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Title	What does determinism mean?
Sub Title	
Author	西脇, 与作(Nishiwaki, Yosaku)
Publisher	Centre for Advanced Research on Logic and Sensibility The Global Centers of Excellence Program, Keio University
Publication year	2012
Jtitle	CARLS series of advanced study of logic and sensibility Vol.5, (2011.) ,p.301- 319
JaLC DOI	
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Notes	I. Study of Logic and Sensibility Part 5 : Logic and Informatics
Genre	Research Paper
URL	https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=KO12002001-20120224-0301

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28 What does Determinism Mean?*

Yosaku Nishiwaki[1]

[1] Department of Philosophy, Keio University

Abstract

Philosophy has adhered for a long time to consider what and how to know in the world. What and how to know in the world essentially depend on the way how the things are determined in it. This kind of investigation has been performed through the repetitive intricate interactions among activities represented by the predicates, 'determine', 'occur' and 'know'. The riddles of the world have been solved as the determined world by determining the world which is supposed to be determined. Logical and geometrical determinisms are the determining determinisms, while block universe model and the usual physical determinism are the determined determinisms. Causal and mechanical determinisms usually imply logical and linguistic determinisms with several additional definitions. 'Determine' and 'being determined' are *mutually penetrated*. Determining instruments and their operations inform us the determined changes, and the determined knowledge is again used to determine the next thing and again further….This kind of repetition has been always seen when we increased our knowledge. And in this way we are able

* In this article we consider the first several aspects of determinism, and so the second part of determinism and indeterminism are considered in the later articles. Here in the article, only determinism before Newton has been mostly considered.

to think of determinism much clearly than before.

I. Introduction

Philosophy has adhered for a long time to consider what and how to know in the world. The questions "what is the world?" and "what is knowledge?" have been intricately intertwined: people have tried to know the world and the changes in it. What and how we know in the world essentially depend on the way how the things are determined in it.

Now let's remember famous Mary's case described in the Jackson's thought experiment.[1] Let's see the knowledge argument more formally, so as to more easily classify responses to it:

(1) Mary comes to know a fact about her experiences when she leaves her black-and-white environment, what it is like for her to see colors.
(2) Mary's knowledge of what it is like to see colors is something she did not know before leaving her black-and-white environment.
(3) If physicalism is true, then Mary's knowledge of what it is like to see colors is not a fact she did not know before leaving her black-and-white environment.
(4) Therefore, physicalism is false.

Premise (3) follows from physicalism plus the assumption that Mary knows all the physical facts, so the only premises that can be questioned are (1) and (2). Those who challenge the knowledge argument, then, do so in one of two ways: they deny that what Mary comes to know is a *fact* (premise (1)), or they deny that it is a fact she did not know before leaving her black-and-white environment (premise (2)).

To see colors as qualia is one thing and to learn colors as knowledge is another. Mary already learned a lot about colors. When someone first looks a color, if she does not have any knowledge of color, what kind of experience

[1] Jackson (1986). Supposing that Mary has the complete physicalistic knowledge about color and she have never seen any color with her eyes, Jackson asks whether Mary has a new knowledge when she see the color.

does she have? No one can remember her first color experience. Mary would be frightened and impressed to receive the strong color stimulus and it would be the first experience and hence she could not recognize what color she was looking at. Unknown color experience makes her to know what it is. Our curiosity responds quickly and acutely to the vivid perceptual experience.

When we say that an experience is unique, it is about the property of the experience as a token, and when the property of experience is about its content, it is as a type. The intentionality of experience is the property of its content. The experience of qualia has two aspects: one is the sense experience as a token, and the other is the informational content of the experience as a type. Mary did not have any token experience of color before, but she had the perfect experience of colors knowledge classified as a type. These two different aspects of the experience of Mary are mixed together through the actual experience of the color qualia, and then Mary might recognize later that they are the same thing. We think this may be an answer to the Jackson's problem.

