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CARROLL C. PRATT, PRINCETON UNIVERSITY

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THE CIRCUMNAVIGATION OF COGNITION

BENBOW F. RITCHIE
University of California

Columbus Day is an occasion in this country for celebrating the belief that the earth is round. Since 1492 this idea has caught on so well that it is now a part of the public school curriculum. Opposition to it has virtually disappeared. Today, however, certain new ideas in modern science suggest that we may have been too hasty in our judgment and that this belief may be quite misleading if not actually false. Now by "modern science" I do not mean what you think. I mean, instead, the new methods of "theory construction" as they are called, devised by psychologists.

These methods were devised, of course, to deal with specific psychological problems, but their use need not and indeed should not be limited to these problems. To my knowledge the present paper is the first to apply these methods to problems outside the social sciences. The problem we have chosen is the problem of the earth's shape. Is it round or is it flat? The analysis we have chosen is one recently used by Kendler (4) in his discussion of a similar problem in psychology.

WHAT IS THE SHAPE OF THE EARTH?

Geographers have disputed about the shape of the earth since Pythagoras first suggested that it was round rather than flat. This is certainly not the place to review all the arguments, but there is one argument which we must discuss. I refer to the argument based upon what is called "the phenomenon of circumnavigation." By this the ball theorists, as they are called, mean that explorers who set out from some place and keep sailing in a constant direction, eventu-

ally return to the place from whence they started. The results of the explorations of Magellan (1), Drake (3) and Captain Cook (8) are all illustrations of this phenomenon. The ball theorists claim that these results contradict the basic assumptions of the disk theory, and they surely seem to, at first sight. But before we decide let us consider the replies which the disk theorists have made to this argument.

Some disk theorists (5) reply by demonstrating that, no matter what the facts appear to be, circumnavigation is impossible. This demonstration is based upon an analysis of the word "to navigate." How do we know, say these theorists, when navigation has occurred? We can only know this if the navigator has moved from one place to another, in short, the empirical meaning of the word means to go to *another* place. Thus the very notion of "circumnavigation" is contradictory since it means to navigate to one's starting place. In this sense the phenomenon is impossible.

Other disk theorists (7) admit that circumnavigation is possible, but seriously doubt that it ever occurs. The fact that a few explorers have "circumnavigated," they say, is given all too much importance. Consider instead the many, many, explorers who have set out to circumnavigate and have failed. Thus the few cases of so-called "circumnavigation," they say, might easily be expected simply on the basis of chance.

There are other disk theorists (6) who admit that circumnavigation does occur, but think that it is a mighty poor way to travel. They point, for example, to the great numbers of travelers who have successfully returned home

by retracing their original route. Thus they demonstrate that the chances of safe return are much greater by this method than by the method of circumnavigation.

The issue, say other disk theorists (2, 9), is not a theoretical one at all. Of course, "circumnavigation" in *some* sense occurs. But in *what* sense is the crucial question. Only when we have discovered all the factors that produce circumnavigation, will we be able to answer this question. And when we have done this, there will be no issue left for theoretical dispute. The facts will have provided the answer.

Finally there are those who might be called "the semantical disk theorists." They say that the controversy results from the use of words. Its solution consists in recognizing that what ball theorists mean by the word "round" is what everyone else means by the word "flat." Once the appropriate word substitutions are made, the problem is resolved. There also is a group of "semantical ball theorists" who apply the same kind of analysis to the problem. They conclude that what the disk theorists mean by "flat" is what everyone else means by "round." The only problem that remains is to decide which "semantical analysis" is the correct one.

So much for the present status of the controversy concerning the shape of the earth. Can the controversy be settled? Certainly there is little hope of either side giving in. What, then, is to be done? Perhaps it is time to apply methodological analysis. Kendler (4) reported great success following his use of such an analysis. He applied it to a problem concerning the nature of learning about which there had been a long and apparently irreconcilable controversy. Following a single application of methodological analysis the controversy was resolved. Because of the re-

that problem we shall employ the same analysis to the problem of the earth's shape.

THE QUESTION AND ITS ANALYSIS

Present-day philosophy of science has devised criteria for discriminating questions that are meaningless from those that are not. So, whenever a question is posed that no one is able to answer, it is time to ask whether the question is answerable. "By application of methodological analysis," says Kendler (4, p. 269), "it is possible to demonstrate that certain problems are not resolvable, not because they are too profound, but rather because the questions they raise cannot be properly answered."¹ If the question can be shown to be a pseudo-question, then all sensible persons will refrain from asking it, and our inquiry can be directed to more fruitful problems. It is the purpose of the present analysis to show that the question, "What is the earth's shape?" is such a pseudo-question, and so should not be asked.

