SCIENCE AND BEGINNING

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Given the initial conditions and the laws, science can uniquely predict the future of any particular system, provided that the system does not belong to the atomic or sub-atomic domain (uncertainty principle). Can science also predict the past *of a system from the present situation and the laws in a unique manner? It can* not, *for we do not know when and where to stop. This means that science has difficulty in qualifying an early situation as a* real *beginning. Theology does not have such difficulties, since it qualifies any beginning, whatever and whenever it may have been, by saying: "God began."*

To use arguments taken from science to establish or make plausible the existence of God or to arrive at God's attributes (natural theology), means ignoring the Biblical usage of contemporary "scientific" notions. Such notions are used in four ways:

1. In instruction in the doctrine of creation (Gen. 1). The contemporary notions of science are here used not to bolster the faith, but to spell out in detail the confession "God created all."

2. In preaching God as Creator (Gen. 2). The contemporary notions of science are here used to preach God as Creator in a very vivid and concrete manner.

3. In praising God as Creator (Psalms). We should follow in the footsteps of the Psalmist and praise God as Creator within our *frame of reference.*

4. In giving people confidence that God has not left them (Isaiah).

A. *Science*

The models used in science are deterministic. That is, given the laws governing a system and given the initial conditions of that system, the future of the system can be predicted, unless we are dealing with systems in the atomic and sub-atomic domain. Consequently, if we deal with macroscopic systems, such as the earth, the solar system, our own galaxy, or the Universe, one would expect full predictability of the future provided that the laws and the initial conditions are known with sufficient accuracy.

Can we also predict the past? At first sight there seems to be no reason why one cannot extrapolate the predictions back into the past. But a closer look gives a different picture, for we see that we run into two difficulties:

a. We may not know where to stop with our extrapolations.

b. For systems obeying the second law of thermodynamics the past is obtained from the future by inverting the sign of time.

Both difficulties hamper us in qualifying a "true" beginning.

Now, there is little doubt that some conclusions about beginning are quite valid. For example, from the constitution of volcanic rocks one can deduce that all are samples taken from a molten system that is about 4½ billion years old. It is therefore not unreasonable to state that the earth is about 4½ billion years old or to conclude that the earth "began" about 4½ billion years ago. There are also quite sound reasons to assume that our solar system is not much older. It may thus be concluded that our solar system "began" not much more than 4½ billion years ago. In the same way one can determine the age of stars. Some are old-timers, like our sun, others are much younger. Trouble arises, however, when one tries to predict the age of the *Universe.*

Let me illustrate the first point first. Suppose somebody throws a stone. It describes a parabola in space and time. Suppose I measure with what velocity (both in magnitude and direction) the stone hits the ground. I can then predict the parabola that was described. Somewhere along this parabola the stone was given the initial velocity that made it describe this orbit. But from the observations made, one cannot conclude where the stone started. To find that out, I must either have earlier information or I must use plausible reasoning. For example, if I had *observed* the throwing of the stone, I would know the exact beginning of the orbit. Or, I might make the plausible assumption that the stone was apparently thrown from the ground; then I could have a fair idea about the location of the stone thrower. But the point is, one cannot conclude it from observations at the end point *alone.*

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Let me illustrate this by another example. Suppose I have a spherical bomb in space and I trigger it at a given time. The fragments of the bomb speed away from the explosion site. When these fragments are observed after a long time, it is seen that their speed is proportional to their distance to the explosion site, as expected. If we now extrapolate back into time, we should not extrapolate back to the time when all the pieces *coincided*, but rather to the time when all the pieces *fitted together* to form the hull of the bomb. In other words, extrapolating back to full coincidence of the fragments leads to a fictitious beginning whereas the true beginning, where all the pieces fitted together to form the hull of the bomb would probably go unnoticed in this extrapolation. Moreover, our extrapolation would never find out what started the explosion.

This last example brings us to the theory of the expanding Universe. We know that the light of distant galaxies shows a red shift that increases with the distance of the galaxy under observation. The most likely explanation is that this red shift is caused by a Doppler effect. Adopting that explanation, it can be concluded that the galaxies move away from us with a speed proportional to their distance. Our previous model thus applies fully. Extrapolating this back into the past, one can determine the time at which the galaxies coincided. As our example indicated, however, this extrapolation is a very doubtful procedure that leads to meaningless conclusions about what went on around that time.

