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The fear of the Lord is the beginning of wisdom. Psalm 111:10

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A. S. A. B U L L E T I N

Marion D. Barnes, Editor
511 E. Fifth Street, El Dorado, Arkansas

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Letter to the Editor

Pentwater, Michigan
May 25, 1949

Dear Doctor Barnes:

Thank you for your nice letter of May 4 and the reminder of May 18 (received the 25th). Perhaps you have given me an opportunity to work out and present an idea that has bothered me considerably. If it is not appropriate, please return this and no harm done whatsoever.

Our Name: The American Scientific Affiliation.

(1) "The American" is not necessary. We could well receive as members of our organization qualified persons from Canada or Cuba or Mexico or South America or even Europe.

(2) "Affiliation" is good, for each member represents an affiliation of Christian love and principles with scientific knowledge. God (Jesus Christ) presents an affiliation of perfect Christian love with <u>all</u> (scientific) knowledge.

The members of this organization, therefore, should follow closely in the footsteps of Jesus Christ as presented to us in the Scriptures: obedience to the commandments of God; earnest and faithful evangelistic witnessing; presenting knowledge in all truth.
John 15:13-14--Greater love hath no man than this, that a man lay down his life for his friends. Ye are my friends if ye do whatsoever I command you. Acts 1:8--Ye shall receive power, after that the Holy Ghost is come upon you: and ye shall be witnesses unto me both in Jerusalem and in all Judea, and in Samaria, and unto the uttermost parts of the earth. I Cor. 1:5 - In everything ye are enriched by Jesus Christ, in all utterance, and in all knowledge.

(3) "Christian" and "Science" are essential to our name.

None are better qualified to present knowledge than those whose specific education are supplemented by faithful Bible study and Christian practice. Luke 2:52 - And Jesus increased in wisdom and stature, and in favor with God and man. Col. 2:3 - Jesus Christ, in whom is hid all the treasures of wisdom and knowledge.

The name of our group might be improved so as to present our ideals more plainly; such as: Association of Christians Affiliated with Science (A.C.A.S.).

In connection with the idea expressed above, would it not be well to make our organization known to Christian teachers of science in the numerous colleges where Bible teaching and Christian influence is a part of the curriculum? There are said to be more than 200 such institutions in the United States. Thirteen are represented by our membership. Real Christians accomplished in science find the atmosphere of such colleges more congenial than schools where atheism is prominent, or Bible teaching is forbidden by law.

In our membership list we have 45 teachers and 28 non-teachers; of the teachers 23 are in Christian Schools, 15 in State-supported schools and 7 in endowed institutions where Bible teaching is not emphasized. Of the 28 non-teachers, 11 are physicians.

Respectfully submitted,

E. N. Gathercoal
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List of Christian and Endowed Schools

CHRISTIAN SCHOOLS	MEMBERS
Asbury College Wilmore, Ky.	1
Calvin College Grand Rapids, Michigan	3
Faith Theological Seminary Wilmington, Del.	2
Gordon College Stoneham, Mass.	1
Goshen College Goshen, Ind.	2
Grace Theological Seminary Winona Lake, Ind.	1
Kansas City Bible College Kansas City, Mo.	1
Marion College Marion, Ind.	2
Olivet College Kankakee, Ill.	1
Taylor University Upland, Ind.	2
Ursinus College Collegeville, Pa.	1
Westmont College Santa Barbara, Calif.	1
Wheaton College Wheaton, Illinois	5
TOTAL	23

STATE OR CITY SCHOOLS	MEMBERS
Manitoba University	1
California Institute of Tech.	1
San Jose State College	2
Colorado A & M College	1
Michigan State College	2
Illinois University	1
Vermont University	1
Oregon State College	1
Kahloties Public Schools (Wash.)	1
Hazeleton Senior (Pa.)	1
Pasadena City College	2
TOTAL	14

ENDOWED SCHOOLS	MEMBERS
Ambassador College Altadena, California	1
Columbia University (N. Y.)	1
George Pepperdine College Los Angeles, California	1
John Hopkins University (Md.)	1
Manchester College (IND.)	1
Purdue University (IND.)	2
Temple University Philadelphia, Pa.	1
TOTAL	8

THE SCIENCE OF HEREDITY AND THE SOURCE OF SPECIES*

A great geneticist has admitted that "No individual can claim such a mastery of all facts pertaining to evolution to enable him to present...."[1] a full discussion of the facts, laws and theories of evolution. This appears to me to be especially true of the bearing of the science of heredity on evolution. Therefore an attempt will be made to answer only one question, "To what extent have species changed into other species?"

Some species appear to have descended from others. If two species can be crossed, and living offspring be produced, there is proof of compatible germ cells from the two species. The obvious source of this hereditary material is descent from a common ancestor.

The birds of the eastern United States which hybridize readily are the Golden-winged Warbler and the Blue-winged Warbler. Their hybrids are called Lawrence's Warbler if there is a black throat, and Brewster's Warbler if there is not. The hybrids show the characteristics of the parents segregated in the offspring. A typical Lawrence's Warbler has a black throat from the Golden-winged parent but has yellow underparts like the Blue-winged ancestor. Similarly, upper parts, wing bars, and ear patches are typical of one parent or the other. Because the hybrids do combine traits of both parents, it is probably that at some past date the two parental types came from one type. To be sure, this transition was not observed; surely each species could have been created separately, even though they now interbreed. However, evidence from fruit flies which indicates that a species is now in the process of subdivision into two major groups indicates that the idea of the derivation of the two warblers from common ancestry is the correct explanation.

A species now undergoing subdivision is Drosophila pseudoobscura. There are two races, A and B which differ from each other, not in any observable external appearance but in the arrangement of genes on the chromosomes. (Genes are the units of heredity in cells arranged serially on rod-like bodies called chromosomes.) The genes in one race are in a certain order; in the other race, some of the genes are inverted.[2] The races are told apart by breeding tests. Race A produces fertile offspring when mated with Race A, but when mated with Race B, sterile male offspring are produced. Here is the indication of the subdivision of the species. If the two races thus formed were to have visible character differences, a classifier would be justified in concluding variations of the chromosomal arrangements. In the third chromosome"....twenty-one different sequences have been recorded."[3] Any subsequent rearrangement may produce a character difference, or mutations (changes in the genes) may do so; then race A will be obviously distinct from race B and two species will have been observed to have arisen from one species.

In another species of Drosophila, melanogaster, character differences have appeared in large numbers. There are hundreds of kinds of flies possessing varied eye colors or wing sizes or body colors. Yet each kind crosses with any other one to produce fertile offspring. To produce two species from this single species,

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* A paper presented at the third annual Convention of the American Scientific Affiliation at Calvin College, Grand Rapids, Michigan, September 2, 1948.

1. Goldschmidt, Material Basis of Evolution, 1940, p. 3.
2. Dobzhansky, Genetics and the Origin of Species, 1941, p. 120.
3. Ibid.

there needs to appear a chromosomal change which will make those individuals possessing one trait sterile with those displaying a contrasting trait. If this occurs, character differences will have preceded reproductive differences in species alteration. On the other hand in Drosophila pseudoobscura, reproductive segregation has already preceded character differentiation.

In nature, the species of Drosophila actually differ in the ways seen in the flies already discussed. Chromosomal rearrangements occur within the members of one species; "....the chromosomal differences between species are identical in kind, if not in degree, with those found among races and individuals."[4] We readily accept the idea that the members of one species have a common ancestry even though they now have various chromosomal patterns; why should we hesitate to believe that flies now admittedly separate species have a common ancestry if the differences between them are the kind that occur within one species?

Current biological thought holds that if any species gives rise to new species, then the conclusion may be drawn that the first living protoplasm could have been the ancestor of all kinds of life of the past and present. Reasoning from the probability that one species may become two, biologists conclude that one form of life may have given rise to all forms. As a creationist, I am willing to accept the origin of species from other species, called microevolution, but do not see the necessity for believing that a protozoon was transformed into a coelenterate, or a coelenterate into a round or segmented worm and similar macroevolutionary transformations up to man. "Experience seems to show, however, that there is no way toward an understanding of the mechanisms of macroevolutionary changes, which require time on a geological scale, other than through a full comprehension of the microevolutionary processes observable within the span of a human lifetime and often controlled by man's will. For this reason we are compelled at the present level of knowledge reluctantly to put a sign of equality between the mechanisms of macro- and microevolution, and, proceeding on this assumption, to push our investigations as far ahead as this working hypothesis will permit."[5]

Hereditary studies are incapable of establishing the assumed connection between all types of life. A university geneticist in a recent lecture remarked, "The higher categories and the problems there presented are a good ways from the field where genetics can make a direct contribution." Crosses can be made between species and between genera, and only infrequently between animals of greater distinctiveness. Because members of categories as widely separated as classes have not been crossed, there is no information about the similarities and differences in the genes of the members. We cannot put genes from two classes into one hybrid; birds and reptiles will not cross; we cannot therefore prove that the two could have come from one. The evolutionist speculates that somehow it could have happened; the creationist follows the statements of the Scriptures which say that the original kinds were brought forth by the command of God.

Notice some of the difficulties there would be in producing coelenterates from protozoa. A single celled animal would have to become many celled. These cells must be arranged into two layers, perhaps by the inpushing of one side of a hollow ball of cells. The inner cells acquire contractile fibers at their bases. Certain outer cells produce stinging capsules. The whole mass becomes arranged into body and tentacles. Only in imagination can there be found hereditary changes capable of producing all of these advances which must have occurred if members of one phylum (major group) were to change into members of another phylum. The evolutionist believes that in the past there were mutations which could do this al-

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4. Ibid., p. 148.
5. Ibid., p. 12.

though they are not observed at the present time. The mutations which have been noted have altered organisms within a limited sphere. One of my professors said, "It would be a miracle that a mutation causing diversity would also cause convergence for an adaptive end."

A NEW THEORY

Neo-Darwinian geneticists conceive that a species changes slowly over many generations until it forms reproductively isolated populations which can be considered two species. But Goldschmidt has questioned the ability of mutations to produce specific differences." Microevolution by accumulation of micromutations - we may also say neo-Darwinian evolution - is a process which leads to diversification strictly within the species, usually, if not exclusively, for the sake of adaptation of the species to specific conditions within the area which it is able to occupy."[6] Consequently, he has postulated a "new" kind of evolutionary mechanism, "Species and the higher categories originate in single macroevolutionary steps as completely new genetic systems. The genetical process which is involved consists of a repatterning of the chromosomes, which results in a new genetic system."[7] No mutations need to appear; all that is necessary is translocation[8] of genes already present.

