

## ‘On “Therefore”’ by Jin Yuelin<sup>1</sup>

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### Translators’ introduction

Jin Yuelin (1895–1984) is the most famous philosopher in modern China to specialize in logic. Throughout his life he published many articles in the area of philosophy of logic among which ‘On “Therefore”’, published in 1960 in Chinese, is the most famous. We are privileged to present the first English translation of it.

Jin Yuelin got his PhD in political science in 1920, from Columbia University of the United States, after which he went to Europe and stayed in England for four years. In 1926, a year after his return from Europe, Jin Yuelin founded the Philosophy Department at the Tsinghua University with his student Shen Youding (1908–1989); one teacher and one student proclaimed one department. From then on, Jin published many articles in philosophy and logic, and established an all-encompassing neorealist system of philosophy in the monographs *Logic* (1935), *On Dao* (1940) and *Theory of Knowledge* (1983). *Logic* is a textbook written in Chinese. *On Dao* discussed metaphysics, also in Chinese. And *Theory of Knowledge*, a massive treatise of over 900 pages of Chinese, although published only a year before the author’s death, was originally drafted in English during the Second World War but it was lost in a Japanese air attack. These works are influenced deeply by Bertrand Russell, Frank P. Ramsey and Ludwig Wittgenstein. In 1955, Jin Yuelin set up with his colleagues the Logic Section

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of Institute of Philosophy in the newly founded Department of Philosophy and Social Sciences of the Chinese Academy of Sciences (out of which grew the Chinese Academy of Social Sciences in 1977).

After 1949, Jin Yuelin published many papers on philosophy of logic from the standpoint of Marxism. In 1960, his paper ‘On “Therefore”’ appeared in the journal *Zhexue Yanjiu (Philosophical Research)*, the most famous philosophical journal in China. This paper discusses philosophy of logic in the following ten sections:

1. Implication
2. “Therefore”
3. An Example in History
4. Relative to the Level of Scientific Development
5. Relative to Class
6. Form and Content of Thinking
7. Refuting Carroll’s Attack
8. Objectivist Doctrine of the Form of “Therefore”
9. Class Characteristics and Correctness
10. Main Joints between World View and Formal Logic

After its publication, Jin’s paper was reviewed by several other scholars. But Jin Yuelin thought that the feedback was of little help, except one by his former student, Zhou Liquan (1921–2008). In 1961, Zhou published the paper ‘Some of the Main Problems in ‘On “Therefore”’ in the same journal, criticizing his teacher’s opinions. Zhou says that

Comrade Jin Yuelin firstly stipulates inference for that corresponding to ‘therefore’, and then he thinks that inference is different from implication, the reason being that inference is the transition from asserting a premise to asserting a conclusion, which means that inference requires its premise to be asserted, but implication does not require its conclusion to be asserted. Inference requires us to assert its premises, and asserting premises is relative to cognition, and cognition is relative to the level of scientific development of its time and relative to class, therefore, comrade Jin Yuelin draws his conclusion: both specific inferences and the form of inference are relative to the level of scientific development of its time and relative to class. Finally, comrade Jin Yuelin also mentions the connection between the proletarian

world outlook and formal logic, and holds that our ‘therefore’ carries out the requirements of Marxism-Leninism, the sufficient reason of dialectical materialism, and the formal correctness of formal logic, so, its correctness is the one of highest degree. (Zhou, 1961, p. 12)

In Zhou’s opinion, Jin’s paper leads inevitably to some confused or even wrong conclusions simply because some of its basic concepts are not explicit enough and some arguments are not rigorous enough. As a reply to Zhou’s criticism, and more importantly, as a “self-criticism”, Jin Yuelin published in 1962 his paper ‘On the class characteristics and necessity of the inference form’ in the same journal. There he says:

The paper ‘On “Therefore”’ has many faults. Its scope is too large, and it raises so many issues that its main issue is much less prominent. The root of these faults lies in the less clear thinking whose cause is that old views have not been ruled out when it advocates new views. Its central idea is therefore somewhat immature. (Jin, 1962, p. 69)

Afterwards, Jin thought that Zhou failed to understand his paper. He believed that Zhou’s criticism missed the ideas expressed in his paper, and so in the new paper he decided to focus his argument on the class characteristics and the necessity of inference, and to limit inference to syllogism and implication to logical implication.

Many years later, Lu Wang, Zhou’s former student, picked up the above story in his 2002 essay ‘On philosophical criticism: epilogue to *Selected Works of Zhou Liquan*’, also published in the same journal. Wang thinks highly both of Zhou’s criticism and of Jin’s modesty. And in his *Selected Works*, Zhou also recalls the story in the preface and explains the motivation for writing such a paper at that time: “whether formal logic is of class characteristics or not is a question of life and death for logic.” (Zhou, 2000, p. 12)

Up to this day, no further work has discussed Jin’s ‘On “Therefore”’ and the papers related to it. It seems that the dust has fallen on this matter. Translating the paper ‘On “Therefore”’ into English is therefore of current interest for at least three reasons. First, its topic is of foundational importance for logic. Second, it contains a comprehensive study of Lewis Carroll’s famous paper “What the Tortoise Said to Achilles”, one that is not yet known to the English readers. And, even for the most skeptical of readers, this episode in the development of Chinese thought about logic and its philosophy must have untapped historical interest.

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# On "Therefore"

**Jin Yuelin**

In my paper 'A self-criticism of my previous textbook *Logic*', I mentioned that whether formal logic is of class characteristics or not is an issue worthy of being studied in detail; at that time, I thought that sometimes "therefore" is of class characteristics. This issue is too extensive to be put forward in the present paper for the whole formal logic. Now, I think that "therefore" is basically of class characteristics. This paper is going to explain this point of view. Some of the terms used subsequently should be stipulated beforehand. Proposition refers to thought, either being affirmative or negative but not yet being asserted, expressed by declarative sentences. In other words, it can be just the thought in thinking, with the restriction that proposition is required to appear in concrete processes of thinking and cognition, rather than be created when logicians emphasize the formal correctness. A judgment is a proposition that has been asserted. For instance, the following proposition has been asserted by us: "If a table is square, then its four sides are equal." Under the condition that it has been asserted, it is not just a proposition, but also a judgment; but the portions following "if" and "then" are just propositions. What the paper discusses is "therefore", and the issue that concerns whether reasoning goes beyond the scope of "therefore" or not is still in dispute. The present paper uses the term "inference" frequently, but it is used only in those inferences in which "therefore" occurs. The term "therefore" in quotation marks is the object of study of the present paper, and that without quotation marks belongs to the contents in the course of discussion. Although the author strives to express them concisely, this long paper might be too tedious and the thoughts it presents might be not clear enough.

## 1. Implication

Both implication and "therefore" are important forms of thinking in concrete processes of thinking and cognition. The topic of the paper is "therefore", but for the sake of understanding "therefore" more clearly, we will discuss implication as a contrast. We are expressing the features of "therefore" based on those of

implication. It is understandable that some comrades are wary of implication. I myself should be particularly vigilant. I had some ideas about implication before. What should be kept firmly in my mind is not to regress. Nevertheless, the thinking form of implication is worthy of being studied because this kind of form of thinking is of significance in concrete processes of thinking and cognition. The processes of thinking and cognition contain thinking and asserting. Our thinking and asserting involves not only daring to think, speak and act, but also mobilizing the masses and combining the revolutionary enthusiasm and scientific spirit, and so on. But as to the form of thinking, there is a considerable division of labor between thinking and asserting. Thinking should not avoid having many implications, and the asserting would be impossible without “therefore”. Just as thinking and asserting, implication and “therefore” are closely related, although there is a big difference between them. We’ll explain the features of “therefore” based on those of implication.

Implication can be classified into several kinds. I have come into contact with four or five of them. This paper is not limited to the existing classifications. The implications discussed here are well-founded in the past; they resemble those hypothetical judgments which reflect correctly objective laws such that their consequents exist in their antecedents. Here the word “resemble” that will be mentioned thereafter is of great importance. The expressions of implication are “if ... then”, “suppose ... then”, and so on. And the relationships expressed by such terms may be unrestrained, which may be used by idealists as tools for their illusion. Modern bourgeois logicians did emphasize the relationship of this kind to serve their metaphysical philosophy directly and the bourgeois class interests indirectly, against which we should be vigilant. At the same time, we should also admit that implication, as a kind of form of thinking, is widely used by the laboring people. Anyway, implication is still worth studying.