It therefore seems that one should not draw theological conclusions about the expanding Universe. It is reported that when Pope Pius XII heard about the theory of the expanding Universe he rejoiced that the scientists had hereby "set the date of creation at about 4½ billion years ago." Actually the theory of the expanding Universe does not "set" the date of creation at all. For there is no reason to assume that the coincidence of all galaxies or pre-galaxies actually constituted a *true* beginning. Extrapolating back to full coincidence is a meaningless procedure.

Moreover, why should one stop at full coincidence? Why not go back further in time and see the explosion of the universe as a consequence of an earlier *implosion?* For who can give a guarantee that a supposed set of initial conditions did not have a precedent? Because of what went on at the moment of impact, all information about the pre-explosion state of the universe would be lost. Nor can we say anything about the starting date of this "implosion." The supposed beginning thus recedes back into the past deeper and deeper and tends to disappear altogether.

Science has thus difficulties in qualifying a true beginning of the Universe. It does not do badly for smaller systems, about which we have earlier information or about which past we can make plausible inferences. But the Universe is, at present at any rate, too big for that. We should not be ashamed to admit this. Science provides many answers, but it does not provide *all* the answers.

Next consider the difficulties introduced by the second law of thermodynamics. We state this second law here as follows: "A system left to itself tends to go from a less probable to a more probable state." This law applies successfully to the future. Does it also apply to the past? It does not, and the reason is in the innocently looking words: "left to itself." We shall see that they imply something about the system. They imply that the present state of the system came about by huge spontaneous fluctuations.

Let me illustrate this with an example. Let us assume that a hot metal ball is suspended on a thin insulating wire. It is more probable that the heat is evenly distributed between the ball and the surroundings than that a large excess of it is concentrated in the metal ball. Hence the ball will lose its excess heat by radiative heat exchange with its surroundings. This comes about with an exchange of quanta between the ball and the surroundings. Since the temperature of the ball is larger than the temperature of the surroundings, the ball will on the average radiate more heat than it receives and as a consequence it will cool down.

The expression "left to itself" means that the only process operating is the exchange of quanta. What does a hot body "left to itself in the past" mean? It means that only the process of exchange of quanta was operating in the past. How can a body get hot by exchange of quanta with its surroundings? Only because, by a strange coincidence, it receives more radiation than it emits. This is an improbable event, but since we required that the system was "left to itself," it is the only event available to heat the system. The *requirement* "left to itself in the past," thus amounts to assuming a very rare spontaneous fluctuation in the emission and reception of quanta** as the cause of the initial conditions.

What holds for this one system applies equally well to all systems to which the second law of thermodynamics is applied. The assumption that the system was "left to itself in the past" requires that the present state of the system came about by a huge spontaneous fluctuation. Since this is a ridiculous result, especially for macroscopic systems, one should be careful not to apply thermodynamical considerations to the past. This avoids the kind of trouble we just talked about.

This discussion was used by some Dutch physicists to argue in favor of creation. "For," they said, "if spontaneous fluctuations are ruled out as an explanation of the present, then the present situation must have arisen from a very improbable situation in the distant past. Since this improbable situation did not arise from a spontaneous fluctuation itself, it must have been *set.* The setting of this improbable situation we call *creation.*"

There is a scientific and theological flaw in this argument. The scientific flaw is that we cannot pinpoint a "beginning of the Universe." The theological flaw is that the Creator introduced in this argument looks more like an engineer who turned the switch at the time $t = 0$ and then retired. This is more the God of the Deists than the God of the Bible. Apart from this, I can quite understand why this argument had considerable appeal.

B. *Theology*

We saw that science has difficulty in qualifying a set of initial conditions as a true beginning. Does theology have a similar difficulty? It would if, like science, it started with data about the world around us. But it does not do so, it starts with *knowledge of God,* as He revealed Himself, and any conclusions, even those about the world around us, are drawn from and dependent on this knowledge.

