TIME TRAVEL,
LOGIC
AND
SPECULATION

Laurent Dubois – 2002

What's the logical point of view on the possibility of the time travel at will to whatever time of the relative past or future, with or without machine ?

The analysis will be essentially dedicated to the assumption of the travel in the future because its possibility seems less obvious than that of the travel in the past. As it was suggested by Pascal, it seems "easier to conceive that what already was either still, than what was not yet be already".

A) SIMULTANEITY AND INSTANTANEITY

Above all, it should be noted that the possibility of travelling in time supposes the capacity to cross the "wall" of time. How to arrive to such or such part of the past or the future if it is necessary "to take the time" of reaching it ? Displacement in time should last, at most, only the "time of Planck", that is to say 10^{-43}s. One can thus raise from the start the character undoubtedly unsuitable of the expression "time travel". But this problem will not be developed nor analysed here. It is not question either of answering the questions, however essential, of knowing "where" - hyperspace, parallel universes, beyond, other dimensions - are the times of destination, nor "how" – Black holes/ White fountains, wormholes, machines, quantum scanning... - to reach them. Essential questions since they compel to define an "identity" of time. This identity will be declined a priori according to three assumptions:

- time is the only way for an entity to be different from itself and to occupy two different space's positions. (Kant, Heidegger, Dubois (theorem of time))

- time is the number of the movement according to before and after (Aristote)

- time is the expression of a causal relation through concepts of "past, present and future"?

Objective: to play the game of the speculation and to imagine the possibility of finding himself "instantaneously" with such or such part of the past or the future. "Instantaneously" !

Consequence: the individual is "simultaneously" what he is in his time and what he must be or what he was in the invested time, according to whether it is of the future or the past, and in so far as it is one time included in the history, the time of existence, of the individual. Indeed, the instantaneity of the travel in time supposes the effective and current realization of all the past and all the future. To reach the year 3001 at the moment, it is necessary that currently is carried out what accounts for the year 3001, or rather it is necessary that is carried out the year 3001. In the same way, to find itself in 1895 "at the moment", it is necessary that all that represents the moment of the year 1895 that one invests, exists indeed somewhere, in this universe or in another dimension, at the moment when these lines are written. To be allocated to the "traveller" of time, one can say that at the same time he "is, will be and was". To extend the logical movement, one can say that this individual "is" simultaneously "his entire temporal development". Indeed, since he can at every moment decide to go to whatever part of the past or of the future, one needs that all these times all exist somewhere at the same time, i.e. "coexist", because there is no formal reason to privilege some time rather than another.

B) DETERMINISM

To what does lead the need for the current and total achievement of the past and the future ? To the absolute determination of the development of "being" and "thought". More there is no place for

chance and freedom since all is already realized, or rather, all is carried out without any possibility for anybody exerting on this realization least true control. It thus does not matter the question of the possibility of investing instantaneously a time different from ours : arrive what must occur.

To go at the end of the reasoning, it should be admitted that the words registered here were always determined and that this consciousness even, this reflexive return on the text being written, is predetermined, and thus ad infinitum, any entity, any expression carried in a universal inertia. Why the enumeration isn't prolonged ? Would the author of these lines express some free-will ? Here in any case is the occasion of wondering about the capacity of suggestion of the word and on the propensity of the mind to be caught with the play of the reasoning until the absurdity. Absurdity ?

C) PROOF OF THE IMPOSSIBILITY OF THE TIME TRAVEL

Assumption : possibility of the instantaneous investigation of any time different from the present.

Consequence : current, effective, simultaneous realization of all the past and all the future.

The future being currently carried out, there is at one more or less remote time in the future, an individual who discovered the possibility of traveling in time. From the moment of this discovery until the infinite, one imagines easily that the man has all the leisure to explore the times posterior and former to his own one. But then, how to believe that an infinity of individuals having eternity to explore the vestiges of their past civilization would not have left the least trace of their passage to one or the other time of past which is common for us ?

Highly improbable; this possibility can be assimilated to a universally negligible probability in the sense of Borel.

Nevertheless, this demonstration does not have all the rigor of the scientific reasoning.

It supposes initially that humanity will not perish. But how to believe that it can disappear completely if it is permissible with a handle of men of going to take refuge in one past or future time in the event of imminent universal catastrophe in their present ? Then, it is supposed that the individual will have all the leisure to use this invention, and especially that an infinity of individuals will profit from it. Easy to believe since humanity cannot perish, and that at a rate of only one individual per terrestrial year during an eternity, to adopt a pessimistic point of view, an infinity of individuals would have the occasion to invest our centuries. Thank you, Cantor !