Now we can say that determinism is the methodological claim of acquiring knowledge and certainly it is not a sort of philosophical ideology, as was thought. The process of determining something is just the process of acquiring knowledge. The epistemological aspect of determinism here is that we know of the events in the world that they are determined and the determined results would occur again as determined. Hence determinism in this sense is a way of acquiring knowledge. We may say determinism *epistemologized*, just as determinism *naturalized*. The change of viewing determinism will also cause the new way of looking at indeterminism. Indeterminism, as being unable to determine, failing to determine and predict, is epistemic and it is connected to the notion of incompleteness, uncertainty, and indeterminacy of our knowledge.[2]

II. Determination of the things which are determined

In the beginning we wrote that the mysteries in the world are solved as being

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2. The question of the existence of ontological indeterminism is essentially the same question of the existence of ontological determinism.

determined things by determining the determined processes. Things don't just happen, i.e., events don't occur without being caused to occur. Newton showed that the position and the momentum of an object such as the moon at any given time determine its position and momentum at any subsequent time. The initial state of the moon at a given time determines the position and momentum of the moon at every subsequent time, whether or not we know this initial state. And if, in addition, we also know its initial state, then making use of Newton's laws of motion, we can predict the moon's any future state.

It is said that Thales put geometry on a logical footing and was well aware of the notion of proving a geometrical theorem. However, although there are many evidences to suggest that Thales made some fundamental contributions to geometry, it is easy to interpret his contributions in the light of our own knowledge, thereby believing that Thales had a fuller appreciation of geometry than he could possibly have achieved. Thales left us the tradition that we should have the questions about the world and the events in it and try to solve them. The set of the answers are called knowledge.[3]

Determinism based on the classical mechanics is the popular representative of causal determinism. But there were already several types of determinism before physics were studied. It would be appropriately called *non-causal determinism* and it may be divided into two: one is *logical determinism* and the other *geometrical determinism*. When we think logically with using language and mathematics, the rules of language and the knowledge of mathematics have the deterministic properties. Determinism of language, logic, and mathematics is the *static* and non-causal determinism.

1. Logical determinism

We must follow the logical rules to argue and to determine about the things in the world. Now let us see again the famous sea-battle of Aristotle.[4]

(1) There will be a sea-battle tomorrow.

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3. Historians estimate Thales in two different ways. One is the precursor of the modern scientific thinking, another is naturalizing mythology. (Guthrie(1962), vol.1, p.70)
4. Aristotle, *On Interpretation*, Part 9.

(2) There will not be a sea-battle tomorrow.
(3) (1) is either true today or (2) is true today.
(4) (1) is either true today or (1) is false today.
(5) Therefore, we can not change the truth-value of propositions whatever we do today.

(3) is called the *principle of bivalence* and if we write (4) in a general form, then "for any proposition it is either true or false." The relations between the principles of bivalence, excluded middle and non-contradiction are not necessarily clear: because there are various formulations of these principles. We can carefully formulate the principle of bivalence as follows:

(B) The evaluation relation is a total function whose domain is the set of propositions and whose range is a set of two truth values, true and false.

Logic is bivalent iff it has at least one sound and complete semantics which obeys this principle (B). Determinism, as Lukasiewicz takes it[5] is essentially the same semantic claim as (B), which has immediate metaphysical consequences. The deterministic thesis can be stated as follows:

[D] For any given object x and property P, if x is P at instant t, then, for every instant s it is true at instant s that x is P at instant t.

According to [D] truth is 'eternal', in the sense that if some fact has occurred at a given time, it has been true since eternity to assert that it would have occurred at that time, it is true now to assert it, and it will remain true in the future for all eternity. The real import of this claim can be fully appreciated if we consider sentences in the future tense; take for instance

(*) Tomorrow noon A will be captured by the soldiers

According to [D], if the fact expressed by (*) occurs, that is, if tomorrow noon A is captured by the soldiers, then it is true at every instant earlier than

5. Lukasiewicz (1922)

tomorrow noon to assert that such a fact will occur: it is true now, it was true yesterday, one year ago,…Analogously, if the fact expressed by (*) does not occur, it is true at every instant earlier than tomorrow to assert that such a fact will not occur.

2. Geometrical determinism

A construction is a geometric drawing for which only a compass and a straightedge may be used. Every construction starts with two arbitrary points, used to draw a line or a circle (or both). Then every extension (next steps of the construction) uses points already given or created by previous construction steps. New points come into existence every time lines and circles intersect.

(1) The process of a geometric change is not determined uniquely because there is no mechanical law in geometry. Different transformations are considered in geometry, but the causes of transformations, the distance and the velocity of transformations are not the geometrical problems.
(2) Physical states or objects are usually represented as types, and it is not sure whether the geometrical figure as a token exists.[6] Types are the equivalence classes of geometrical objects. The same changes of individual tokens are represented as the change of a type.