This process, he feels, will produce new species more rapidly than will happen by the slow accumulation of small mutations. Drosophila miranda and Drosophila pseudo-obscura are only slightly different in external appearance, but hybrids between the species are sterile. Studies of chromosomes reveal that the species are distinguished by different arrangements of similar genes. But Goldschmidt believes that a relatively small repatterning of chromosome will also produce considerable changes in appearance.[10] This would avoid the difficulties of conceiving a gradual change from one species to another.[11] Peculiar structures like the preformed exit in a plant for the insect living in it could have been formed at a single step. The imitation of a distasteful species of butterfly by an inoffensive one need not be by a gradual change over many generations but could have occurred between parents and offspring merely by rearrangement of the positions of the parts of chromosomes.

Goldschmidt emphasizes the large amount of change which may be produced in an offspring if a pattern rearrangement occurs in the germ cells of the parents. The development of the offspring is considerably altered. The wingpattern in a butterfly (Papilio dardanus) varies markedly depending on a few differences in genes. It is supposed that a rearrangement of these genes would produce as great or a greater difference. There would be "macroevolution by single large steps."[12] However, some of the new characters in fruit flies showing greatest change from normal characters, such as the appearance of four wings instead of two, are the result of simple mutations and not the result of pattern changes. Goldschmidt presumed that alterations occur in the germ cells and survive or perish there. They need not wait until they have produced visible characters and these characters have been selected for survival or death. The altered chromosomal pattern finally selected

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6 Goldschmidt, op. cit., p. 183.
7 Ibid., p. 396.
8 A segment of a chromosome broken away and joined to another chromosome.
9 A segment of a chromosome broken out, turned around, and reattached to the same chromosome.
10. Ibid., p. 209.
11. Ibid., p. 244.
12. Ibid., p. 331

affects a developing individual so strikingly that a decidedly different form is produced. "The first bird hatched from a reptilian egg."[13] Goldschmidt admits "unfortunately no experimental attack upon this problem is at present apparent.."[14]

In a sentence summary, Goldschmidt's view is this: Slow accumulation of mutations over many generations will not change one species into another but the rearrangement of the genes will produce in the germ cells a pattern resulting in strikingly altered offspring which have become different species from the parents in a single step and are separated from them by a "bridgeless gap."

How has this idea been received by other geneticists? Dobzhansky notes that Goldschmidt's"...systemic mutations...have never been observed. It is possible to imagine a mutation so drastic that its product becomes a monster hurling itself beyond the confines of a species, genus, family or class...The assumption that such a product may, however rarely, walk the earth, overtaxes one's credulity,..."[15] Again "...the simplicity of Goldschmidt's theory is that of a belief in miracles."[16] Goldschmidt's chronosomal mutations, which are supposed to cause new species, are no different than those which occur within races of the same species. This is to say that Goldschmidt is offering nothing new; he is merely claiming more for a phenomenon than others do.

Single genetic changes may produce striking effects but the result is not likely to be a structure working harmoniously with other parts of the body. Summer holds that such "jumps" as Goldschmidt believes in are not integrated with the rest of the animal. To get a bird from a reptile by any other means than the slow accumulation of small changes, which is typical Darwinian evolution, would need "the direct intervention of the Creator Himself." "Only the wave of the magician's wand could have transformed the scales of a reptile forthright into the plumage of a bird."[17]

Another criticism of Goldschmidt's work is that he maintains species to be discrete groups, separated by the bridgeless gap from other species. Bridgeless, that is, by any other mechanism than the rapid transformations which he thinks his systemic mutations will produce. But species do not fit into rigid compartments. "The lack of universality of such rigid subdivisions is what has ever since Darwin been one of the main arguments in favor of evolution."[18] Certain species can easily be told apart. However, there are some species that blend into others; intermediates are placed arbitrarily. Among flies of the genus Drosophila, some types seem to belong to distinct species, other variants are classified according to the opinion of the investigator into different species or merely into different races of the same species.[19] Further, Dobzhansky and others point to the lack of definition of species by Goldschmidt so that a reader has difficulty in detecting where the "bridgeless gaps" between species exist. Consequently "...the main premise of his theory is wholly unacceptable."[20]

It should be mentioned to the credit of both Goldschmidt and neo-Darwinians, like Dobzhansky, that the latter admits, "It must, nevertheless, be recognized that Goldschmidt's keenly critical knowledge has emphasized the weaknesses and deficiencies of the neo-Darwinian conception of evolution, which are numerous, as even

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13. Ibid., p. 395. The statement was made by Geoffrey St. Hilaire.
14. Ibid., p. 334
15. Dobzhansky, op. cit., p. 53.
16. Dobzhansky, Science, Vol. 52, 1940, p. 358
17. Sumner, Science, Vol. 93, 1941, p. 522.
18. Dobzhansky, op. cit., p. 357.
19. Dobzhansky, Genetics and the Origin of Species, 1941, p. 371.
20. Ibid.

partisans ought to have the courage to admit. It would seem that this fact alone obliges anyone interested in the modern evolutionary thought to read Goldschmidt's book."[21] In my opinion, one is obliged to read Dobzhansky's excellent volume also and compare his handling of data with that by Goldschmidt.

COMPLEX ORGANS

The source of structures as complex as the eye has always been difficult to explain. "Here is one of the puzzles of evolution which appears to be still far from solution."[22] Goldschmidt has listed nineteen different features which he challenges Darwinian evolutionists to explain "by accumulation and selection of small mutants."[23] Mayr has admitted that "it is a considerable strain on one's credulity to assume that finely balanced systems such as the eye or a feather could be improved by random mutations."[24]

"The eye appears as if at a single jump from no definite previous form, and 'transitional stages are wholly conjectural'!"[25] There are eight or more theories recounted in Walls' volume. None of these is corroborated by comparative anatomy, because no animals exist possessing the stages which should have preceded the eyes of the cyclostomes (the first vertebrates), which in all essentials are like mammalian eyes. What caused the lens to be formed from ectoderm at the same time the retina was developing from the nerve tube is a 'tantalizing mystery'.[26]

"The study of heredity provides practically no evidence for a type of genetic change capable of producing the transformation of any kind of simple light-sensitive structure into a complex organ of visian."[27] A duplication of genes at one location on a chromosome of a fly will reduce the number of facets in a compound eye to a bar eye. Several eye color alterations have appeared but these are shades of red;.... "there has been no blue or green. In view of the frequency of mutation of eye color, one is led to suspect that blues and greens are absent because Drosophila is incapable of mutating in that way."[28] A certain mutation produces an eyeless condition. Another gives an antennalike structure "instead of an eye or combined with a rudimentary eye."[29] Not only is it difficult to see how mutations could improve the eye as it now exists, but also how they could even begin to form an eye in view of the fact that the known mutations of the eye are harmful to it. According to Walls, Froriep compared the origin of the eye to the birth of Athena full grown from the brow of Zeus. Because creation is the making of something without the necessity of a prototype, this abrupt appearance of the eye in vertebrates is in harmony with the Creation doctrine.

One modern scholar has seen the reasonableness of creation. "Some people assume, entirely as a matter of faith, a Divine Creation of living substance. The only alternative seems to be the assumption that at some time in the dim past, the chance association of the requisite chemicals in the presence of favorable temperatures, moisture, etc., produced living protoplasm. In other words, if one subscribes

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21. Dobzhansky, Science, Vol. 92, 1940, p. 358
22. Shull, Evolution, 1936, p. 161.
23. Goldschmidt, op. cit., pp. 6,7.
24. Mayr, Systematics and the Origin of Species, 1942. p. 296.
25. Neal and Raud, Chordate Anatomy, 1939, pp. 395, 407.
26. Walls, The Vertebrate Eye, 1942, p. 108.
27. Mixter, A Christian View of the Origin of the Vertebrate Eye, Christian Medical Society News, May, 1947
28. Shull, op. cit., p. 123
29. Goldschmidt, op. cit., p. 327.

to this theory, he admits that the first protoplasm to appear on our earth was a product of spontaneous generation. Then, if he accepts the evidence of Pasteur and others against spontaneous generation, he must reverse his explanation of the origin of the first protoplasm to explain the origin of all subsequent living protoplasm from the first protoplast. In other words, spontaneous generation, according to these opponents of the idea of Divine Creation, worked when the first living substance was formed, but probably hasn't worked since. Actually, biologists are still as far away as they ever were in their attempts to explain how the first protoplasm originated. The evidence of those who would explain life's origin on the basis of the accidental combination of suitable chemical elements is no more tangible than that of those people who place their faith in Divine Creation as the explanation of the development of life. Obviously, the latter have as much justification for their belief as do the former. It is possible that the problem of life's beginning on our planet will always remain insoluble, a philosophical question rather than a subject capable of experimental investigation and solution."[30]

R. Mixter 1/1/49

DISCUSSION OF DR. MIXTER'S PAPER:

DR. VOSKUYL: Thank you very much, Dr. Mixter. Are there any questions or any comments that you (the audience) would like to make?

QUESTION: I would like to ask Dr. Mixter whether the number of genes increase. I notice you have one with nine and another with nine and you get eighteen and so you have a combination, but the originals were always there to begin with. Now do you ever get eighteeen from nine without drawing in some other source of genes?

DR. MIXTER: Yes, sometimes in one species the number will just be duplicated so you have twice as many at the same time as before.

QUESTION: And then the combination results--

DR. MIXTER: Often in that case in bigger species or bigger specimens of the same species, but not structurally much different.

PROF. DE KONING: Dr. Mixter mentioned something about the interchange of the genes and the particular chromosomes as brought about by X-rays. Since his paper was entitled "The Mechanisms of Evolution", do you have any suggestion about how that accomplishment is made?

DR. MIXTER: Apparently it has not been produced by natural radiation because that is insufficient to produce the changes which are obvious by artificial radiation. No, they are still at a loss as to what has produced these changes.

MISS ALTA SCHROCK: Are there areas in the earth where these changes are more rapid than others?

DR. MIXTER: Yes, apparently down in some mines where there is more radiation down there. They took flies down there to see if the mutations increased and it did not do so significantly.

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30. Fuller, The Plant World, 1941, pp. 19, 20.

DR. KULP: I think we might well look to Brookhaven and similar laboratories that are doing extensive evolution-biology research using all types of radiations that are now available in attempting to see just what can be done along that line. Certainly results, if they are going to come, will come from that source. I would also like to ask Dr. Mixter if he has considered the new synthetic theory for the mechanism of evolution which Simpson claims is the final answer. I have read his article in the Scientific Monthly and I have tried to get around to write an appraisal of it, and it doesn't seem to me that he has said anything new. I wondered what you would say about that, Dr. Mixter.