Now of course most geographers not only regard this as a sensible question, but also believe that an answer to it is crucial to an understanding of geography. On the other hand, as we have seen, empirical evidence refuses to provide us with an answer. Consider, for example, the results from various balloon ascensions made by geographers seeking an answer to this question. When they came down and described what they saw from aloft, the descriptions of the ball theorist and the disk theorist were alike in every detail. There is only one difference between them. One describes the earth's surface as round, the other as flat. How is this possible? Methodological analysis states that such a paradox arises whenever the question posed is a

¹ Unless specifically noted, all further quo-

pseudo-question. This is expressed in one of the fundamental principles of methodological analysis.

If comparable data are employed to support diverse answers to the same question, then the major source of difficulty lies not in the seemingly opposed answers but, rather, in the question itself.

Now how do these conflicting notions about the shape of the earth arise? When we read the theoretical papers of various geographers, these notions appear to be basic to the theories presented. But are they really? Now, no matter how convinced a geographer may be that his notions about the earth's shape are essential to his *thinking*, these notions may be quite external to his *theory*. At this point it may be helpful to introduce another principle of modern methodology. According to this second principle it is essential to distinguish between a scientist's *thinking* and his *theory*. It was formerly believed that a scientist's thinking produced his theory, and as a result his theory represented his thinking. But this is all wrong. It is based upon a prescientific notion of causation, and so is rejected by modern methodology. In its place we have the sharp distinction between thinking and theory. So, although a geographer may think a great deal about the shape of the earth, his theory need not and perhaps should not make any reference to the earth's shape. At this point the reader may find this distinction between thinking and theory puzzling. However, when we see what is considered "theory" by modern methodology, the distinction should become obvious. And to this matter we now turn.

It has been suggested that notions about the earth's shape may be external to geographical theory. To decide this question, we must review what are called

"the structural requirements" of a geographical theory.

The geographer is concerned with stating in as precise a way as he can where things are. This task has two aspects: (a) the stating of the location of some given thing or group of things, and (b) the description of the thing or group of things in a given location. Now in order to do this the geographer must travel from place to place noting first what is in each place and second how he got to each place. Thus his empirical "first-order laws" as they are called take the following form:

If I start from place A, and go a certain distance in such and such direction, then I will reach B.

Such a first-order empirical law describes the relation between the independent variables of starting place, direction, and distance, and the dependent variable of terminal place, which results when the antecedent conditions specified by the independent variables are satisfied. So far, the geographer has no need of theory. If he wishes, he can merely make a list of all the empirical laws discovered in his travels and do without theory. But the geographer, if he travels enough, will discover two remarkable things which may lead him to begin theorizing.

First, he will discover that place B can be reached from a variety of starting places. If he is in a methodological mood, he may express this by saying that the dependent variable is a function of several independent variables. Secondly, he is likely to observe that different terminal places can be reached from the same starting place. These two discoveries lead the geographer to construct or erect a theory. He does this by making a map on which place B, as well as many other places, is represented. The map shows how it is possible to get to B from many of these

places, and also how it is possible to get to many of these places from place B. Such a map, speaking methodologically of course, "bridges the gap existing between the independent and dependent variables."

The geographer with a methodological orientation prefers such maps, which he calls "intervening variables," to a list of directions or rules for getting from one place to another. As he puts it, he would rather create such a theory than "treat separately the relationship each independent variable bears to many dependent variables," and vice versa. It is, of course, important to understand that the intervening variable is not discovered by the geographer. Not at all. It is invented or constructed by him and "this intellectual construction," as he will tell you, "has as its aim the economical description of the known empirical relationships and the prediction of new phenomena." Once you have grasped these essentials of theory construction you are in a position to understand "the structural requirements" of a geographical theory. Such a map, or theoretical erection, must, if it is not to collapse, be anchored to the antecedent independent variables on the one side, and to the consequent dependent variables on the other. Any map which is not so anchored is useless for guiding us anywhere, and so is said to be without operational meaning. Thus, the structural requirements of a theory state in a very methodological way the conditions which ensure that the theory has operational meaning.