Geometrical determinism claims that the properties of objects are determinate in a transcendental way from the beginning. The determination in geometry is like in law or in grammar. Geometrical determinism is not causal. It is also type determinism. This will give the possibility of the indeterminacy of token level phenomena.[7]

3. The riddle of points

In Discrete Geometry, a point is a dot. Lines are composed of an infinite set

6. The triangle written on the note is a token, but it is used as a type to prove a proposition. Whenever we draw a triangle as a token, it is used as a type. In this meaning, a geometrical object exists as a type.
7. The distinction of type and token would be one of the origins of making the difference between determinism and indeterminism.

of dots in a row. Dots may or may not have size and shape, depending on the version studied.

In Synthetic Geometry, points are locations. The ancient Greeks idealized points as an exact location, having no size or shape. A line is then the set of points extending in both directions and containing the shortest path between any two points on it. The technical term for shortest path is geodesic. There is then exactly one line containing any two points.

In Coordinate Geometry, points are ordered pairs. The Cartesian coordinate system was invented by Pierre de Fermat and René Descartes about 1630. Each point in the plane is now a location in the Cartesian plane and is represented by an ordered pair.

In Graph Theory, points are nodes. A fourth description of point is of a node or vertex in a network. A line is now an arc connecting either two different nodes or one node to itself.

Now let us think of the following question that is in the basis of geometry:

> Can we make a line from points? It seems to be easy to answer at a first glance, but the answer is not unique, and two different answers we have.

[solution1]: By the definition 1 of *Elements*, *A point is that which has no part.* And therefore, it has no size. How many points we collect, we cannot make a size. According to Leibniz, for every event, there is some cause of that event. It is never the case that something occurs uncaused, i.e., for no reason.

[solution 2]: The interval [0, 1] consist of the points (or corresponding real numbers) between 0 and 1. A line is made of points, and is also reduced to points. As for a line segment, we are able to specify a line with two points. Therefore, the answer is certainly yes.[8]

The present correct answer is [solution 2]. If we interpret a line with a set of real numbers, each point on the line corresponds to a real number. And

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[8] The meaning of [solution 1] is clear if we consider the equation 0 + 0 +…+ 0 +…= 0. But the expression '0 + 0 +…+ 0 +…= 0' is very ambiguous and we should not call it a mathematical equation.

our answer is 'yes.' But the answer would be 'no,' if the real numbers are not used as Greeks. The real number system is the *continuum* and the natural number system is *discrete*.

III. Block universe model and divisibility

1. Parmenides' philosophy: invariance

Parmenides is the first Greek thinker who satisfies Plato's principle of 'proceeding through argument.'' K. Popper says: 'it was, for all I know, the first deductive theory of the world, the first deductive cosmology: One further step led to theoretical physics, and to the atomic theory.'[9]

Parmenides is the first philosopher who denies any change in the world. If we believe in his claim, we have to refuse to accept our usual experience with birth and death. His bold claim is the consequence of basic principles. Parmenides and Zeno say that there is no motion in the world. But the reason why Parmenides does not admit the motion and the reason Zeno proposes are quite different. Therefore, even if we solve the Zeno's paradoxes, we cannot say that we denies Parmenides' philosophy and *vice versa*.

Parmenides is offering an argument in support of his central thesis:

(CT) That which is not cannot be thought about or spoken about.

The argument for the central thesis is as follows.
Premise
a. A thing can be thought about only if it is possible for it to exist.
b. Anything that does not exist cannot exist.
But (b) is equivalent to:
c. Anything that can exist does exist.
From (a) and (c) it follows that:
d. A thing can be thought about only if it exists.
And (d) is equivalent to:
e. Anything that does not exist cannot be thought about.

9. Popper (1998), p.143.

Parmenides does not allow that you can think about what does not *actually* exist but could *possibly* exist. His argument rules out any distinction between *what is* and *what is not but might be*. Parmenides collapses modal distinctions. For him:

What is possible = what is actual = what is necessary

We may take the Block Universe Model as a model of Parmenides' philosophy, which denies the distinction among existence, possibility of existence, and possibility of thought. Thinking of the Parmenides' world as mathematical and there is no change in the mathematical world, Parmenides' model easily satisfies the premises of Parmenides. There is no change in the model and the premises of Parmenides are satisfied here.[10] This may explain his claim that the motional change is only an illusion.