The well-founded implications in the past may not necessary be correct now. But we take correct implication for discussion. Correct implication reflects correctly the necessary connection between objective laws and objective things or facts. If being reflected and completely expressed, this kind of necessary connections will be expressed by hypothetical judgments or propositions. In a hypothetical judgment or proposition, those portions that follow “if” or “then” are also judgments or propositions. We call the part that follows “if” antecedent, and that that follows “then” consequent. Correct relationship between antecedent and consequent reflects correctly the necessary connection between objective things or facts. We call it implication. Note that this is the implication that fully

expressed the objective necessary connection. We will indicate that implication is neither necessarily recognized by us nor necessarily expressed fully, which will be discussed later. Now we use the fully expressed implication to illustrate the properties of implication. The implication we are talking about here is the correct implication which reflects the objective necessity correctly.

We will cite the fully expressed implication to illustrate the properties of implication. Now that implication reflects objective laws or objective necessary connection, what it reflects emphatically is the universality of the connection, rather than whether it works or not in specific environments. Objective laws are of universality, but whether they work here and now or not is another matter. The correctness of a hypothetical judgment or proposition depends on whether the relationship between its antecedent and consequent reflects objective laws correctly or not, rather than whether its antecedent and consequent respectively reflect objective facts correctly or not. The antecedent and consequent of a correct hypothetical judgment may just be propositions with correctness unasserted or unknown yet. As examples, the implications in this section are all correct ones, and their correctness is just the same as that of those correct hypothetical judgments. The correctness that this paper insists on is just like that of the relation between the antecedent and the consequent of a hypothetical judgment. As to examples, the present author would strive to take correct antecedent and consequent although that done would not be so.

Above, only two points were mentioned. First, correct implication is the reflection of objective necessity. Second, the correctness of implication is just like that of the correct relation between the antecedent and consequent of a hypothetical judgment. Moreover, we should highlight further features of implication as follows.

First of all, we want to point out that the implication in this paper is not limited to that asserted by correct hypothetical judgment. In this regard, some comrades have different views. The extension of the implication mentioned in this paper is broader than that of correct hypothetical judgment. The implication asserted by correct hypothetical judgment certainly falls into the category discussed in this paper, but implications discussed in this paper are not necessarily asserted by any hypothetical judgment. “The earth is round” was asserted long before. When this proposition was asserted, it implied “if we sail to the west, we would come back from the east”. Though it existed long before, this implication was asserted until the last half of the fifteenth century. This hypothetical judgment was asserted only after its implication had been there for a considerable period

of time. “Things with weight are those with downward pressure” was asserted long before. When this judgement was asserted, the discovery that air has weight already implied that air is with downward pressure; but it was not until 1640s that the hypothetical judgment “if air has weight, then it is with downward pressure” was asserted definitely. These examples show that implication may exist before its hypothetical judgment, or the assertion of its hypothetical judgment never occurs. Implication is different from hypothetical judgment.

Correct hypothetical judgment reflects correctly objective laws or the objective necessity. The ultimate foundation of a correct hypothetical judgment is objective laws or necessity. But for the process of cognition, asserting a hypothetical judgment sometimes comes from studying directly the judgment that has been confirmed, that is to say, directly from the studying of implication. Some new discoveries are obtained from studying the implication of existing knowledge or the asserted judgment that represents this knowledge. Some of the stars have been discovered by calculation. This calculation is based on the facts that have been found, the knowledge that have been obtained, or the asserted judgments and their implication. Scientists can point out in advance where stars exist, and we would find them in that position. The ultimate foundation of hypothetical judgments is objective laws or necessity, which can not be distorted, much less be denied. However, for the process of cognition, it can be obtained directly from objective facts, the existing knowledge, or asserted judgments and their implications. That is to say, hypothetical judgment is a different implication. It is said at the beginning of the second paragraph of this section that implications are those that “resemble those hypothetical judgments which reflect correctly objective laws such that their consequents exist in their antecedents”, which indicates that we use hypothetical judgment to state implication, and implication is not just hypothetical judgment. This point is the first one that we should highlight in particular.

Secondly, let's explore what “*A*” can only be when we say “*A* implies *B*”. Actually what it asks for is the object of implication. Obviously, *A* could only be a judgment or proposition. This also involves the issue of directness or indirectness. That what judgment or proposition reflects is objective fact or objective possibility, therefore, the problem that what implies what ultimately goes back to objective laws or necessity. But, for the direct object of cognition, *A* can only be a judgment or proposition, and what “*A* implies *B*” means can only be that one judgment or proposition or a set of them imply another one or a set of them. The reasons here are the positive ones. For the difference between implication and “therefore”,



the negative ones are much more important. Implication does not mean that it is a human being that implies, and the subject term of implication is not a human being. Implication is neither a matter of a human being, nor a matter of a knower or a logician. A knower should not say: “Let’s imply!” A logician should not say: “Let’s make an implication!” It may argue that judgments or propositions are all set up by a human being! Yes, it is a human being that asserts or thinks about judgments or propositions based on objective facts. However, after being asserted or thought about, judgments or propositions have relative independency, and whether they imply other judgments or propositions or not is none of the asserters’ or thinkers’ business. The judgment “the earth rotates” is asserted by human being, but what it implies is determined by objective facts. It is not at all that a human being implies, let alone a human being asks it (the original judgement) to imply. This point is of much importance and it goes on with the previous one. After this point being present, it becomes clearer that implication is different from hypothetical judgment. Hypothetical judgment is asserted by a human being, but implication is not at all asserted by a human being.

Thirdly, implication is objective. This objectivity is with regard to origin, existence, and foundation. To say that implication is objective does mean that “therefore” is not objective. Here we only declare that “therefore” is also objective. But its objectivity is different from that of implication, the latter is essentially the objectivity of laws or necessary relation reflected by implication. There is a difference between the two kinds of objectivity. “‘The earth rotates’ implies that ‘the inhabitants on the equator move seventy-five thousands of miles in every twenty-four hours’”. The objectivity of this implication is not the same as that of the laws reflected by it. This objective law has existed for hundreds of millions of years, and it is even objective for the original Javanese. However, for the original Javanese, the judgment “the earth rotates” had not yet been asserted and it would take tens of thousands of years to assert it. The implication in this judgment did not exist yet for the original Javanese. Chronologically, the objectivity of its implication is different from that of laws. But, after “the earth rotates” being asserted and the size of the earth being discovered, the objectivity of its implication is the same as that of the laws reflected by it. On March 28 this year, I moved in the city. Moving a desk into the study is moving a piece of furniture into the study. My focus is the desk, which is different from the situation in which some comrades focus on furniture. The judgment or proposition reflecting the former situation implies the judgment or proposition reflecting the latter one. Here the objectivity of implication coincides completely with that of fact.

The last point is implied in those previous three points, and perhaps needs not to be presented. But presenting it is of help. The existence of implication does not depend on cognition. This is the most basic content of objectivity. Judgment and proposition do depend on cognition, we could not assert or consider them without cognizing them. But what does a judgment or proposition imply after its being asserted or considered? Maybe we know, or maybe not. It exists no matter whether we know or not. “The earth rotates” implied that “the inhabitants on the equator move seventy-five thousands miles in every twenty-four hour” long before the discovery of the size of the earth. But cognizing this implication happened afterwards. At the same time, taking the existence of an “implication” for granted can not cause its actual existence. Thirty-six years ago, there was one person that took for granted that “the earth rotates” implies “Arctic natives feel dizzy”. This is faulty. “The earth rotates” has no such implication, even if this person has such “cognition”. For the implication, what we can only ask is whether it exists or not; implication sometimes exists actually in the concrete process of cognition but we did not recognize or think about it, and sometimes the so-called “implication” actually does not exist but we take it for granted. We make a mistake in the latter case.

The examples mentioned above are for the right implications. But the following examples are with reasons in history. Some of them are still correct, but others may be not. Nevertheless, they are still with reasons in history, and they were recognized by sufficient reasons or the level of scientific development at that time.

## 2. “Therefore”

Implication and “therefore” are different forms of thinking. The present paper will illustrate the features of “therefore” via this difference. That which the paper discusses is “therefore”, and sometimes it will use the term *infer* which is limited to the inference centered on “therefore”. Mr. Zhou Liquan held that sometimes the term *infer* does not mean “therefore”. In the present paper we will not discuss this, and instead leave it for my further study. Since it is so, this paper will not use the term *infer*, as its meaning may not involve the content of “therefore”. All inferences in this paper are “therefore”. The “therefore” discussed in this paper is not limited to syllogism. And we will take syllogism as examples. In the next section we will take an example in history. Originally, this example was not

in the form of syllogism, but we will express it in this form. Nevertheless, the "therefore" of this paper is still not limited to syllogism. The ultimate foundation of "therefore" is objective laws or objective necessity. But its immediate one is the assertion of judgment. "Therefore" is the transition from the assertion of one judgment or proposition or a set of judgments or propositions to the assertion of another one or another set of those. Our actions sometimes involve "therefore". Seeing that a car comes rapidly towards us, we hasten to stand aside. Obviously this action is not just the effect of some causality; it is based on existing knowledge and cognition of current facts. Maybe we will not speak anything about this situation; once we speak something to interpret it, our action is actually a conclusion. That is to say, "therefore" in action is still a transition from the assertion of one judgment or proposition or a set of judgments or propositions to the assertion of another one or another set of those. Studying "therefore" is to study this transition.

