is ‘us’ who devised this apparatus which ‘we’ can experience; it is true that we are not experiencing infrared light, we are instead experiencing the measurement the apparatus is giving us! We don’t *know* infrared light; we *experience* the apparatus measuring something which we termed infrared light. As the philosopher, Ludwig Wittgenstein, puts it in *Philosophical Investigations*:

> But let us consider an analogous case. There is one thing of which one can say neither that it is one metre long, nor that it is not one metre long, and that is the standard metre in Paris.—But this is, of course, not to ascribe any extraordinary property to it, but only to mark its peculiar role in the language-game of measuring with a metre-rule.—Let us imagine samples of colour being preserved in Paris like the standard metre. We define: "sepia" means the colour of the standard sepia which is there kept hermetically sealed. Then it will make no sense to say of this sample either that it is of this colour or that it is not. [1953, §50, p. 25’]

Wittgenstein sharply points out that we don’t *know* what a metre is, we have devised “the standard metre in Paris”, and now this is a metre. The ‘metre’ is what measures a metre, if the metre has the length of a ‘metre’ then it is a metre, if it doesn’t have the length of a ‘metre’ then it is not a metre. So now we can *experience* this table to be a metre, because we *know* it to be equal to a metre, by measuring it with an apparatus which is “the standard metre in Paris”. The same thing with an apparatus that measures infrared light, if the needle goes up to ‘infrared’ on the apparatus, we *know* there is infrared light, otherwise there is none. And this is not to question the fact that there *is* infrared light there, the same as that table *has* the measurement of one metre long. The same goes for Wittgenstein’s example of “sepia” above.

It is only what we *experience* that we can *know*, what is not experienced by us is non-existent for us. It is the certainty that ‘I’: *experience* which has any validity or truth for us. This is why Parmenides and Zeno could accept that change and movement is not possible, even if they were constantly surrounded by change and movement. The certainty they experienced through logic, had more validity or truth to them than their senses could afford them. They realised that the senses can often mislead you, while solid and valid logic seldom does. *So they put the experience they had of the world through their logic, above the experience they had of the world through their senses*. They did the experiment that Descartes would repeat long after them in a different variation, they concluded that ‘I’: *that is, cannot be that not-is, so ‘I’ is*—and *experienced certainty*; while Descartes concluded the same experiment with ‘I’: *doubt*, and *experienced the certainty through undoubtable doubt*.

We can do the same experiment without flinching, and every creature has that certainty without even performing the experiment, ‘I’: *experience*. ‘You might have an illusion that you experience!’ might be the reductionists or eliminativists rhetoric, but then I *experience illusion*, which is still experiencing. Whoever grasps this simple concept to its core, will never undergo existential ‘doubt’; ‘I’: *experience*, *is constant, and therefore becomes also a constant certainty*. To

finalize the point and make it stronger: *regardless if 'I' and the 'self' are illusory or exist, in a relative 'mattermind'* there *is a constant, that constancy is 'experiencing'*, that is *not illusory*! *And this constancy and certainty Descartes already experienced through doubt, a philosopher of constant certainty indeed!*

6 An experiencing universe

The most astonishing phenomenon of our universe is that *experiencing* actually exists in our universe. At what point can some-thing not experiencing become experiencing? How has our universe become *an experiencing universe*? Let's say I take two *properties* 'A' and 'B', and form from them the *element* 'C', and 'C' is now experiencing itself as 'C'; were 'A' and 'B' separately then also: 1. e*xperiencing themselves*, or 2. they as properties cannot experience, but they can *emerge* as 'C' experiencing itself? Most scientists and philosophers will reject option 1 outright and only accept option 2. They will claim that 'A' has some *non-experiencing potential* to become experiencing, and that 'B' has another *non-experiencing* potential to become experiencing, and together they *emerge* into 'C' that actually becomes an experiencing element. As you can intuitively grasp, there seems to be something awry in this logic. If 'A' has already a potential to experience, and so does 'B', then experiencing is already inherent in 'A' and 'B'. Maybe not *actualized* as experiencing yet, like a sleeping dreamless person who is not experiencing at that moment, but no one can say that that person does not have experiencing inherent in him, this experiencing will be *actualized* once he awakes or enters a REM dream-cycle sleep.

It is like saying that someone's shadow can experience itself, while the person whose shadow it is, does not. Or as a mirror that reflects more properties than the object it is reflecting has. The shadow or reflection cannot *have* something more than the source has; an object 'C' cannot *have* something more than 'A' and 'B' *have*. It can be in a different *relation* than 'A' or 'B' is separately, like a funny mirror can distort the source it is reflecting, but 'C' cannot *possess* something different. 'C' can now 'act' or be 'acted upon' differently than 'A' or 'B' can separately, but it cannot *possess* something different. Here is where point four and five I asked you to remember kicks in, *it's only the relation of the properties and elements that change, not the properties and elements themselves*. And *also,* but not only because of this reason, we have already seen that *'C' doesn't possess an absolute substance or subject that can have emerged and become experiencing*, no-thing does, neither do 'A' nor 'B' have an absolute substance or subject. 'A' or 'B' can now be in a relation which we will call 'C', but 'A' or 'B' have never changed into becoming 'C', only the *relation has changed*!

It is like the example of the two photons travelling next to each other on two nearby point particles or Planck's, as in point four that I asked you to remember. Let the one photon be 'A' and travel on Planck 'a', and the other photon be 'B' and travel on Planck 'b', and they are in a relation to each other, therefore forming 'C' in our *perspective*, and become a light bundle. Now, at what point can 'C' experience itself if 'A' and 'B' cannot? Between the photons there is only the "space" that is "outside the bounds of physical reality", so *where* exactly is 'C' experiencing itself as 'C', on what

Planck? If on Planck 'a', then it is photon 'A' that is experiencing itself as either 'A', or as 'A' but being in a relation 'C' now, and the same goes for 'B'; so *where and how* does experiencing become possible for 'C' if neither 'A' nor 'B' experience on themselves? And if you say that it is photon 'D' that travels on Planck 'd' that can experiences the relation 'C' travelling on Planck's 'a' and 'b', then you are saying again that a photon—be it 'A', 'B' or 'D'—can experience itself, so why not say that photons 'A' and 'B' can experience themselves too? And let's not forget the conclusion from point four above, that for each photon, there is no space, time, or other photons or objects; so what is experiencing what, and how can it come to experience itself? This you can abstract to humans, as we all have as our building-blocks the same ultimate elements travelling on the same Planck's, and the bridging of the *gap*[12] of possible experiencing has to be made at some-point some-where.

So now back to the first example of the *potential properties* 'A' and 'B', how do they *actualize to become* and *emerge* into 'C'? 'C' can only act out what 'A' and 'B' merged together in a relation can allow for, not emerge *new properties ex nihilo*—out of nothing, which have not existed prior to the new relation now called 'C'. To put the question more concrete: if these *properties* 'A' or 'B' are not experiencing, how would 'C' then be experiencing? And what does it mean to have a property which *can potentially experience*, but does not just yet experience? And if you will try to avoid this difficulty by allowing for a *brute emergence*, where *new properties can emerge ex nihilo*, then you cannot say anymore that 'A' and 'B' *cause* the experiencing of 'C' to emerge, because there is nothing inherent in them to allow for the experiencing of 'C' to emerge, as the experiencing of 'C' *emerges ex nihilo*. So 'C' should sometimes be experiencing and sometimes not, *as there is no cause to necessitate 'C' to experience.*

The philosopher and theologian, Søren Kierkegaard, has an interesting argument in *The Sickness unto Death*; he uses it in a different context and wants to prove that there is a self and a spirit, but nonetheless, I can use his argument to make an equal point about experiencing:

> The human being is spirit. But what is spirit? Spirit is the self. But what is the self? The self is a relation which relates to itself, or that in the relation which is its relating to itself. The self is not the relation but the relation's relating to itself. … If, on the other hand, the relation relates to itself, then this relation is the positive third, and this is the self.
> Such a relation, which relates to itself, a self, must either have established itself or been established by something else.
> If the relation which relates to itself has been established by something else, then of course the relation is the third term, but then this relation, the third term, is a relation which relates in turn to that which has established the whole relation.
> Such a derived, established relation is the human self, a relation which relates to itself, and in relating to itself relates to something else. [1849, p. 43]

[12] This is another version of what is known as "The Hard Problem" by David Chalmers (2002).

Here again we can use the shadow example from above; if there is a shadow, there must be some-thing that the shadow is *of*. There cannot be a shadow without there being some-thing between the source of light and the shadow, *the shadow is of the thing*. Kierkegaard is making the same point but taking it a step further; he says that "the relation relates to itself, then this relation is the positive third, and this is the self." The shadow being of the thing, we already covered; but here the shadow is also actually having positive reality itself, because the *shadow would somehow relate to the thing*. This is what Kierkegaard would call the self, and for our purposes we will call it experiencing. So if the 'thing' is 'A' and 'B' combined, and the shadow is 'C', and 'C' can experience itself by being 'A' and 'B' combined that has now *become* 'C', then 'C' is *relating* to itself as a combined 'A' and 'B', exactly like a shadow would start relating to the 'thing'.

Because if we move the 'thing' above the light, the shadow doesn't have to go away somewhere, it only ceases to be the shadow *of* the thing. As the shadow has no existence on itself, it vanishes into no-thing. Not only cannot some-thing be created out of no-thing, some-thing can also not disappear into no-thing. Only no-thing can be created out of no-thing (*ex nihilo nihil fit*), and only no-thing can vanish into no-thing. The same is true here, if 'A' and 'B' separate, 'C' vanishes into no-thing, because it ceases right away to be 'C' *of* the 'A' and 'B' being combined, *as 'C' does not actually exist on itself*! So how can a non-existent 'C' experience itself? Or we can ask the question also like this now: could a non-experiencing 'A' and 'B' *emerge* into an experiencing 'C', but which can experience neither 'A' nor 'B', *but only itself as an emergence*? *It's like a shadow would suddenly have a shadow of itself*! Out of non-experiencing, experiencing cannot arise, because there is *no-thing* which will be experiencing it. There will only be a *relation* of two non-experiencing things, and some philosophers and scientists try to convince themselves of the idea *that a relation can experience itself*. And all this arm-twisting is all in order not to allow for option 1, that either property 'A' or 'B' can inherently already experience by themselves.