How can we represent our world of experience within the block universe model? We usually have our own perceptual point of view and by using our own knowledge of experience, we explain the phenomena within the model. The trajectory in the 4-dimensional model is interpreted to represent a motion moving on the trajectory, when we think of the motion in the 3-dimensional model. The reduction of a dimension by eliminating it is complemented with the introduction of our perspectival experience. In the 3-dimensional world, the moving body is described as a trajectory from the point where it was located to the present point and its motion in the future is going to be described as an extension of the same trajectory. But in the 4-dimensional world we do not have to describe in the two different ways. This is formulated as follows;

A trajectory in the 4-dimensional world ⇔ the motion in the 3-dimensional world + the experience of motions

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10. It is natural to think that there are motions in the geometrical world. We may think that points, lines and figures are able to move in a space. Rather this idea would be fitted to Euclid's original idea. Points or figures which are used to represent the objects in the world do not move by themselves, but they can move as mathematical objects.

Although we can freely move from side to side, up and down, and back and forth, we cannot voluntarily go back to the past or go forward to the future.[11] In the 4-dimensional world, any change is just an illusion. We have the experience of a motion in the 3-dimensional world. That experience of the motion can be described by the mathematical formulas as a content of the experience of motion. What we should describe and explain is the complete change and the finished motion and the completion of a motion is possible if we add a time-dimension. To understand motion completely it is not enough to know the states during the motion. We must understand the whole motion, the finished one. If we add the time dimension, the temporal change disappears and then the change is just a way of supplement to the time dimension.

2. The content of experience in block universe models

We do know almost nothing about the experience of 4-dimensional or 2-dimensional world, although we know well the perceptive experience in the 3-dimenisional world. How do we see the light or hear the sound in the 4-dimensional world? It is very difficult to have the clear answer, because no one has the experience of perceiving in the 4-dimensional world. Light and sound are very 3-dimensional objects and the constituents of 3-dimensional phenomena. The idea of the states themselves of an object seems to be very 3-dimenisional and there might be no states in the 4-dimensional world. The state or the process of a motion is also very 3-dimensional, and we cannot find the corresponding state or process in the 4-dimensional world. Non-existence of motion doesn't imply any perception of motion. Without motion, we cannot have an experience of phenomena. A water fall, a flame, or a flying bird can exist if we admit that there is a change or motion in the world.

[11] It is appropriate to know the concrete differences between the temporal point of view and the special point of view through concrete examples. The point of view is usually thought not to be in the mathematical model, but it is a very important element of mathematical coordinate systems. The point of view is indirectly introduced into the coordinate system.

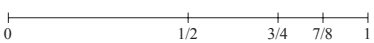
3. Infinitesimal, limit

Now let us apply the infinite sum to Zeno's paradoxes. The first paradox, called 'dichotomy,' asserts the non-existence of motion on the ground that that which is in locomotion must arrive at the half-way stage before it arrives at the goal.[12]

The argument that 'Achilles cannot reach the goal' is as follows:

(a) The course can be divided infinitely. Hence, the length of the course the infinite sum of finite parts of the course.
(b) The infinite sum of finite parts is infinite.
Conclusion: Achilles cannot reach the goal.

Achilles must first run half way, then half the remaining way, then half of that and so on, so that he must run the following endless sequence of fractions of the total distance: 1/2, then 1/4, then 1/8, then ….



Analysis denies the premise (b). An infinite sum is finite. In this case, the number sequence of partial sum $\{S_n\}$ is given by $f(n) = 2^n - 1/2^n$. Therefore,

$S_\infty = \lim_{n\to\infty}(1-1/2^n) = 1$.

Let us see the Zeno's argument of Achilles and the tortoise. The argument says that it is impossible for Achilles to overtake the tortoise when pursuing it. For in fact it is necessary that what is to overtake [something], before overtaking [it], first reach the limit from which what is fleeing set forth. In [the time in] which what is pursuing arrives at this, what is fleeing will advance a certain interval, even if it is less than that which what is pursuing advanced … . And in the time again in which what is pursuing will traverse this [interval] which what is fleeing advanced, in this time again what is fleeing will traverse some amount … . And thus in every time in which what is pursuing will traverse the [interval] which what is fleeing, being slower, has already advanced, what is fleeing will also advance some amount. We may represent the argument as follows.

12. Aristotle, *Physics*, 239b11

Premise: There is a motion
Motion can be divided infinitely
Achilles cannot catch up with the tortoise.
But, Achilles passes the tortoise.
This is a contradiction.
Therefore, there is no motion.

The argument, using analysis, can be written as follows.

Premise: Motion can be divided infinitely
There is a motion
Achilles can catch up with the tortoise.

