creation as an act of thought. . . . And yet, so little do we understand time that perhaps we ought to compare the whole of time to the act of creation, the materialisation of thought." Jeans, Sir James, 1930. The mysterious universe. The Macmillan Company, New York, pp. 154-155.

[48]Weaver, Visions of order, *op. cit.*, p. 228.

[49]Weaver, Ideas have consequences, *op. cit.*, p. 25.

[50]Regarding the notion that human language originated or evolved from animal "language" Noam Chomsky remarks: ". . . a careful look at recent studies of animal communication seems to me to provide little support for these assumptions. Rather, these studies simply bring out even more clearly the extent to which human language appears to be a unique phenomenon, without a significant analogue in the animal world. . . . "In fact, the processes by which the human mind achieved its present stage of complexity and its particular form of innate organization are a total mystery . . ." Thompson, William Irwin, 1971. At the edge of history. Harper and Row Publishers, New York, p. 188. Subsequent research underscores the above statement.

[51]Lewis, *op. cit.*, p. 21. He concludes: "Hence every theory of the universe which makes the human mind a result of irrational causes is inadmissable, for it would be a proof that there are no such things as proofs. Which is nonsense."

[52]Elsewhere, he also notes the limitations of science: "Christian theology can fit in science, art, morality, and the sub-Christian religions. The scientific point of view cannot fit in any of these things, not even science itself." Lewis, C. S., 1980. The weight of glory. Macmillan Publishing Company, Inc., New York, p. 92. (Original copyright 1949.) Revised and expanded edition.

[53]Another illustration of how the evolutionist invalidates his own argument comes from his view of reason and logic. Evolutionary economist Ludwig von Mises writes: "Nothing suggests that logic as we know it is the last and final stage of intellectual evolution. Human logic is a historical phase between prehuman nonlogic on the one hand and superhuman logic on the other hand. Reason and mind, the human beings' most efficacious equipment in their struggle for survival, are embedded in the continuous flow of zoological events. They are neither eternal nor unchangeable. They are transitory." von Mises, L. 1949. Human action. Henry Regnery Company, Chicago, pp. 33-34. But if reason is so ephemeral, is there any realistic hope of knowing the truth? For example, how can an evolutionist know that his present evolutionary view is valid or that it will not be invalidated in the future? He thereby undermines his own case.

[54]Lewis, *op. cit.*, p. 66.

[55]The existence of non-self-validating entities logically requires the existence of a self-validating entity. It is in the one unlimited, uncreated Being that the limited and created world has any meaning. Jaki writes: "The metaphysician knows, of course, that the totality of perfections, which entails the exclusion of all singularities, is reserved for the noncreated Being for whom the capability of creating things, that is, concrete singularities, is exclusively reserved. The only being he cannot create is his infinitely perfect being with no trace of those singularities which are always signs of existential limitations that in him alone find their ultimate explanation." See Jaki, *op. cit.*, p. 273.

[56]Weaver, Ethics of rhetoric, *op. cit.*, p. 207.

[57]See reference 25.

[58]Speaking of statistical thermodynamics, Jaki summarizes Max Planck's view: "True, the theory permitted Boltzmann to conjure up cosmic processes running backward, but as Planck pointed out, they were not scientifically meaningful because they could not refer to *our* universe taken as a whole and in the broadest sense." He also presents Eddington's view of the matter: ". . . Eddington made shambles of the major counterargument based on the idea of statistical fluctuations. He termed it a blind alley to assume that since there is an infinite time ahead, very rare but sufficiently large reversals in the increase of entropy should take place with the result . . . that the present meeting of the Mathematical Society should occur by chance an infinite number of times while time flows on endlessly." See Jaki, *op. cit.*, p. 176. And, respectively, Jaki, Stanley L., 1974. Science and creation. Science History Publications, New York, p. 339.

[59]Georgescu-Roegen, *op. cit.*, p. 165.