6.1 Self-Compounding & Combining

William James had the same argument regarding *combining* of experiences, which he wrote out already in his *magnum opus, The Principles of Psychology*. James fatally objects to the theory of *self-compounding* or the *combining* of feelings, and delivers it a knock-down critique for being "logically unintelligible", a critique to which the theory of self-compounding cannot intelligible respond:

> But there is a still more fatal objection to the theory of mental units 'compounding with themselves' or 'integrating.' It is logically unintelligible; it leaves out the essential feature of all the 'combinations' we actually know.

All the 'combinations' which we actually know are EFFECTS, wrought by the units said to be 'combined,' UPON SOME ENTITY OTHER THAN THEMSELVES. Without this feature of a medium or vehicle, the notion of combination has no sense. …

In other words, no possible number of entities (call them as you like, whether forces, material particles, or mental elements) can sum themselves together. Each remains, in the sum, what it always was; and the sum itself exists only for a bystander who happens to overlook the units and to apprehend the sum as such; or else it exists in the shape of some other effect on an entity external to the sum itself. Let it not be objected that H2 and O combine of themselves into 'water,' and thenceforward exhibit new properties. They do not. The 'water' is just the old atoms in the new position, H-O-H; the 'new properties' are just their combined effects, when in this position, upon external media, such as our sense-organs and the various reagents on which water may exert its properties and be known.

"Aggregations are organized wholes only when they behave as such in the presence of other things. A statue is an aggregation of particles of marble; but as such it has no unity. For the spectator it is one; in itself it is an aggregate; just as, to the consciousness of an ant crawling over it, it may again appear a mere aggregate. No summing up of parts can make an unity of a mass of discrete constituents, unless this unity exists for some other subject, not for the mass itself."[13] …

Where the elemental units are supposed to be feelings, the case is in no wise altered. Take a hundred of them, shuffle them and pack them as close together as you can (whatever that may mean); still each remains the same feeling it always was, shut in its own skin, windowless, ignorant of what the other feelings are and mean. There would be a hundred-and-first feeling there, if, when a group or series of such feelings were set up, a consciousness belonging to the group as such should emerge. And this 101st feeling would be a totally new fact; the 100 original feelings might, by a curious physical law, be a signal for its creation, when they came together; but they would have no substantial identity with it, nor it with them, and one could never deduce the one from the others, or (in any intelligible sense) say that they evolved it.

Take a sentence of a dozen words, and take twelve men and tell to each one word. Then stand the men in a row or jam them in a bunch, and let each think of his word as intently as he will; nowhere will there be a consciousness of the whole sentence.[14] ... The associationists say the mind is constituted by a multiplicity of distinct 'ideas' associated into a unity. There is, they say, an idea of a, and also an idea of b. Therefore, they say, there is an idea of a + b, or of a and b together. Which is like saying that the mathematical square of a plus that of b is equal to the square of a + b, a palpable untruth. Idea of a + idea of b is not identical with idea of (a + b). It is one, they are two; in it, what knows a also knows b; in them, what knows a is expressly posited as not knowing b; etc. In short, the two separate ideas can never by any logic be made to figure as one and the same thing as the 'associated' idea.

This is what the spiritualists keep saying; and since we do, as a matter of fact, have the 'compounded' idea, and do know a and b together, they adopt a farther hypothesis to explain that fact. The separate ideas exist, they say, but affect a third entity, the soul. This has the 'compounded' idea, if you please so to call it; and the compounded idea is an altogether new psychic fact to which the separate ideas stand in the relation, not of constituents, but of occasions of production.

This argument of the spiritualists against the associationists has never been answered by the latter. It holds good against any talk about self-compounding amongst feelings, against any 'blending,' or 'complication,' or 'mental chemistry,' or 'psychic synthesis,' which supposes a resultant consciousness to float off from the constituents per se, in the absence of a supernumerary principle of consciousness which they may affect. The mind-stuff theory, in

[13] [James' footnote:] J. Royce, 'Mind,' VI. p. 376. …

[14] [James' footnote:] "Someone might say that although it is true that neither a blind man nor a deaf man by himself can compare sounds with colors, yet since one hears and the other sees they might do so both together. [...] But whether they are apart or close together makes no difference; not even if they permanently keep house together; no, not if they were Siamese twins, or more than Siamese twins, and were inseparably grown together, would it make the assumption any more possible. Only when sound and color are represented in the same reality is it thinkable that they should be compared." (Brentano; Psychologie, p. 209.)

> short, is unintelligible. Atoms of feeling cannot compose higher feelings, any more than atoms of matter can compose physical things! The 'things,' for a clear-headed atomistic evolutionist, are not. Nothing is but the everlasting atoms. When grouped in a certain way, we name them this 'thing' or that; but the thing we name has no existence out of our mind. So of the states of mind which are supposed to be compound because they know many different things together. Since indubitably such states do exist, they must exist as single new facts, effects, possibly, as the spiritualists say, on the Soul (we will not decide that point here), but at any rate independent and integral, and not compounded of psychic atoms.[15] [1890, pp. 158-62]

James is not allowing any room for self-compounding or combining of feelings or experiences. He points out clearly that also for "atoms", "when grouped in a certain way, *we* name them this 'thing' or that; but the thing we name has no existence out of our mind." A 'thing' does not exist outside of our mind, there is no such substance or subject to be considered as a 'thing', it is simply a grouping together of atoms. The same is true with experiences; *they cannot become a new experience solely by being grouped together*. James recognizes that "higher mental states" can emerge, but "a higher state is not a lot of lower states; it is itself"! "But such emergence is that of a new psychic entity", and not "an 'integration' of the lower states as the mind-stuff theory affirms." New experiences are facts, no one denies that part, but they are not old experiences grouped together that now emerge into a new experience.

In the quote above, James also brings a quote from Josiah Royce, where Royce writes: "For the spectator it is one; in itself it is an aggregate; just as, to the consciousness of an ant crawling over it, it may again appear a mere aggregate." It is our good old same (microscopic) ant that we saw Greene discuss above, as jumping from one Planck to another. For "the consciousness of an ant", there is only one Planck at a time, there is no 'thing' made out of Planck's, and there can neither be a new experience between two adjacent Planck's. Because "to the consciousness of an ant" there is always the 'experience' of each individual Planck, and any supposed experience between the Planck's, is simply "outside the bounds of physical reality" as Greene phrased it. James also points out later on, that there are difficulties with what "may be called the *theory of polyzoism or multiple monadism*;" (Ibid., p. 179) that would allow only for *combinations* of atoms already evolved as a

[15] [James' footnote:] The reader must observe that we are reasoning altogether about the *logic* of the mind-stuff theory, about whether it can *explain the constitution* of higher mental states by viewing them as *identical with lower ones* summed together. We say the two sorts of fact are not identical: a higher state is not a lot of lower states; it is itself. When, however, a lot of lower states have come together, or when certain brain-conditions occur together which*, if they occurred separately, would produce* a lot of lower states, we have not for a moment pretended that a higher state may not emerge. In fact it does emerge under those conditions; and our Chapter IX will be mainly devoted to the proof of this fact. But such emergence is that of a new psychic entity, and is *toto coelo* different from such an 'integration' of the lower states as the mind-stuff theory affirms.
… That, notoriously enough, is a fact: our consciousness is a series of feelings to which every now and then is *added* a retrospective consciousness that they have come and gone. What Mr. Ward and I are troubled about is merely the silliness of the mind-stuffists and associationists continuing to say that the 'series of states' *is* the 'awareness of itself;' that if the states be posited severally, their collective consciousness is *eo ipso* given; and that we need no farther explanation, or 'evidence of the fact.'

"brain-cell" to become conscious, because a "cell is no more a unit, materially considered, than the total brain is a unit", and the cells "are in turn compounds of atoms."

> Every brain-cell has its own individual consciousness, which no other cell knows anything about, all individual consciousness being 'ejective' to each other. There is, however, among the cells one central or pontifical one to which *our* consciousness is attached. But the events of all the other cells physically influence this arch-cell; and through producing their joint effects on it, these other cells may be said to 'combine.' …
> But, to offset these advantages, one has physiological difficulties and improbabilities. There is no cell or group of cells in the brain of such anatomical or functional pre-eminence as to appear to be the keystone or centre of gravity of the whole system. And even if there were such a cell, the theory of multiple monadism would, in strictness of thought, have no right to stop at it and treat it as a unit. The cell is no more a unit, materially considered, than the total brain is a unit. It is a compound of molecules, just as the brain is a compound of cells and fibres. And the molecules, according to the prevalent physical theories, are in turn compounds of atoms. The theory in question, therefore, if radically carried out, must set up for its elementary and irreducible psycho-physic couple, not the cell and its consciousness, but the primordial and eternal atom and its consciousness. [Ibid., pp. 179-80]

James cannot allow for a "brain-cell" to "have its own individual consciousness," without "if radically carried out," to conclude that it is "not the cell and its [individual] consciousness, but the primordial and eternal atom and its [individual] consciousness." And this James concludes, "although [it's] not self-contradictory, becomes so remote and unreal as to be almost as bad as if it were." (Ibid., p. 180) So how do we explain that new experiences arise without allowing for old experiences to combine? For this we will use the theory that we will call 'HOT'[16], but disagree with one fundamental principle of it, only to make it become more coherent and intelligible.