One of these conclusions is that this God, Who thus revealed Himself, is also the creator of heaven and earth; that is, of everything. The aim is here not to make scientific conclusions about the world around us; rather it is *to connect* the world that we see *to God.* Any beginning of this world and in this world thus means: "God began." And such a beginning is a true beginning in the theological sense, for beyond God we cannot go.

The conclusion, that God is creator, is a conclusion of faith. This conclusion coincides with similar conclusions drawn in the Old and New Testament. The key concepts of the Old Testament are that God revealed Himself to Israel and chose Israel as His people. Based upon this faith the Biblical writers conclude that this God is also the creator of heaven and earth. The key concept in the gospel of St. John is the Incarnation (. . . And the Word was made flesh, and dwelt among us . . .). The conclusion is that this Jesus Christ, the incarnate Word, is *also* the creator of heaven and earth (. . . All were made by Him; and without Him was not anything made that was made . . .). The statement that creation is a conclusion of faith is thus entirely Biblical.

It has often been tried to draw conclusions from science that can strengthen the faith. For example, one has tried to find parallels between what science teaches about the beginning and what the first chapters of Genesis teach about beginning. I do not think very highly about what has been achieved in this manner, for in my opinion this procedure dims our view of the Biblical message instead of enlightening it. It seems to me that it is more fruitful to learn how the Biblical writers make use of the scientific notions of their times and then decide how we can follow in their footsteps.

The Biblical writers use the scientific notions of their times in four ways:

a. In teaching that God is Creator (Gen. 1).
b. In proclaiming God as Creator (Gen. 2,3).
c. In praising God as Creator (Psalms).
d. In teaching the people that God has not left them (Deutero-Isaiah).

Let me say a few words about each of these problems and then conclude what our Christian task as scientists is in these matters.

Biblical scholars (von Rad, etc.) tell us that Gen. 1 is teaching of the priests. What is taught, is that God is Creator. Hence these long lists of creation events. They are not told so that we get a better idea what went on at the beginning. Rather they are told so that one might understand better what it implies that God is creator. It implies that *all* the world that we see is God's good creation; the firmament, the dry land, the sea, the plants and the trees, the sun, moon and stars, the birds and the fishes, cattle and man. There is nothing to be worshipped but God, for even the most powerful things or beasts are fellow creatures, and there is nothing to be feared, not even the whales of the sea.

When we look at it from this angle we see how skillfully the ancient concepts and the ancient world view are used in this teaching. And since this is God's word, and is thus binding for us, this means that the church should follow the same path. Its task is not to defend ancient concepts and ancient world views. Rather it is its task to use *modern* concepts and *modern* world views with equal skill in the teaching of God as creator. And it is here that scientifically trained people can help and support the church.

Biblical scholars tell us that Gen. 2 is more proclamation than teaching. Who is proclaimed? The God of Israel is proclaimed as creator of all. Again ancient concepts and ideas are used to the fullest extent. Creation is here seen mainly in the light of the blessings and the benefits given to man. His environment, his life, his task, his wife, they are all God's good gift to man. And since this is God's word and is thus binding for us, this means that the Church should follow the same path. Its task is not to explain how man could be made of clay or how Eve could be made of Adam's rib; these are purposely chosen statements to underline how closely man is related to the ground he tills and how intimately man and wife belong together. Rather it is to proclaim that all the benefits that have been bestowed on modern man, are God's good gifts to man. And it is here that scientifically trained people can help in making others better aware of all these benefits.

But still another side of the proclamation that God is creator must be stressed. The example for that is given in Genesis 3. Here it is proclaimed that man is a sinner and that God is the punisher and the forgiver of sin. The glory of God as creator is not that he leaves man in his sin but that he comes to seek him, to punish and to forgive him. The Creator does not let go of the work of his hands. He comes to seek what was lost, as he has shown especially in the coming of Jesus Christ.

The Bible also *praises* God as creator. Psalms 8, 19, 104, to mention only a few, are full of this praise. Again we can note how freely ancient concepts and views are used by the Biblical writers. The Church should therefore use modern concepts and modern views in its praise of God as creator with equal freedom. And again, it is here that scientifically trained persons can help the church.