DR. MIXTER: Simpson's synthetic creation is essentially that natural selection is the Creator, that nature has somehow watched over the whole process and selected-not in a sense that a Divine Mind would plan ahead and get things done--but in a sense that nature would somehow control its processes. I agree with you that I don't know exactly what he means by this synethetic creation. It is definitely an attempt to avoid thinking of a Divine Creator, somebody different from a member of the natural order of things. It seems to me that it was very intangible, and just a way of saying, I believe, "something has controlled all that, so we have gotten where we are."

DR. VOSKUYL: Are there any further questions? I am sure we wish to express our appreciation to Dr. Mixter for this excellent address.

DR. MAC RAE: I wonder if this would be a fair summary, to say that if a person sets out to imagine how this house was built and says they built that wing first and then this one next, or vice versa--you have a right to advance either hypothesis you want to so long as there is no definite evidence, but if you show no evidence either way, then it is purely a guess. If one man says, "I believe that God created by a single effort, and in accordance with his plan created the earth," and another man says, "No, I believe that through a natural process this came into effect,"--so long as there is no evidence wither way, one has a right to choose, and no one has a right to call the other a fool for choosing the other way.

The teachings of most of our colleges is that there is sufficient evidence of the way things came into existence; that the way our species came into existence is through an evolutionary process and that one is rather foolish not to accept it or to hold the other view.

Are we safe today in saying that there is no evidence that is at all conclusive as to any particular way in which such an evolution has occurred and therefore it remains a matter of individual choice as to which guess you prefer to make, rather than something which at present is not provable one way or the other? Is that right?

DR. MIXTER: I think all you can say is that this indicates that some sub-species have come from other sub-species and probably some species from other species. From that point on, the evolutionist assumes the process continues to work so you can get all the differentiation that appears in the animal and plant worlds. This says that there has been some change within birds since creation but that is quite different from saying that birds came from reptiles and reptiles from something else, so I think you have made a very good statement of it except this is the kind of evidence that the evolutionist works on at a minor level and that it must have worked that way in every case has been imagined.

DR. MAC RAE: You wouldn't say it was conclusive evidence that it has worked on any minor level?

DR. MIXTER: No, I think it is conclusive that on the minor level it has worked, but that is much different from saying that all has occurred that the evolutionist says has occurred.

DR. MAC RAE: A man said to me--a student said to me, "Of course, we have to believe in evolution, because you can always see the evolution of a boy into a man." To my mind, change which takes place in the natural world is something entirely different from evolution. The development of a caterpillar into a butterfly is in no sense an evolution. Now an evolution, if you have your species-A here as definitely existing and you see it under the appropriate circumstances develop into a species -B which is now distinct and cannot cross with A, and there you have before you clear evidence of the development of a new species. If you merely say you have A and B which you can't tell the difference except that they do not cross, it is purely conjectural, and I don't see how it is provable.

DR. MIXTER: I would agree with you.

DR. MAC RAE: Then you wouldn't say it is proven, would you, but merely conjecture.

DR. MIXTER: Well, all I would say is that it would be easier to believe that some one of those has given rise to all the others than to believe that the Creator bothered to make every special kind.

DR. MAC RAE: You mean you could believe that he created 1000 but not that he created 5000?

DR. MIXTER: Well, that is on too small a level. I could believe that he created 100,000 major types and that those 100,000 have given rise to the two million species that we now have.

DR. MAC RAE: But it is merely a matter of degree?

DR. MIXTER: That is right.

DR. MAC RAE: I mean if we can believe that the creator created 100,000, then it is just as easy to believe that he could create a million. It is simply a matter of proof one way or the other and the proof is lacking. It is merely a question of which seems easier to believe.

DR. MIXTURE: That is right, definitely.

DR. MONSMA: I don't think that statement is entirely correct. There is proof that there have been changes and we do know that within certain limits changes such as have been illustrated in this paper have taken place, so that we do know that there are more, well, what-do-you-call-it, species, or what else do you want to call it, than there were at the time of creation. I think that is quite definitely established.

DR. MAC RAE: Do you have any actual instances of that?

DR. MONSMA: I think so. It makes a difference as to what you want to call a species. Evidence has been found among the flies and the birds, evidence that one could cite that different forms have arisen from these similar types of ancestors.

DR. MAC RAE: You have a man and woman that are tall and maybe they have a dwarf child or a midget; and a couple of midgets have a child and it is tall. That is a striking change but it is entirely within our human species, and even if from

a tall group, small dwarfs are born and keep on being dwarfs as long as they interbreed with the tall group, you wouldn't say it is a new species, would you?

DR. MONSMA: No, I wouldn't, but who is going to tell what somebody else's point of view is. Taking an example of two groups, one called 'clumpers' and the other that they call 'splitters.' If you were a 'splitter,' you would call everything a new species; if you were a 'clumper,' you wouldn't.

DR. KULP: There is another problem. You are attempting to use the criterion of breeding. That is fine until you get into the field of paleontology. Naturally when you get into paleontology, the question arises as to what makes a species. According to the average paleontologist, it is simply a question of a distinguishable difference. When his whim decides that there are enough more rings on a certain shell to make it distinguishable for purposes of classification, that is a species. He can't say anything about breeding when he is a paleontologist. The only thing he can tell you apparently in a very broad way is that mammals and birds are not found in the earliest structures you find invertebrate life, but in considerably later structures you find mammals and in the very uppermost sheet of paper on this whole stack of volumes, you find hominoid fossils, and in a very broad way, that is about all he can say.

MISS ERDMANN: I disagree with that. I think you are talking about the greater gaps of evolution when you talk about man and the invertebrates and if you talk about just down to the level of the invertebrate paleontology there are many instances where we have indisputable changes through a succession of strata in a given number of centimeters. In other words, say you have 100 centimeters in a certain bank some place exposed, and in the bottom layer of those however many layers are there, you find one type of an animal; then in the successive ascending layers which represent successively later periods of time, you have changes in this one type of animal, and then by the time you get to the top layer, you have something entirely different from what you started with at the bottom layer, obviously something has happened there, and subjectively or not they call it two different species; but we have this direct proof on a small scale that we do have indisputable changes.

DR. KULP: I would disagree that it was indisputable, on the basis that a slight change in temperature would gradually make any species migrate along the coast so it would maintain precisely the same condition from top to bottom, so you might merely be reporting changing conditions at that particular spot.

MISS ERDMANN: You can change the strata across the country; you can check on that.

DR. KULP: If you can trace it in two dimensions it becomes of more significance but the paleontologist cannot hurdle the ecological barriers up to the present time. Until we can get physico-chemical methods to determine solubility, temperature, and pressure of the deposition, we cannot determine whether the fossil is the same or whether it has changed. I think that may come in ten years, but at the present time it isn't indisputable. It is merely evidence that there has been that change.

DR. VOSKUYL: Shouldn't we wait for the next ten years: There is a number of you that have been sitting here for at least an hour and a half, and the next two papers do not look like bed-time stories, so let's have a five-minute recess at this time.

THE SCIENTIFICO-LOGICAL STRUCTURE OF THE THEORY OF EVOLUTION

by
Bernard Ramm, A. B., B. D., M. A.
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Many scientists do not understand the actual structure and nature of scientific knowledge. In the laboratory they are of a very practical bent of mind, and they take things just about as they find them, i.e. they do not subject their methods nor materials nor scientific heritage to any kind of critical scrutiny. The results of this are usually bad because they lead to a very biased, dogmatic scientism.

This naivete is apparent in reference to the usual conception of scientific law. We speak of "proving" a scientific law beyond the shadow of a doubt. To the contrary today logicians admit that certainty of proof is possible only in formal logic, i.e. in the logic of classes in extension which neatly clips off the perplexing problem of intension.[1] Hence logicians restrict the word "prove" to the realm of formal logic where all statements are tautologies. Cohen and Nagel put it this way: "A hypothesis becomes verified, but of course not proved beyond every doubt, through the successful predictions it makes."[2]

In the realm of material[3] implication are to be found the problems of science. In material implication we prove nothing with certainty. We can only verify with degrees of probability. The naive scientist makes his big mistake right at this point: he uses the categories of formal logic in the realm of material implication and comes up with the application of formal certainty to the material non-formal world. And so it is that many writers speak of evolution as having been proved as if as a scientific statement it were endowed with the certainty of conclusions in symbolic logic.

Broadly speaking a law of nature is generalization. It may be a simple, empirical statement such as "lead has the properties of a, b, c...n." It may be a broader statement, i.e. more general, e.g. chemical reactions occur in units or multiples thereof. This would not only include lead but all the elements. Or we may even generalize further and say that every particle in the universe is attracted to every other particle in the universe in direct proportion to their masses, and in inverse proportion to the square of the distance.

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[1]The difference between intension and extension is somewhat as follows: To give the intention of a term is to indicate its qualities or characteristics, which is a very difficult job in many cases, e.g. the varying interpretations of man himself. To give the extension of a term is to give a list of the objects in the class or to simply indicate the class. Hence it is far easier to say X is a man (extension) than to say man is characterized by x, y, x,..n (intension). For further details on this cf. Blanshard, The Nature of Thought.

[2]Cohen and Nagel, An Introduction to Logic and Scientific Knowledge, p. 208

[3]Formal implication is the deduction of theorems from axioms, or primitive sentences. Geometry is the classical and historical example of a formal system with formal implication. In reference to the regular connections in the natural world the problem is far more complicated. Here connection is described as "material implication." Such implication is probable.

Thus generalization arises from the observation of particulars. We do not see laws; we see only instances, or cases of the law. In the falling of a rain drop we do not see the law of gravity but what we consider to be an instance of the law. When we have seen a great number of instances that appear to be similar we endeavor to form a generalization, i.e. a hypothesis that will explain the instances by showing that they are all members of a class.

The next question is this: how do we know if we have chosen the correct hypothesis? The truth or falsity of a hypothesis is in terms of the logical and experimental entailment of the hypothesis. In a logical system no hypothesis can be both true and false. If our hypothesis gets us into logical trouble we may find out that our system is wrong (i.e. the hypothesis is right) or that the hypothesis is wrong (the system is right).[4]

From the standpoint of experimentation an hypothesis must survive rigid tests. As soon as the hypothesis involves us into a contradiction in material implication then we must revise our hypothesis, or revise our entire science of that subject, or drop out the hypothesis. If, on the other hand, the hypothesis meets with success it gains prestige. If it meets with more success it is "converted" into a law.