[60]Dampier, Sir William Cecil, 1948. A history of science and its relation with philosophy and religion. Cambridge University Press (4th edition), Cambridge, England, p. 230.

[61]Georgescu-Roegen, *op. cit.*, p. 166.

[62]*Ibid.*, p. 169.

[63]Lewis, Miracles, *op. cit.*, pp. 105-106.

[64]*Ibid*, p. 106.

[65]Nobel Laureate E. P. Wigner does present a calculation from group theory to show that the probability of a self-reproducing system occurring by chance is indeed zero. See Wigner, Eugene P., 1967. Symmetries and reflections. Indiana University Press, Bloomington, pp. 203-206.

[66]Baker, Jeffrey J. W. and Garland E. Allen, 1971. The study of biology. Addison-Wesley Publishing Company, Reading, Massachusetts, p. 729.

[67]Jaki, Road of science, *op. cit.*, p. 286.

[68]Polanyi, *op. cit.*, p. 59.

[69]Baker and Allen, *op. cit.*, p. 746.

[70]*Ibid.*

[71]Weaver, Ideas have consequences, *op. cit.*, p. 154.

WHAT IS SCIENCE?

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Received 19 May, 1982

The nature of science is investigated. It is concluded that science is a tool, a means of learning about reality. Any pretensions beyond this, made in the name of science, should be discounted.

The word "science" is used for many reasons and purposes. Among these are to imply an idea is proven, a concept is based upon empirical data, or a conclusion is based upon objective observation. The word is also often currently used as a catchword to lend credibility and authority to some conclusion. In advertising, statements such as "our brand has been scientifically proven to be superior to brand y" or "in a recent scientific study, more people preferred Mitz milk than ordinary milk," are often heard.

So-called "religion-science" conflicts, such as the recent "creation-evolution" controversy, often include claims that evolution is "science" and therefore the implications are that evolution is more true and valid than the "non-scientific" theories, being supported by the facts and empirical data. The other side, or "creationism," it is claimed, is "religion" and therefore not supported or supportable by testable empirical data, etc. As to this problem Hardin notes:

> The polarization "science versus religion" is largely in the eyes of the beholder. Unfortunately a perceived polarization can breed a real one. By

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1920 a real polarization inspired the creation of the word "Fundamentalist" to stand for the minority of churchmen who were consistently opposed to Darwinian evolution.[1]

A problem with this dichotomy is that there is only one ultimate reality, and all "means of knowing" are only different ways of learning about this one reality. The goal of science is "to produce a description of the universe so complete that everything that occurs can be understood as an instance or instances of regularities which we call laws.[2] As Spinoza said: "The Universe is ONE. There is no supernatural [non-real enties]: all is related, cause and sequence. Nothing exists but substance and its mode of motion." Today most researchers recognize that much more than "substance" and its mode of motion exists; but the observation that "all is related" and there is one reality is still quite valid. It would seem in the search for knowledge, all methods of knowing should be utilized (and in fact all methods are often utilized). Brena concludes that "science" traditionally defined as a method can carry us only so far:

> As soon as the scientific process outgrows the analytic investigations which constitute its preliminary stage and passes on to synthesis, it naturally culminates in the realization of unity beyond apparent diversity, of harmony above contrasting theories. Different paths of scientific investigation must necessarily lead to the same Truth, since Truth must be only One, and beyond the different aspects of the same Truth there is but one Revelation . . .[3]

What is Science?

Science is actually nothing more than a *method* by which knowledge is obtained. Most commonly it is the collection of objective empirical data obtained by observation and measurement via the senses which is then summarized. From this summary some principle or generalization is produced (The process of induction.) For example, one might drop a few thousand items of different weights, sizes and so on, inside a 20-foot evacuated tube placed vertically and discover that they all fall with an acceleration of 32 feet per second per second (in other words, the speed increases by 32 feet per second for each second the object drops). A key factor needed to merit the label science is "can the hypothesis, law, summary, or principal be proved false" (falsifiability)? The theory must lend itself to the construction of a *null hypothesis* or a contradictory statement which can in some way, disprove one's assumption.[4] For example, one can easily construct a null or contradictory hypothesis, or a hypothesis which, if true, disproves the statement that matter falls in a vacuum with an acceleration of 32 feet per second, per second regardless of the weight: "The rate of fall of 10 lb. objects does not equal the rate of fall of objects with a weight of 20 lbs."