6.2 HOT

The philosopher, David Rosenthal, developed in *Two Concepts of Consciousness* (1986) the theory of "higher-order thought", and it is a theory worth mentioning for our purposes here. But we will first have to strip it from one of its fundamental principles, which Rosenthal deemed necessary. In the theory there are *first-order* perceptions of blue for example, and then there is a *higher-order thought* that can *think* the mental state someone is in having this multiple first-order perceptions of blue. According to Rosenthal, in our example, a perceiving first-order is *not aware of itself (self-aware or self-evident),* and therefore it can also not be conscious *of* itself or be experiencing for that matter. In Rosenthal's words[17]: "*the first-order perception would, on my view, make one aware, but not consciously aware, of whatever objects and properties are perceived,"*—and "I think people are aware of mental states when those states are conscious states, and I agree that the term, 'experience', applies only to mental states that are conscious." In other words, *first-order level is not*

[16] "HOT" was also already introduced by David Rosenthal as an abbreviation for "Higher-Order Thought".
[17] This was written by Rosenthal when he did me the honor of reviewing the chapter 'HOT'.

self-aware or experiencing. So how do you make your perception *become* conscious? Here Rosenthal introduces the higher-order thought than can *think* a mental state that have a *group of first-order perceptions,* and it is with this higher-order thought that your lower-order mental state *becomes conscious*. But in turn, this higher-order thought is also *not self-evident* and therefore does not become conscious *of* itself, in order to make this higher-order thought become conscious you will need a *third-order thought*, that is *thinking* the mental state of the second-order thought you are having, which is according to Rosenthal what we do when we *introspect*. But once again, now this third-order thought is also *not self-evident* and therefore cannot be conscious of itself, unless you can manage to have a fourth-order thought, etc.

Somehow Rosenthal has allowed for higher-order thoughts to make lower-order *mental states* that have *contents* become conscious, without the higher-order thoughts themselves being *self-evident or experiencing*. His theory does not have an infinite regress regarding how a thought becomes conscious, because at some point you simply stop making the one-higher thought becoming conscious. So far so good, but according to this theory, the highest-order thought in your *stream of thoughts* at that moment, which is *aware* according to Rosenthal (whatever that means), is *neither self-aware* nor *self-evident,* not *conscious* nor *experiencing*. And every thought or perception that happens to be *one-order lower* than that higher-order thought, is also *aware* but *not aware of itself*. So the obvious question now is, *what is it that is actually self-aware in order to be responsible*[18] *for the experiences you are having*? All you get is a chain of higher and lower –orders; all of them are *aware*, but none of them are self-aware, so what is actually self-evident and *making you experience*?

If at that moment in your stream of thoughts, the highest-order thought is 'aware' but *not self-aware*, *then at that moment all there is, is a non-self-evident awareness that is not experiencing*. You can thus at most be *thinking* the first-order mental state as the *content* of your higher-order thought; and you cannot *think* the self-evidence or experiencing of the lower-order either, because it too is *not self-evident*! Rosenthal seems to explain very well which thought can *think* a particular mental state, but not which thought can *experience* a particular mental state. He falls to the same

[18] Rosenthal's response: "On my view, argued extensively in articles such as "How to Think about Mental Qualities" and "Explaining Consciousness," both available on my website at http://tinyurl.com/drpubn, I think that the HOT is responsible for there being something it's like for one to see blue, for example. The first-order perception of blue, which is not intrinsically conscious, is responsible for the psychological processing, apart from conscious awareness, to go with seeing a blue stimulus.
As I said in my last email, you assume, so far as I can tell without argument (though with some appeal to authority), that consciousness is in some way intrinsic to the state that is conscious. I am contesting that, and at various places have given arguments against it."

fatal critique[19] James expressed upon these kinds of theories, where two unconscious states supposedly can *combine* into one conscious state. According to James you cannot even possibly have unconscious mental states, "they may be unconscious of much in the reality which the other states are conscious of. But that does not make them in *themselves* a whit dim or vague or unconscious." (1890, p. 174) And then James also writes in *A World of Pure Experience. II* that: "a thing in itself …—that is, it must be an experience *for* itself whose relation to other things we translate into the action of molecules, ether-waves, or whatever else the physical symbols may be." (1904c, p. 569) "A thing in itself" always "must be an experience *for* itself", and not as Rosenthal[20] claims in his theory.

And it is even more fatal to Rosenthal, because he doesn't even allow for any *awareness of itself* to *emerge*. The strength of the critique can also be better understood by thinking of it in *time-slices*. If the HOT is happening at time 2, and the lower-order perception at time 1; according to Rosenthal I would experience the lower-order perception at time 2, and not at time 1. But experiencing is always happening in the constant and *eternal* 'now'[21], I cannot be experiencing in time 2 what happened in time 1, because it already *happened*, it's not here anymore to be experienced 'now'. So in order to experience the perception of time 1, I need to be experiencing it in time 1, and not in time 2. Because in time 2 it is already too late to experience the perception of time 1, it is already gone in the past. Unless I can experience in time 2 the *experience of the HOT itself* thinking time 1, but that would also not be possible according to Rosenthal, because this I would only experience in time 3. It is as if the experience is always one time-slice away, *so when are we experiencing*? Rosenthal's theory would work for a *universe of zombies* where there might be thoughts, but no experiencing; unfortunately it doesn't work for an *experiencing universe like ours*.

The reason why Rosenthal doesn't allow for *self-evidence* to be is itself not self-evident, but it is not a necessary addendum for the theory. Once we remove this obstacle, it allows for his theory to shift from the universe of zombies to our experiencing universe. We can apply the same theory but allow for perceptions and thoughts to be *self-evident* and *experience themselves, which is the same as experiencing what they are in relation with*. We can also drop the 'thing' as becoming the *content* of a perception, or lower-order mental states becoming the *content* of a higher-order

[19] Rosenthal's response to this critic: "I don't think that the compounding you discuss in the section just before the HOT section is relevant to the higher-order-thought theory.
The cooocurrence [sic] of a higher-order thought with the that [sic] is makes one aware of is not at all, on my theory, one of compounding two states. Rather, it is simply that the higher-order thought makes one aware of oneself as being in the first-order state."

[20] Rosenthal's response to this critic: "I don't know what you mean by self-aware. I do not think any mental states are aware of themselves, and I do not know what else one could mean by saying that they are self-aware. I think people are aware of mental states when those states are conscious states, and I agree that the term, 'experience', applies only to mental states that are conscious. That, however, is no reason to think that their property of those states' being conscious is intrinsic or internal to the states, though many, seemingly yourself included, simply assume that without argument."

[21] This phrasing resembles the *eternal* 'now' of *Parmenides*.

thought. A perception can *relate to or experience* a 'thing', but what would it even mean to *have* it as its *content*? Now that we have allowed for *self-evidence*, we can also allow for a thought to *relate to or experience* a perception. The same goes for mental states, a higher-order thought can *relate to or experience* lower-order mental states. So in order to experience what a *related group* of first-order thoughts are experiencing, you will need a *higher-order thought*, that is *experiencing* the *related group of first-order thoughts*, which is what we do when we *introspect*. But if perceptions or thoughts are *not self-evident* or *self-aware*, then whenever a higher-order is *about* a lower-order, it is never actually experiencing them. This doesn't mean of course, that we are actually *experiencing* at every moment every *possible self-aware experience*. The possible experiencing of, for example, *subliminal perceptions*[22] would not be experienced by us; instead, we would be experiencing the self-awareness of frontal perceptions or other thoughts at that time. Not all self-awareness is equally experienced in our *stream of experiencing*, like there is a difference between higher-order and lower-order experiences, as we will soon see. Regarding this, James writes the following:

> To be radical, an empiricism must neither admit into its constructions any element that is not directly experienced, nor exclude from them any element that is directly experienced. For such a philosophy, *the relations that connect experiences must themselves be experienced relations, and any kind of relation experienced must be accounted as 'real' as anything else in the system*. Elements may indeed be redistributed, the original placing of things getting corrected, but a real place must be found for every kind of thing experienced, whether term or relation, in the final philosophic arrangement. [1904b, p. 534]

For James, you cannot "admit into its constructions any element that is not directly experienced, nor exclude from them any element that is directly experienced." And James points out that this is so because "*the relations that connect experiences must themselves be experienced relations, and any kind of relation experienced must be accounted as 'real' as anything else in the system*." But this doesn't mean that all possible experiences are also actually being experienced. And in *The Principles of Psychology* James also writes the following about "faint" and "vague cognizers":

> Again, the feelings from our viscera and other dimly-felt organs, the feelings of innervation (if such there be), and those of muscular exertion which, in our spatial judgments, are supposed unconsciously to determine what we shall perceive, are just exactly what we feel them, perfectly determinate conscious states, not vague editions of other conscious states. They may be faint and weak; they may be very vague cognizers of the same realities which other conscious states cognize and name exactly; they may be unconscious of much in the reality which the other states are conscious of. But that does not make them in *themselves* a whit dim or vague or unconscious. They *are* eternally as they feel when they exist, and can, neither actually nor potentially, be identified with anything else than their own faint selves. A faint feeling may be looked back upon and classified and understood in its relations to what went before or after it in the stream of thought. But it, on the one hand, and the later state of mind which knows all these things about it, on the other, are surely not two conditions, one conscious and the other 'unconscious,' of the same identical psychic fact. It is the destiny

[22] The example of "subliminal perception" was first remarked by Rosenthal, who brought it to my *stream of experiencing*.

> of thought that, on the whole, our early ideas are superseded by later ones, giving fuller accounts of the same realities. But none the less do the earlier and the later ideas preserve their own several substantive identities as so many several successive states of mind. To believe the contrary would make any definite science of psychology impossible. [1890, p. 174]

Subliminal perceptions then "may be unconscious of much in the reality which the other states are conscious of. But that does not make them in *themselves* a whit dim or vague or unconscious."