But whether it be a simple empirical law of the nature of lead or a very broad generalization like the second law of thermodynamics, the law is still a probability statement. It is not a logical statement possessing universality and necessity. Its validity hangs upon further experimentation.[5]

So far we have endeavored to establish two propositions: (1). We must not think of physical laws in terms of logical certainty, and (2). We must conceive them as probability statements. Our (3) next statement is this: the more general a law is the more difficult it is to establish it with a high degree of probability[6] and the more susceptible it is to suplantation by another generalization. This can be illustrated by contrasting the problem of determining the specific heat of iron with the most general laws of astronomy. Perhaps a hundred more years of experimentation will not change our present figure for the specific heat of iron but cosmological generalizations involve such a complexity of data that we cannot have such simple assurances as we have about the specific heat of iron.

Now let us take our three propositions and endeavor to apply them to the theory of evolution.

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[4]The genius of Einstein was his reconstruction of physics rather than trying to patch up Newton. Relativity was born out of logical trouble, Einstein's so-called "thought experiments."

[5]For example, in reference to lead itself besides 204 they have discovered 206, 207, 208. Thus our law about lead must be further defined.

[6]However "crucial experiments" that meet the requirements for such have a high evidential value such as Eddington's verification of Einstein's theory of light being bent when passing a large body and thus confirming relativity theory (1919).

(1). If our first proposition is true, then we cannot think of evolution being established as certain, universal, and necessary. Scientists who use such terms are not speaking or writing accurately or clearly. They evidence lack of understanding in failing to discriminate between formal and material implication, between verification and confirmation.[7]

Bold pronouncements then as to the finality of evolution as the ultimate theory of biology are not in keeping with the nature of scientific knowledge.

(2). According to our second proposition, evolution is a probability statement.[8] It is, to begin with, based on a great number of observations, geological, biological, embryological, and psychological. From these observations are noted similarities and from these similarities a class is extracted, e.g. "all ostriches have long necks," "this animal reproduces by internal gestation," "event X follows event Y in the embryo." Such generalizations may be quite particular such as "ostriches have long necks" and others would be quite general such as "ontogeny recapitulates phylogeny."

Finally, the great bulk of scientific data is summarized by the most universal generalization possible such as "all animals are the result of previous gradual transformations and will in turn change into other forms by the continuance of this process of transformation." This much is clear, nobody actually saw evolution at work. What are observed are specific incidents and these incidents are classed into generalizations of different compass and are in turn probability statements. Evolution is a generalization of the widest biological compass and it cannot rise in certainty higher than the simple, empirical generalizations that are foundational to it, and it is therefore a probability statement.

As a hypothesis it can only survive when it can be shown that no logical inconsistency is involved in the systematic organization of the biological and geological sciences, and no material inconsistency develops. If a logical consistency is discovered, or if a material inconsistency develops, then evolution must either be modified or discarded depending on the seriousness of the trouble.

For example, if the theory of evolution be discovered to contain a series of contradictory statements the theory must be revised or discarded. It cannot categorically state at the same time the following: (a) Life comes only from life; (b) Life arose spontaneously ages ago. Nor can it state categorically: (c) offspring tend to keep within the normal spread of variation. This task of detecting internal inconsistency in the theory of evolution is a difficult and a tremendous one, and part of the current prestige of evolution is that this is not a major note in biological studies.

Again, evolution must be revised or altered if it can be shown that it runs into difficulty with material implication. If no mechanism for evolution can be demonstrated then the theory stands in grave danger. Typical of the evolutionists is Howells who admits that there is no known mechanism for evolution yet he accepts

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[7]A Classic article on such terms and the problems here mentioned is that of Rudolph Carnap, "Testability and Meaning," Philosophy of Science, 3:419-71, 1946, and 4:2-40, January, 1947.

[8]The philosopher of science who has most developed the probability character of scientific statements is Hans Reichenbach, Experience and Prediction, Chapter I.

the theory without facing the logical implications of the lack of a mechanism. He writes: "And there is also the mystery of how and why evolution takes place at all . . . Evolution is a fact, like digestion. . . Nor is it known just why evolution occurs, or exactly what guides its steps."[9]

Furthermore, the geologic record might get evolution into trouble. If in the course of the next hundred years it be clearly recognized that no real intermediary forms exist in the geological record, or that they exist in such meagre numbers as to forbid any real prediction, then evolution must again reckon with serious change or bankruptcy. Granted, all would agree not everything was preserved in the rocks, but at least we must reckon that things were representatively preserved.[10]

To summarize, all of the statements in evolution are probability statements whose further life hangs on further evidence that may confirm or deny. To assert finality is not in keeping with what we know to be the logico-scientific structure of scientific theory.

(3) The generalizations of generalizations are the most difficult statements to make because they are at the long end of a series of probability statements and because the verification of such a statement is fraught with so many problems such as the strong element of subjectivity in the scientist, the welter of details, the number of possibilities, the various less-generalized statements that need to be harmoniously worked in.

If the history of science is anything it is the history of ruined and wrecked generalizations. Although this is a sign of the health and self-correctiveness of science, it is also a sign of its uncertainty and tentativeness on the theoretical level. Two great generalizations have been accepted by western culture only to be subsequently discredited by the later developments. The first is Ptolemaic astronomy which seems to be so obvious to the naked eye. However we today pride ourselves in our emancipation from it. What was then commonplace and adequate is today listed among the mistaken theories.

Secondly, the Newtonian system acquired even more prestige than the Ptolemaic system for Newton had apparently written the very laws of God. For over two hundred years his system reigned supreme. But now after the work of such men as Einstein, Bohr, Planck, and Heisenberg, it stands as a special case of a now larger theory. Its absolutes (time, mass, and space) have been rejected. Its application to sub-atomic particles is an impossibility.

Besides these two great instances hundreds of others could be cited where the obvious and accepted has given way to the new such as in the theory of phlogiston, the generation of germs from slime and muck, the abhorrence of vacuum by nature. It would be well if the evolutionists would seriously face the significance of the history of science with its thousands of defunct hypotheses before it takes the theory of evolution as unquestionably established.

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[9]William Howells, Mankind So Far, p. 5.

[10]In a most interesting series of charts prepared by Dewar, the latter sets forth the statistics concerning fossil remains in terms of the number of general, the percentage, the relationship to those now living, etc. Dewar claims that this is the first time this has ever been done in the history of geology. Dewar and Shelton, Is Evolution Proved, p. 61 ff.

If the evolution theory be a generalization of a host of lesser and greater generalizations then it is not possible to show that--at the present time of knowledge--all possibilities have been exhausted. Like Ptolemaic astronomy and Newtonian physics it may be subsequently replaced. We must therefore insist that evolutionists use the word "probable" and not "true" when speaking of evolution. At best it is an effort at reconstruction as to how things might have happened, not how they must have happened. It is the best guess to date that an unregenerate mind can make that rejects Biblical revelation, and without revelation might never shift its position.

Finally, what is the interpretative principle that the Christian brings to the myriad of facts, biological, geological, and the like?

The general interpretative principle that this writer adopts is that Genesis 1 records in broad outline the successive creative acts of God in bringing the universe and world to the state when it could be inhabited by man. Being a very general and broad sketch, Genesis 1 leaves considerable room for the empirical determination of various and diverse facts. Hence a multitude of facts now generally accepted by scientists would remain unchanged according to this view we are advocating.

Secondly, there is no advance upward apart from the creative activity of God. There may be horizontal radiation of life but no vertical. This is precisely the point where this view differs from theistic evolution. Evolution, theistic and naturalistic, believes in the radiation of life from lower to higher forms, from the simple to the complex. According to our view radiation can only be horizontal. That is, the "root-specie" of, shall we say the "dogs" may radiate outward into wolves, coyotes, and dogs and all the varieties of each. But there is only unraveling of gene potentialities--no upward evolution. And this seems to be in keeping with the fact that we do have in geology no demonstrable verticle radiation but plenty of horizontal radiation.

Thirdly, Genesis gives us the general movement of the origin of geological strata and life forms. The six work-days are geologico-biological work days. We expect then the basic rocks to be azoic. We expect the simpler forms on the bottom layers. We expect the higher forms on the higher levels, and man the highest form on the highest level.

This presentation is, of course, limited by space, and thus somewhat sketchy but if fully worked out we believe that it would constitute a general interpretive concept that would replace the evolutionary one because it can account for all that evolution tries to account for, and then can go on and account for the things that evolution cannot. The reason for this is, we believe, that the basis of it, namely Genesis 1, is a divine revelation.

In closing we wish to point out that to indicate weaknesses and inconsistencies in evolution theory is all right but it does not go far enough. For example, in modern psychology there are serious objections to all the major schools of psychology yet the adherents to these various schools do not give up their convictions. Convictions are surrendered when a more unifying and integrating hypothesis is suggested and demonstrated. So, we as Christians must not think we have done our job by indicating the difficulties with evolutionary theory. We must go on and present clearly and factually the Christian interpretative principle in geology and biology. If we can show that this view has the maximum of internal consistency, and has a high degree of accuracy in material prediction, then we have really done something to the evolutionary theory. Until then we fight pretty much of a guerilla warfare that may sting but does not force a retreat.

DISCUSSION OF DR. RAMM'S PAPER:

DR. VOSKUYL: Thank you, Dr. Cowperthwaite, for reading this paper. Since the gentleman who wrote this paper is not present today, and it is not the best of Christian ethics to discuss someone else's paper behind his back, we perhaps should not discuss it. However, the following paper is so closely similar to it, that I think we shall postpone all discussion until that time.

I am sure that the Secretary of our group will extend to Prof. Ramm our appreciation for his splendid paper.

SOME PRESUPPOSITIONS IN EVOLUTIONARY THINKING

E. Y. Monsma, Prof. Organic Science, Calvin College

Some time last winter President Everest presented to the members of our affiliation a proposal that we publish our estimate of the evolution theory after we have thoroughly studied and discussed the matter and have come to certain definite conclusions. The proposed publication is to appear about ten or eleven years hence, at a time coinciding with the centennial of the publication of Darwin's "Origin of Species." This would give the members of our affiliation ample time to prepare a thoroughly scientific and scholarly work on the Christian approach to this vital and important subject. The suggestion is no doubt an excellent one. There is perhaps no greater need among us than a scholarly Biblical statement of views in regard to evolution.