Lastly, calculation of the desire, at these men of the future, to discover the past of humanity concretely. But one can speak without exaggerating of “need” to know the past, if the man to come resembles even a little to the man of today. In any case, it seems that one cannot imagine a thinking being, human or different, stripped of curiosity.

It is necessary to be let convinced by these arguments, while recognizing their probabilistic character in the sense of Bayes/Ramsey.

D) EXTENSION OF THE THESIS RELATIVE TO THE CHAPTER INSTANTANEITY AND SIMULTANEITY

The first demonstration showed that the possibility of the time travel implies “all the development” of any being at the same moment and at every moment. Does one imagine the “phenomenal” obstruction of the universe in such a case ? Chaos reigns : all the possible events must occur simultaneously. But where “to put them” ? One might as well say that the vacuum and the silence alone would reign, because good-bye time. Overflow of being ! Too much of all. All, nothing.

Unless... the coexistence of several universes, the “multiverses”... Theory of the quantum reduction of the universe by Hugh Everett III. A kind of extension of the “wave of probability” from the micro to the macro level. All the possible variants in the course of the events give birth to as many branches of universe.

The question is then to know if there exist bridges between these universes and which is the

nature of these means of communication.

Another answer to the problem of the "phenomenal" obstruction could come from the existence of the "wormholes", or of the "white fountains", these symmetrical and complementary structures to the "black holes".

These assumptions make the object of another article.

E) ADDITIONAL ARGUMENTS "AGAINST" THE POSSIBILITY OF THE TIME TRAVEL

Having the preoccupation with an exhaustiveness, here some other arguments which will make improbable or impossible the time travel at any part of the relative past or future, with or without machine.

For Christian Grenier, "the time travel suffers from certain contradictions with the most elementary logic, which draws aside it from the scientific field" (the S.-F., readings with a future ?).

"A barrier is drawn up, that of logic wanting that one cannot at the same time be here and elsewhere", adds Van Herp. The simple possibility of the time travel is a paradox and modifies the course of the events, as opposed to what Watzlawick says in "The reality of reality" : "It retrogresses fifteen years (what takes to him, let us say, a few minutes), stops the machine and leaves there, thus recovering in the course from time... in a point where he is himself fifteen years old. If he is satisfied with looking at around without causing any effect - namely, without fitting in any manner in causality by an action or a communication - it will produce nothing strange. But as soon as it starts to interact, the amusing and disconcerting consequences will follow." Precisely, by his simple presence, the time traveller interacts with his environment and is, ipso facto, the cause of a chaotic phenomenon, a butterfly effect due to a disturbance of the initial conditions, as could have discovered it Bradbury if he had been until the end of its reasoning in "A thunder clap", not seeing that a sudden appearance in the world is at least as disturbing as the fact of crushing a butterfly. (in this novel, facetiously, the temporal butterfly effect is caused by the… dead of a butterfly at the Jurassic!)

The paradoxes caused by a voluntary or involuntary act of the time traveller constitute of course new argument against the possibility of the time travel :

- the "grandfather" paradox - positive "and" negative retroaction's loops - in "Le voyageur imprudent" of Barjavel :

- "He goes back in time.
- He kills his ancestor?
- Therefore he does not exist.
- Therefore he doesn't go back in time.
- Therefore he does not kill his ancestor.
- Therefore he exists.
- Therefore he goes back in time.
- Therefore he kills his ancestor.
- Therefore he does not exist.
- Therefore he doesn't go back in time.
- Therefore he does not kill his ancestor.
- Therefore he exists... "

- and the paradox of "knowledge" in "The end of Eternity" of Asimov :

- to go to seek in the future an information which will be at its own origin in the past.

are the best examples.

Temporal butterfly effect, “grandfather” and ”knowledge” paradoxes are nothing else than three versions of the same ontological paradox which can be synthesized in the following way : by its identity, i e. the distinction between past, present and future, time gives its meaning to the assumption of travel ing in time, but if the time travel is possible, it removes its identity, its meaning at time, which results in to make "impossible" the time travel. The alternative is: Time or Time Travel; Time exists, ergo Time Travel doesn’t exist.