We can concretize our new version of HOT now, let 'A' be the *property* which has the perception of *blue* which is a *primary colour*, and 'B' the *property* which has the perception of *yellow* which is also a *primary colour*, and 'C' is then the relation of 'A' and 'B' which makes it the *element green*, green being a *secondary colour,* meaning, it is a *combination of blue and yellow*. So when *Charlie* sees blue, 'A' is experiencing it, and when he sees yellow, 'B' is experiencing it. All Charlie needs in order to experience blue is for 'A' to see blue, and because of 'A' being *self-evident*, Charlie will also experience blue, the same goes for yellow but with 'B'. But how does Charlie who has never seen or experienced green, get to see or experience green? When 'A' and 'B' are both seeing and experiencing simultaneously blue and yellow that are the *properties* of green, Charlie is still not seeing or experiencing green. Because 'A' cannot see or experience green and neither can 'B', so how can he experience green? 'Surely Charlie can see and experience green with 'C' you say', but what is 'C'? 'Well, 'C' is the *combination* of 'A' and 'B'!' can be a possible answer, but that would still not allow him to see or experience green, as we have elaborated in the previous chapter and above at length. Because 'C' has *not become* any-thing which is neither in 'A' or 'B', 'C' is just 'A' and 'B' "represented in the same reality" (Brentano in note 14), but it *is* not green, it never becomes another *thing or colour*. Besides, if 'A' and 'B' are enough for Charlie to experience 'C', then he should be able to experience green without ever having seen it. All Charlie will have to do is *think* blue and yellow simultaneously, and 'C' would experience green. Obviously this is not possible, Charlie has *actually to see green, and have a new property 'E' emerge to experience it.*

But when Charlie will see green for the first time, he will surely also experience green, so *new experiences are possible*. Yet with the arguments above it seems that all that Charlie would ever see is blue and yellow simultaneously, but never green! This is where HOT kicks in, when Charlie sees blue and yellow "represented in the same reality", a *higher-order property* 'E' becomes activated, which can experience 'A' and 'B', and 'A' and 'B' being in a relation 'C', and it is 'E' that *is* the *new element and colour* that can *self-evidently experience itself as green*! So when Charlie sees blue and yellow combined for the first time, the higher-order 'E' *is* created or activated, and Charlie can finally enjoy the experience of green. This is what James means with "a higher state is not a lot of lower states; it is itself", 'E' *is itself the green*, and being *self-evident*, it also experiences itself as green! So

does that mean that everything experiences, and a chair experiences itself being a chair? Is the only solution in order to allow for experiences to be, the inevitable *panpsychism*? Not for Mach, James, Russell or Boman; they don't see a chair experiencing itself being a chair, but both Mach and James might allow for an element to be self-evident and experience itself being an element, or even an atom being self-evident and experiencing itself being an atom; which can mean equally much or not much, as Russell will allow, for a plant experiencing itself being a 'plant'. And this means that:

> The essence of "experience" is the modification of behaviour produced by what is experienced. … When an organism, either animal or plant, is subjected to a stimulus, producing in it some state of excitement, the removal of the stimulus allows it to return to a condition of equilibrium. But the new state of equilibrium is different from the old, as may be seen by the changed capacity for reaction. [Russell, 1921, p. 83]

The plant that experiences sunlight will *change* into a *new state of equilibrium that is different from the old state of equilibrium*. But a chair is just atoms in a certain relation allowing *us* to see and experience a chair, the chair cannot change into a new state of equilibrium that is different from the old state of equilibrium. And there is also no *higher-order* in the chair that can experience any *relation of the atoms* being part of the chair, unless you view *us* as being the *higher-order experiencing* the chair. So when Mach explains why his writing might *seem* to be by way of idealism, he also mentions that "Many are the victims that fall a prey to pan-psychism":

> For, of all the approaches to my standpoint, the one by way of idealism seems to me the easiest and most natural. And connected with this is the fear of pan-psychism, which at the same time seizes my readers. Many are the victims that fall a prey to pan-psychism, in the desperate struggle between a monistic conception of the universe and instinctive dualistic prejudices. In my early youth I had to work through these tendencies myself, and Avenarius was still labouring at them in his book of 1876. [1914, p.362]

And it is obvious that Mach doesn't think anything close to panpsychism, but it is this struggle between monism and dualism that is reason for many to opt out for panpsychism. Also Boman sees panpsychism as something "primitive":

> In that sense, even to the Hebrew, 'being' was something objective which existed independently of him and stood fast. The 'being' of things and of the world as the totality of things was to him something living, active, and effective, a notion which, however, has nothing at all to do with primitive pan-psychism. [1954, p. 45]

For "the Hebrew, 'being' was" "something living, active, and effective," and yet to him at the same time "'being' was something objective which existed independently of him and stood fast." And this notion "however, has nothing at all to do with primitive pan-psychism." James only mentions briefly that: "This opens the chapter of the relations of radical empiricism to panpsychism, into which I can not enter now." (1904c, p. 569) But as we have seen above, James does hold that an *emergence* of a

higher state of experiencing exists, this means at least, that not every-thing has an equal state of experiencing. And then there is also the same quote from above about "individual consciousness":

> Every brain-cell has its own individual consciousness, which no other cell knows anything about, all individual consciousness being 'ejective' to each other. …
> The theory in question, therefore, if radically carried out, must set up for its elementary and irreducible psycho-physic couple, not the cell and its consciousness, but the primordial and eternal atom and its [individual] consciousness. We are back at Leibnitzian monadism, and therewith leave physiology behind us and dive into regions inaccessible to experience and verification; and our doctrine, although not self-contradictory, becomes so remote and unreal as to be almost as bad as if it were. Speculative minds alone will take an interest in it; and metaphysics, not psychology, will be responsible for its career. That the career may be a successful one must be admitted as a possibility—a theory which Leibnitz, Herbart, and Lotze have taken under their protection must have some sort of a destiny. [1890, pp. 179-80]

James doesn't want to speculate about the possibilities of a "primordial and eternal atom and its [individual] consciousness." This kind of panpsychism he will leave to "metaphysics, not psychology, [which] will be responsible for its career." Also Russell wants to reintroduce the "conception of quality, which plays such a large part in our perceptual life" into the physical world, and believes that it is not possible anymore for physics to ignore "*qualities*":

> In the present chapter, I wish to consider what can be meant by the "quality" of an event; …
> Physics traditionally ignores quality, and reduces the physical world to matter in motion. This view is no longer adequate. …
> When we start from perceptions instead of from mathematical physics, we find that the events with which we are best acquainted have "qualities," by means of which they can be arranged in classes and series. … But this whole conception of quality, which plays such a large part in our perceptual life, has been wholly absent from traditional physics. Colours, sounds, temperatures, etc., have all been regarded as caused by various kinds of motions. There was no objection to this so far as it succeeded, but, if and where it proves insufficient, there can also be no objection to reintroducing qualitative differences into the physical world. [1927, pp. 345-6]

Russell understands that we have to be "reintroducing qualitative differences into the physical world", especially "if and where it proves insufficient" to simply cling on to a "view [which] is no longer adequate." We also have to reintroduce experiencing into the physical world, especially if the old conception that all is "caused by various kinds of motions", "is no longer adequate." Experiencing is a *fact* we all *experience*, it has nothing to do with panpsychism, or has to become therefore more mysterious than many other mysteries. In the next chapter we will encounter other "strange" mysteries that physics has to deal with, in order to allow for the world to be understood as *we experience it*. Our experiencing is not a reason to think chauvinistically that experiencing is reserved only for humans, experiencing is probably much more widespread than we can imagine, it is at its lowest-order most probably *omnipresent*. *Experiencing lower-order experiences-in-relation* though, *introspection*, is a scarce commodity in our universe, *because it requires a higher-order experience*.

6.3 Entropies arrow of time

> For example, the electron could emit a photon *before* absorbing one (b)[23]. Even more strange is the possibility (c) that the electron emits a photon, then *travels backwards in time* to absorb the photon, and then proceeds forwards in time again. The path of such a "backwards-moving" electron can be so long as to appear real in an actual physical experiment in the laboratory. …
> The backwards-moving electron when viewed with time moving forwards appears the same as an ordinary electron, except … it's called a "positron." The positron is a sister particle to the electron, and is an example of an "anti-particle."
> This phenomenon is general. Every particle in Nature has an amplitude to move backwards in time, and therefore has an anti-particle. When a particle and its anti-particle collide, they annihilate each other and form other particles. … Photons look exactly the same in all respects when they travel backwards in time[24]—as we saw earlier—so they are their own anti-particles. [Feynman, 1985, pp. 97-8]

I promised you in the last chapter some other "strange" *mysteries* besides experiencing, and there is no better place to find them than reading Feynman's book *QED* from 1985. There he allows for "Every particle in Nature … to move backwards in time," how mysteriously "strange" it might sound. That a particle "*travels backwards in time"* seems absurd, it defies all we experience about the *arrow of time* and what is defined as *entropy*, or does it? Did physicists simply postulate entropy in order to allow us to understand the world *as we experience it*? Let's first describe entropy.

> First, entropy is a measure of the amount of disorder in a physical system. High entropy means that many rearrangements of the ingredients making up the system would go unnoticed, and this in turn means the system is highly disordered (…). Low entropy means that very few rearrangements would go unnoticed, and this in turn means the system is highly ordered (…). Second, in physical systems with many constituents (…) there is a natural evolution toward greater disorder, since disorder can be achieved in so many more ways than order. In the language of entropy, this is the statement that *physical systems tend to evolve toward states of higher entropy*. [Greene, 2004, pp. 154-5]

Greene explains that *states of higher entropy* is simply put, *greater disorder*. Now Greene adds that a state of high entropy *can* also go to one of lower entropy:

> The tendency of physical systems to evolve toward states of higher entropy is known as the *second law of thermodynamics*. (The first law is the familiar conservation of energy.) As above, the basis of the law is simple statistical reasoning: there are more ways for a system to have higher entropy, and "more ways" means it is more likely that a system will evolve into one of these high-entropy configurations. Notice, though, that this is not a law in the conventional sense since, although such events are rare and unlikely, something *can* go from a state of high entropy to one of lower entropy. [Ibid., p. 156]

[23] To view the illustrations (b) and (c), I recommend purchasing the book *QED* (1985).
[24] If a photon can travel backwards in time, maybe Descartes could have allowed for 'thoughts' to also be freed of the laws of time. Descartes could have made the perfect analogy with photons and mind; photons have neither size nor mass—so it's not extended—and yet photons can interact with matter, and carry the information with them from objects to our retina. Photons are not even limited to the arrow of time, and they are their own anti-particle, allowing only for themselves to eliminate themselves. They can even become non-locally entangled, and defy therewith almost all known laws. Too bad Descartes didn't know this; he might have dropped dualism only to allow for mind to compare with photons.