In previous works, I thought that the form "therefore" of thinking needs two conditions. One is that it needs a well-founded implication relation between the premise and the conclusion. Here it may be disputed. Syllogism is of categorical inference, which I certainly admit. Furthermore, I never deny this subjectively. I never advocate adding a hypothetical judgement as a third premise to syllogism. Otherwise I am indeed changing a categorical inference into a hypothetical one. However, I do not have such an opinion. My previous expression might be imperfect so that it might give the readers an impression that I stick to such an opinion. I have never held this opinion. Indeed, however, I advocated that it needs a well-founded implication relationship between premise and conclusion. I still think that this kind of relationship between premise and conclusion is indispensable. Not only "therefore" in general but also "therefore" in syllogism needs this condition. Does this exclude the relation of inclusion between classes reflected by syllogism? No, it does not. Moreover, it proposes the inclusion relation between the classes, so that it expounds more precisely that implication relation does exist between premise and conclusion.

The second condition of "therefore" is to assert the correctness (called veridicality before) of the content of premise. Here I would like to give some explanations. First of all, asserting the correctness of premise does not mean the correctness of premise. What the correctness of premise means is that a premise reflects correctly the objective things or objective laws; once the reflection is correct, the premise would be correct. But asserting the correctness of premise is relative to the asserter's cognition. And the asserter's cognition has its cognitive origin

and class origin. The cognitive origin is connected with the level of scientific development of the age. Formerly, a human thought that the sun moves around the earth, which is wrong by now; but was the human of the other days wrong? Did they have no sufficient reason at that time? I think they had. At that time it was possible to assert this judgment. But now this judgement is not correct so that it is impossible to assert it. Now we reach a high level so that we do not assert this judgment and use it as a premise of “therefore” any more. Landlords exploit peasants and peasants support landlords. But it is alleged that landlords support peasants. As to this fact, landlords and peasants have completely opposite judgments. Then how to explain this? We are Marxists, so our viewpoint is of materialism. We can only admit that the difference of viewpoints results in the difference of positions, but we never say that the difference of viewpoints results in the difference of facts. Facts remain, but humans of different class positions can make different judgments about these same facts. Our judgments are correct, and their judgments are incorrect. But even if their judgments are incorrect, do they not “assert” them? Certainly not. The fact is that their viewpoint is reactionary, so that they “assert” a wrong judgment. Asserting the correctness of premise is not the same as the correctness of premise.

In the process of discussion, it was suggested that the requirement of asserting the correctness of premise is too subjective. This idea is wrong. We can not deny this possibility that subjective factors may exist. But what we emphasize is that asserting the correctness of premise is just one of the conditions of “therefore”. So, the assertion we discuss is not subjective.

Some may ask: according to what you said, a judgment is an assertion of a proposition or an asserted proposition. And sometimes you add the word assert between judgments, is not this redundant? We do not think so. Asserting judgment often occurs repeatedly. Judgments before “therefore” are always to be asserted again. What “therefore” requires is not only an asserted judgment but also an assertion of a judgment. These two conditions on “therefore” mentioned above are those that the author still insists on.

We should analyze what exactly is “therefore”. When we discuss that a sentence *A* implies *B*, we will say that *A* represents one judgment or proposition or a set of judgments or propositions, that so does *B*, that *B* is implied by *A*, and so on. In this sentence, the word imply is a verb, and it is *A* that implies and it is *B* that is implied. Obviously this is not the case with “therefore”: in “*A* ‘therefore’ *B*”, it is not the case that *A* is “therefore<sup>ing</sup>” *B*, nor that *B* is “therefore<sup>d</sup>” by *A*. Generally, “therefore” is not seen as an action, it is inference that is seen as an action.

Obviously, inference also does not mean that it is one judgment or proposition or a set of judgments or propositions that infers. The agent of implication is a judgment or a proposition, but not a person; conversely, the agent of inference is a person, but not a judgment or a proposition. We should admit this just at the beginning, because it is the most important thing from which many problems arise.

In discussing implication, we have pointed out that after asserting one judgment or proposition or a set of judgments or propositions, what the judgment or proposition implies exists objectively, and its existence is none of the asserter's business; discovering and asserting the existence of implication is available from analyzing the judgment or proposition itself. From the objective law or objective necessity reflected by judgment or proposition, the issue remains the same: we can find out their laws or necessity from the objective things themselves. Certainly this does not mean that this issue is simple. To say that implication itself may be complex is to say that it may be difficult to analyze and study. Nevertheless, implication can be analyzed, studied, discovered and asserted based upon the judgment or proposition itself, or upon the objective laws or necessity reflected by it. As to inference, it will be another matter. It can not be found or produced only from judgment or proposition itself or the objective laws or necessity reflected by it. Although implication is one of the conditions of inference and inference will not happen without implication, having implication does not mean that it will necessarily have inference.

In this paper, inference means exactly "therefore". The reason for using two different terms is just a kind of language habit. On the one hand, since inference is seen as an action, it is natural to say "inference" when it comes to "make" or "occur". On the other hand, "therefore" is the transition from asserting the premise to asserting the conclusion. From the relationship between the agent of asserting and both of the premise and conclusion, it will be natural to use "therefore". Another condition of "therefore" is asserting the correctness of premise. The agent of asserting is a human being, so is the transition of "therefore". This transition is something weird. It is a transition from asserting the premise to asserting the conclusion, but at the same time it is a bridge between "logic" and history. It crosses both fields of historical facts and the possibility of thinking. Although "therefore" accepts those possible conditions of thinking, it is not entirely dominated by these conditions. It is determined by historical conditions, and it reflects those possible laws of thinking under historical conditions. The issue of the unity and division of logic and history is very significant, about

which I will not make a comprehensive discussion due to my academic level. However, as to the matter of “therefore” or inference, we cannot but touch upon these two fields. These two conditions are both necessary for “therefore”, but not sufficient as far as whether inference occurred in history or not. Here we use the following two judgments (1) and (2) to indicate that these two conditions are not sufficient: (1) “ $A$  implies  $B$ ”; (2) “Asserting  $A$  does not imply asserting  $B$ ”. These two judgments (1) and (2) can be asserted simultaneously. It really says that under these two conditions,  $A$  implies  $B$  and that the correctness of  $B$  is asserted, it is not necessary that asserting  $B$  happens, though it could happen. Inferring from  $A$  to  $B$  always involves asserting  $A$  and asserting  $B$ . Since asserting  $B$  does not happen necessarily along with the two conditions, that  $A$  implies  $B$  and that of asserting  $A$ , inference does not happen necessarily with the these two conditions satisfied. We can express this situation in another way. We introduce the judgment (3): “Asserting  $A$  implies asserting  $B$ ”. Clearly, (1) ( $A$  implies  $B$ ) does not imply (3) (Asserting  $A$  implies asserting  $B$ ). In the case of asserting (1) and asserting  $A$ , inference does not happen necessarily. Note that here what we are saying is not that this judgment or proposition  $B$  is not necessary or has no necessity under these two conditions, but that inference does not happen necessarily.

We have presented the above question. For the purpose of understanding “therefore” better, we would like to propose the following three points.

First of all, we will propose the foundation of “therefore”. The foundation of “therefore” is those two conditions mentioned above, i.e. well-founded implication and asserting the correctness of the content of the premise. For the correct “therefore”, these two conditions are both correct, i.e. they are both objective. However, “therefore” may not be correct, and the reason of this incorrectness may be that its foundation is not objective; in turn, the reason of which may be the implication on which it is based is not correct or the premise of the content on which it is based is incorrect. Maybe this is the so-called issue of correctness and veridicality that most comrades discussed. Now we will not discuss it. Here we are only saying that the foundation of the correct “therefore” is correct, that is to say, it is objective. It is of very importance that not only implication but also the foundation of the correct “therefore” are objective. The ultimate reason, i.e. the reason of its foundation, of the correct “therefore” are still objective things and objective laws. This point is very important. But it is not the one that we want to emphasize here and now. What we want to emphasize is that the foundation of “therefore” is one thing but the occurrence of “therefore”

is another thing. Although inference could be made out and the foundation of that "therefore" could occur exists, "therefore" does not occur necessarily and inference does not have to be made out necessarily. This point is very important in the present paper, which will be discussed below. At this point we want to remind the readers that here the foundation includes asserting the veridicality of the premise or correctness of the content. Any proposition that the correctness of its content can not be asserted is certainly not in the foundation of "therefore". The sequence of false propositions, "all metals are solid," "mercury is solid," and "mercury is metal," now is not an inference, so there is no "therefore" here.

