

The being of the past
in the present

Memory and information

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○ International Conference
“SPACE AND TIME: An Interdisciplinary Approach”
29-30 September 2017
Lithuania, Vilnius University, Faculty of Philosophy, Room 201

Introduction

The arrow of time

- The time is irreversible
 - What is past and thus transformed into a part of the past cannot be reversely transformed into a real and interacting part of the present as all other parts of the present
- Anyway the past can be present in the present as memory
 - However, it as memory cannot influence immediately to the present, but only by the meditation of an actor such as a human being

The present versus the past

- The present is qualitatively different from the past
 - Many essential properties of the present and the past are opposite to each other, e.g.:
- The past is unchangeable, the present is changeable
 - The past needs some carrier in the present for it to be conserved as information
- The present does not exist in any way in the past, being an undetermined future according to it

The different qualities of the past and of the present

- Thus, the transition from the past to the present should be a leap from one quality to another quality
 - Both past and present can be unified by the shared quality to be “time”
- So, the concept of time assists that fundamental difference in quality between the past and the present to be neglected and therefore, to remain hidden, ununderstood
 - For example, the physical quality of time in classical mechanics reveals the qualitative difference between the past and the present analogically

Transforming the quality of the past ...

- Furthermore, the former quality can be transformed into the latter, but not vice versa:
 - The quality of the past should be able to be transformable in the quality of the present
- However, the quality of the present should not be able to be transformed into the past reversely
 - A certain cause for that impossibility should be able to be pointed out and eventually explained in turn

The problem

- Then, what is the form by which the past is represented in the present as far as the proper quality of the past cannot be conserved literally in the present?
 - Indeed, the past is necessary to be in the present in a certain, new form qualitatively different from the quality of the present properly and even disjunctively separable from it
- Those two different qualities closely linked to each other, though always disjunctively separable, can be visualized by information and its carrier: by their corresponding qualities

Memory

- On the other hand, any human being has the past in the present as memory
 - Then, that sense of memory is to be information, which is carried e.g. by a human being as its carrier
- The usual prejudice is: memory can be linked only to very complex creatures such as human beings, mammals, and maybe some other animals
 - Nevertheless the term “memory” is spread in technics processing information such as computers, but maybe in a more or less different meaning

Memory versus action

- One differs qualitatively the memory of the past from the action of the present
 - Nonetheless, both action and memory share an actor such as a human being only able to transform memory into action
- Whether in fact?
 - Is an actor such as a human being only able to transform memory into action?
- If memory is interpreted as the information of the past, would not the link of information and action be more fundamental and thus direct?

The necessary actor between memory and action

- It seems: the transformation of memory into action is possible only by the mediation of an actor such as a human being, but not immediately
 - Information is not able to be transformed into action immediately
- This seems to be a very, very well confirmed postulate of all human experience rather than only of science
 - Anyway, which are the boundaries of that impossibility?
- Obviously the same as those of all experience: those of the present

Time in physics

- All physical theories includes time as a fundamental physical quantity
 - However, they as well as a considerable part of science rely only on experience or on its special form of scientific experiments in particular
- What is not empirically testable is too suspicious for physics though not absolutely unacceptable
 - Well, if the boundaries of any experience is the present, the concept of time seems to transcend them
- Then, what about the physical quantity of time?

Reversible time versus irreversible time

- However, different physical theories interpret the quantity of time in two, absolutely incompatible ways:
 - Either as reversible (e.g. classical mechanics, special and general relativity),
- Or as irreversible (e.g. thermodynamics)
 - Any conflict or contradiction does not appear if or as far as they are disjunctively separated from each other:
- One might say that different “homonyms” of the concept of time are utilized and coined by each of those two groups

The change of the viewpoint

- The transition from the former to the latter interpretation is due to the viewpoint change from an element (such as an atom or molecule obeying the reversible concept of time) to the huge system of many, many elements sharing a state distribution of the system as a whole (obeying the irreversible concept of time)
 - So, the concept of reversible time corresponds to the single quality of separate elements
- On the contrary, the fundamentally different qualities of elements or of a whole need the irreversible time of thermodynamics

Quantum mechanics “crucified” between reversible and irreversible time

- Quantum mechanics was forced to unify consistently both mechanic and thermodynamic approach to time
 - Thus, both incompatible (as reversible as irreversible) concepts of physical time had to share a common theory
- The fundamental Planck constant being thermodynamic in essence, but involved in mechanics needs that reconciliation
 - So, quantum mechanics had to resolve that contradiction in a consistent way furthermore confirmed experimentally perfectly convincingly