Once we understand that the *second law of thermodynamics*, entropy, "is not a law in the conventional sense", we can better understand how it can explain the "arrow of time":

> Although it may not be immediately apparent, we have now come to an intriguing point. The second law of thermodynamics seems to have given us an arrow of time, *one that emerges when physical systems have a large number of constituents*. [Ibid., p. 157]

So now that we understand that entropy tends towards disorder, and that entropy also explains the arrow of time, we can conclude that it's only with the "arrow of time", that everything becomes more disordered, and therefore in a "higher state of entropy". Entropy *is* "the arrow of time"!

> Notice, too, that this entropic arrow is not completely rigid; there is no claim that this definition of time's direction is 100 percent foolproof. Instead, the approach has enough flexibility to allow these and other processes to happen in reverse as well. …
> This seems like a convincing story. Statistical and probabilistic reasoning has given us the second law of thermodynamics. In turn, the second law has provided us with an intuitive distinction between what we call past and what we call future. … But … the full story of time's arrow is more surprising. Boltzmann realized that although entropy had illuminated important aspects of the puzzle, it had *not* answered the question of why the past and the future seem so different. Instead, entropy had redefined the question in an important way, one that leads to an unexpected conclusion. [Ibid., pp. 158-9]

So why does entropy *not* explain the arrow of time? How the question has been redefined by the physicist, Ludwig Boltzmann, is what Greene explains next in "an unexpected conclusion":

> This leads us to a simple but astounding point: *Since Newton's laws of physics have no built-in temporal orientation, all of the reasoning we have used to argue that systems will evolve from lower to higher entropy toward the future works equally well when applied toward the past.* Again, since the underlying laws of physics are time-reversal symmetric, there is no way for them even to distinguish between what we call the past and what we call the future. Just as there are no signposts in the deep darkness of empty space that declare this direction up and that direction down, there is nothing in the laws of classical physics that says this direction is time future and that direction is time past. The laws offer no temporal orientation; it's a distinction to which they are completely insensitive. And since the laws of motion are responsible for how things change—both toward what we call the future and toward what we call the past—the statistical/probabilistic reasoning behind the second law of thermodynamics applies equally well in both temporal directions. Thus, *not only is there an overwhelming probability that the entropy of a physical system will be higher in what we call the future, but there is the same overwhelming probability that it was higher in what we call the past.* [Ibid., p. 160]

In classical physics, particles and laws can go as equally well *forward as backward in time*! This is also why Feynman can say that an electron "*travels backwards in time" without having broken any laws of physics!* Travelling forwards with the arrow of time is only true for how *we* experience and perceive '*things'*; *it is not true for ultimate particles or laws*! Entropy only explains *our experiencing of the universe*, what *we call* greater order or disorder; entropy does *not* explain anything about the

various *relations of the ultimate building-blocks* of the universe—*including ourselves*. But Greene keeps explaining why, according to Boltzmann, there does seem to be order instead of disorder:

> It was a small step for Boltzmann to realize that the whole of the universe is subject to this same analysis. When you look around the universe right now, what you see reflects a great deal of biological organization, chemical structure, and physical order. Although the universe could be a totally disorganized mess, it's not. Why is this? Where did the order come from? Well, just as with the ice cubes, from the standpoint of probability it is extremely unlikely that the universe we see evolved from an even more ordered—an even less likely—state in the distant past that has slowly unwound to its current form. Rather, because the cosmos has so many constituents, the scales of ordered versus disordered are magnified intensely. And so what's true at the bar is true with a vengeance for the whole universe: it is *far* more likely—breathtakingly more likely—that the whole universe we now see arose as a statistically rare fluctuation from a normal, unsurprising, high-entropy, completely disordered configuration. [Ibid., pp. 166-7]

So in order to explain how we experience the world as being ordered *and* having an arrow of time, Boltzmann postulates "that the whole universe we now see arose as a statistically rare fluctuation from a normal, unsurprising, high-entropy, completely disordered configuration"; because "it [the above postulate] is *far* more likely—breathtakingly more likely—" than to postulate "that the universe we see evolved from an even more ordered—an even less likely—state in the distant past that has slowly unwound to its current form." Boltzmann understood that to postulate that the universe was at some earlier point more ordered than today, is only making the problem worse. Because if you cannot explain how it's possible that the universe is as ordered as it is *today*, you surely will not be able to explain how the universe was supposedly even more ordered *before today*! So Boltzmann rather postulates that the universe had a "rare fluctuation" and *voila*, we get a *low-entropy—high-ordered* universe as a result. It is that hard for Boltzmann to even *imagine* a possible higher-ordered state prior to today, that he rather postulates another fantastic story. Yet, our current physics still postulates that the *big bang* was exactly this *low-entropy—high-ordered* moment we were all looking for:

> We have now come to the place where the buck finally stops. *The ultimate source of order, of low entropy, must be the big bang itself.* In its earliest moments, rather than being filled with gargantuan containers of entropy such as black holes, as we would expect from probabilistic considerations, for some reason the nascent universe was filled with a hot, uniform, gaseous mixture of hydrogen and helium. Although this configuration has high entropy when densities are so low that we can ignore gravity, the situation is otherwise when gravity can't be ignored; then, such a uniform gas has extremely low entropy. In comparison with black holes, the diffuse, nearly uniform gas was in an extraordinarily low-entropy state. Ever since, in accordance with the second law of thermodynamics, the overall entropy of the universe has been gradually getting higher and higher; the overall, net amount of disorder has been gradually increasing. …
> *The future is indeed the direction of increasing entropy. The arrow of time—the fact that things start like this and end like that but never start like that and end like this—began its flight in the highly ordered, low-entropy state of the universe at its inception.*

> That the early universe set the direction of time's arrow is a wonderful and satisfying conclusion, but we are not done. A huge puzzle remains. How is it that the universe began in such a highly ordered configuration, setting things up so that for billions of years to follow everything could slowly evolve through steadily less ordered configurations toward higher and higher entropy? Don't lose sight of how remarkable this is. … Probabilistically speaking, it is mind-bogglingly more likely that everything we now see in the universe arose from a rare but every-so-often-expectable statistical aberration away from total disorder, rather than having slowly evolved from the even more unlikely, the incredibly more ordered, the astoundingly low-entropy starting point required by the big bang. … The puzzle then is to explain how the universe began in such an unlikely, highly ordered configuration. *That* is the question to which the arrow of time points. It all comes down to cosmology. …but notice first that our discussion of time suffers from a serious shortcoming: everything we've said has been based purely on classical physics. Let's now consider how quantum mechanics affects our understanding of time and our pursuit of its arrow. [Ibid., pp. 173-7]

Greene points out that we cannot understand the arrow of time with classical physics alone, in other words, until the 1920's the arrow of time could not be understood to actually exist, *except that we experience it that way*. It could not be understood to exist because "Probabilistically speaking, it is mind-bogglingly more likely that everything we now see in the universe arose from a rare but every-so-often-expectable statistical aberration away from total disorder, rather than having slowly evolved from the even more unlikely, the incredibly more ordered, the astoundingly low-entropy starting point required by the big bang." We need some other understanding of physics to allow us to understand how an arrow of time is possible in our universe, this other understanding of physics has only become possible through *quantum mechanics*. So that's where we shall go next.

7 Shaping the past in the constant present

> Classical physics, which relies on the commonly held belief that happenings have unique, conventional histories, would say that any electron that makes it to the detector screen went through either the left slit or the right slit. But this view of the past would lead us astray…
> Quantum physics provides just such an explanation, but in doing so it drastically changes our stories of the past—our descriptions of how the particular things we observe came to be. ... Maybe each individual electron itself actually travels through both slits on its way to the screen, and the data result from an interference between these two classes of histories. That is, it's tempting to think of the waves emerging from the two slits as representing two possible histories for an individual electron—going through the left slit or going through the right slit—and since both waves contribute to what we observe on the screen, perhaps quantum mechanics is telling us that both potential histories of the electron contribute as well.
> Surprisingly, this strange and wonderful idea—the brainchild of the Nobel laureate Richard Feynman, one of the twentieth century's most creative physicists—provides a perfectly viable way of thinking about quantum mechanics. According to Feynman, if there are alternative ways in which a given outcome can be achieved—for instance, an electron hits a point on the detector screen by traveling through the left slit, or hits the same point on the screen but by traveling through the right slit—then there is a sense in which the alternative histories all happen, and happen simultaneously. …
> Feynman called this the sum over *histories* approach to quantum mechanics; it shows that a probability wave embodies all possible pasts that could have preceded a given observation, and illustrates well that to succeed where classical physics failed, quantum mechanics had to substantially broaden the framework of history. [Greene, 2004, pp. 179-80]

Classical physics held the “belief that happenings have unique, conventional histories,” but quantum physics claims that there can be “two possible histories for an individual” happening. As if this is not enough, according to Feynman “there is a sense in which the alternative histories all happen, and happen simultaneously.” “Feynman called this the sum over *histories* approach”, “and illustrates well that to succeed where classical physics failed, quantum mechanics had to substantially broaden the framework of history.” Now, what exactly does it imply when according to Feynman “alternative histories all happen, and happen simultaneously”?

> You might wonder how literally you should take the sum over histories description. Does an electron that strikes the detector screen *really* get there by traveling along all possible routes, or is Feynman's prescription merely a clever mathematical contrivance that gets the right answer? This is among the key questions for assessing the true nature of quantum reality, so I wish I could give you a definitive answer. But I can't. Physicists often find it extremely useful to envision a vast assemblage of combining histories; I use this picture in my own research so frequently that it certainly feels real. But that's not the same thing as saying that it *is* real. The point is that quantum calculations unambiguously tell us the probability that an electron will land at one or another point on the screen, and these predictions agree with the data, spot on. [Ibid., p. 182]

So “it certainly feels real” to “take the sum over histories description” as what is “the true nature of quantum reality,” but if you press Greene to “give you a definitive answer” if “it *is* real”, he would have to admit and answer: “But I can't.” It is “Clear that classical and quantum physics treat the past

in very different ways." (Ibid., p. 184) Greene has three variations that tell us the story of how different both physics treat the past "to an even greater, even more surprising level":

> Some simple variations of these experiments take this challenge to our intuitive notion of how things unfold in time to an even greater, even more surprising level.
> The first variation is called the *delayed-choice* experiment and was suggested in 1980 by the eminent physicist John Wheeler. The experiment brushes up against an eerily odd-sounding question: Does the past depend on the future? [Ibid., p. 186]

And to this Greene offers a mysteriously strange answer, but after all we have seen, can we really still expect anything in our universe to be mysterious or strange?