Second, we want to put forward the making of inference or the occurrence of "therefore". This is one thing or activity which has the issue of whether it happens or not and of when it happens. Asserting the correctness of the content of the premise is also one thing or activity. Sometimes these two things happen connectedly, but sometimes, although the correctness of the content of the premise is asserted, that is to say, the latter has happened, the inference still has not happened and "therefore" still will not appear. This section is about the latter. Inference occurs under some historical conditions. The existence of class struggle had been considered before Marxism occurred, but it is not considered as a premise involved in inference until Marxism appears, especially as it happens only within a specific class. That whether inference happens or not and "therefore" occurs or not depends on whether the transition from asserting the premise to asserting the conclusion comes true or not, and whether the transition comes true or not depends on the full understanding of the agent of inference (here the agent is not limited to individuals). Asserting a judgment alone without understanding it fully will make us just stop at the judgment without transforming it into a premise. Full understanding depends on historical factors that promote or block. Full understanding depends on in-depth research which sometimes has the issue of whether it is placed on the historical agenda. "From the west you could reach the east" was thought as a fantasy long before. But its study has not been placed on the agenda until the road from Europe to the Far East was cut off. With such an impetus, it was not until the 16th century that the conclusion that the earth is round became reliable. Some factors hinder in the history; for example, the thought "nature abhors vacuum" impeded the development of pneumatics in the 16th century. These obstacles only remain in thought, and there are many other obstacles which we do not mention. Anyway, that whether inference occurs or not has historical reasons and conditions which are also objective. The foundation of correct inference is objective, and that whether inference occurs or not also has objective reasons. Nevertheless, these

are two different things. This differentia is particularly important. The inference as our theme is the one that occurred, but not the foundation which *could* make inference.

Finally, we want to put forward the issue of the existence of “therefore”. What the above two paragraphs said is that both the foundation of “therefore” and the occurrence of inference has objective reasons. In the previous section, we held that implication is objective. The objectivity of implication is different from that of “therefore”, but what they share is that they both have objectivity. But, as to existence, implication is very different from “therefore”. The agent of implication is not human being, and the existence of implication does not depend on human’s cognition. But the agent of the transition of “therefore” is human being, and it is human being that makes inference out. Inference does not exist until the transition has become true and inference occurs. That is, if, in concrete processes of thinking and cognition, or, at some specific moment, in a specific place and on specific problem, the cognitive agent has not made inference, so inference does not occur and inference does not exist, then, at that moment, at that place and on that problem, inference does not exist. Here some of us may want to think of individuals. But what is discussed here is not about individuals. Inference’s occurrence has the feature of age. It is after 1957 that a large number of inferences about artificial satellites and artificial planets occurred, but there is not even individual inference about these before 1850. Among the classes in opposition, inference made out by one class is usually not made out by another class. Now that the latter class does not make these inferences out, then in its thinking and cognition they do not exist. Someone may say that this is too exaggerated about the ability of a human being like this: if inference is made out then inference exists, and if not then inference does not exist. But it indeed is the fact, with which we have no choice. As to this point, it is the same to make out an inference or something else. We, old-style intellectuals have not engaged in guerrilla war, so in our lives guerrilla war does not exist. Although inference has objectivity from two aspects, it is after all made out by human being. Inference does not exist without making it out.

Nevertheless, there is again a problem. Some comrade would argue that what you said is about specific inference but what formal logic says is the form of inference. Now that it comes, this problem will be discussed in Section 6. Content is indivisible from form. During the course of research, a logician does make the form temporarily divorced from its content in order to do abstract research. However, we hold that the so-called “temporarily divorced from” has but the



divorce method discussed in Section 6. Form can not be divorced at all from *all* concrete contents or *every* concrete content of it, instead it can only be divorced from this concrete content or that concrete content and the form is combined with other concrete content closely when it is divorced from this or that concrete content. During the course of research, a logician treats the form of thinking as the object of study. It only has the above-mentioned divorce method when it is just an object. It is an object just temporarily and it cannot be an object in the long term or permanently. It comes from a concrete process of thinking and cognition, and it will return to a concrete process of thinking and cognition. The form returned is not an object any more. It may return to a wrong place. This is the question posed by Mr. Li Shifan. I do not agree with him. We, but not the form of thinking, are responsible for the fault. In any case, when the correct inference "appears", "occurs", or "is made out" in a concrete process of thinking and cognition, its form and concrete content "appear", "occur" or "are made out". Some logicians may feel "weird", and perhaps they will hold that the form of thinking has no "appearing", "occurring", or "being made out". This idea is wrong. According to this idea, we would be forced to admit form without content, general without individual, and abstraction without concrete. Clearly there are no such things.

Even in this regard, implication is different from "therefore", and the difference is not about the divorce of form and content. Form and content can not be divorced, which is so for both "therefore" and implication. The difference between "implication" and "reason" is as follows: in a concrete process of thinking and cognition, even though the agent does not recognize an implication, it exists; so this process has it though the agent does not recognize it. But, in a concrete process of thinking and cognition, if the agent did not make an inference then the inference does not exist. When an implication has not been recognized, the concrete content of it exists, and the form of it also exists along with the existence of this content. If the agent did not make an inference then this inference does not exist; not only does the concrete content of this inference not exist, but also the form of this inference does not exist either. From this point, a series of questions can be raised. But here we will not raise further questions. Clearly, some questions should be raised in the future.

### 3. An Example in History

In this section we will discuss implication and “therefore” by a concrete example. When narrating history, saying “what was invented or discovered in which year” or “some thought appeared in which year” sometimes refers to the invention and the discovery itself, and sometimes refers to the article’s publication date. The following examples are about the issues of weight, weight of air and air pressure.

Humans have discovered long ago that many things have weight. It has been discovered long ago that some things press down when we lift them up and the degree of the difficulty of lifting them up is proportional to downward pressure. Things that have weight are those that press down. This is what humans discovered already a long time ago. As a judgment, this judgment was asserted by a human a long time ago. However, the implication in this judgment was not made clear a long time ago. It may have been discovered long before that air has weight, but to my knowledge, it was Jean Ray in Western Europe in 1630 who discovered it. He listed a number of reasons in that article to illustrate that air has weight. We will not talk about these reasons since they are irrelevant here. Anyway, Jean Ray discovered that “air has weight” in 1630. Meanwhile, he can not afford not to know “things that have weight are those that press down”. These two judgments jointly *imply* that “air is a thing that presses down”. This implication already exists in 1630. But Jean Ray did not cognize this implication. If he knew the implication, he *could* arrange these two judgments as the premises of a syllogism to make an inference: “things that have weight are those that press down, air has weight, therefore air is a thing that presses down”. He could generalize to that above the surface of water there are things that press down, given that above the surface of the water air exists. However, he did not make this inference. In that case, this inference did not exist in the concrete process of his thinking and cognition, and his contemporaries also did not make it. The reason why this inference could have been made can only be searched for in the history.

In 1638, Galileo published a dialogue about two new sciences. In this book there have two sections concerning pumping. Two of Galileo’s friends and followers, Sagredo and Salviati, participated in the dialogue. Sagredo posed his question. With the method of pumping air, he took air out of the pipe to let the water in. This method works as long as the height (or length of the pipe) of the water level in the pipe (from the horizontal line) is not more than thirty-four feet. Otherwise, the water will not be pumped up. He thought his machine was out of order, so he

invited a worker to repair it. Please note that a worker had already discovered a fact which existence is unknown to a scientist at that time. The worker said that the reason is that the water level exceeded thirty-four feet instead of the pump. Beyond this limit, there is no way no matter how good the pump is. This is the issue raised by Sagredo. We will not mention his own explanations. To solve this problem, Salviati presented such an opinion: If we know the weight of the water in the pipe that is thirty-four feet high, then we will know the resistance forces of the vacuum in the pipe. This view links the past and the future. It admits the previous understanding. The reason why water rose in the empty pipe is "nature abhors a vacuum" which has been retained for a long time. The problem arose after discovering the aforesaid fact. Why nature abhors a vacuum only to the extent of thirty-four feet? Why nature does not abhor a vacuum at that point? Salviati's opinion really is that vacuum resists the water rising when it rises to thirty-four feet. His idea does not divorce from that nature abhors a vacuum. But it is of great instructive, because he links up the height level and weight of the water. This connection made scientists at that time link up the height level of the water in pipe and the weight of air.