Generally, science refers to knowledge obtained by the scientific method. Although there is no one scientific method, the following steps are generally included:

1. Observation — or awareness of certain aspects of the environment. This quality may be improved by training designed to help the person carefully observe a certain phenomenon, especially that which regularly occurs. Knowledge is useful in taking special note of phenomena which are regular, and which are different, intriguing, etc. This helps researchers discover new laws, modify existing laws, specify under what specific conditions known laws operate under, and develop hypotheses which help explain reality.
2. Construction of some type of hypothesis — i.e., a statement of a possible relationship between two events such as the relationship between the amount of education a person has and his or her income. Data are then collected to find out if there is, for example, a positive correlation between income and education or if, in fact, as income goes up education increases.

Haas notes that scientific investigators generally begin with a model which, he stresses, is incomplete, inexact and framed on the basis of "a hunch, intuition or subconscious thought, perhaps suggested by considerations of an apparently unrelated field."[5] Then experiments are developed to evaluate the validity of this model.

3. Establishing an experimental design in order to test one's hypothesis is the next step. In the case above, this step would entail gathering data on income and education and then correlating the data using the appropriate correlation formula. The researcher may take a random sample of taxpayers, such as every 10,000th case, or draw names out of a hat, etc.; find out the income and educational level of each person, and then correlate the two.
4. Developing some type of statement which generalizes the relationship found. In the above example, one might state that "there is a positive correlation between education and life income." This generalization enables us to predict what we can expect to occur under a given set of conditions in the future. For example, if we know that a person has a high level of education, given the data above, by use of regression analysis we can say that his or her income will probably be above average; although a certain percent will have an average, and a smaller percent, a below average, income. Thus, the empirical method may give us *trends*, and, especially in the social sciences, probabilities with many exceptions.

As Robertson notes "Science relies for its generalizations, explanations, and predictions, on careful, systematic analysis of verifiable evidence — that is, evidence that can be checked by others and will always yield the same results."[6] In carrying out scientific research, it is important that the experimenter specifically delineate what he or she did to achieve the results found, so the study can (one hopes) be replicated.

Actually, science is not quite so restrictive as the above definition implies. Anthropology, sociology, and even many areas of psychology are difficult to replicate. For this reason some prefer a broader definition of science such as, "Science is a branch of study that is concerned with discovering and organizing facts, principles and methods."

Most researchers divide science into two types, the hard or natural sciences, such as math, physics, biology, chemistry and astronomy, and the soft, or social sciences, such as sociology, anthropology, history and the like. Psychology would be included in both the hard and the soft sciences because psychology includes both research similar to that found in sociology using similar methods, as well as that in biology, using like methods (physiological psychology for example).

When a study is completed, often a number of other scientists will replicate it to determine under what specific conditions the findings are true — and to determine whether the findings are true — unfortunately there has been fraud in scientific research.[7] Whether through fraud or through honest mistakes, there are examples of breakthrough research in which *all* attempts at replications have failed to reproduce. A good recent example is the research on planaria worms. "Naive" planaria worms were randomly fed either trained or non-trained planaria worms. Those with the trained planaria worm diet did better, it was reported, in subsequent training than those fed non-trained planaria worms. The implications were that learning could be transferred via eating "intelligent" worms or "educated" worms. Subsequent studies *failed* to confirm these results. The null, or contradictory, hypothesis which stated "there is no difference in the performance of planaria worms between a group which ate trained and one which ate non-trained planaria worms" was not disproved.