Since the publication of the "Origin of Species" the theory of evolution has become established in the various fields of science to such an extent that one must admit its well nigh universal acceptance. Hundreds and perhaps thousands of books and papers have been written against it but to no avail so far as the prestige of the theory among the rank and file of the scientists is concerned. Religious leaders have attempted to stop the onrush on this theory because it seemed to conflict with the account of creation in Scripture but their attempts have gone largely unheeded. There is no use in duplicating work already done by others. If our organization is to do anything in this line it should be something different, something more fundamental than anything that has thus far been attempted. We shall have to be positive rather than negative. We shall have to construct rather than break down. If we do that, we shall have to start at the bottom, at the foundation. And it is just here that we, who believe the Scripture as God's inspired truth, differ from most evolutionary scientists of today. Faith in God and in His word is not a refuge for a bewildered mind whose native capacities have failed to comprehend the intricacies of a complex universe. It is rather a starting point and an accompaniment to the normal functioning of the mind. It is a guide to truth. We must be willing to assert that we start with certain presuppositions, test their validity, and proceed from them to the logical conclusions.

This may sound very unscientific in this age of inductive reasoning, and yet, in following this method we need be no more deductive than the modern scientist who interprets all he sees in the light of his evolutionary conception. I have yet to see a consistent evolutionary interpretation that was derived by a purely inductive process.

It is the purpose of this paper to point out briefly some fundamental presuppositions that are basic to evolutionary thinking, to evaluate them, and to give their phenomena. I mention just four. (There may be others):

The evolutionist believes:

1. That our knowledge of natural phenomena comes from nature alone.
2. That the fundamental similarities among living organisms can be explained only on a basis of a relationship of descent.
3. That the variations or changes that are observed in living organisms are unlimited in their scope, and
4. That the causes of such changes are operative today in the same way they have always been in the past.

The first mentioned presupposition, namely, that our knowledge of natural phenomena comes from nature alone, is in a sense basic to all the rest, for it is our counterpart to this proposition which enables us to see the limitations and shortcomings of the other three. The counterpart to the first proposition would read something like this:

> Natural phenomena are not known from nature alone but from nature and from the Scriptures, for God has revealed himself not only in nature but in the Scriptures as well. And it is precisely with the aid of this latter revelation that we get a complete picture of the facts.

Now it is evident that right here at the beginning of our considerations our faith plays its important part. It is here also that we can expect the most severe opposition. For what, after all, have we done with the so-called scientific method? Have we discarded it altogether? If so, we cannot expect to receive a listening ear from those who have so proudly and to a large extent so justifiably lauded its achievements during the past century. It is for us to point out that we have not dropped the scientific method altogether but that we have amplified it. We have included with our sources of knowledge the inscripturated word, because we believe it to be a part of the whole. Our unbelieving and liberal associates will not accept this inclusion as valid. We can only point out that without it we shall not be able to get a complete picture, for such questions about nature as whence? whither? and wherefore? can not be answered without it. We must be willing to take this position from the outset or lose the cornerstone of our entire scientific structure.

The second presupposition (that the fundamental similarities among living organisms can be explained only on the basis of a relationship of descent) is an assumption which seems logical when one considers that ordinarily things which are similar have a common origin. Lindsey in his "Textbook of Evolution and Genetics," for instance, devoted several paragraphs to this point.* He states among other things that, "When relationship is mentioned, the immediate thought aroused is of similarity. Further analysis shows that we cannot have similarity, i.e., relationship, without some degree of community of origin." To Lindsey and other evolutionists any similarity indicates a relationship of descent, a genetic relationship, and therefore, since living organisms have at least some structures in common, even though they be only protoplasm and cell structure, they must all have come from a common protoplasmic and cellular ancestor. This conclusion is unwarranted. Though we may be willing to admit that similarities usually indicate a common origin, we cannot conclude that all living organisms are genetically related. Sometimes similarity does not indicate such a relationship but is evidence of a common creative idea. Our counterpart for this second evolutionary presupposition would be: "Similarities in living organisms do not always indicate a genetic relationship, but they may and do in this case point to a common cause, a common author, a common creator who has made all things according to certain fundamental plans." This conclusion is just as logical as the evolutionary conclusion and we accept it because it is in accordance with the revelation in the Scriptures.

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*Lindsey--Chapter VII--1937.

A third presupposition deals with variations observed in living organisms. It is an observed fact that living organisms are not wholly static. That is, offspring are not identical with the parents. They differ from them in varying degrees of dissimilarity. The reasons for such dissimilarity can, at least to a large extent, be explained by Mendelian heredity, gene mutations, and polyploidy. It must be said to the credit of Charles Darwin that he took note of the importance of variations although the above-mentioned phenomena were not known at his time. We cannot, however, proceed to Darwin's conclusions that such variations have given rise to the various groups of animals and plants that exist today. Although modern scientists recognize the inadequacy of Darwin's theory, they nevertheless conclude that variations somehow or other have in the past and do now give rise to new forms of organisms. The whole quest of the modern evolutionists is to find some explanation for changes sufficiently significant to account for the appearance of these different forms. It is admitted that our present knowledge has not yet supplied us with an adequate explanation. Nevertheless, it is the firm conviction of evolutionists that there is an explanation and that through continued study and experimentation it will some day be discovered. It is this conviction that we cannot share, for it is based not on facts in the first place, but on a previous acceptance of the evolutionary process.

On the other hand, both Scripture and our present knowledge of scientific facts indicate that variations are limited in their scope. All known causes for change, such as ordinary Mendelian inheritance, hybridization, mutations, polyploidy, appear to operate within certain set boundaries, within which we observe the variation to which evolutionists attach such great significance. They argue from the specific to the general. Since they see variations which give rise to different forms within a species, they conclude that similar variations have given rise to different species and genera, and families, et cetera. Such a conclusion is not logically warranted.

In Scripture we have the significant statement that God created living organisms "after their kind." The word "kind" is not necessarily synonymous with the word "species" as used by the modern scientist. Because of the confusion presented by the use of the word "species" for the Genesis "kind," Marsh suggests that the word "baramin" be used. Says he, "If this word were used it could present but one idea in the mind of the reader; not the broad Linnaean species, nor his narrow one, nor the modern 'species', but only the 'Genesis Kind,'"* I do not know whether the use of such a new word is necessary. If it were used, however, it should be defined as a sort of kaleidoscopic entity within which the pattern and appearance may change and vary a thousand times, but whose various appearances are always limited by the number, shape, and color of the pieces that make up the pattern. This, I believe, is a true picture of the created Kinds of organisms. They vary and change, but their pattern is always limited by the genetic composition of the germ cells. So far as I can determine there is nothing in Scripture or in science that conflicts with such a conception. All the known facts seem to conform with it.

We come now to the fourth and last mentioned presupposition, namely, that the causes for change are operative today in the same way they have always been in the past. This has become one of the most fundamental assumptions of evolutionary thought. Dobzhavsky in his "Genetics and the Origin of Species" mentions it as one of the three main assertions of evolution when he says, "All these changes have arisen from causes which now continue in operation and which therefore can be studied experimentally."** Following in the wake of Charles Lyell and his actualistic

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* Marsh, F. L. --"Evolution, Creation, and Science," p. 162, 1944.

** Dobzhavsky, T. "Genetics and the Origin of Species," 2nd edition, p.8, N. Y. 1941.

geology, all evolutionists have made this principle their leadstar in determining the events of the past. For, as Nordenskield puts it, "if past natural phenomena in general are to be calculated or at least reconstructed with fair probability, it is necessary to start from the present, whose course of events it is possible to survey."*

It is no doubt due to the appeal of such statements that this principle has been so universally accepted not only by evolutionists but also, credulously, by some who profess not to believe in evolution. A consistent application of this principle, however, spells evolution if not in fact then certainly in a way of thinking. A consistent application of this principle, it seems to me, does away with creation in the orthodox interpretation of this term. It identifies present phenomena of development and change with the developmental processes which we call creation. The latter has always been interpreted by conservative Bible scholars as a unique process, which was completed at the beginning of the seventh day. It should not be confused with God's continued sustaining care of his creation, and his continued operation in the universe. These we call his providence. The distinctive character of God's creative work is clearly indicated in Genesis where we read: "And the heavens and the earth were finished, and all the host of them. And on the seventh day God finished his work which he had made; and he rested on the seventh day from all his work which he had made."**

A belief in the uniqueness of the creative process brings us face to face with certain difficult questions. These questions should be squarely faced before we attempt to publish our views of the origin of this universe from a Christian scientific point of view.

Why is it, for instance, that we so readily accept the period theory of the days of creation? Why is it that we so readily accept the two billion years estimate of the age of this earth and include in that age the entire creative period? Is it not in part due to the fact that we erase the line of demarcation between creation and providence? Is it not because consciously or unconsciously we accept the principle that present natural phenomena are a measure of past events, including the events of creation? Have we not with credulity accepted the interpretations based upon this fourth presupposition?

If so, should we not first of all reconsider the implications of some of our conclusions lest we find ourselves torn loose from our moorings?

Scripture tells us that God created this universe with all that it contains. It does not tell us how God created it. Does his other revelation, the revelation in nature, tell us that? Are his operations in the care and sustenance of this universe perhaps the same as those which governed his creation? This appears to be the assumption of some of us. But is this assumption in accord with the Scriptures? If it is not, we err when we come to certain conclusions which are based upon it. Paul under the guidance of the Holy Spirit tells us that, "The invisible things of him since the creation of the world are clearly seen, being perceived through the things that are made, even his everlasting power and divinity."*** Do these "things that are made" also show us the processes God used in making them? And the writer to the Hebrews tell us that it is" "By faith we understand that the worlds have

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* Nordenskield: "The History of Biology," p. 456, 1928

** Genesis 2:1 and 2

*** Romans 1:20

been framed by the word of God, so that what is seen hath not been made out of things which appear."* Does the Holy Spirit here mean to tell us that present appearances do not lead us into the mysteries of God's creative work?

It appears to me that we stand committed to an evolutionary philosophy if we do not distinguish clearly between creation and providence. But how then can we explain certain natural phenomena? How can a Christian geologist for instance, explain the earth's strata without Lyell's presupposition? Will he have to return to the old cataclysmic theories of Cuvier and others? Hardly. But upon the basis of Scripture, cataclysms can not be ruled out altogether. In this connection, we may ask: Have Christian biologists and geologists (outside of Price and his associates) taken adequate account of such Biblical and historical facts as the effects of sin and the fall, the peculiar characteristics of the antediluvian period, and the tremendous effects of the deluge?

In connection with this fourth presupposition it seems to me we shall first of all have to assert that we cannot hope to explain God's creative work by means of empirical procedure. Furthermore, we can accept the assertion of Marsh** that: "any.....changes which have appeared in organisms since creation have arisen through natural causes which now continue to be in operation and which therefore can be studied experimentally."