Although the connection discussed above is important, the connection alone will not produce the concept of air pressure. Even though Jean Ray has discovered that air has weight, the weight of air is not easy to measure. But above all, the idea at that time was that "air is very light", so its weight could be ignored even if it has it. But that air is "very light" gives us a fuzzy impression. Measuring air in air would have been difficult, what is more, what is measured is a small amount of air. Is a great deal of air still "light"? Now that air is light, so does it pressure upon us?

In a 1644 letter, Torricelli pointed out that someone had estimated that the earth's atmosphere was fifty or fifty-four miles thick. When this idea was discovered and by whom was not known to us. Torricelli did not agree with this estimate, but thought that fifty miles may be too high or too thick. Nevertheless, "we still live in the deep ocean of air". The thickness of air is at least several hundred miles! Although the pressure of a small amount of air, such as that in a bottle, is small, but the pressure of the thick layer of air pressing on our heads is not small. Torricelli's calculation is: the weight of air is as much as 1 in 400 of the weight of water of same volume. The strength of this pressure on the surface of the water is not small. With this thought, Torricelli was able to regard the downward pressure of air on the surface of water or mercury as the reason of that water or mercury rises up in an empty glass tube, so he could be against such statements as "nature

abhors a vacuum” on this issue. Torricelli is the inventor of barometer, but there is still something unclear about the concept of air pressure.

Torricelli mentioned that the pressure of air on flat ground and that on the top of mountain are different. Bhaskar also raised this issue. If the height of water or mercury rising in pipe is the same both on flat ground and on top of mountain, then whether the reason of rising is the air pressure or not is debatable. Torricelli did not try to resolve this problem, instead it was resolved by Bhaskar. He thought that the air pressure on the top of mountain is less than that on flat ground. If the height that mercury rises in pipe reduces on the condition that the air pressure on the top of mountain is small, and the height that mercury rises increases on the condition that the air pressure on flat ground is big, then it proves that its rising is caused completely by the air pressure. At the same time it also completely shattered the statement “nature abhors a vacuum”. Obviously nature can not abhor a vacuum on flat ground more than on the top of mountain. Bhaskar designed an experiment and invited his relatives (an official living in a city near the top of some mountain) to carry it out. The result of the test carried out in 1648 fully confirmed Bhaskar’s view that mercury rose only about twenty-three inches on the top of the mountain, but it rose to twenty-six inches on flat ground. Thus, the reason for mercury’s rising is not “nature abhors a vacuum” but just air pressure.

What was said above is the process during which the beginning is the discovery of air’s weight in 1630 and the end is formation of the concept of air pressure in 1648. What is described here is more simple than the historical facts themselves. However, what we are studying is “therefore” or inference. It is inference or “therefore” that is studied in this section, although it is studied with regard to some development process of cognition in the history. We will return to our subject below.

First of all, we should point out that, only after Jean Ray’s 1630 discovery that air has weight, the judgment “air has weight” implies that “air is a thing that presses downward” or “air is something that exerts downward pressure”. Do we have any reason to say so? I think we have sufficient reasons. What we want to know is that whether or not “air is a thing that presses downward” exists in the two judgments “air has weight” and “something that has weight is that what presses down”. Yes, if it exists, and no, if not. We can not say that the implication did not come about after the previous judgment being asserted until its being asserted fourteen or eighteen years later. Implication and recognizing the implication are two different things. Torricelli recognized this implication fourteen years

later, and Bhaskar recognized it in greater depth after eighteen years. However, the object recognized by them is not and can not in principle be the thing which did not exist before but created by them in their cognition process. What they recognized is something that existed originally and it is objective relative to their cognition. This is an obvious truth. However, someone would say: you absolutized implication. The above implication is relative. We admit that it is. Without those two judgments, the above implication does not exist. However, as we have already pointed out, the definition of weight is established long before. Therefore, by saying that the judgement "air has weight", after its being asserted in 1630, implies that "air is a thing that presses downward", we just mean this implication itself. After Newton and Einstein, the so-called "weight" gets its new meaning. However, we never say that from 1630 to 1648 "air has weight" implied the laws discovered by Newton and Einstein. In that period of time, this above judgment did not have this implication. Implication is also a matter in the history of human cognition. But it is relatively independent. And under the relative circumstance, it exists independently. After Jean Ray's 1630 discovery that "air has weight", it implies "air is a thing that presses downward". The existence of this implication is independent of the agent of cognition, which means that its existence is independent of the human being, let alone Jean Ray, Torricelli, or Bhaskar.

Although this implication exists, Jean Ray did not recognize it. After 1630, "should or should not" it be recognized by a human being? It depends on what the "should" means. We have already pointed out that at that time we *could* arrange the related judgments in some form of syllogism, moreover, in the form of *AAA*, and conclude that "all things that have weight are things that press downward, air has weight, 'therefore', air is a thing that presses downward". If logicians of that time combined their research with the practical problems in the physical science, they might have made natural scientists move a further step forward. But they had not done it like this, and they could not do it like this. Although this inference *could* be made, it has not been made until 1644. The so-called "*could* be made" is just with both of those two premises being asserted. The so-called "should cognize the implication" is just with the implication that existed. But, the implication did not get recognized before 1644, and the implication discussed in this paragraph exists during those years from 1630 to 1644, that is, it could have been recognized; on the other hand, the inference could have been made. It was neither made, nor did it exist. What was talked about here is not other inferences which are irrelevant here although they were made out. For the process from "air has weight" to the forming of the scientific

concept of air pressure, we hold that what has been mentioned above is the situation of thinking and cognition from 1630 to 1644.

In 1638 (the year that the document was published), one important thing was discovered, and at the same time it was a valuable association for this thing. The thing is that the water in the suction pipe will not rise to the height of more than thirty-four feet, which had been discovered (although we do not know how long after the discovery) and passed on to scientists by workers. Prior to the discovery of this fact, it is agreed that the reason for water rising is “naturally abhors a vacuum”. But problems rose along with the discovery of the fact. Why nature abhors a vacuum below thirty-four feet height but does not abhor a vacuum above that height? Here we need to explain why this discovery is of importance. Its importance lies in its shaking the thought of “naturally abhors a vacuum”, which is not just about physical science. This thought comes from Ancient Greek philosophy, and became popular in Europe through Aristotle. It was accepted by Catholicism through Aquinas. Although it is not a thought about physical science, but more importantly about the later discussion, it was accepted by physical scientists. For the specific problem about the rising of water level in the pipe, this thought hampered natural scientists to build pneumatics, and it was regarded as the reason for the rising of water level, so the scientists did not look for further reasons before 1638 and did not discover the real reason until 1644. The importance of the above discovery lies in this. It shook the thought “nature abhors a vacuum”. It made possible the emergence of the concept of air pressure. Before the next point, we want to point out emphatically: the fact that the so-called “nature abhors a vacuum” hindered the establishment of pneumatics theory actually means that philosophical thought might play an obstructive role in the establishment of scientific theory by natural scientists’ thought. We can further say that not only can the wrong philosophical thought hinder scientific development, but also the correct philosophy can have a promoting effect.

What is said above is that not only is the above discovery important, but also the valuable link that the discovery has made in both thought and concept are mentioned. The link is made out by Salviati. He links the height of the water rising and the weight of the risen water. Without this link, the water rising, the air pressure and the weight of air are difficult to be connected together. That we discuss this issue in the 1950s–60s may be a “hindsight to foresight”, and may think the issue too easy. But clearly this association is not simple at that time. The rising of the water level is one thing, but that air has weight is another thing. Moreover, the ingrained thought “nature abhors a vacuum” lies across them.

Only knowing the weight of the water rising can know that there may be a direct link between this weight and the weight of air. Only knowing this direct link can fight against the thought "nature abhors a vacuum". Salviati did not do the latter and instead made that link out.

In terms of the literature (a letter written in 1644), it is Torricelli in 1644 who starts the struggle. Meanwhile he recognized that "air has weight" implies "air exerts pressure downward". He did not express his ideas in the form we have used here. He did not even use the term imply. He only talked naturally from air's weight to air's pressing downward. Not only did he recognize the implication, but also asserted that air presses downward. These are clear in the letter written in 1644. In 1644, after Jean Ray's discovery in 1630 that air has weight, Torricelli discovered that the rising of the water level in empty pipe is caused by the pressure of air instead of "nature abhors a vacuum". It took fourteen years from the discovery that air has weight to earlier formation of the concept of air pressure. For the development of science, many things have been ignored. What we study is not this development itself but the thought "nature abhors a vacuum" played a negative role in this development. Torricelli had to fight against this thought and he started the struggle. But this struggle was not won until Bhaskar, and then the scientific concept of air pressure was fully formed. It took eighteen years from Jean Ray's discovery to Bhaskar's experiment and article.