By a retroactive effect, these three paradoxes not only show that contradictions appear because of the reintroduction of the logic after having removed it, but precisely that the contradiction is “original”, the initial expression “time travel” is auto contradictory!

This idea, that I have formalized in the first part of this article (first version written in the mid 80’s) and in which I develop the argument of the loss of the identity of the time, has been proposed independently, but not formalized, by the twin brothers Igor and Grischka Bogdanoff : “If the voyage towards the past had been invented somewhere in the future, we would surely have already received the visit of a man of the future”. This is an argument, still not formalized, that has been advanced by Stephen Hawking who said that “The best proof that the time travel is impossible is that we have not be invaded by some hordes of tourists of the future”. In addition, Hawking thinks that nature detests the machines to travel in time. It is an idea that he develops in his conjecture of “chronological protection”, according to which the laws of physics prohibit the machines to travel in time : “each time somebody tries to make a machine to travel in time, and whatever the device used for this purpose (a worm hole, a cylinder in rotation, a "cosmic string", or anything other), just before the device does becomes a temporal machine, a beam of fluctuations of the vacuum crosses it and destroys it”. Hawking showed that quantum fluctuations of fields would become infinite in the vicinity of a mouth of a worm hole, - my argument of the “infinite temporal overprinting” arrives at the same conclusion by a reasoning of pure logic -, preventing the formation of time loops or destroying the traveller who would approach a Loop of the time kind. Hawking called with humor that its assumption “makes it possible to keep the world sure for the historians”.

The Bogdanoff brothers advance another argument to cancel the possibility of the time travel : “the entropy of a system can be only increasing ; in other words, which we name “flow of time” is only a direct function of the entropy to which all the systems (biological or not) are subjected. As it is impossible to reduce the entropy of a system, it would be also impossible to reverse time and, a fortiori, to travel in the past”, (Keys for the science fiction).

Directly connected with the problem of entropy, the question of the modification of the “total mass” of the universe due to the sudden apparition or vanishing of a time traveler has been suggested by Robert Silverberg in “The Time Hoppers” : this is clearly in contradiction with “$e=mc^2$” and with the experimental observations of Lavoisier establishing that “Nothing disappears, nothing appears, all is becoming/changing”.

On a practical and an humoristic ground, the possibility of the time travel would constitute a funny explanation to the mysterious disappearing of entities all time/history long.

Less powerful arguments against the possibility of traveling in time consist in disparaging the interest of the time travel because the temporal short-circuit, the absolute determinism, the temporal reduction and the infinite temporal overprinting do not offer very amusing prospects to the individual who wants to explore the past or the future. These prospects will be developed in a forthcoming article.

Let us return finally to the assumption of the theory of the multiple universes to note that it reveals ab absurdo the importance of the principle of economy of nature and the relevance and the topicality of the remark of Leibniz according to whom we evolve in “The best possible world”. It seems that a universe without possibility of traveling in time is the best possible world, because it presents the optimum of existence.

F) COUNTER-ARGUMENTS "FOR" THE POSSIBILITY OF TIME TRAVEL

To allow some open perspective, and in a divergent, disrespectful foot-of-nose towards the principles of the classical argumentation which wants that positive arguments were first advanced, here, now, the arguments which will make possible or even probable the time travel at any part of the relative past or future, with or without machine.

Against the argument of Grenier and Van Herp, one can point out that the barrier of logic wanting that one cannot at the same time be here and elsewhere, is actually only one axiom, on what “rests” logic. A fundamental axiom cannot be shown. It contradicts thus not logic.

Against argument of Hawking proposing risks of infinite fluctuations of quantum fields at the time of creation of the time travel machine, Deutsch and Lockwood answer that infinites, which one knows that they are the obsession of the physicists and the mathematicians, simply reveals an insufficiency of the theory. Deutsch and Lockwood cancel also the argument of Hawking-Bogdanoff-Dubois on the absence of invasion of hordes of the future because the wormhole would make it possible to go up in time only until the time of its creation and not beyond. Deutsch and Lockwood also answer that there are perhaps currently kind time loops exploited by an extraterrestrial civilization, but that this does not inevitably imply that it wants to come to see us in its past. And even then, the "time travelers" would go only in certain “copies”, branches, of the past. Lastly, the traveler of time is not compelled to speak off that he is a time traveller!

For Deutsch and Lockwood, “If the theory of the multiple universes is exact, then all the usual objections with the time travel are founded on erroneous models of physical reality. Whoever rejects the idea of time travel must formulate a new argument, scientific or philosophical”.