Before we as an organization are ready to express ourselves publicly and officially on the larger aspects of the evolution problem we should study prayerfully and scientifically such fundamental issues as I have tried to present in this paper. Then, with the help of God, we may at least be able to establish more firmly the faith of those who by God's grace are led to the truth and significance of that majestic pronouncement: "And God said let there be.....and there was."

DISCUSSION OF DR. MONSMA'S PAPER:

DR. VOSKUYL: Thank you, Dr. Monsma. I do not know but what you have precipatated what will be a very lengthy discussion.

MISS ERDMANN: I have a question for information. You seem to deplore the acceptance by Christians of the idea of geologic ages. Are you implying that evidence for geologic ages is insufficient for us to believe in them or if you believe in them, where would you place them in our current interpretations.

DR. MONSMA: I do not believe that we as Christians can--at least with the information that we have in hand now--say these geological ages represent the same days of creation as pushed back into the creation period. I would not deny, of course, the fact that we have stratification and all of that, but if we are going to interpret it upon the basis of what we see now, we can go back to the end of the creation period and no further.

I do believe that personally we as Christians have not taken into account enough of what has happened since creation. There is a series of events that took place there, and I don't believe that Christian geologists have taken into consideration at all as far as the series that I mention there, the sin, the effects of sin,

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* Hebrews 11:3

** Marsh, F. L.: "Evolution, Creation, Science," p. 24. Washington, 1944

the curse, and what the effect of that has been upon this universe.

If you want to talk about cataclysm, that is out, I know, but that cataclysm is a fact and you know the effect of it on creation. Then we also know that this whole antediluvian period was a period that is different from the present time. We know that definitely, We haven't taken that into consideration. I haven't seen it at least from the Christian geologist; and then so far as the deluge is concerned, I haven't seen any of our other Christians take that into consideration at all.

Weren't there tremendous changes in the description in Genesis there, tremendous changes which should certainly be evident in the world now. I think if we as Christians take that whole series of events into consideration we may come to a certain conclusion.

MISS ERDMANN: And then the second question I wish to ask you is whether or not the time which has elapsed since the flood wouldn't be negligible in geological effects in comparison with the time which passed up until then?

DR. MONSMA: In the first place, we don't know just how long that time is.

MISS ERDMANN: Within the limits, say, of 25 thousand years.

DR. MONSMA: I would not dare to answer that question because I am not a geologist. I would have to consider that seriously. Gedney, for instance, mentions a series of woods--of course, this reveals my ignorance here--but geologically speaking, seventeen woods on top of each other which can all be seen there and if we figure all that at the rate at which these things go on now, I suppose we would come to a tremendous amount of time. However, how long does it take to build up a woods? I am speaking perhaps now ignorantly, but I know I can say that within one hundred years you can have a full grown forest.

At the University of Illinois they have the university forestry which was planted from very small trees in 1870 or thereabouts, and I drove along there a couple of weeks ago and they are now giant trees, actually a forest. That has grown up in that short length of time, so I do believe that the possibility of woods growing up within one hundred years and having a good sized woods is quite possible and I know that some volcanic destruction of such a forest could take place in three or four days and perhaps even less time than that. I am thinking of that Mexican event down there, and no doubt conditions in early creation were different from what they are now, and what things have taken place in the past there, I am just wondering; I don't know whether the time that the geologist sets is correct, nor am I certain that the time that we have for the Biblical chronology is correct. They tell us that this early chronology is not correct, so I think we need more study on that question.

DR. KULP: I feel compelled to say something if I could have the board and some chalk.

One of the most probable facts in geology, I believe, is that the earth is close to two billion years old, and I think this can be demonstrated, at least by way of order of magnitude with as much validity as we can demonstrate many of the laws such as conservation of momentum that we meet with as physicists.

Unfortunately, historically this is true: Over the last fifty years there have been practically no Christians in the field of geology. I was trained as a chemist before I felt that the Lord wanted me to go into geology. I went into it very critically, and I am still overly critical of all information that I receive. How-

ever, most of us do not understand enough geology to appreciate the geologist's method of securing geological data. He is not one millionth the philosopher that he is usually given credit for being.

I would like to give you about four examples indicating the antiquity of the earth; and the only requirement that I would want Professor Monsma to agree with me on is that the rules haven't been changed. If he will say that the fundamental interactions between atoms, if the binding energies have changed, if God has completely changed the rules since whatever time you wish to specify, I can say nothing. However, if the rules have remained the same, if the hydrogen atom today is the same as the hydrogen atom of creation, if the combining energy of two atoms and if the binding energy of the uranium nucleus is the same, I think my case will be evident.

Really one doesn't have to go any farther than radio-activity to demonstrate the antiquity of the earth. First let's consider radioactivity. We know that uranium is something that disintegrates through a series to the end product, lead. We know that in doing so, it gives off helium atoms. We know that the rate at which this takes place is not affected by any temperature or pressure that we can put on that system at the earth's crust. That has been attempted. We have put pressure on uranium up to the equivalent of twenty miles of depth in the earth's crust which is deeper than most rocks that are now found, since they are found near the surface; and furthermore, we have subjected it to temperatures up to three or four thousand degrees without any change.

Now if the rules remain the same, the rate of disintegration of that specified uranium nucleus must have been the same whenever this uranium atom was put somewhere in the earth's crust as it is today. What happens geologically speaking is something like this: We have some simple horizontal strata of, say, sandstone and limestone. In the course of time there may be a fracture in the strata and some molten rock or some electrolyte solutions come up of high temperature and possibly high pressure, and in that fissure they may precipitate or crystallize crystals of uranium minerals and all other minerals.

Suppose now that a small crystal of uranium mineral forms in that belt at that time. Prior to the formation of that crystal, the uranium atoms were not directly associated with lead atoms. How do we know that? We know it in two ways; first, we know it because geo-chemically or just chemically uranium and lead are quite different in their reactions, and therefore, in a belt deep in the earth's crust they tend to be differentiated from each other because they are fundamentally different chemically.

But more than that we have analyzed the species of lead that one finds everywhere in the earth's crust. Now most of you here today have heard of the term isotope where the biologist would use the term species just as well. There are four isotopes of lead that are found everywhere you find ordinary lead, that is, lead that is not in close proximity to uranium, and the ratio of those four to each other is exactly the same. However or whenever you obtain or measure the lead that is found in a uranium crystal, you find that it is essentially composed of just one of these four species, and that one specie as we know by experiment is derived from the decomposition process. Well now, if there are some of the other prominent species in that crystal also, we know they were there because there was some primary lead present in the neighborhood and we can subtract that out before we make our computation of the ratio of lead to uranium. The ratio will increase with a known rate. If we measure the uranium:lead ratio and the species of lead that are present, then we have a very good estimate of the time since that crystal was formed.

Now this isn't the only story, because fortunately uranium decomposes into lead and while decomposing, gives off eight helium atoms and that is all trapped there. If we have another small crystal which is a magnetite crystal, that crystal will contain just a small amount of uranium. We can't measure the helium in this uranium crystal because there is just so much of it produced and most of that leaks out, but you take a tight crystal such as magnetite and you have 10^{-6} grams of uranium and in geological time that does not produce enough helium to produce enough pressure to explode and leak out, and we see no evidence of fracture or leakage. When we take the crystal and measure it, measure the ratio of helium to uranium and find that the age from that crystal compares favorably with the age as determined from uranium-lead ratio, we have very, very strong confirmatory evidence--but that isn't the end of it.

It also happens that the element rubidium, isotope 87 decomposes into strontium 87. Anywhere that you can find rubidium which is close to potassium, a certain fraction of it (about twenty per cent) is radioactive and decomposes into strontium. They are very different chemically, and when we get a pegmatite to freeze in such a position, we find rubidium that is independent of strontium except for this peculiar strontium No. 87, which is the result of the decomposition of rubidium 87, and again we know that the rate of decomposition is not dependent upon nor effected by temperature and pressure, and again these values in a rough way check. We have values for all of these, and they show that they are up towards two billion years old.

There are still other methods, since this process occurs and since strontium is found in ocean water and all over the world, and since the process itself is taking place in our geologic time, the ratio of strontium in the ocean water of this species is going to increase over ordinary strontium during geological time, and again in a gypsum bed, the ratio of strontium 87 to ordinary strontium No. 88 should constantly increase, and once we can calibrate that system, that becomes a way of measuring the time when that strontium was deposited out of the ocean; and that too gives confirmatory evidence.

Maybe that is all philosophy, but it is just physics and chemistry really, so let's go on to something a little more picturesque.

First I would like to go back to the petrified forests. We have out in the western edge of Yellowstone Park a formation showing seventeen successive petrified forests which is exposed in the gorge of the Yellowstone River. Now there are several things to note here. First of all, the seventeen successive petrified forests are not the geological count of that area. There are quite a number of other strata on top. There are some folded sedimentary rocks below, and of course, the gorge is not cut to the bottom of the sequence. Let's reconstruct what happened here.

First you have to lay down under water these successive sedimentary rocks and with this sandstone, that means that there were just certain conditions of velocity of water that could have washed out that particular material, because if the water is moving more slowly, fine clay would have been deposited. We find a shale or a silt bed and then we know that the water is carried more slowly. Furthermore, we know that if there is a limestone, the limestone was precipitated under quite different conditions. Therefore, these had to be laid down each under different physico-chemical conditions. After that sequence was laid down, just from what you see on the board here, you know that this area had to be folded.

Now from some of the comments I received in the discussion yesterday, it is evident that many of us do not have much appreciation perhaps for what happens when you fold rocks. The rocks that are folded are just as hard as any other rocks that you have ever seen, but they are not fractured, and they still show the individual unformed shells, deformed shells or fossils, and the undeformed sand and silt grains.

Very elementary knowledge of physics will certainly tell anyone that if you attempt to squeeze solid rock and fold it into a pattern a tremendous length of time will be required otherwise the internal friction would be so tremendous that you would melt the rock, and then of course, it would look like granite. You would no longer have the undeformed shells or nice little rounded sand grains. It would be quite a different looking thing, and in fact, it wouldn't be too difficult a thing to compute how slowly such a process would have to be for the adequate dissipation of the heat so that it wouldn't melt the rock, knowing the internal coefficient of friction. After all, that took place while this whole thing was growing. It is true, as was pointed out to me this noon that you can weather away soil if it isn't properly protected. You can take six or ten or fifty feet of soil away and loose dirt without much trouble but to weather away solid rock and bring it down to that low a level, takes a tremendous length of time.