Let's return to implication and "therefore". After 1630, "air has weight" already implies that "air is a thing that presses downward" and "there is something that exerts pressure on the water". This implication had not been recognized although it existed then. Only in 1644 (the time of the document's publication) it began to be recognized. It is in 1648 that it was recognized definitely. The inference corresponding to this implication began to be made and formed in 1648, too, and it did not exist until 1644. The inference did not exist although the implication has been there for fourteen years. But the inference was made out during 1644 to 1648. Although it is not in a form of syllogism, part of the inference could be formulated in a form of syllogism; for example: (1) "all things that have weight are things that press downward, air has weight, 'therefore', air is a thing that presses downward", (b) "air is a thing that presses downward, on the water exists air, 'therefore' on the water there is something that exerts pressure". The implication that corresponds to these two syllogisms had already been there, but the inference had not been made out during that decade, for which some important reasons are formulated in this section. That is, that the height of water rising in empty pipe has limitation was discovered, and this worker's discovery

helped scientists to have a breakthrough in solving the problem of water rising which was caused by the thought “nature abhors a vacuum”. But how could this idea play that kind of a role? Such a problem has to be posed and discussed in the future.

#### 4. Relative to the Level of Scientific Development

The action of inference lies in the cognition and the history of cognition. Human cognition is of cognitive origin and class origin, both of which are unified. However, for the sake of clarity, we will discuss them separately. First of all, we put forward the issue of cognition. The development of cognition is a process that begins from incognizance to cognizance, from less cognizance to more cognizance, from not too much to much. Cognition depends on practice, and practice is the foundation and test criterion of cognition. It progresses in the cyclic form of practice–cognition–practice–cognition. Cognition is distinguished as perceptual and rational, and the action of inference is mainly a matter of rational cognition. Cognition is also distinguished as direct and indirect, and the action of inference is mainly a matter of indirect cognition, which develops with the development of cognition. It develops along the direction from less to mass, from simple to complex, from unprecise to rigorous. Cognition promotes this development, and in turn it promotes development of cognition. We have to discuss inference and cognition as one unit given that they are integrated closely together. In any case, we do not have a history of inference themed by inference.

Both cognition and reference are cumulative. Although not linear, in general, this development is moving forward, which resembles snowballing. We know little about the history of cognition, much less about the history of inference. Nevertheless, we still get hints. Social production modes play a decisive role in the history of social development, and the decisive factor in the development of social production modes is social productive force, the development of which is inseparable from the use of productive tools and motive powers. It is slowly that the tools evolved from stone tools to iron tools. Stone tools and iron tools made great strides in the development of cognition, and they also involve a lot of inferences, some of which are correct and others are incorrect, but both contributed to the forming of tools. But the development process is long. And during that long period there is little inference. The development process from iron to steel was long, too, much longer than that from steel to various



contemporary alloys. The usage of motive powers, evolved from manual labor, animal power, primary firepower, hydroenergy, wind power, advanced firepower, electric power, to nuclear power, is also slower at the beginning than later. Each adoption of new powers involves a lot of inferences. These inferences were getting more and more precise along with the development motive powers. Each step in the process of development of using tools and motive powers means the deepening and improving of cognition, of which specific performances are those inventions and discoveries in different times. The book *Technics and Civilization* by American Lewis Mumford, is a book against historical materialism. But at the end of the book there is a list of inventions and discoveries that are still available for our reference:

Eleventh Century	4	Twelfth Century	9
Thirteenth Century	10	Fourteenth Century	12
Fifteenth Century	15	Sixteenth Century	37
Seventeenth Century	58	Eighteenth Century	72
Nineteenth Century	210		

This list not only focuses on Western Europe and also is not exhaustive. According to the list, in the eleventh century there were only 4 discoveries. But there were 210 discoveries in the nineteenth century. The process of invention and discovery resembles snowballing. For each invention and discovery, too many assumptions and inferences are involved in the process from posing problems to accomplishing the invention and discovery. By and by, with cognition becoming richer and richer, inferences become much more complex, and more rigorous.

Basically, however, the above situation happens in a capitalist society. For the socialist society, the development process of invention and discoveries resembles ten thousand horses galloping ahead, but not snowballing.

However, in the development of inference, some factors hinder and others promote. The process of inference is not a smooth one. In the above example we mentioned that the thought "nature abhors a vacuum" has hindered the development of pneumatics in a short period. There are more of such examples, some of which are not limited in thought. Copernicus was aware of the revolutionary nature of his theory. Although his theory had been formed long before, he did not publish it until his death. Galileo was persecuted to prove Copernicus's theory. Here both popular thoughts and the regime and

magisterium of that time were all obstructive. Generally speaking, natural sciences and technical sciences are promoted by the development of productive forces, the accumulation of the experience of production struggle, and the discoveries and inventions themselves. Both cognition and inference are promoted by them. But, in spite of this, sometimes it *could* make inference but it does not. In this aspect the occurrence of inference is relative.

A very important factor is the level of scientific development of one era. Sometimes inference lags it and sometimes preacts it, which is an exception. For most of inferences, they are relative to the level of the era. A correct inference of one era is not necessarily a correct one in the following era, so the correctness of inference has contemporaneity. This refers to the level of scientific development. The science of one era is completely different from the contemporaneous superstition, so we should not erase the difference between science and superstition in ancient times based on its lower the level of scientific development, and in principle this difference is the same with the present one.

The thought that the earth is the center of the universe may be a good example. It is true that this thought had been manipulated by religion. But we should not evaluate the correctness of the inference, which is no more correct now, at that time according to this fact. Similarly, we should not think it was incorrect according to its incorrectness now.

The forming of this thought is mainly based on the motions of the sun and the moon. Almost every day we see that the sun and the moon rise in the east and set in the west. For our feeling, we have to admit that this is true not only for the ancient but also for the modern human. Sometimes the sun and the moon are obscured by clouds, but we will see them when the clouds clear away. It is also the visible truth that the same sun and the same moon rise from the east and set in the west. Is it the same sun and the same moon that set in the west and then rise from the east? We never saw that the sun or the moon set without rising. But apparently this phenomenon is one stage of the motion of sun or moon, and undoubtedly it is the same sun or moon what is running. This is an obvious fact and the materialist reflects this fact faithfully. Idealists, particularly subjective idealists, exploit an advantage on this point, but no matter how they exploit, they can not erase the fact that there is but only one sun and one moon. According to the evidence that the ancients got, did they have sufficient reasons to assert that the sun or the moon “revolves around the earth”? I think they did. And since “the sun or the moon revolves around the earth”, was geocentrism wrong at that time? I think this inference is not wrong. We now know that it

is not the case that the sun revolves around the earth. Quite the opposite. Now we do not admit the geocentrism any more. The nowadays' level of scientific development is different from and improves the previous one, and we should not make the inferences that our ancestors did. Otherwise we will make mistakes, which does not mean that our ancestors made mistakes when they did so. For the level of scientific and technological development at that time, their inference is not wrong.

The level of technological development is part of that of scientific development. The example mentioned above involves a technical level which had not yet been, especially put forward by us. For natural sciences, the level of technological development is particularly important, because natural sciences rely on experiments which involve the level of technological development. The following example will fully show the importance of the level of technological development. It is Harvey that discovered blood circulation. But the discovery process is one that transforms the hypothesis into a conclusion, and this process is driven mainly by the improvement of the level of technological development.

Harvey discovered the fact of blood circulation as early as in 1616. He reported on this and in 1628 he published it in his book. He collected a great deal of evidence to prove that the blood flowing from the heart to the red blood vessels is that flowing from the blue blood vessels to the heart. We will not mention the argument he put forward on this view. Judging at the present level, whether this argument and evidence agree fully with the facts or not is out of the scope of our discussion. What these arguments and demonstrations alone confirmed is just the unity of the blood that reaches and leaves the heart but not the blood circulation in the blood vessels. The main reason for his theory of blood circulation is the amount of blood. The hearts of animals, such as dogs and sheep, contract and relax more than one thousand times per hour, the amount of the blood through heart every half hour is no less than three and a half pounds. The total amount of blood of one of these two kinds of animals is less than four pounds, and these four pounds of blood is not enough for one hour's flow. The source of blood becomes a problem unless blood flows circularly, that is to say, not only the blood that outflowed from the heart is that which flowed into the heart, and vice versa.