The solution of the paradox with analysis denies the proposition that Achilles cannot catch up with the tortoise by means of the concept of infinitesimal or limit and therefore shows that there is no contradiction anywhere. By the way, how can we interpret the proposition that motion cannot be divided infinitely? To deny that the sum of the inner angles of a triangle is 180^0 is either that the sum of the inner angles of it is bigger than 180^0or that the sum of the inner angles of it is smaller than 180^0. Similarly we have two interpretations. A classical version is used when space and time are continuous, and a non-classical version is used when space and time are discrete like quantum gravity theory. Either version allows Achilles to pass the tortoise.

<Classical version>
Premise: Motion can be divided unaccountably.
There is a motion.
Achilles can catch up with tortoise.

<Non-classical version>
Premise: Motion can be divided finitely.
There is a motion.
Achilles can catch up with tortoise.

Zeno's paradox was caused from the false proposition 'the infinite divi-

sion is impossible within the finite time, it needs infinite time'. A supertask is a task which occurs within a finite interval of time but involves infinitely many steps. In 1996 Laraudogoitia has invented a particular simple "physical" realization of such a supertask in which an infinite collection of equal masses is located at position 1/2, 1/4, 1/8, 1/16,…along a line of unit length. He then introduces a particle of the same mass and unit velocity directed along the line which performs an elastic collision with the first particle on the line (at 1/2). However, the amount of time is finite, since the distance decrease accordingly.

Zeno's infinite divisibility induces to question whether there is infinity in our world or not. Here again we have to face with two opposite answers.

[solution1]

No matter how big the desert is, the number of sands in the desert is finite. A sand grain has a size and how small the size of the grain if we collect infinitely many grains, then the desert become infinitely large, and cannot be located within the earth. No infinite objects and no infinite amount exist in the physical world. Hence, the infinity exists only in our conceptual world and in the physical world only finite objects exist. Everything in the physical world is finite, the infinite is only in the mathematical world.

[solution 2]

If you are asked how many instants there are in an hour, we have to answer that the number of the instants is infinite. Time or space has the infinite number of instants or locations. The number of atoms is finite, but the space they move and collide is continuous (hence, infinite).

Then can we think and treat that the infinite is a definite object? By the way, are irrational numbers definite numbers? We cannot have the unique answer. The negative answer that we should not think of infinity as an independent entity was given by Aristotle's potential infinity, intuitionism, constructive mathematics, and the positive answer is that cantor's actual infinity and usual set theory.

According to classical Newtonian mechanics, the world is like a clock governed by natural laws. This deterministic mathematical/scientific model was perfected by Laplace in *Celestial Mechanics* (*Mécanique céleste* Vol. I–IV, 1799–1805), which can be summarized as Laplace's equation $\Delta\phi = \rho$,

where ρ is a mass distribution and ϕ a gravitational potential combined with Newton's first and second laws: knowing the mass distribution of a given system at a given moment, the gravitational forces can be computed as $\nabla\phi$ by solving Laplace's equation and the accelerations can be determined from Newton's second law, from which velocities and positions can be updated for the next moment. Thus the time evolution of the system can be determined from knowing initial data in the form of positions and velocities at a given time instant.

IV. The nature of atomism

1. Atom and void

Physics studies properties and laws of interaction of matter and energy. The ancient Greeks, especially philosophers such as Democritus and Leucippus, came up with the notion that everything in the world can be explained as collisions of the indivisible constituents of matter called *atoms*. According to Guthrie, "Atomism is the final, and most successful, attempt to rescue the reality of the physical world from the fatal effects of Eleatic logic by means of a pluralistic theory".[13]

The atomic world is completely mechanistic and deterministic. The world view of atomism is similar to the modern world view. But, atomism was not born by the scientific quest. Atom was supposed to exist as the real entity and indivisible in order to answer to the philosophy of Parmenides and Zeno. Then in what sense is the atom of Democritus indivisible? We might say two meanings of his atom as follows.

(1) Atom cannot be divided physically.
(2) Atom cannot be divided logically and conceptually.

If (1) is Democritus' claim, it is meaningful to think of the part of atom though we cannot divide atom into its parts. But if (2) is Democritus' claim, the division of atom is in principle impossible and has no meaning at all. (1)

[13] Guthrie (1965), vol. 2, p. 389.

was proposed by Burnet,[14] and (2) by Guthrie.[15]

Why did Aristotle deny void? His reason is: the velocity of a body in void has to be infinite, which is impossible. After Aristotle, void has been the topic in the discussion of philosophers. Although void means nothing, no one think that void is nothing. Certainly we find the two different meaning of void.