After that took place, the area had successive petrified forests, seventeen of them. Let's concern ourselves with that for a moment. I don't claim that you can make several hundred thousand or million years for that, but I think you have to allow a little more time than Prof. Monsma wanted to admit.

In the first place, many of these forests have very considerable trees, trees in which the rings can essentially be counted because they are petrified so well, and it has been demonstrated that the rings are annular and they can be counted and therefore you can demonstrate that some of these forests are up to one thousand years old, but suppose that a volcanic ash wipes it out in three days which it could have done and probably did; have you considered how long it takes to make fertile soil out of that volcanic soil? Before the next set of trees can even start to grow in an area -- assume that it was a wide area, and then the second one starts and so on for seventeen times, and after that is all over with, you still have some other layers laid down, and then when you finish laying all those down, the top of this formation had to be the level of ocean or an inland sea, and once all that was done, this whole area had to be lifted possibly a mile or more in the air in the Grand Canyon region, and then in that lifting process, the river had to cut down through. This is qualitative, but I think that is an impressive example.

My last example brings us to Grand Rapids, Michigan, because it is always interesting to know a little bit about what we are standing on. We are standing on something like fifteen miles of sedimentary rock. In this board illustration, I can only sketch in a very rough way the sedimentary sequence under Michigan, the famous Michigan basin, those rocks go down to tremendous depths. Again, each of these layers is of a different type laid down under different conditions. Very deep oil wells across the state have penetrated these.

What is the significance of the sequence here? Is it not the fact that all of these have been laid down on a very old basin which had to be provided before you even started? All of these have been laid down in a depositional trough, and that trough was constantly sinking.

The important thing is that there is a very thick band of salt which provides great wealth for the state here.

Let's consider how those bands of salt were formed. They are salt, anhydrite and gypsum, and if you were to take ocean water of about thirty miles in depth which, of course, is about six times deeper than most places in the ocean, and evaporate it, you will get something on the order of one hundred feet of gypsum. This, of course, can be computed accurately. It is on this order of magnitude because sea water is so diluted. Of course, you don't have thirty miles of sea water over Michigan, but what you must have is a lagoon type of surface under arid conditions where water is washed over the inland sea or lagoon and where you have constant evaporation and concentrating in the trough.

Over in Africa and in Mexico, the oil geologists have driven over this type of sequence. You have an arid condition and an inland sea with constant washing into a sinking trough, because some of these go up to about three hundred feet in thickness in West Texas, and if you take all of the salt, you would come to probably over a half a mile thick.

Well now, to me, that sort of thing means that the Creator either put all this in together to deceive us, which obviously isn't true to my way of thinking, or the rules have been the same and great antiquity is required for this in every one of these strata from top to bottom, and in all of them you can find fossils or fossil life of one type or another.

DR. VOSKUYL: Thank you very much. We didn't promise you this extra lecture, but we appreciate it. Are there any further questions, any more discussions?

DR. BENDER: I appreciate what we have had, and I appreciate very much the approach that Dr. Kulp has given us in the study of geology. I think, however, that the arguments that Dr. Monsma has presented in the latter part of his paper essentially still stand, and that is that we must give recognition to the viewpoints that he was mentioning. We must give recognition to the possibility of some cataclysms of various kinds, not that we will blindly close our eyes to the obvious physical facts, certainly not. That is part of our condition. I am not a geologist, but I have been interested in geology for some time and there is a number of problems that I would like to have answers for. One of them is simply the large extent of fossils and fossil content in these strata and stratified layers.

So far as one can determine now, it is difficult to find anything on the surface of the earth that would be fossilizing, plants or animals, at the present time, and so one will need to postulate some condition other than what is existing at the present time in order to have produced fossils at all, at least to the large extent in which they are found; also the very large extent of the stratified layers must have some explanation other than present conditions because nowhere do we find stratification occurring over any extended area such as these things would require. Those are merely problems. I don't know what the answers are. I hope that somebody will find the answers to them, but it seems to me that we will have to recognize them as problems and also recognize that Dr. Monsma has presented the fact that the Bible does postulate some cataclysms, and I don't see why we can't piece these things together. I think that is the tremendous task before us now.

May I say one more thing. I think that Dr. Monsma has done a very excellent job in pointing out to us that we need to be positive in our actual approach to the whole problem, and I think it certainly connects with our purpose, as will probably be discussed tomorrow, that our task as an Affiliation is not so much to add to the existing argument against evolution as it is to present a consistent treatment of the whole problem that is positive and that is Biblical.

DR. MAC RAE: I wonder if Dr. Kulp would say a word on the matter of fossils. What does make fossils and is it true that they are not being made now? What is that situation? I don't know anything about it whatsoever.

DR. KULP: I hesitate to disagree so flatly with Dr. Bender but I have seen large areas of fossils and fossil formation at the present time and I can point to half a dozen areas in the earth's crust where there are tremendous crusts undergoing stratification at the present time. One example that is very close is the present Gulf of Mexico.

They are drilling for oil in the Gulf of Mexico at the present time, and that is a very vast area taking in more than all of New England and New York put together. The area is a depositional trough at the present time as big as some of these great trough-like areas such as the Michigan basin in times past. The basin of Southern California is another one. There is a great one in the Caspian Sea and another one in the Black Sea.

Regarding the fossils, you can go down on the Florida coast and if you can get out and get with some of those well drilling companies where they are drilling through recent lime muds, you can see everything, and you can see limestone while it is still soft. You can see all sorts of fragments of fossils. Maybe you can get Miss Erdmann to tell you more about that. I was also thinking of an example of Jones Beach in New York. You can go down to the water and come back about thirty feet from the water and there is just a little rise of about six feet of sand and you can go there and look at that bank, and it is the most perfect example of a fossiliferous sand I can think of that is not stone yet. You can pick out every little shell, and every one of them is perfectly in place in a layer, and if that region were to subside or the ocean were to move out and a stream were to come down over there and deposit more material, in time that would go over into sandstone, but to me that is the best textbook example that I can think of.

I think that the geologists who have been out in the field and who have followed a lot of these oil drilling companies will recognize many places where the same type of rock and the same form of fossilization is going on today.

Now as far as the catastrophies are concerned, that is a very good point and something that we should look for. However, regarding the flood, insofar as geology is concerned, one would not expect much of a record of the flood of Noah, even if it had covered, as apparently it did, the entire earth. The reason for that is that if you had certain displacement which would allow a great tidal wave to go over the entire earth, the amount of sediment would be negligible. That doesn't come from tidal waves. It comes from the gradual erosion of mountain slopes and uplands, and therefore, that certainly may have covered the entire face of the earth. A thousand years later, subsequent erosion may have removed all traces of such an event. However, there should have been those major displacements, and the geo-physicist particularly with his seismological equipment should pick up something like that, and I think that is where we ought to look, but not to look for these shells on the top of the peak.

DR. MONSMA: May I just say this? I know I am sticking my neck out in starting the geology here, but I am very glad that Dr. Kulp has given us his viewpoints on that. I think that we should have it. The statement that I want to call attention to is the fact that my emphasis was this, that there is a difference between Creation and Providence. I believe that upon the basis of Scripture we must adhere to that, and I am afraid that at the present time geologists are not doing that. My solution is perhaps not the correct one; the solution at least, that I answered Miss Erdmann is perhaps not the correct one but I would like to consider this: If things do

occur the same way now that they always have, is God operating now the same way as he did in the past? I think we should seriously consider that, and that is the point that I wanted to make.

DR. GATHERCOAL: I would like to say that Dr. Monsma's presentation is the most sound and fundamental one that I have ever seen presented in this organization, because it is based upon the word of God. Now we all recognize innumerable difficulties this vast amount of study involves, but I really believe that if it is undertaken that the Lord himself will help us most wonderfully in it. Now, in the first place, there are about fifteen thousand statements in the Word bearing upon this subject, and I really believe that if those are carefully looked up and analyzed, put into tables under the different headings and studied by scientists who know how to interpret a good many of them, that you will have a foundation that will not be overturned. It is a great amount of work but we are laying aside for this work perhaps a period of five or six years. If the work is started at once, and if it is divided up and assigned and is really undertaken in the spirit in which it has been offered here this afternoon, I think it will be an absolute success.

Now I am not going to offer to list by positions those fifteen thousand references, but I am going to make a start on them.

DR. MAC RAE: How many of them bearing on evolution or geology did you say there was?

DR. GATHERCOAL: The subject was on evolution. Geology doesn't hurt us any. That is all right, and as far as that period of two billion years is concerned, we don't need to worry about that. That is all provided for in the Word.

DR. MAXWELL: May I ask a question in regard to uranium? They seem to be using the disintegration of these materials as a clock more or less, and I wanted to ask, is there any uranium in the world that has not disintegrated? And if so, where does it come from and who started it?

When does the clock start, in other words? I think that ought to be answered. Then I have this further remark in regard to Dr. Gathercoal's remarks. I think that is in line and along the point that Dr. Monsma is suggesting, that we can work along on that as a positive line, and that is what we have all been wanting.

Just this last year or so I have been working on that line Dr. Gathercoal mentioned, and I find a tremendous lot of material. I think he is very conservative in saying fifteen thousand statements in the Bible, and therefore to my mind it is fundamental science, basic science, the truth, and from that we can really produce something which will stand the test of a true science in time, and being out of the study-method, but there are other methods, and whatever method we use we will get the same truth. So then let's start using our Bibles and our knowledge of science and see if we can't build up something constructive and positive.

DR. VOSKUYL: I will stand corrected by anyone that wants to correct me, but as far as I know there has been no such thing as pure uranium found. The isotopes are all found in a definite specific ratio and that indicates that at one time there perhaps was pure uranium, but since that time there has been that constant disintegration going on.

DR. KULP: I think part of the problem has been half-life. It doesn't all go off at once.

DR. COWPERTHWAITE: I wonder if that really answers the question which has been raised by Dr. Maxwell. As I understand Dr. Maxwell's question, it is that if we find some uranium in a pegmatite, how do we know that when the pegmatite was formed, the uranium was pure and not already partially decomposed. We get that from our theories of solution that the pegmatite is a liquid and the different minerals and crystals formed from the liquid state according to their individual solubility. Uranium mineral would have a different solubility from the lead mineral. Therefore, when the liquid solidified, the uranium would crystalize out free from disintegration products so that at the time of solidification, you would have pure uranium mineral which could start this disintegration from that time on.