> It's as if the photons adjust their behavior in the past according to the future choice of whether the new detector is switched on; … It's as if a consistent and definite history becomes manifest only after the future to which it leads has been fully settled. …
> The actual past, of course, did not change one bit. Yet a different experience now would lead you to describe a different history.
> In the psychological arena, rewriting or reinterpreting the past is commonplace; our story of the past is often informed by our experiences in the present. But in the arena of physics—an arena we normally consider to be objective and set in stone—a future contingency of history makes one's head spin. To make the spinning even more severe, Wheeler imagines a cosmic version of the delayed choice experiment in which the light source is not a laboratory laser but, instead, a powerful quasar in deep space. …
> What's striking about this version is that, from our perspective, the photons could have been traveling for many billions of years. Their decision to go one way around the galaxy, like a particle, or both ways, like a wave, would seem to have been made long before the detector, any of us, or even the earth existed. Yet, billions of years later, the detector was built, installed along one of the paths the photons take to reach earth, and switched on. And these recent acts somehow ensure that the photons under consideration act like particles. They act as though they have been traveling along precisely one path or the other on their long journey to earth. But if, after a few minutes, we turn off the detector, the photons that subsequently reach the photographic plate start to build up an interference pattern, indicating that for billions of years they have been traveling in tandem with their ghostly partners, taking opposite paths around the galaxy.
> Has our turning the detector on or off in the twenty-first century had an effect on the motion of photons some billions of years earlier? Certainly not. Quantum mechanics does not deny that the past has happened, and happened fully. Tension arises simply because the concept of *past* according to the quantum is different from the concept of *past* according to classical intuition. Our classical upbringing makes us long to say that a given photon *did* this or *did* that. But in a quantum world, our world, this reasoning imposes upon the photon a reality that is too restrictive. As we have seen, in quantum mechanics the norm is an indeterminate, fuzzy, hybrid reality consisting of many strands, which only crystallizes into a more familiar, definite reality when a suitable observation is carried out. It is not that the photon, billions of years ago, decided to go one way around the galaxy or the other, or both. Instead, for billions of years it has been in the quantum norm—a hybrid of the possibilities.
> The act of observation links this unfamiliar quantum reality with everyday classical experience. Observations we make today cause one of the strands of quantum history to gain prominence in our recounting of the past. In this sense, then, although the quantum evolution from the past until now is unaffected by anything we do now, the story we tell of the past can bear the imprint of today's actions. If we insert photon detectors along the two pathways light takes to a screen, then our story of the past will include a description of which pathway each photon took; by inserting the photon detectors, we ensure that which-path information is an essential and definitive detail of our story. But, if we don't insert the photon detectors, our story of the past will, of necessity, be different. Without the photon

> detectors, we can't recount anything about which path the photons took; without the photon detectors, which-path details are fundamentally unavailable. Both stories are valid. Both stories are interesting. They just describe different situations. [Ibid., pp. 188-91]

This amazing passage by Greene is worth being read at least two-three times, and is yet another reason to go ahead and buy his amazing book of over 500 pages. Greene is explaining a lot of his findings based on the *double-slit experiment*, which we are not going to enter into in this thesis. “The actual past, of course, did not change one bit”, but still Greene can say: “Yet a different experience now would lead you to describe a different history.” And again, this is not based on “the psychological arena, [where] rewriting or reinterpreting the past is commonplace;” “But in the arena of physics—an arena we normally consider to be objective and set in stone—a future contingency of history makes one's head spin”! So if you feel that your head is spinning after this last passage, *this means only that you have actually understood the passage*! “Has our turning the detector on or off in the twenty-first century had an effect on the motion of photons some billions of years earlier?” is the billion dollar question, “Certainly not” is the first answer to be understood very well to this question. Remember, quantum mechanics doesn’t allow for your *experience today* to change what *happened yesterday*, the question is rather: *what did happen yesterday*?

When we try to find out what *happened* yesterday, or billions of years ago, it is not correct to say that “a given photon *did* this or *did* that”; “Instead, for billions of years it has been in the quantum norm—a hybrid of the possibilities.” So “Observations we make today cause one of the strands of quantum history to gain prominence in our recounting of the past”; and therefore “the story we tell of the past can bear the imprint of today's actions.” And this is then why Greene finishes this section in his chapter *Time and the Quantum* with the following:

> An observation today can therefore help complete the story we tell of a process that began yesterday, or the day before, or perhaps a billion years earlier. An observation today can delineate the kinds of details we can and must include in today's recounting of the past. [Ibid. p. 191]

It is with “An observation today”, *in the constant present*, that we can complete and *shape* “a process that began yesterday”, in *the past*. There seems not to be *absolute space* or *absolute time*, neither does there seem to be an *absolute subject* or an *absolute substance*; there is also no *absolute change* or *absolute movement*, neither are there any *absolute ‘things’*; they are rather *all processes*. There seems also not to be *absolute matter* or an *absolute mind*, but they are rather a *relative ‘mattermind’*; *now there is also no absolute past or an absolute future; they are rather experienced in the constant present and shaped relatively accordingly, what else did you expect?!*

> If you can't change something that has already happened, can you do the next best thing and erase its *impact* on the present? To one degree or another, sometimes this fantasy can be realized. A baseball player who, with two outs in the bottom of the ninth inning, drops a routine fly ball, allowing the opposing team to close within one run, can undo the impact of his error by a spectacular diving catch on the ball hit by the next batter. And, of course, such an example is not the slightest bit mysterious. Only when an event in the past seems definitively to preclude another event's happening in the future (as the dropped fly ball definitively precluded a perfect game) would we think there was something awry if we were subsequently told that the precluded event had actually happened. The *quantum eraser*, first suggested in 1982 by Marlan Scully and Kai Drühl, hints at this kind of strangeness in quantum mechanics. [Ibid., pp. 191-2]

In this second variation, Greene is asking if *erasing the impact* of the past on the present is possible, when changing "something that has already happened" is impossible, and Greene answers that "sometimes this fantasy can be realized." It is "Only when an event in the past seems definitively to preclude another event's happening in the future", that it becomes impossible to undo the *impact* of the past, because *nature* doesn't allow for *contradictions in the happening's* to arise. "And, of course, such an example is not the slightest bit mysterious", that here is nothing *mysterious* about *nature or experiencing* was mentioned already, even though there seems to be "hints" of some "kind of strangeness in quantum mechanics." It is *our view of reality* which has to be changed, in order to accommodate what *we experience* and can *experimentally prove* to be the nature of the universe.

> Thus, as this discussion forcefully highlights, the story you'd tell to explain the signal photon data depends significantly on measurements conducted ten years after those data were collected.
> Again, let me emphasize that the future measurements do not change anything at all about things that took place in your experiment today; the future measurements do not in any way change the data you collected today. But the future measurements do influence the kinds of details you can invoke when you subsequently describe what happened today. ... We thus see that the future helps shape the story you tell of the past.
> These experiments are a magnificent affront to our conventional notions of space and time. Something that takes place long after and far away from something else nevertheless is vital to our description of that something else. By any classical—commonsense—reckoning, that's, well, crazy. Of course, that's the point: classical reckoning is the wrong kind of reckoning to use in a quantum universe. We have learned from the Einstein-Podolsky-Rosen discussion that quantum physics is not local in space. If you have fully absorbed that lesson—a tough one to accept in its own right—these experiments, which involve a kind of entanglement across space and through time, may not seem thoroughly outlandish. But by the standards of daily experience, they certainly are. [Ibid., pp. 198-9]

In this third variation Greene is finishing off with a "crazy" variation, but "Of course, that's the point". The experiments which Greene discusses—which we will not go into in this thesis— "are a magnificent affront to our conventional notions of space and time." By now we already understand that "quantum physics is not local in space", and that's why "Something that takes place long after and far away from something else nevertheless is vital to our description of that something else." This "lesson" that Greene taught us through experiments of quantum physics, makes it clear that "a

kind of entanglement across space and through time" is actually happening. And this is how it is possible to make the following statement without having to be necessarily "crazy": "We thus see that the future helps shape the story you tell of the past." *Shaping the past in the constant present!*

So how do we end up understanding the arrow of time according to Greene? Because after all of this, we have not yet answered the question of *how the arrow of time and entropy are possible*; we only answered how *we can experience* time and how *entropy is postulated* to accommodate *our experience of* the *arrow of time*.

> Thus, even though a time-asymmetric law would provide a partial explanation for why things unfold in one temporal order but never in the reverse order, it could very well call for the same key supplement required by time-symmetric laws: an explanation for why entropy was low in the distant past. Certainly, this is true of the time-asymmetric modifications to quantum mechanics that have so far been proposed. And so, unless some future discovery reveals two features, both of which I consider unlikely—a time-asymmetric solution to the quantum measurement problem that, additionally, ensures that entropy decreases toward the past—our effort to explain the arrow of time leads us, once again, back to the origin of the universe, the subject of the next part of the book. [Ibid., p. 216]

And this is where I will have to disappoint you for the first time, because we cannot follow Greene's voyage "to the origin of the universe" in this thesis. This question in the previous chapter was a necessary one though, in order to follow the new realizations about *relative time*—both, the past-future, and the present—through the arena of quantum mechanics. Our *constant experience* bridges between the *past* and the *future*, and allows it to be *shaped* according to the *constant present*; without, of course, creating *contradictions* and *paradoxes* between the different *happenings*. To find out Greene's answer to the arrow of time, I can only recommend reading part III of his book.