At that time, the theory of blood circulation was advocated by some people and rejected by others, which was mentioned by Harvey himself. From the later development, one of the reasons for the disapproval may be the following argument. You say that the blood flowing from the heart to the red blood vessels is that flowing from the blue blood vessels to the heart. Yes, we agree. The

amount of blood flowing through the heart is very large, and for some animals, the amount of blood flow per hour exceeds the total amount of blood in the body. Yes, we agree, too. But we think that the blood circulation in blood vessels is still just a hypothesis. This hypothesis requires new evidence to be proved. You only proved one half of the circulation—that the blood that flows out of the heart is that which flows into the heart. But, to confirm the whole circulation, you have to prove that the blood, not in the heart yet but flowing into the heart, is the blood that flows out of the heart. In order to prove the latter, you need facts to illustrate how blood flows from red blood vessels into blue blood vessels. If you have such facts, then your hypothesis becomes a scientific truth. Harvey did not, and could not, discover these facts. This fact was discovered in 1688 by Leeuwenhoek. He made a microscope of a high degree of accuracy, and by using this tool he discovered the tiny vessels between the red blood vessels to the blue ones. The discovery makes the original hypothesis transformed into a scientific truth. In any case, after this discovery, the theory of blood circulation has become a universal truth without controversy.

The above example is a good one, for the blood circulation theory alone, as it develops from incomplete cognition to complete one. This development will not stop, and new discoveries will raise new questions, so maybe the original blood circulation theory has already been modified greatly. But if so, it is the matter that happens after 1688. The discovery in 1688 is a decisive step for the original theory. As to formal logic, the development from 1616 to 1688 is that from the incomplete implication to the complete inference. Of course, this is an afterthought. Probably Harvey's own thought is not this. He listed the facts that he discovered, and then presented these facts as the premises to reach the "conclusion" of the blood circulation. But someone did not agree. The one who did not agree not necessarily overturned his argument completely. It seems that Harvey's premises can not deduce his conclusion, although they are true. Although the premises are true, but as antecedent they do not imply the consequent (i.e. blood circulation), therefore, the consequent is not a conclusion. Although the consequent is not a conclusion, it has some necessity. It is the scientific hypothesis that will be used later. This is a positive factor in Harvey's theory. Without it, the facts that Harvey listed could not be understood. It can explain these facts, so it is of good scientific hypothesis. Someone would have the feeling of illusion when hypothesis is talked about. In fact, the hypothesis talked here is a scientific hypothesis. Such a hypothesis is based on a considerable amount of facts. With this hypothesis, many facts can be understood, and more importantly, such a hypothesis is a guide for further research, with which we can

discover new facts. For blood circulation, if this hypothesis is true, then there must be small blood vessels between these two kinds of blood vessels. This is the new implication obtained from the research. Although Harvey reached a good hypothesis, he did not use it as a hypothesis. Leeuwenhoek also did not finish Harvey's discovery based on this hypothesis, but what he discovered is exactly the verification of this hypothesis. With this fact (small blood vessels between these two kinds of vessels), this hypothesis is confirmed. Adding this fact to Harvey's premises, this hypothesis turns into a complete conclusion. In 1616, what Harvey had is an incomplete implication. After 1688, this incomplete implication has developed into a complete inference.

However, the above development and the inference rely on the using of microscope. Without a powerful microscope, tiny blood vessels can not be found, this fact also could not be found, hence Harvey's hypothesis is difficult to turn into a scientific truth. Generally speaking, it is in the middle of the 17th century that microscope was used extensively. No matter when microscope was invented, the middle of the 17th century is the beginning of the time that microscope was used extensively. After this period, the level of scientific development has been improved, and the inference mentioned above becomes a truth at the new level of scientific development. Here, let's return to our subject: inferences are relative to the level of scientific development. Without the corresponding level of scientific development, some inferences can not be made.

## 5. Relative to Class

Inferring, i.e. the occurring of inference, is relative not only to the level of scientific development, but also to class. Basically, cognition is of class characteristics. Since inference is the transition from asserting the correctness of premises' content to asserting that of conclusion's content, it is a very crucial link of the cognition, and basically it is of class characteristics. Saying that cognition and inference are basically of class characteristics does not mean that generally speaking they are of class characteristics or several tens of percent of them is of class characteristics. Some cognitions obviously do not have class characteristics. Your cognition about the animals and plants in the zoo and a botanical garden is apparently not of class characteristics. Some cognitions are obviously of class characteristics. Landlords exploit and are supported by peasants, but they announce that peasants are supported by them. As indirect cognitions, they all involve inferences. For the

same fact, since the antagonistic classes have opposite cognitions, inferences are antagonistic. Most cognitions are those about the struggle for production or class struggle. The former is about the natural world and the latter about society. Generally speaking, the cognitions and inferences from natural sciences are not of class characteristics but those from social sciences are.

In recent years, some of the articles engaged in the discussion of logic put forward some examples about alleged incorrect “inference”. Some of them may be examples of incorrect inference. Apart from these, others are not at all examples of incorrect inference. The key is that they are not inferences. Some of them are not present inferences. That is to say, in terms of the current level of scientific development, all of them will not and *can not* happen in the present, so they are not inferences at present. Others are not *our* inferences. That is to say, in terms of class position, we *will not* and *can not* make such inferences. So, they are not inferences for us. The former kind of issues are those involving the level of scientific development considered in the previous section. We need not discuss their examples here. The difference of inference’s occurring and possible occurring has been discussed in the section titled “therefore”, and here “will not occur” contraposes “occur” and “can not occur” contraposes “can occur”. The following example (I just call it an example but I do not admit it as an example of inference): when they attacked the Party in 1957, the bourgeoisie said: “science should be led by a scientist, the Communist Party is not a scientist, therefore the Communist Party should not lead science.” Such “therefore” can not occur among the people of our country, as it is short of one of the necessary conditions of inference, i.e. asserting the correctness of the premises. Since the necessary conditions are not satisfied, this example will not occur. It is the “inference” of the bourgeois rightists, which is obviously of class characteristics.

In respect of philosophy and social sciences, that “therefore” is of class characteristics may be agreed by many people. The point is that what we have is not only this aspect of “therefore”. In the aspect of natural sciences we have “therefore”, and in the aspect of daily life we also have “therefore”, moreover, some “therefores” in the aspect of natural sciences were of scientists’ matters in the past, but now they have already become daily “therefores”. More and more daily “therefores” come from natural sciences. “Therefores” from natural sciences have no class characteristics. This is indeed the case, which has to be admitted. Since that is the case, we should recognize it truthfully. However, we still have to keep in mind that the “therefore” in natural sciences and the “therefore” of natural scientists are two different things; that the former has no

class characteristics but the latter is not necessarily without class characteristics. A natural scientist is a person who is in a certain class society, so he is of brand of a class. In his social activities and in his views on social issues, his “therefore” is still of class characteristics. Even on the opinion of natural sciences, his “therefore” is not necessarily without class characteristics.

Eddington is a natural scientist. Although his *The Nature of the Physical World* is not about physics, it is still a book about natural science which expressed the following ideas. He put tables into two kinds: ones in the common sense and the others in the “physics” sense. He pretended to admit these two tables, but his thought “my second scientific table is the only one which is really there—wherever ‘there’ may be” (p. XII) is finally exposed. We certainly admit that the hand and table in the macro world are essentially a mass of electrons for the micro world. We also admit that in the macro world “on” means putting hands on the table but in the micro world it means the contradiction between the pressure and reaction of electrons. The problem is that we would agree that only the “scientific table” is really there if “really” refers only to that the pressure and reaction of electrons is real. But what “really” means is not limited to this. What it means is that the situations in the macro world are merely phenomena but only the situations in the micro world are real, which is more than a matter of natural sciences. We can ask: Are there real hands or tables on the macro world? And is this whole reality that objective hands are putting objectively on the objective table? If your answer is yes, that’s good. But, from the point of view of the whole book, that is not your answer. That consists with this argument is the negative answer which abolishes the reality, objectivity and materiality both of the micro world and of the macro world. Why? For the process of cognition, the reality of the micro world is from that of the macro world. Some time ago, I saw the experiment that Mr. Wu Zhengzhi did at the auditorium of the Tsinghua University. The object of this experiment is from the micro world, which is certainly right. But attention please—the tools used in our observations and the results observed are all objective facts from the macro world. For epistemology, recognizing the reality of the micro world is based on the cognition of the reality of the macro world. If the hands, tables and cuvettes for the experiment in the macro world are not real, then where are the reality of the pressure, reaction, and so on, of the electrons from? Does not this undermine science? Eddington’s statement contains an inference, and this statement alone is Kantian; but, for the argument of the whole book, Eddington is a Machist and a Berkeleyist. Machism and Berkeleyism are of class characteristics. Although natural sciences have no class characteristics, natural scientists are of class characteristics. Although

“therefore” in natural sciences has no class characteristics, the inferences about natural sciences made by natural scientists are not necessarily without class characteristics. This is what is said in this paragraph.