It is clear from all this that the structural requirements of a geographical theory include no references to the shape of the earth. In this sense, at least, such statements are external to theory. But modern methodology reveals an even deeper sense in which this is true. Consider for a moment the first-order empirical laws of a ball and a disk

theorist. Will there be any differences in these laws? No, for the consequences of going a certain distance in a certain direction from a given starting place will be the same for both. Since a map is merely a shorthand description of such empirical laws there can be no *operational* differences between the maps of two "opposed" theorists. Thus in a deeper methodological sense statements about the shape of the earth are external to geographical theory.

But what, the reader may ask, am I talking about when I say that the earth is not flat? The methodological answer to this question is simple and direct. Nothing! Such statements, the methodologist will tell you, "represent secondary and unnecessary elaborations about the meaning of these intervening variables." You would never make such completely pseudo-statements if you remembered that these intervening variables serve as economical devices to "order" the relations expressed in our first-order laws. These maps, he will go on, "are *shorthand descriptions* and nothing more. . . . The only *meaning* possessed by these intervening variables is their relationship to both the independent and dependent variables. Because this point has been ignored, an immense amount of confusion concerning the 'real meaning' of these intervening variables exists."

But why, one may ask, has such an obvious point been so persistently ignored? The reason, says modern methodology, is the "fallacy of reification or hypostatization." This fallacy consists in regarding certain words as names of things or entities when they aren't. Let's begin by assuming we know what is meant by the words "thing" and "entity." Without such an assumption it is very difficult to make this fallacy understood.

Any *thing* can be given a proper name like "Julius Caesar" or "53A270," and

can also be given a class name like "Roman general" or "Ford sedan." Now, although all class names in English are nouns, not all English nouns are class names. This is most easily illustrated with slang expressions like: "He threw a tantrum," or "She copped a gander." In such cases it is clearly silly to ask where the tantrum is that was thrown, or the gander that was copped. The reason why it is silly is that the nouns "tantrum" and "gander" have no meaning apart from these phrases in which they appear. The fallacy of reification is committed when you regard such a noun as a class name referring to things or entities.

Now as we have seen, a geographer's duties consist in traveling, recording observations on a map. This whole complex process is called "mapping the earth." The geographer commits the fallacy when he thinks of the word "earth" as having some meaning apart from this phrase. He then regards the word "earth" as a class name and imagines that it refers to some thing or entity. It is thus, modern methodology makes clear, that the fallacy of reification creates the problem of the earth's shape. The realization that the word "earth" does not refer to a thing or entity, disposes of the problem.

THE USE AND ABUSE OF INTUITIVE MODELS

Hume recommended that nonsense, when discovered, be committed to the flames. In his view it could contain "nothing but sophistry and illusion." Modern methodology, however, is not so reckless with the products of human creation. Although, as we have seen, statements about the shape of the earth are nonsense, we should not conclude from this that such statements are worthless. Far from it. They serve to help the geographer in his construction of what is called an "intuitive model."

This model serves as a "*thinking aid*" leading to the invention of theoretical constructs and intervening variables. Some geographers, for reasons which are not yet fully understood, get more help from thinking of the earth as flat, others are helped more by thinking of it as round. "It would be hazardous, as well as somewhat presumptuous, for any theorist to insist that every theorist think in his style."

The failure of Hume and others to recognize the usefulness of such nonsense was due to their misunderstanding of the relation between thinking and theory. As we have pointed out, modern methodology makes a sharp distinction between "the personal thought processes leading to the invention of theoretical constructs and the operational meanings" of these constructs.

But the fact that such meaningless statements form the core of scientific thinking should not mislead the reader into thinking that such statements are capable of being either true or false. Modern methodology insists that the decision between various such intuitive models "is in the last analysis a decision having no *truth character*. That is, in spite of the fact that the choice of a model may, and usually does, influence both experimentation and theorizing, the *choice itself* cannot be evaluated as being right or wrong. It is a matter purely of personal taste. The most we can do is to attempt, in a sincere and conscientious manner, to understand the implications of such decisions, but we should not be led astray by believing we can experimentally test their validity. . . ."

SUMMARY

We have almost completed the "circumnavigation of cognition." One further methodological homily will serve to end the trip. Henry Fielding in *Tom Jones* has this to say:

The only supernatural agents which can in any manner be allowed to us moderns, are ghosts; but of these I would advise an author to be extremely sparing. These are indeed, like arsenic, and other dangerous drugs in physic, to be used with the utmost caution; nor would I advise the introduction of them at all in those works, or by those authors, to which, or to whom, a horse-laugh in the reader would be any great prejudice or mortification.

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