7.1 Time has content

> We have examined the ideas underlying the expression of *calculable* time and more than once have found that the Israelites understood time as something qualitative, because for them time is determined by its content. We shall now look into this side of the Israelite understanding of time. [Boman, 1954, p. 137]

Again we see that Boman—as Greene did through quantum mechanics 50 years later—hits the concept of time right on its head by interpreting the Israelites. Boman realizes that time is actually "qualitative", and is not "*calculable*" or "mathematical" "determined" by its "unique, conventional histories," but rather by its *experienced* "content." We have already mentioned Russell above who makes the strong case that "qualities" have to be reintroduced into the "physical world":

> In the present chapter, I wish to consider what can be meant by the "quality" of an event; … Physics traditionally ignores quality, and reduces the physical world to matter in motion. This view is no longer adequate. …

> When we start from perceptions instead of from mathematical physics, we find that the events with which we are best acquainted have "qualities," … But this whole conception of quality, which plays such a large part in our perceptual life, has been wholly absent from traditional physics. … There was no objection to this so far as it succeeded, but, if and where it proves insufficient, there can also be no objection to reintroducing qualitative differences into the physical world. [1927, pp. 345-6]

Those two giants—Russell and Boman—have understood how *Parmenides and Zeno*, and later *Plato and Aristotle* have brought the *unity* of "events" in our lives to a staggering *fragmentation*, thereby making it impossible to have a living, dynamic and active process in a "*calculable*" and "mathematical physics" of the *matter of space*. Boman speaks his *mind* in an Israelite/Hebrew voice:

> a. *The identity of consciousness.* For us space is like a great container that stores, arranges, and holds everything together; space is also the place where we live, breathe, and can expand freely. Time played a similar rôle for the Hebrews. Their consciousness is like a container in which their whole life from childhood on and the realities which they experienced or of which they had heard are stored. Because every person is and remains identical with himself, a consolidating unity adheres to each person's psychical content which could be expressed thus: all this is my world, my existence. … Seen from the inside his personal experiences form a unity, a world; in that world he moves freely and with ease. Thus even while the Hebrew lives in time, time-distinctions play a very trifling rôle for him. … Consciousness comprises an entire life as a unity and cannot be divided like space; even an event is a coherent whole. It is essentially inadmissible to break up or analyse this unity into a series of segments or rapidly consecutive points of time. … When a song is being sung, its beginning, in our spatial manner of thinking, already belongs to the past and its end still to the future; but essentially the song is a living unity which, even after it has been sung to the end and logically belongs to the past, is something present and in the highest sense real. The possibility of conceiving as a unity a melody that has been sung demonstrates that for us, too, the now, the earlier, and the later are a unity, and so too are past, present, and future. We would not follow Bergson when he tries to explain melody as the harmonious working together and fusion of sounds, but we would regard melody, word, speech, meaningful acts, and above all our own individual psychical existence as originally temporal data which are comprehensible without explanation for every man who has any conscious psychical life.
> Moreover, we Europeans must learn to regard events as facts that are and abide. The sound waves that mediate the melody to us disperse (as indeed all light waves, too, vanish or are somehow turned into heat), but the melody itself lingers and never perishes for us, as psychology teaches us. [1954, pp. 137-8]

With this most excellent and fantastic quote from Boman, we can *wrap-up* what James means with "breathe" and "experience", Russell with "qualities" and "events", and Greene's "future [that] helps shape the story you tell of the past." Boman is saying that for the Hebrews, all "the realities which they experienced" is the "content" inside "a container" of "consciousness" where they "live, breathe, and can expand freely." This played itself out as "a consolidating unity", so that "even an event is a coherent whole." And this then becomes "expressed thus: all this is my world, my existence."

James would have wanted his 'I breathe' and 'experience' to be phrased this way; this whole world and existence of mine, 'is' my *breath* and 'is' my *experience*. 'I' don't *think* 'it' or *know* 'it' from

a certain *subjective* point in this universe, but it rather 'is' my breathing and constant experiencing of "events as facts that are and abide." But for James this is not "each person's psychical content" as Boman remarks about the Hebrews, but this is rather true for *every-thing* that breathes and experiences it *being* in a *subject/object relation*, which then can also *switch* around and *become* in an *object/subject relation*; this happens within events in this *all-encompassing breathing and experiencing universe*. What is a subject ('I') and relates to an object ('it') can become the object ('it') for a subject ('I'). Confused? Let's take our two buddies, Tom and Frank as an example. For Tom who *experiences himself* as a *subject* ('I'), it's Frank that is an *object*, the object *being* this 'thou'[25] called Frank; but for Frank who *experiences himself* as a *subject* ('I'), it's Tom that is an *object*, the object *being* this 'thou' called Tom. Tom and Frank can *think* that the *other experiences himself as a subject*, but they don't *experience the other as a subject*; at most they can experience the other as an *object (thou) experiencing himself as a subject*, but Tom can never *experience being* Frank or vice versa. Every-thing is *breathing* and *constant experiencing* each-other all the time according to James, without having to descent into *panpsychism*, as mentioned before.

Russell, who is making the case of reintroducing qualities into the physical world, believes this also to be possible only thanks to "what can be meant by the "quality" of an event". It is through "events" that qualities can arise, even though that for Russell:

> There is, however, a considerable difficulty in finding laws governing what we are calling "qualities." In a world of continues processes, one would say that qualities must change gradually. But in quantum process they apparently change suddenly. Perhaps, however, this suddenness does not exist in a steady rhythmic process; or perhaps, even if it does, it may involve small changes producing a serial character in the successive qualities. [1927, pp. 346-7]

Without going into the detailed technical difficulties and solutions offered by Russell, we will focus on a solution offered to "qualities", that doesn't seem to have a "continues processes," but "apparently change[s] suddenly." Russell views "qualities" as *events happening* on 4 co-ordinates paths, which don't contradict with a "mathematical physics" in any way, but rather "by means of which they can be arranged in classes and series." This can be explained in the classical "mathematical physics" way of thinking, as events travelling a path of numbers: 1→2→3→4→5→6→7. Qualities can then be reintroduced as letters: blue=A, yellow=B, blue and yellow=C, and green=E; which can give us the following: 1A, 2B, 3AB(C), 4E, 5A, 6E, 7B. Now 1 can travel from: 1A→2B or: 1A→3AB(C) or: 1A→5A; and neither case will contradict "mathematical physics" with qualities reintroduced into it. The same with: 2B→3AB(C) or: 2B→7B, neither case will contradict "mathematical physics" with qualities

[25] I am alluding to Martin Buber's distinction between an 'I'/'thou' and an 'I'/'it', as pointed out to me by Wes Wallace.

reintroduced into it. When the event: 1A→3AB(C) or: 1A→5A happens, you can still *experience blue*; but when the event: 1A→2B happens, it doesn't contradict "mathematical physics", but you might not *experience blue* as a continued process, or maybe even at all in this particular event. This way of viewing "events" and "qualities" will be better understood with Greene's "future [that] helps shape the story you tell of the past."

Greene allows for the past to be told every time different in the constant present, because for Greene *the whole past is always one long event*. It is in this container of *spacetime* that the whole past has always an "entanglement across space and through time" with the future. Different than Boman, who had to describe the Hebrews experiencing of time as: "comprehensible without explanation for every man who has any conscious psychical life", "as psychology teaches us." Greene can claim thanks to quantum mechanics that "In the psychological arena, rewriting or reinterpreting the past is commonplace; our story of the past is often informed by our experiences in the present. But in the arena of physics—an arena we normally consider to be objective and set in stone—a future contingency of history makes one's head spin." It's not like Boman suggests only "In the psychological arena" that we experience events, "But [it's] in the arena of physics" that our *observations and constant experiences today shape the past events*.

What decides if 1A will travel: 1A→2B or: 1A→3AB(C) or: 1A→5A, is shaped according to our experience of 1A today. If we don't *experience blue* (A), then 1 travels: 1→2→3→4→5; but the moment we do *experience blue* (A), then 1A travels to 5A and doesn't need to travel through: 1→2→3→4→5, but travels right away as: 1A→5A. Of course *this doesn't mean that we can experience* 5A traveling *backwards in time* to 1A, even though this is possible according to the laws of physics, and experimental proven to be the case for photons, as seen above from the quote of Feynman. Now, if we end up *experiencing today* 1A as having actually been *green* (E) *yesterday*, then we *shape* our past according to the new present with a different story; now we will tell the story that 1A travelled to 3AB(C)—Blue and yellow=(C)—where 1A then continued its travel to 4E, and became *green*. While what we see today, as 1A having travelled to 5A, is because there is a *prism that filters* the yellow (B) from 3AB(C) which made it become *blue* 5A again, after having been *green* 4E. But we cannot tell the story that 1A travelled to 3AB(C) and then to 6E yesterday, because then it couldn't have become again *blue* 5A *today,* that would be travelling *backwards in time*. We cannot tell a story of two happenings that will *contradict* each other or have a *paradox* amongst them. All the other possible stories we tell, is then also all the paths 1A *has* travelled. "Feynman called this the sum over *histories* approach", as he also made clear by demonstrating how photons do behave. And again, this is not in the *psychological arena*, but in

the *physical arena* that those *stories* are told according to our *current observation and constant experience*. Feynman and Greene might limit the "sum over *histories* approach"—written out in these last subchapters—to elements without size or mass. As the *probabilities* of elements with size and mass, will resemble the history of *particles* "set in stone", as we will see in the next subchapter. But we can allow ourselves even according to physics—with all the arguments presented in this thesis until now—to regard at least *past events with qualitative experienced content*—which are in *"*the physical world" and in the "arena of physics"—*to be shaped by stories which are told and experienced in the constant present*!