All science research rests on the important assumption that once a relationship is found, it describes a natural and consistent reality. Robertson notes that:

> All science, natural and social, assumes that there is some underlying order, or regular pattern, in the universe. Events, whether they involve molecules or human beings, are not haphazard. They follow a pattern that is sufficiently regular for generations to be made about them. It is possible to generalize that all human societies created some system of marriage and family. Generalizations are crucial to science because isolated, meaningless events must be placed in patterns or groups that we can understand.[6]

Probably one of the most important aspects of science is that its findings should be treated as *provisional*, never revealing the final truth. Historically, what has been accepted as scientific truth — even scientific laws such as the laws of Newton — have repeatedly been modified or overturned by subsequent investigation. Some assumptions which were firmly believed for centuries have now been totally discarded as a result of subsequent research. Robertson summarizes this as follows:

> For centuries common sense told people that the world was the center of the universe and that the earth was flat. Using scientific methods, Copernicus found that the world is simply one planet among others, and the investigations of Columbus and other geographers proved that the earth is round. In making their factual investigations, these men and others like them risked their reputations and sometimes even their lives, for their findings were at odds with important social beliefs of the time. But their challenge to ideas held dearly by their societies tells us something else about science: there are no areas so sacred that science cannot explore them. Any question that can be answered by the scientific method is, in principle, an appropriate subject for scientific inquiry — even if the investigation and the findings outrage powerful interests or undermine cherished values. Yet science is not arrogant: it recognizes no ultimate, final truths. All scientific knowledge is provisional. The body of scientific knowledge at any particular moment represents nothing more than the most logical interpretations of the existing data. It is always possible that new facts will come to light or that the available data will be reinterpreted in a new way, shattering the existing assumptions. Science, therefore, takes nothing for granted: everything is always open for further testing, reinterpretation, correction, and even refutation.[6]

Yet, if one claims something is "science" or scientific, it is often incorrectly understood by the public as "proved," "true," and not just a guess or claim or probability. Conway noted:

> The scientist is regarded as a genuine authority, an expert in esoteric matters that are quite unintelligible to the lay person. Further, the scientist is regarded as expert in matters of "hard fact." The scientists' knowledge is seen as demonstrably correct, else how could polio have been eliminated and men have been landed on the moon? Thus, the scientist, speaking as a scientist, can be a powerful authority on any topic.[8]

Science is rarely seen for what it is, a method or means to finding out knowledge, which itself is always subject to modification and further testing. It is not final truth.

The major conflict between philosophy/religion and science is that philosophy/religion attempts to develop statements that are universally true (the major premise)[9] in all areas such as "all animals are warm-blooded" but science only to summarize limited aspects of reality (the sample). Unless they are arbitrarily defined as such, there are very few major premises in science. All mammals are warm-blooded only because scientists define mammals as warm-blooded, but there are many animals similar to mammals which are not warm-blooded. And thus scientists are more apt to state "according to the Linnean classification system, mammals are, by definition, warm-blooded." Aside from definitions, the word "all" is used tentatively in science. A scientists would be more apt to state "according to present research, animals which have certain characteristics are warm-blooded," or "Taylor, 1981, Jones, 1980, and Smith, 1978, found that animals with certain characteristics . . .".

Summary

Science, then, is a method, a tool, used to learn about reality, and only this. It is a way of finding out what "is," what exists; and how parts of reality interact.

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[5]Haas, John, 1971. Biogenesis: a revived interest in an old question. *Christian Scholars' Review* 1(4):2.
[6]Robertson, Ian, 1977. Sociology. Worth Publishers, New York. P. 7.
[7]See, e.g., *Time,* 29 April, 1974, 3 and 10 June, 1974, 26 August, 1974, and 7 December, 1981. Also *U.S. News and World Report* 2 March, 1981 and *Science and Government Report,* 1 October, 1976.
[8]Conway, David, 1982. Jastrow and Genesis. *Free Inquiry* 2(1):32.
[9]It will be recalled that in the first figure of syllogism, which Aristotle called the most scientific, the major premise must be universal. See any work on logic.
Incidentally, Aristotle's discussion of the scientific method, in his *Posterior Analytics,* is well worth reading.