Not all of us are gifted with the gift of poetry, of course. But nevertheless here is a task for us that we can perform either in prose or verse. And the subject brings its own poetry with it. The world of the almost infinitely small, the world of the atom and the nucleus, is God's creation. The world of the almost infinitely large, a vast universe of stars, galaxies and supergalaxies, is His domain. The world of the almost infinitely distant past, with ages measured in billion's of years, is God's world and is the scene of His love and care. The almost infinite numbers of forms of life, they are all His creatures. Who can help but being awed by the vastness of God's creation and who can help but becoming a poet when speaking about it!

But here we must be careful. We do not harnass all these facts to present a good case in favor of creation. We use them in our *praise* of *God the Creator.* This might well be the best way of bringing the message that God is creator.

Finally there is another use of the concept of Creator. It is found in the second half of the book of Isaiah. Israel is here in captivity, far from the promised land. It seems to them as if God has rejected them. Here the prophet comes once again with the message that God is creator. And that means that He will not let go what He has begun. He Who made the world and made Israel will remain true to His creation and will help Israel and restore them. The theme of creation is here once again not an end in itself but is a means of strengthening and heartening a defeated people.

There is a connection between the second part of Isaiah and Gen. 3. The connecting theme is that God does not let go what He has begun. Human sin and human misery do not have the last word, but God has the last word. In this, that God shows Himself powerful enough to overcome sin and misery, He shows that He is the Creator indeed.

Our Christian task as scientists is not to provide a more powerful apologetics, though apologetics may sometimes be needed. Rather it consists in helping the church to teach and to proclaim that God is Creator, to praise His work and to strengthen and hearten defeated people, bent under sin and misery.

**As a further consequence, if the future state of the system is described by a function f(t), where t is the time, then the past state of the system is described by the function f(-t) and $f(-t) = f(t)$.

"If Genesis is only a book of human origin and its allusions to astronomy reflect the knowledge extant at the time of writing, we would expect it to be full of gross scientific errors. If, on the other hand, we find Genesis to be in agreement with the latest developments known to modern astronomy, such agreement would be evidence that God supplied the information just as the book claims.

Today there appears to be considerable harmony between astronomy and Genesis. This does not mean that all astronomers believe the Genesis account, although it seems to the author that astronomers as a group often possess a more reverent atitude toward God than do other scientists. It means that a careful study of the fact and well-established hypotheses of astronomy reveals a striking consistency with the outline of origins found in the first chapter of Genesis."

Peter W. Stoner, M.S. in *Modern Science and Christian Faith,* F. Alton Everest, editor, Scripture Press, Wheaton, Ill. Reprinted by permission.

"The Sophist begins his dialogue by proclaiming the absence of truth or fixed principles of which we may have a sure knowledge. He then asks us to rely on the undefined concept of *truth* in his own argument, asserting that while all other fixed positions in the universe are but mere products of the mind that would make them so, his position is, of all things, *true.* This reminds me of the deist assertion that God created all things and then passed away. To which we simply say, if He did in fact create all things He created time and therefore never came into being nor passes away. These are purely temporal concepts of which He was the creator. If the Sophist has truly destroyed the concept of truth, how can he possibly revert to this very concept as the reason for accepting his doctrine? If truth does not exist, then it certainly cannot be true that there is no truth. Scientific positivism has seen this weakness in the ancient relativism of the Sophists and has given the old doctrine a new twist."

Ervin Page Bailey, *The Sunday School Times,* Nov. 7, 1964. Reprinted by permission.

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within the context of other references mentioned by reviewers Ault and Roberts and used by Morris and Whitcomb. However, to express myself succinctly regarding the value which this born-again Christian personally attaches to *The Genesis Flood,* I re-affirm the following recommendation prepared shortly after the book appeared in 1961:

After close scrutiny of this book, I recommend it particularly to American youth in science courses. The authors have accomplished a unique preliminary report of a new scheme of historical geology based upon Biblical revelation within which scientific data may be interpreted.

This book, which provides thorough documentation, will help students encounter the circular reasoning of bold evolutionists, and will point out basic objections to uniformitarian geology and radioactive timekeeping. By their discussion of some major problems, the authors have shown clearly that religion can be a stimulus to a re-thinking and re-studying of "actual observed" data of geology.

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