7.2 A stubbornly persistent illusion

Yet after all this is said and done, according to Einstein and Greene, *all* of our *past*, and also already our *future*, *are* "set in stone". The only possible *change*, or what we would also call *movement*, *is only in how we tell the story today*! It looks like Parmenides and Zeno will never be left out of our understanding of the universe, they are apparently also "set in stone" in our past. According to the *big bang theory*, our universe *expanded* like a balloon to the size and shape it has today, with all the elements *sticking to its surface* and moving further along with the balloon as it continues expanding. The elements would each move away from the other at the speed of the expansion, *entropy*, where it not for *gravity* that causes for elements to stay together as *The Fabric of the Cosmos* keeps on expanding. Except that the elements don't *jump* from one *thread*—of the balloon that is expanding—to the other thread; *the elements are still at each thread too, as well in the past, present and future!* They are "set [there] in stone"! This is what Einstein meant when he wrote a condolence letter, as his closest and oldest friend, Michele Besso, died in March 1955:

> Now he has departed from this strange world a little ahead of me. That means nothing. People like us, who believe in physics, know that the distinction between past, present and future is only a stubbornly persistent illusion. [Dyson, 1979, p. 193]

You could say that it is "a stubbornly persistent illusion" indeed, but what is meant by that exactly? In order to answer this question, Greene suggests imagining the whole universe to be like a *loaf of bread*, where you can slice into. Let's take again our 1→2→3→4→5→6→7 example, where you can see it as being 7 different moments, or the 7 days of the week which have been *sliced* into our universe, we now have 7 different *time-slices*. We can also have 'A', 'B', 'AB'(C), and 'E' on each of the different time-slices. Now our good buddies Tom and Frank are each going to make sure to *observe* when 'A' would supposedly have *left* 1A and have *arrived* respectively at each his own time-slice; Tom *observes* time-slice 2, and Frank *observes* time-slice 3. Frank says he just *now observed* 'A' to have arrived at 3A; but it is not because 'A' is *now* for Frank at 3A, that 'A' has *left* 1A or 2A;

because out of Tom's perspective who observes time-slice 2, 'A' *is just now* at 2A. 'A' *is now here* for Tom, even though that out of Frank's perspective 'A' *is now here*. And they are of course both right, 'A' is both at 2A and 3A simultaneously; it is only out of either perspective that 'A' has moved 1→2A or 2→3A. Because our homunculus who I sneakily placed to observe time-slice 1; *is just now observing* 1A, and will observe that 'A' *is now* at 1A! And again, the three of them will of course be right, 'A' did not actually *move*: 1A→2A→3A, it is only from *their different perspectives* that it did.

If we will approach it the other way round it might become even clearer yet; imagine our homunculus is observing time-slice 6, while both Tom and Frank are at time-slice 3 and agree on 'A' *being now* at 3A. But for our homunculus 'A' *is now* at 6E; because our homunculus tells the story that he *experienced* 3A→4AB(C)→5AB(C)→6E. While time-slice 6 is 3 days away for Tom and Frank, yet when Tom and Frank will arrive at time-slice 6 in 3 days, they both will agree with our homunculus that 'A' *is now* 6E. Even though they can tell the story according to their *experience*, that 3A→4A→5AB(C)→6E. So it seems that 3A is also already 'set in stone" to *become* 6E in Tom's and Frank's *future*, but this, Tom and Frank don't know yet at time-slice 3, 4 or 5; only the homunculus knew at time-slice 6, while Tom and Frank were still at time-slice 3, that 3A will end up becoming 6E. They can tell different stories of how it *happened* and how *they experienced* it, but not of the actual being of 6E in time-slice 6. Here we can conclude that the "past, present and future" are "set in stone", and there is no "distinction" between them, at least, if you "believe in physics".

So if you would have this bird-eye view of the *entire universe at once*—as a *loaf of bread*—for one week. You would *observe* 'A', 'B', 'AB'(C), and 'E' being *smeared* out along some path across the entire length of it, from: 1→2→3→4→5→6→7, becoming: 1ABCE→2ABCE→3ABCE→4ABCE→5ABCE→6ABCE→7ABCE, each "quality" on its particular path, with sometimes one "quality" crossing another "quality". But you would not be able to speak of any *movement* or *change* for that matter; it will all be there as one *piece of lump*, with *lines* of different colours through it, some *blue*, other *yellow*, and where they cross, you would get this special colour *green*. Now, if you would also be observing our homunculus, Tom and Frank in that loaf of bread, you would also see them *smeared* out through: 1→2→3→4→5→6→7, as 'H', 'T', and 'F'. So you will get: 1HTF→2HTF→3HTF→4HTF→5HTF→6HTF→7HTF; and all three of them would be like 'things' for you, who are *smeared* out like *lines* through this one piece of lump, which has no *movement and change*. Even though you might *know* that they are in there *experiencing* themselves as being homunculus, Tom and Frank for the duration of a week. Now that's what I would call "a stubbornly persistent illusion" indeed; yet, *we do constantly experience, or do we?*

8 Concluding with zombies

According to Greene and other physicists, we are only experiencing as an *epiphenomena*; which means as much as, experience being some-thing that *hovers and floats* above what is *actually and really happening*. The experiencing isn't a *self-evident ingredient* of our universe; it's rather a freak coincidence that happens to be there at some point in the universe. We have already seen above, that this is not a sustainable argument anymore, because if this would be the case, *what is* experiencing then? *Some-thing needs to be experiencing, and non-experiencing elements cannot become experiencing elements, however floatingly you imagine experiencing to be.* Yet for Greene this argument is somehow true in *low states of entropy*, in a low state of entropy, *order* starts to form, and all kind of things *can happen*, including experiencing. And we are currently in a low state of entropy, so that's why stars, planets, life and eventually experiences are being formed; *they are all—including stars and planets—being formed as an epiphenomena to the real underlying process of disorder the universe is actually moving towards*. Once we will reach a *high state of entropy*, every-thing will dissolve back into *disorder*, including experiences, life, planets and stars, according to Greene. Of course Greene cannot explain how comes we *are* currently in a low state of entropy, no one can for that matter, *it just happens to be so*. There are theories that can make it plausible for a low state of entropy to stay *consistent* with what we know today in quantum mechanics, but that still doesn't explain *why there was* a low state of entropy to begin with. *It remains a mystery not much less mysterious than experiencing itself.*

Besides, when you are watching the *piece of lump* with our homunculus, Tom and Frank *smeared* through it, you don't see there to be any experiencing smeared along with them, because apparently it is only an epiphenomena that hovers above the *real smearing*. If you are observing: 1HTF→2HTF→3HTF→4HTF→5HTF→6HTF→7HTF, but now over 7 billion years; then in the 1st, 2nd and 3rd billion years there would be no experiencing, *as order is still being formed*, then in the 4th billion year there would finally *have formed* experiencing, only to disappear again in the 5th, 6th and 7th billion year, when *disorder* kicks in. But from your birds-eye view, there would not be any difference between the billion years 1-3, 4, and 5-7; they would all look equally smeared in with 'HTF'. So it is easy to conclude that experiencing does *not necessarily have to exist* in order to explain[26] what you are seeing in that piece of lump; and this is why Greene concludes that it is an epiphenomenon at best. This is out of an *economical* reasoning, if we can explain the piece of lump without experiencing, why introduce experiencing?

[26] This is another version of what is known as "The Explanatory Argument" by David Chalmers (2002).

So why does Greene introduce experiencing as an epiphenomena into our universe? Because even a physicist happens to experience, and he cannot deny that *we are experiencing*; so we experience as an epiphenomenon is the best remaining solution available for a physicist, even if it's at the expense of not being economical. But if you are not being economical anyhow, why not allow for experience to be an active self-evident ingredient of the universe? This will swoop away in one go with the problem of how a non-experiencing element can end up experiencing, and with the problem of experiencing being epiphenomenal, which looks like a bag we all have to carry above our heads because we cannot seem to get rid of it. This could also explain why you don't seem to observe any experiencing in the piece of lump, not because it is *floating somewhere 'above' there*, but because it is *in* the smearing, *it is in it and self-evident, you are looking at it!* But this will demand a re-evaluation of our current understanding of matter, which brings us right back to the first quote of this thesis by Russell.

What if I were to tell you that I tricked you? I tricked you by not having told you that our homunculus is actually a *zombied homunculus*; and a zombied homunculus behaves exactly like an *experiencing homunculus*, except that it doesn't experience[27]! So you were observing from your bird-eye view 'HTF' closely, and using all the best possible measurements equipment that we have out there. Yet, you had to postulate that 'H', 'T', and 'F' are epiphenomenal experiencing, and admit that you cannot measure it; but 'H' did not experience, epiphenomenal or otherwise, you were postulating something wrong, which you couldn't measure and it was neither economical. You happen to have been right about 'T' and 'F', but that's only because you were *assuming* them to be experiencing *like yourself*. Experiencing could be happening right before your eyes, and you would not be able to *measure* or *know*[28] it in any way as experiencing or not, all you're left with are *assumptions* which you are *projecting from your own experiences*.

The example of *lucid dreams* can also be useful here, because the difference between a dream being lucid or not can only be recounted by the dreamer. But how would we know about any dream being lucid or not, if the *dreamer* never *wakes up*? Her dreams would always be *non-lucid* to us, no matter how lucid the dream might have been. *What else is dreaming in our presence?* Our universe could be experiencing right before our eyes, and you would not be able to *measure* it in any way as experiencing or not, all you're left with are *assumptions* which you are *projecting from your own constant experiencing*. Our zombied homunculus might not be experiencing, but he might be *gnicneirepxe*[29], but we will never *know* that unless we become ourselves a zombied homunculus.

[27] This is another version of what is known as "The Conceivability Argument" by Chalmers, Ibid.
[28] This is another version of what is known as "The Knowledge Argument" by Chalmers, Ibid.
[29] *gnicneirepxe* is of course *experiencing* written backwards.

The point is not to be speculating, the opposite is true; the point is to realize that we *are* constant experiencing, and we therefore do live in a universe that *is* constant experiencing—be it epiphenomenal or self-evident—in a relative 'mattermind'. And when some-one who looks at this *piece of lump that is our universe*, and concludes that it is not experiencing, *we would know with certainty that she is wrong, but no-thing we do will be able to prove that to her. She will have a stubbornly persistent illusion that no-thing in our universe is experiencing, or would she not?*

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