In the third section, we mentioned the thought “nature abhors a vacuum”, and pointed out that it played an obstructive role in the forming of the concept of air pressure. Here we will not discuss this thought itself. I do not know whether the present-day natural scientists still regard this thought as correct or not, but at one time natural scientists did accept that “nature abhors a vacuum” and it played an important role in their thinking and cognition. In the third section, we affirmed the positive role Salviati played in scientific development, and at the same time, we also pointed out that he did not get rid of the influence of the thought “nature abhors a vacuum”. He said: “We could know the reactive force of the vacuum in the pipe when we measured the weight of the water rising thirty-four feet high in the pipe.” The so-called vacuum, however, influenced his cognition and inference. This thought is not of natural sciences but a philosophical one. It is reported that it comes from Aristotle and was accepted by Aquinas but spread by Catholicism. Many people accepted it and it was very popular. When Torricelli criticized it from one aspect, Descartes still defended it generally in 1644. Not only that, but Hume also maintained the statement “nature hates a vacuum” later. There is no intention to discuss whether this thought is correct or not. What we want to point out is that the general philosophical thought plays a part in scientists’ “therefore”.

Even though the above is Aristotle’s thought of philosophy, we can not say that he was intentionally going to deceive later natural scientists. As to changing the Ancient Greek Aristotle into the one that serves for scholastic Catholicism, this is not just an unconscious action. But even so, we also can not say that this is going to particularly affect natural scientists. But for some philosophical ideologists it is not as simple as this. I published a paper in the *Journal of Peking University* to criticize Russell. In the paper I put forward the following inference of Russell: naive realism leads to physics, and “physics” proves that naive realism is false. “Therefore” if naive realism is true, then it is false, “therefore” naive realism is false (‘An Inquiry into Meaning and Truth’, p. 15). Indeed, from the point of view of implication, if a proposition implies that it itself is false, then it is false, which is a principle that we admit. But is this Russell’s inference correct? Obviously not. Here is a disguised replacement of concept. The first occurrence of physics in the sentence is the real physics, and the second one is the so-called Machism “physics”. Russell was against naive realism in a way of passing fish eyes



for pearls, and naive realism is naive materialism. We can not say that Russell did it unconsciously. Of course, we do not know how many philosophers and natural scientists he deceived. In any case, in their inferences natural scientists are attacked by the thoughts outside natural sciences; some of these attacks are not intentional, but others are intentional.

Now let's turn to the everyday "therefore". Of course there are lots of examples of this kind of "therefore", some of which have no class characteristics. "It's three o'clock now, Jim is not at home, he went to the department", "Aha (when I saw your hair cut short) unexpectedly you find the opportunity for a haircut", "You did not drink alcohol? If so, why do you have a stomach trouble?" "So happy, you must have found some book", and so on. These are all inferences. There are many-many inferences like these in daily life. Obviously, such inferences have no class characteristics. How many inferences are there? We have no idea and this needs not to be considered, because if this kind of inferences greatly reduce then our life would not roughly be "daily" any more. Saying life is daily means that there are many-many such inferences. We admit this. However, we also need to consider the conditions under which inferences are brought in force. Take "it's three o'clock, Jim was not at home, he went to the department", for example. Suppose that the daily life talked about is that in some universities from 1952 to 1955, after the adjustment of colleges and departments, the daily life refers to ideological remolding and teaching reform and giving lectures in the morning but often having meetings in the afternoon. This general arrangement is to carry out a revolution in education and it was the system at that time. Is this arrangement of class characteristics? I think yes. It is impossible for it to happen before liberation, nor before the struggle against the "three evils" and the "five evils" and the movement of ideological remolding. Anyhow, this problem leads to the point presented at the beginning of the paper.

At the beginning of the paper, I said that I think that basically "therefore" is of class characteristics. Let me explain this idea first. Here what I said does not mean that all inferences are of class characteristics, which would be false. Nor that most "therefores" are of class characteristics. I did not lay out the "therefores" and put those with class characteristics on one side and those without class characteristics on the other side so as to count them one by one to draw a conclusion. I did not do such a study. We can not treat inference by the attitude of absolute equalitarianism. Thoughts are divided into dominant ones and subordinate ones, so are the inferences. The function of those dominant inferences is also dominant. Our question is, is it the inferences with class characteristics or those

without class characteristics that function dominantly in inference? If the fact is the former, then basically “therefore” is of class characteristics; otherwise, no. Then, is the objective fact the former or the latter?

After primitive community, human beings moved into the class society in which the thought of the ruling class alone is dominant. Of course, this thought is not the only thought, and the ruled class has its own thought which, however, does not occupy a dominant position. In the slave society, slave owners’ thought occupies the dominant position, and in the feudal society, the feudal thought occupies the dominant position. In the capitalist society, the bourgeois thought occupies the dominant position, but in the socialist society, the Marxism-Leninism occupies the dominant position. That which occupies the dominant position in thinking and cognition is that which plays a leading role in inference or “therefore”. Shortly after the founding, Mr. Feng Youlan went abroad and said definitely that in China the people will become the masters of our country. A foreign scholar did not believe this and asked “then who will be working?” This gentleman expressed his conclusion only in the form of a question, and his inference can be written in the form of a syllogism. It is an exploiting perspective that runs through this inference. In that country this inference is “natural”. But do we have such an inference here? Not only would we not make such a conclusion, but also fewer people would understand this inference years later. Here is an example from the feudal times. In the feudal society, hierarchy controls relationship among people. Family members have their own different statuses which control their speaking, doing, and even thinking. To my knowledge, Chapter 46 of *The Story of the Stone* expressed this point most clearly. The story is that Jia She wanted to marry Yuangyang as his concubine but she refused. His mother Jia-Mu was very angry with Jia She after finding out about this matter and took it out on Mrs. Wang. The persons, except Feng-Jie, on the spot are not permitted to discuss this matter. However, the different feudal statuses discourages Mrs. Wang, Aunt Xue, Feng-Jie, and Baoyu to discuss it but on different reasons. The author supplemented these reasons afterwards. Tanchun came forward. She said only two sentences of which the conclusion is “this matter has nothing to do with Mrs. Wang” and the reason is that “a younger brother’s wife should not discuss her brother-in-law’s private business”. The whole thing can be said to be a small ideological struggle. The ones who dare not to talk about all have their own inferences, so does Tanchun. Her first conclusion is: She is the most suitable one to talk about. She is a girl and will marry off in the future. Her status is different from the others in the Jia family. She is Mrs. Wang’s daughter, but Mrs. Wang is not her biological mother. She is not of the same status as Baoyu. What she

put forward is a principle generally accepted in feudal families, i.e. a younger brother's wife should not discuss her brother-in-law's private business. Inferring from this principle, Mrs. Wang should not discuss Jia She's private business. This is the second conclusion, which is admitted by Jia Mu. Jia Mu laughed immediately at these words, so the situation changed. In Chapter 46, there are many inferences in the paragraphs from "Jia Mu is trembling all over in rage" to "read the next chapter". These inferences are all about feudalism. Baoyu's inference is the best, because he makes a perfunctory remark, but this could satisfy the complex etiquette of feudal families. Tanchun's inference occupies the dominant position, and the tone of her inference is doubtless of feudalism. Such inference appears neither in proletarian families nor in bourgeois ones. In any case, it is the feudal thought that occupies the dominant position in the inferences of feudalism talked in this paragraph, and the inference that occupies the dominant position is of feudalism.

The above things happened in the past. How about now? Now with what enthusiasm we are building socialism! In the last year's great leap forward in industrial and agricultural production, there was an unprecedented number of inventions and discoveries in which lots of inferences are not of class characteristics. Most of them are analogical inferences. Mr. Wen Gongyi even published a paper devoted to this point. But are these inferences irrelevant to the general line? Irrelevant to go all out and aim high? Irrelevant to better, faster and more economically? Obviously no. Local experts will not emerge largely without breaking some superstitions about science; water conservancy facilities could not be built on an enormous scale without breaking restrictions of private ownership; many simultaneous developments in the countryside could not be possible without people's commune; these many inferences will not produce without the guiding ideology. In this paper, inference is not only possible with "therefore", it is the inference of that that has realized the "therefore", i.e., it is the inference that inferred. Without the encouragement of the general line, last year's inferences, especially those that occupy the dominant status, would not have happened.

Inference is relative not only to the level of scientific development but also relative to the dominant ideology of an era. That is, it is relative to class in a class society. Many people focus on the level of scientific development, but I think that the dominant role is still class and this is particularly evident today. Just think about the use of atomic energy, the conflict between peace and war, then we will see which is the nature of inference that occupies the dominant status.

Does this not clearly prove that class occupies the dominant status in inference?  
Does this not prove that basically inference is of class characteristics?

However, you are talking about concrete inference, right? But it is formal logic that we are engaged in! It is the form of inference that we are talking about! This is an important issue which is unavoidable, and I never want to avoid it. In fact, my question began with the form of inference. The following sections will focus on the form of inference.

*(To be continued)*

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