Hawking itself reconsidered its first declarations and recently affirmed in the press that he considered now the possibility of traveling in time.

Against the “entropy” argument of the Bogdanoff brothers, one will object that nothing prohibits a local inversion of the entropy, the existence of the most negligible particle is a testimony of that ; and this is precisely, in the case of the time travel, a local modification of the entropy, that is to say the own time of the time traveller. The assertion of Einstein : “We, which believe in the physics, know all that the distinction between past, present and future is only an illusion, even if it be tough”, comes reinforce the idea that the time has not the identity that we it grant, and give thus some weight with assumption of possibility of traveling in time. The interpretation of Wheeler of the diagrams of Feynman goes in the same direction. Let us recall that this interpretation consists in seeing reality like only one extremely complex universe’s line already realized, i.e. for which does not pass time. The feeling of flow of time would be an illusion related to our perception of reality.

One cannot not evoke the artist M.C. Escher, who managed to represent and to make us penetrate in a universe of “impossible figures”. It is a little what occurs with certain mathematical theories and the accounts of time travel.

For Rudy Rucker, the reasons to draw aside the time travel rest on one a priori : “It cannot appear contradictions in the world ; the time travel and SL (supraluminic) displacement lead to contradictions ; therefore there cannot exist the possibility of time and SL travels in our world”. This argument presents for Rucker three weak points.

1. The world itself is paradoxical.
2. It could exist a "police of the time" which would prevent the use of the machine to create a paradox.

3. There is the possibility of the multiple universes, even if "... of course, strictly speaking, a travel in a parallel world is not at all a time travel".

"At a certain level, these paradoxes are a little more than intellectual entertainments".

Indeed, like the paradox of the impossibility of the movement of Zeno, they highlight the schizophrenic character of the reality. Rucker adds that Relativity affirms that there is no absolute space and time. However the time travel requires an absolute time and an absolute space. Consequently, the time travel seems from the start prohibited by modern physics. But in addition to the fact that there are laws of transformation which make it possible to pass from a frame of reference with another, Relativity authorizes the travel in the past until a certain limit, and in the future in an unlimited way, as shows it the paradox of the Twins of Langevin. Would relativity contradict itself ?

For David Lewis, the time travel is possible. The paradoxes prove only that the world where the time travel would be possible would be in a fundamental way stranger than that which we believe being ours. He is the burning defender of an author as Heinlein of which he finds the account "You them zombies", perfect antithesis of the paradox of the grandfather, self-consistent. The hero of Heinlein goes up in the past and makes pregnant a girl who is not different than himself before the operation which will make him change sex. The baby resulting from this on-consanguineous union is transported in a past a little more still moved back to justify the birth of the heroin-hero. Had Heinlein consumed some ?

The fault of the temporal algorithm of Heinlein : the girl exists before being born since she gives birth to herself ; the hen before egg. It is paradoxical in a sense more extreme still perhaps than the fact of being sown by oneself. The existence of the girl seems to come out of the causal loop "dad-baby". And yet, which difference with reality ? Is the universe not at its own infinitely regressive origin?

It is clear that what poses problem in the travel in time, that's the multitude of the paradoxes which it generates.

A reasoning "ab absurdo" consists in saying : reality cannot be put up with the paradoxes ; however reality exists ; therefore the paradoxes do not exist and the travel in time either.

But reality is coherent only seemingly, it is basically irrational, as us suggest it quantum physics and pure logic itself. Thus, the possibility of displacement in time is in perfect agreement with reality. L.M. Krauss, in "The physics of Star Trek", emits an argument of common sense : "As long as it is not refuted by the scientific framework, that remains field of possible". It is what underlines also J. Gribbin in "In search of the edge of time" : "Whatever the type of curve of space-time, the equations of Einstein say to us exactly which distribution of matter and energy must appear. The question is then : such a type of distribution of matter and energy is possible ?".

CONCLUSIONS

Despite of the optimistic arguments of the previous chapter, I think I have developed the definitive argument that Deutsch and Lockwood are waiting for: the ontological argument of the total incompatibility between the definitions of time and the intrinsic character of the moving in time. Maybe a mathematical translation would make it more presentable, but the discursive formulation is perfectly convincing.