How to reconcile the contradictory approaches to time

- Thus, physics in turn approaches the problem how the past should be in the present in such a way to reconcile the reversibility and irreversibility of time as a physical quantity
 - Though it is not the original wording of the solution, it can be represented so in contemporary terms:
- The concept of information, referring to how the past is available in the present, should be generalized to 'quantum information' referable in turn as to information and as to its carrier in the present

Husserl's phenomenological time

- One can add Husserl's conception of the past in the present as retention ("Retention") vs. future in the present as anticipation ("Protention")
 - Husserl's philosophical phenomenology is absolutely independent of, and different from quantum mechanics
- Nonetheless, it had come to conclusion about the nature of time similar to those of the contemporary quantum mechanics
 - This makes that conclusion more convincing

Theses

Information in time

- (1) The present has the past only as information (memory)
 - The concept of information is able to conserve the fundamental difference between the quality of the past according to the framework of the present, in which it exists
- Information in a narrow sense has always a certain 'carrier' in the present
 - However, information is generalizable as quantum information thus including its carrier as a form of information, too

Information and action

- (2) Information is transformed into action in the present
 - So, information generalized to quantum information is as if “divided” into two parts in the present: bodies and their actions
- This distinction corresponds to the usual distinction in classical physics between ‘bodies’ and ‘fields’
 - However, quantum mechanics and the Standard model erase that distinction for both bodies and fields can be considered as “elementary particles”
- In fact, ‘quantum information’ means the same unification

The Planck constant

- (3) The physical quantity of (quantum) information is transformed directly and explicitly into the physical quantity of action by the Planck constant
 - Thus, the Planck constant involving thermodynamics in mechanics unifies entropy referring to the information of a whole and action, which that whole as a single element is able to cause to other elements
- Quantum mechanics can be called thermodynamic mechanics, too
 - It is forced to transcend the boundaries as of the whole as of the present

The Planck constant and the transition from the past to the present

- (4) Thus, the Planck constant describes quantitatively the transformation of the past (information) into the present (action) as equivalency
 - That equivalency means that information and action are two different quantities and thus two different qualities, which can be considered as a single quality right by means of that equivalence
- Thus, quantum mechanics manages to include both reversibility and irreversibility into time in a consistent and mathematically rigorous way

The qualities of information and action

- (5) Nevertheless, information and action are two different physical quantities and thus two different qualities corresponding to the different qualities of the past and the present
 - The nature of that fundamental difference between them can be represented by the concept of choice, even in a mathematical sense as in the axiom of choice in set theory
- Action is always a choice in the present
 - The result of that action equivalent to a choice is always stored in the past as information

Time shared by both human beings and nature

- (6) The transformation from the past into the present is fundamentally the same in human beings and nature therefore
 - This generates a series of misinterpretations of quantum mechanics as if “subjective” (ostensibly) vs. the rest science being as if “objective”
- We meet an omnipresent philosophical principle about the course of time and shared by both (e.g.) electrons and human beings making the formers to possess “free will” in quantum mechanics

The past by mathematics

- (7) The past can be always represented as a single series 'well-ordered' in the rigorous mathematical meaning
 - That well-ordering can be visualized by the principle of causality:
- The intervals between the events of that series depend on the space position according to special and general relativity, but not the well-ordering itself:
 - Causality is invariant as in classical mechanics as in special and general relativity as in quantum mechanics
- Causality is underlain by the axiom of choice for it is equivalent to the principle of well-ordering meaning physically right causality

Space and the present

- (8) Space exists only in the present being the process of ordering of a set of well-orderings different for any point of space into a single well-ordered series of the past
 - The single well-ordering of the past is identical for any space point because of the principle of causality
- However, arbitrarily many different well-orderings co-exist simultaneously in the present
 - The actions in the present being choices order all of them into the single series of the past
- Space is the room where that ordering is realized

Conclusions

- Time is both reversible and irreversible
 - The consistency of those reversibility and irreversibility is the “key” for time to be understood
- Quantum mechanics being a thermodynamic and mechanic theory is forced to reveal the solution of how they can be reconciled
 - That solution can be represented by the concept of quantum information generalizing that of information nowadays
- The core of that solution is the equivalence of the quantities of information and action by means of the fundamental Planck constant

Labai ačiū už jūsų malonų dėmesį!

Laukiu jūsų klausimų ir komentarų!

Thank you very much for your kind attention!

I am waiting for your questions and comments!