DR. BARNES: I wanted to ask one or two questions purely for information. We have all been urging a positive approach to this problem. It seems to me that we have been presented with a positive scientific evaluation of some of the existing phenomena and if we accept that as positive it is necessary to provide for a great deal of time.

Now, I would like to ask this question: could the proposed or supposed lapse in time usually placed between the first and second verses of Genesis be considered useful for this purpose? I suppose that perhaps Prof. MacRae could straighten me out on that or perhaps Dr. Kulp.

DR. KULP: I would refer you to that article that you have had in your possession for some time by Prof. Ramm who very beautifully treats that subject. I think it shows that particularly from a Biblical point of view there isn't too much to commend the view, but from the geological point of view there is even less.

DR. MAC RAE: Will you explain that last statement?

DR. KULP: I think that if we are going to have a great catastrophe such as Satan and his hosts, you are going to do awful things to the neatly placed geological strata and there isn't any evidence of such a thing in the geological record.

DR. MIXTER: Are these strata in Dr. Monsma's suggestion part of God's providence or what or where are providence and creation in relation to that?

DR. MONSMA: I am not ready to answer that. That is one of the questions that I think we should face. If that is entirely determined upon the basis of present-day changes, I would say we must be careful about how we go into that. You use the same yardstick that we are using for what happens today, and I should just like to make that at the present time a warning lest we are cut loose from our moorings. I think we have to be very careful there to make certain presuppositions which perhaps we do not have to take. I know that there is a great deal of possibility in that creative period. The earth was waste and void. In the beginning God created the heavens and the earth. What does that mean, a separation of water and land? That must have been some tremendous things too, but can we on the basis of present-day phenomena determine just what it was and when it was? That is my question.

DR. MIXTER: How much of Genesis One is Creation and how much is Providence?

DR. MONSMA: The way I indicated it in my paper, you can't distinguish the whole thing, but the way I would distinguish it is when God said that the heavens and the earth were finished, we have the end of the creative period, and from then on, we can't speak of Creation any more. At the end of the sixth day it was completed, and then we get Providence. I believe that is the Biblical view of it, and I think we must realize that the evolutionist's view of it, of course, doesn't

and so my feeling as far as the geology is concerned, it is wise for us to reserve judgment on a great many things.

There are certain points that appear to Dr. Kulp to be practical and answerable at present. I don't think that any one of us should take his word for it. We need to go further in that ourselves, and he also needs to work on it. I think if we find that the evidence is just about absolutely definite on these points, I think there is a way of interpreting the Scriptural evidence in such a way that these matters can be worked out. I can think of five or six hypotheses in the Scripture, on the basis of Scriptural questions where there is no difficulty in the matter of the earth's being two billion years old, but I don't want to adopt any one of these five or six hypotheses and stand on that; I simply don't know, and I would rather not adopt any one of them unless it is necessary, but I don't see any difficulty from Scriptural standpoint in seizing one of the five or six on the matter of the age of the earth.

The age of man is more difficult, but not insuperable.

There is one point on which we should be cautious, and that concerns the statement that Dr. Kulp made, "if the rules were not changed; if the rules remained the same." I think it is entirely possible and quite probable that the Lord has kept the rules the same for a very long period but I think what we know of the rules is a very small proportion of what there is to know. What we have been told is a very small part. In any field of past history, social or human or physical, there is always the possibility of other forces or factors that we don't know about at all, which could make tremendous changes over a large period of time and then be quiescent for a period.

I feel that when we get into the dogmatic statements, particularly about the time before writing came into existence, I think there is a tremendous possibility of other forces that we can't think of but which we can discover at some time. A man of a few years ago would say it was utterly impossible for an airplane to fly without a propeller. Today jet planes are common; there is a new factor that we didn't think of then, and we can find that over and over in all phases of science, and when we come to past history, I think we must reserve a large amount of the decision on the question, that there may be some other factor that we don't know about. Even of this matter of the decomposition of uranium, it would seem on the basis of present knowledge that the rate might not have been different, and yet I think it is far from possible to say that there might not be some other factor that was operating over a large part of the earth's surface at one time, perhaps before the flood and removed at the present time, and perhaps some other thing that might be discovered at some future time.

I feel that when we get into the past history, we should be very very cautious. You will find any book in our archeology of thirty years ago telling about the great rulers of 5500 B. C. and that 4241 B. C. is the earliest fixed date in history of the Egyptians. Today no archeologist believes that there is any date that can be given previous to 3000 B. C. because it is now regularly understood or recognized that all those dates they put of five or six thousand B. C., or all higher than 3000 B. C., are incorrect because there was no writing. The whole attitude has changed. As far as any probable date in archeology is concerned today, Ussher's Chronology could be correct.

Now ten or twenty years ago people on the basis of archeology would just laugh. You can't do that today, so I would like to recommend extreme caution on past history on chronology, and I think we should have a more open mind on these matters of geology than we have as yet, and I hope that there will be others like Dr. Kulp who will go into the archeological work quite thoroughly in the next few years.

DR. VOSKUYL: Thank you. Well, that seems to conclude the speeches for the afternoon. We wish to express our appreciation for the kind attention which our visitors have given us. We are glad that you could be with us.

Bertrand Russell, Human Knowledge: Its Scope and Limits. New York; Simon and Schuster, 1948. 507 pp.

Reviewed by Bernard Ramm
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This is a typical Bertrand Russell book. The reviewer has read most of the serious philosophical works of Russell and can verify that this is simply refinement and extension of former views. Russell has stated elsewhere that he planned to write one more really philosophic work and that it was to be on epistemology. Human Knowledge is it.

The content of the book covers a wide range of material. It is divided into six sections: The World of Science, Language, Science and Perception, Scientific Concepts, Probability, Postulates of Scientific Inference. There is a vast amount of material here and as such the book can be used as a ready reference for a number of subjects. However, the reader unacquainted with philosophical terminology and problems will find the book almost a complete bore. Russell touches many vital and sore spots in philosophic territory but he writes on the more difficult and more technical subject matters. For example, the section on Language would be quite irrelevant to some not knowing of the linguistic movement in science and philosophy as propagated by the Vienna Circle. Again, the section on Probability might seem more for mathematicians than for philosophers, yet the problem of probability is one of the most acute in the philosophy of science at the present hour.

To understand this book one must understand Russell's pan-objectivism which is the leading notion of the new realism school of philosophy. Most philosophers, as well as the common herd of humanity, consider that mental life and mental events are very different from physical events and objects. For example you can give an added impetus to the velocity of a ball but to reinforce a thought an entirely different procedure is necessary. New realism says that the world of mind and the world of physics make up one unbroken continum and that mental life is to be considered as much a part of the objective physicalistic world as atoms and electrons. What previous philosophers had said was --objective--colors, tastes, smells, variant perspectives of objects--new realism grants full objective status. Even hallucinations, dreams, and illusions have some type of objective existence. Unless one realizes that Russell represents this extreme objectivism this book will not make too much sense, for the entire book is built around this leading notion.

First to be noticed is the complete omission of ethics, morality, and religion as of any vital or valid interest to philosophy. In that philosophy is really the more general aspect of science quite obviously what is subjective must be ruled out. In fact elsewhere Russell has said that (1) ethics ought not to be allowed in philosophy, and (2) we must not bemoan the fact that scientific philosophy is dry, abstract, technical, and unhuman (not inhuman). He says if we are to blame anybody for this we should blame the universe. His personal autobiography reveals that his rejection of Christianity was on a very immature and flimsy basis. However, it has

been pointed out before that Russell's intense social activity and writing stands in dire contradiction to his ruling ethics out of philosophy.

Secondly, Russell well illustrates what has been called in these days "the idolatry of physics." Russell takes Einstein'a relativity as metaphysical. As a result the entire range of his philosophy is heavily colored by a resolute determination to make everything a branch of or a derivation from physics. This means that he follows a most intense reductionism. In reference to biological life he writes: "There is no reason to suppose living matter subject to any laws other than those to which inanimate matter is subject, and considerable reason to think that everything in the behavior of living matter is theoretically explicable in terms of physics and chemistry (p. 36)." In reference to mental life he says: "On the evidence as it exists the most probably hypothesis is that, in the chain of events from sense organ to muscle, everything is determined by the laws of macroscopic physics (p. 41)." Eventually mental life is reduced to a case of quantum mechanics.

The third observation is that the entire book is a struggle of a sensationalist to get something (knowledge) out of nothing (blind percepts). The primitive assumption is that the brain is simply a bundle of potentiality and plasticity. However the brain of a very learned philosopher is filled with a tremendous variety of very technical and complicated details. Yet Russell undertakes to derive the latter from the former and that leads him into many long dry pages of psychological analysis, linguistic analysis, and conceptual analysis. In reality, if pan-objectivism is true then meaning and truthfulness are simply impossible. A physical event cannot be its own meaning, and a completely determined physical system cannot even engage the categories of meaningfulness and truthfulness. In short, it seems that Russell's attempt to dispense with a mind--an organ that can think, know, judge, have meanings, and make decisions--can only be done by the use of the thing he is trying to get rid of.

The fourth observation is the use of the methods of mathematics and logic in the analysis of many philosophic problems. Russell has a solid and enduring reputation as both logician and mathematician. He applies these methods in philosophy. In fact philosophy to him is the analysis of science and its problems with the use of logic and mathematics. Here again the non-philosophical reader will run into large sections of the book that will be quite boring. However, that doesn't bother Russell for to Russell that simply means that the universe is technical and boring! But this method of analysis stands in direct opposition to the traditional Christian and spiritual interpretation of the universe. All mystical, intuitive, synoptic, and revelatory methods of gaining truth are rejected. Any cues from emotion, aesthetics, human need and aspirations are ruled out. Only that which can be handled by mathematics and logic is permitted to stay. However it does not seem to dawn on such a man as Russell that this resolute effort to be pan-objectivistic is the very reason that neither political scientists nor physical scientists can handle moral and spiritual crises in our civilization, e.g., the atom bomb.

A fifth observation is that twice he makes reference to the Christian notion that creation took place at 4004 B. C. which means that for the most part that is still the common view about our position by even educated people. Therefore, it means that our Christian apologetic needs to be pushed seriously and hard so that such accusations will no longer be made.

In summary we would say that this book covers quite thoroughly a very wide range of knowledge; that anybody who cares to painfully digest all that is said will come out a very much wiser and informed man; that many very vital and important subjects are authoritatively dealt with and as such the book can be a sort of handbook for this type of material; but the pan-objectivism of the book--its emphasis on physics, mathematics and logic, and its rejection of ethics, morality, religion, and revelation--reveals its basic deficiency from the Christian viewpoint.