We could express it in an other way. As Bergson and currently Prigogine develop it through the notion of "duration", the matter is taken in time, it is the fundamental definition of any kind of being. The development and wear, characteristic of any form to be, are inconceivable out of any temporal framework. The being makes time, to be "IS" time in the sense of duration. The matter - and the human being is also matter, development and wear - cannot travel in time because it cannot travel through itself, it must be satisfied with accelerating or slowing down the course of its development or its wear. It is "prisoner" of the time, of a universal inertia without any possibility to escape from it. Time travel is impossible because time cannot travel in itself, "time cannot travel in time". Time is prisoner of itself !

That's what have shown Einstein and Minkowski through the concept of "space-time continuum". Lemaître will infer that any entity is blown off in a universal inertial movement

consecutive to a Big-bang.

Ironically, since, despite of his deep comprehension of the time's notion, he will draw inferences in contradiction with this deep notion, the father of the modern idea of the time travel, H. G. Wells, will give a spectacular description of this conception in the first chapter of "The time machine" :

"Can a cube that does not last for any time at all, have a real existence ?"

…"Clearly", the Time Traveller proceeded, "any real body must have extension in FOUR directions : it must have Length, Breadth, Thickness, and--Duration. But through a natural infirmity of the flesh, which I will explain to you in a moment, we incline to overlook this fact. There are really four dimensions, three which we call the three planes of Space, and a fourth, Time. There is, however, a tendency to draw an unreal distinction between the former three dimensions and the latter, because it happens that our consciousness moves intermittently in one direction along the latter from the beginning to the end of our lives." (The Time Machine)

At the first reading, one is impressed by the spectacular anticipation of the fundamental lesson of the theory of the Relativity of Einstein. In the same spirit and the same geometrical conception than that of Einstein, Wells see there an excellent argument to justify his option of the possibility of the time travel.

But a deeper analysis reveals that the real innovative and important thought is contained in the initial question : "Can a cube…" which shows that reality is time and time is movement (and not only number of the movement).

Irony : this hidden innovative conception of the impossibility of a non-persistent being contradicts the geometric interpretation of the obvious and more spectacular innovative space-time conception and consequently the heart of this memorable fiction : the possibility of the time travel. In fact, no more logical conclusion.

The reflection about the possibility of time travel, in addition to its intellectual interest, makes it possible to get to the root of the comprehension of the nature of time and reality.

So the determinism implied by the possibility of the time travel leads us inexorably to the question of the "universal evolution process" ; the complexification of the universe is obvious. The question is: is it the application of a predetermined program or the fruit of random combinations ? The first option gives birth, at the extremes, to the anthropic and theological conceptions ; the second option allows some kind of ghost of freewill or indetermination.

ANNEX :

The possible universal histories can be synthesized like this :

absolute non-being
↓
qualitative jump
↓
↓
↓
original singularity

(if not “non-being” before B.B., there is the alternative also absurd of eternity with or without “god” ; infinite regression and quantum void/vacuum are variants of eternity)

↓
qualitative jump
↓
↓
↓
matter
↓
qualitative jump
↓
↓
↓
life
↓
qualitative jump
↓
↓
↓
brain
↓
qualitative jump
↓
↓
↓
consciousness
↓
↓
qualitative jump
↓
↓
↓
???

the less to the most complex stratum (each step in the evolution is a stratum) but the important term is "qualitative jump"; and we have absolutely no idea on the nature of it!

Are the entire evolution and its qualitative jumps contained in an original qualitative jump or are there a series of random qualitative jumps all independents ?

In the first case, each stratum is the consequence of a preprogrammed qualitative jump, and

we stay in the absolute determinism; in this hypothesis of an initial singularity, transcendental perspective, some people infer the anthropic or the theological perspective which are “ad hoc” explanations.

In the second branch of the alternative, the evolution could be totally different because of totally different qualitative jumps. This empirical perspective, based on immanence, seems to be the less absurd of the two, if the attribution of a degree to the absurdity makes sense !

NEXT DEVELOPMENTS

• temporal short-circuit,

• absolute determinism,

• temporal reduction,

• infinite temporal overprinting (Dubois/Hawking) positive/negative retroaction loops,

• temporal collision,

• infinite oscillation of being (Grandfather paradox), paradox of knowledge, sensibility to the initial conditions: one and the same paradox,

• Twin paradox of Langevin,

• Doubling time(>< Relativity ?) : does the solution to this puzzle question the essential point of the theory of Relativity ?

See Time, Travel, Logic and Speculation II.