Void is an object; the other is void for representation (void in a model). Comparing 0 and 101, 0 of 101 has the notational meaning of representing the number 101. 0 of 101 is used to represent a certain number, and it does not refer to any particular number. Similarly void as object is literally nothing. But in a model, void has the role of representing the distance, the area, or the volume. That there is nothing does not mean that there is not any object. There may be space and time. It would be better to think that there is space and time for the reasoning in mechanics. Void is useful to represent physical phenomena.

Space and time are necessary to understand the motion deterministically, we can say that there is no motion without space and time. Space and time are used to represent motions. Now let us think again of what I have said. Suppose the space is 3-dimensional R^3 and the coordinate system. Any point in the space is represented by (x, y, z). The void means that there is no such point. Then,

$$R^3-\{w|\exists x\exists y\exists z\ (w = (x, y, z)\wedge x\in R\wedge y\in R\wedge z\in R\}=R^3-R^3=\phi$$

It means that void is just an empty set. This is the literal interpretation of void, but it is not used in sciences. Let us apply this idea to time. If we think of the correspondence between locations and instants,

If there is no instant, then there is no time.

That there is no instant implies that there is no point and therefore the set of instants is empty, and so we have the conclusion that there is no time. Similarly, we can deduce the following:

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14. Burnett (1892)
15. Chalmers (2009)

If there is no location, then there is no space.

Putting them together, *if there is neither instant nor location, there is neither time nor space*.

2. Double standard

Atomism claims that matter and space are completely different. While it maintains Parmenides' philosophy based on the invariance, it also tries to explain the motional change. It is the excessively ambitious hypothesis.
The existence of void allows atoms to move and collide and saves the change in the world which was absolutely denied in Parmenides. Philosophical atomism appears again during the scientific revolution and produced the chemical atomism of Lavoisier. For Maxwell and Boltzmann atomism was the basic hypothesis that explains the thermodynamical phenomena by using probability.

Matter and space-time are divided differently. The different division principles according to what we divide should be called the double standard. Then we can conclude that atomism explains motion consistently by adopting the double standard of the division of matter and space-time. This standard has been used for a long time among the scientific theories based on atomism. This is the reason why we have been impressed by Greek atomism.

Finite divisibility of matter cannot be extended to infinity like finite additivity can be extended to countable additivity, uncountable additivity. If it is possible, matter can be divided to the point with no size. And then we have to suppose matter with no size as a spacio-temporal point[16]

V. Conclusions

The most important passages where Aristotle discussed his theory of 'causation' are to be found in *Posterior Analytics, Physics,* and *Metaphysics.* Aristotle stated that, in reference to any singular entity, the question 'What is

16. Body without size is called point particle in a mechanical model.

this?' could be answered in four different ways. Aristotle argued that the most important and decisive cause was the formal cause (*Physics*II.3,194b23–195a3). Aristotle conceived efficient causes as 'things responsible' in the sense that an efficient cause is a thing that by its activity brings about an effect in another thing.

Determinism of being determined is the natural framework of knowing the changes in the world. That something is determined needs the tools of determining it. They are geometry, logic, and language. Determining cause is represented nicely by means of logico-linguistic tools. Determinism of being determined could be understood by determinism of determining. This is the consequence of understanding the nature through mathematical knowledge. The riddles of the world are solved as the determined world by determining the world which is supposed to be determined. This is the true claim of determinism and what I have written here. Logical determinism and geometrical determinism are the determining determinisms while block universe model and Zeno's paradox, and the usual physical determinism are the determined determinisms.

Causal or mechanical determinism usually imply logical and linguistic determinism with several definitions. And so we are not aware of such basic determinism when we think of problems in classical mechanics.

We determine and so something is determined. If something is determined, we further determine. Like this, 'determine' and 'being determined' are *mutually penetrated*. Determining instruments, operations inform us the determined changes and the determined knowledge is again used to determine the next thing and again further….This kind of repetition has been done gradually we increased our knowledge, and we can think of determinism much clearly than before.

Determinism has been considered wrongly as a philosophical ideology or as a metaphysical theory. And indeterminism is also thought similarly. The problem of free-will and determinism has been the typical puzzle in philosophy. The expressions like 'determine', 'decide', suggests that determinism is the idea of connecting existence and cognition. To determine something is the first step to know it. To determine something is the rational step to find it.

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