PANORAMA OF SCIENCE

Concerning Mimicry

A most interesting article on the coevolution of a butterfly and a vine in the *Scientific American* discusses various types of mimicry which occur in the passion-flower vines which are members of the genus Passiflora.[1] A careful study of the facts presented in this article would seem to indicate that mimicry from the creationist's viewpoint is of two basically different kinds. One kind is no doubt part of God's original creation and is exemplified by the type shown in the pair of butterfly species known as the monarch (*Danaus menippi* or *Anosia plexippus*) and the viceroy (*Basilarchia archippus*). Evolutionists claim that because the monarch has a disagreeable taste to birds it is mimicked by the viceroy butterfly, and so is protected from birds. But actually another species of the genus *Basilarchia,* the Lorquin's admiral *(B. lorquini)* is a very conspicuous black and orange brown butterfly with a pattern of very prominent white spots extending through the middle of both wings. And this species gets along just as well as the viceroy! Also there is no clear evidence that birds are important predators of moths and butterflies. Rather it would seem that these two species of butterflies were simply created as 'look alikes' to demonstrate that very distinct generic types could actually be made to look quite similar in appearance. In other words though God usually did use a very definite plan in creating the marvelous diversity which we see in nature, He at times created very similar plants and animals from genera and even families which are basically different. Or it might well be said that He was not a slave to His own laws. Actually the fact that such genetically distinct creatures could end up looking so much alike is a strong argument for their creation. For surely it would seem to be most difficult to explain exactly how two unrelated butterflies could ever come to look so superficially similar by the natural selection of mutations. Thus it is hard to see how a mutation giving a resemblance in some one part of the wing would be of enough protective value to become fixed in the population. Many such mutations would have to occur to cause such a complete similarity in wing color and design as is shown in the monarch and the viceroy butterflies.

Similar types of mimicry are exhibited by the walking sticks and especially the amazing "walking leaf,' a *Phyllium* species. This insect has its wings and flattened expanded body and legs all green except for irregular yellowish spots which look like the fungus and rust growths which often occur on leaves. Even the usual midrib of the leaf and the lateral veins diverging from it are clearly shown. These remarkable examples of mimicry of which there are many undoubtedly were part of God's original creation, and fortunately have been preserved until now. They should cause us to marvel at the remarkable ingenuity of our Creator.

But another type of mimicry occurs which can hardly have been part of the original creation, since it has to do with God's preservation of His creatures. It is this type which is described in a most interesting way by Lawrence E. Gilbert. The butterflies which he discusses are species of the genus *Heliconius* and the plants are the tropical members of the passion flower-vine family or *Passiflora* species. *Heliconius* butterflies deposit their eggs only on the passion-flower vine. And the vine has features which appear to mimic the distinctive bright yellow eggs of the butterflies. Now interaction between the vines and their butterfly parasites, or caterpillars, is highly detrimental to the plants; for occasionally so many leaves are eaten by them that the defoliation is fatal to the plant. One species, *Heliconius hewitsoni,* deposits its eggs only on one species of passion-flower, namely *P. pittieri.* So then the butterfly's opportunities for egg laying are limited. Thus the island of Barro Colorado in Panama has 113 families of plants, represented by 1369 species. Only 11 of these are passion-flower vines. So the butterfly has available to it only about 1/10 of one percent of the plant life on the island. The mere discovery, then, of an appropriate egg-laying site is a difficult and time-consuming process for the egg-laying female butterfly! Furthermore, field observation shows that even after the female has found its host plant and good fresh growth, it may not deposit an egg. For the site must not only suit the female but also be both suitable and safe for the caterpillar that will emerge from the egg. Just how is this accomplished? First of all, it has been found that the leaves of the passion-flower vine give off an odor that attracts butterflies of the *Heliconius* type. But this would bring the butterfly only to the *general* vicinity of the vine. Now actual determination of which sort of leaves to use is made by a specially